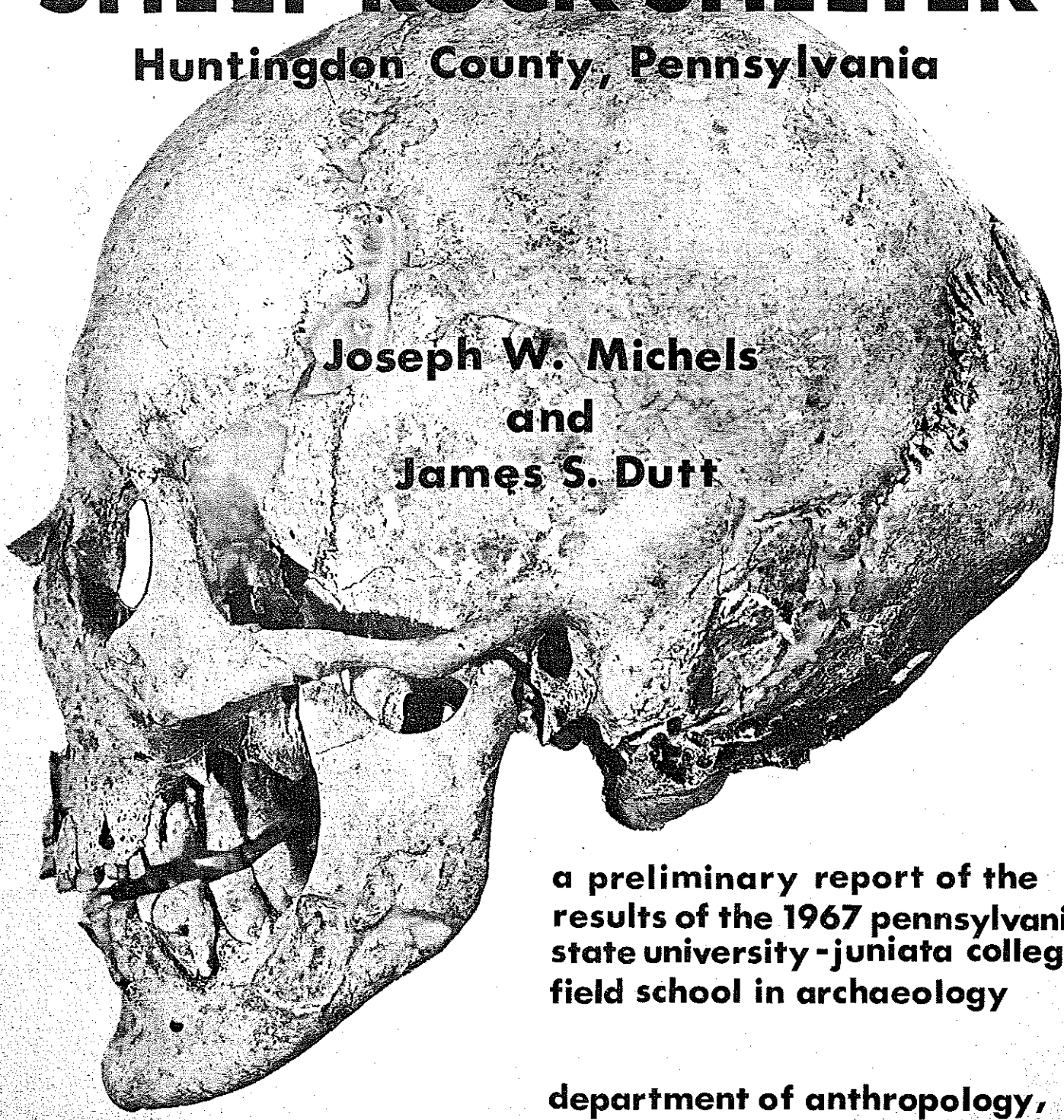
Archaeological Investigations of

SHEEP ROCK SHELTER

Huntingdon County, Pennsylvania



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and

James S. Dutt

a preliminary report of the results of the 1967 pennsylvania state university - juniata college field school in archaeology

department of anthropology, pennsylvania state university

Volume 3

may, 1968

A PRELIMINARY REPORT

OF

ARCHAEOLOGICAL INVESTIGATIONS

OF THE

SHEEP ROCK SHELTER SITE

Huntingdon, Pennsylvania

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FOREWORD

by

Joseph W. Michels

INTRODUCTION TO VOLUME THREE

After eight seasons of field work the excavation of Sheep Rock Shelter has come to an end. A terminal excavation program was conducted in Summer 1967 by the Penn State archaeological field school. The primary objective of that program was to secure additional information for the preparation of the final stratigraphic profiles, and to explore the Archaic deposits at the south end of the rock shelter. This report, the last of a three-volume series, discusses the results of our final season of excavation. In addition, this volume constitutes the final preliminary report on the various programs of analysis associated with archaeological investigations of the shelter. As such, this volume may be considered a supplement to volumes one and two. Chapters in this report which function essentially as supplements to chapters published in the first two volumes are so designated in the chapter introductions. Chapters that report new programs of analysis are similarly indicated.

In the months that have passed since our last preliminary report, we have made substantial progress in all phases of our investigation. We have located previously unpublished manuscripts by Fred Kinsey and John Witthoft reporting on the results of earlier field seasons, and have reproduced them in this report with the kind permission of the authors. Fred Kinsey's report gives us a glimpse at original field techniques and early estimates of site occupation. John Witthoft provides us with a number of impressions that dramatically bring the shelter's early inhabitants to life. In addition, his report of the upper stratigraphic levels of the site deposit clarify relationships among features and artifacts that were unclear in the field notes and stratigraphic profiles. Their summary reports, together with the exerpts from the article by Edgar Stackhouse and Melville Corl entitled "The Discovery of the Sheep Rock Shelter" published in Volume One enables us to announce that preliminary field reports for all eight field seasons are incorporated in this three-volume study:

Field Season	Location of Report
1958	Volume One (Foreward)
1959	Volume Three
1960	Volume Three
1961	Volume Three
1962	Volume Three
1965	Volume Two (Features)
1966	Volumes One and Two
1967	Volume Three

Bebrich and Willey's chapter on site stratigraphy reports on the final integration of eight years of field notes concerning site stratigraphy and the procedures developed for acheiving that integration. They provide us with a series of Master Levels that effectively segregate occupational components, thus enabling us to key all of our observations into an intelligible temporal framework.

A chapter on the physical geography of the Raystown River by Turner and Huner draws our attention to the topography of this region. The general pattern of site distribution along the river in this region is described and illustrated, and several factors of human settlement are discussed in connection with this distribution. Two appendices to Turner's chapter provide information on two categories of ecological evidence for Sheep Rock Shelter. Willey and Ruskin report on the distribution of fresh water mollusc shells in the site deposit, and Bowser and Willey report on the distribution of several species of fresh water fish based on the identification and tabulation of fish scale remains.

Subsistence oriented plant utilization by the inhabitants of the Sheep Rock Shelter has become a major program of study. The recovery of substantial quantities of cultigens, nuts, seeds, and miscellaneous plant fibers have brought Sheep Rock Shelter much attention among specialists in Northeastern archaeology who hope that new light can be shed on the history of horticultural practices in this region. Michael Steffy discusses the progress made to 1968 in investigating this topic, and outlines in detail the several lines of evidence and procedures of analysis that are involved in his research project on subsistence oriented plant utilization.

Frank Saul, Assistant Professor of Physical Anthropology at Penn State, has provided a description of the osteological characteristics of human skeletal remains recovered at Sheep Rock, together with a description of the collection of disarticulated human bones mixed within the midden. His discussion focuses in on the "Sheep Rock Woman" skull that dates to the Middle Archaic, commenting upon the important similarities between it and other skeletal finds of this general period for North America as a whole.

A supplementary report on archeological features recovered at Sheep Rock is provided in a chapter by Green. Her work presents a summary of the 1967 features. This in conjunction with the original records provides a basis for a more intensive analysis of the activity structure of the shelter to be conducted in the future. Gamber and Rehm report on the unmodified faunal remains collected during the field seasons 1958, 1962, 1965, 1966, 1967. Faunal remains collected during the 1959, 1960, 1961 seasons were examined by Guilday and Parmalee of the Carnegie Museum and published in the Pennsylvania Archaeologist (1965: 34-49). They reported the species represented in the first sample of 35,000 bone fragments. Gamber and Rehm have focused on the stratigraphic distribution of faunal material in terms of dry weight, thereby supplementing the largely taxonomic report of Guilday and Parmalee. A supplementary note to the latter authors' 1965 article on the fauna of Sheep Rock Shelter has been published as an appendix to Gamber and Rehm's chapter.

Supplementary reports on the ceramic artifacts and the lithic artifacts are included. They discuss the additional specimens recovered during last summer's excavation, and report corrections and

revisions to the original reports contained in Volume Two. A large quantity of perishable artifacts--of bone, plant and animal fiber, wood, and leather--associated with Woodland levels of the deposit were recovered during the early seasons of excavation. A preliminary descriptive study of these specimens was included in Volume One. A supplementary report by Lorraine Willey is included in this volume. She is conducting an intensive analysis of these items and discusses her program of investigation in the chapter.

Drobnock has contributed a supplementary chapter on the charcoal samples recovered from Sheep Rock Shelter during the 1967 field season. Six additional samples were submitted to the University of Michigan for radiocarbon dating, and these samples are fully described. The results of dating are included as an appendix to this chapter.

A sample of maize kernels has been biochemically analyzed by Turner. The information included in this chapter adds yet another dimension to the growing mass of data provided by the excavations at Sheep Rock Shelter.

A final supplementary report completes this volume. It is concerned with describing the documentation control system that we have evolved in trying to cope with the enormous amount of data that this eight-season excavation program has generated. The key to the system is the use of the computer for data storage, retrieval, and manipulation. Coding systems that we have devised are reproduced in this chapter.

THE PENN STATE-JUNIATA FIELD SCHOOL IN ARCHAEOLOGY

One of the very gratifying aspects of an archaeological program such as this is the extent of cooperation among individuals and institutions that is achieved in making the program a success. The 1967 season of field work was undertaken jointly with Juniata College, Huntingdon, Pennsylvania. The Penn State-Juniata Field School in Archaeology was the first experiment in co-sponsored archaeological instruction for Central Pennsylvania, and we all felt that it was a great success. Juniata College provided one member of the field school staff, Professor Paul Heberling, physical facilities (laboratory, dormitory and dining accommodations), some field equipment, and one expedition vehicle. Penn State provided six members of the teaching staff, the bulk of the field equipment, two expedition vehicles, and an archaeological reference library. Both institutions supplied students, who enrolled for the course at either Juniata College or Penn State at their option.

There are several important aspects to such institutional cooperation. First, such arrangements augment the capability of both institutions. Penn State needs a host institution for large-scale archaeological field work when it is to be located at some

distance from University Park. Without adequate physical plant facilities and services the logistics of such field work become extremely hurdensome and the size of the program usually has to be reduced.

Juniata College, and other institutions which do not have a developed anthropology program, also benefit by such co-sponsorship in important ways. Members of their teaching staff are given an opportunity to develop the necessary skills and background for conducting local archaeological programs in the future. The student body of the college is given an opportunity to enroll in a course which would not otherwise be offered by the institution. Tuition generated by the course goes directly to the college, rather than to some distant university. Similarly, the college's physical plant can be more efficiently utilized during the summer months by the presence of such a program.

ACKNOWLEDGMENTS

I am very much in debt to Dr. John L. Cotter, Chief of Archaeological Research for the Northeast Region, National Park Service, for his continued financial support of our survey and salvage programs within the Raystown Dam Flood Basin, of which the Sheep Rock excavation forms a part. This work was conducted under U. S. Department of the Interior, National Park Service, Order Numbers 950-485 and 950-683 (Sheep Rock II). I am similarly indebted to Dr. S. K. Stevens, Executive Director of the Pennsylvania State Historical and Museum Comission, and the other members of the commission, for their continuing financial support of the work at Sheep Rock, and for the interest they have expressed in publishing the final report of these investigations.

Mr. and Mrs. James Filson, Huntingdon, Pennsylvania, again deserve our many thanks for the assistance they have rendered to the project. As property owners of the Sheep Rock Shelter site, they have continually welcomed our presence; taking a keen interest in the day-to-day developments connected with the excavation. They own the anchorage from which we chartered boats to take us to the site, and consistently gave us prompt and reliable service.

Professor Paul Heberling, of Juniata College, deserves our very warm appreciation for all he did on behalf of the program. As the official representative of Juniata College, he expertly coordinated the needs of the project with the facilities of the Juniata campus. Long before the field school arrived on the Juniata campus, Professor Heberling had stimulated great interest in the program among the students and faculty of the college; providing for an atmosphere of genuine enthusiasm and hospitality that lasted all summer. Furthermore, Professor Heberling contributed his teaching skills to the program as a member of the field school teaching staff. We look forward to further collaboration between

Professor Heberling and the Penn State anthropology faculty in the archaeological investigation of the Raystown River Basin.

Assistants Lorraine Willey and Carl Bebrich were responsible for integrating the artifact catalogues of eight separate seasons, and successfully monitoring the master catalogue's conversion to IBM cards and computer listings, making the analysis of artifacts, features and stratigraphy by the many contributing authors more efficient and more successful. They coordinated the activities of the many student volunteers. The task of encouraging and assisting authors to complete their manuscripts was handled with considerable skill. In addition, they assumed responsibility for keeping track of line drawings, half-tone plates, manuscripts, bibliographies, proofreading, stencil correction, etc., handling them all with a professional air and good spirits. I speak for all the authors when I extend to them my warmest thanks for a job well done.

Lorraine and Carl were aided by three volunteer assistants who shared with them many of the editorial tasks: Pamela Smith, Sally Frear, and Sybil Calabro. Pam has been involved with the editorial labors right from the beginning; giving aid in connection with virtually all of the editorial jobs. Sally Frear was of great aid in connection with manuscript editing and proofreading. Proofing of mimeo stencils and the collation of the volumes required much work to accomplish it and practically everyone connected with the anthropology laboratory gave us a hand at one time or another. However, some deserve special mention: Joyce Huner, Lynn Dixon, Kate Trout, Diane Cohen, Nona Berman, Janet Rehm, Don Austin, Charles Kolb, and John Huner.

Christine Nelson deserves our thanks for volunteering to perform much of the keypunching in connection with converting the artifact catalogue to an electronic data processing form. Helen Taylor is warmly appreciated by all of us for operating the mimeograph machine with such skill. Similarly, we are indebted to Rennell Taylor for the multilith work that is to be found in this report.

I sincerely thank Kay McKinley, Carol Leathers and Judy Nastase for doing such a splendid job in typing the manuscript stencils.

Last, but certainly not least, I want to thank my wife, Gabriele A. Michels, for her many services in connection with data processing. Her outstanding skills as a computer programmer were placed at the author's disposal, greatly facilitating their work. She exercised much patience and skill in instructing all of us in the use of the IBM equipment at the Penn State Computation Center, and in educating us in the range of computer applications connected with this archaeological investigation.

EDITOR'S NOTE

Due to unforseen difficulties this report was not published until 1971; three years later than expected. All but a few chapters had already been printed and assembled when we made the decision to postpone completion. During the three years that have elapsed, the stratigraphy of the rock shelter was thoroughly reanalyzed, the results of which are included in this volume. Other additions and revisions, more minor in scope, were also prepared. We have tried to minimize the effect of this delay, and the associated revisions, on the chapters already printed. There will, however, be occasions when the reader will come across editor's notes that inform him of last minute corrections to chapter sections previously prepared. We regret this delay and hope that the considerable quantity of new information, together with the scope and precision of our stratigraphy profiles, will compensate the readers who have been waiting for this 1968 report.

A REPORT ON THE 1959 FIELD SEASON AT SHEEP ROCK SHELTER*

by

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*Slightly revised version of a paper read at the Eastern States Archeological Federation, annual meeting, Albany, New York, 1959.

The Sheep Rock Shelter, located on the Raystown Branch of the Juniata River in Huntingdon County, is approximately twenty miles south of Huntingdon. Its archaeological importance was first discovered and reported by two amateur enthusiasts from Altoona. The foresightedness of the discoverers in turning the site over to the Pennsylvania Historical and Museum Commission and the splendid cooperation of the land owner is respectfully acknowledged.

During the summer of 1958 several test squares were excavated which yielded considerable plant material and artifacts of cordage, fabric, and wood, as well as the usual less perishable pottery and projectile points. The desirability of intensive field work was indicated.

In the 1959 season the site was worked with a crew of four for eight weeks with funds provided by the Pennsylvania Historical and Museum Commission and a small grant from the Social Science Research Council of the Pennsylvania State University. Work was cooperatively directed by John Witthoft and the writer.

The Sheep Rock, named for the animals penned there during the 1870's, is formed from a massive rock ledge of Chemung shale. It is a true rock shelter of almost classic European proportions with a rock wall overhang towering an estimated seventy-to-eighty feet above the shelter floor. An abundance of wood ash and the overhang of the shale ledge shielding the site from the elements, contribute toward a remarkable preservation of cultural and plant materials. Roughly, the horizontal dimensions of the habitation area are twenty feet by three hundred feet depending upon how far the deposits extend up the talus slope. Cultural deposits may be as much as twenty-five feet deep since this is the height of the shelter floor above the present average water level of the Raystown.

This is a region of mountainous terrain but in the geologic past the Raystown flowed on the Cretaceous peneplane in a meander pattern. Uplifting during the Laramide Revolution in late Cretaceous and post-Cretaceous times has changed the topography and entrenched meanders are now conspicuous. The site is situated in the bend of one of these meanders and because of the steep sides it is virtually inaccessible by land. The field party always approached the site by boat.

Horizontally, the Sheep Rock Shelter can be divided into two parts: a dry portion and a wet portion. The latter is caused by a tiny, brackish spring which at no time contained more than a quart or two of water. Vertically, a similar division is possible with the upper levels the driest and the lower levels somewhat humidified.

An area slightly more than twenty feet by thirty feet consisting of twenty-four five-foot squares was excavated. Squares

were cleared by six-inch levels to a depth of five feet and then in checkerboard fashion eight alternate squares were excavated five additional feet. Features were cleared by natural contour and levels were maintained by line level from a datum point. Some difficulty in maintaining accurate levels was experienced in the driest parts of the midden where slumpage was a problem. Once a five-foot square was isolated by the checkerboard technique, it was cleared by following the natural slope of the occupational levels. Soil samples were collected from each of the deeper natural levels.

Unquestionably, the Sheep Rock was intermittently inhabited by different peoples of differing cultural traditions over a long time span. The debris left by these many groups is slight if considered in terms of conventional projectile points and pottery fragments. Indeed, if the organic material had rotted away and the site were compressed into the usual compact and confused rock shelter picture the Sheep Rock would not be worthy of consideration. One must look to the dry shelters of Kentucky and of the Southwest for parallel conditions.

Extending over about a fourth of the excavated portion was a dense dry midden three-to-four feet thick. This midden yielded most of the large quantity of plant material, cordage, and the more perishable goods. All plant material has been sent to Hugh Cutler of the Missouri Botanical Gardens, St. Louis, Missouri for analysis. His preliminary examination indicates most of the corn is 8-rowed, large shanked, big-butted variety of Northern Flint. The squash (Cucurbital pepo) is also large. Other plants include several forms of the true gourd, beans, a few sunflower seeds from cultivated plants, and many wild plants and seeds. Ultimately, the site may provide some indication of the importance of agriculture and gathering as contrasted with hunting and fishing.

The midden shows a realistic index of the proportion of perishable to non-perishable cultural materials. A reasonable estimate might be that non-perishable items, sherds and stone tools, normally represent less than ten percent of the total cultural remains.

It is sometimes difficult to interpret features in the dry midden. Typological considerations are not always helpful in ascertaining the culture responsible for the midden since the sample included some unfamiliar tools while others are of a nearly universal, conservative and non-diagnostic nature. It is difficult, if not impossible, to separate the midden into different cultural traditions.

However, the dry midden holds a mixture of Shenk's Ferry and Susquehannock ceramics and it is believed that most of the debris was deposited by the former group. Presumably, the farmland was the river terrace on the opposite side of the Raystown. Shenk's Ferry people probably lived at the Sheep Rock at the time

when Susquehannock longhouse groups or extended families were being forced from their homes on the North Branch of the Susquehannock by the Iroquois and/or were being drawn into the lower Susquehanna in the desire for trade with very early itinerant European traders situated on the Delaware Bay.

From what we know of the archaeology here and at Washington Boro, Lancaster County, it is apparent that the Susquehannocks displaced the Shenk's Ferry Culture to become the major force in south central Pennsylvania during the seventeenth century.

The largest class of material culture from the dry middens is cordage made principally from bast fibers obtained from butterfly milkweed and Indian hemp or dogbane. A preliminary analysis indicates a vast majority of the cordage is two strand with a "Z" twist.

Granny, square, overhand with a bight, and halfhitch are some of the familiar knots recognized. Knot trying is a cultural universal, thus, it is not surprising to find these common knots widely distributed throughout the world.

The largest and most spectacular artifact found at the Sheep Rock was a large, highly worn, food-storage container possibly fashioned from willow bark. The vessel, in a remarkable state of preservation considering its age and the great deal of use it undoubtedly received, is largely intact with only portions of the back, some of the lower parts of the sides and the bottom missing. It rested in a bark-lined pit that penetrated both the dry midden and the deeper humidified portions of the site.

The container was made by bending into an oval a solid sheet of bark and tying it along one side with a six-to-eight inch overlap. The tie at the overlap was made by making a double row of vertical holes and lacing heavy 2 ply "Z" twist cordage through the holes thus forming two parallel ties. A bottom was fashioned from another piece of bark and then stitched to the sides.

The material found in the container was similar to the plant material in the midden. This consisted of a large number of corn cobs and beans which supports the contention that this is a food storage container. Two shell-tempered sherds, probably Schultz incised, were found inside and near the barrel. For this reason the artifact is considered to be Susquehannock dating about 1550-1570.

Bark was used for many purposes including pit and bed lining. Beds were made by placing a bark sheet, frequently pine bark, over layers of marsh grass or leaves. With use, the bark became polished and the grasses and leaves compressed into matting.

Other significant finds associated with the dry middens are fabric, net, cut leather, braided items, bark ties, a carved deer

antler knife handle with the leather packing still present in the haft socket, several arrow shaft fragments, a 24" wooden paddle with most of the blade missing, possible pack strap fragments, the proximal halves of both a humerus and an ulna of two individual trumpeter swans made into end scrapers, the hearth from a fire-by-friction set, a small shell-tempered pipe, and an assortment of unfamiliar tools. The economy of this stage was primarily geared to farming, but an abundance and variety of animal, bird, and fish remains were present. There is a high incidence of bone from aquatic animals, especially turtle. Mammal identifications are being done by John Guilday, Carnegie Museum.

The stage back of Shenk's Ferry is Clemson's Island, but there is no apparent close relationship between these two cultures. The hallmark of Clemson's Island pottery is a horizontal row of punctates, punched from the interior or exterior, just below the rim edge. Rims are everted and usually decorated on interior and exterior surfaces with paddle edge markings. Oblique rows of similar decorations sometimes extend to the neck and shoulder. Bodies are fabric impressed and the tempering is quartz.

A newly discovered pottery type termed Sheep Rock Corded was found concentrated in two adjacent squares and scattered in three other squares. The sherds are coarsely cord-marked on the exterior and they have modified cord-marked interiors. It is likely that these sherds belong to a single vessel which can be reconstructed. The major distribution of this type was below the Clemson's Island pottery centering in the fourth, fifth, and sixth levels.

Possibly some of the dry middens and some of the unfamiliar tools belong to horizons older than Shenk's Ferry and Susquehannock. It will take considerably more fieldwork and refined analysis of the profile drawings before this can be determined. At present the material and field notes have received only preliminary study. In the older deposits there is a paucity of artifacts and only tentative statements can be made about this material.

There are numerous, preceramic stages, including a strong soapstone or Transitional component. An upper level of the Late Archaic is represented by short, stubby, broad, notched projectile points most of which are made of Penn's Creek flint. Similarities to Laurentian and Gay Shriver Site points are noted. A large nearby hearth yielded a wood charcoal sample which could provide radiocarbon date for this stage.

Not all occupational levels contained artifacts useful for interpretation but the presence of animal bone, charcoal, and tiny flint chips attest to human activities. In the deeper levels bone scraps become progressively smaller, suggesting a parsimonious attitude on the part of the inhabitants toward the food supply. Hearths in these levels are scarce. Possibly this reflects band organization where one fire served the needs of the whole group.

The archaeology of Central Pennsylvania is poorly known but there is now a deep site of considerable potential for interpreting the prehistory of that area. On the basis of present knowledge it appears that interior Pennsylvania developed no distinct traditions. Rather it was on the receiving end of culture traits diffused from the Susquehanna and Allegheny Valleys. Over the millenium cultural remains were deposited at the Sheep Rock which have affinities elsewhere. A Monongahela pipe, and Allegheny Valley-like projectile points with a Laurentian cast, along with Susquehanna Valley traditions including Susquehannock, Shenk's Ferry, and Clemson's Island pottery, soapstone vessels, and certain projectile point types, are found here.

Excavations have only begun. Perhaps ninety percent of the deposits are still undisturbed either by rodents or humans. Extensive excavations at the Sheep Rock Shelter are planned for the future.

SHEEP ROCK SHELTER: REFLECTIONS AND OBSERVATIONS AFTER THREE SEASONS OF EXCAVATION 1960-1962

by

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MISCELLANEOUS REFLECTIONS

The lower Raystown Valley is a rugged land of great natural beauty. Devastated by lumbering and grazing after 1860, it had been unsettled wilderness before that time and had healed many scars since. The beginning of modern encroachment came in 1920 with the construction of a small power dam, which has raised the level of the river twelve feet at the Sheep Rock, and which has drowned the small floodplains of the valley. The pool formed by the dam has gradually become a major recreation area, bringing many people to a wilderness refuge that was scarcely able to support human life, so scant were its economic resources. Much of the shore is now a pleasant suburbia. During the years that I worked at the Sheep Rock I came to know this land well, learned to understand much of its history, and was conscious of many changes going on about me. Now a new high-level dam is projected and the valley will be drowned, the Sheep Rock under a hundred and twenty feet of water. Each site we touch, it seems, will be a salvage problem tomorrow if it is not yet so today.

Each year I have seen twice as many cottages, twice as many motorboats as the previous year. The Raystown is but a small lake and it has more horsepower per square mile than any other water in the United States. As I worked at the site, camped on the lake shores, cruised the river at night and at dawn, explored the forest, and climbed rock ledges, I saw many aspects of nature that were still in full vigor and that I could see reflected in the archaeology of the site. Many of these wonderful things are gone now, and I suppose the rest have a limited life expectancy. I saw much going on that I needed to see in order to interpret the archaeology.

During the first two years that I worked at the site, a pair of red-tail hawks nested on a rock ledge fifty feet above my head. I thought they must have always been there, for I found their feathers in the dry soils of Zone 4, where they had fallen four hundred years ago. I watched them soar and hunt, stoop to mice, and bring their prey back to their young. I watched them grip the corpse in sharp claws and use the beak to rip the carcass apart, sometimes dropping a crushed bone to the floor of the shelter. I found concentrations of small bones from rodents and birds in deeper levels of the site directly under the same roosting points, many of the bones with the same pattern of crushing. These birds had been collecting biological samples from the surrounding region for me for thousands of years, and many Indians had watched the process as I watched it now. Alas, someone has shot my harriers.

At night the hawks slept, but then the great horned owls came out for my admiration. A pair nested and raised brood in a ravine in the ridge above the Sheep Rock. I followed them with a

boat along the river at night as they hunted along the shores, great silent shapes that often flew at the base of overhanging fog. I tracked them to their nest in a dead tree, and faced the cold threatening stare of this magnificent bird, thinking, "God bless you and save you, my untamable friend." The owls carried rabbits to perches on the rock ledges above my head; if I were very quiet and stayed in shadow, I could watch their behavior. They did not pull the prey apart, but they cut it up with their formidable beaks the way we cut metal with a chain-cutter. The bones that they dropped were sheared as though cut with scissors. At the spots where they dropped bones for me, I found concentrations of owl-cut bone at much greater depths within the site, and realized who else had been sampling the ecology for me through millenia of prehistoric time. They never dropped an owl-ball for me; I suppose their visits to the site were brief because they knew the presence of humans. I did find owl-balls in the dry earth of Zone 4, however. I no longer hear the wonderful cry of the owl at night; someone has shot my owls and their brood for thirty-five dollars in bounty payments.

One night the owl brought in a chicken. As the carcass was dismembered, the gizzard was split and its contents discarded. The gravel from the crop dribbled onto the shelter floor. The owl had solved a problem for me. I had found scattered throughout the site tiny white quartz river pebbles with polished surfaces, and occasional larger quartz pebbles, although there was no alluvium whatsoever in the site. The quartz pebbles were crop-stones from passenger pigeon and turkey.

During the daytime the Sheep Rock was quiet. Occasionally a mouse ran along a ledge, the phoebe came and went from her nest of the shelter wall, sometimes a blacksnake came in and made many futile attempts to get at the phoebes, and the flickers visited their nest cut into a dead tree at the edge of the site. Life was somnambulant. At night the place came to life. The Allegheny cave rat, our large eastern pack-rat, came down from his nests on high ledges and sought food in the forest. Here the copperhead, now fully awake and as alert as the mainspring of a gun, awaited the rat. The kangaroo mice danced out to collect basswood seeds. We left food for these creatures. If we left a bit of aluminum foil, a plastic bag, or any other object on the site, it was claimed by the cave rats. Larger things left in the site would be all rearranged when we came back in the morning; the cave rats played with them.

I watched the cave rats seek gaudy objects for their collector's cabinets. One day I climbed to a high ledge and looked into a rat nest. It held the most varied collection of our discarded personal property. There were also curiously-shaped sticks, including one piece cut with a stone axe at each end, which must have been dug from the Indian debris in Zone 4. The nest was made of bark which the rats had pulled from the dwarfed red cedar trees on the ridge tops, carried down to their nest, and teased into soft fiber.

When I cleared out a great pile of fallen flagstone against the rear of the shelter, I found a cedar bark nest within it, built after 1870 but now long abandoned. It held no modern artifacts, but there were Indian-cut sticks, a bone awl, and some Susquehannock potsherds, hoarded up by this pioneer excavator. I found other cedar bark nests buried within the site and made under overhanging ledges, nests roughly contemporary with Zone 4. They contained many bones from the Indian garbage, potsherds, and bone and wooden tools. At deeper levels the nests had rotted out, but they were marked by accumulations of bone which their occupants had gathered.

However, I found very little trace of rat burrowing in the dry soils; I suppose the dusty soil contains too much raw wood ash to please them. Other creatures had also dug little in the site, but contributed biological material to it today as they had in the past. The racoon had been a significant factor in providing us with ecological samples from the past.

Racoons generally came into the site at night, and left numerous tracks. In 1961 a young racoon moved into the site with us, digging a burrow under a rock ledge in slightly damp soil. A considerate fellow, he excavated his house within our back-dirt. He never showed himself during the daytime, although we lived amicably as neighbors and we left food for him. He was shot out of a tree by the beam of a spotlight one misty night.

Although the copperheads hunted vigorously in the surrounding woods and along the shore, I never saw one in the shelter, nor any track of one. I believe they avoid very dry environments. The racoons looked for dead game along the river. When they found a dead copperhead or snapping turtle or fish floating in the river, they would carry it into the shelter and clean the edible flesh from it, leaving behind strings of snake vertebrae and cleaned turtle carapaces. The mice who lived in the shelter then carried the bones back under the ledges and gnawed on them. We found many copperhead bones, scattered and gnawed, under ledges at all levels in the site. I believe they were brought by the racoon and buried by the mouse.

When we first worked at the shelter, we saw great wilderness copperheads, not at all like the puny vipers of our cultivated land. Brilliantly colored with camouflage patterns to match the sun-shadowed leafy woods floor, and their length the full forty-two inches of an adult, they were of the girth of my upper arm. Torped and filled with rodents after a night's hunt, they dozed in the sun on the rocks by our boat landing. I tried to protect them as guardians of the site and as conservators of the wilderness, for they frightened many visitors away. When they shed, we collected their cast skins and nailed them to our trespass-notice signs. My efforts to save them were ineffectual; I have not seen a full-grown copperhead near the site since 1961.

In 1961 a young bear came to live on top of the rock cliff, directly above where we worked. I climbed out to visit his den when he was away from home. He lived under a low rock overhang with a sheer drop of two hundred feet from the edge of his bedroom floor to the river edge below. A narrow ledge with difficult footing was the only approach. Here I saw his tracks and fallen hair, and noted the pads of bear manure. Later I found bear manure in the Susquehannock midden of Zone 4, mixed into bedding along with human excrement. I wondered whether the bear had visited the site after the people had left, or whether they had captured a bear and brought him home alive. The bear was sacred game to these people, almost a diety, but one whose flesh was required for the ritual meals which were parts of religious ceremonies. Bear bone, hair, and bits of skin in Zone 4 documented the hunting and use of the bear. My neighbor of the lofty bedroom did not survive the autumn.

Neither did the wood ducks that nested in an old woodpecker tree some three hundred feet downstream from the site. As I worked at the site through many weary days and months, I grew nostalgic for the creatures I saw perish and for the many more that had gone before. The Sheep Rock provided me with a full biological record that included many marvelous things. Bones of the cougar, the lynx, the fisher, the otter, the beaver, and the timber wolf, myriad bones of the passenger pigeon scattered through the whole depth of nine thousand years of prehistory, bones of the sandhill crane, whistling swan, and bald eagle, fishbones from the shad, sea trout, and huge rockfish, all represented things of incalculable value that the Indian conserved and that we had destroyed. As I removed familiar bones from the ground, I wondered if I would ever again hear the cry of the wolf pack, the unbelievable scream which is the mating cry of the female cougar, or watch the ospreys rob the eagle fisherman of his catch. Even the thin cry of the red-tail hawk and the chatter of the flickers was gone from my site. The bats still slept high under the rock ledge through the day, and passed by my face in the river fog at night, but each year they were a smaller band.

In winter the snow-blanketed countryside is without people, except for three friends who refuse to live in town and live here the year around. Only tracks of wildlings mark the snow. In the Sheep Rock, during snowfall, one is in a silent world completely isolated by the luminous white translucence over the river. My neighbors who live in the site sleep. Not a flake of snow drifts onto the floor of the shelter. Wet parts of the site are frozen, but the dryer soils are as well excavated now as in the summer. During the early night deer who have been browsing along the river walk up through the site and follow the floor up to rock ledges which take them to the ridge top. I am not able to follow some of their routes; the footing is too slight for me and the leaps too long. At first they leaped over my excavation confidently, but as the hole grew, they came to walk around it. They apparently will not go down into my quarry. As the snowfall ceases and the

sky clears, I enjoy the brilliance of the sky and the whole deserted world visible in the soft shadowless illumination from the sky. It is too beautiful a world for sleep, so I sit and muse. The site seems alive with the imaginary voices of long dead languages spoken by long dead peoples, and with sight and sound of all the richness of the life of nature that men and creatures have experienced here.

A GENERAL DISCUSSION OF THE UPPER LEVELS OF THE SITE DEPOSIT

Zone 1 - 1880-1960

The superficial layer averaged four inches in thickness and consisted mainly of shale chips which had fallen from the roof of the shelter. Despite the large number of picknickers and campers who have used the Sheep Rock in the past half-century, there was very little modern litter. Matchsticks, bottle caps, cases from modern rifle and shotgun shells, a few pearl buttons, a 1903 penny, and the carbon rod from an early dry cell battery were about all we found. The ash from modern campfires was an almost negligible accumulation, slight as compared to that of earlier hearths within the site. Bones were mainly those of small rodents, rabbits, and small birds, some of them occupants of the site, many of them brought here by hawks and owls roosting within the shelter.

The most striking feature of the modern layer was the rapid accumulation of fall from the roof of the shelter, about an inch of gravel per twenty years. Many large blocks of flagstone had also fallen during this recent interval. These were large slabs, not broken down by weathering, much bigger and heavier than any rockfall which we found in deeper layers of the site. We broke them up with a sledge-hammer, but a number were so hard, large, and tough that we had to drag them out of the site on skids and rollers with a chain-hoist. They all lay upon soils later than 1870. Apparently deforestation and other recent changes in the environment have accelerated fall from the roof and have caused the collapse of massive flagstone ledges which were entirely stable in earlier times. I believe this is entirely a result of the massive destructive exploitation of this mountain forest area during the last century.

Zone 2 - 1860-1880

On dry parts of the shelter floor, the second layer was made up almost entirely of the manure of domestic sheep. This varied from six to eighteen inches in thickness. Where the shelter floor was damp, the manure zone had rotted down into a reddish-brown topsoil from two to six inches thick. The old local name for the site, the Sheep Rock, persists from the time when sheep were grazed upon

the cut-over hills when brush began to follow the virgin forest which had been timbered off in the 1860's. The manure layer included only small amounts of fallen shale chips, so it must have accumulated rapidly. And the interval when sheep were barned in the shelter must have been short. Any soil that persisted on this steep landscape after logging must have been quickly eroded away under the hoofs and grazing of the sheep.

We found no traces of human occupation in the layer of sheep manure; no hearths, no artifacts, no litter. Scattered pieces of lamb bone, many of them gnawed by carnivores and rodents, occurred throughout the manure zone. Five fox dens had been dug under overhanging ledges at the back wall during this interval, penetrating into deeper layers of the site. Each of them was more or less filled with dry manure, and each contained an accumulation of lamb bones. The evidence of death of lambs at foal and of scavenging of the dead lambs by foxes who had burrowed into the barn suggest that the sheep herd was half-wild and poorly shepherded. Owls and hawks roosted within the shelter. Of the bones that they dropped, the overwhelming were rabbit, reflecting the open countryside which surrounded the site. Passenger pigeon occurs in small numbers, indication that the local pigeon roost had not yet been entirely wiped out by fowlers.

Zone 3 - 1570-1860

Beneath the manure we found a thin layer of shale chips fallen from the roof, ranging from one-half to three inches in thickness, but only rarely more than an inch. This layer, like the soil immediately below it, was packed by pressure from the tread of the sheep and was saturated with seepage from the manure layer above it. The most striking detail was the thinness of this zone, with an average increment of about a third of an inch of soil per century to the shelter floor. Bones from the hawk and owl included a great many flying squirrel and practically no rabbit, suggesting that the surrounding landscape was completely covered with mature forests. As in deeper layers of the site, the most numerous bird bones were those of the passenger pigeon. The Sheep Rock is the first northeastern site to produce more than a trace of pigeon bone; it is apparently the first site we have explored which was near one of the roosts of the pigeon, where these gregarious birds nested and bred in communities of millions of birds.

Seven large hearths were found within this thin layer. Because the middens from the last Indian occupation lay directly below the surface of Colonial times, with so little intervening gravel, any fire that had been built on that surface roasted the soils beneath. The soils of zone 4, the Susquehannock occupation layer, in many places consisted of more than three-fourths grass, twigs, leaves, corn fodder, and other perishable material. Hence later fires ignited the older dry midden, burning out its organic material, and the fireplace slumped down as the midden below burned

out. The hearths of Colonial and Federal times had slumped down six to eight inches into zone 4 through the burning-out of large volumes of the earlier zone. Apparently once a hollow had been formed by ignition of zone 4, later campers tended to build their fires in the same spot, gradually building up an accumulation of wood ashes that was five to seven inches thick. The sunken hearths were three to four feet in diameter, filled with a homogenous mass of ash with no layering and with scattered gravel chips and occasional chips of burned deer bone.

These hearths represent the camps of all the hunters, traders, and Indians who camped at the Sheep Rock for almost three hundred years. Considering the mass of the ash deposits and the length of time involved, we found remarkably little that had been lost or discarded during this long interval. Scattered wood chips cut with a steel axe, two rifle balls, a French rifle flint of the late 1700's, and two fragments of worn and tattered "Kentucky Cloth" (the tough blue jeans cloth made by the Germantown weavers for the mountain frontier in olden times) were the total record of many bivuacs. The austerity and frugality of frontier life is strikingly demonstrated by the ash of innumerable fires associated with practically no artifacts.

Zone 4 - About 1560

Separated from the overlying manure by only the thin gravel of zone 3, and in places scuffed and eroded at its top by later humans and sheep, zone 4 was a remarkable deposit of the latest native culture of the Raystown area. Within an area roughly thirty by sixty feet, and as much as three feet deep at its center, the debris left by the Susquehannock had always been dry and the site looked as though the Indians had only moved out a few days before. Layering or stratification within the dry midden was slight and very localized, with sticks, corn fodder, grass stems and strings, running through it in every direction and interlocking various levels within the dry midden. The soils were made up of gravel chips, dust, and woodash, with often more organic material than inorganic. The dry midden was dissected as much as possible by lenses and other natural units, with profiles prepared and drawn as we went through units of the deposit in order to damage natural structures as little as possible. This midden is one of the most difficult field problems I have ever tackled. One was constantly faced with the choice of wholesale cutting through mats of organic material to prepare a profile, or of removing matted lenses as units and destroying the profile. Excavation proceeded by a series of compromises.

Our stripping off of the manure layer had been difficult and unpleasant, for we became saturated with foul organic dust from the sheep excrement, and all developed a chronic hacking cough. The dry midden was almost as bad, for it was filled with unleached woodash. After a few days one developed skin irritations and incipient potash burns from the constant mixture of

hardwood ash with sweat. The dry midden was also saturated with human urine, and the acrid dust became a plague to scent and taste. Excavation was extremely slow and tedious, and dust, ash, and gravel kept cascading from any cut like sand running through an hourglass. The site seemed like a billion jackstraws interlocked within a matrix of loose dust and gravel.

As we took the dry midden apart, we discovered that it consisted of an oval group of about thirty-two pits almost coinciding with the dry area of the shelter floor. The exact number of pits is uncertain because some of them had been redug, altered, and merged with other pits. The pits were three to four feet long, two to three feet wide, and about three feet deep. Many of them had been dampened in their lower parts and organic material had wholly or partially decayed in the lower fill. Most of them had been lined with pieces of bark. A layer of organic material lay upon the bark, in most cases a mat of marsh grass, in some cases a layer of forest leaves collected from the autumn leaf-fall. Surfaces of the bark lining were highly polished from the grass and leaves slipping over them. It seemed obvious that these pits were beds, dug to receive a mattress of grass or leaves and intended to place the bed below ground level to break winter winds. In the bedding we found grape stems, chestnuts and chestnut hulls, grains and cobs from mature maize, gourd and pumpkin plant fragments, bean vines, ripe beans, and sunflower seeds.

Some of the bedding had caught fire, smouldered for a time, and then been extinguished. New grass had then been added to the mattress. Others had had successive layers of bark and grass added to them, with a few inches of gravel above the lowest grass-layer, then bark and grass, then more gravel, with more bark and grass above that. All appeared to have been filled up by scraping gravel and rubbish into them when they were abandoned. A bark barrel, quite worn out and filled with corncobs, had been buried in one bed-pit.

Many strange things, including tool fragments, garbage, and industrial debris were found in the bedding and in the fill above it. Toward the center of the oval of pits, we found a number of scats, the manure of small children. Pits toward the center also produced the bulk of the pieces of cord and material for spinning cord, including some partially-spun examples. We thus concluded that the women with small children slept toward the center of the group of bed-pits, and that the men slept in the outer circle. Thus in the recent longhouse towns of the Amazon, the men sleep closest to the walls to form a protective ring around their families.

The western edge of the bed area abutted against a friable shale outcrop that rises through the shelter floor to form a steep slope. Four pits had been excavated into the shale bedrock. The eastern edge of the pit area was approximately at the edge of dry soils, so that zone 4 thinned to about six inches in an area

of Susquehannock hearths. In the pitted area, loose dry soils had been deeply churned by the Susquehannocks, and the excavation of bed-pits had added much soil from deeper levels to the thickness of the Susquehannock midden. There had been little digging in the hearth area, where soils were more compact and better resisted churning and where organic material decayed away and wood ash was leached away to a small volume. As a result of pit-excavation, many objects from deeper levels had been thrown up into zone 4 and were intermixed with Susquehannock artifacts. The Susquehannock community was doubtless the largest that had occupied the Sheep Rock, probably including at least twenty adults, and it disturbed soil zones much more drastically than they had been at any other time.

We have completely excavated the dry midden and bed-pits of zone 4, although analysis and study of the bulky collection is far from done. The hearth area has been partially excavated, with six hearths and their surrounding floor explored. Like all earlier hearths at the Sheep Rock, they are merely the ash accumulations from fires built upon the level ground. Pits were not used as fireplaces. The ash accumulations, leached and compacted by ground water, are about four feet in diameter and include little but ash; practically no charcoal, small quantities of gravel, scant potsherds, and very small amounts of deeply cremated animal bone. Two of the Susquehannock hearths lie directly upon earlier hearths of zones 5 and 6, forming the top of ash-columns, one might say. This continuity of fireplace-accumulations from zone to zone indicates that there were no long intervals between Indian occupancy of the site in Late Woodland times.

Mixture of older soils and artifacts into zone 4 complicates our interpretation of the Susquehannock occupancy. Many older potsherds found in zone 4 were already buried in the site when the Susquehannock camped there, and were dug up from deeper zones. Other potsherds, especially those of the Shenk's Ferry culture, were probably contemporary with the Susquehannock camp and represent face-to-face contact between Shenk's Ferry indigenes and Susquehannock invaders. The churning up of older soils into zone 4 makes this interpretation uncertain. Botanical materials in the dry midden include buds, leaves, fruits, and other features that represent every season of the year. This should indicate that the Susquehannock band lived in the shelter for nearly a full year. However, it is very possible that zone 5 included some bulk of loose dry midden and that the Susquehannocks stirred earlier botanical material into their own debris. We did not find any dry midden of zone 5, so I feel quite sure that the botanical material from zone 4 must include within it older material that was once part of zone 5.

The dry midden of zone 4 yielded very large samples of cultivated plant remains. Maize was most abundant, beans were less so, pumpkin fragments were numerous, while gourd and sunflower were not abundant. All parts of the mature maize plant except

tassles were found. Cobs in both the mature and the early milk stages were abundant. We found several stalks of immature maize, twisted and chewed by Indians who had sucked the sweet juices from the stem. Bundles of husks represent drying-clusters, where several ears were tied together by their husks and hung for storage. Bean pods were very abundant, and pieces of bean vine and pumpkin vine occasionally were found. The presence of so much horticultural debris suggests that gardens must have been very near, probably on the low terrace across the river. Six stone hoe blades, the type used by the Susquehannock, all well worn, were found in zone 4.

Although study of the cultivated plant remains is far from completed, there seem to be two distinct races or varieties of maize represented. One is apparently a Susquehannock variety, the other the Shenk's Ferry variety, both being very similar kinds of Northern Flint Corn. There are three ways in which they might have been intermixed in the Susquehannock midden, and I suspect that all three situations did occur. Some may be maize stirred up into zone 4 from older middens; some may have been loot from a Shenk's Ferry community; some may have been Shenk's Ferry seed planted by Susquehannocks.

Our current understanding of the prehistory of the Susquehannock and of their emergence into historic times as a documented tribal group depends upon a complex body of archaeological evidence. Since this has been presented elsewhere (Witthoft and Kinsey, 1959, pp. 19-60), the following summary is centered upon the problems of their residence at the Sheep Rock. Prior to 1550 A.D. the Susquehannock resided on the North Branch of the Susquehanna, north of Wyalusing, Pennsylvania. They were scattered in tiny farming hamlets along the river bottoms. This was their homeland, and their ancestry can be followed back into prehistory, stage by stage, in this area. Their tool types and craft-ways show close relationship to those of Mohawk, Cayuga, and Munsee.

At the time when the first European-made objects were bartered into their area, Iroquois war-parties began to raid the Susquehannock and other neighbors. The Susquehannock abandoned their homeland and began to drift southward in the Susquehanna Valley, drawing together into larger bands. They first attacked and extirpated the aborigines of the Wyoming Valley, a folk unknown to history whose ancestors had shared in the cultural tradition of the Shenk's Ferry people but whose pottery styles had come to match closely those of their Munsee neighbors. They were beseiged by the Susquehannock at the Schacht Site, a large and massively-fortified town at the mouth of Warriors' Creek near present Nanticoke. The Susquehannock then turned their arms against the Shenk's Ferry communities of the West Branch Valley, leaving potsherds and other Susquehannock debris on the latest sites as far west as Clearfield. After they had reduced this area, they made at least minor forays into Ohio and New Jersey, leaving their potsherds in those regions and carrying back smoking pipes to sites

on the West Branch. During this stage in their Odyssey, one small band lived for a time at the Sheep Rock. At about 1570, the Susquehannocks had reduced the Shenk's Ferry communities of the lower Susquehanna Valley and came to rest at the Schultz Site near Cresswell, Lancaster County. Whereas the Susquehannock pottery of the West Branch, the Juniata, and the middle Susquehannock Valley is like that made in their homeland, the pottery styles at the Schultz Site have changed a trifle and can be distinguished from slightly earlier forms. The Susquehannock material at the Sheep Rock is like that of Bradford County rather than like the Schultz Site.

When the Susquehannock settled at the Schultz Site, they left the whole Susquehanna Valley depopulated, and they had many Shenk's Ferry captives living among them. The region between them and New York remained a no man's land, traversed only by Susquehannock and Iroquois war parties until the Iroquois beseiged and destroyed the Susquehannock towns in 1675. In the meantime, the Susquehannock remained in the Lancaster County area, concentrating their military force against the Iroquois, but raiding into the upper Potomac and beyond the western Virginia frontier. Their sweep down the Susquehanna River system left an unpeopled wilderness behind, and it ended the record of native culture history at the Sheep Rock.

Zone 4 produced some archaeological evidence of forays to the west and east of the Susquehanna. Several sherds of Monongahela Woodland pottery and a pipe represent the closest Ohioan communities. The latest sites in the area of Bedford, less than forty miles upstream on the Raystown from the Sheep Rock, were of the Monongahela culture. The sherds at the Sheep Rock could have come from the upper Raystown or from the Pittsburgh area. However, there are also fragments of several pots from the Clover Complex, a Fort Ancient culture found between Pittsburgh and Marietta; these document some penetration into the upper Ohio Valley. Beads and bits of ornament made from sea shell indicate trade or other contacts with the Atlantic coast. One striking specimen is the columella from a conch shell, roughly ground into a cylindrical rod three inches long. It is a stick of unfinished wampum, not yet drilled, sized, or severed into beads. Blanks for beads were no ordinary item of Indian barter, and such an unfinished piece must have been a souvenir of some visit to the coast. Susquehannock potsherds, like those at the Sheep Rock, have been found in some numbers near Tom's River, New Jersey, indicating that the New Jersey coast had been thoroughly infiltrated before the Susquehannock settled at the Schultz Site.

Zone 5 - Late Prehistoric Times

In the dry area of the site, zone 5 was a brown soil made up of medium-fine gravel chips and flecks of brown decayed organic matter. Apparently it had been dry and had preserved organic materials, but it had been buried deeply enough beneath zone 4

that the ground water rode into it, dampening it slightly. Because this zone looked to be so recently decayed, I believe that some of it was filled with organic material at the time of the Susquehannock encampment, and that much of its organic material had been churned up into zone 4 and there preserved out of its original context.

During the interval when zone 4 was being formed, large flagstone rockfalls dropped from the front edge of the shelter onto the dripline in front of the dry area. The flagstone had been deeply weathered and cracked prior to its fall, and we could easily pull it apart in small pieces. This rockfall formed a sort of natural breastwork or dam across the front of the shelter. When the Susquehannock arrived, the dry part of the shelter was a bowl-like depression, its front formed by the rockfall which projected two feet above the surface. The basin was filled up with Susquehannock debris, its concavity partially explaining the thickness of zone 4 in the dry area.

Zone 5 was a single stratigraphic unit, three to six inches thick, brown in the dry areas, whitish and with a high ash content in damp areas. It was not, however, a single cultural unit. It represents several centuries in time, and it includes pottery from several Late Woodland culture stages. To complicate the matter further, it bears a mixture of pottery from two culture areas, since the Sheep Rock is between them. In the last stage, there are Shenk's Ferry sherds like those of the West Branch Valley, and like those found at Ardenheim, Juniata County, to the north. There are also cord-marked rimmed pots resembling Shepherd Cordmarked, which is found in the Bedford area to the south and which extends southward into Maryland. Representing an earlier stage, but intermixed with other types within this thin layer, is some variety of Owasco-like pottery. Certain Owascoid rimsherds are intermediary between earlier Clemson's Island types (of zone 6) and Shenk's Ferry, indicating a continuity and a genetic relationship between these two stages in the Juniata Valley. Along with them are a few Redford sherds from the Bedford area; as with the later Shepherd type, these represent a northern and eastern extension of a western Virginia type.

THE STRATIGRAPHY OF THE SHEEP ROCK SHELTER

by

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with a report on the geology of the
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ABSTRACT

This chapter presents a detailed discussion of the stratigraphy of the Sheep Rock Shelter. Special attention is given to the rationale underlying stratigraphic analysis and to the methodology by which composite profiles of the site were prepared from original field drawings. An effort has been made to include as much cultural information as possible in the scale reproductions accompanying this report. On the basis of an analysis of the distribution of diagnostic artifacts and radiocarbon dates nine Master Levels are defined, eight of which correspond to the major divisions of the Middle Atlantic and Northeastern archaeological sequence. Most of these levels can be shown to have high integrity.

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INTRODUCTION

The definition of archaeological site units, such as activity sets, assemblages and components depends on the ability to associate cultural items and features. Association of these remains in turn depends on the ability to assign stratigraphic context. In the absence of semi-permanent structures, such as floors, walls, tombs and the like, stratigraphic units are defined on the basis of arbitrary or natural excavation strata. These strata provide the minimal framework within which site units may be defined. Natural strata by definition reflect the ongoing processes of cultural and geological accumulation and are apt to yield the most reliable information about context and associations.

Rock shelters are a primary source of stratified deposits. Because they are more restrictive than open air sites in usable living area, deeply stratified midden deposits are more frequently found in rock shelter contexts. In general, the volume of cultural deposition is proportional to the amount of protected usable living area: Small shelters yield shallow middens, probably because they do not allow the full complement of domestic activities; large shelters, on the other hand, may yield substantial middens, because they allow a wider range of activities and can therefore function as permanent or semi-permanent settlements. However, even large shelters with substantial midden deposits may be poorly stratified.

The amount of definable cultural stratigraphy is conditioned by several factors. Among these, surface water drainage, ground water seepage and post-depositional disturbance, such as pitting, potting and burrowing, are the most frequently encountered factors which may obscure or destroy beyond recognition the boundries of strata within a cultural deposit. Smaller shelters generally suffer more from the effects of these factors and yield less well-defined stratigraphic profiles.

With few exceptions, the rock shelters of Pennsylvania are of the smaller variety, that is, they usually contain small, poorly differentiated cultural deposits. A highly unusual exception is the Sheep Rock Shelter. In a preliminary analysis of the site's stratigraphy Horn (1967: 169-206) demonstrated that the cultural deposit was both large and complex. Based on an analysis of the stratigraphic distribution of radiocarbon dates and chronometrically diagnostic artifact forms, Michels (1967: 187, 202-203) attempted a trial integration of Horn's profiles. His findings suggested that, in general, the deposit exhibited a high level of integrity and that the sequence of superimposed strata was in essential agreement with the Northeastern archaeological sequence.

However, in working with the profiles and distributional data two major problems emerged which prohibited the definition of site units and made difficult the task of profile integration.

(1) The resolving power of Horn's profiles was not great enough to differentiate activity sets, assemblages and components, nor was it capable of differentiating the Early and Middle Woodland deposits at the site. Similar difficulties were encountered in attempting to define the stratigraphic perimeter of the Transitional components.

(2) Although all of the profiles prepared by Horn demonstrated internal continuity of strata, continuity between the profiels was not maintained. As a result, the North-South profiles used by Michels in his trial integration functioned independently of one another rather than in unison. In effect, the lack of continuity impaired evaluation of the behavior of site accumulation with respect to the major periods of utilization.

Resolution of these problems lay outside the objectives of Horn's preliminary study. Her aim was (1) to prepare an interim document demonstrating the size, complexity and integrity of the deposit and (2) to offer a set of guide lines for a thorough analysis of the deposit upon completion of the 1967 excavations. As a result, the profiles lacked such desirable qualities as uniformity of scaling, completeness and detail (particularly with respect to cultural features). In short, they were not designed as research instruments for the investigation of site units. This capability was recognized as essential but could not become feasable until excavation of the site was terminated.

The objectives of our work therefore became:

(1) The preparation of a new set of composite profiles which were both uniform in scaling and as nearly complete as possible.

(2) The inclusion of as much feature data as a once-over gleaning of the field notes, manuscripts, and published data would permit.

(3) In so far as possible, the definition of the cultural stratigraphy corresponding to the major divisions of the Middle-Atlantic and Northeastern archaeological sequence (Willey 1966: 250-251).

DESCRIPTION OF THE SITE DEPOSIT

In 1965 Dr. Vincent C. Shepps of the Pennsylvania Geological Society examined the site deposit and vicinity and prepared a short statement on the geology of the Sheep Rock Shelter area. His statement is reproduced here in full.

> The site is situated in the Appalachian Mountain section of the Ridge and Valley Province of Pennsylvania. Rocks throughout the area consist of layers of ancient sediments which have been compacted into beds and have been folded so that the rocks are now tilted no matter where they are seen in this part of the Commonwealth. Erosion through the folded layers has created valleys in the soft rocks and mountains where the rocks are resistant.
>
> Rocks at the site are tilted 25 degrees from the horizontal toward the southeast. The Raystown Branch of the Juniata River, which flows past the site, has cut a meandering valley into the tilted strata so that the valley walls along the stream rise 250-300 feet. To the northwest, resistant layers creat higher land which rises 500-600 feet above stream level. To the southeast, even more resistant rocks form Terrace Mountain, which rises steeply 1100 feet above stream level. The stream cuts rocks of the Devonian Catskill and Chemung Formations. These rocks, which were laid down as sediments approximately 360 million years ago, represent deposits of an old delta or deposits laid down on the sea floor off-shore from the delta. The delta sediments are red shales and sandstones of the Catskill Formation; the marine rocks are gray and greenish shales and sandstone of the Chemung Formation. Scattered marine shells have been found in the latter rocks.
>
> The site itself is located in an undercut notch in the Chemung Formation. The notch was cut during past generations by the Raystown Branch as its waters, flowing then at higher elevations, were swung in against the outcrop as the stream flowed around a tight bend.

> Through the years, the stream has cut downward and eventually abandoned the notch, leaving the shelf of overhanging rock as a protection from the rain to passersby. Cutting of the notch was probably accelerated during the period of the ice ages. Although the glaciers or their meltwaters never reached this part of the Commonwealth, the change in the climate which attended the advance of the ice probably caused heavier precipitation and increased frost action.

The major portion of the deposit at the Sheep Rock Shelter is composed of decayed shale derived from the shelter's overhang and by the creep of similar material from the steep slope at the northwest end of the site. Occupational debris, naturally-derived humus and rock fall account for the remainder of the site material. The deposit rests on an irregularly terraced bench formed as a notch by intensive errosional in-cutting of an intrenched meander of the Alligripis Ridge.

The overhang thus formed rises abruptly from the innermost recesses of the shelter towards the drip line (a distance of 15-30 feet), rising from less than five to more than 70 feet above the present floor level. This impressive overhang not only protects much of the shelter from wind, rain and snow by virtue of its size, shape and orientation, but because of its abrupt rise also permits sunlight to reach at least some portions of the floor area from early morning to afternoon, thus making it a very desirable living location.

The present usable living area of the shelter measures about 3000 square feet (roughly 25' x 120'), a maximum in the site's history. Cultural materials have been found as much as 14 feet below the present surface (204" below datum), and shaley gravels continue down another 10 feet or more to the prehistoric river level (which is now higher as a result of dam construction). In general, lower strata are moister and contain a greater amount of shale relative to soil per unit volume than upper levels. The ratio of shale to soil is probably a function of the frequency of use by human occupants per unit time, group size and composition.

An exceptionally dry midden comprises the top two to three feet of the deposit on the western end of the site from about W5 to W50. The moist condition of the east side is largely the result of a small spring at the back wall of the shelter and of the inclination of the surface which slopes down into the shelter from the drip line. Ground water seepage from the spring and surface drainage along the drip line have obscured strata boundaries, sometimes beyond recognition, in some portions of the deposit. The volume affected is confined, for the most part, to pre-Middle Woodland strata between N10-S15/E0-E15 and to the S20 line where

boundaries were difficult but not impossible to follow (see, for example, the S0, S5, E5, E10, and E15 profiles. Near the spring water containing ferro-magnesium impurities has combined with the soil matrix to form a very compact reddish-brown clay which continues down to bed rock. As cultural items and features were sparse throughout this area, it is inferred that the spring was either intermittantly or continuously active during most, if not all, of the site's occupational history and the area was probably undesirable as an activity locus.

From top to bottom the deposit may be divided into five zones based on soil composition, as illustrated in Figure 1.

Zone 1: a surficial layer averaging four inches in thickness and consisting mostly of shale chips, very heavy rock fall and the debris of picnickers, campers, and hunters who have used the site over the past half century (see Witthoft, this volume, p. 25, Zone 1, for additional details). This layer was removed with Zone 2 and does not appear on the stratigraphic profiles accompanying this chapter.

Zone 2: a culturally barren layer of domestic sheep manure 6-18 inches in thickness. A considerable amount of this layer was removed as a single unit prior to excavation of the prehistoric deposit (see Witthoft, this volume, p. 25-26 (Zone 2), and p. 27, bottom paragraph, for additional details).

Zones 3-5 are differentiated on the basis of water content, size of shale chips, the ratio of shale to soil, and the presence/absence of cultural items and features. Each of the zones can be further subdivided on the basis of color, texture and composition into units of cultural stratigraphy defined in terms of diagnostic artifact content.

Zone 3: comprises the Late Archaic, Transitional, and Woodland period deposits. These consist of soil (including humus, ash and charcoal) as the predominant component admixed with medium-sized shale chips and rockfall. Based on water content the zone may be subdivided into a dry and a wet component. The dry component is found in the upper two feet of the western end of the site and is flanked on the east and underlain by the wet component.

Zone 4: comprises the Early and Middle Archaic deposits. These average about 90" in thickness and consist of coarse shaley gravels as the principal component admixed with soil and humus. In some portions of the site the two cultural components are separated by a massive rockfall.

Zone 5: is a thick pre-occupational stratum consisting of numerous layers of fine shaley gravels. These form the base of the site deposit and extend down 50-120 inches to bedrock and the prehistoric river level.

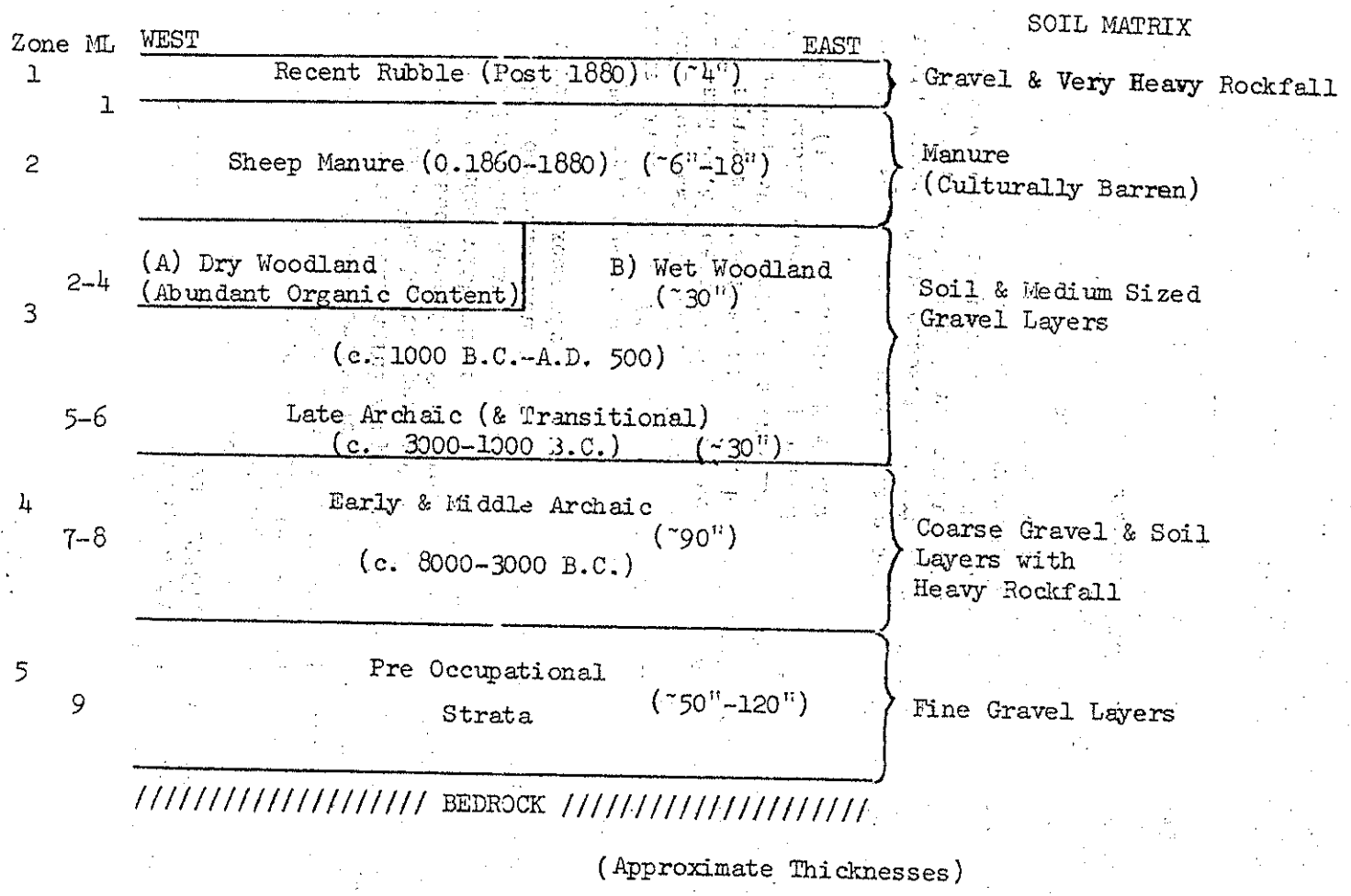


Figure 1. SOIL ZONES OF THE SITE DEPOSIT

FIELD METHODOLOGY

Subsequent to the exploratory testing of Miller on the east end of the site (see the S10 and S15 profiles) and the first controlled excavations of Stackhouse and Corl (1958), Witthoft and Kinsey established the excavation grid system used since that time for the control of horizontal provenience. Acting on the belief that dam construction would soon result in inundation of the site, they settled upon a checkerboard excavation strategy focusing on the western half of the deposit as the most efficient means to obtain an adequate and meaningful sample of the cultural deposit. This work consumed the better part of the 1959 and 1960 field seasons. As the proposed deadline for completion of the dam moved back and forth in tandom with the state of appropriations, later work expanded into the eastern half of the site (see the site maps in Michels' documentation chapter, this volume, for a season-by-season record of the excavation proceedings).

The grid system was laid out in 1959 when systematic excavations first began. At that time a datum point and coordinate base lines were established, with grid north perpendicular to the back wall and 44.6° east of magnetic north. The site was then partitioned into squares five feet to the side, with north-south lines running the length of the site (in an east-west direction) and east-west lines running more or less perpendicular to the back wall of the shelter (in a north-south direction).

Each square was excavated as a separate unit by the natural stratigraphy of the deposit, by arbitrary 3" and 6" levels, or by a combination of natural and arbitrary levels. Upon completion of an excavation unit profiles were drawn for one or more of the surrounding vertical walls, generally by the workers who had excavated the unit. Drawings were prepared on 8 1/2" x 11" sheets of graph paper of various brands and scaling (8, 10 and 20 lines to the inch were the most common scales used). All measurements were taken and recorded in the English (inch-foot) system. Vertical measurements were given in inches below the arbitrary zero datum point and are referred to hereafter as BD's. The profiles were then included with the field notes for the square recorded.

During the following Horn's preliminary attempt to consolidate these field profiles into a coherent stratigraphy of the site certain problems were brought to light (Horn 1967: 169-206). The study showed that the varying excavation strategies of past seasons had resulted in disparities in data recording. These included failure to record all four walls of an excavation unit or previously unprofiled wall sections, failure to record essential descriptive information, such as an adequate number of BD's, soil color, texture and composition, and failure to cross-check newly prepared profile drawings against those already completed for adjacent squares. At the time of the 1967 field season there was no complete and continuous (unexcavated)

profile within the drip line running the length of the site against which an integrated set of field profiles could be checked. Finally, in a trial integration of the profiles prepared by Horn, Michels encountered some difficulty in defining the spatial extent and boundaries of the deposits layed down during the major periods of the Northeastern archaeological sequence (Horn 1967: Ed. note, 187). This latter problem involved in particular the Early, Middle and Late Woodland components.

In response to these several problems a list of recommendations was drawn up to guide future stratigraphic work at the site. It was suggested that one person trained in stratigraphic recording be placed in charge of this aspect of the excavations. This person would supervise the recording of profiles by individual excavators, thus standardizing the recording procedures. It was felt that one of the most vexing problems encountered was the questionable accuracy of some field profiles. As a solution, it was suggested that BD's be taken for each level and that each level be systematically described in terms of color, texture and composition. Profiles should also be drawn to scale as accurately as possible and the scale used noted on each profile. It was advised that use of a standard color chart, such as the Munsell Soil Color Chart, could aid in standardizing soil color descriptions. A set of soil samples from the site could also help establish a standard for the description of textural and compositional variations. Black and white and color photography was recommended as an aid in detecting color changes which perhaps might not be seen by the naked eye. It was suggested that profiles be recorded soon after exposure so that drying and other weathering processes would not affect level descriptions and drawing accuracy. Finally, it was proposed that a trench be cut across the length of the remaining deposit in order to relate and to make more meaningful the profiles from past years.

These recommendations were followed to the greatest practical extent during the 1967 field season. The squares bounded by the S10 and S15 lines were chosen for the trench excavation, as they formed the longest continuous (although not complete) line across the site and included the deepest excavations to date. The major effort of the 1967 field season at Sheep Rock was directed toward excavating the squares between these lines. In retrospect, as far as the objectives of stratigraphic work were concerned it probably would have been more valuable to have excavated the squares between the S5 and S10 lines. While not extending beyond the drip line, the S15 line was so close to it in places that much of the wall was a consolidated matrix of red clay and shale in high natural strata were often difficult or impossible to observe and follow.

In the past, the excavators of a square were responsible for recording the stratigraphy of the exposed vertical sections. While such a procedure does introduce all students to the techniques of drawing a detailed stratigraphic profile, and while the person who excavated a unit should be the one most familiar with its natural strata, past experience had nevertheless shown that adequate profile drawings are not therefore an automatic product. It was felt that

the one student-one profile approach to recording stratigraphy invariably leads to inconsistencies in soil descriptions and BD readings. It was therefore decided that profiles for the walls of the trench would be drawn at the end of the field season by a small group of students familiar with the stratigraphy of the site.

Upon completion of the 1967 excavations a group of four students recorded the profiles using the following procedures. Walls were scraped down to expose a fresh profile. Small, brilliantly colored markers were then inserted along lines of color, textural and compositional variation. Below datum readings were taken for each of these points and the points plotted on a single large sheet of graph paper using a scale of one inch to one foot. The points were then joined free-hand and checked against the existing profile for accuracy.

These procedures met with only partial success, however, for in the meantime unanticipated heavy summer rains draining from the roof of the shelter had considerably obscured many areas of the S15 profile. Moreover, the lack of consistent lighting and differential moisture content in different parts of the deposit prohibited the accurate use of a Munsell Soil Color Chart.

A number of color transparencies of sections of the trench walls were taken, but when the slides were examined for detail, fewer strata could be observed than by visual examination of the walls themselves. However, they did serve as a useful check on the reconstruction of certain profile sections. Finally, use of a standard set of soil samples was also found to be impractical, as drying altered their apparent characteristics.

In sum, the recommendations followed in the field during 1967 met with variable success. In spite of the difficulties encountered, however, perhaps the single most important outcome -- the one which figured most significantly in the preparation and analysis of the composite profiles accompanying this report -- was the first hand experience gained in dealing with the deposit in all its disguises. This experience provided an invaluable intuitive basis for the accessment of soil descriptions without which the task of linking together eight years of profiling by some 70 individuals would have been made considerably more difficult.

LABORATORY ANALYSIS AND METHODOLOGY

This phase of our work was specifically concerned with the three stated objectives of this report: (1) preparation of a new set of composite profiles; (2) inclusion of as much feature data as possible; and (3) definition of the cultural stratigraphy corresponding to the major divisions of the Middle Atlantic and Northeastern archaeological

sequence. Particular attention is given to the problems associated with each objective and the techniques used to cope with them.

The Preparation of Composite Profiles

During the eight seasons of work at the Sheep Rock Shelter an estimated 70 individuals, including students, amateurs and professionals, were involved in the recording of field profiles. With few exceptions, these profiles, numbering some 447, were independently recorded by the five foot sections of the grid, generally without regard to the previously drawn profiles of adjacent squares. As would be expected, problems emerged which had to be resolved if the field profiles were to be successfully integrated into composite cross-sections of the site. The problems of integration derive from four sources: (1) condition of the deposit; (2) failure to record data; (3) quality of data recording; and (4) data comparability.

The condition of the deposit has already been discussed in some detail. Its significance lies in the manner in which the deposit may influence an observer's ability to record what ever structuring may have once been present. Loss through erosion, excavation, burrowing and slumpage obviate observation altogether, although to some extent the lost sections may be reconstructed, as discussed later in this section. Less drastic alterations of the deposit often result from surface and ground water drainage which may obscure site structure in part or in whole. Again, with some limitations the stratigraphy may be reconstructed. Both loss of deposit and loss of detail have contributed to the problem of profile integration at Sheep Rock, and both were generally dealt with by inferential reconstruction of the missing or obscured profile sections.

Failure to record data, particularly profile data, was dealt with in a similar manner when possible. The most frequent form of omission involved profile sections rather than entire walls (a profile section is a portion of an excavation unit wall of any dimensions; in general, such sections were five feet wide and variable in height).

Variations in data quality and comparability were perhaps the most difficult problems dealt with. Variations in data quality were essentially of two kinds: (1) omissions and (2) inaccuracies. Omissions include the failure to record such essential information as grid designations, BD's, soil color, texture and composition, and elements of the site structure (a structural element is a segment of any soil, rock or feature boundary which served to define and/or differentiate natural strata). Particularly aggrevating were inaccuracies in the recording of these data, since strata boundaries of adjacent and intersecting profiles failed to meet in continuous (unbroken) lines.

Inaccuracies derived from two sources: (1) failure to accurately measure or characterize profile elements and (2) failure to record these data correctly. The first involves misinterpretation of the stratigraphy but accurate recording of what was observed. In the second,

all of the structural elements of the stratigraphy may be present but one or more of their spatial relationships and/or morphological properties may be incorrectly rendered in the scale drawing. Both kinds of error were discovered (1) by cross checking with adjacent and intersecting profiles and (2) by comparison of duplicate profiles when these existed. In most cases good agreement was found between at least four of the six profiles lying adjacent to or intersecting a given profile segment. When duplicate profiles were available the one which best satisfied the criteria of accuracy, completeness and consistency with adjacent and intersecting profiles was selected for integration. When duplicate profiles had not been recorded corrections were made through application of a consistency test. This test is a form of coherency truth theorem which states that the most appropriate solution (that is, the most appropriate kind of change to make in the original field profile) is the one which is supported by the greater number of independent checks, and accounts most economically for the observed discrepancy.

In general, the tendency was to use the most economical change, the one which involved the least alteration of the original field profile. The kinds of checks that can be made include accuracy and completeness of essential data and agreement with and quality of associated field notes. Thus, when any of these data could be shown to be inaccurate, incomplete or incompatible the conditions of profile alteration could be specified and an appropriate solution devised so that continuity of strata was maintained. The only condition underwhich the consistency test breaks down is when all of the profiles concerned are prepared by the same individual at the same time. In this way agreement between profiles is maintained along with the error, since consistency is established by the observer. Examination of duplicate profiles recorded by different individuals at different times provided the only means by which such errors could be detected.

Variations in data comparability only compounded the problems of omission and inaccuracy. These variations concerned primarily the description of soil color, texture and composition. For example, the same soil matrix was sometimes characterized differently by different individuals, occasionally to the point of total incompatibility. It was in regard to this frequently encountered problem that our field experience paid off handsomely. Problems arising from variations in data comparability, like those of data quality, were generally resolved by application of the consistency test.

Profile Integration

Preparatory to integrating the field profiles, all originals were culled from the notes, given identification labels and organized according to grid square. Identification labels included the grid designation(s) of the profile(s) shown on the graph (for example, E5/S10---S15 S10/E5---E0 indicates two intersecting profiles were prepared on the same sheet of graph paper, one of which runs North-South from S10 to S15, and the other East-West from E5 to E0). This form of identification has the advantage of specifying both the location of a profile and the direction

from which it was drawn.

In order to insure the greatest possible accuracy and completeness in the integrated composite profiles, all original field profiles were reproduced to actual size using a 3M (Model 209) copying machine. These copies were than spliced together (using 3M milar transparent adhesive tape) according to the following procedures.

All of the profiles pertaining to a given grid line were abstracted from the file of field profiles organized by grid square and were arranged in vertical and horizontal sequence as they would be seen from a particular direction. For example, the S10 line may be viewed looking either to the north or to the south, and profiles drawn from both directions were included in the field notes for this grid line. In only a few cases, moreover, were all of the field profiles for a grid line drawn as viewed from the same direction. In order to minimize reproduction error, therefore, the direction chosen for integration conformed to the one in which the greater number of original profiles was drawn. The remaining profiles for a given grid line were reversed by carefully tracing the structural elements of the 3M copy on the opposite side of the page over a light box. For the sake of uniformity, final copies of the integrated composite profiles were prepared with grid West and North to the left hand side of the drawing. This procedure necessitated the reversal of some composite profiles, as discussed later in this chapter.

Adjacent profiles (those lying side by side in the same plane) were aligned first by the BD's indicated on them. They were then checked for continuity of strata, as suggested by the articulation of strata boundaries at grid junctures and by continuity in soil description and soil slope. Integration involved joining the profiles so that the layers could be traced as they extended across the site. Some minor disagreements in continuity were to be expected, since most profiles were recorded by different individuals at different times and were seldom checked against previously drawn adjacent and intersecting profiles. Experience showed that dimensionally such disagreements typically amounted to about three scale inches or less (1/4 inch on the Stratigraphic Profile Supplement accompanying this volume and 1/8 scale inch on the Master Level profiles contained in this chapter); rarely did disagreement approach six scale inches, and only once did it exceed this figure (field notes stated that the line-level in use at the time was faulty).

We therefore followed the rule that if disagreement did not exceed three scale inches the lines forming the boundaries of strata could be altered so as to join in an unbroken fashion. If disagreement exceeded three scale inches and joining of the lines seemed warranted on the basis of additional descriptive information, the lines were again corrected; in this case, however, dashed rather than solid lines were used to warn the user of the composite profiles of the possible inaccuracy in representation of the articulation (only that segment of a line which deviated more than three scale inches from the original was drawn in dashed lines). When confidence in the alteration

was high, a long dash-short dash line was used; in all other cases a uniform short dash line was drawn.

Profile Reconstruction

In order to maximize completeness of coverage and continuity in the composite stratigraphic profiles, about 20% (62) of the profile sections used in their preparation were reconstructed from original field notes. Lacking the desired sections, reconstruction of these portions was accomplished by plotting on a sheet of graph paper BD measurements of the vertical boundaries of natural strata along a specified grid line, as provided in plan views of the excavation units to either side of the line or as stated in the field notes. In this manner, the field notes of each unit could be used to cross check the other for accuracy, completeness and consistency. Other essential data were gleaned from the notes and entered on the reconstructed profile, which was then integrated with those prepared in the field.

To insure that individual idiosyncrasies were not a significant factor in profile reconstruction, a number of sections were independently reconstructed by two different individuals. In all cases, critical aspects of the reconstructed profiles thus prepared, such as the BD's of strata terminating along vertical grid lines, number of strata, soil descriptions, number, location and composition of features, etc. were in essential agreement when these data were provided. Disagreement was almost solely restricted to the contour of strata boundaries (for lack of sufficient BD's) and to the location of various elements of the profiles, such as rocks, disturbed areas, feature dimensions and contours (again, because of the lack of the required measurements and descriptive data).

Reconstructed profile sections are always shown as dashed lines in the reproductions accompanying this chapter and volume. High confidence lines are shown by a combination of long and short dashes; lines composed of short dashes only indicate that presence of the structural element is reasonably certain but that its exact location and/or dimensions are not and may be subject to revision. The use of dashed lines was decided upon in order to permit maximum flexibility in the use of the composite profiles as research instruments. The feature analysis now in progress is considered to be the final test of the profiles and may result in some alterations of the profiles when complete.

Final Reproduction

This section deals with the preparation steps leading from the completion of profile integration to final reproduction of the profiles for publication.

Each composite profile was traced in pencil on velum paper and the tracing checked in every detail against the original so as to maintain complete fidelity. Vertical and horizontal scales were also blocked out in pencil and double checked for accuracy. The pencil tracings were then inked using the pencil drawn lines as guides and checked again

against the originals for accuracy. All profiles were arbitrarily rendered with grid west and north to the left hand side of the drawings. This requirement made it necessary to reverse some profiles by inking on the side opposite the pencil work.

Deviations in a single line not exceeding 1/2 scale inch were ignored as we felt this to be a reasonable limit of control; larger deviations were corrected to agree with the originals.

Finally, rocks, bedrock, ash, charcoal and burned soil were shaded in different patterns using Zip-a-tone in order to give the profiles relief and to emphasize feature areas. To expedite processing of the drawings, original soil descriptions were hand lettered; vertical and horizontal scales, however, were done with Para-tipe press-on characters.

All final drawings were prepared to a scale of 1:12. These were then photo-reduced to 1/2 original size (1:24) for the Stratigraphic Profile Supplement accompanying this volume. Master Level profiles were reduced by 1/2 again to a scale of 1:48 so that they could be bound within this volume.

In working with the reductions, it will be observed in a few cases that when strata boundaries of intersecting profiles are properly aligned the zero inch vertical datum planes may not match. In general, this disagreement amounts to less than four scale inches, and in only one instance does it exceed this figure. The observed disparity is the collective result of all of the sources of error which have affected the integration task and is comparable to the measurement error inherent in the original field profiles.

Feature Data

Our second objective was to include as much feature data as a once-over gleaning of the field notes, manuscripts and published reports would permit. The rationale underlying this effort is based on two assumptions concerning the nature of cultural features: (1) they constitute stable, fixed loci and (2) they are a fundamental key to understanding the activity structure of a component. In some instances, when relatively little displacement of artifacts has taken place, living floors may be defined on the basis of artifact distributions alone. Our experience with the Sheep Rock Shelter stratigraphy has shown, however, that this is not a wholly reliable procedure because mixing has affected nearly all of the Master Levels and most of the components within them. Some additional information is therefore needed for the definition of living floors. Because of their apparent locational stability with respect to time, cultural features constitute a more or less permanent record of living floor activities, and combined with evidence drawn from artifact function and distribution such site units as activity sets, assemblages and components may be defined.

Within the time limitations imposed on us our efforts were directed along three lines: (1) to include the total range of morphological and functional variability manifested in the available data; (2) to give special attention to morphological detail; and (3) to make the inclusion of these data as exhaustive as possible. In attempting to fulfill these objectives we discovered a considerable variability in the quality and quantity of data recording. A large number of features are represented by profile drawings and/or face view drawings only; another group is described in variable detail in the notes; while still another group is mentioned with a minimum of descriptive terms. In those cases where data recording was less than desirable we made a special effort to seek out pertinent and supporting data.

In spite of these drawbacks, the inclusion of feature data has made several positive contributions: (1) they are responsible for a considerable increase in resolving power, that is, previously combined stratigraphic units can now be distinguished; (2) actual living floors can now be defined and their structure analyzed; (3) a better understanding of site structure and accumulation through time has been gained; and (4) certain anomalies of artifact distribution can now be adequately explained.

Master Level Definition

The final objective of our work was to define in so far as possible the cultural stratigraphy corresponding to the major divisions of the Middle Atlantic and Northeastern archaeological sequence (as defined by Willey 1966: 250-251). This task was accomplished using the following procedures:

(1) All radiocarbon dates and diagnostic artifacts were plotted on the composite stratigraphic profiles.

(a) In those cases where the recorded BD for an artifact was given as a range (for example, 78-84 inches BD) the artifact was plotted at the median point (81 inches BD in the preceding example), unless one or more of the three following conditions was encountered, with condition (c) taking precedent where applicable.

(b) If the BD range crossed over a line or lines separating two or more stratigraphic levels, the artifact was plotted in the level including the greater part of the range; if the range was equally divided among the levels the artifact was assigned on the basis of either conditions (c) or (d), with (c) taking precedent where applicable.

(c) Whenever additional descriptive data were available, these were used to reduce ambiguity encountered in conditions (a) and (b) above. These data include one or both of the following: an excavation level designation (Zone 1, Level F, etc.) shown on the original field profile for a square (these are given in parentheses on the composite profiles), or a description of the soil context in which the artifact was found and which was keyed to the field profile.

(d) If no additional descriptive data were available but the BD range permitted a choice between two Master Levels, as determined under procedure (2) below, the artifact was plotted in the appropriate Master Level.

(2) Subsequent to plotting the diagnostic artifacts, the composite profiles were examined for differential distribution of period-specific artifacts. For example, the distribution of Early Archaic artifacts was determined and compared with that for subsequent Middle Archaic items. In general, the analysis began with the S10 profile because of its central location and its relatively well-documented stratification. A stratigraphic boundary was then selected which appeared to adequately partition the two components. This boundary was then traced via all of the 14 East-West cross profiles to the adjacent S0, S5, S15 and S20 profiles and was tested against the independently determined distributions of diagnostic artifacts, radiocarbon dates and associated features. If the projection to these additional profiles via each of the 14 cross profiles supported the S10 partition, a Master Level boundary was drawn on all five North-South profiles at the appropriate locations.

When disagreement was encountered, that is, when a projected boundary did not adequately partition the components, one of three courses of action was taken:

(a) the initial S10 boundary was altered to conform with the other profiles, but so as to still maintain maximum separation of the components;

(b) where options were available, different strata boundaries were followed through the cross profiles so as to establish agreement between all five North-South profiles;

(c) a combination of (a) and (b) was followed.

Because the natural strata intersect and diverge at numerous points on any one profile (both East-West and North-South), options for alteration were almost always available. In virtually every instance where such options were not available, but an alteration such as the splitting of a stratum seemed warranted, the stratigraphy was found to be poorly defined, either because of ground water seepage or because of inattentive field recording. In these few cases Master Level boundaries were arbitrarily imposed.

These procedures were repeated for each successive Master Level, from the earliest to the latest deposit. The early-to-late sequence was chosen as the best approach to partitioning the profiles because initial study of the artifact distributions had shown that, in general, out of context artifacts were to be found above rather than below their appropriate location. Upward migration was to be expected, since the dense, coarse shale component of the deposit acts as an effective barrier to downward filtration of most artifacts. The periodic shuffling of feet and the burrowing of rodents would tend to uplife rather than

bury these items. The downward displacement of artifacts was by far less frequently encountered and is accounted for by two mechanisms:

(1) deep pitting of the site by Late Woodland inhabitants, such as the large, steep-sided, bark-lined pit shown on the S10 profile between W20 and W25;

(2) side wall slumpage.

Thus, the lowest artifacts diagnostic of any given period, the presence of which could not be explained by the disturbance factors discussed above, determined the approximate lower boundary of the Master Level in question. Minor adjustments were then made in order to achieve maximal partitioning of the deposit, as discussed previously.

Nine Master Levels were defined in this manner, eight of which correspond to the Middle Atlantic and Northeastern archaeological sequence. They are described below with respect to the following seven parameters where applicable:

(1) Level Number
(2) Approximate Chronometric Range
(3) Period Association
(4) Extent of Artifact Mixing
(5) Radiocarbon Dating
(6) Associated Diagnostic Artifacts
(7) Location, Extent of Coverage, Thickness

Level 1 (post A.D. 1580) - constitutes the top layer of the site which has been termed sheep manure and modern rubble on the various profiles. It is associated with the Historic Period but contains some artifacts uplifted from the Late Woodland stratum directly underlying it. One radiocarbon date of A.D. 1870 ± 100 (M-2081) was obtained from a hearth apparently dug into an old Susquehannock bed pit. Such artifacts as French gun flints, a rifle ball and a piece of Germantown blue jean cloth were found in this level. Level 1 covers the entire site area and measures about 6-18 inches in thickness.

Level 2 (c. A.D. 700-1580) - consists of Protohistoric and Late Woodland deposition. The Early and Middle Woodland artifacts found in this level owe their presence to deep pitting into the earlier deposits. Current evidence suggests that all such pitting originating from Level 2 is the exclusive product of Protohistoric inhabitants, that is, Shenk's Ferry or Susquehannock, and predominantly the latter. Five radiocarbon dates were obtained from this level, all of which pertain to Protohistoric occupation (Shenk's Ferry and Susquehannock). They are as follows: A.D. 1450 ± 100 (M-2086); A.D. 1460 ± 100 (M-1904); A.D. 1490 ± 100 (M-2084); A.D. 1690 ± 100 (M-1903); and A.D. 1600 ± 100 (M-1905). The standard errors associated with these dates result in a considerable overlap of chronometric ranges, such that the assignment of cultural context within the Protohistoric period cannot be based solely on the mean value given for each C^{14} determination. Archaeological cultures

represented in this stratum include Clemson's Island, Owasco, Shenk's Ferry, Monongahela and Susquehannock. Level 2 covers the entire site area and measures 18-36 inches in thickness.

Level 3 (c. 500 B.C.-A.D. 700) - represents the Middle Woodland deposit. Some Early Woodland ceramics were found in this level, the presence of which is accounted for by the normal processes of uplifting and by the small to medium sized pits excavated at this time. Most of these pits appear to have functioned as hearths, although one, which is distinctly larger than the others, may have served a different, possibly storage, function. Two radiocarbon dates were obtained from this level. Both were secured from small pits of densely packed charcoal situated on the far eastern side of the site. The dates are as follows: A.D. 60 ± 140 (M-2083) and A.D. 320 ± 140 (M-2082). Diagnostic projectile points indicate use of the shelter by at least four groups in contact with or representatives of archaeological cultures to both the west and north: Raccoon Side-notched (Type 27), Snyders (Type 31), Fox Creek Stemmed (Type 45) and Jack's Reef Corner-notched (Type 46). Only one ceramic type was identified for this period, Sheep Rock Cord-Marked, a locally evolved ware possibly of Point Peninsula affiliation. Sherds of this ware form two well-separated clusters, as shown in Appendix II, figure 1. Level 3 appears to have covered the entire site area but was considerably disturbed by deep pitting during Protohistoric times. Before disturbance, the level probably measures 6-18 inches in thickness.

Level 4 (c. 1000-500 B.C.) - constitutes the Early Woodland deposit. Some Terminal Archaic and Transitional period artifacts were found in this level, generally in its lower portions, and owe their presence to uplifting and to the excavation of at least two medium-sized pits by Early Woodland inhabitants. No radiocarbon dates definitely assignable to this period were obtained from Level 4. Three related varieties of pottery resembling Vinette I derive from the level, and all show an isomorphic distribution. Two projectile point types are also associated with this stratum, Meadowood (Type 26) and Juniata Stemmed (Type 29), both of which have Vinette I associations elsewhere. Level 4 covers most of the site area but appears to lens out on the far western end of the site. Most of the artifactual material identified with this period was recovered from the far eastern end of the site, where the Early Woodland deposit is thickest (Appendix II, figure 2). The level measures 0-30 inches in thickness.

Level 5 (c. 1500-1000 B.C.) - is a relatively thin layer constituting the Transitional Period deposit. Although soil accumulation during this period may have involved a greater proportion of the site area, diagnostic artifacts show a highly restricted distribution which is confined to the central and western portions of the site (see Appendix II, figure 3). Several varieties of Transitional points were recovered from Level 5: Susquehanna (Type 11), Perkiomen (Type 12), Fish tail (Type 35) and Frost Island (Type 21), the last constituting the only true Transitional complex at the site. One radiocarbon date of 1270 B.C. ± 160 (M-2085) was obtained from a small hearth lacking definitive associations but believed to be associated with the Frost Island phase

component of this period (this contention is more fully discussed on page 65). A few Terminal Archaic artifacts were found in or on the same horizon as the Transitional stratum. Level 5 measures 0-8 inches in thickness.

Level 6 (c. 3000-1500 B.C.) - constitutes the Late Archaic deposit. Although a few artifacts of this period have found their way into Master Levels 2, 4 and 5 through pitting and uplifting, this level appears to be relatively undisturbed and little difficulty was encountered in defining its boundaries. Several varieties of points were associated with this stratum: Brewerton Side-notched (Types 9 and 10), Brewerton Corner-notched (Type 8), Helgramite (possibly related to the Brewerton Eared-notched type (Type 13), Bare Island-Wading River (Type 18), Genesee (Type 24), Rossville (Type 17) and Savannah River (Type 19). Two radiocarbon dates were obtained from Level 6: (1) a date of 2350 B.C. ± 180 (M-1906) secured from a hearth forming part of a Brewerton living floor; (2) a date of 1850 B.C. ± 180 (M-1907), which appears to represent charcoal sweepings from the same floor contaminated by carbonaceous material derived from a later context. Level 6 is continuous throughout the site and measures 12-36 inches in thickness.

Level 7 (c. 5000-3000 B.C.) - constitutes the stratum of Middle Archaic deposition. The base of the level was dated at 5100 B.C. ± 250 (M-1908). At least two distinct components are represented in this stratum, the earliest, termed the Raystown River phase, dating 5000-4000 B.C., and the latest, an early Laurentian phase, dating 4000-3000 B.C. Diagnostic points from this stratum include Raystown Stemmed (Type 2), an early Laurentian corner-notched form (Type 3) and a style much resembling the Halifax type (Type 4). Level 7 is continuous throughout the site and measures 18-48 inches in thickness.

Level 8 (c. 8000-5000 B.C.) - constitutes the Early Archaic deposit. The top of the stratum is marked by a radiocarbon date of 5100 B.C. ± 250 (M-1908); a second radiocarbon date of 6920 B.C. ± 320 (M-1909) was obtained from the middle of the level. Only three diagnostic artifacts were found in Level 8, two Kirk serrated points (Type 1) and one LeCroy point (Type 7). The deepest artifactual material, all non-descript in nature, was found at the base of this stratum at 204 inches BD. Level 8 is continuous throughout the site and measures 12-48 inches in thickness.

Level 9 (c. pre 8000 B.C.) - constitutes the pre-occupational deposit. This level is composed mostly of fine angular, bedded shale and occasional rock fall. Level 9 is continuous over the site and measures 50-120 inches in thickness.

DISCUSSION

The results of our work are discussed in relation to the following five topics: (1) excavation statistics, (2) stratigraphic profiles, (3) cultural features, (4) Master Levels and (5) recommendations.

Excavation Statistics

During the eight seasons of excavations at Sheep Rock approximately 12,800 cubic feet of deposit were removed over an area of 2240 square feet. This amounts to about 1/2 of the total estimated volume of the site and 2/3-3/4 of the cultural deposit. At least 70% of the total estimated surface area of the shelter (3050 sq. ft.) and nearly 83% of the main habitational area within the drip line (2460 sq. ft.) was opened through the excavation of 98 whole or partial squares, as shown in figure 2. These statistics are summarized in Table 1.

Table 1

Summary of Excavation Statistics

Parameter		Area or Volume Sampled	% Sampled
Total Estimated Site Area	c. 3050 ft^2	2240 ft^2	73
Total Habitation Area (within drip line)	2460 ft^2	2040 ft^2	83
Total Estimated Volume of Site	c. 25,000 ft^3	12,800 ft^3	c. 50
Total Estimated Volume of Cultural Deposit	16,000 - 18,000 ft^3	12,000 ft^3	c. 67-75

The average surface and bottom BD's of the excavation are tabulated by square in Appendix III, figure 1; based on these figures a tabulation of the volume of earth excavated from each unit is presented in figure 2 of the same appendix.

Stratigraphic Profiles

The underlying principle guiding our preparation of the composite profiles was that they should function primarily as research instruments. If they served only an illustrative function, as published profiles often do, we should not have taken the trouble to prepare more than two or

36Hul SHEEP ROCK SHELTER

Squares Excavated During the Eight Seasons of Excavation (1958 - 1967)

---- Estimated Maximum Area of Habitation Deposit (~3000 Sq. Ft.)

- - - - Main Habitation Area (within Dripline): 2400 Sq. Ft.

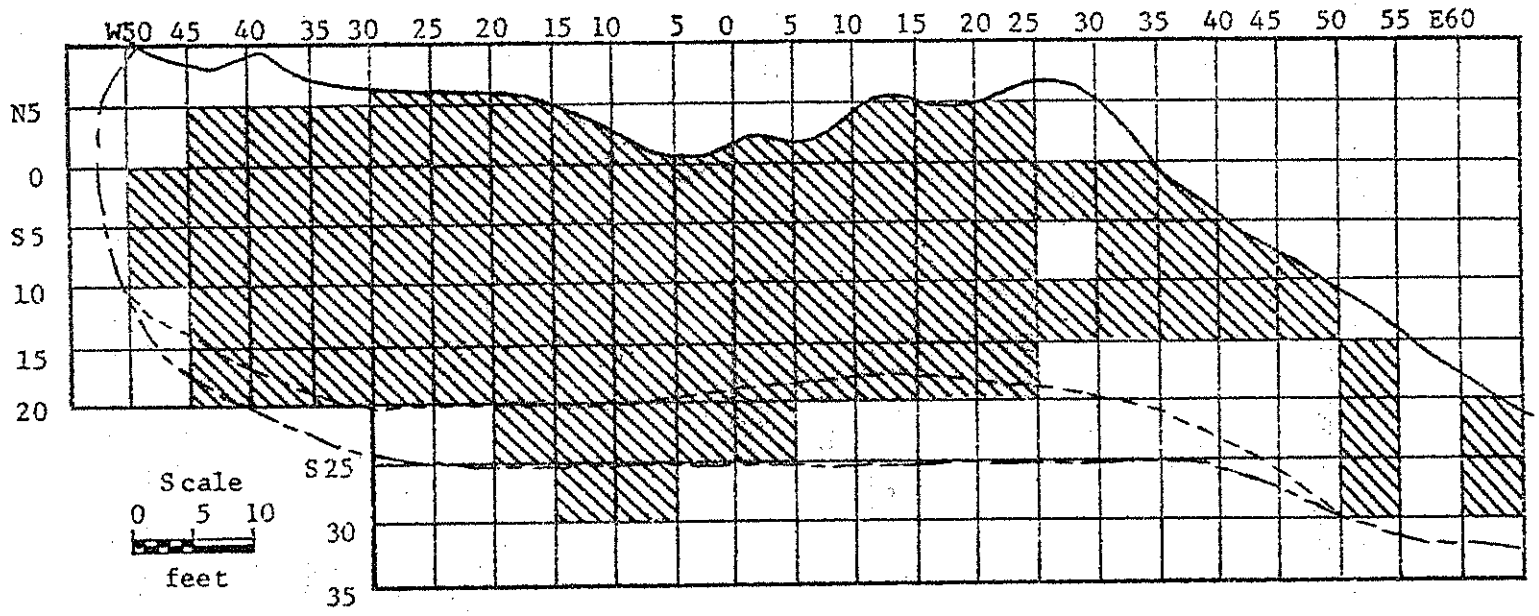


Figure 2 DISTRIBUTION OF EXCAVATED SQUARES IN RELATION TO TOTAL SITE AREA AND MAIN HABITATIONAL AREA

three profiles representative of the range of data inherent in the complete set. However, excavation of the major portion of the cultural deposit at Sheep Rock made possible a more ambitious effort: the preparation of an integrated set of profiles reconstructing the structure of nearly the entire site deposit as it is known through recorded field observations. We could attain 90-95% coverage of the excavated deposit or roughly 2/3 of the total estimated volume of cultural deposition. We were thus confronted with a rare opportunity for combining expansive coverage and a high level of structural specificity, and the combination of these two factors was considered to be a precondition for a full grasp of the site's behavioral significance. Only through a 3-dimensional analysis of the site deposit could activity sets, living floors and components be defined, compared and contrasted.

During the 8 seasons of excavation a total of 447 profiles were recorded by an estimated 70 different individuals. About 1/3 of these are duplicates. The frequency distribution of the total sample is presented by square in Appendix IV, figure 1. Two hundred and forty-eight of the 447 provides (55% of the total) were actually used in the preparation of the composite profiles accompanying this volume. An additional 62 profiles were reconstructed from field notes in order to fill voids created by the lack of records for part or all of the side walls of some excavation units. The distribution of the 310 existing and reconstructed stratigraphic sections used in the preparation of the composite profiles is shown in Appendix IV, figure 2.

A total of 20 composite stratigraphic profiles were constructed, 6 of which (the North-South profiles) run east-west, and the remainder (the East-West profiles) north-south. These are listed by grid line in Table 2; also provided in this table are the coordinate end points which specify the location and length of each composite profile. Their distribution is graphically represented in Appendix IV, figures 3 and 4.

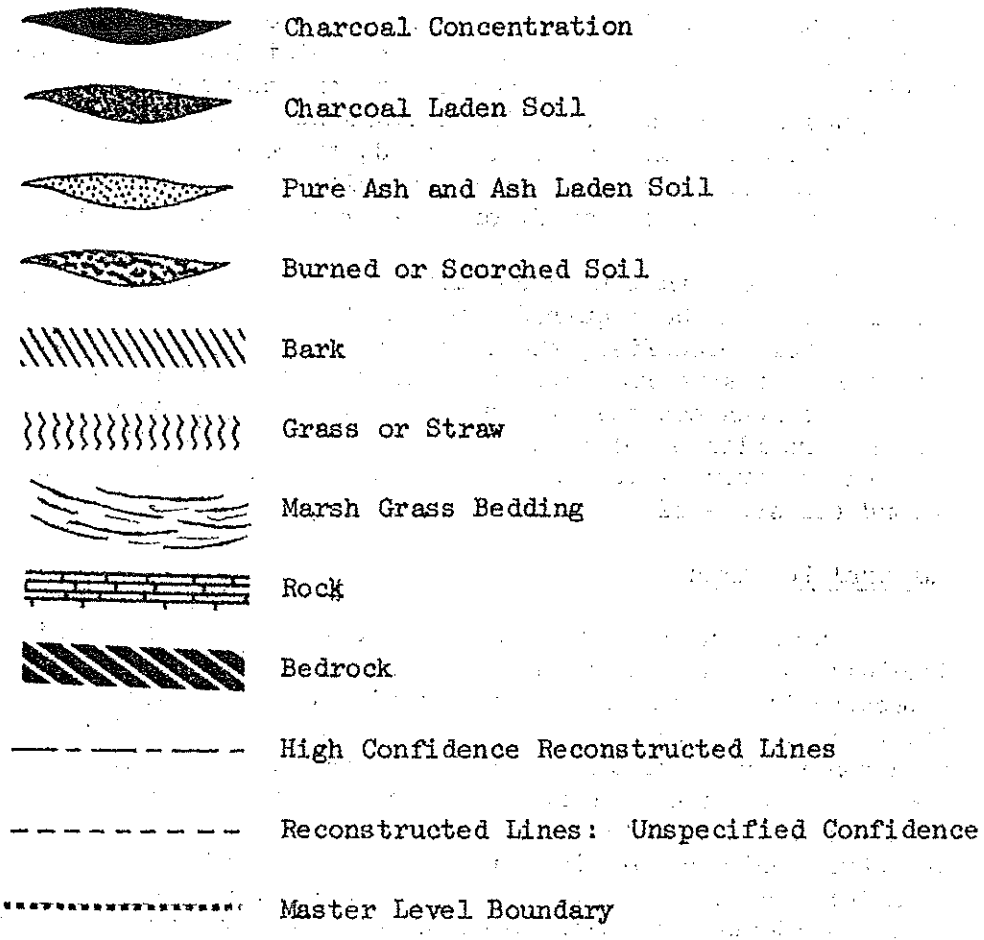
Table 2

Name, Location and Length of Composite Stratigraphic Profiles

N-S Profiles			E-W Profiles		
Name	Location	Length (Ft)	Name	Location	Length (Ft)
N5	E5 → E25	20	W40	S0 → S15	15
S0	W40 → E30	70	W33	N7 → S15	22
S5	W40 → E30	70	W30	N8 → S25	33
S10	W45 → E50	95	W25	N7 → S21	28
S15	W40 → E57	97	W20	N8 → S28	36
S20	W35 → E20	55	W15	N5 → S30	35
			W10	N4 → S30	34
			W5	N1 → S20	21
			E0	N3 → S20	23
			E5	N3 → S25	28
			E10	S0 → S20	20
			E15	N5 → S20	25
			E20	N5 → S20	25
			E25	N5 → S15	20

Altogether, the composite drawings represent about 5530 square feet of profiled deposit, 3060 square feet of which lie along the North-South profiles and 2470 along the East-West profiles. The original composite profiles were prepared at a scale of 1:12. The reductions contained in the Stratigraphic Profile Supplement to this volume are reproduced at a scale of 1:24, and the Master Level profiles included in this chapter are further reduced to a scale of 1:48. Vertical scales on all reproductions are in inches; horizontal scales are in feet. A legend for the various patterns of shading and line styles used in the drawings is provided in figure 3; a copy of this figure also accompanies the Stratigraphic Profile Supplement.

With the exception of the Rock and Bedrock legends, all of the patterns used were designed primarily to emphasize the presence and composition of cultural features. Actual soil descriptions were used is place of a small set of standard soil patterns (1) so as not to submerge the feature patterns and (2) because it was felt that they would make the composite profiles better research instruments by providing original descriptive information keyed to the field notes. To further enhance their value in relation to the notes, excavation level designations are included in parentheses on the composite profiles whenever these were provided either on the original field profiles or in the notes accompanying them.



SCALE

Stratigraphic Profile Supplement	1 : 24
Master Level Profiles	1 : 48

Vertical Scales in Inches
Horizontal Scales in Feet

Figure 3 LEGEND TO MASTER LEVEL PROFILES AND STRATIGRAPHIC PROFILE SUPPLEMENT

Examination of the features shown in the composite profiles suggests that a wide range of activities were conducted at the site and that these are differentially distributed by Master Level, a hypothesis supported by the composition and distribution of cultural items. Testing of the new profiles began with an analysis of the distribution of diagnostic artifacts. This analysis suggested that, while some mixing of the components had occurred, there were a number of clearcut associations of diagnostic artifacts with what appeared to be living floors, and a thorough study of these relationships is now in progress.

We expect that upon completion of this study a few changes in the profiles may be required, such as the slight alteration of some Master Level boundaries, the inclusion of new feature data, or the alteration of some reconstructed lines. It does not seem likely, however, that such changes will be of sufficient magnitude to make the current profiles obsolete or inadeuqate for interests either of direct concern to study of the Sheep Rock Shelter or for those which extend beyond the scope of the site itself.

Cultural Features

Our second objective was to include in the composite profile drawings as much feature information as possible. Attainment of this objective is perhaps the drawings' single most impcrtant contribution. The inclusion of broad scope and morphological detail (1) has resulted in a considerable increase in stratigraphic resolving power; (2) now makes possible the definition of living floors with some degree of structural specificity; (3) provides a better understanding of site structure and accumulation through time; and (4) has provided an explanation for certain anomolies of artifact distribution. Horn's preliminary analysis identified major zones of site-modifying activities and designated them feature areas. The resolution of these into their constituent components will premit a more detailed and unequivocable evaluation of site function during the various periods of use through a comparison of living floor activities. The reconstruction of these activities would be severely handicapped if cultural items were analyzed without regard to context, and context is what the new profiles provide.

Master Levels

The definition of Master Levels, our third objective, was a relatively straight-forward operation. Our efforts were directed along two lines: (1) to resolve the problem of defining the stratigraphic perimeter of Transitional, Early and Middle Woodland deposition; and (2) to establish continuity between, as well as within, the Master Levels of the North-South composite profiles. At the time of Horn and Michels' analyses only provisional control had been gained over the Transitional deposit, and the Early and Middle Woodland components could not be differentiated. Using the new set of profiles we are now able to satisfactorily partition these components and to explain certain anomolies of artifact distribution.

The distribution of diagnostic Transitional period artifacts shows strong localization within a relatively thin stratigraphic band. We do not believe, however, that the perimeter of the distribution shown in Appendix II, figure 3, therefore represents the only zone of soil accumulation during this period. Rather it appears that the boundaries of Terminal Archaic, Transitional and Early Woodland deposition merge to some extent, and the absence of diagnostic artifacts beyond the perimeter of figure 3 prevents definitive assessment of this factor. For this reason, the Transitional boundaries shown on the composite profiles reflect only the zones of cultural features and associated deposits that could be identified on the basis of diagnostic artifact associations; they do not reflect the total vertical distribution of these artifacts, as some upward migration has occurred, nor do they necessarily reflect the total horizontal distribution of soil accumulated during this period. We do believe, however, that the boundaries shown are consistent with quantitative aspects of the evidence: diagnostic artifacts are few in number and restricted in distribution; typologically, they appear to be predominantly the product of a single complex (Frost Island) supplemented by a few projectile points representing certain other complexes; associated cultural features are also few in number and are modest in size and complexity. These data taken together suggest that groups making use of the shelter during Transitional times were small and that the interval of time involved is relatively short.

DIfferentiation of the Early and Middle Woodland components was accomplished after careful analysis of the distribution of ceramics dating from these two periods (see Appendix II, figures 1 and 2. There has been a considerable amount of uplifting of both ceramics and points diagnostic of the periods. Particularly affected was the Middle Woodland deposit, largely if not exclusively as a result of Protohistoric pitting of the site, and without knowledge of the ceramic distribution, deposition dating from this period could not have been identified.

The principle used for the definition of the lower boundary of Master Levels was particularly helpful in this case: the lowest artifacts diagnostic of any given period, the presence of which cannot be explained by such disturbance factors as pitting and side wall slumpage, determine the lower boundary of the Master Level in question. Once a boundary is determined at a few widely separated points, it can be projected through indeterminate locations where diagnostic artifacts may be lacking. By application of these rules we were able to secure at least provisional control over the Middle Woodland deposit. Early Woodland deposition was treated in a similar manner but presented less difficulty.

Establishing continuity between the North-South Master Level profiles was perhaps the most rewarding aspect of our work, particularly with respect to the S20 line. This profile had given us considerable difficulty during integration of the field profiles because of the degree to which ground water drainage has obscured its stratigraphic boundaries. When the Master Level boundaries determined for the S0 through S15 profiles

were projected to the S20 line, however, we were at first surprised then gratified by the stratigraphic partitioning attained, for they were in one instance considerably different than we had expected on the basis of Horn's preliminary analysis and our plotting of the diagnostic artifacts.

This instance concerned the Master Level placement of Projectile Point Type 5, which hitherto had been regarded as a late Middle Archaic style because the BD's of the points suggested a greater time depth than is now believed to be the case. Their relationship to point Type 8 was recognized but were segregated on the basis of blade outline to conform with what the BD's suggested. At that time we lacked two essential stratigraphic tools: (1) a S20 composite profile and (2) continuity between the North-South and East-West profiles. With these tools now in hand it became apparent that the greater depth of Type 5 was a function of slope in the deposit beyond the drip line, that Types 5 and 8 belong essentially to the same cultural provenience, and that the typological distinction is therefore unnecessary. In effect, a spatial-functional difference between sets of points of the same type had been mistaken for a temporal-stylistic one (see Bebrich's discussion of Type 5, this volume).

In general, the establishment of continuity between profiles proceded with little difficulty and gave us an optimistic preliminary view of what may be expected in the way of defining living floors. At least one such floor can be defined for each of the Archaic periods. The same is likely for the Transitional and Early and Middle Woodland deposits. The Late Woodland period presents a challenge in this regard, for Proto-historic pitting has resulted in extensive destruction of the stratigraphy for the early phases of this period. No attempt will be made to define these floors at this time, as they are the subject of a more thorough analysis now in progress. Suffice it to say that the preliminary results are encouraging and that we expect to gain considerable insight into living floor activities and site function through time.

Recommendations

In the course of our analysis we encountered a number of problems which stemmed directly from deficiencies in the recorded field observations, the most frequent of which were omissions. These omissions considerably increased the time required for integration of the field profiles and left many uncertainties which could easily have been avoided if field observations had been more thorough and systematic. We have therefore included in this report a series of recommendations which are designed to make the task of stratigraphic analysis easier and the results more certain. The list is not exhaustive but touches upon the salient kinds of data which are most useful to profile integration and analysis. It was designed with stratified midden deposits in mind but may be applicable to other contexts. The recommendations are presented under two headings: (1) Profile Drawings and (2) Face View Drawings.

Profile Drawings: systematic recording of the following list of observations is considered essential to profile integration and to stratigraphic analysis; other interests may also be served by the recording of these data, including the analysis of features and the definition of activity sets.

(1) Name of Recorder; Date (including year)

(2) Grid Square

(3) Side wall shown in drawing (using grid coordinates in all cases and cardinal directions of the grid system when applicable).

(4) Scale (if possible, all drawings should be prepared to the same scale).

(5) BD's for the termini of all strata boundaries at points of intersection with vertical grid lines. The BD's of additional points to determine the contour of strata boundaries should also be taken.

(6) Precise recording of cultural features, including morphology, internal stratification, soil description(s) and the relation of cultural items to feature components.

(7) Soil description(s) of all soil components, including color, texture and composition.

(8) Notation of the relation of cultural items to components of the stratigraphy, including unusual concentrations and associations.

(9) Precise plotting of rocks and other materials which may indicate slope and location of strata boundaries, particularly at grid junctures, where they may play an important role in the linking of adjacent profiles.

(10) Numbering of excavation levels.

(11) Cross-checking against previously drawn adjacent and intersecting profiles, noting the nature of discrepancies, if any, and recommendations for correction.

Face View Drawings: to supplement the profiles and act as an independent check on measurements and associations, the generous recording of face views is also recommended. These should include at a minimum the following information:

(1) Name of Recorder; Date

(2) Square, including the grid definition of all four corners.

(3) Level designation.

(4) BD's on the floor being viewed at each of the four corners.

(5) BD's at other locations if the floor is highly irregular.

(6) Definition of the perimeter of cultural features, including internal horizontal stratification (with soil description(s), field identification designation and descriptive characterization.

(7) Description(s) of all soil components.

(8) Location of all shaped artifacts on or near the plane of the face view.

(9) Location of obvious artifact concentrations.

(10) Inclusion of rocks and other materials which may be projecting through the floor being drawn.

(11) Statement as to whether the face view is at the top, bottom or some intermediate position in an arbitrary or natural excavation level.

(12) Use of an arrow symbol to indicate grid north.

(13) Cross-checking against previous excavation records of adjacent squares, noting discrepancies, if any, and recommendations for corrections.

Over the years, multiple excavation strategies were applied at the Sheep Rock Shelter in order to extract various kinds of data. These included checkerboard excavation to acquire a broad sampling of the variation in cultural items and features within a short period of time, small scale excavation of particular units to acquire certain kinds of feature data, and as more time became available, large scale excavation to fill out sampling of previously unexcavated portions of the site.

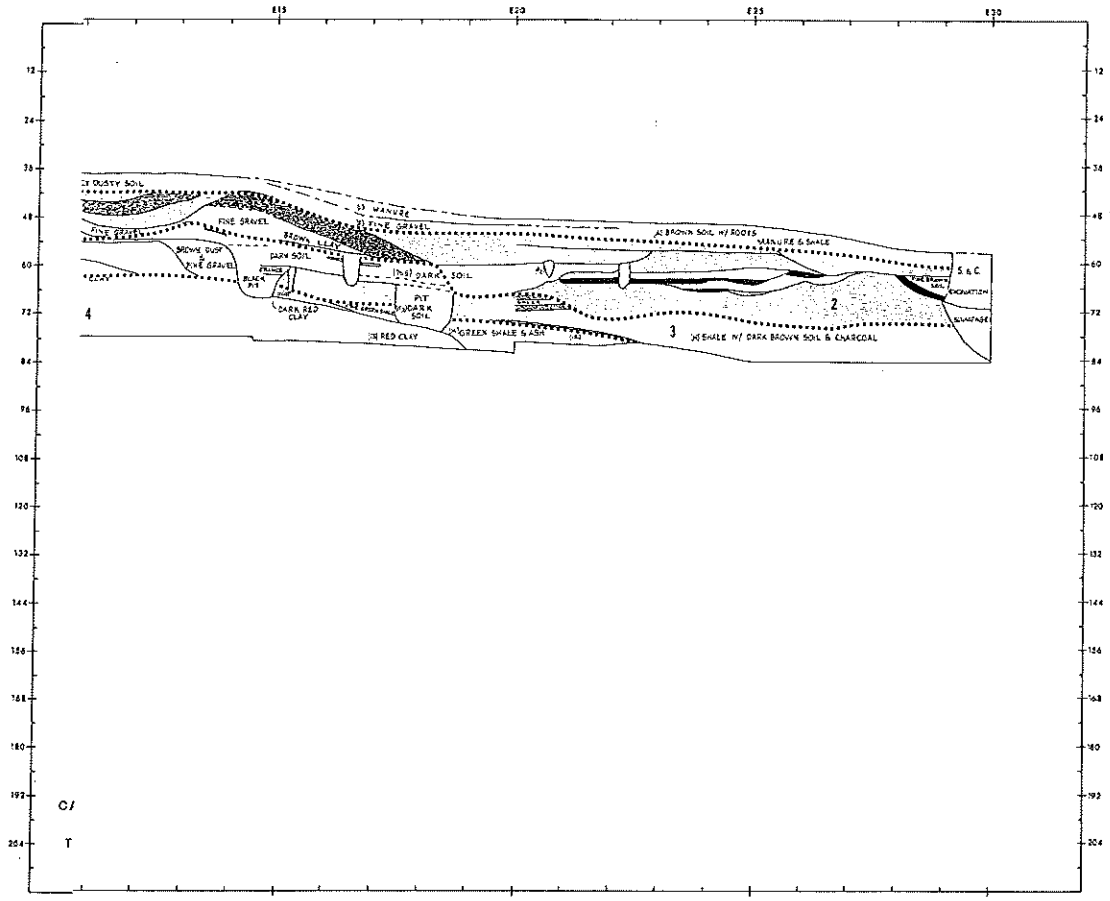
Under these circumstances variations in data recording procedures are inevitable unless guidelines are established and followed. It is towards this end that procedural recommendations have been included in this report. Their implementation is likely to yield, with far less effort, a more reliable stratigraphic reconstruction of any deposit, particularly one which is complex in composition. This task can be made long and difficult by failing to systematically record the kinds of observations enumerated above, as we have experienced with the data from the Sheep Rock Shelter (in excess of 2/3 of the 2500 hours spent on integrating the composite profiles went for resolving one kind of disparity or another, most of which could have been avoided). Or it can be made shorter and less difficult and the results probably more reliable if the observations are properly attended to.

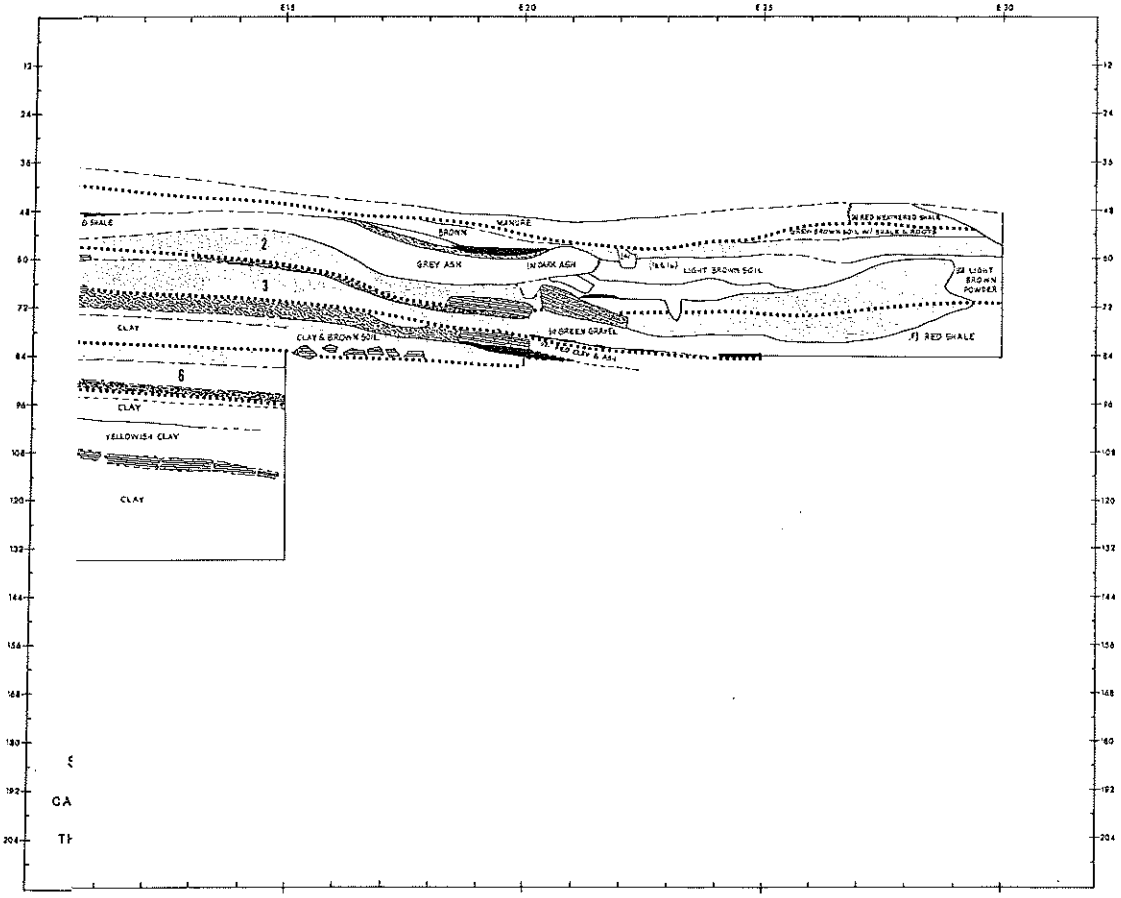
The value of stratigraphic reconstruction lies in whether or not the results can yield reliable and behaviorally sensitive units of

association. Should it fail in either of these two respects the task of reconstruction then becomes little more than an academic exercise. Properly executed, both in the field and in the laboratory, stratigraphic reconstruction can be a powerful tool for the investigation of behavioral aspects of site deposits, as we anticipate will be the case at the Sheep Rock Shelter.

APPENDIX I

MASTER LEVEL PROFILES


E15
E20
E25
E30
DUSTY SOIL
MANURE
FINE GRAVEL
BROWN CLAY
BROWN DUST & FINE GRAVEL
DARK SOIL
DARK SOIL
PIT
DARK SOIL
DARK RED CLAY
RED CLAY
GREEN SHALE & ASH
BROWN SOIL W/ ROOTS
MANURE & SHALE
S & C
EXCAVATION
SLIMPAGE
SHALE W/ DARK BROWN SOIL & CHARCOAL
4
2
3


E15
E20
E25
E30
SHALE
MANURE
BROWN
GREY ASH
DARK ASH
LIGHT BROWN SOIL
LIGHT BROWN POWDER
RED SHALE
CLAY
CLAY & BROWN SOIL
GREEN GRAVEL
RED CLAY & ASH
CLAY
YELLOWISH CLAY
CLAY
2
3
6

APPENDIX II

TRANSITIONAL, EARLY AND MIDDLE WOODLAND ARTIFACT DISTRIBUTIONS

36Hul SHEEP ROCK SHELTER

Each mark indicates the location of one (1) sherd.

Solid and dotted lines indicate the approximate boundries of major habitation areas.

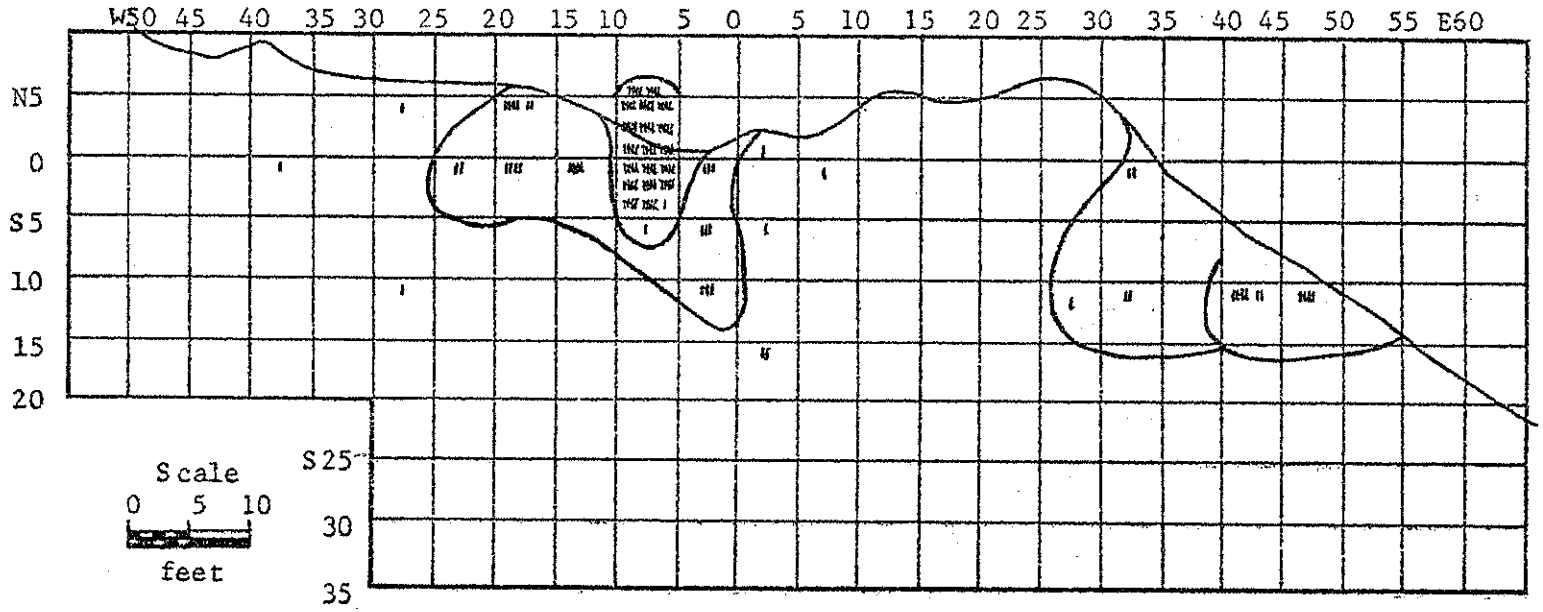


Figure 1 MIDDLE WOODLAND CERAMIC DISTRIBUTION BY SQUARE

36Hul SHEEP ROCK SHELTER

Each mark indicates the location of one (1) sherd.

Solid and dotted lines indicate the approximate boundries of major habitation areas.

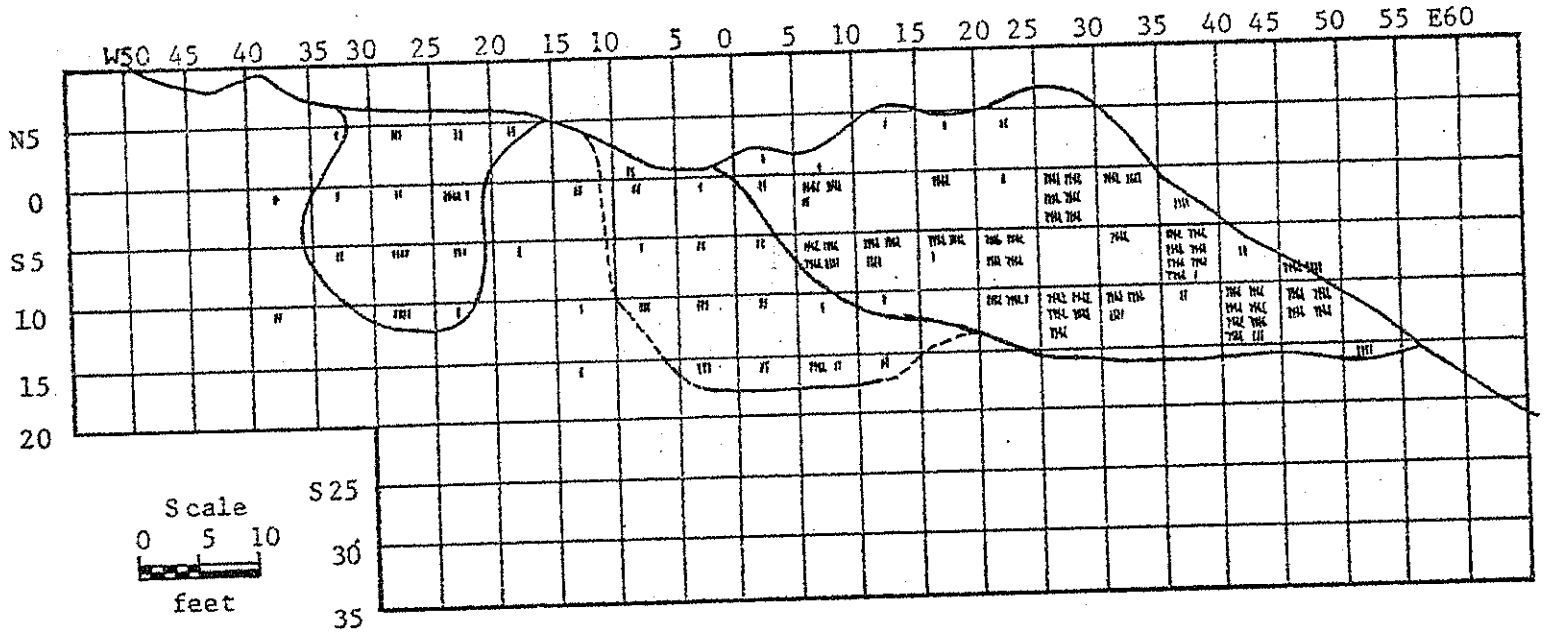


Figure 2 EARLY WOODLAND CERAMIC DISTRIBUTION BY SQUARE

36Hul SHEEP ROCK SHELTER

○-- Steatite vessel fragments

△-- Transitional projectile points

Numbers within the symbols indicate quantity

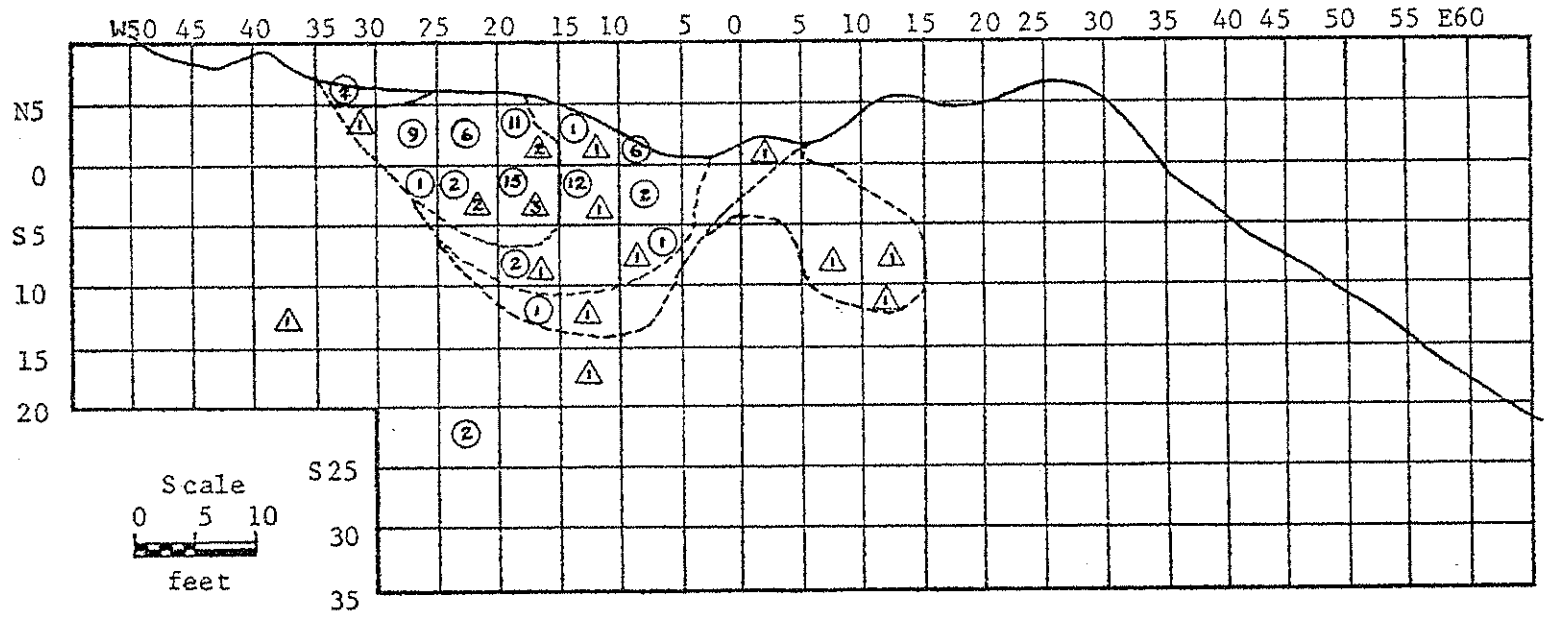


Figure 3 TRANSITIONAL ARTIFACT DISTRIBUTION BY SQUARE

APPENDIX III

AVERAGE SURFACE AND BOTTOM BD'S:

VOLUME OF EARTH EXCAVATED BY GRID SQUARE

36Hul SHEEP ROCK SHELTER

Upper figure denotes average surface below datum reading.

Lower figure denotes average bottom below datum reading.

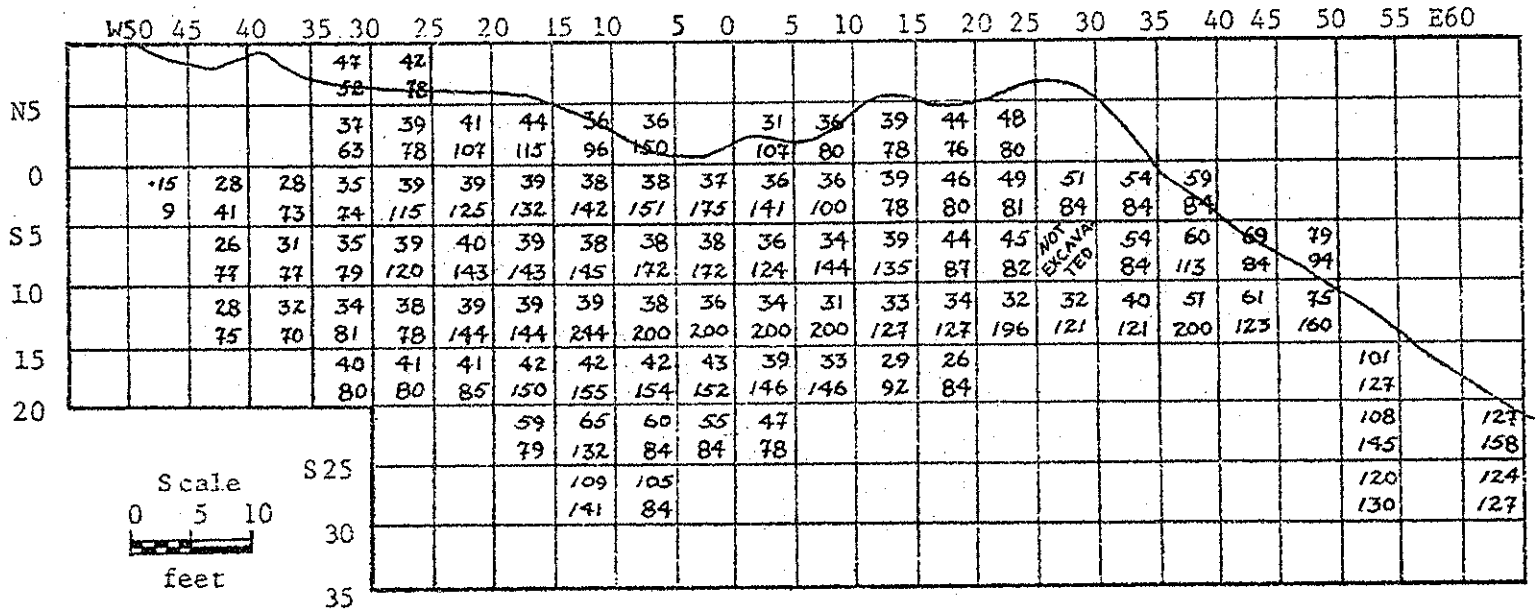


Figure 1 AVERAGE SURFACE AND BOTTOM BD'S BY GRID SQUARE

36Hu1 SHEEP ROCK SHELTER

Upper figure denotes square volume in cubic inches.

Lower figure denotes square volume in cubic feet.

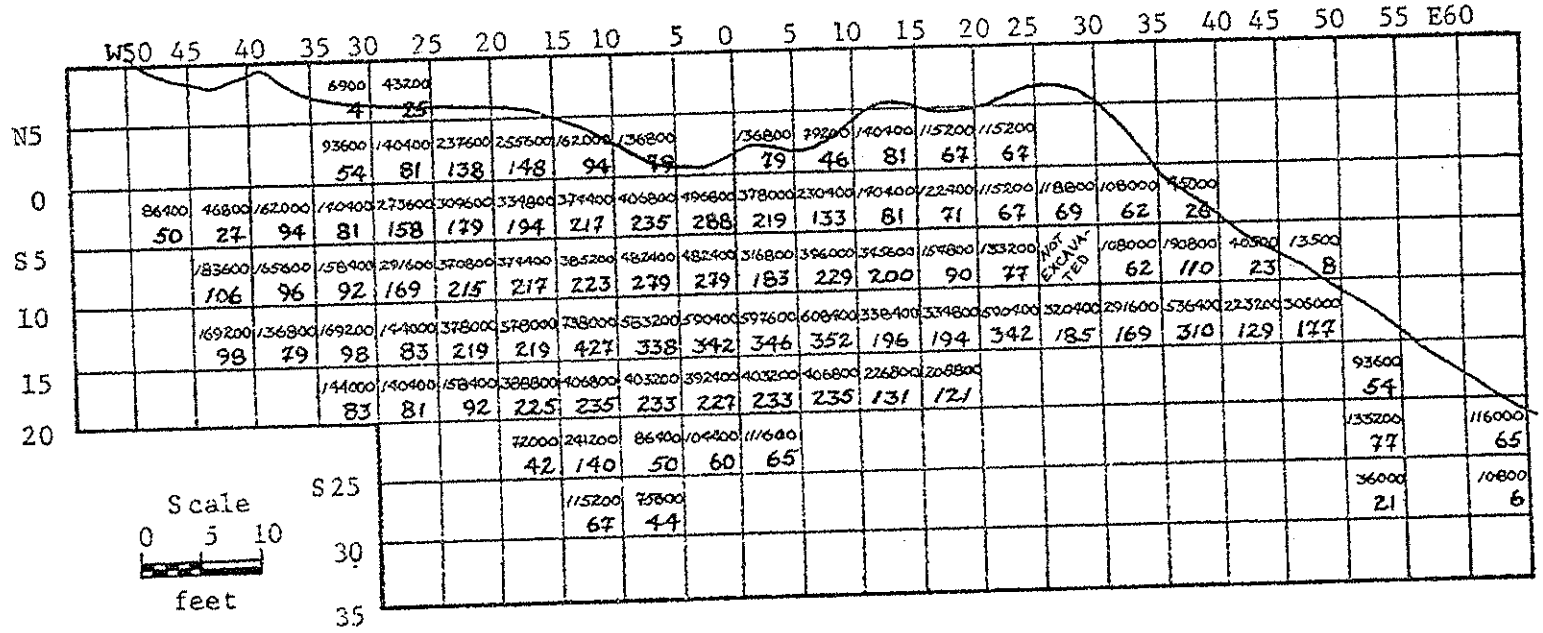


Figure 2 VOLUME OF EARTH EXCAVATED BY GRID SQUARE

APPENDIX IV

FIELD AND COMPOSITE PROFILE DISTRIBUTION BY GRID SQUARE

36Hu1 SHEEP ROCK SHELTER

Criteria of Tabulation: 1. 90° profiles on the same page -- each count 1.

2. 180° profiles on the same page -- count 1 for each square.

3. Partial profiles of a square -- each count 1.

Lines sectioning a square denote partial square profiles in the indicated direction.

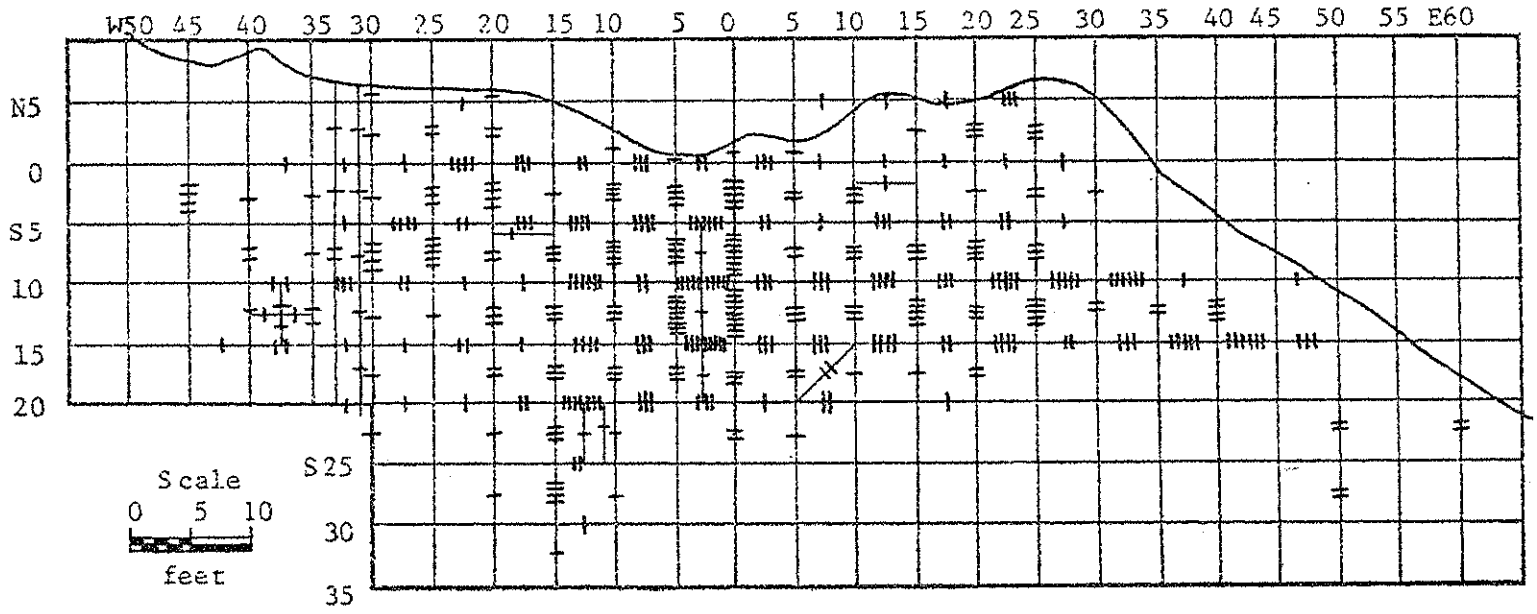


Figure 1 FREQUENCY DISTRIBUTION OF TOTAL SAMPLE OF ORIGINAL FIELD PROFILES

36Hul SHEEP ROCK SHELTER

Criteria of Tabulation: 1. Reconstruction within existing profiles not counted.

2. Reconstruction of a substantial nature (2+ ft.) between existing profiles counts as 1 reconstructed profile.

|-- Existing profile

x-- Reconstructed profile

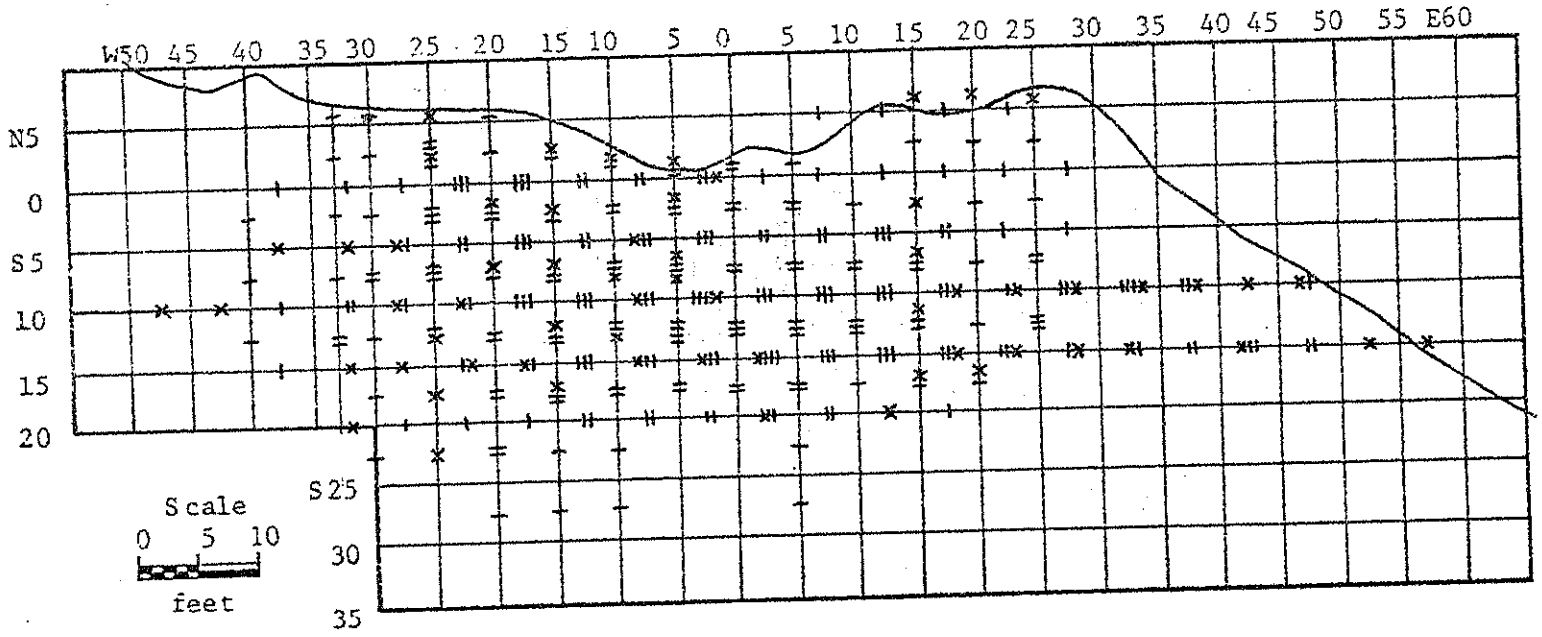


Figure 2 FREQUENCY DISTRIBUTION OF ORIGINAL AND RECONSTRUCTED PROFILES USED IN THE PREPARATION OF THE COMPOSITE PROFILES

36Hul SHEEP ROCK SHELTER

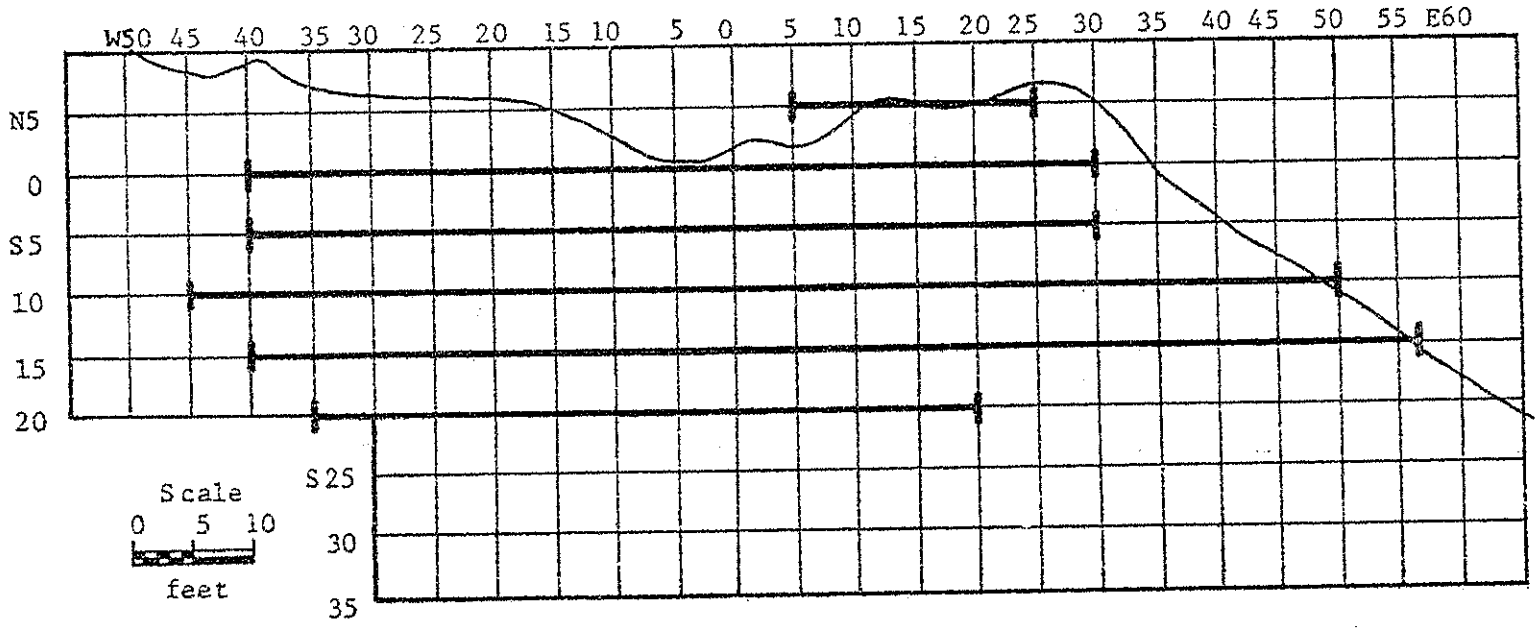


Figure 3 DISTRIBUTION OF NORTH-SOUTH COMPOSITE PROFILES

36Hul SHEEP ROCK SHELTER

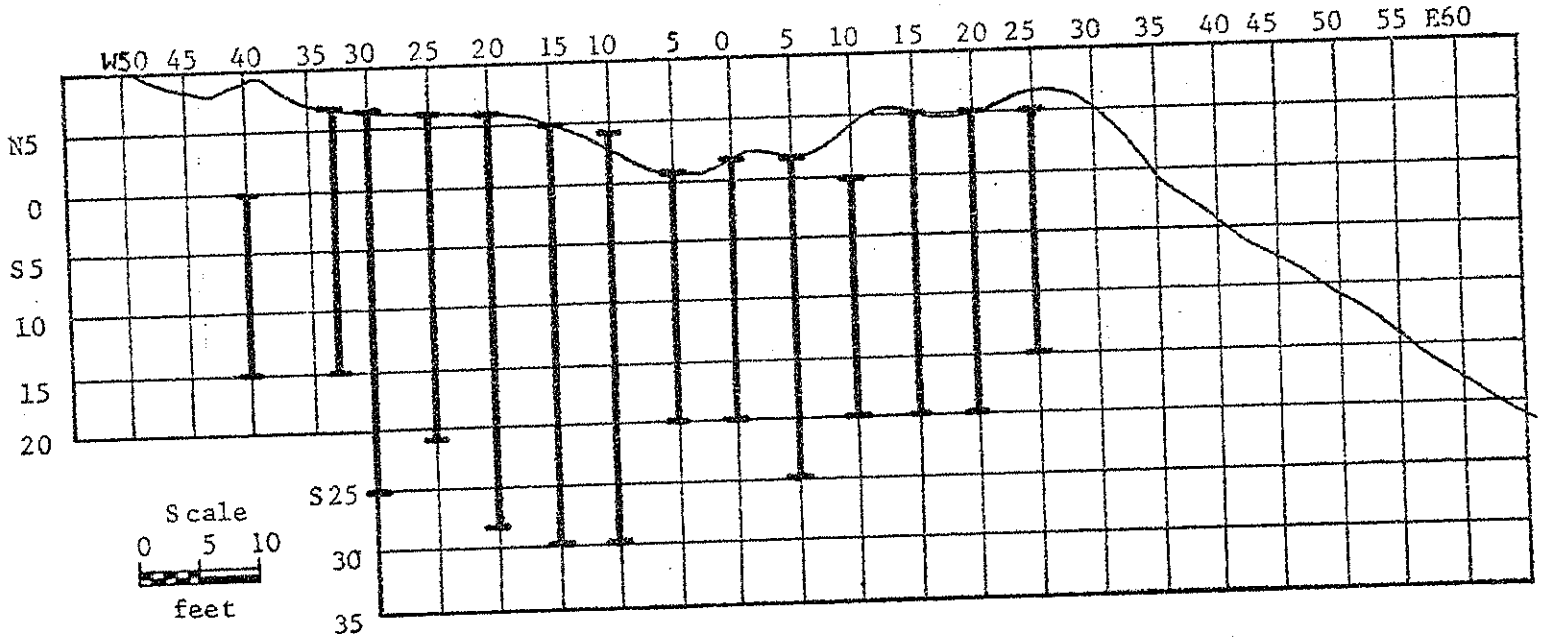


Figure 4 DISTRIBUTION OF EAST-WEST COMPOSITE PROFILES

A PHYSICAL GEOGRAPHY OF THE RAYSTOWN RIVER VALLEY

by

Russell Turner
and
John B. Huner

ABSTRACT

The Raystown Branch of the Juniata River is situated within the most rugged portion of the Ridge and Valley Province. However, instead of being confined to the narrow water gaps or wind gaps which were cut by the action of streams through the ridges, the river flows through a rather broad valley providing spacious and relatively flat areas in which to live while having the benefit of east-west communication linkages. The alluvial plain of the river valley provides an excellent soil in which any of the crops known to Northeastern aboriginal inhabitants could be produced. Substantial erosion due to deforestation appears to date to the historic period. It is noted that by far the majority of sites are found on the down-river bend of a point bar meander. No correlation between soil productivity and subsistence pattern could be established on the basis of the location of archaeological sites dating to the Archaic and Woodland periods.

ACKNOWLEDGMENTS

The authors express appreciation for the aid and criticism given them by Charles C. Kolb and Miss Muriel Ryan whose assistance in the preparation of this report was invaluable.

Appreciation is also expressed to the Soil Conservation Agency of the Department of Agriculture, Huntingdon County, Pennsylvania, and especially to Tom Kraft, soil scientist on the staff, for his help in the understanding of soils and for making available as yet unpublished material; and to Jim Filson of Jim's Anchorage who made his boats available for river studies.

We also extend our thanks to Jim Vallentine, Huntingdon County Fish Warden, for answering our questions concerning the Raystown Branch of the Juniata River, and to Donna Conway who helped in the compilation of this report.

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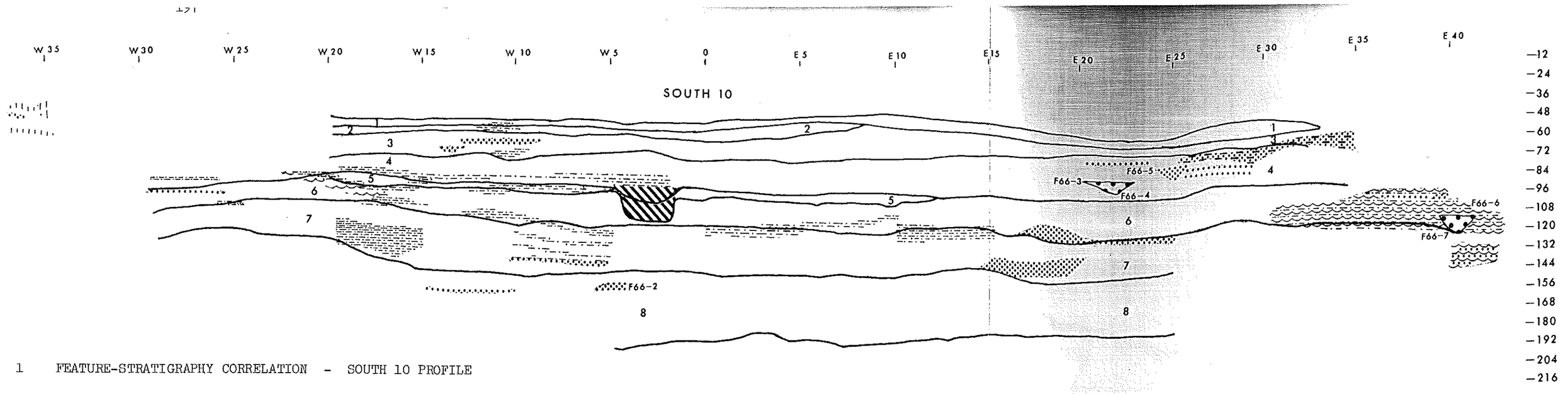
INTRODUCTION

Man has often been called a culture-bearing animal, and culture is certainly one method by which he adapts to his environment. It is necessary, therefore, to reconstruct the environment in order to study the lifeways of prehistoric groups. While this study is confined to the area of Huntingdon and Bedford Counties in Pennsylvania, it should be noted at the outset that human groups participating in an Archaic or Woodland subsistence pattern seldom remained in one given location. That is, although they may have tended to spend the majority of their life in one area, they can be expected to have ranged from area to area at certain times, thus traversing a variety of ecological niches. For example, steatite vessel fragments have been recovered from sites in the Raystown Reservoir Basin although the natural environment of this region does not contain steatite deposits. It was, therefore, necessary for the inhabitants of the Raystown locality to exploit the Piedmont of Lancaster County -- directly or indirectly -- to obtain this material. Many other such instances indicate that man knew of other areas in which he could have settled. It, therefore, becomes interesting to try and establish what factors appealed to him in a given area.

Several interesting correlations between site locations and geographic factors were found. Unfortunately, this study was somewhat hampered by the fact that the present Raystown Dam has inundated portions of the river valley, and it was necessary to reconstruct the prehistoric river conditions, or pre-dam conditions as the case may be. Although the river basin (and ultimate flood pool) is the prime theme around which this report, and in fact all the archaeological investigations in this area, revolves, it may not be the most important ecological factor. Competing with the river for ecological primacy is the vegetative cover of the region during prehistoric times. This topic is treated elsewhere in the report.

PHYSIOGRAPHY

Based on work of Smith (1966) and Michels and Smith (1967) the 1967 joint Pennsylvania State University-Juniata College Archaeological Field School conducted a series of excavations along and near the Raystown branch of the Juniata River. This river valley is situated within the most rugged portion of the Ridge and Valley Province, more commonly known as the Appalachain Mountains. This great folded mountain range is oriented in a northeast-southwest direction, and extends from New York to Georgia. In Pennsylvania the Ridge and Valley Province is bordered on the west by the Allegheny plateau and on the east by Blue Ridge and Piedmont Provinces. Long parallel mountain ridges separated by lowlands are

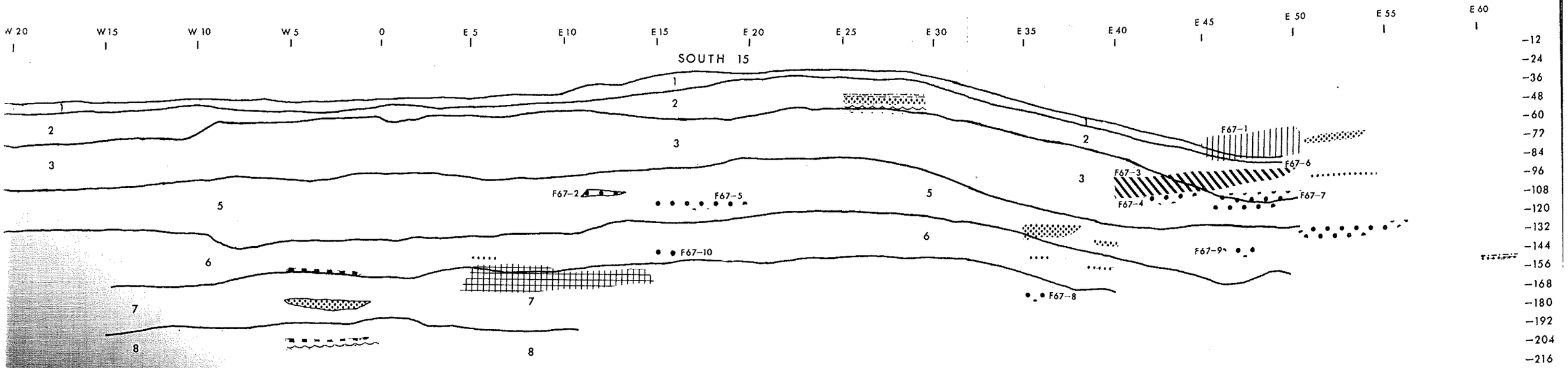


1 FEATURE-STRATIGRAPHY CORRELATION - SOUTH 10 PROFILE

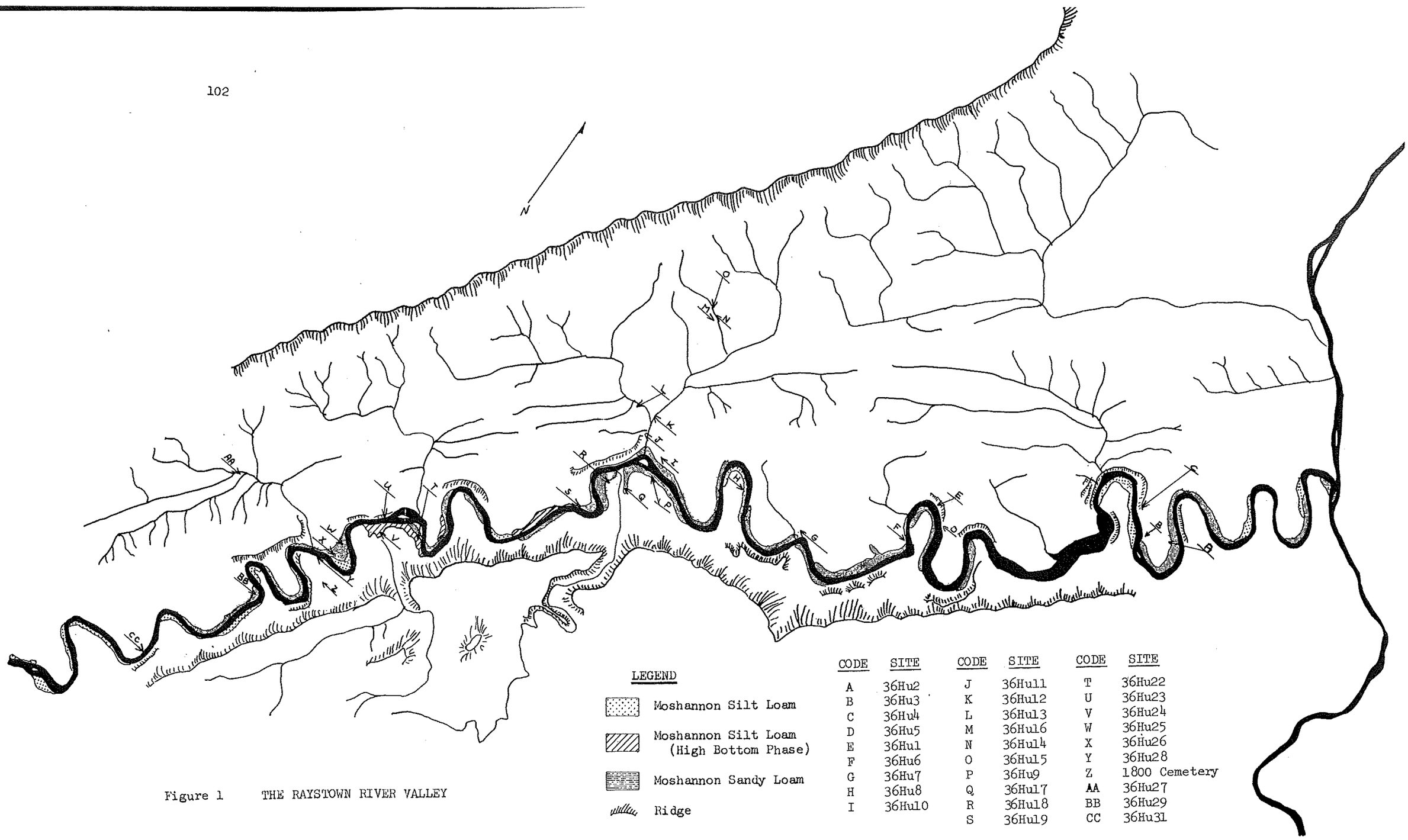
SCALE: 1 inch = 5 feet

LEGEND

- Ash
- Charcoal
- Reddish Soil
- Fire Pit
- Refuse Pit
- Occupation Floor
- Organic Material
- Bone Concentration



2 FEATURE-STRATIGRAPHY CORRELATION - SOUTH 15 PROFILE



CODE	SITE	CODE	SITE	CODE	SITE
A	36Hu2	J	36Hu11	T	36Hu22
B	36Hu3	K	36Hu12	U	36Hu23
C	36Hu4	L	36Hu13	V	36Hu24
D	36Hu5	M	36Hu16	W	36Hu25
E	36Hu1	N	36Hu14	X	36Hu26
F	36Hu6	O	36Hu15	Y	36Hu28
G	36Hu7	P	36Hu9	Z	1800 Cemetery
H	36Hu8	Q	36Hu17	AA	36Hu27
I	36Hu10	R	36Hu18	BB	36Hu29
		S	36Hu19	CC	36Hu31

Figure 1 THE RAYSTOWN RIVER VALLEY

characteristic of the area. These ridges, which are composed of hard sandstone and quartzite, have an average elevation of approximately 2,000 feet. Two of these ridges -- Tussey Mountain and Terrace Mountain -- bound the Raystown River Valley to the northeast and southwest respectively. In the case of the Raystown Reservoir, the lowlands between the two ridges are composed of red, brown and yellow shales. These shales form "rolling hills" which lie some 300 to 500 feet above the alluvial plain of the valley (Higbee 1934).

The Raystown Reservoir can be considered as that portion of the Raystown Valley which is located between the towns of Saxton, in Bedford County, and Huntingdon, in Huntingdon County, Pennsylvania. In this area of the Raystown River Valley the stream flows in a northeasterly direction. The drainage pattern approximates a trellis or rectilinear pattern, with the Juniata River and its Frankstown and Raystown branches flowing at right angles to the mountain barriers, thus, forming natural east-west passages linking the adjacent valleys. The secondary streams flow within the valleys in a northeast or southwest direction, parallel to the ridges. Instead of being confined to the narrow water gaps or wind gaps which were cut by the action of streams through the ridges, the river flows through a rather broad valley providing spacious and relatively flat areas in which to live, while having the additional benefit of east-west communication linkages. In addition, both Huntingdon and Bedford Counties are well watered. There is an adequate rainfall and the majority of streams retain moderate rates of flow throughout the year; facilitating water transportation when water travel came into use.

The relief can be considered to be steep, with the majority of slopes being greater than 30%. The on-going process of erosion has prevented soil material from accumulating and forming deep, mature soils in this area. Thus, 98% of Huntingdon County contains relatively shallow soils. The upland soils are primarily derived from the weathering of shale and sandstone and are acidic in nature as a result of leeching in the humid climate. These mountain soils are found to be deficient in nitrogen, organic matter, lime and phospherous, and are not well-suited for the growth of crops, such as corn. The Level land which is more suitable for farming represents only a small percentage of the relief of the county as a whole. Level land does occur extensively along the alluvial plain of the river valleys which are generally narrow and are bounded by the steep slopes of the rolling lowlands. This alluvium provides an excellent soil on which any of the crops known to Northeastern aboriginal inhabitants could be produced.

CHANGES IN THE PHYSIOGRAPHY

Although there has been some uplifting as evidenced by the fact that the Raystown Branch of the Juniata is entrenched (i.e. the meandering is confined by the geological structuring), this appears to have been gradual, not affecting the physiography of the region as far as human occupation is concerned. The only active physiographic factor in the area is the river. Due to the dynamic nature of fluvial and alluvial processes, and the affect of climatic change on these processes, the river is potentially susceptible to rather rapid change in relatively short periods of time. This obviously plays a prime role in the configuration of the environment and it is absolutely necessary to know the prehistoric river conditions to make meaningful assumptions.

The most obvious source of river flux would be increased rainfall or dehydration of the area. Climatic changes during the period of human occupation of the Raystown Reservoir (i.e. the geologically Recent Period) were certainly not of the same magnitude as changes during the Pleistocene, however, some fluctuation did occur. During the Early Archaic Culture Period the climate appears to have been cooler and damper. Kovar (1964:18; 1967:100) has reported that prior to 7000 B.C. the dominant vegetation was a coniferous forest throughout the region, as evidenced in the pollen columns of Sheep Rock and Bear Meadows. At approximately 7000 B.C., there was a shift to mixed hardwoods. This shift produced a more abundant and varied food resource such as mast, berries, etc. which, in turn, attracted numerous game animals including deer; making the region more amenable to an Archaic lifeway. The exact effect this change had on the river is not known.

Guilday and Parmalee (1955) have reported that there was a change in the relative frequency of rabbits and flying squirrels in the stratigraphic sequence of Sheep Rock. This change indicated to them that there was a clearing or removal of the forest cover (the natural habitat of the flying squirrel) and a consequent increase in the rabbit population due to the availability of an agricultural field ecology. Deforestation can effect the river since erosion would be greater, but ethnographic examples of northeastern aboriginal horticulture indicated that it was not the Indians' practice to clear vast areas of the watershed simultaneously, the effect would, therefore, be minor when compared to the major removal of the forest cover by European settlers.

As the forest cover was removed during the colonial and later periods, the rate of erosion increased. As a result, the sediment load became greater than the tractive capacity of the river (i.e. its ability to carry sediment) permitted and the sediment was dropped causing the river to silt up. The river as

it became shallower, became wider and spread over its narrow banks. This has undoubtedly had some effect on aquatic life, through changes in the bottom configurations, channel location and amount of sediment. In addition, the flood control projects of recent times have contributed further complications to the fluvial action of the Raystown Branch of the Juniata River.

DESCRIPTION OF THE PRESENT DAY RIVER CONDITIONS

Investigations of the present day river conditions were undertaken to answer several questions: does the ecology of the river vary significantly from place to place, and if it does, can study of the unaffected river be extrapolated into reconstructing the area inundated by the present dam and then how would these conditions affect the Indians living along its banks, the location of their settlements and their lifeways? The river was investigated from the Entriken Bridge to Jim's Anchorage downstream approximately 22 miles. To facilitate recording of the river's characteristics at given points, the area above the pool of the present Raystown Reservoir was divided into 22 sectors. Further subdivision was made when physical changes became apparent. Measurements consisting of approximation of depth and speed were taken at various checkpoints, using the velocity of the river below the Entrikan Bridge as a point of comparison (arbitrarily defined as of "moderate" velocity). Thus, on a relative scale each subsequent measurement was referred to as "fast", "moderate" or "slow" relative to the speed of the river at Entrikan Bridge. Observations were also made at the checkpoints regarding aquatic vegetation, mollusk concentrations, and type of river bottom. The checkpoints can be seen in Figure 2 and their description in Table 1. It was noted that the inclination of the river bed was greater on the north side with a corresponding decrease in depth and velocity, and an increase in water temperature and mollusk concentration. Certain other characteristics including depth, speed, type of bottom cover and mollusk concentration were observed to vary in a periodic manner. These changes along with attempted reconstruction of the region inundated by the affects of the Raystown Dam are plotted on Figure 3.

LOCATION OF THE SITES

During the investigation of the river it was noticed that a definite pattern of site location along the river could be observed. The majority of the sites were found to be within the alluvial valley proper, while a fewer number of sites were

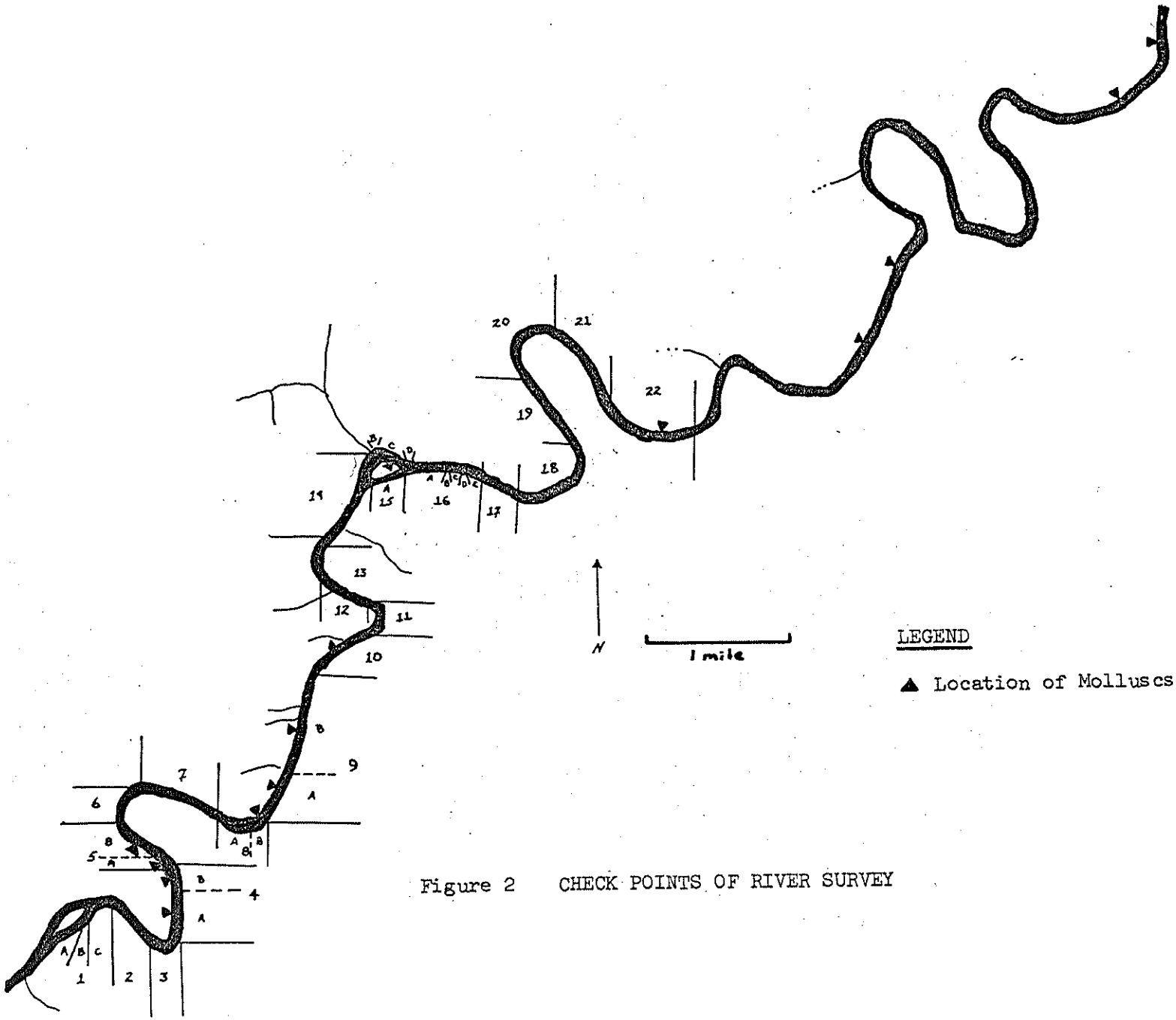


Figure 2 CHECK POINTS OF RIVER SURVEY

Sector	River Depth	Current Velocity	Description of River	Mollusk Occurrence
1a	3-4 feet deep	Moderate current	Grassy bottom	
b	6 inches deep	Fast current	Rocks above surface	
c	2-3 feet deep	Moderate current	Grassy bottom	
2	1-2 feet deep	Fast current	Rock concentrations break surface	
3	3 feet deep	Slow current	Marsh grass grows on northern side of the river	
4a	1-2 feet deep	Fast current		Several live mollusks were found approximately 15 feet off the northern bank where the river was only 9-18 inches deep and the current was slower than in mid-stream. No mollusks were found mid-stream.
b	6-12 inches deep	Fast moving	Moss covering a rocky bottom	Shell fragments, but no live mollusks were found.
5a	1 1/2 feet deep	Moderate current		Broken mollusk shells observed.
b	3 feet deep	Moderate current	Grassy bottom	Live mollusks scattered along the grassy bottom, large number of aquatic insects on surface.
6	4-7 feet deep	Slow current	Grassy bottom, shallow silt floor	

THE RAYSTOWN BRANCH OF THE JUNIATA RIVER

Table 1

Sector	River Depth	Current Velocity	Description of River	Mollusk Occurrence
7	1-1 1/2 feet deep	Fast current	Rocks above surface	
8a	2-3 feet deep	Moderate current	Bottom sparsely covered with grass	
b	1-2 feet deep	Moderate current	Moss and other plant species occupy bottom	Mollusks observed.
9a	1-2 feet deep	Moderate current		Mollusk concentrations found in shallower and more slowly moving water off the northern bank. None were found in the center of the stream.
b	4-8 inches deep	Moderate current		Large mollusk concentrations found in slow moving water off northern bank.
10	2-3 feet deep	Moderate current	Light concentrations of grass and mollusk on bottom	
11	4-5 feet deep	Slow current	Smooth river bed with grass growing on silt and sand covered bottom	
12	1-1 1/2 feet deep		Areas of more shallow swift moving water where rocks break surface alternating with deeper and slower moving areas	
13	4-6 feet deep	Slow current	Silt covered bottom with grass	
14	1-2 feet deep	Moderate current		

Sector	River Depth	Current Velocity	Description of River	Mollusk Occurrence
15a	1-1 1/2 feet deep	Fast current	Protruding rocks made water quite swift and white	
b	4 inches deep	Fast current		
c	1 foot deep	Moderate current		Large number of mollusk shells and a few live mollusks observed. Rabbits, deer, groundhog, ducks and racoons were observed in the area.
d	1-1 1/2 feet deep	Fast current	Large number of rocks breaking the surface of the water	
16a	2-2 1/2 feet deep	Fast current	Rocky bottom, large aquatic turtle seen on northern bank.	
b	1-1 1/2 feet deep	Fast current	Large rocks breaking surface	
c	Same as a			
d	Same as b			
e	Same as a			
17	1-2 feet deep	Moderate current	Moss covered bottom	
18	3 feet deep	Moderate current	Bottom covered with moss and grass	
19	1-2 feet deep	Moderate current	Moderate current, alternating with areas of more shallow and rapidly moving water with rocks breaking the surface.	
20	5-7 feet deep	Slow current	Grass covered silt bottom	

Sector	River Depth	Current Velocity	Description of River	Mollusk Occurrence
21	1-1 1/2 feet deep	Fast current	Rocks breaking surface alternating with deeper and slower moving areas	
22	2 feet deep	Moderate current		Mollusks scattered on grassy bottom.

located up on the slopes of the ridges primarily at the junction of two streams (Table 2). This seems to indicate that settlements were located primarily along the Raystown River with satellite hunting stations located along the secondary streams up on the ridge slopes.

Settlements of the Archaic or Hunting and Gathering phase in the Raystown Reservoir Basin Area were widely dispersed. The majority of such components are found along the river, although some are found on the low rolling hills near streams. Smith (1966:8) cites Robinson who states that the Archaic sites of northwestern Pennsylvania are found predominantly in the hilly regions south of the lake plain bordering Lake Erie on the terraces overlooking valley lowlands, especially at the confluence of streams. In the Raystown, these sites would function as hunting stations with the main settlement focus in the alluvial valley. The riparion flora of the valley floor, and the fauna which it attracts, seem to have had a significant effect on prehistoric settlement pattern. Thus it would appear that the "seasonal round" of Archaic groups would include extensive utilization of the uplands during short periods of the year for hunting and specialized foraging but that the greatest number of subsistence activities were undertaken along the river, exploiting its more diverse resources.

The ties of the Transitional People to the riverine environment are well known (Witthoft 1953) although this period is not well established as of yet in the Raystown Reservoir. This pattern of concentration along the river during the Archaic and Transitional times continued into the Woodland Period. The advantages of living in contact with the river are numerous for horticulturists. Yet there is no doubt that Woodland groups utilized the upland and probably occupied many of the same sites as those of the Archaic hunters as well.

It is interesting to note that by far the majority of sites are found on the down-river bend of a point bar meander. This location would seem highly desirable. The alluvial flood plains are the widest at the meander bends and are seasonally replenished through the annual flooding which would benefit the early agriculturalists and also the hunter/gatherer by allowing a more abundant plant growth whether domestic or wild. In addition, the downstream side would be the location of the slackest current, even during flood, which would allow mollusks to accumulate and where fishing would be successful. This is also the location of greatest silt deposition and hence the highest ground during periods of flooding.

While the river does have stretches of shallow, rapid moving water, which could create some difficulties in river transportation, the river forms a natural northeast-southwest communication route which joins the east-west oriented Juniata River.

Table 2

TOPOGRAPHICAL DISTRIBUTION OF SITES

Sites located at the confluence of two streams

36 Hu 10
36 Hu 11
36 Hu 12
36 Hu 13
36 Hu 14
36 Hu 15
36 Hu 16
36 Hu 27

Sites located in association with point bar meanders

36 Hu 9
36 Hu 36
36 Hu 39
36 Hu 25
36 Hu 26
36 Hu 27
36 Bd 40
36 Hu 2
36 Hu 3
36 Hu 4
36 Hu 7
36 Hu 19
36 Hu 22
36 Hu 24
36 Hu 28
36 Hu 29
36 Hu 31
36 Bd 37
36 Bd 38
36 Hu 8
36 Hu 17
36 Hu 18
36 Hu 20
36 Hu 21
36 Hu 23

Sites not associated with point bars or stream confluences

36 Hu 30
36 Hu 5
36 Hu 1
36 Hu 6

SOIL CORRELATIONS

It has already been noted that most of the sites have been found to be on alluvial soils. An attempt was made to determine whether there is any correlation between the type of soil on which a site is located and the cultural period of that site. A tabulation of sites, occupational components, and soil types was made. Sites have also been grouped according to soil types and the relative soil productivity gradings after Higbee (1944:108). This information is found in Tables 2 and 3. The productivity groups described in Table 2 were ranked from 1 to 6. In Table 2 the sites have been grouped both for soil type and kind of surrounding soils on an assumed agricultural utility to aboriginal horticulturalists. The soils mentioned are all listed according to the soil types as viewed on Pennsylvania soil maps (Soil Map Huntingdon Co. 1934 and Soil Map Bedford Co. 1913). Also listed are the productivity ratings for each of these soil types.

For the correlation of soil type and occupational component the sites have been listed in sequence: first, the multi-component sites, youngest to oldest, have been listed with those having continuous occupation; next, those having a broken occupational sequence; finally, single component sites were listed by component priority, followed by non-occupational sites and sites of undetermined cultural classification (see Table 3 for conclusions).

It was believed that there would be a relationship between soil productivity and occupational component, the Woodland horticulturalists being found on the more productive soils, while the sites of the non-agriculturalists would be more widely distributed. However, no such correlation was apparent. It is possible that the scanty data available was just not adequate enough to show such a correlation.

CONCLUSION

The effect that environment has had upon the cultural development of the populations occupying the Raystown River Valley can hardly be overemphasized. The availability of natural communication routes allowed some degree of contact with neighboring populations while at the same time the long rugged ridges bordering the valley encouraged isolation. The availability of only small areas of level land tended to limit the habitable area and forced the population to occupy the alluvial flood plains along the main streams. The availability of food limited the size of the population and tended to force the population to occupy regions where food was most easily obtained, primarily along the streams, if site concentration is any indication of this effect.

Table 3

SOIL TYPE CORRELATION WITH POSTULATED OCCUPATIONAL COMPONENTS

Site Names			Occupation		
			Archaic	Woodland	Historic
36Hu 1	Sheep Rock	Calvin Shale Loam	X	X	X
36Hu26	Baker # 1	Moshannon Sandy Loam	X		X
36Hu25	Baker # 2	Moshannon Silt Loam	X		
36Bd39	Jack Rhodes Farm	Dekalb Shale Loam	X	X	X
36Hu11	"Potatoe Patch"	Philo Silt Loam	X		X
36Hu19		Moshannon Sandy Loam			X
36Hu22	Entriken	Moshannon Silt Loam	X	X	X
36Hu13	James Creek # 2	Philo Silt Loam	X		X
36Hu12	James Creek # 1	Philo Silt Loam	X	X	
36Bd37		Huntingdon Loam	X	X	
36Bd38		Huntingdon Loam	X	X	
36Hu29		Moshannon Sandy Loam	X	X	
36Hu 9	Cunningham	Moshannon Sandy Loam	X	X	
36Hu18		Moshannon Sandy Loam	X		
36Hu30		Lehew Shale Loam	X		
36Hu 8		Moshannon Sandy Loam	X		
36Hu24	Entriken Bridge	Moshannon Silt Loam	X		
36Hu17		Moshannon Sandy Loam	X		
36Hu31		Huntingdon Loam	X		
36Bd37		Huntingdon Loam	X		
36Hu 7		Moshannon Sandy Loam	X		
36Hu 2		Moshannon Sandy Loam	X		
36Bd40		Dekalb Shale Loam	X		
36Hu27	Shy Beaver	Philo Silt Loam	X		
36Hu 4		Rough Broken Land (Calvin Material)		X	
36Hu 6	Mussel Rock	Calvin Shale Loam		X	
36Hu36	Workman	Dekalb Shale and Huntingdon Loam	X	X	X
36Hu 5		Calvin Shale Loam		X	
36Hu 3		Moshannon Sandy Loam		X	

REFERENCES:

(Soil Map Hunt. Co. 1934
Soil Map Bedford Co. 1913)
(Smith 1966; 1967)

APPENDIX I

IDENTIFICATION AND PROVENIENCE OF FISH SCALES FOUND AT SHEEP ROCK SHELTER

by

Joe Bowser
and
Lorraine M. Willey

ABSTRACT

This chapter is concerned with the identification and provenience of the fish scales found at Sheep Rock in 1966 and 1967. The fish scales were divided into five types and identification was made as accurately as possible. Furthermore, the provenience of all scales was examined and general observations are made regarding the local prehistory of the exploitation of fish for subsistence.

ACKNOWLEDGMENTS

The authors extend their sincere appreciation to Dr. Edwin Cooper for his invaluable assistance in the identification of the fish scales.

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INTRODUCTION

At least a portion of the subsistence of the Sheep Rock inhabitants was made up of fish. This is evident from the large number of fish scales found in the site located in almost every square at almost every depth. All of the scales found were of the cycloid type belonging to the more primitive types of fish such as herring, suckers, and minnows.

TYPE A SCALES

Type A Scales vary from 1/4 to 3/4 of an inch long. The radii are horizontally located running approximately parallel to one another. In overall appearance this scale is reminiscent of a thumbprint.

The Type A fish scale belongs to the Alosa sapidissima or American Shad, a member of the herring family. The maximum weight of this fish is twelve pounds and may run to 22 inches in length (Cooper 1968).

The Shad is native to the Atlantic coast from the Gulf of St. Lawrence to Florida. An anadromous fish, the Shad lives most of its life in the sea but runs up into fresh water rivers (including the Susquehanna River system) to spawn in the early part of the spring. Large Shad runs have been reported in historic times near Sheep Rock.

TYPE B SCALES

Type B fish scales belong to the sucker family. Positive identification is very difficult as to the particular kind of sucker. This type is probably the Moxostoma duquesnii or Black Redhorse (Cooper 1968).

This fish occasionally goes to 20 inches in length. Like most suckers, it spawns in April, May, and June.

TYPE C SCALES

Type C fish scales are few in number. This is one of the reasons that they are difficult to identify. However, they do belong to the sucker or minnow family (Cooper 1968).

TYPE D SCALES

Type D fish scales also belong to the sucker family. They appear to be from the Carpiodes cyprinus or Quillback (Cooper 1968).

The Quillback is a carp-shaped sucker that reaches 15 inches in length. They move into the smaller tributaries to spawn in the spring.

TYPE E SCALES

Type E fish scales include all the scales that were too encrusted with a brown, opaque coating to be identified. In this category are also the broken pieces of scales too small to allow identification.

CONCLUSIONS

The lengths, weights, and distributions mentioned are all of the present time. In the past, the fish (indicated by the size of the scales) were probably larger (Cooper 1968).

All of the identified fish spawn in the spring and are very easy to catch at that time. They probably supplied a major portion of the Indians' food in the spring.

STRATIGRAPHIC DISTRIBUTION OF FISH SCALES

A total of 7994 fish scales were recovered from Sheep Rock Shelter during the eight seasons of excavation at the site. At

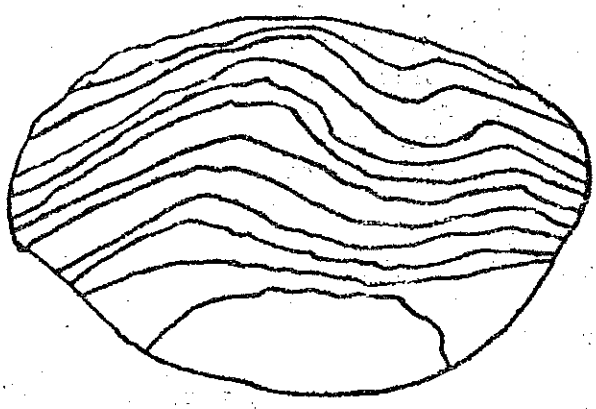


Figure 1a.
TYPE A SCALE

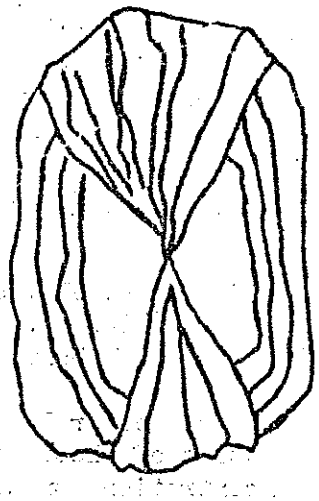


Figure 1b.
TYPE B SCALE

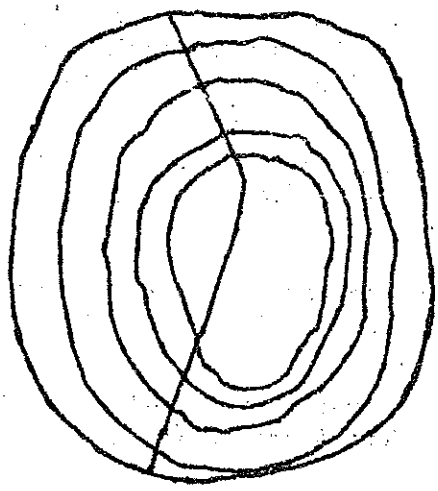


Figure 1c.
TYPE C SCALE

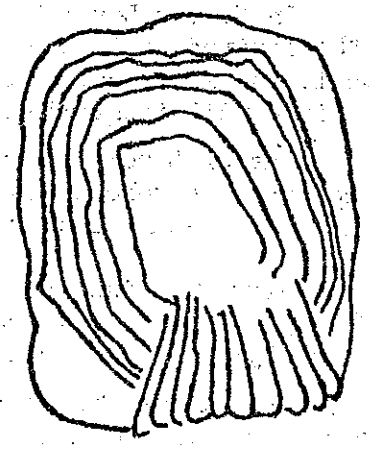


Figure 1d.
TYPE D SCALE

Scale: 4.75 x actual size

this time, 2040 or 25.6% of the fish scales could be assigned to stratigraphic Master Levels. For each Master Level, the type and number of fish scales were recorded according to their horizontal provenience in order to obtain concentrations, and thus, possible information as to "kitchen" or refuse areas for that cultural time period. A discussion of the cultural period represented by each Master Level is presented in a previous chapter of this report (Dutt 1968).

Master Level 1 contained 29 fish scales scattered randomly in the site (Fig. 2). This figure represented 1.4% of the fish scales for which Master Level could be determined.

From Master Level 2, 1018 fish scales (49.9%) were recovered. The results of plotting the horizontal distribution showed two areas of concentration, one in the center and one in the eastern end of the site (Fig. 3). Type A scales totaled slightly over 50% of the scales recovered in this level. In addition, this is the only level in which the full range of types was represented.

Master Level 3 & 4 contained the second longest number of fish scales, totaling 796 or 39%. Again two areas of concentration were noted, one in the middle and one in the eastern end of the site (Fig. 5). Type A scales were again predominant representing 76.1% of the total.

In Master Level 5, 9 fish scales (4%) were recovered. Because of the limited horizontal occupation of Sheep Rock during the Transitional, the fish scales are thus limited to the control portion of the site. All identifiable fish scales from this level were Type A.

Master Level 6 contained 180 fish scales (8.8%). Again, no concentrations were noted (Fig. 7). Type A was the most numerous, with Types B and D also represented.

Very few fish scales (5) were recovered from Master Level 7, and they were randomly scattered in the site (Fig. 8). Four of them were of Type A, while one was Type D.

Only three fish scales were recovered from Master Level 8, and two of them have been identified as Type A scales (Fig. 9).

There were also 5930 fish scales recovered for which the Master Level is indeterminate at this time. With further work on the stratigraphy and feature associations which is to be undertaken within the next year, it is expected that the majority of these fish scales can be placed in Master Levels.

The numerical and statistical distribution of the fish scales by Master Level is presented in Table 1, and the horizontal distribution of all the fish scales recovered from Sheep Rock Shelter is presented in Figures 10 and 11.

Of the fish scales that could be placed in Master Levels, over 50% were Type A scales. This type is represented in all Master Levels. Type D fish scales were recovered in all Master Levels except 5 and 8, and Type B scales were recovered from Master Levels 2, 3, 4, and 6. Thus, it appears that the Shad (Type A) was the most common food fish, and was utilized very early by the occupants of Sheep Rock Shelter. The Quillback (Type D) and the Black Redhorse (Type B) apparently were also utilized throughout the majority of the shelter's history. The Black Redhorse remains were far more numerous than the Quillback remains, however few of them could be assigned to Master Levels at this time. Type C fish scales occurred only randomly, and this fish, of the sucker or minnow family, does not appear to have been an important part of the diet of the prehistoric inhabitants of the shelter.

Areas of concentration could only be noted for Master Levels 2, 3, and 4. However, horizontal concentrations for all fish scales, including all Master Levels and indeterminate levels, indicate three main areas of concentration (Figs. 10 and 11). In the western end of the site there is a well-defined concentration. This concentration does not appear in the other illustrations because the Master Level for these scales is indeterminate at present. However, from the below datum readings, it is probable that the majority of the fish scales in this area are from the Late Woodland time period. The second area of concentration is in the middle of the site. Although in relation to the over all horizontal placement it appears to be a rather small concentration, the fact that the fish scales are concentrated, for the most part, in two Master Levels (2 and 3) is significant. The final area of concentration covered a large area in the eastern end of the site. This area is larger than is shown on the individual Master Level illustrations because of the addition of the data for which Master Level was indeterminate. The majority of the fish scales in this area are from a dispersed refuse pit (Smith 1967).

Until the features from all eight seasons of excavation are correlated, and the stratigraphy extended, it is difficult to determine whether the concentrations indicate a "kitchen" or refuse area. This is particularly true of the concentrations in the center and western end of the site. Although the concentration of fish scales noted in the eastern end of the site is, for the most part, from the large dispersed refuse pit, the full extent of this pit must be determined to locate all of the fish scales associated with it.

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

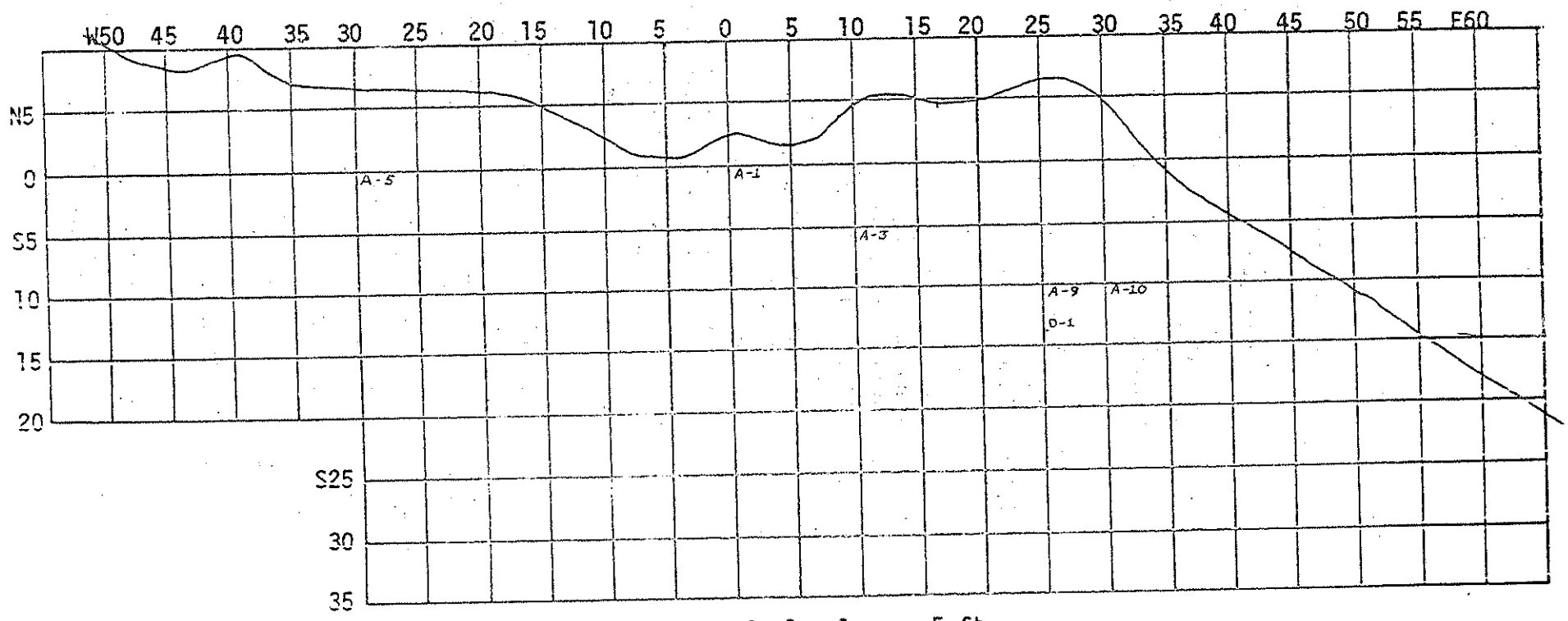
DATE: MAY, 1968

LEVEL and/or PERIOD: MASTER LEVEL 1

RECORDER:

BD (if applicable):

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

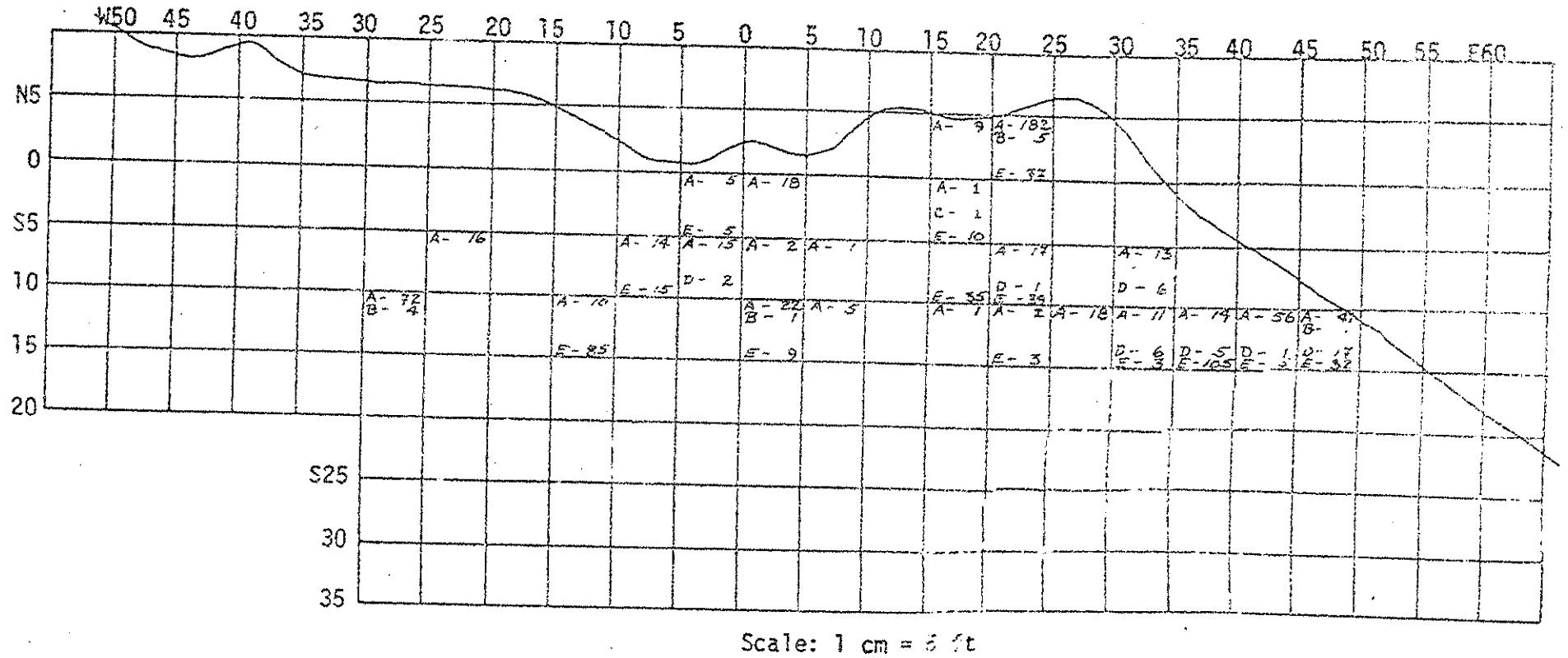
Figure 2

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Late Woodland (Master Level 2)



Scale: 1 cm = 5 ft

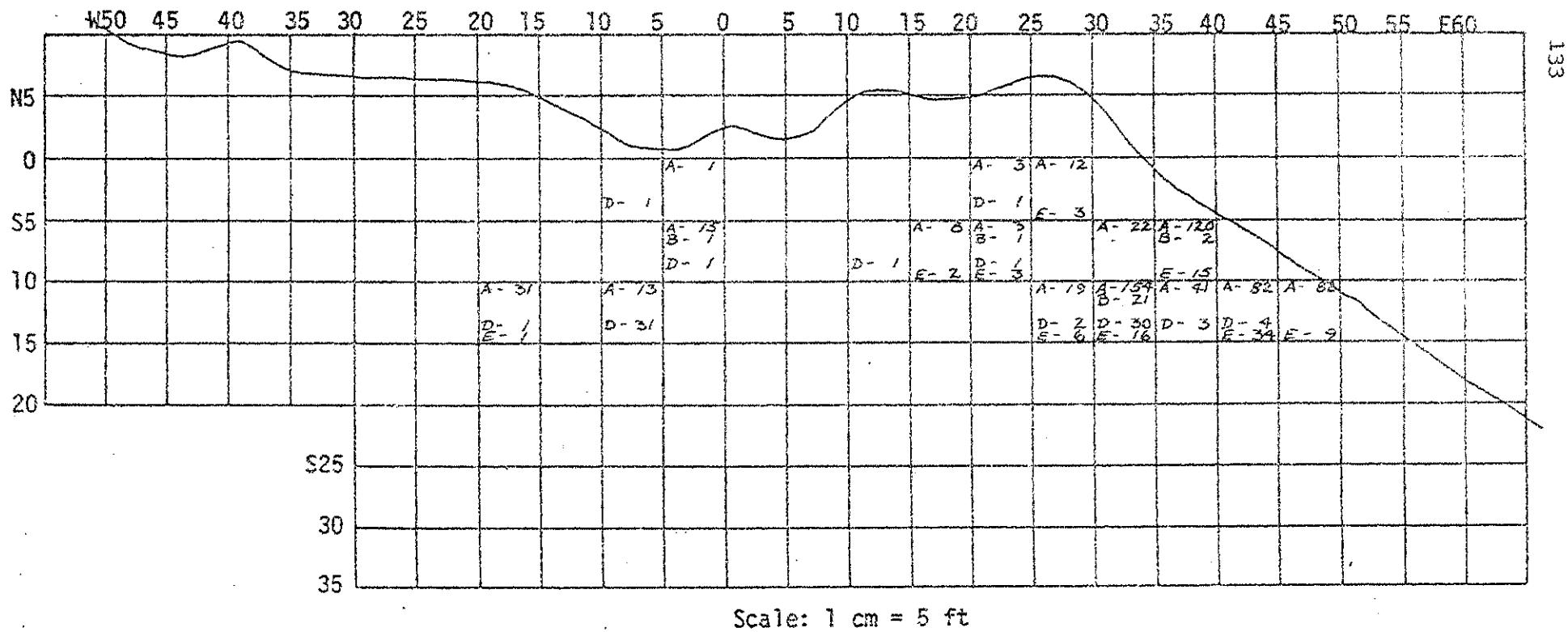
Figure 3

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Early & Middle Woodland (Master Levels 3 & 4)



Scale: 1 cm = 5 ft

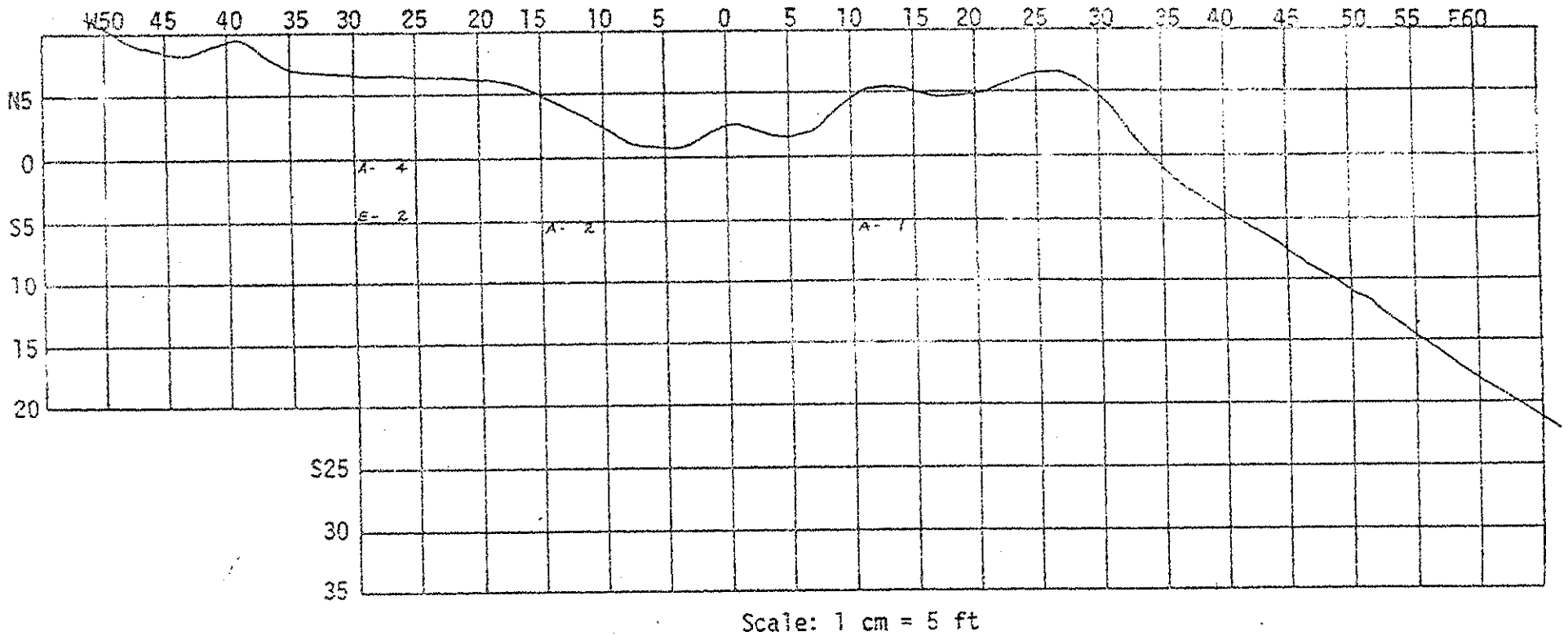
Figures 4 & 5

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Transitional (Master Level 5)



Scale: 1 cm = 5 ft

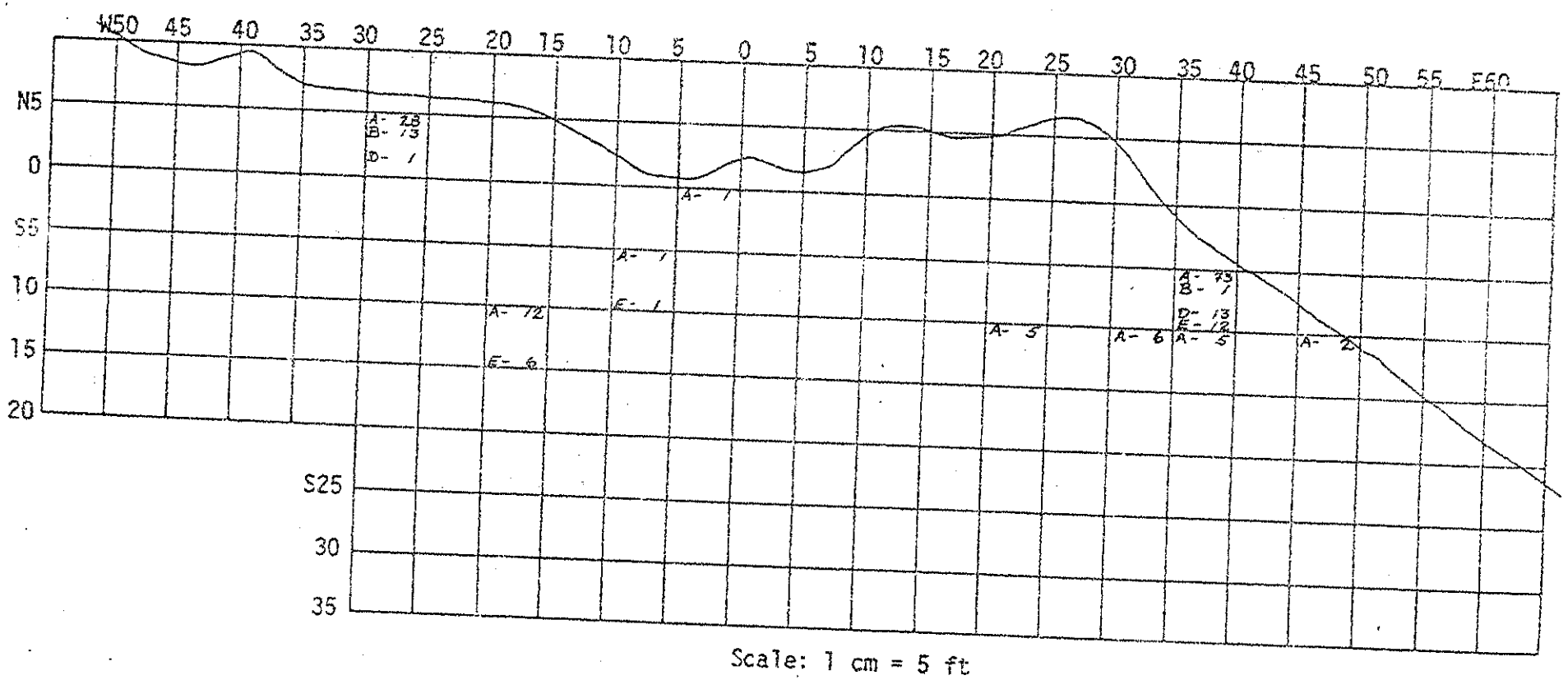
Figure 6

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Late Archaic (Master Level 6)



Scale: 1 cm = 5 ft

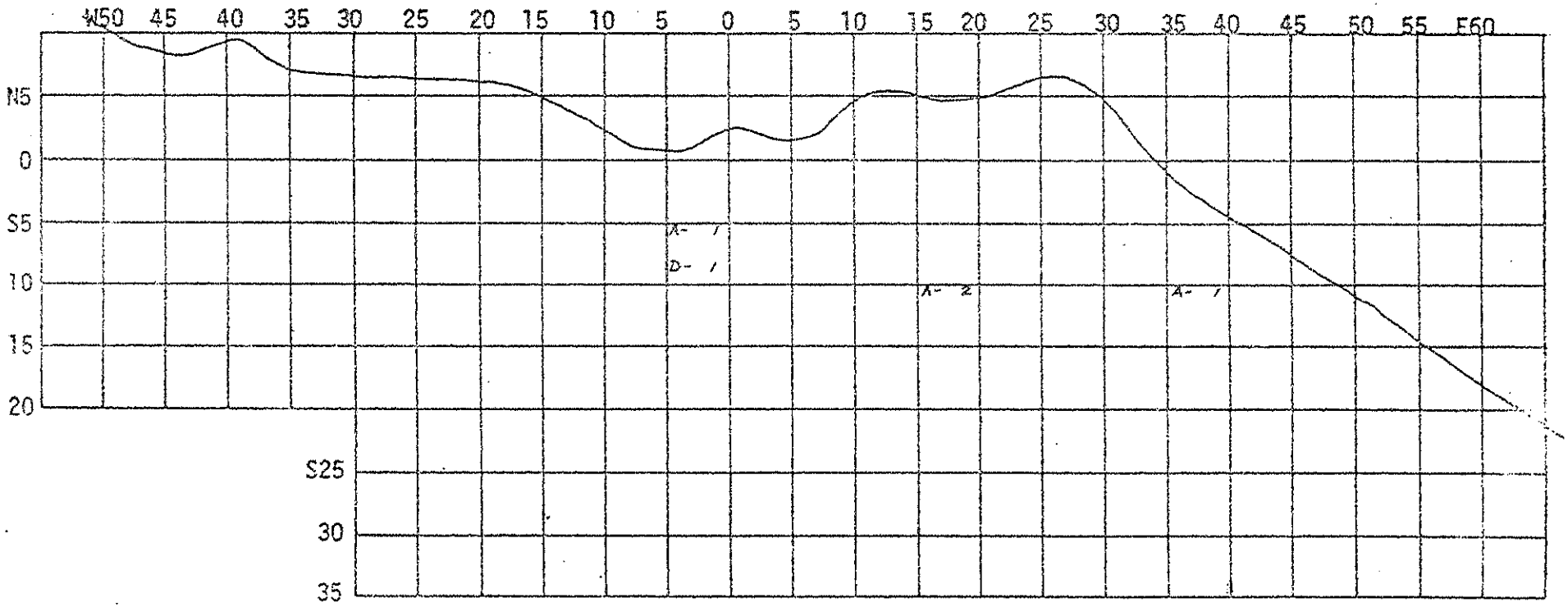
Figure 7

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Middle Archaic (Master Level 7)



Scale: 1 cm = 5 ft

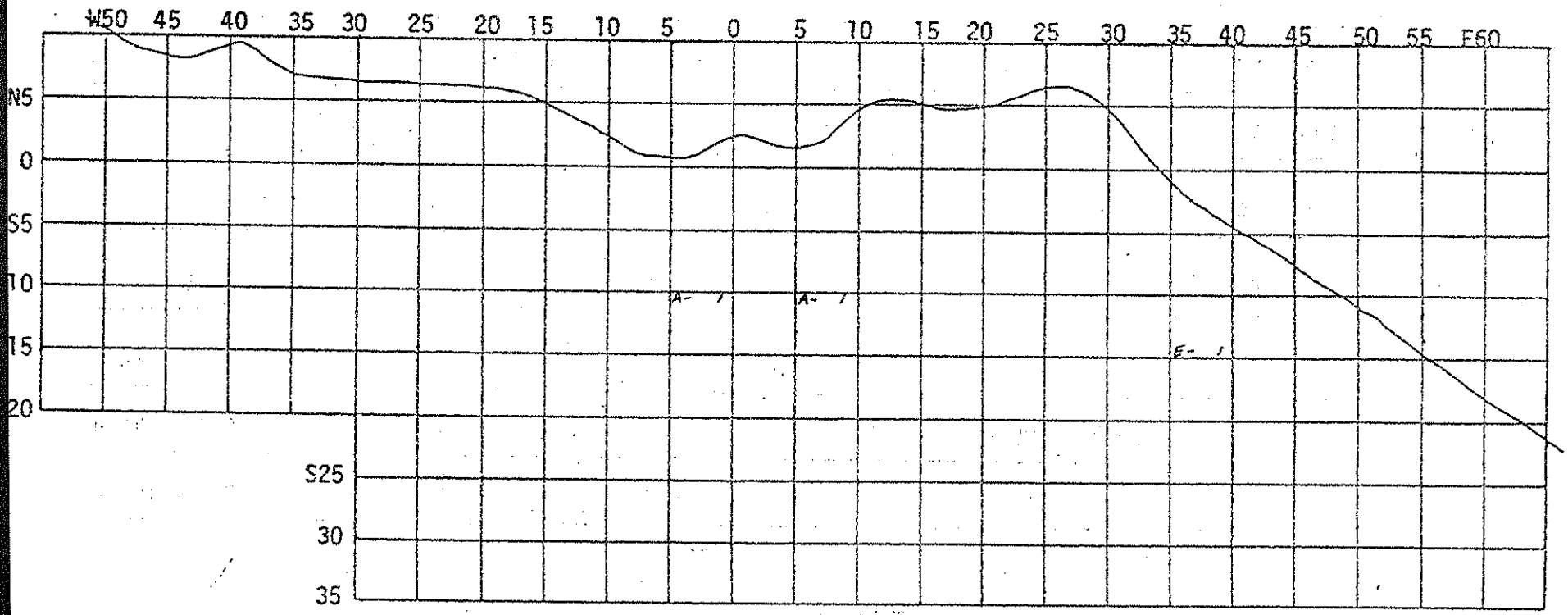
Figure 8

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES

PERIOD: Early Archaic (Master Level 8)



Scale: 1 cm = 5 ft

Master Level	TYPE A Quantity	TYPE A Per-cent	TYPE B Quantity	TYPE B Per-cent	TYPE C Quantity	TYPE C Per-cent	TYPE D Quantity	TYPE D Per-cent	TYPE E Quantity	TYPE E Per-cent	TOTAL Quantity	TOTAL Per-cent
1	28	96.5	0	0.0	0	0.0	1	3.5	0	0.0	29	1.4
2	545	53.5	11	1.1	1	0.1	38	3.7	423	41.6	1018	49.9
3 & 4	606	76.1	25	3.1	0	0.0	76	9.5	89	11.2	796	39.0
5	7	77.8	0	0.0	0	0.0	0	0.0	2	22.2	9	0.4
6	133	73.9	14	7.8	0	0.0	14	7.8	19	10.6	180	8.8
7	4	80.0	0	0.0	0	0.0	1	20.0	0	0.0	5	0.2
8	2	66.7	0	0.0	0	0.0	0	0.0	1	33.3	3	0.1
Subtotal	1325	65.0	50	2.5	1	0.0	130	6.4	534	26.2	2040	25.6
No Data	3813	64.3	1494	25.2	27	0.5	378	6.4	218	3.7	5930	74.4
Total	5138	64.5	1544	19.4	28	0.4	508	6.4	752	9.4	7970	100.0

Table 1
TABULAR SUMMARY OF THE DISTRIBUTION OF FISI SCALES

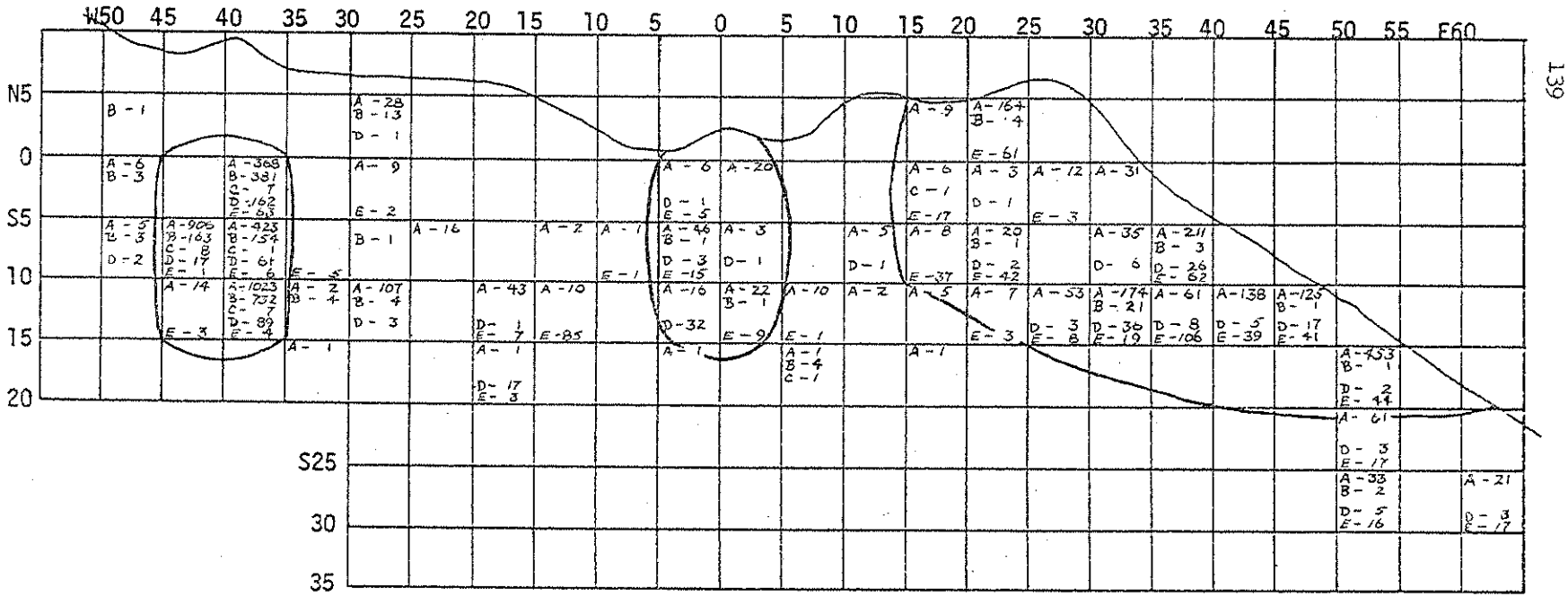
36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES DATE: MAY, 1968

LEVEL and/or PERIOD: MASTER LEVELS 1 - 8 RECORDER:

BD (if applicable):

OTHER PERTINENT INFORMATION:

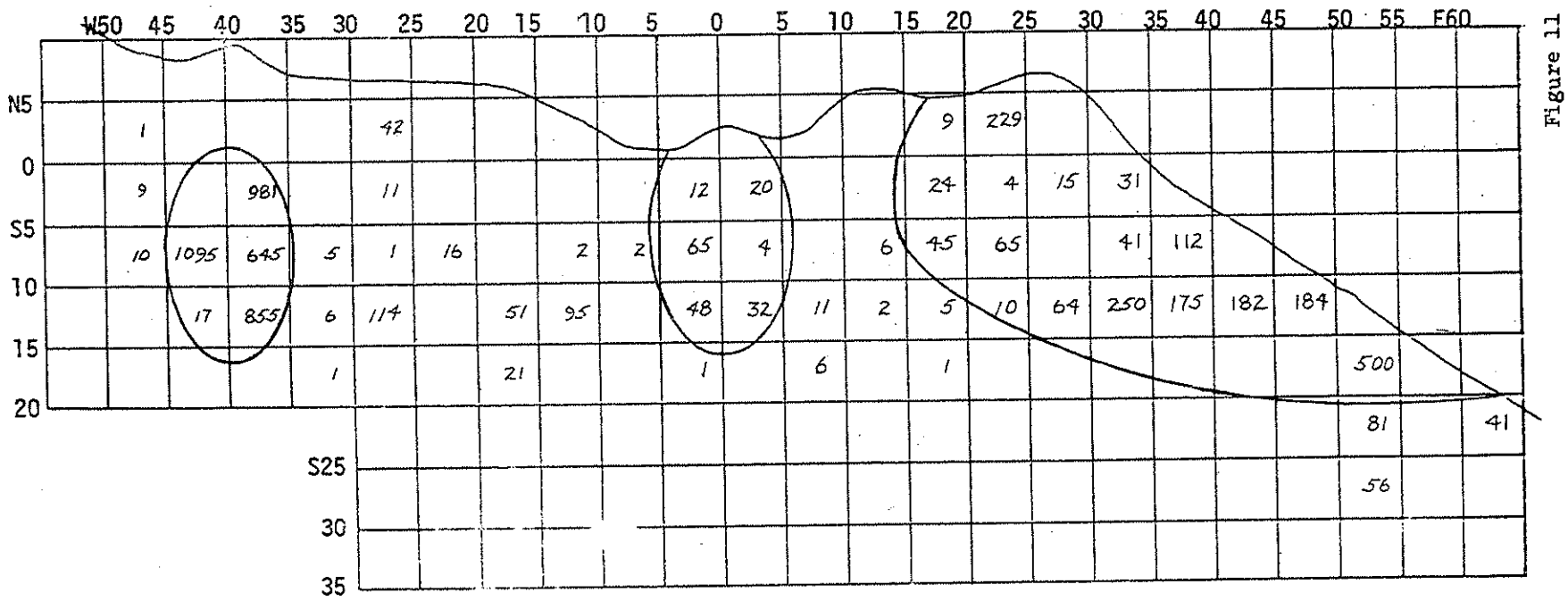


Scale: 1 cm = 5 ft

Figure 10

36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: FISH SCALES
DATE: MAY, 1968
LEVEL and/or PERIOD: MASTER LEVELS 1 - 8
RECORDER:
BD (if applicable):
OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 11

APPENDIX II

MOLLUSC ANALYSIS AND DISTRIBUTION AT SHEEP ROCK SHELTER

by

Lorraine M. Willey
and
Paul T. Ruskin

ABSTRACT

The shell remains from Sheep Rock Shelter have been analyzed in terms of the stratigraphy, and a short discussion of their use and importance to the prehistoric occupants of the shelter has been included.

ACKNOWLEDGEMENTS

The authors extend their thanks to Barbara Best, Donna Conway, Ralph Garruto and John Huner for their assistance with various portions of the analysis, and to Jim Filson for the use of his river craft.

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INTRODUCTION

Mollusc remains form an important part of the artifact inventory at Sheep Rock Shelter. Approximately twenty-two pounds of shell have been removed from the site during the eight seasons of excavation.

Until specialists can be consulted, the shell remains have been divided into two major and easily identifiable groups: the Pelecypods (aquatic bivalve invertebrates, such as clams and mussels), and the Gastropods (coiled shell invertebrates, such as snails). The class Pelecypodia includes many families comprising both salt and fresh water forms. Of these families, only two are of importance, the Unionidae and the Mustelidae which contain the species of fresh water molluscs. However, only species of the Unionidae are found in North America, and about 30 years ago, members of the genus Unio were reclassified into the newer genus Elliptio which refers specifically to the North American fresh water varieties (Webb 1942). Simpson (1900), Webb (1942), and others have used the term Naida to describe the fresh water molluscs. but for convenience, the general term mollusc will be used in this report when referring to the Naida.

The main importance of the molluscs lie in their utilization as a food source by the inhabitants of the shelter. Not only are they high in protein content, but are also readily available in the river below the site. Guilday and Parmalee (1965) identified two species of mollusc in the 224 shell specimens included with the bone samples from the 1959-1961 seasons. All but three of them were Elliptio dilatatus, while the others were Ellipsaria fasciolaris (Guilday and Parmalee 1965:40).

The snails, on the other hand, may be both aquatic or terrestial, and as a result it is far more difficult to determine their importance at Sheep Rock without knowing exactly which species are represented. Since the majority of the snail remains found at the site are small in size, it is expected that many are terrestial and are incidental to the prehistoric occupation. Guilday and Parmalee (1965) have identified seven species (33 individuals). The aquatic snails were probably brought to the site by the prehistoric inhabitants.

METHODOLOGY

The study of the Mollusca involved two types of investigation: (1) a field study of living mollusc in the Raystown Branch of the Juniata River, and (2) the laboratory analysis of the shell remains excavated from Sheep Rock Shelter.

The field study involved a continuation of the modern mollusc collection begun by Gene Paull in 1966 (Paull 1967:81-84). Following his pattern, the amount of live mollusc, location, and river conditions were noted for the 22 sectors into which the river was divided (Turner 1968:106). A tabular summary of this work may be found in the Ecology chapter (Turner 1968:106-110). A collection of the molluscs was taken, during a canoeing trip from Entriken bridge downstream for 22 miles and placed in plastic jars partially filled with alcohol and labeled. Concentrations of live molluscs were noted, as were areas where shell fragments though few live molluscs were found. Collection and observation in shallow clear water was relatively easy, but for the deep water in the river area surveyed, scuba equipment was used.

Three shells were taken for experimentation from those collected to determine the probable methods of opening the shells to extract the animal, and to determine the appearance of shell remains after burning. The techniques used to open the shells involved applied force with a rock, leverage with a sharp stick, and burning in a fire. In order to determine changes in the shell after burning, all the shells, after the animals were removed, were placed in the fire overnight.

In the laboratory, five categories were set up to cover the possible classifications of the shell remains from the shelter. These were given letter designations for use in the material distribution portion of the analysis and are as follows: A -- Mollusc (Naida); B -- Burned Mollusc; C -- Snail; D -- Modified Snail; E -- Egg Shell. The Modified Mollusc remains had been previously excluded and placed in the province of the Perishable Artifact Project. Of the five classes constructed, only four were used, as no modified snail remains were found in the collection. In order to determine relative distribution of the shell remains, they were weighed and the amount of each type recorded for its specific catalog number. It was felt that weight rather than a numerical count of the pieces would give a more comprehensive picture of the shell remains at Sheep Rock Shelter since an accurate count is difficult, if not impossible, because of the fragile condition of the shells. The shells were weighed in grams on a balance in their original plastic bags and the weight of the bag subtracted from that amount.

Prior to the weighing process, IBM cards with artifact number and provenience were punched in the new format for each artifact recorded as shell in the 1967 catalog, and the 1966 catalog, already on cards, was converted into the new format (see Michels' chapter on Documentation in this volume for further information). The cards were sorted by catalog number and a print out of this numerical sort was obtained. The weight of shell for each catagory represented within a catalog entry was recorded on this list. After all weighing was completed and had been properly recorded, this information was added to the computer cards. These were subsequently sorted by grid square and master level within that square, and a new list was prepared. Finally, the material distribution by weight of the shell was entered on forms prepared for this purpose (see Figures 1 - 10).

RESULTS

The river survey indicated that at the present time, molluscs in the Raystown tend to live in shallow water (an average of 1 - 2 feet) of moderate current and water temperature off the North bank of the river. Living mollusc or mollusc shell fragments were taken from 14 locations along an approximately 23 mile area of the river. In sector 15 (see Turner 1968:106) near 36Hul0 a large number of shells were found, but few living molluscs were observed. Evidence of raccoons were seen in this area, and it is possible that in this area, as well as in the other sections where shell fragments were found, that raccoons had been catching and eating the molluscs since shellfish are among their major foods. If true, this would indicate that the river is quite populated with molluscs in relatively close proximity to the sites along the Raystown.

The experiments conducted with the three living molluscs involved methods of opening the shells to extract the animal. The first shell was opened with applied force utilizing a rock as a hammer, the result was to render the meat crushed beyond editablity. The second shell was opened with leverage from a sharp stick, however, the process was a time consuming one. The last shell was placed in an open fire, and with the buildup of heat, the shell opened of its own accord, thus, both cooking the animal and providing easy access to it. Finally, the meat was removed from all the shells tested, and the shells were left in the fire overnight in order to see the effects of fire on the shell. The fragments changed in color from a silver-brown to a silver-grey.

For the first four master levels, three areas of concentration appear in each level in the Western, Central, and Eastern portions of the site. Percentages of the total weights of mollusc, burned mollusc, and snail for each area per master level were tabulated. (See Table 2).

In those master levels which contained burned mollusc shell, the majority of it came from the central portion of the site. The only exception this is Master Levels 3 & 4 (combined in the distributional tables at present) which contain only a trace of burned mollusc (2.4 grams) all in the eastern area of the site. The snail shell was concentrated in the eastern portion of the site for Master Levels 1, 2, and 3 & 4.

The mollusc shell was most predominate in the central area of Sheep Rock in Master Level 1 while over one half was concentrated in the eastern portion in Master Level 2. Master Levels 3 & 4 again contained well over one half of the total mollusc for that distributional level in the eastern area of the site.

Master Level 5 has a limited horizontal range of occupation, and thus all types of shell remains are concentrated in the central area. The remaining master levels show a continuity in distribution of mollusc shell from approximately W15 to E45.

Mollusc shell appears in all master levels, and in a high proportion to the other types of shell. Disregarding the shell for which the master level is indeterminate at present, the highest concentrations of mollusc shell appear in Master Levels 2 and 3 & 4, with the percentages of the total being 34.7% and 24.2%, while Master Level 6 contained 7.5%. Master Levels 1 and 7 both contained 5.8% of the total mollusc shell excavated (see Table 1). Burned mollusc shell appears only in Master Levels 1, 2, 3 & 4, and 6. The highest proportion being in Master Levels 1 and 2 with 30.6% and 23.2% respectively of the total burned mollusc shell (again, the indeterminate master level shell is disregarded). Snail shell appears in all master levels in various proportions, being highest in Master Levels 3 & 4 and having 20.2% and 22.2% respectively of the total snail shell recovered.

DISCUSSION

Molluscs are present in the Raystown Branch of the Juniata River, and in some areas are even rather numerous. It is expected that during prehistoric times they were even more prolific, for the effects of periodic partial deforstation, of water pollution and the dam has changed the river considerably in some areas. The quantity of mollusc shell recovered from Sheep Rock Shelter indicates that the mollusc shell served as an important supplement to the diet of the Shelters occupants, particularly during Woodland and Transitional times. Furthermore, the close proximity of the site to the river would make collection relatively simple.

The preparation of the molluscs for consumption probably involved cooking, though they can be eaten raw. Because of the difficulty in opening the bivalves by any means other than heat, it is probable that they were placed directly in the fire, or placed

in hot to boiling water, or steamed. Since only 2.6% of the approximately 21 pounds of shell recovered from the site showed evidence of direct burning, it is probable that either or both of the latter two methods were employed by the occupants of the shelter since these processes would not involve direct heat for a sufficient length of time to cause the change in color observed during the overnight burning experiment. Furthermore, the majority of the burned shell came from the uppermost levels of the site, (shell marked indeterminate Master Level include these for which no vertical provenience was noted and for those areas where Master Levels have not yet been determined, i.e. for the far western and far eastern portions of the site, which because of the structure of the shelter could not be occupied until the later periods of Northeastern prehistory). Since historic camper's fires were built on the surface of the shelter, which caused partial ignition of some of the lower prehistoric dry midden levels (Witthoft 1968:26) it is quite possible that much of the burned shell can be attributed to accidental burning during "post-occupational" times.

Not only were molluscs used for food, but part of the shell remains were also utilized, at least during the later portion of the Late Woodland period. These later occupants made a fine shell tempered ceramic wear, thus further utilizing the mollusc. Other shells were also modified, sometimes by serating the edge of the shell, but at this time functional identification of these is not available and it is only mentioned to demonstrate the increasing importance of the mollusc in the total pattern of occupation at Sheep Rock Shelter.

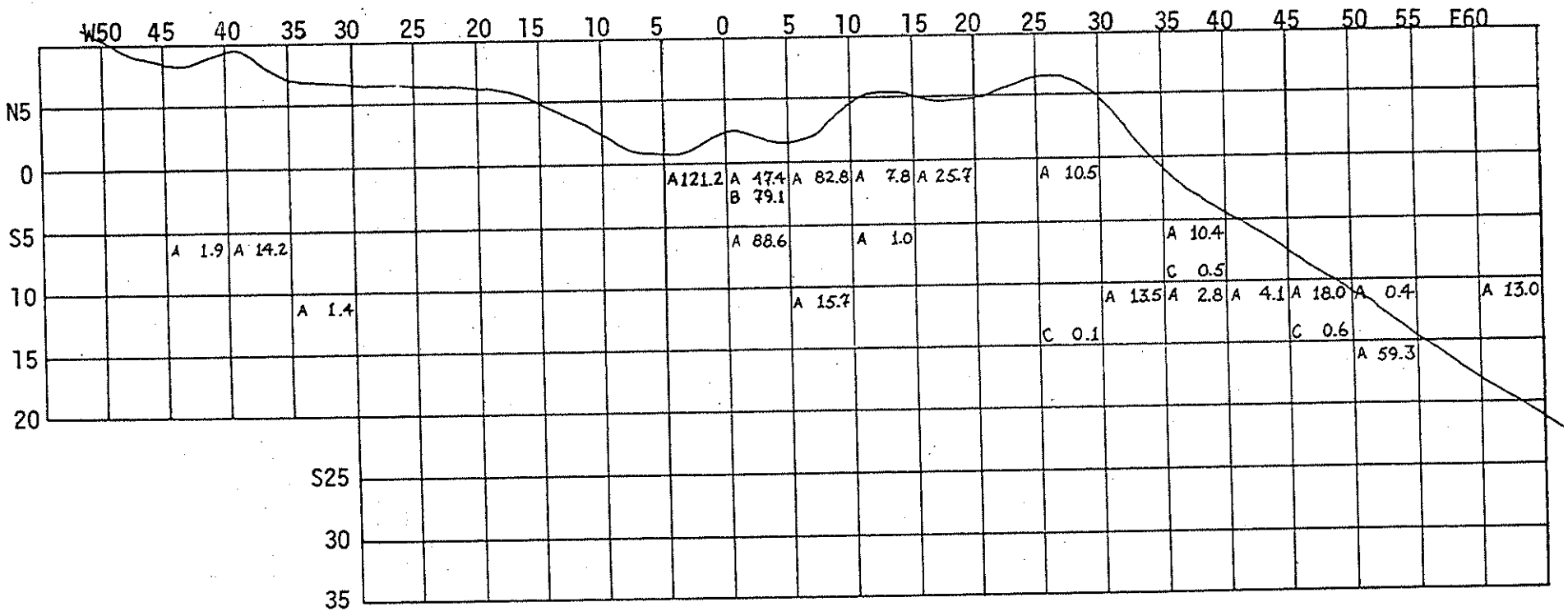
36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in grams) DATE: _____

LEVEL and/or PERIOD: MASTER LEVEL 1 - Historic Period RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Figure 1

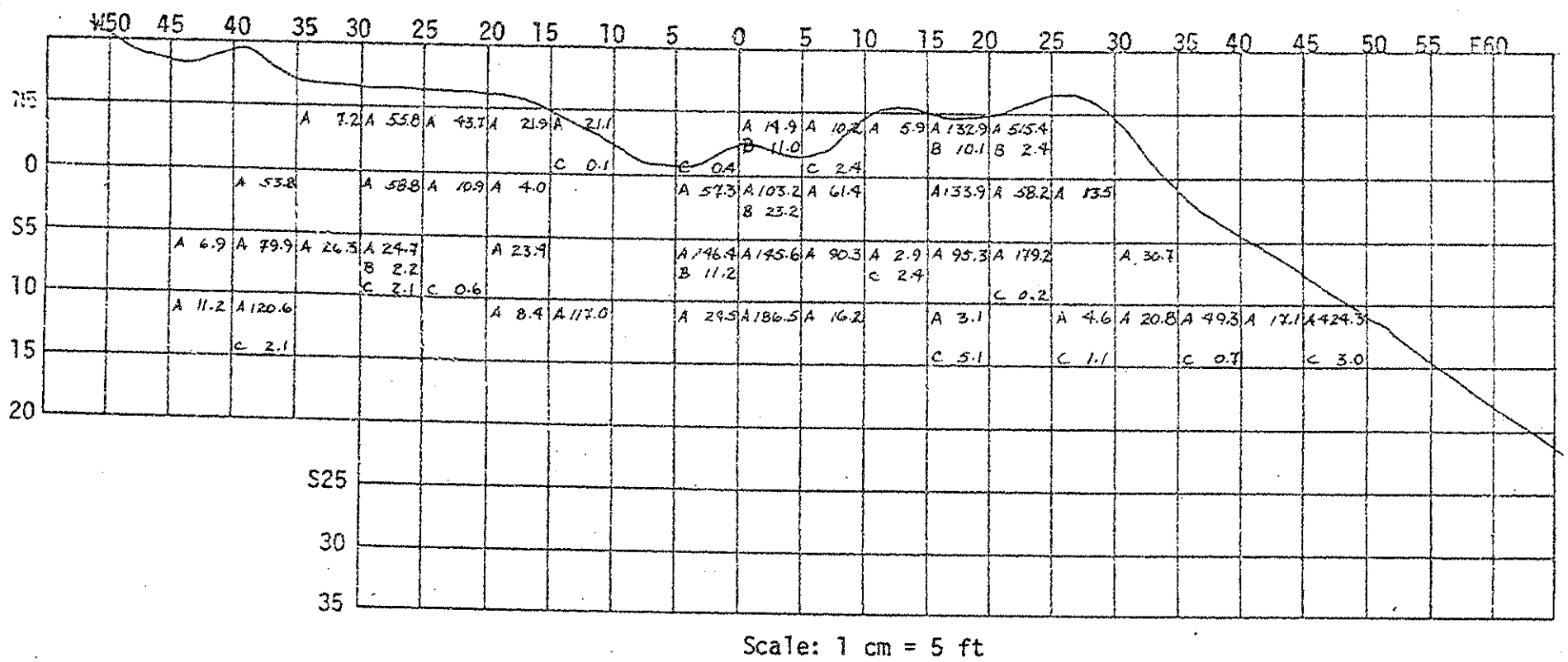
3[illegible]1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Late Woodland (Master Level 2)

Figure 2



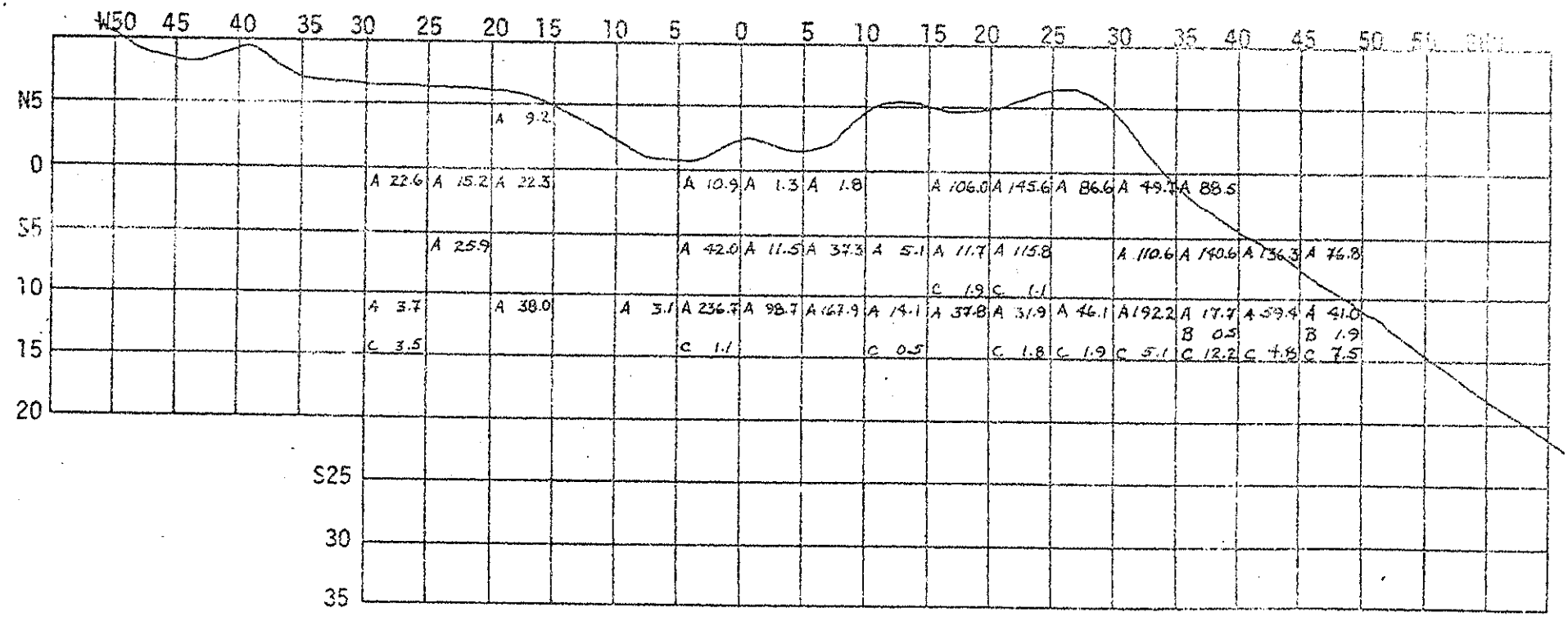
Scale: 1 cm = 5 ft

36Hu7 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Early & Middle Woodland (Master Levels 3 & 4)



Scale: 1 cm = 5 ft

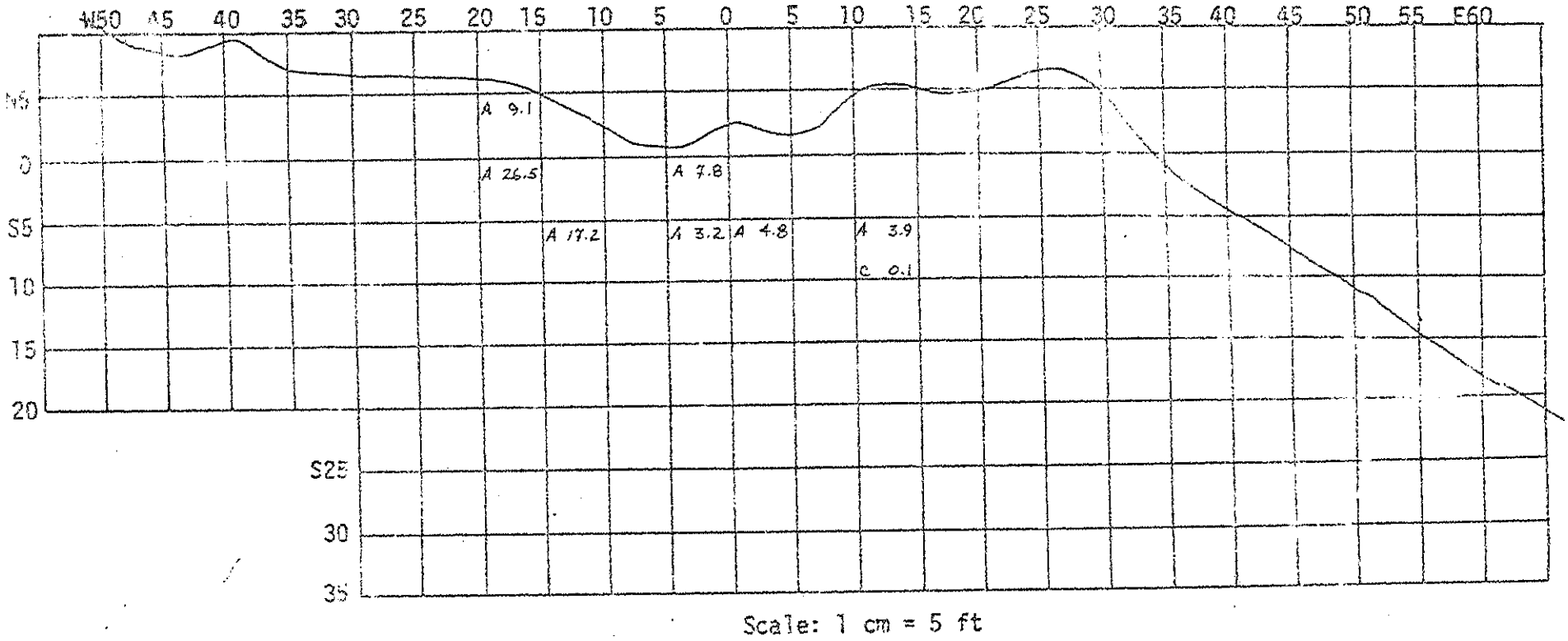
Figures 3 & 4

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Transitional (Master Level 5)



Scale: 1 cm = 5 ft

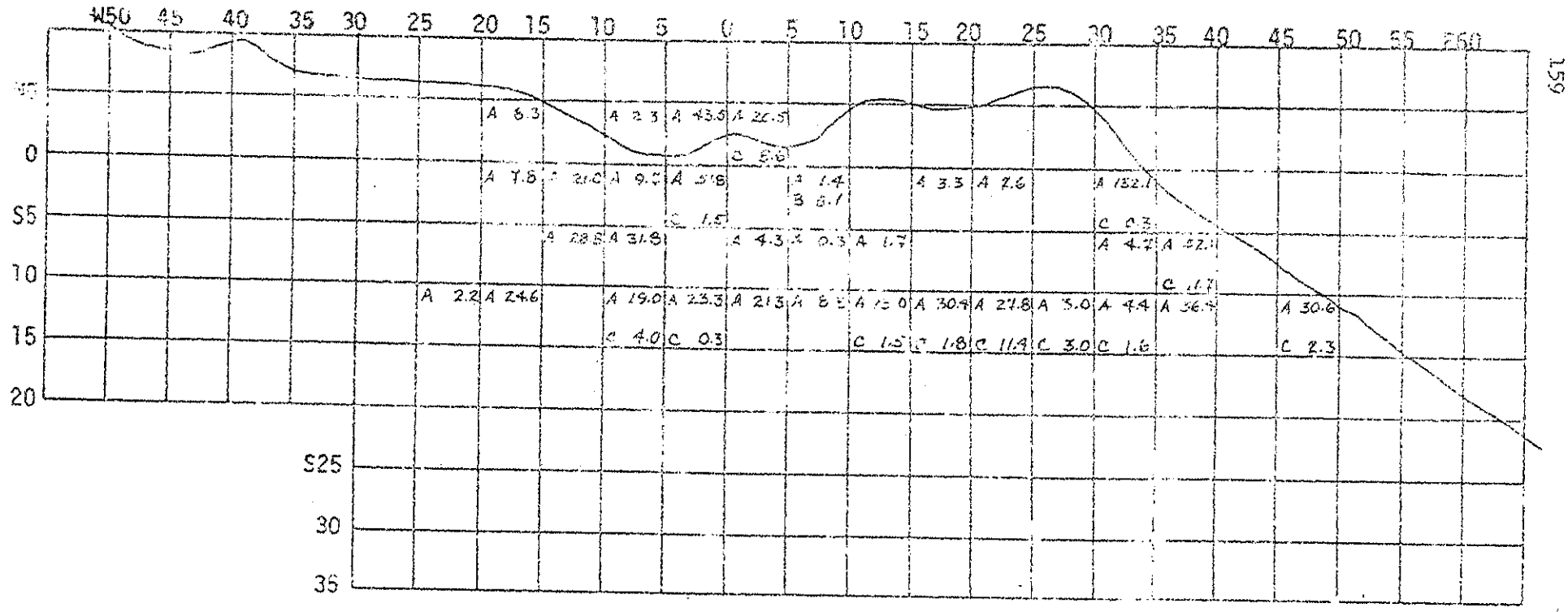
Figure 5

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Late Archaic (Master Level 6)



Scale: 1 cm = 5 ft

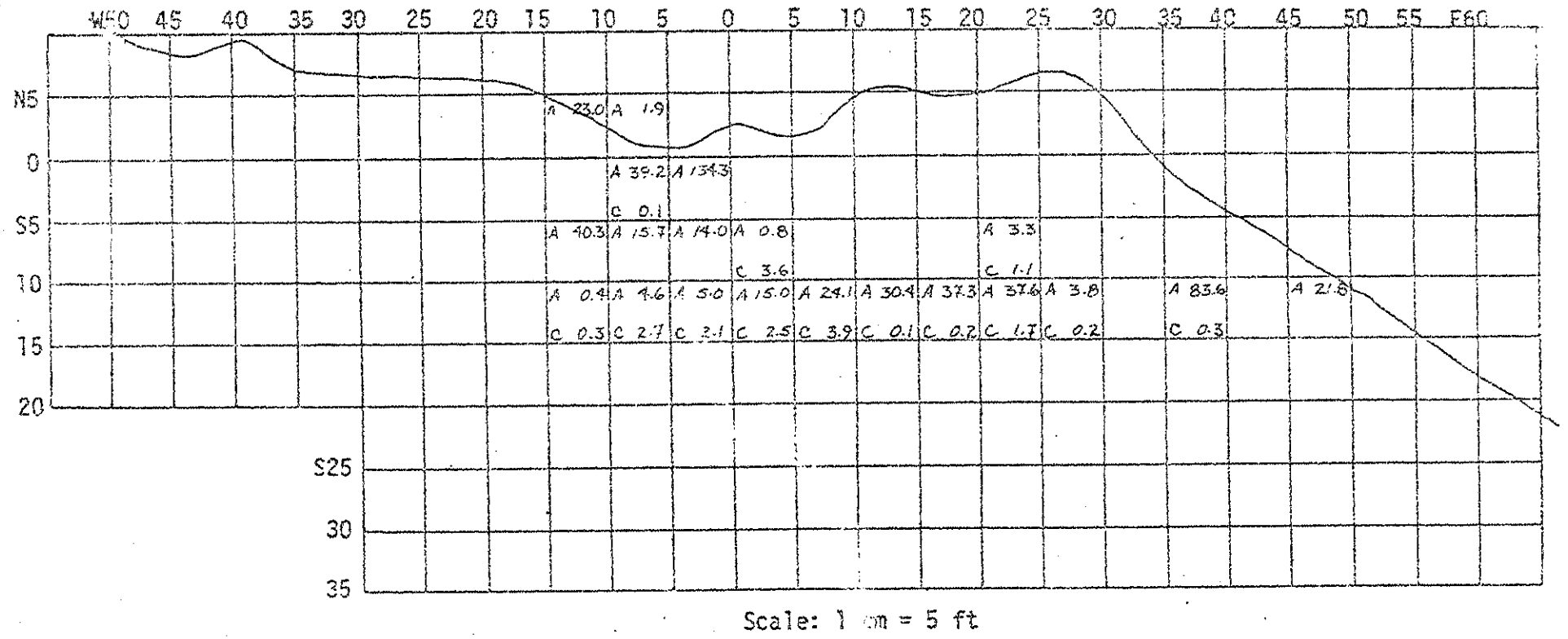
Figure 5

36Hul SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Middle Archaic (Master Level 7)



Scale: 1 cm = 5 ft

160

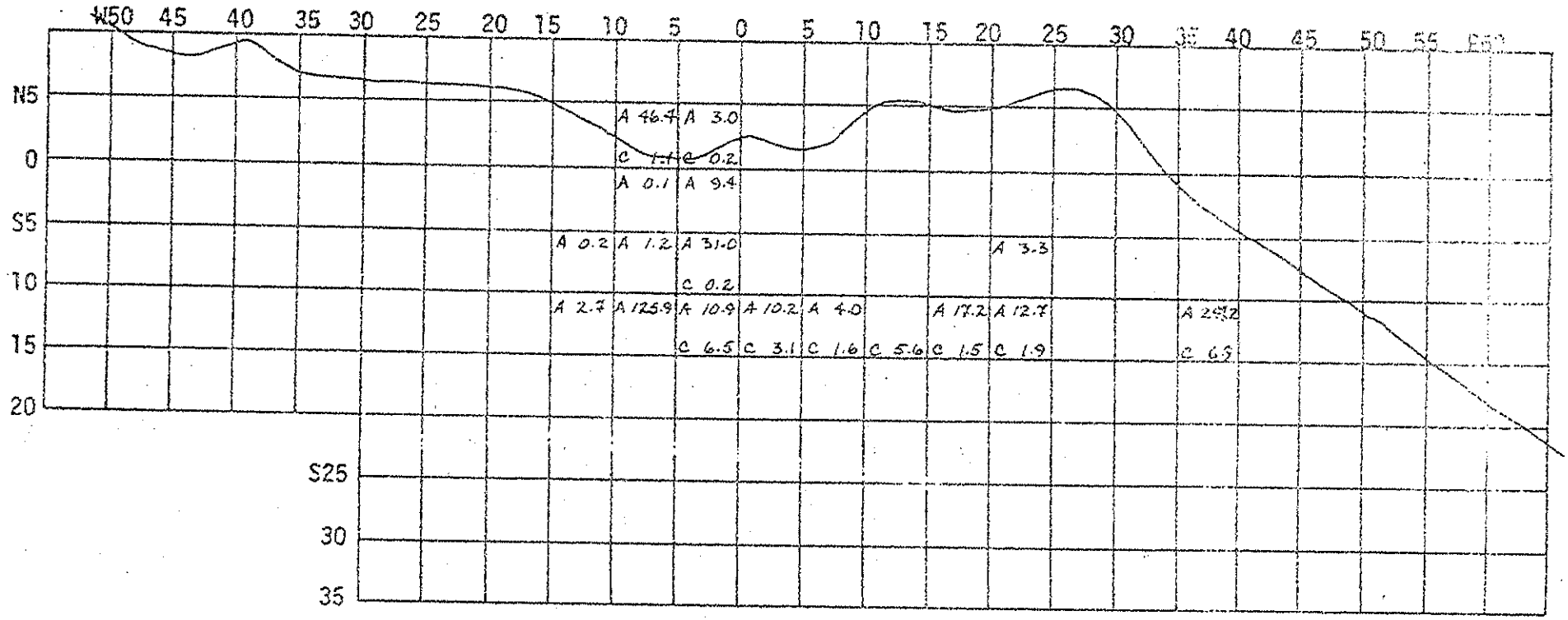
Figure 7

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in Grams)

PERIOD: Early Archaic (Master Level 8)



Scale: 1 cm = 5 ft

Figure 8

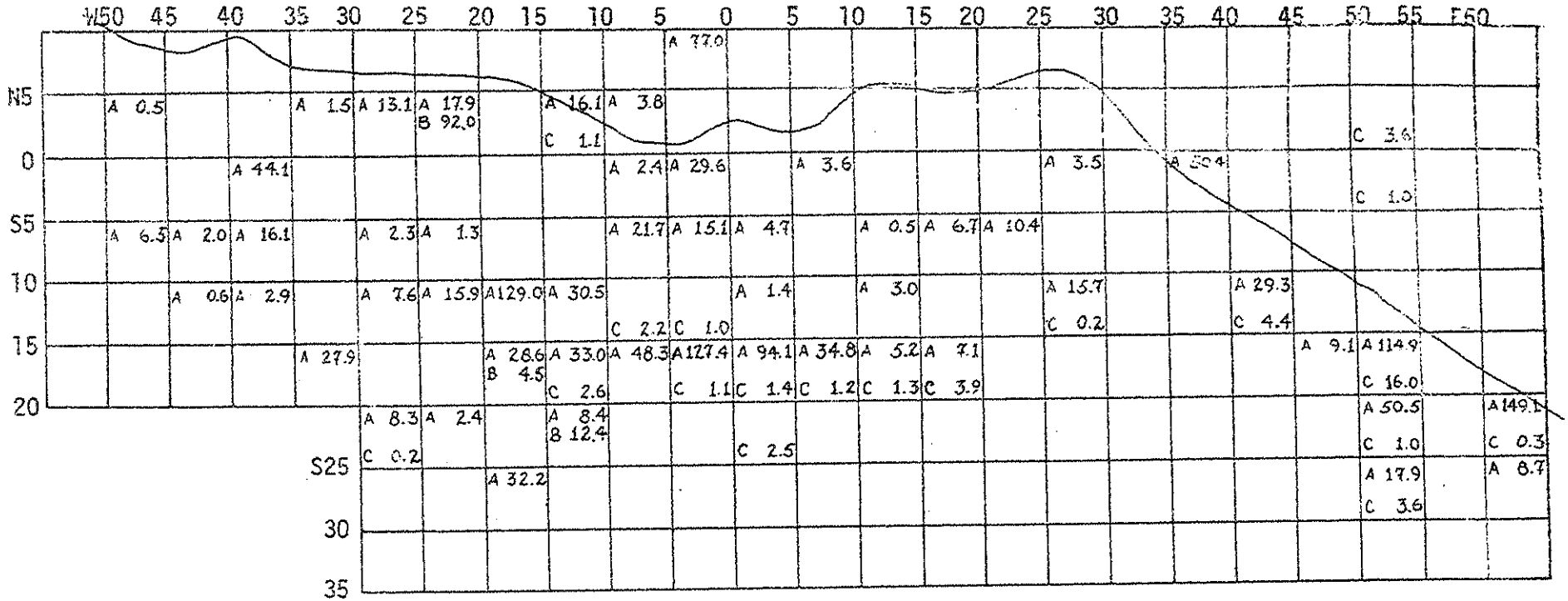
36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in grams) DATE: _____

LEVEL and/or PERIOD: MASTER LEVEL INDETERMINATE RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Figure 9

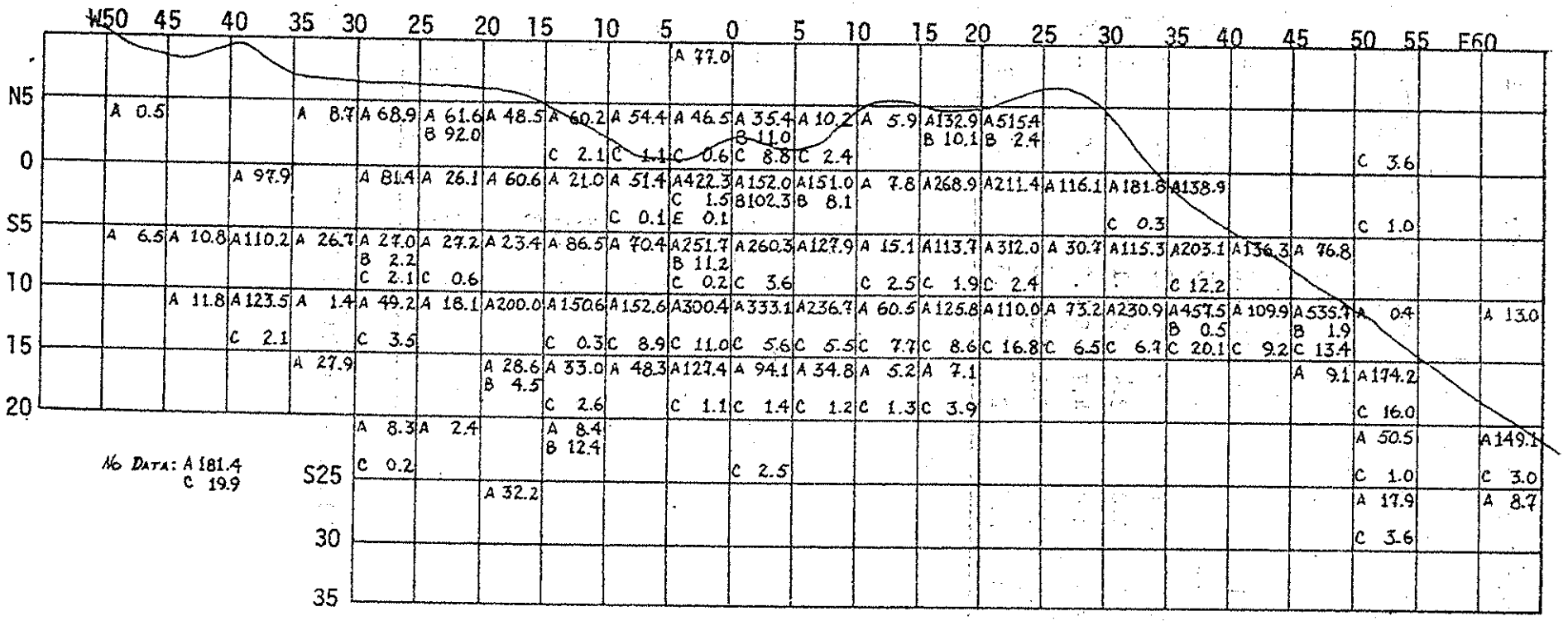
36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED SHELL (Weight in grams) DATE: _____

LEVEL and/or PERIOD: MASTER LEVELS 1 - 8 (Total Wt. Shell per Square) RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Master Level	Percent Per Level %Mol-lusc	%Burn. Mollusc	% Snail	Weight Per Level Wt. Mol-lusc	Wt. Burn. Mollusc	Wt. Snail	Percent of Total %Mol-lusc	% Burn. Mollusc	% Snail
1	87.0	12.8	0.2	539.7	79.1	1.2	5.8	30.6	0.6
2	97.6	1.8	0.6	3241.6	60.1	20.2	34.7	23.2	9.9
3&4	98.1	0.1	1.8	2261.6	2.4	41.4	24.2	0.9	20.2
5	99.9	0.0	0.1	72.5	0.0	0.1	0.8	0.0	0.0
6	92.9	1.1	6.0	697.8	8.1	45.3	7.5	3.1	22.2
7	96.6	0.0	3.4	536.1	0.0	19.0	5.8	0.0	9.3
8	95.3	0.0	4.7	584.8	0.0	28.6	6.3	0.0	14.0
Ind.	89.8	7.1	3.1	1394.6	108.9	48.6	14.9	42.1	23.8
Total	95.3	2.6	2.1	9330.5	258.6	204.4	100.0	99.9	100.0

Table 1 MASTER LEVEL PERCENTAGES

Master Level		WEST	CENTRAL	EAST
1	A	3.2	72.3	24.4
	B	0.0	100.0	0.0
	C	0.0	0.0	100.0
2	A	21.5	26.1	51.8
	B	3.7	75.5	20.8
	C	24.3	25.7	50.0
3	A	6.0	27.9	66.1
	B	0.0	0.0	100.0
	C	8.4	3.9	87.7

Table 2 PERCENTAGE CONCENTRATIONS PER AREA PER MASTER LEVEL

A PRELIMINARY REPORT ON THE INVESTIGATION OF SUBSISTENCE ORIENTED PLANT UTILIZATION AT THE SHEEP ROCK SHELTER SITE

by

D. Michael Steffy

ABSTRACT

This chapter describes a project that was a direct result of the research objectives that emerged following the preliminary investigation of the Sheep Rock Shelter undertaken by the Pennsylvania State University Field School in Archaeology during the 1966 field season. The project involves the investigation of the sequence of subsistence oriented plant utilization at the Sheep Rock Shelter. The progress to date on the project is reviewed and the types of observations which were coded and catalogued for one type of botanical remains are presented.

ACKNOWLEDGMENTS

The author wishes to thank Dr. Joseph Michels and Dr. Anton Kovar for their assistance in the ongoing project which this report outlines. Special thanks to Barbara Best, Arden Heverly, Bette Salmon, Betsy Taylor, and especially Nona Berman for their devotion and perserverance in a very difficult task.

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Figure 1. Card Form Layout Sheet. 179

INTRODUCTION AND BACKGROUND

From its first discovery as an archaeological site in 1957 by John E. Miller, Sheep Rock Shelter gave every indication of becoming a significant find in Northeastern United States archaeology. Early test pits in 1957 and 1958 by Miller, Edgar J. Stackhouse and Melville W. Corl revealed substantial quantities of corn cobs, corn husks, corn stalks, cordage, kernels of corn, pumpkin and squash seeds and shell, sunflower seeds, various types of bark, and Indian hemp stalks and fibers. It is in the unusual preservation of these and other botanical specimens and the artifacts fashioned from them that Sheep Rock Shelter can, perhaps, make its greatest contribution to the study of precontact Indian culture in Northeastern United States. Yet, before the summer of 1967, little had been accomplished toward the ultimate objective of a comprehensive archaeological analysis of the botanical remains recovered from the site during the ten years since its discovery.

The preliminary report published in the Spring of 1967 as the result of the Pennsylvania State University's assumption of responsibility for the site and for the analysis of the total archaeological collection from it did contain: (1) a report on pollen analysis of soil samples from the site by Anton Kovar, Paleobotanist at the Pennsylvania State University; (2) notes on some plant remains from the shelter by Hugh C. Cutler and Leonard W. Blake of the Missouri Botanical Garden, prepared from a sample of remains recovered during the early stages of excavation and sent to them by Fred Kinsey; and (3) a stratigraphic distribution of that early sample prepared by Carl Bebrich, a Pennsylvania State University graduate student in anthropology, combining a list of identified materials in the Cutler report and their proveniences with the stratigraphic profiles prepared in the Summer and Fall of 1966 by the Pennsylvania State University Archaeological Field School.

Noting the lack of information on plant remains available from the site for the 1967 preliminary report, a more complete, problem-oriented botanical analysis was included as a major research objective for the 1967 field season at Sheep Rock. As a result of that research objective, a research proposal was prepared and submitted to Dr. Joseph W. Michels on July 1, 1967 by this author. That proposal was approved and stands today as the framework within which the analysis of the botanical remains from Sheep Rock is progressing.

THE RESEARCH PROJECT

Project Characteristics

It is of value to note here a few general points with regard to the research proposal and the project which it outlines before they are considered in detail. First, the project is problem oriented. It is concerned with the investigation of the sequence of subsistence oriented plant utilization at the Sheep Rock Shelter and, therefore, involves only the plant remains from the site that are directly or indirectly connected with prehistoric subsistence activities. Second, the project is designed to make maximum use of student volunteers with a minimum dependence on specialists in botanical analysis. Finally, it is hoped that some contribution can be made to the important ethnobotanical questions associated with the Woodland cultures of Northeastern United States.

Specifically, the project involves:

1. A survey of the literature on northeastern prehistoric subsistence.

2. The collection of a sample of modern plant materials reported as being related to prehistoric subsistence for the purposes of comparative identification.

3. The identification of subsistence oriented plant materials in the total collection of excavated botanical remains from the site.

4. The extraction of data on plant materials utilized for subsistence from the laboratory analysis of human fecal remains from the site.

5. The extraction of data on plants utilized in subsistence from the pollen analysis of soil samples and human fecal remains from the site.

6. The flotation recovery in the field during the 1967 season and identification in the laboratory of any small, subsistence oriented plant remains not recovered from features by conventional excavation techniques.

7. A stratigraphic analysis of the subsistence oriented plant remains where availability of data permits.

8. The final synthesis of all the obtained data into a tentative reconstruction of the sequence of subsistence oriented plant utilization at the Sheep Rock site.

The project will utilize in the generation of its final results:

1. The work of Hugh C. Cutler and Leonard W. Blake of the Missouri Botanical Garden on a sample of plant remains from the site.

2. The work of Anton J. Kovar of the Pennsylvania State University on the analysis of pollen extracted from soil samples collected from Sheep Rock in 1960 and 1966 and obtained from human fecal remains recovered during early excavation of the site.

3. The work of Anton J. Kovar on the analysis of human fecal remains from the site.

4. The work of various students at the Pennsylvania State University on the stratigraphic profiles from the Sheep Rock Shelter.

5. The work of an as yet unselected expert on the identification of any problem plant materials encountered during this project.

Project Objectives

The general objective of the subsistence project as stated in the original proposal is to investigate the sequence of subsistence oriented plant utilization at the Sheep Rock Shelter and indicate the degree to which this sequence and its dates can be applied to other regions in the greater northeastern culture area. Several specific objectives present themselves, however, when the general objective is considered in terms of some individual problems related to Sheep Rock and Northeastern United States archaeology. As reported in the original proposal the subsistence project is endeavoring to reveal, where availability of data permits:

1. Evidence for the type of subsistence oriented plant utilization related to the various cultural components represented at the site.

2. The earliest evidence for the storage of plant materials in the site.

3. The date of the introduction, and, if possible, the derivation of agriculture at the site.

4. The sequence, if any, of the introduction of domesticated plants into the site.

5. Any evidence for the cultivation of plants other than corn, beans and squash commonly reported and the date of their introduction.

6. The relative importance of wild plant foods and domesticated plant foods throughout the stratigraphic sequence.

Project Methods and Techniques

The methods involved in the subsistence project are primarily those of archaeology modified in some cases toward those in paleobotany. They include:

1. Excavation. Some of the plant remains to be studied in this project were recovered by the excavation techniques of direct exposure, separation from the soil on a 1/4 inch mesh screen and water flotation.

2. Laboratory Analysis. The remainder of the plant remains to be studied in this project will be recovered by the laboratory techniques of fecal and pollen analysis and chemical flotation.

3. Comparative Identification. Identification of plant remains to be studied in this project will be accomplished by comparison with known modern samples.

4. Expert Identification and Review. The identification of unknown problem plant materials for which the comparison method fails will be made by an expert. This expert will also check significant identifications, discoveries and conclusions to assure their validity.

5. Stratigraphic Analysis. The sequence of subsistence oriented plant utilization will be reconstructed by locating identified materials in the stratigraphic sequence according to their proveniences.

Having now considered briefly the research design and, therefore, the framework within which the subsistence project is progressing we can turn to a review of the work accomplished to date.

PROGRESS TO DATE

The 1967 Field School

During the 1967 summer Field School in Archaeology, several students were assigned to work on the botanical remains from Sheep Rock. Besides performing several specific activities related to the subsistence project, they made a major contribution in preparing the large botanical collection for detailed identification and analysis. These general activities involved:

1. The extraction of all botanical remains from the total Sheep Rock collection.

2. The cataloging of the, as yet, uncatalogued remains that had been sent to Dr. Cutler during an earlier stage of excavation at Sheep Rock.

3. The separation of all botanical remains into several major categories arbitrarily called types. These types include:

A. Nuts, shells, hull, caps.
B. Seeds, seed pods, cobs, gourd, squash shell.
C. Grass, stalks, stems, husks.
D. Leaves.
E. Twigs and wood.
F. Bark.
G. Miscellaneous - small unclassifiable particles, unknown materials.

The specific activities performed in relation to the subsistence project in particular involved:

1. The flotation recovery of small plant remains from feature soil samples not recovered by conventional excavation techniques.

2. The collection of a sample of contemporary plant materials from the Raystown area.

3. A start of the identification and laboratory analysis of the macro-botanical remains related to subsistence.

The start on the identification and analysis of the subsistence related plant remains listed above was made with the Type "A" materials. They were divided into 11 visible categories. Identification of these categories based on W. M. Harlow's Fruit Key and Twig Key to Trees and Shrubs ( ) provided four varieties and five subvarieties. Each one of these standard botanical taxonomic units contained one or more of the original visible categories as each genus and species could be represented by several different parts of the same nut (i.e., nut shell, outer hull, or meat of the nut). These varieties and subvarieties included:

1. Juglans
   Subvariety a. Juglans nigra (black walnut)
   Subvariety b. Juglans cinera (butternut)

2. Quercus - Oak (not subdivided)

3. Carya - Hickory
   Subvariety a. Carya ovata (shag bark hickory)
   Subvariety b. Carya laciniosa (shellbark hickory)
   Subvariety c. Carya ovalis or Carya glabra (pignut hickory)

4. Castanea
   Subvariety a. Castanea dentata (American chestnut)

By the close of the summer field season a little more than half of the Type "A" remains had been sorted into the above listed categories.

Post Field School Progress

Immediately following the 1967 field season, the project was moved from the field laboratory at Juniata College to the Anthropology Laboratory at the Pennsylvania State University. Since this move the variety and subvariety categories in Type "A" have been expanded to include a previously overlooked variety, and then adapted to conform to an IBM coding system designed to facilitate the handling of this large quantity of data.

When work on the Type "A" remains is completed, work will begin on the Type "B" remains which will be handled in much the same manner. Ultimately all observations and identifications will be made under the supervision of Dr. Kovar and coded for machine processing. Then and only then can the final step of the project be started. That final step involves the stratigraphic analysis mentioned previously and the final synthesis of all available data into as complete a reconstruction of the prehistoric sequence of subsistence oriented plant utilization as the data will permit. We estimate completion of this project by Winter, 1968.

CLASSIFYING, CODING AND CATALOGING TYPE "A" BOTANICAL REMAINS

The following list includes the kinds of information that are generated, coded and catalogued as part of the laboratory analysis of the Type "A" botanical remains. The list also includes standard information obtained from the original field artifact catalogue and information produced by the synthesis of basic data obtained in the field. A newly standardized artifact catalogue format is utilized (Fig. 1) in this coding and classifying so that a final artifact catalogue complete with all available information might be the end result. This new format includes:

1. Accession Number
   obtained from original field artifact catalogue.

2. Feature Association (if any)
   obtained from original field notes.

3. Horizontal Provenience
   obtained from original field artifact catalogue and where necessary from original field notes.

4. Vertical Provenience
   obtained from original field artifact catalogue and where necessary from original field notes.

5. Original Excavation Unit (if any)
   obtained from the original field artifact catalogue and used when necessary to establish correct vertical provenience from the original field notes.

6. Profile Level
   obtained from the synthesis of the original square profiles from the field notes into site stratigraphic profiles.

7. Master Level
   obtained from the synthesis of available profile, cultural and chronological data.

8. Material Code
   obtained from the original field catalogue and the same for all botanical remains (08 - botanical).

9. Modification
   obtained from the original field catalogue and laboratory analysis (U - unmodified, M - modified).

10. Artifact Description
    obtained from laboratory analysis. In the case of the Type "A" botanical remains it includes:

    (a) Type
        one of the seven gross types listed previously in the main body of the botanical analysis report. (In this case Type "A" nuts.)

    (b) Variety, stage one: identification.
        one of seven categories so far established within Type "A" as follows:
        (0) Unknown
        (1) Butternut - Juglans cinera
        (2) Black walnut - Juglans nigra
        (3) Acorn - Quercus
        (4) Hickorynut - Carya
        (5) American Chestnut - Castanea dentata
        (6) Hazelnut - Corylus

    (c) Variety, stage two: kind and condition of remains.
        one of six categories so far established within Type "A" as follows:
        (0) Unknown
        (1) Shell fragment/s
        (2) Nuts

(3) Hull fragment/s or cap/s
(4) Whole fruit
(5) Meat of nut

(d) Variety, stage three: observable oddities.
one of six categories so far established within Type "A" as follows:
(0) None
(1) Charred or whitish ash-like discoloration suggesting exposure to fire
(2) Holes somewhat regular suggesting insect or rodent action
(3) Both 1 and 2 present
(4) Other discoloration
(5) Both 1 and 4 present

(e) Weight
recorded in grams to nearest tenth of a gram.

11. Quantity
obtained from laboratory analysis.

PSU

PENNSYLVANIA STATE UNIVERSITY — LABORATORY OF ANTHROPOLOGY (1968)

CARD FORM LAYOUT

ACCESSION NUMBER	FEATURE ASSOCIATION	HORIZONTAL PROVENIENCE: SUB-QUAD	ZONE	SECTOR	SUB-SECTOR	SQUARE	BLOCK	QUARTER	VERTICAL PROVENIENCE	ORIGINAL EXCAVATION UNIT	LEVEL	PROFILE LEVEL	MASTER LEVEL	CODE MATERIAL	IDENTIFICATION	ARTIFACT DESCRIPTION	QUANTITY
10 20 30 40 50 60 70 80 90 10 11 12 13	14 15 16 17	18	19	20 21	22	23	24 25	26	27	28 29 30	31 32 33	34 35 36 37 38 39	40	41 42	43	44	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76	77 78 79 80
A66.001.07621		W	35	S/C					0.36-0.42					08	UA	2 3 0	1.753	200

ARTIFACT DESCRIPTION

52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
TYPE		VARIETY 1		VARIETY 2		VARIETY 3															WEIGHT IN GRAMS (F4.1)			
A		2		3		0															1	7	5	3

Figure 1

A PRELIMINARY ANALYSIS OF 1967 SHEEP ROCK FEATURES AND ACTIVITY AREAS

by

Rachel Green

ABSTRACT

This report contains descriptions and a preliminary analysis of the features found at Sheep Rock shelter during the 1967 field season. In addition, there are lists of the charcoal areas, ash lenses, post molds and unusual soil coloration areas found in the daily field records of the 1966 and 1967 seasons. The features and latter items are plotted on the S10 and S15 profiles to locate possible activity areas and zones, and are compared with the master levels of 1967.

ACKNOWLEDGMENTS

I would like to thank Lorraine Willey for her considerate help and encouragement both as an advisor and as the organizer of the 1967 field notes for Sheep Rock, without which this report would have been nearly impossible.

Appreciation is also extended to Lynn Dixon for help in deciphering the stratigraphy of Sheep Rock Shelter.

Thanks also go to the students who, if their reports were not perfect, willingly gave all further information possible.

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Figure 2. Feature-Stratigraphy Correlation, South 15 Profile. 197

INTRODUCTION

Ira Smith, in his chapter entitled "A Preliminary Analysis of Some Feature Types and Burials from the Sheep Rock Shelter" published in the first volume of this report (Smith 1967:207), provides a very useful definition of the kinds of features recovered during the 1967 excavation season. The nine formally designated features of the 1967 season have therefore been classified on the basis of his typology, and this chapter is intended to present summary descriptions of them. In addition, the author has made a systematic check of the field notes for both the 1966 and 1967 field seasons and has listed all reports of charcoal areas, ash lenses, post molds, heavy bone concentrations, and unusual soil colorings. Although these latter observations were not formally designated features, they will play a key role in the analysis of the activity structure of the rock shelter that will be completed in time for the final report.

This chapter, then, is the second (after Ira Smith's) in which progress is being made in assembling all of the relevant data in prelude to a formal activity structure analysis. The two principal categories of features discussed in this chapter are fire areas and refuse pits.

METHODOLOGY

The primary object of this report is the description of the formally designated features uncovered during the summer of 1967. In order to achieve a complete definition of the feature, the feature reports and the daily field notes were used for reference. When the reports were unclear, not complete enough, or contradictory, the excavators themselves were questioned for further information. This technique was fairly successful as far as answering immediate questions was concerned, but the error involved cannot be discounted. Some of the information gleaned from the excavators did not agree strictly with the field notes and drawings, and preference was generally given to what was said to be correct rather than what was written.

The second part of the report is on the charcoal areas, ash lenses, post molds, heavy bone concentrations, and unusual soil colorations that were not called features but which may still help to define activity areas and habitation levels. The only information source for these is the field records taken by the students. Reading through the catalogues and paying special attention to the "Additional Field Observations" enabled me to learn about the above-mentioned items. The identification and provenience of these

items is listed at the end of this chapter. Because of a shortage of time, only the reports of the last two seasons of excavation, 1966 and 1967, were included.

DESCRIPTION OF THE 1967 FEATURES

Fire Areas

Stone-lined Fire Pit - Feature No. 67-2. This feature is a fairly large area measuring at its widest points 36 inches SW/NE and 15 inches NW/SE. It is composed of a semi-circular arrangement of stones surrounded and stained by a blackened deposit. Toward the top of this feature were about six large stones in a rough semi-circle sloping inward toward the center of the arrangement. The blackened deposit was mostly very fine grained charcoal, but there was probably some decayed vegetable material from a nearby tree root. Along the edges of the larger stones were a number of smaller stones that fit roughly into the general arc. Because only the Northwest half of E05S20 was excavated on the E05S20/E10S15 diagonal, only about half of the fire pit was uncovered. The soil of the surrounding area was brown-tan, dry and fine with small shale gravel. There were no associated artifacts and very little bone.

If this feature is a stone-lined fire pit it is not a particularly clear example of one. The semi-circle is very rough and there is no way of knowing or even accurately guessing what lies in the other portion of E05S20. The absence of much bone material and chunks of charcoal is probably primarily due to the proximity of the drip which runs right through the center of the square. The shortage of artifacts and bone may also be accounted for by the depth of the feature in what has been designated as the Archaic part of the site.

Provenience: E05S20 BD of stones in the pit - 96 to 99 inches; BD of blackened soil - 93 1/2 to 102 inches.

Diffuse Fire Pit - Feature No. 67-5. This fire area is a collection of about thirty large charred rocks and a large amount of charcoal in a matrix of ash and burned soil. It is widely scattered -- measuring 49 inches toward the East from the West wall of the pit, and 36 inches toward the South from the North wall of the pit. The first signs of the feature were located in the Northeast corner of the pit at 102 to 105 inches BD. Charcoal and ash appeared there, but there were no associated objects. In the center of the feature, from 106 to 111 inches BD, there was a large collection of stones whose heaviest concentration was from 108 to 110 inches BD. The charcoal was spread all around the rocks. In the Northwest corner of the feature the charcoal was more of a stain than in the form of a material. The charcoal in the center

of the feature was quite thick -- from approximately 106 to 110 inches BD. There was also heavy charcoal in the North half of the feature at about 108 inches BD. There were patches of both burned, hardened soil and of light orange or red clay in the feature. The clay patches were on the East side of the feature and outside the immediate feature area on the East edge of the pit. The matrix soil for the feature was primarily fine brown soil mixed with fine shale gravel. There were large amounts of both burned and unburned bone (239 fragments) found in association with the feature. However, there were no artifacts found.

From the large amounts of charcoal, both in its depth and linear spread, it would appear likely that the area could have been used extensively and/or over a long period of time. The level of the feature corresponds well to the level of some of the other features found this year (see Appendices I and II).

Provenience: E10S15 BD 106 1/2 to 110 1/2 inches.

Diffuse Fire Pit - Feature No. 67-10. The fire area was located on the West border of the square about a foot from the South wall. It was 16 inches East to West and 13 inches North to South. The charcoal of the pit was quite shallow; about two inches deep at the most. Associated with the fire pit and in close proximity to it were three medium sized stones, one fire burned, and a large shale slab. In addition there was a cresent arrangement of stones at the same BD in the South half of the square stretching from the fire area to within a foot of the East wall. There were also patches of fine, darkly stained soil with fragments of charcoal in them in the Northeast corner of the square. There was bone throughout the area and a jasper core was located on the North side of the square away from the feature area. It should also be noted that the associated rocks are not definitely of the same period as the fire area. The whole level of the feature was full of medium sized stones and those at the feature level may be only coincidental.

Provenience: E10S15 BD 131 3/8 to approximately 133 inches.

Conical Ash Pit - Feature No. 67-8. This feature was located in the Northwest corner of the E35S15 square, and probably continued North into E35S10 and E40S10 and West into E35S15. The portion of the ash pit exposed extends 21 inches East from the West wall and about 13 inches South from the North wall. In addition to being an approximate sector of a circle, the ash pit was raised in the center into a mound. All around the edge of the pit is a broad border of reddened soil. The pit primarily contained gray-white ash with very little charcoal. Throughout the feature and in the matrix of brown soil there was moderate sized shale gravel. Above the pit there was a heavy deposit of large shale slabs. There were no bones or artifactual remains around the ash pit.

Provenience: E35S15 BD 173 to 178 inches.

Diffuse Fire Pit - Feature No. 67-4. This feature consists of an association of rocks, ash, blackened earth and a small amount of charcoal. The outline of the main portion of the feature is somewhat defined by a crescent arrangement of rocks in the Southeast corner of E4OS15. These outline an area that measures 30 inches N/S and 28 inches E/W. Within the crescent of rocks at 101 inches BD was a small circular area of extremely dark red soil. It measured approximately six inches in diameter and was located 1 1/4 feet from the South wall and 1 3/4 feet from the East wall. Around this to the East was a larger concentration of dark gray ash. The Eastern third of the square in which these two areas were located is composed of gray-brown soil with ash and charcoal flakes. The Western third of the square that was apparently unrelated to the feature was dark brown soil with fine shale gravel and was said to be "well mixed with charcoal" in the feature report. The central third of the square between these two areas had very little charcoal in it. On the whole there was relatively little charcoal associated with the feature. Likewise there were only two very small fragments of bone found, and there were no smoke marks on the overhanging section of the shale cliff. This lack of material and the comparatively small red soil area leads one to concur with the inference of the excavators that the area was probably little used for fires, at least at this level.

Provenience: E4OS15 BD 101 to 107 inches.

Diffuse Fire Pit - Feature No. 67-7. The feature is a large charcoal area combined with patches of white ash-like material. The charcoal area extended 4 1/2 feet East from the West wall, about three feet two inches toward the North from the South wall, and is an irregular oval shape with an approximate depth of eight inches. There were four clay areas in the charcoal region, two found at 112 1/2 inches BD, one at 114 1/2 inches BD, and one at 116 inches BD. The charcoal area was overlain by a number of shale slabs and was lying in a matrix of shaly brown-red soil. There is associated burned bone but no other artifactual material. The refuse pit also extends to this level in some areas (see Section II A and B). Any further details of this feature are missing, and information already given is from the excavators memory.

Provenience: E45S15 BD 112 1/2 to approximately 118 inches.

Diffuse Fire Pit - Feature No. 67-9. The feature first appeared at 139 inches BD as a discoloration of the soil. The pit started 19 1/2 inches from the North wall toward the South, and 20 1/2 inches North from the South wall. The pit was roughly circular with an East/West measurement of 26 1/2 inches and a North/South length of 29 inches. It was approximately seven inches deep. The dimensions of the pit were difficult to distinguish on the surface. Within the pit were very large amounts of charcoal; some chunks measuring as much as 3 inches in diameter. The sides of the pit were very hard and more easily distinguished. The feature lay in a matrix of light brown shaly soil with patches of hard

clay-like red earth, the latter being located to the Northeast side of the pit. There was one burned cobble and one burned rock found in association but there was no artifactual material. The pit was tucked close under the shale cliff.

Provenience: E45S15 BD 139 to about 146 inches.

Refuse Pit

One refuse pit was excavated in two different pits and was treated as two separate features in the reports.

Dispersed Refuse Pit - Feature No. 67-3. This feature occupies approximately the Northeast half of E40S15. It extended along the entire length of the East/West wall and 2 1/2 feet toward the South from the North wall. The contents of the pit included 20 potsherds, one fragment of a steatite vessel, around 300 bone fragments, about 50 rocks, ash and charcoal. The soil of the pit was very fine, light gray-brown and very gravelly. The matrix soil was firm and red-brown. The rocks became more concentrated toward the bottom of the pit and the frequency of the refuse decreased in rough proportion.

Provenience: E40S15 Top BD 89 inches.

Dispersed Refuse Pit - Feature No. 67-6. This part of the feature occupied the whole of the square but the heaviest concentration of refuse was in the Southeast half of E40S15. The material was very numerous and well mixed. There was some lithic material, large amounts of bone, some shell and some pottery. There were also notable amounts of more perishable materials such as bark, twigs, twisted corn husks, grass, leaves and corn cobs. Small fragments of charcoal were also found throughout the feature. The soil of the pit was a fine powdery gray.

Provenience: E45S15 Top BD 89 1/2 inches.

Unique Unidentified Feature

Unidentified Feature - Feature No. 67-1. It was a layer, 1/4 inch thick, of black, rough, bark-like substance located three inches from the square's South wall and extending about 15 inches East from the West wall. Under this was a "turf-like layer of organic material," bones, potsherds, two incised bones and pieces of carbonized wood. The pit at this level had been disturbed extensively. All but a portion of the Southwest corner had been excavated to below 76 inches BD, so the feature may have been much more extensive.

Provenience: E40S15 BD 75 1/4 inches.

ADDITIONAL AREAS OF UNUSUAL COLORATION OR COMPOSITION

Data from the 1966 Field Notes

Provenience Square	BD	Description
W45S15	52 to 61"	"Leaf bedding" on the North edge of the square and charcoal concentration in the Southeast corner.
W30S10	87 3/4"	Ash concentration.
	98"	Charcoal fragments.
	103.25"	Ash lense in the Northeast corner with charcoal fragments.
W05S15	147 1/2"	Possible living floor.
	187 1/4"	Level C - two hearth-like areas. Level D - "occupation level" with a large amount of decomposed charcoal and a scorched area. Charcoal lens - 3 inches thick on the Southeast wall.
	188"	Charcoal throughout the pit, and a fired area on the South wall.
W05S10	156 1/2"	Charcoal lens in the Northeast corner (part of Feature 66-3).
E50S20	111"	Fire complex or midden area containing charcoal; located in the North and Northeast part of the square.
E20S00	51"	Ash area in the Southwest part of the square measuring 30 inches in diameter.
	55"	Charcoal concentration in the center of the pit measuring 2 feet in diameter.
	71 1/4"	Ash area on the North wall, 3 inches to 4 inches deep, 2 feet from the West wall, and 6 inches from the East wall.
	64 1/4"	Post hole 9 inches from the West wall.
	68 1/2"	Post hole 18 inches from the West wall.
E20S10	65"	Rocks associated with charcoal in the West-center portion of the square and in the Southeast corner.
E25S15	39"	Gray soil and charcoal located in the entire North half of the square.

Provenience Square	BD	Description
E25S15	34"	Sub-level 7 - thin ash layer comprising the entire square.
	40 to 45"	Fine red soil with charcoal in the Southwest corner measuring approximately 2 feet in diameter.
E25S05	59 to 61"	Charcoal lenses in Level C.
	66 1/4"	White ash with "red and tan coloring" in Level D.
	64 3/4"	Gray ash in the Northwest corner - Level E.
	76"	Post mold 4 inches deep.
	75"	Charcoal areas or charred bark concentration 8 inches by 10 inches and 3 1/2 inches deep.
E35S10	97 to 98"	Charcoal concentration in Northeast corner.

Data from the 1967 Field Notes

Provenience Square	BD	Description
W05S15	176 1/2 to 178 3/4"	Chunks of charcoal "as large as walnuts" on North and East sides of the square in matrix areas of light beige, and dark brown soil.
	178 3/4 to 185 1/8"	Same soil colors as above with less charcoal.
	185 1/8 to 187 3/8"	Same soil colors as above with lumps of charcoal and without associations.
	196"	Sloping charcoal area 1 1/2 inches thick, above a red soil area, and along the West wall; and a clay pit 6 inches deep.
E00S15	143 3/8"	Small concentration of charcoal 12 inches x 12 inches, 18 inches from the West wall, and 24 inches from the South wall.
	150"	Area of bone concentration (540) extending across the square East to West in a 2 foot band. There were no associated artifacts. The soil was blackened with organic matter, and the bone count gradually decreased as it approached 162 inches BD.

Provenience Square	BD	Description
E05S15	150 1/2 to 162 1/2"	Large amounts of bone (660) but no associations or concentrations, and no unusual soil color.
E05S20	122 to 125"	Small concentration of charcoal in Northwest corner with lightly burned earth.
E10S15	85 to 100"	Small patches of charcoal and ash (gray). Sparse association with charred bone.
	105 1/4"	Heavy charcoal concentration and burned soil in the Southeast corner, center, and Northeast corner.
	119 7/8"	Charcoal in the Southwest corner extending 6 inches from both walls.
	120"	Charcoal concentration in the center of the square.
	143 to 145"	Layer of charcoal and bone (716) associated with wood and worked bone located in the Southeast corner.
	155 to 161"	Bone concentration (740).
E15S15	85 5/8 to 105 5/8"	Small amounts of charcoal associated with charred bone.
	113"	Slanting layer of charcoal (slanting from North to East).
	107 to 112"	Vertical burned spots in the Southwest corner.
	128 to 134"	Small thin areas of charcoal throughout the level.
E20S15	81"	Many charcoal fragments associated with large shale rocks in the Southeast corner of the square.
	94 to 97"	Charcoal associated with yellowish clay extending East to West across the square in a narrow band.
	121 to 127"	Very heavy concentration of bone (2500) with charcoal scattered through it. Charcoal concentration at 124 inches BD located 18 inches from the North wall and 32 inches from the East wall in a circle 12 inches in diameter and 3 inches deep.
E35S15	49 to 84"	Multicolored soil - red-brown with gray or beige patches, and small amounts of charcoal and ash.

Provenience Square	BD	Description
E35S15	113 to 119"	Frequent bone and concentrated charcoal in the Southeast corner.
	119 to 126"	Charcoal in the Northwest corner, extending 1 1/2 feet along the West wall to 3 feet from the East wall.
	130"	Charcoal concentration in the Northeast corner of the square with associated artifacts and ash.
	138 to 144"	Charcoal concentrations in the Southeast and Northwest corners.
E40S15	64 to 90"	Cream colored soil turning dusty gray and possessing organic remains at approximately 90 inches BD.
	105 to 120"	Multicolored soil - patches of dark brown, yellow clay, dark red, gray-brown and orange-tan. Charcoal also appeared around 120 inches BD.
E45S15	81 1/2 to 85 1/2"	Dusty gray soil on the surface.
	85 1/2 to 89 1/2"	Concentration of organic materials and charcoal.
E50S25	76 to 79"	Abundant charcoal in large chunks with light red brown soil.
	91 to 94"	Stone slab steps (recent?) leading toward the river.
	98"	Large pieces of charcoal associated with potsherds.
	128"	Possible fire area located 24 inches from the West wall and 20 inches from the North wall.
E60S25	132 to 139"	Possible fired area or refuse pit containing large amounts of burned bone, some white ash, and some potsherds.
	145 to 151"	Charcoal streak, white ash, gray and brown bands of soil.

INFERENCES AND CONCLUSIONS

It is very difficult to assign specific functions or activities to the areas containing fire pit features, especially at this stage of analysis. It has been suggested for Features 67-8 and

67-9 that they both share a common use although it is unknown. They are alike in that they have no associated bone, but are definite pits and are within the drip line. There is a possibility that they were cooking pits that had periodically been cleaned out and thus filled with more ash than charcoal or bone.

The two refuse pit areas found this year are in all probability part of one large pit extending over much of that section of the site (refer to Preliminary Analysis of Some Feature Types... by Smith on page 236 of Volume 1 of the 1966 Sheep Rock Report). The refuse pit is probably Susquehannock as concluded from the description of the pit and the types of pottery found. The unique "bark" feature remains a puzzle.

Some tentative conclusions can be drawn from the arrangement of the fire areas, refuse pits and possible sleeping areas. The areas of the site most frequently used for fires are from W25 to W05 and from E35 to E55. The refuse pit areas are generally in the Eastern edge of the site. This suggests that the fire areas were possibly daytime living and cooking areas, while the Eastern edge was always too low and too close under the cliffs to be comfortable and so was used as a depository for refuse. The blank areas may also have been used for daytime living or perhaps for sleeping and thus were kept clean.

EDITOR'S NOTE

Figures one and two on the following page illustrate the approximate provenience of sheep rock shelter features with reference to the Master Levels of the South 10 and South 15 profiles. The reader should note that the Master Levels used are the 1967 preliminary versions. The Master Levels reported in the stratigraphy chapter of this volume are revised final versions. An approximate correlation between the two versions can be made, however. Accordingly, the Master Level numbers on figure one and figure two have the following period equivalents:

Figure One S10	Level 1	Sheep Manure layer
	Level 2&3	Late Woodland
	Level 4	Early & MIddle Woodland
	Level 5	Transitional
	Level 6	Late Archaic
	Level 7	Middle Archaic
	Level 8	Early Archaic
Figure Two S15	Level 1	Sheep Manure layer
	Level 2	Late Woodland
	Level 3	Early & Middle Woodland
	Level 5	Late Archaic
	Level 6	Middle Archaic
	Level 7&8	Early Archaic

THE HUMAN SKELETAL REMAINS OF THE SHEEP ROCK SHELTER*
(An Osteobiographic Analysis)

by

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*This paper is an expansion of "Osteobiography and Sheep Rock" which was presented as part of A Symposium on the Archaeology of the Sheep Rock Shelter Site at the William Penn Memorial Museum, Harrisburg, Pennsylvania on May 27, 1967.

ABSTRACT

The skeletal remains of up to 33 individuals are described in chronological order. The remains discussed include:

Burial No. 4, previously described in press releases as a male of approximately 45 years of age who was actually a female of about 30 years of age (range 20-40 years). Her similarity to one of the females (# 103) from the Upper Cave at Choukoutien is commented upon along with her similarity to various other Amerinds.

Numerous isolated remains, including a few which may have been cut or broken while fresh are listed and discussed in relation to possible cannibalism.

Six newborn or younger individuals are listed and the apparent absence of older children is commented upon.

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INTRODUCTION

The archaeological excavation of Sheep Rock has uncovered the remains of five individuals who have been classified by the archaeologists as burials (Smith 1967) together with the scattered and usually fragmentary remains of up to 28 additional individuals. The exact count is, of course, uncertain owing to the possibility that scattered fragments may actually belong together.

I have listed these skeletal finds below in chronological order, together with comments as possible and appropriate.

INDIVIDUAL SKELETAL REMAINS (IN CHRONOLOGICAL ORDER)

ARCHAIC

Middle Archaic

#3295 Burial # 4 (Smith 1967). Associated cranial fragments (now restored but with some warpage), left patella, left tibia (fragmentary proximal epiphysis), left fibula (no proximal epiphysis), left tarsals, metatarsals, and one mid phalanx. Young or middle adult (20-40 years, probably ca. 30), female.

This is the individual previously described in April 16, 1962 press releases as a male of approximately 45 years of age at death.

Unfortunately, my examination of the remains in 1967 indicates that the unknown evaluator of 1962 was in error. Burial # 4 is probably a female between 20 and 40 years of age but most likely about 30.

Sex. The brow ridges and supramastoid crest are slightly prominent but the mastoid processes are small, muscle markings are poorly defined, and the total jaw structure is very gracile.

In addition to the above visual evaluation I have metrically evaluated the sex of Burial # 4 using discriminent function formulae for dimensions of the cranium (Giles and Elliot 1963) and for dimensions of the mandible (Giles 1964). The value of such a procedure is uncertain in this case inasmuch as the formulae were derived from Caucasoid and Negroid series, but it may be of some interest to note that both Caucasoid and Negroid formulae place the

mandible well into the female category. The cranial analysis is slightly less positive since use of the Caucasoid formulae results in an in-between placement. Furthermore, the Negroid formulae which are based on a primarily dolichocranic series and, therefore, perhaps more appropriate for our dolichocranic Burial # 4 yield a female category placement.

Age. As also mentioned above, the press release of 1962 referred to this individual as being about 45 years old at death, whereas I have estimated her age as anywhere between 20 and 40 years of age but most likely to be about 30 or so.

My estimate range is based on the lack of closure (both externally and internally) in the cranial sutures. I am aware that degree of suture closure as a criterion for the determination of age is in disrepute (McKern and Stewart 1959) but more recent studies by Neméskeri et al (1960) suggest it may continue to have some utility, especially as in a case like this where other preferred criteria such as changes in the pubic symphisis are lacking.

I suspect that the 1962 estimate ignored suture closure and took into account only the high degree of tooth wear present in Burial # 4 thus leading to what I consider to be an overestimate of age at death. Tooth wear is the end product of the interaction of many factors ranging from composition based on heredity together with pre and post natal diet, on through the complexities involved in actual usage of the teeth. Therefore, wear rates are subject to much individual as well as populational variation.

In this instance I have assigned a relatively young age (ca. 30 years) because I believe that tooth wear had to occur at a very rapid rate in order for so many badly worn teeth to have been retained in such a greatly degenerated alveolus. The periodontal degeneration seen here is probably due to a combination of factors including calculus deposits, but the major cause of recession as well as the tooth wear itself is likely to have been an activity such as the crunching of hickory nuts (potentially lacerating shells and all). That such a masticatory activity was possible is suggested by the finding of pieces of hickory shell (up to 1 cm in diameter) in the coprolites or preserved feces of other ancient Eastern Americans such as the occupants of Salts Cave.

Stature. Stature estimates based on bone lengths are subject to many types of error especially when, as in this case, formulae based on an appropriate population are not available.

I have, however, used the tibial fragments to reconstruct a maximum tibial length of approximately 360 mm and then inserted this tibial length in several recent formulae used in statural reconstruction with the following results:

Caucasoid Female Formula (Trotter and Gleser 1952)	165.93 cm ± 3.66 cm
Negroid Female Formula (Trotter and Gleser 1952)	160.85 cm ± 3.70 cm
Mexican Female Formula (Genovés 1967)	159.20 cm ± 3.51 cm

I have included the results arrived at with the aid of the Caucasoid formula but I believe that the Negroid and Mexican formulae are more appropriate in that they both take into account the attenuated extremities often associated with Amerinds.

If the results of the two latter formulae are tentatively accepted and are then compared with the averages for recent female Delaware, 158.6 cm (Boas 1895) and Iroquois, 158.5 cm (Boas 1895) respectively, it would appear that Sheep Rock Woman was slightly taller than the average recent female Indian of this region.

Comparisons with Other Ancient Remains. I have compared Sheep Rock Woman with two famous ladies of the past -- Minnesota Woman (dated as up to 11,000 years ago if not an intrusive burial) and the so-called "Eskimo Wife" or # 103 of the Upper Cave "Family" of Choukoutien, China (dated as late Pleistocene = Final Wurm).

As may be seen from the accompanying photographs and tables Sheep Rock Woman resembles Minnesota Woman in general, but her most striking resemblance is to Upper Cave Woman # 103. The major discontinuities occur in the dimensions and form of the jaw apparatus owing to the light construction of Sheep Rock Woman's maxilla and mandible.

Although I have presented metric and photographic comparisons for just Minnesota and Choukoutien, similar characteristics can be found in other ancient Amerind populations such as Tranquillity, California (Angel 1966) and Indian Knoll, Kentucky (Snow 1948) as well as more recent populations.

The only conclusion that can be drawn at this time from the foregoing is that Sheep Rock has morphological features that have much time depth and wide geographic distribution in North America together with seeming (but far removed in time and space) ties to the Upper Cave people of Choukoutien, China.

#3643 Burial # 3 (Smith 1967). Immature (ca. newborn).

? "Symphysis pubis and a toe bone." Destroyed, no further information (Guilday and Tanner 1968).

Table 1

SELECTED CRANIAL MEASUREMENTS OF BURIAL # 4 FROM SHEEP ROCK COMPARED WITH THOSE OF MINNESOTA WOMAN AND CHOUKOUTIEN UPPER CAVE # 103

Measurement Name	Sheep Rock	Minnesota	Upper Cave # 103
1. Cranial Length	181 ?	179	180
2. Cranial Breadth, Max.	131 ?	138	131
3. Cranial Circumference	498 ?	495	-
4. Cranial Height, Basion-Bregma	145 ?	127	143
5. Cranial Height, Auricular	117	116	118
6. Frontal Breadth, Min.	88	93	101
7. Bizygomatic, Max.	131 ?	125 ?	137 ?
8. Biorbital Breadth	94	92.5	-
9. Interorbital Breadth	19	19.5	-
10. Orbit Height, Left	35	34	31
11. Orbit Height, Right	35	-	-
12. Orbit Breadth, Left	41	38	45
13. Orbit Breadth, Right	39	-	-
14. Upper Face Height, Nasion-Prosthion	73 ?	67	68.5
15. Nasal Height	50	47	51
16. Nasal Breadth	26	21	25.5
17. Palate Length, Ext.	49 ?	51	58 ? (cast)
18. Palate Breadth, Ext.	59 ?	66	67 ? (cast)
Index Name			
A. Cranial (2/1)	72.4	77.1	71.3
B. Height-Length (4/1)	80.1	70.9	77.8
C. Height-Breadth (4/2)	110.7	92.0	109.1
D. Auricular Height-Length (5/1)	64.6	64.8	64.2
E. Cranial Module, Auricular (1 + 3 + 5)	429	433	429
F. Cranio-Facial (7/2)	100.0	90.6	100.1
G. Upper Facial (14/7)	55.7	53.6	50.1
H. Nasal (16/15)	50.5	44.7	50.0
I. Orbital, Left (10/12)	85.4	89.5	71.2
J. Orbital, Right (11/13)	89.7	-	-
K. External Palatal (18/17)	120.4	129.4	115.5

Note # 1. All dimensions given in millimeters.
Note # 2. ? indicates degree of uncertainty due to warpage, missing parts, etc.

Table 2

SELECTED MANDIBULAR MEASUREMENTS OF BURIAL # 4 FROM SHEEP ROCK COMPARED WITH THOSE OF MINNESOTA WOMAN

Measurement Name	Sheep Rock	Minnesota
1. Symphysial Height	35	30
2. Corpus Thickness (M_2), Left	12	14.3
3. Corpus Thickness (M_2), Right	12.5	14.3
4. Ramus Breadth, Min., Left	29	34
5. Ramus Breadth, Min., Right	30	34
6. Bigonial Breadth	92 ?	94
7. Bicondylar Breadth	112 ?	115
8. Condylo-symphysial Length	100	107
9. Gonial Angle	129°	128°
10. Ramus Height, Right	49	54
11. Ramus Length, Right	85	76
Index Name		
A. Mandibular (8/7)	89.3	93.0

Note # 1. All dimensions given in millimeters.
Note # 2. ? indicates degree of uncertainty due to warpage, missing parts, etc.

Figure 1a. Front View

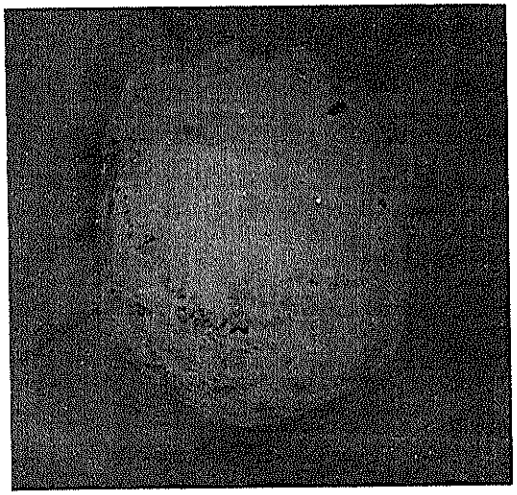

Figure 1b. Rear View

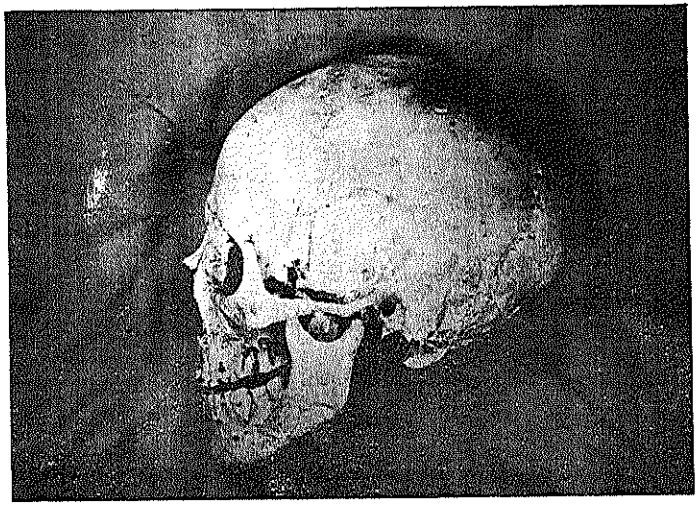

Figure 1c. Left Side View

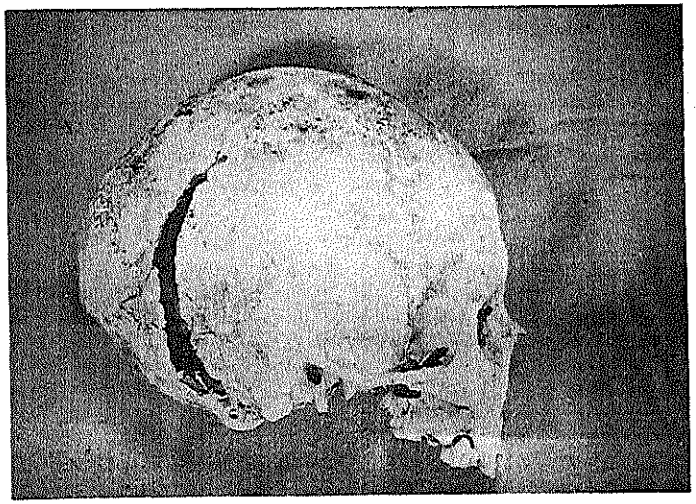

Figure 1d. Right Side View

Figure 1 SHEEP ROCK WOMAN

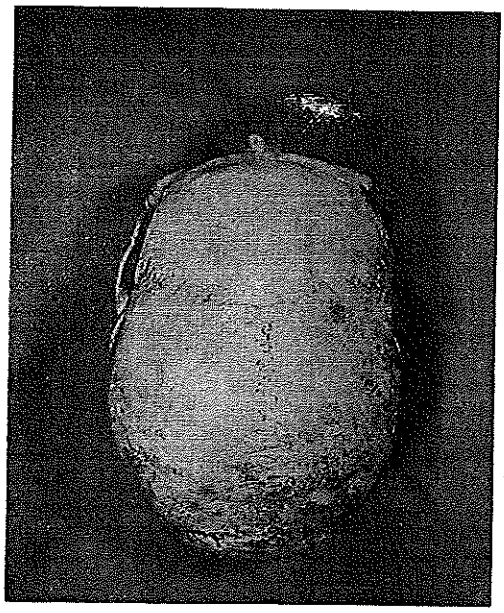

Figure 2a. Skull, Top View

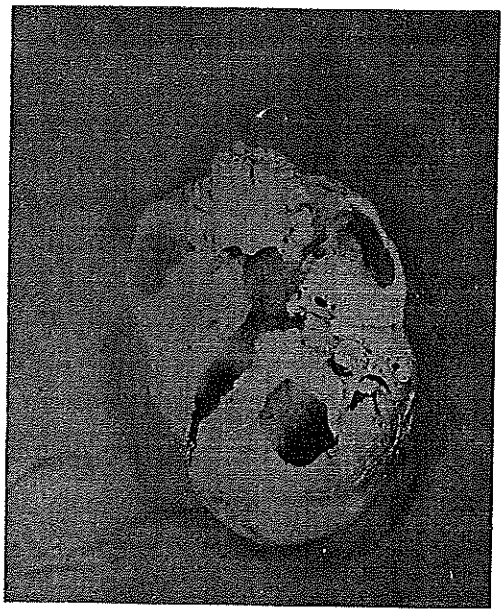

Figure 2b. Skull, Bottom View

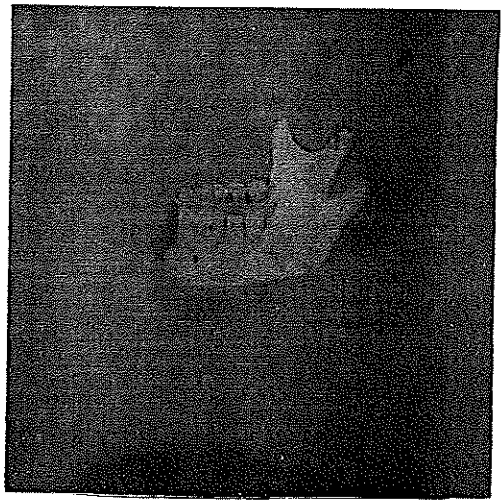

Figure 2c. Mandible, Side View

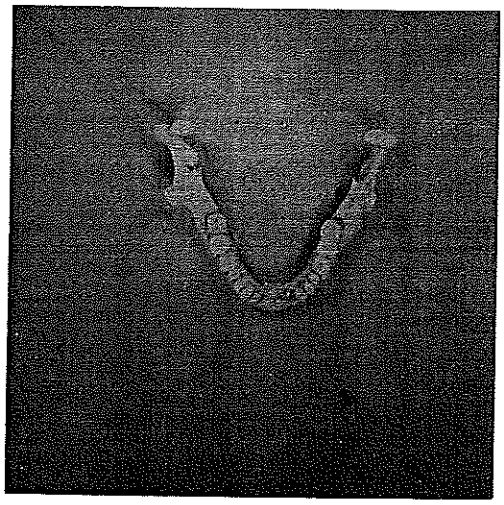

Figure 2d. Mandible, Top View

Figure 2 SHEEP ROCK WOMAN

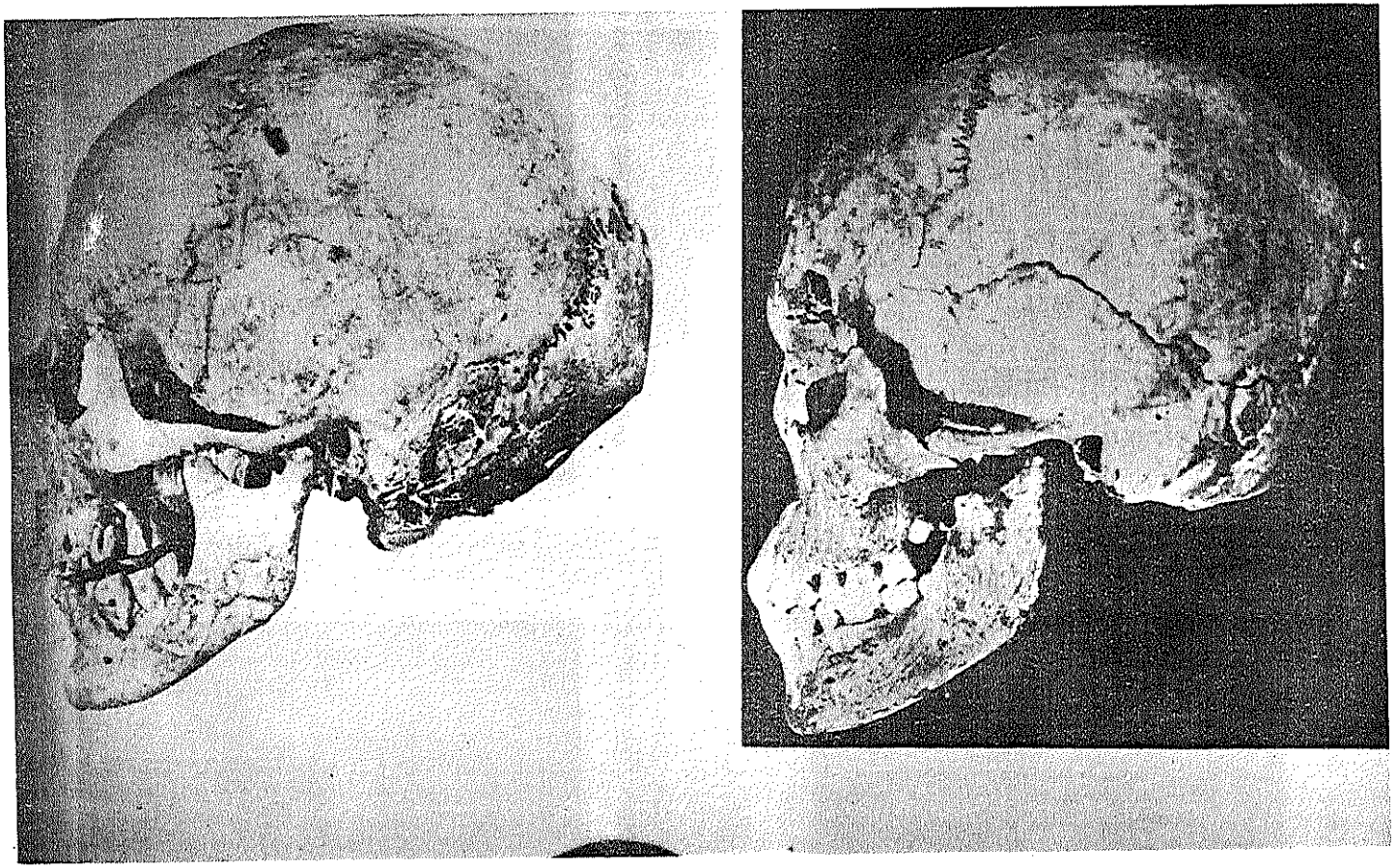

Figure 3 COMPARISON OF SHEEP ROCK WOMAN AND MINNESOTA WOMAN

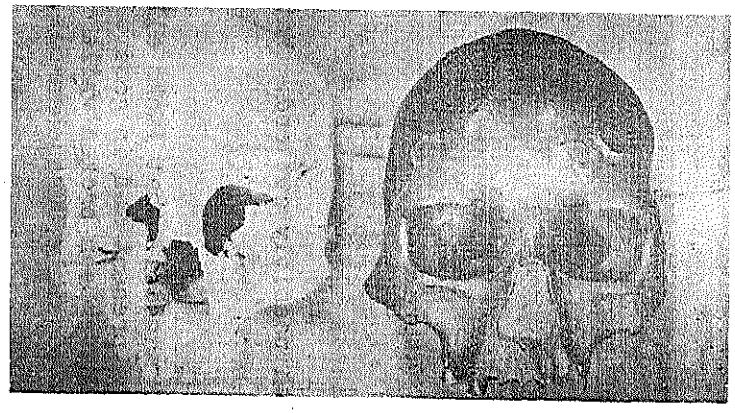

Figure 4a. Front View

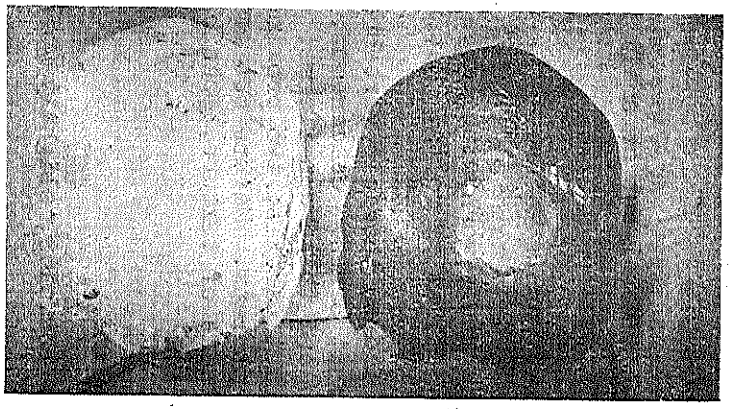

Figure 4b. Rear View

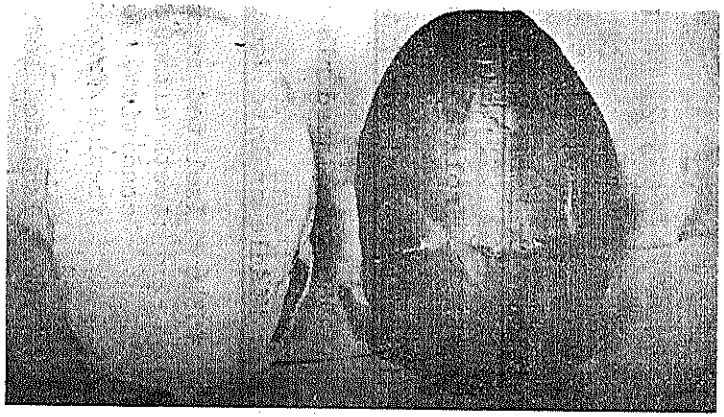

Figure 4c. Top View

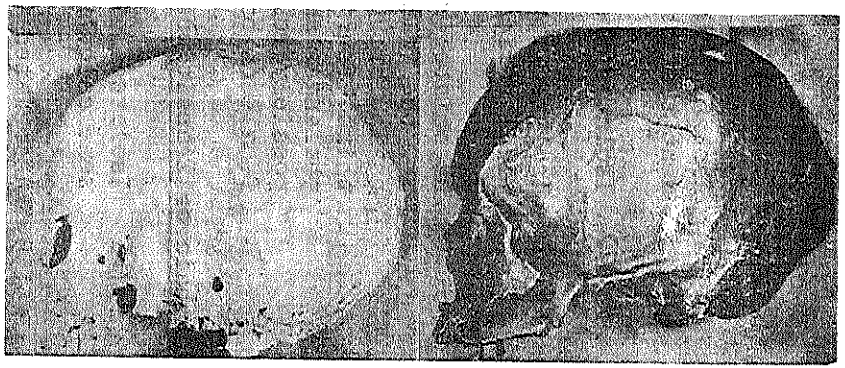

Figure 4d. Side View

Figure 4 COMPARISON OF SHEEP ROCK WOMAN AND #103 CHOUKOUTIEN

Late Archaic

635 Burial # 5 (Smith 1967). Mature, probably male, too fragmentary for further comment.

#4958 Isolated rib fragment with several cut or small rodent tooth marks. Mature.

#5174 Isolated premolar, slightly worn. Mature.

#5182 Isolated upper molar, moderately worn with large cervical caries and hypercementosis of roots. Mature.

#5153 Associated rib fragment, fourth thoracic vertebrae, and the following right foot bones: calcaneous; navicular; cuboid; second and third cuneiforms; third, fourth, and fifth metatarsals; two proximal phalanges and one middle phalanx. Mature but small, possibly young adult on basis of texture, possibly female on basis of size.

Late Archaic or Transitional

746 Isolated left upper first premolar, slightly worn, some calculus present. Mature.

#5155, 5157, 5158 Associated (?) proximal phalanges of hand (three). Mature. May belong to same individual as # 746 above.

WOODLAND

Transitional or Early Woodland

#5159 Isolated right patella. Mature.

Transitional or Early or Middle Woodland

#4956 Isolated rib fragment with possibly cut end. Mature.

Early or Middle or Late Woodland

#5346 Isolated major portion of mandible that lacks all teeth although sockets are present and in good condition. Mature. May have been broken while fresh. From pit which is possibly Susquehannock.

#5162 Isolated left femur. Immature (fetus).

#4961 Associated (?) rib fragment, sixth cervical vertebra, and left clavicle. Mature. Possibly male on basis of robusticity of clavicle.

#5637 Associated (?) upper right and left mesial incisors, extremely worn with hypercementosis of the roots of the right incisor and a very short root on the left incisor (perhaps due to long-term hypercementosis). Mature.

Late Woodland or Proto Historic

#1836 Burial # 1 (Smith 1967). Immature (ca. newborn). Essentially complete less cranial bones.

#2569 2570 Burial # 2 (Smith 1967). Immature (either very late fetus or small newborn). Fairly complete less cranial bones.

#5111 5165 Associated bones (19) which probably belong to same individual. Immature (fetus).

#5166 Associated bones (three). Immature (either very late fetus or small newborn).

#5161 Associated (?) rib fragment and left third (?) metatarsal. Mature.

483 Isolated third molar, moderately worn with gum line erosion and some calculus. Mature.

PROTO HISTORIC

Proto Historic

#1893 Isolated upper right canine, moderately worn with slight enamel hypoplasia. Mature.

#5175 4959 Associated left lateral upper incisor (# 5175), very worn, and a fragmentary neural arch from a thoracic vertebra. Probably same individual. Mature.

#5350 Isolated left lateral upper incisor, very worn. Mature.

#5163 Isolated left fourth (?) metacarpal. Mature.

#4960 Isolated left distal humeral fragment 9 cm long, has septal aperture. Mature. May have been broken while fresh.

#2717, 4957, 5169 Associated (?) left distal tibial fragments, probably warped but might be pathological (# 2717), two rib fragments (# 4957), and a middle thoracic vertebra and a distal left (?) phalanx of foot (both # 5169). Mature.

400 Isolated left ulna. Adolescent or young adult (15-23 years, inasmuch as distal epiphysis is nearly fused [Flecker 1942]). Probably male on basis of robusticity and length (maximum = 295 mm).

As mentioned previously, stature estimates are subject to all sorts of error especially when as in this case there are no appropriate formulae available, but again for the record I have inserted the maximum ulna length of 295 mm into several recent formulae with the following results:

Caucasoid Male Formula (Trotter and Gleser 1952) — 183.20 cm ± 4.32 cm

Negroid Male Formula (Trotter and Gleser 1952) — 175.66 cm ± 4.42 cm

Mexican Male Table (Genovés 1967) — ca. 172.00 cm ± ?? cm

Mongoloid Male Formula (Trotter and Gleser 1958) — 180.11 cm ± 4.66 cm

Once more I doubt the appropriateness of the Caucasoid formula in relation to attenuation of Amerind extremities, and I also have reservations about the accuracy of the Mongoloid formula on the basis of the heterogeneity and small size of the sample involved in its development.

I, therefore, tend to accept the Negroid and Mexican results as closer to the truth and would say that the stature of # 400 is only slightly greater than the averages for recent male Delaware, 171.5 cm (Boas 1895), and Iroquois, 172.7 cm (Boas 1895), respectively.

#5160 Isolated proximal phalanx of hand. Mature.

#5114, 5156 Associated (?) middle phalanx of hand (# 5114) and proximal phalanx of hand (# 5156). Mature. Possibly Middle Woodland.

UNKNOWN PROVENIENCE

#5154 Isolated left navicular. Mature.

#5179 Isolated molar crown, very slightly worn and carious. Mature.

#5178 Isolated seventh cervical vertebra. Mature.

GENERAL COMMENTS ON CANNIBALISM

Cannibalism in this region in ancient times has been reported by eye witnesses as well as suspected by archaeologists.

It is tempting to associate the large number of isolated and fragmentary remains found at Sheep Rock with this practice but it should be remembered that animal activity as well as burial practices may have something to do with the scattered nature of these remains.

However, several fragments: a rib fragment (# 4958 - Late Archaic), with possible cut or small rodent tooth marks, a rib fragment (# 4956 - Transitional or Early or Middle Woodland) with a possibly cut end, the major portion of a mandible (lacking all teeth although the sockets are present and in good condition) that may have been broken while fresh (# 5346 - Early or Middle or Late Woodland), and a left distal humeral fragment (# 4960 - Proto Historic) that may also have been broken while fresh are all potential evidence for this practice at Sheep Rock. Furthermore, the above fragments and several others have an appearance which is suggestive of having been cooked according to some archaeologists who have examined them.

I myself accept the possibility that cannibalism may have occurred at Sheep Rock but I do not feel personally competent to verify at this time the "worked" and/or "cooked" characteristics of the above remains.

GENERAL COMMENTS ON PATHOLOGY

Only a few relatively minor dental or dental associated pathological conditions can be determined with certainty in the remains from Sheep Rock.

They include caries (two individuals, # 5179, 5182), enamel hypoplasia (one individual, # 1893), root hypercementosis (two individuals, # 5182, 5637), gum line erosion (one individual, # 483) and periodontal degeneration (one individual, # 3295).

In addition, there is one seemingly warped but possibly pathological fragmentary tibia (# 2717).

GENERAL COMMENTS ON POPULATION COMPOSITION

The skeletal remains of up to 33 individuals have been found at Sheep Rock. Of these, two may be categorized as fetal, two as late fetal or small newborn, two as newborn, one probable male as late adolescent (15-23 years), and 26 others as mature including two possible males and two possible females (one of whom, Burial # 4 or Sheep Rock Woman, was between 20-40 years, probably about age 30).

The scattered and fragmentary nature of the remains precludes an in-depth analysis of population composition but enough has been determined to raise questions regarding the finding of so many (six) newborn or younger individuals (whose skeletons are often too fragile to be preserved) and the apparent absence of the remains of older children. Is this cultural selection in regard to burial practice or is something else involved?

The large number of mature fragments may, of course, relate to cannibalistic practices.

GENERAL COMMENTS ON POPULATION AFFINITIES

In the absence of more complete skeletal materials of the sort that could be used for modern multivariate analyses, about all we can say at this time is that the one fairly complete specimen, Burial # 4, has, as mentioned previously, morphological features that have much time depth and wide geographic distribution in North America together with seeming (but far removed in time and space) ties to the Upper Cave people of Choukoutien, China.

A SUPPLEMENTARY REPORT ON THE STEATITE VESSELS, CERAMICS AND PIPES OF SHEEP ROCK SHELTER

by

John B. Huner
and
Pamela K Smith

ABSTRACT

The sherds recovered this field season from Sheep Rock conform with those types and varieties established in the previous Sheep Rock Report. However, two new varieties are described as well as the recovery of two Susquehannock types previously unknown at Sheep Rock. In addition, re-analysis of several of the previously reported type-varieties has corrected their apparent relationships. Assessment of the ceramic pipes of the Sheep Rock Site seems to place some of them in association with those recovered in the Monongahela Basin and they are similar to that type known as Monyock Cord Impressed. An extremely small sample of steatite was found in association with the early woodland periods and thus indicates that the steatite vessel tradition was associated with and to some degree coexistent with clay vessels.

ACKNOWLEDGMENTS

The authors express their thanks to Miss Sybil Calabro, Miss Diane Cohen, and Miss Karen Kelley for their aid in the initial preparation of this report. Miss Calabro did the majority of the line drawings while Miss Kelley searched the literature and established the typology of the ceramic pipe industry. Miss Cohen aided the two authors in the sorting of the various ceramics recovered from Sheep Rock during the 1967 field season. We also thank our numerous colleagues whose suggestions aided us in the preparation of this report.

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INTRODUCTION

This report will vary from the normal ceramic report in the sense that it is considered to be supplemental to our previous report (Huner et al 1967). Therefore, only the material which is "new" or previously unreported will be discussed. For those interested in the theoretical approaches employed, it is suggested that they refer to the earlier work (Huner et al 1967). Other than the recovery of several new types and the establishment of several new varieties, the basic chronology remains the same even though the stratigraphy has yet to prove itself sensitive to the ceramic change except in the broadest sense.

Several interesting refinements of the existing type-varieties appear to demonstrate a longer period of continuity between the Early Late Woodland and the Late Woodland for this area and the southern portion of the state. In retrospect several of the new "types" discussed in the original Sheep Rock Report have been demonstrated or found to be part of a ceramic complex that existed to the south of the state in what must be considered to be a new area of ceramic development which combines various aspects of the Northern Allegheny Ceramic Area (Evans 1955); the Monogehala; and the Susquehanna River Basins. While this complex is better illustrated by the Workman Site (36Bd36), it definitely has some influence on the Sheep Rock ceramics.

MATERIALS RECOVERED DURING THE 1967 SEASON

The sherds from the 1967 excavations conform well with the preliminary classification established in the preliminary report on Sheep Rock (Huner et al 1967). Virtually all types and/or varieties previously recovered were represented in the 1967 collection. The only exceptions were the two previously unreported Susquehannock types; Munsee Incised and Washington Boro Incised, and two previously undescribed Owasco varieties: Owasco Corded Horizontal var. Punctate, and Owasco Herringbone var. Punctate. Their description along with a recapitulation of the two Susquehannock definitions will appear in a later section of this report.

Only one sherd of steatite was recovered durng last season's excavation and it is associated with the Early Woodland Component. The presence of striations on both the interior and exterior of the sherd are thought to be a by-product of the manufacturing process and it can be assumed that the association of steatite and Early Woodland materials indicates continuum with ceramic vessels gradually replacing steatite vessels.

The following is a tabulation of the previously described types and/or varieties recovered during the last field season at Sheep Rock.

Juniata Thick var. Interior Cordmarked	49
Juniata Thick var. Plain	13
Juniata Thick var. Interior Smooth	18
Sheep Rock Cordmarked	16
Clemson's Island Platted	7
Clemson's Island Punctate var. Overhanging Rim	9
Owasco Corded Horizontal	2
Owasco Platted	1
Carpenter Brook Cord-on-Cord	84
Shenk's Ferry Incised var. Simple	3
Shenk's Ferry Incised var. Complex	13
Shenk's Ferry Incised var. Multiple Banded	10
Shultz Incised	11
Shultz Incised var. Notched Lip	2
Monongahela Cordmarked	1

The following tabulation is of sherds which were not typed but classed as to temper for they lacked any identifiable characteristics.

Flint Tempered	74
Quartz Tempered	152
Shell Tempered	22
Large Limestone	5
Undetermined Rims	5

DESCRIPTION OF NEW VARIETIES

Owasco Corded Horizontal var. Punctate (Fig. 1a)

PASTE:

Method of Manufacture: Coiled and malleated with paddle and anvil.

Color: Gray to tan

Temper:

Size: Coarse on the Wentworth Scale

Material: Quartz

Texture: Microcrystalline

SURFACE TREATMENT:

Exterior: Cordmarked

Interior: Smoothed

DECORATION: There is a row of deep punctates around the neck of the vessel and parallel to the lip which produce knobs on the interior surface. The exterior surface is stamped with the edge of a cordwrapped paddle or cordwrapped stick in more or less continuous lines which are parallel to the rim. The interior of the rim is stamped with similar impressions which are diagonal to the lip.

FORM:

Lip: Square

Rim: Straight or Outflaring

Neck: Concave

Body: ?

Base: ?

Shape: Jar Form

SIZE OF SAMPLE: 2

COMMENT: Although the size of the sample is small, this only indicates the number recovered during the 1967 season. Several other examples were recovered during earlier seasons and there are a few examples from the Workman Site. The possibility of this variety was pointed out earlier (Huner et al 1967:475) and was originally considered to be part of the Clemson's Island Series, however, the similarity of design to Owasco Corded Horizontal as described by Ritchie and MacNeish (1949: 111-112) and the presence of quartz tempering indicate that it is closer to the Owasco series -- the only resemblance to the Clemson's Island Series being the row of deep punctates. This variety again indicates the "cross-over" of design elements so common in the Raystown Reservoir during the Early Late Woodland.

Owasco Herringbone var. Punctate (Fig. 1d,e)

PASTE:

Method of Manufacture: Coiled and malleated with a paddle and anvil.

Color: Gray to tan

Temper:

Size: Coarse on the Wentworth Scale
Material: Quartz
Texture: Microcrystalline

SURFACE TREATMENT:

Exterior: Cordmarked

Interior: Smoothed

DECORATION: The rim is stamped with the edge of a cordwrapped paddle or stick in a herringbone design running perpendicular to the lip with the chererons pointing around the neck of the vessel. There is a row of deep punctates around the neck of the vessel that produce knobs on the interior surfaces. There appears to be an incised line on the lip of the vessel and the interior of the rim is smooth.

FORM:

Lip: Square

Rim: Outflaring

Neck: Concave

Body: ?

Base: ?

Shape: Jar Form

SIZE OF SAMPLE: 1

COMMENT: This variety is very similar to Owasco Herringbone as described by Ritchie and MacNeish (1949:112) and only the presence of the punctates causes it to be given a variety designation. Again the low sample is not truly indicative of the sample size for it only represents those recovered during the 1967 season (see Huner et al 1967:475). This might represent an experiment in design techniques learned by various group interactions.

DESCRIPTION OF UNREPORTED TYPES

Washington Boro Incised (Fig. 2c-e)

PASTE:

Method of Manufacture: Coiled (?) and malleated with a paddle and anvil.

Color: Gray to tan

Temper: Small laminated flakes of shell

SURFACE TREATMENT:

Exterior: Cordmarked with a cordwrapped paddle and smoothed

Interior: Smoothed

DECORATION: Two small bands of incised lines run parallel to the rim at approximately 1/2 inch intervals. Across these, are

parallel incised lines which are diagonal to the rim and are slightly deeper and closer together than those parallel to the rim. In addition, there are a series of short incised lines perpendicular to the rim, and the lip has some indication of punctating.

FORM:

Lip: Square

Rim: Straight

Neck: Concave (?)

Body: ?

Base: ?

Form: Collard-Jar Form

SIZE OF SAMPLE: 1

COMMENT: While a sample size of one is usually not considered to be significant, the sherd agrees with those reported in the type description by Kinsey (1959:78).

Munsee Incised (Fig. 2f)

PASTE:

Method of Manufacture: Coiled and malleated with a paddle and anvil.

Color: Gray to tan

Temper:

Size: Coarse on the Wentworth Scale

Material: Crushed chert

Texture: Microcrystalline

SURFACE TREATMENT:

Exterior: Cordmarked with a cordwrapped paddle

Interior: Smoothed

DECORATION: Deep incised lines on the lip extend down onto the rim to form diagonal lines which are approximately 1/2 inch apart. Short, deep incised lines which are parallel to the rim break the diagonal line. In the area formed by the crossing of the diagonal and horizontal lines are short lines, almost elongated punctates, parallel to the diagonals.

FORM:

Lip: Sloping

Rim: Straight

Neck: Concave (?)

Body: ?

Base: ?

Shape: Collard Jar Form

SIZE OF SAMPLE: 1

COMMENT: Again the size of the sample is rather small but there appears to be a high degree of correlation between this sherd and those described by Witthoft (1959:51). This late form might indicate some contact with the Susquehanna Basin during the later periods of turmoil.

RE-ANALYSIS OF PREVIOUSLY REPORTED TYPE-VARIETIES

As one reworks materials from an archaeological site in order to glean more meaningful information, he invariably notices mistakes in the original sorting and analysis of the data. Several of these have occurred in the original Sheep Rock Report (Huner et al 1967) and it is now our purpose to eliminate these from the record.

Perhaps the most glaring error was the incorrect application of an established type name, Castle Creek Neck Incised to a certain temper-design manifestation occurring at Sheep Rock (Huner et al 1967:480). It was originally thought that this quartz tempered, incised chevron design pottery most closely resembled that of its namesake by comparison with the literature and the similarity of tempers. However, it was pointed out to the authors by several persons at the 1967 Sheep Rock Symposium in Harrisburg that the Sheep Rock manifestation was not Castle Creek Neck Incised. However, it should be noted that no one could offer a possible type or similarity for the Sheep Rock manifestation. It is felt that the 1967 excavations at the Workman Site (36Bd36) did produce types which have some degree of correspondence. This type, or rather types, Saxton Incised and Stonerstown Incised, both have a chevron incised design around the rim of the vessel and are limestone and flint tempered respectively. Although the Sheep Rock manifestation is incised around the neck, is quartz tempered and has a series of deep punctates around the neck, it is felt that there is enough similarity between the two types from Workman and the one recovered at Sheep Rock to point to a local origin for this design motif.

While all three have the typical Early Late Woodland low-collared rim profile; the appearance of this motif on three separate temper or paste types indicates a localized source without the motif becoming firmly established. There is nothing in the literature, i.e., Virginia, Maryland, and West Virginia that resembles this "type". Therefore, what was labeled Castle Creek Neck Incised will simply be called a quartz tempered variant of Saxton-Stonerstown Incised.

Another error was that of ministerpretation of Evan's New River series (1955). It was pointed out that Raystown Plain could not be part of the New River series for the New River series was limestone tempered (Huner et al 1967:530). This was completely wrong. The New River series is shell tempered and not limestone. However, the possibility that Raystown Plain is associated with this series does not exist for .either Evans (1955) or Manson, MacCord and Griffin (1944) illustrate this rim form. It should be noted, however, that very similar sherds have been recovered from the Seneca Farm site (36Ve50) along the Allegheny River.

The third question which arises as a result of the re-analysis of the Sheep Rock ceramic materials is that of the Clemson's Island series, typed as Clemson's Island Platted, Clemson's Island Incised, and Clemson's Island Punctate (Huner et al 1967:471-475). While the last type, Clemson's Island Punctate is easily recognizable, the other two were previously undescribed. Because of the similarity in temper, shape, rim form, surface treatment, stamping, and general overall appearance they were placed in the Clemson's Island series. At the time, it was recognized that there were some affinities to the Shenk's Ferry types, especially the cordmarked type but it was felt that the Clemson's Island types more clearly belong in that series, although little could be found in the literature to confirm this position. A question arose as to the lack of the "more common" Shenk's Ferry Cordmarked as described by Heisey and Witmer (1964) and Witthoft and Farver (1952) at Sheep Rock when the presence of Shenk's Ferry Incised was easily recognizable. Re-analysis of the type descriptions and the viewing of some examples convinced the authors that the two types, i.e., Shenk's Ferry Cordmarked and Clemson's Island Platted, are the same, with the only noticable difference being in the temper and this appears to be a regional variation (see Huner et al 1967:481-483).

This would indicate an evolutionary sequence with the more or less typical incising of Shenk's Ferry replacing the punctating and stamping of Clemson's Island and the "common" cordmarked ware remaining the same or at least transgressing the two. This is further substantiated by Witthoft and Farver's statement, "Shenk's Ferry Cordmarked seems to represent an older pottery tradition surviving as a minority type into the period of Shenk's Ferry Incised, but not surviving as long (1952:18)". Thus it becomes a question whether the type names Clemson's Island Incised, Clemson's Island Platted and Clemson's Island Punctate should remain in the

literature. It appears to be obvious that Clemson's Island Punctate is firmly established at least in common parlance. The other two, however, are subject to debate. By historic precedence, the name Shenk's Ferry Cordmarked should be employed but the case for Clemson's Island Platted is strong. In the Raystown, all attributes of Clemson's Island Platted resemble the well known Clemson's Island Punctate and it is felt that since the Clemson's Island Period is thought to be earlier it would be better to employ this concept in nomenclature. (Examples of Shenk's Ferry Incised on an earlier rim form can be seen in Fig. 2a,b.) An additional possibility would be to label the Clemson's Island types varieties of the Shenk's Ferry types and omit the descriptive variety names, i.e., Collarless, Plain, and Paddle Edge Impressed (see Heisey and Witmer 1964:22).

CERAMIC PIPES

Two Ceramic pipe fragments were recovered during the 1967 field season at Sheep Rock. One was a flint tempered stem fragment and the other was a quartz tempered bowl fragment (Fig. 3a-f). The stem fragment can be associated with the Clemson's Island but more likely the Shenk's Ferry occupation because of its temper type while the quartz tempered bowl fragment is associated with the Owasco manifestation.

The Shenk's Ferry stem fragment is tan in color, 3 mm in diameter at its narrowest point and 6 mm at its widest. The bowl fragment is undoubtedly part of an "elbow" pipe and is gray in color, with an outside diameter of 5 mm. Although it exhibits no decoration, the surface appears to have been roughly smoothed and the clay is not as fine as that employed in pipe manufacture during the later periods. No decorative association could be made from either the pipe stem or the bowl fragment because they are too small for accurate calculation of the remainder of the pipe.

Two previously described pipe fragments, a tubular bowl fragment (A66.1.4493; Huner et al 1967:542, 28-c) and a complete bowl with part of the stem attached (A66.1.1586; Huner et al 1967:544, 29-a) bear very close resemblances with Monyock Cord Impressed pipes of the Monongahela Complex in the Upper Ohio Valley (Mayer-Oakes 1955:115, 55-a, 223, 26-t). The tubular fragment exhibits vertical cord impressed lines alternating with undecorated portions around the pipe. A single line of cord impressions extends horizontally around the rim and also approximately half-way down the pipe bowl. The angle pipe also exhibits the same vertical design; however, the design lends itself to the oval shape of the bowl: eight lines of cord impressions on the longer side are divided from the two lines on the short sides by undecorated portions. The pipe stem is square and both the bowl fragment and the angle pipe (A66.1.1586) exhibit well burnished surfaces. It can be noted that it is only on the ceramic pipes that burnishing is found at Sheep Rock. The form,

decoration, surface treatment and stem form are diagnostic of the Monyock types listed by Mayer-Oakes (1955).

The presence of both Monongahela pipe types and Susquehannock pipe types (Huner et al 1967:536-540) could lead to many interesting speculations as to peace ceremonies, warfare, trade, etc. but it is unwise to speculate at this early date for very little is known about the distribution of pipes and their usage. One only has to look at the widespread distributions of Catlinite pipes and the various associated customs to realize that a great deal of research, both ethnographic and archaeological, needs to be done before any firm conclusions can be reached.

CONCLUSIONS

With the steatite vessels as a basis of the hollow ware container tradition, the Woodland period can be seen in a series of "wares" which are characterized by their temper or aplastic. The Early Woodland is characterized by a gross limestone temper ware known as Juniata Thick which is replaced during the Middle Woodland by Sheep Rock Cordmarked. This appears to be gradual with Sheep Rock Cordmarked evolving from Juniata Thick var. Interior Smooth. In the former case, the temper is still large grit but is "somewhat smaller" and the vessels are better constructed.

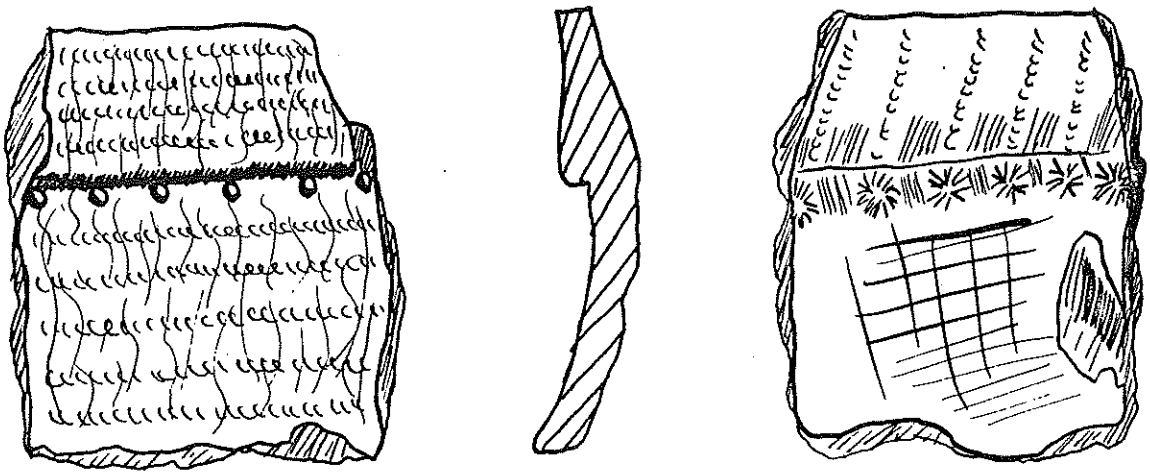
The termination of the Middle Woodland marks an end to the indigenous ceramic sequence, and the Early Late Woodland is marked by a period of great flux in the ceramic design motifs. It is assumed that there were two basic technological traditions as manifested by the paste and aplastic coexisting during the Early Late Woodland at Sheep Rock. These are: Clemson's Island, associated with angular flint or chert tempering; and Owascoid, associated with rounded quartz temper. The design motifs, however, are not necessarily associated with their "typical ware", that is, the typical Clemson's Island can be found on the same vessel which exhibits typical Owascoid stamping. This obviously represents groups of potters who are in contact with one another and are exchanging ideas and experimenting with new techniques. The nature or type of contact, however, is not discernible from the ceramic evidence.

It then appears as though the "Clemson's Island Peoples", or at least their flint tempered ceramics, evolve into the Shenk's Ferry culture whose ceramics differ in the employment of incised lines as their almost exclusive decorative technique. This appears to be an exclusive occupation at Sheep Rock, however, the general lack of proliferation of designs indicates that this was a rather self-contained, short-lived occupation. It is felt that the incised line motif of Shenk's Ferry was copied or diffused from the Proto-Iroquoian groups to the north. The casual employment of castellations also indicates some form of imitation.

During the Shenk's Ferry occupation there is also an indication of Monongahela ceramic influences, and at Sheep Rock the exact nature of this manifestation is quite unclear. However, there is also some indication that there was a coexisting tradition to the south [as found at the Workman Site (36Bd36)] which had affinities with both the south and west.

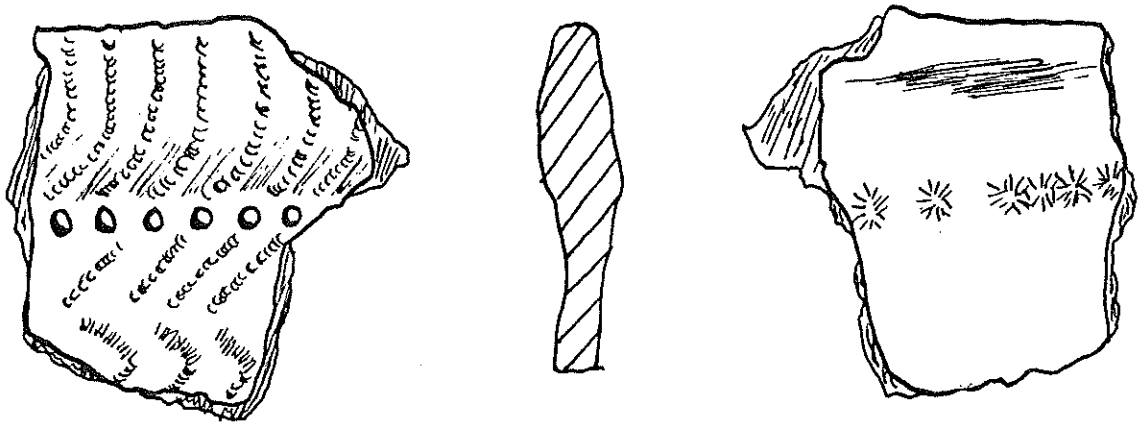
The Shenk's Ferry ceramics were then replaced by the Susquehannock shell tempered ware with only the earliest forms represented at Sheep Rock and a slight indication of the later forms. This would indicate that Sheep Rock was occupied for a short period of time during the Susquehannock Period which is understandable in light of the Historic Susquehannock Village of Standing Stone (modern Huntingdon) approximately six miles upstream.

Thus, the ceramic sequence of Sheep Rock is one of rather simple temper-defined wares exhibiting a series of design motifs which become increasingly complex until the movement of the occupation to another site.



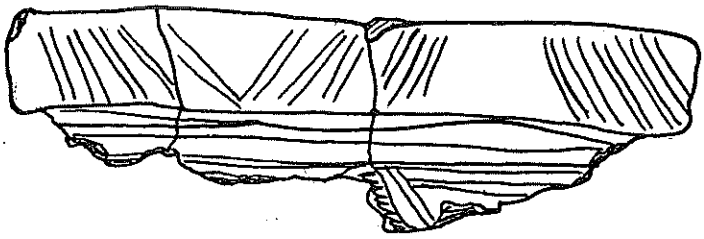
a. Exterior b. Rim Profile c. Interior

Figure 1 a-c. OWASCO CORDED HORIZONTAL var. PUNCTATE

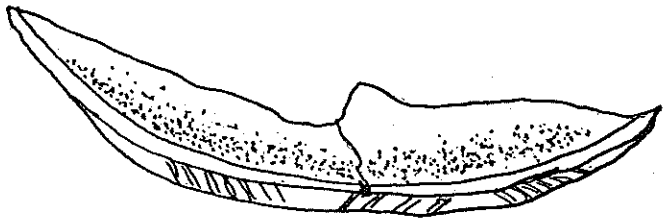


d. Exterior e. Rim Profile f. Interior

Figure 1 d-f. OWASCO CORDED HERRINGBONE var. PUNCTATE

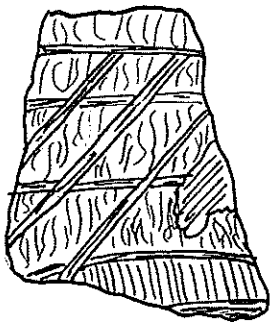


a. Exterior



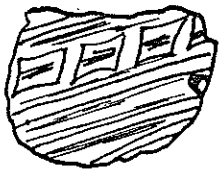
b. Interior

Figure 2 a-b. SHENK'S FERRY INCISED COMPLEX



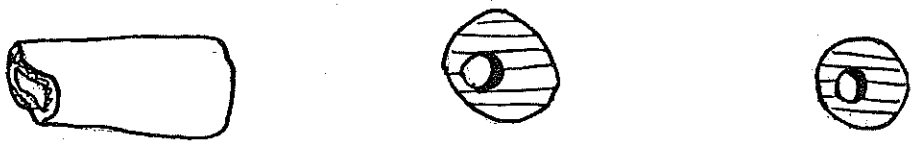
c. Exterior d. Rim Profile e. Top View of Rim

Figure 2 c-e. WASHINGTON BORO INCISED



f. Exterior

Figure 2 f. MUNCEE INCISED



a. Side View b. Profile Wide End c. Profile Narrow End

Figure 3 a-c. PIPE STEM FRAGMENT

d. Exterior e. Interior f. Top View of Rim

Figure 3 d-f. PIPE BOWL FRAGMENT

A PROPOSAL FOR THE STUDY OF THE LATE WOODLAND PERISHABLE ARTIFACT COMPLEX AT SHEEP ROCK SHELTER

by

Lorraine M. Willey

ABSTRACT

The proposed research is the initial step of a larger study to be submitted as a thesis in partial fulfillment of the requirements for a Master of Arts degree in Anthropology at The Pennsylvania State University. The primary objective of this study is the functional analysis of the various perishable artifacts and the reconstruction of perishable artifact utilization as a cultural complex within the total lifeway of the Late Woodland inhabitants of Sheep Rock Shelter.

The techniques to be used in this study include computer analysis, ethnographic analogy, and experimental archaeology, as well as other techniques that will contribute to determination of function and understanding of perishable artifact utilization.

ACKNOWLEDGMENTS

I extend my sincere appreciation to James S. Dutt, Donna L. Conway and Mary Moser, and Donald E. Hardenbergh for their preliminary analysis of many of the perishable artifacts, and to Susan M. Conway and Robert R. McConnell for their help in obtaining some of the comparative data that will be utilized in the future.

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INTRODUCTION

The perishable artifacts from Sheep Rock Shelter constitute a unique archaeological assemblage in the Northeastern United States in that it is widely representative and consists of several thousand artifacts in a well preserved condition. For purposes of cataloging and analysis, these artifacts have been subdivided into several categories based on type of material which include bone, antler, turtle shell, shell, wood, bark, cordage, fabric, leather, fur, feathers, and certain modified vegetable remains.

The preservation of this extensive range of perishable materials is a function of the structural formation of Sheep Rock Shelter and its orientation to the prevaling winds. The 70 foot high overhanging cliff protects an area of approximately 400 square feet. This area remains dry except for the humidity in the air and a small spring which runs through the middle of the site from the cliff wall to the river. The spring, however, is of such small proportions that an area of no more than 4 feet is affected. Furthermore, the shelter is located in a position where the wind tends to hit the rear of the shelter, thus, preventing rain and snow from being blown into the site.

Spatially, the perishable artifacts are almost exclusively limited to the northwestern portion of the site, however, the 1967 excavations in the northeastern section, particularly in the location of the dispersed refuse pit (as defined by Smith 1967), produced some additional articles. With the exception of the bone, antler, and shell, which are the least perishable of the assemblage and thus extend over a larger time period, the temporal distribution of the artifacts is felt to be of the Late Woodland and Protohistoric Periods. In one sense, this presents a distinct advantage since only two components may be represented in the perishable artifact inventory. From certain ceramic associations that have been noted, it appears that these components are Susquehannock and Shenk's Ferry. Though lacking in temporal range, the knowledge to be gained from the wide variation in types of perishable artifacts is such that an important but previously missing element can be added to our understanding of the activities of prehistoric northeastern groups. Thus, to fulfill this objective, an analysis of the function and technology of the perishable artifacts is a necessity.

BACKGROUND OF THE PROJECT

Little analysis of the perishable artifacts was undertaken prior to the 1966 field season at Sheep Rock Shelter, with the

exception of a few selected specimens of modified bone which were sent to Dr. Guilday of the Carnegie Museum for identification along with the unmodified bone.

During the summer of 1966, work was begun on the preliminary analysis of the perishable artifacts. For ease in this analysis, the artifacts were divided into three sections: (1) Bone (including antler and turtle shell); (2) Cordage and Textiles; and (3) Perishable Artifacts (including wood, leather, fur, feathers, etc.).

The initial analysis of the bone was done by James Dutt on the basis of general descriptive attributes. His technique involved determination of large classes through visual inspection of the artifacts. Subsequently, sub-classes were described within each class, again on the basis of visual inspection. Further examination of the artifacts microscopically was undertaken; and method of manufacture and possible functions of the artifacts were proposed (Dutt 1967).

The cordage and textiles were originally analyzed by Donna Conway and Mary Moser. Their analysis concentrated on description, a tentative classification of some fiber types used, the method of manufacture of the cordage and fabrics, and the relationship of type of twist to the type of fiber, and diameter to tightness of twist of the cordage. The knots that were tied in certain pieces of cordage were also typed and described (Conway and Moser 1967).

The remainder of the perishable artifacts were analyzed by Donald Hardenbergh. As with the bone, these artifacts were typed on the basis of physical form. Associations between these artifacts and other remains (both modified and unmodified) were noted when available. Finally, a possible function was suggested for each artifact or class of artifacts analyzed (Hardenbergh 1967).

In the summer of 1967, it was decided to bring the bone, cordage and other perishable artifacts together for analysis as a material culture complex. The proposed project will involve several techniques to obtain functional information which will result in our understanding of perishable material utilization by the inhabitants of Sheep Rock Shelter during the Late Woodland-Protohistoric Periods. Completion of this project is planned for January, 1969.

TECHNIQUES OF ANALYSIS

Several basic techniques of analysis will be used in the determination of function for the various types of perishable artifacts. These techniques are summarized below.

1. Although the majority of the artifacts have been described previously, the technique employed was visual observation, thus subjective data, for the most part. Attribute lists will be prepared and special forms designed for recording various measurement data. The resultant data will be transferred to IBM punch cards for computerized analysis.

The first step in the computer analysis of each specific artifact material will consist of factor analysis of the attributes using the Q-Technique (Tugby 1965). The purpose of this analysis is to determine morphological types from the structural attributes.

The second step involves a test of the validity and usefulness of these morphological types by means of multivariate analysis.

2. Since each of the perishable artifact categories are functionally interrelated with themselves and other non-perishable artifacts, the total range of association within horizontal and vertical provenience will be recorded, as well as any associations with features, to determine significant relationships for the functional identification of the various perishable artifacts.

3. Comparative data on perishable artifacts from other sites will also be utilized, not only to determine similarities in physical form, but also to note associations with other artifacts (perishable and non-perishable) within each site. Thus, additional information concerning the function of particular types or classes of artifacts may be obtained. Some of these comparisons may be taken from sites in the western portion of the United States. Although there is a distance factor, it is felt that what distortion occurs will be overridden by the advantages of having further clues to the possible functions for various artifacts.

4. The fourth technique of analysis will involve the use of ethnographic analogy. Both library sources and museum collections will be investigated to glean all possible information on the description, manufacture and function of perishable artifacts.

5. Finally, experimental manufacture and testing of various forms of perishable artifacts will be done to obtain further information on manufacture and utilization of the various classes of perishable artifacts recovered from Sheep Rock Shelter (Semenov 1964).

The results of these analyses will then be combined and assessed, and a cultural reconstruction of perishable artifact utilization at Sheep Rock Shelter during the Late Woodland-Protohistoric Periods completed.

SPECIFIC OBJECTIVES

Using the techniques outlined above, certain specific data for various materials will be determined.

Since some artifacts (notably stone and shell) have been recovered from as deep as 147 inches below datum, almost twice as deep as artifacts from other categories, the stratigraphic location of each artifact will be plotted to isolate the Late Woodland materials. Careful note must also be taken of their feature associations, since Susquehannock pits, of which there are several in the site, were often intrusive into other cultural levels.

Experimental shaping and utilization of bone tools is planned to determine by microscopic comparison of the models with the actual artifacts the possible wear patterns and manufacturing techniques that would lead to conclusions about the function or functions which the artifact served.

As with the bone, the wooden artifacts will be copied and tested to determine utilization patterns, and thus function. Furthermore, a botanical analysis of the materials used in the manufacture of these artifacts will be made to observe the relationship of the choice of material to the function.

Specific research is planned on the relationship of cordage with several aspects of pottery manufacture, such as determination of the diameter of cordage used, percentage of twist type on pottery with the prevalent twist type of the cordage recovered, and possible paddle wrapping techniques, as well as providing information relative to the configuration of various decorative motifs which may be the result of a particular utilization of the cordage.

Furthermore, since several distinct types of knots have been identified at Sheep Rock Shelter, research will be undertaken to determine in what situations specialized forms of knots may have been most appropriately used.

A suggestion put forth by Dr. Hugh C. Cutler, Curator of Useful Plants, Missouri Botanical Garden, for identification and further study of fibers from Sheep Rock Shelter will also be acted upon in an attempt to determine if any relationship exists between fiber type, size, and possible function of the cordage.

LABORATORY ANALYSIS OF CORDAGE

Using standard Pennsylvania State University Card Form Lay-out Sheets, specific fields of information to be noted about each artifact have been designated (Fig. 1). Since this form is intended for laboratory and computer analysis rather than full inclusion of the data in the compiled artifact catalogue, information such as provenience, excavation unit and stratigraphic levels was excluded. It is felt that such information can be introduced separately when it becomes necessary to the analysis.

Certain fields will be utilized in the initial computer analysis to determine types while other fields will be used in later analyses to determine function. The cordage format includes:

Col. 1 — Year
- 6 - 1966 Cataloging Season
- 7 - 1967 Cataloging Season

Col. 2-5 — Artifact Number

Col. 7-8 — Artifact Sub-number. Often several items were catalogued under one lot number; to distinguish individual pieces they are given sub-numbers.

Col. 9-10 — Fiber Type. Based on botanical analysis.

Col. 11 — Twist
- 0 - Indeterminate
- 1 - S-twist
- 2 - Z-twist

Col. 12-13 — Number of twists per cm.

Col. 14 — Ply. Number of fiber bundles (yarn) from which the cordage is formed.
- 0 - Indeterminate
- 1 - 1-ply
- 2 - 2-ply
- 3 - 3-ply
- 4 - 4-ply

Col. 15-19 — Length of cordage in cm.

Col. 20-21 — Diameter of cordage in mm.

Col. 22-23 — End Modification
- 1 - Knot
- 2 - Loop
- 3 - Burned
- 4 - Cut or broken
- 5 - Finished

Col. 24 Cordage Type

Col. 25-27 Knot Types. Three columns are provided for as many as three knots have been found on a single piece of cordage.
0 - Indeterminate
1 - Overhand
2 - Half hitch
3 - Two-half hitches
4 - Clove hitch
5 - Girth hitch
6 - Square knot
7 - Running overhand
8 - Granny knot
9 - Sheep Rock knot (?)

Col. 28-31 Loop Diameter. Certain pieces of cordage contain a loop and the diameter of this loop is recorded.

Col. 32-38 Composite Cordage
32-33 Number of pieces composing the artifact.
34-37 Four spaces are provided for different cordage types which may be tied together to form the artifact.

Col. 38 Form
0 - Indeterminate
1 - Straight
2 - Loop
3 - Netted
4 - Woven

Col. 39-49 Composite Artifacts
39-40 Number of pieces of cordage.
41-43 Cordage types.
44-47 Material code(s) of item(s) to which the cordage is attached.
48-51 Place of attachment.

It is expected that as work progresses on the cordage, that more information may have to be added to the present layout. Thus, 29 spaces are reserved for any additional information that may be included later.

PSU

CARD FORM LAYOUT

CORDAGE ANALYSIS FORM

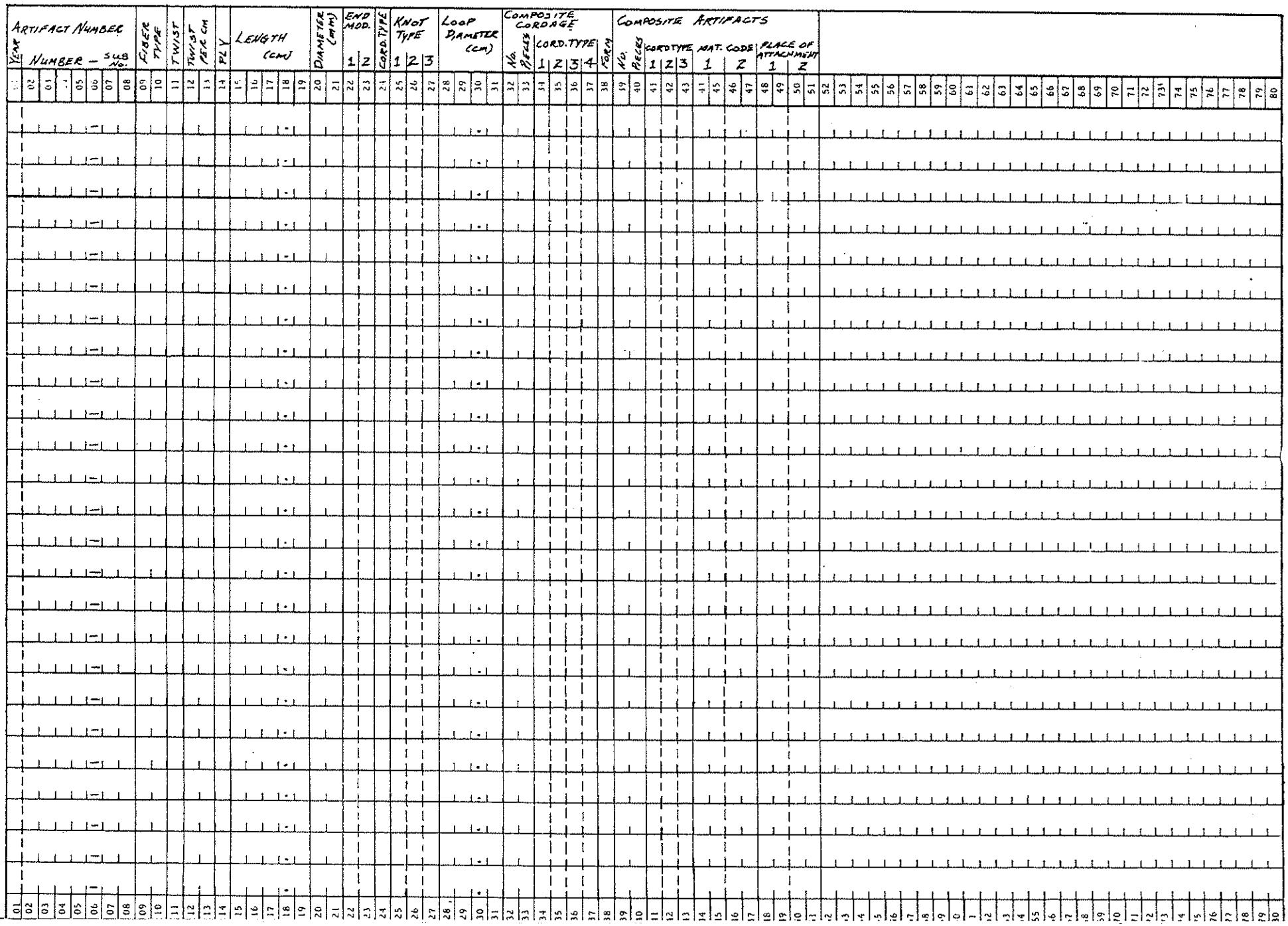

Figure 1

STRATIGRAPHIC DISTRIBUTION OF UNMODIFIED FAUNAL REMAINS FROM THE 1962-1967 FIELD SEASONS

by

Janet M. Rehm

ABSTRACT

The stratigraphic distribution of cataloged, weighed, unmodified bone fragments collected at the Sheep Rock Shelter Site has been analyzed and correlated with the number of burned bone fragments in culturally defined Master Levels.

ACKNOWLEDGMENTS

For their advice, encouragement, and help, the author wishes to thank Lorraine Willey, Carl Bebrich, Ralph Garruto, and Terry Gamber.

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INTRODUCTION

This is a preliminary report describing the stratigraphic distribution of cataloged, weighed, unmodified bone fragments collected at the Sheep Rock Shelter from 1958 to 1967.

Unmodified bone fragments is a general classification category; as such it includes two classes of bone: bone indicating human occupation, such as deer bone and fish bone which may be either burned or unburned, and bone indicating animal occupation, such as rodent bone. These are arbitrary categories, however, for some deer bone may have been brought into the shelter by predators, and likewise, some rodent bone may be remains of human use. Since the catalog does not distinguish between these or any other arbitrary classes, the undefined "fragments" were the only data available; these are the unmodified bone fragments used in this report.

The stratigraphic distribution of identified bone fragments and the inferences drawn about habitation of the area has been described by Guilday and Parmalee (1965) and Guilday and Tanner (1968). Unfortunately, the 35,000 bone fragments used in these reports were destroyed, as were their provenience data. Therefore, other than stating that the fragments came from the western part of the site, and that excavation at that time was sometimes as deep as 144' BD (Michels 1968), it is not possible to draw any conclusions or inferences as to weight and burned bone distribution in that area of the shelter.

METHODOLOGY

This research was concerned with only the catalogued, unmodified bone from Sheep Rock, and as such included bone found in excavation from 1958 through 1967, excluding the 35,000 fragments used by Guilday and Parmalee in their discussion of faunal remains at the site. To the standard provenience information recorded by the excavators, the following information was added: (1) the estimated number of burned bone pieces included in each catalog entry, and (2) the weight to the nearest tenth of a gram for each catalog entry. Since the information was to be organized by computer, it was recorded on standardized forms for punching (1967 information) or added to already punched cards (1966 catalog numbers).

The computer was programmed to indicate to which arbitrarily defined cultural-oriented level (Master Levels, Dutt, 1968) the data belonged. It was hoped that these Master Levels would provide a linkage or unity of data that would be overlooked by using BD

information alone. The smallest working units per square were the Original Excavation Units (Michels 1968) which incorporated field note and catalog BD information, often overlapping, or given by letter designation only. The total weight, number burned, and number of fragments in each Original Excavation Unit were tabulated, and this information was listed by Master Level.

Figures 1-8 show the Master Level bone weight distribution. The totals per Master Level are tabulated in Table 1. Figure 9 shows the distribution of the bone weights which have no BD information. The number of burned fragments was also arranged by Master Level; the distributions are seen in Figures 10-18. Since the number of fragments per level was not counted, the absolute number of burned fragments is not significant; however, burned bone and weight concentrations have been correlated.

RESULTS

From the data available, the following results have been observed:

Master Level 1 (Figures 1 and 10). A total of 1097.0 grams of bone has been recovered from this level. The distribution in the eastern site centers along the S05 and the S15 lines, and the burned bone distribution follows the same pattern.

Master Level 2 (Figures 2 and 11). 6,639.1 grams of bone are distributed in this level. The heaviest concentration is in E45S15 (2,582.5 grams), near the back of the shelter. There is also a high concentration of burned bone in that square. Distribution of the fragments is spread throughout the site, although there is no bone recorded along the S10 line east of E05, except 0.9 grams in E40S10.

Master Level 3 (Figures 3 and 12). There are 22,567.2 grams of bone in this level. It is rather uniformly distributed in the eastern area, concentrating slightly along the S15 line. There is also a corresponding distribution of burned fragments. E40S15 contains a high concentration of both weight (5,000.7 grams) and burned bone (1,309 pieces).

Master Level 4 (Figures 4 and 13). This level contains 6,624.3 grams of bone. The weight is concentrated along S10, squares E05 and E20 showing very large amounts. E05 also contains a concentration of burned bone.

Master Level 5 (Figures 5 and 14). 7,900.6 grams of bone are included in this level. The distribution of weight is not concentrated in one area of the site, although S05 and S15 have continuous

concentrations. The burned bone concentration is very high along S15, especially E10, E15, and E20.

Master Level 6 (Figures 6 and 15). In this level are 13,218.2 grams of bone, most of which is centrally concentrated along E00 between W15 and E15. The largest single square concentration is 2,156.8 grams in E20S15. This also has a high concentration of burned bone.

Master Level 7 (Figures 7 and 16). A weight of 8,701.4 grams of bone was recovered from this level. Three large concentrations are evident along S15: E15 (1,317.3 grams); E20 (1,639.8 grams); and E35 (1,679.0 grams). These squares also have relatively larger burned bone concentration in this level.

Master Level 8 (Figures 8 and 17). Very little bone was found in this level--721.4 grams. It is mostly along the S15 line. There is also little burned bone.

BD Levels (Figures 9 and 18). As can be seen in Figures 9 and 18, a great deal of the bone (24,936.9 grams) or almost half of the total gram weight for the site (95,105.8 grams) has no Master Level data, although the square, and often the BD, is known. When the stratigraphy is extended to include the extreme eastern and western portions of the site, the majority of this bone (with the exception of 3,216.4 grams for which the square is unknown) can be assigned to Master Levels.

DISCUSSION

While the unmodified bone weight distribution at Sheep Rock is an indicator of human and animal utilization of the shelter, the distribution of burned bone is a human occupation indicator. The latter, however, may overlap into nonhuman habitation zones if it is buried or dumped into a common refuse pit. Likewise refuse pits and middens may overlap even into other cultural levels. It appears, however, from weight concentration and burned bone distribution, stratigraphically, that human habitation utilized all eight culture bones.

The Sheep Rock Shelter is a three-dimensional site, i.e., its data should be analyzed not only be depth and by east/west distribution, but also by considering the north/south distribution. In studying this distribution, the drip line and area of dampness associated with it (Dutt 1968: Figures 1-8) must be considered, for location of this line limits the amount of dry habitation space under the shelter. Since all the bone in the Master Levels is within the drip line, it may be thought that: (1) the inhabitants utilized the dry area, even for bone disposal; (2) the dampness at

and beyond the line would destroy the bone; and (3) little excavation occurred south of the line. On the other hand, Figure 9 shows that some bone was excavated from beyond the drip line.

It should also be pointed out that the bone distribution found was not necessarily indicative of original deposition patterns, for distribution of bone fragments may have been influenced by several factors, including differential areal occupation of the shelter by man and animals; natural decay rates; and removal by later populations, human or otherwise.

It is apparent from the above discussion that a great deal of provenience data and weight data is absent, since: (1) the bone fragments analyzed by Guilday and Parmalee were destroyed, and (2) about fifty percent of the weighed bone does not have Master Level data. The lack of such a major portion of the data is a serious deterrent to inference of patterns of bone distribution for the site.

CONCLUSIONS

Based on the available data, the following conclusions can be drawn:

1. 95,105.8 grams of unmodified bone fragments have been recovered from Sheep Rock Shelter, of which 24,936.9 grams have no Master Level data at present.

2. All Master Levels contain burned bone, indicating human occupation.

3. All the bone oriented by Master Level is behind the drip line.

SUMMARY

The stratigraphic arrangement of weighed, unmodified bone fragments has been studied and correlated with the number of burned bone fragments in each culturally defined Master Level. No inferances, however, concerning the cultural implications of the bone distribution have yet been drawn.

Master Level	Weight (gram)
1	1,097.0
2	12,083.3
3 & 4	22,172.2
5	498.5
6	15,206.2
7	7,397.2
8	7,700.6
Indeterminate	24,936.9
(No data for square)	3,216.4
Total	95,028.3

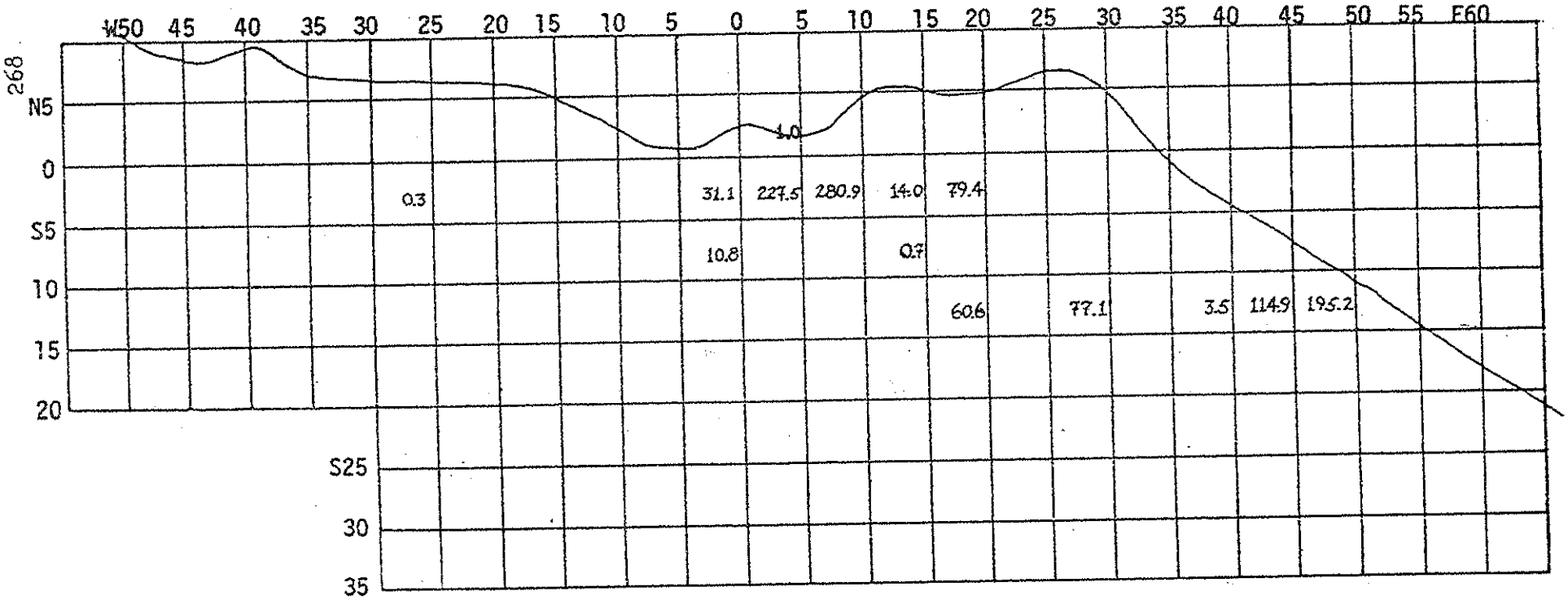
Table 1

TOTAL WEIGHT PER MASTER LEVEL

36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: BONE (Weight in grams)
LEVEL and/or PERIOD: MASTER LEVEL 1 - Historic Period
BD (if applicable): _____
OTHER PERTINENT INFORMATION: _____

DATE: _____
RECORDER: _____



Scale: 1 cm = 5 ft

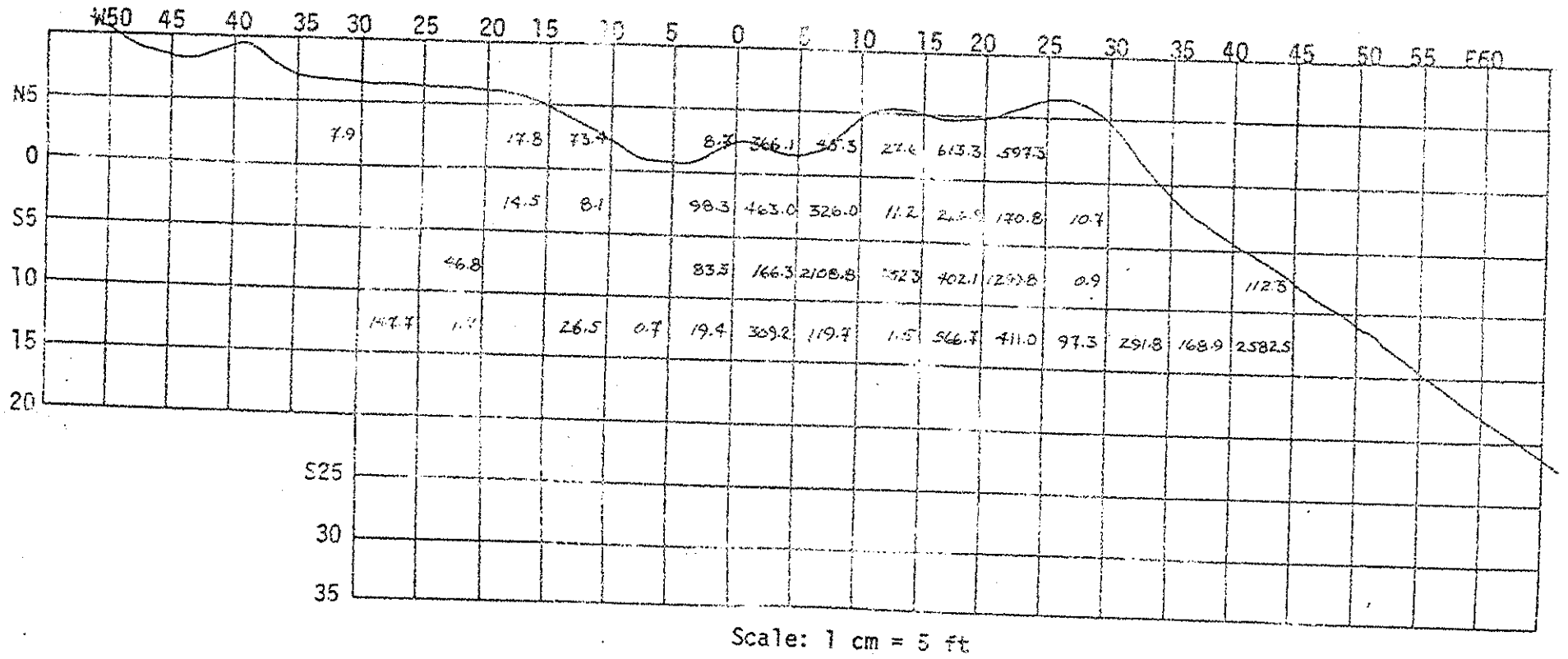
36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Late Woodland (Master Level 2)

Figure 2



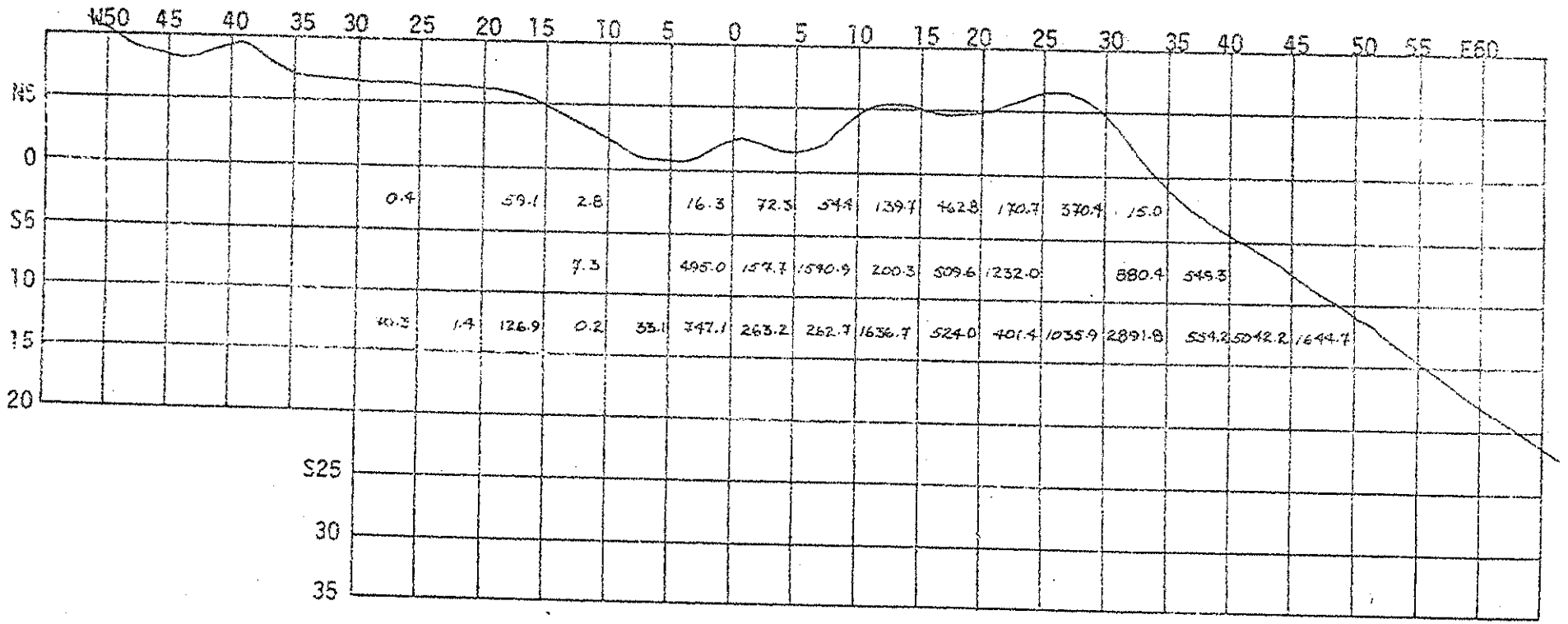
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Early & Middle Woodland (Master Levels 3 & 4)



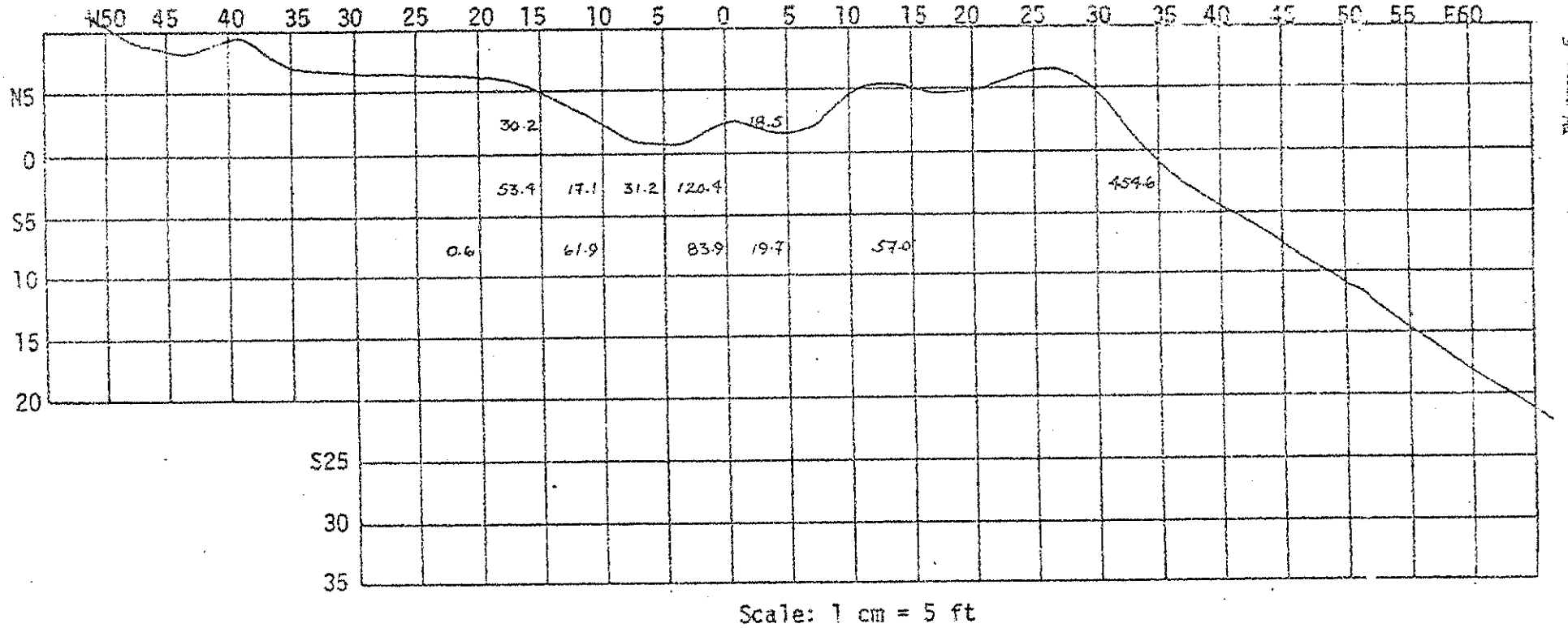
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Transitional (Master Level 5)



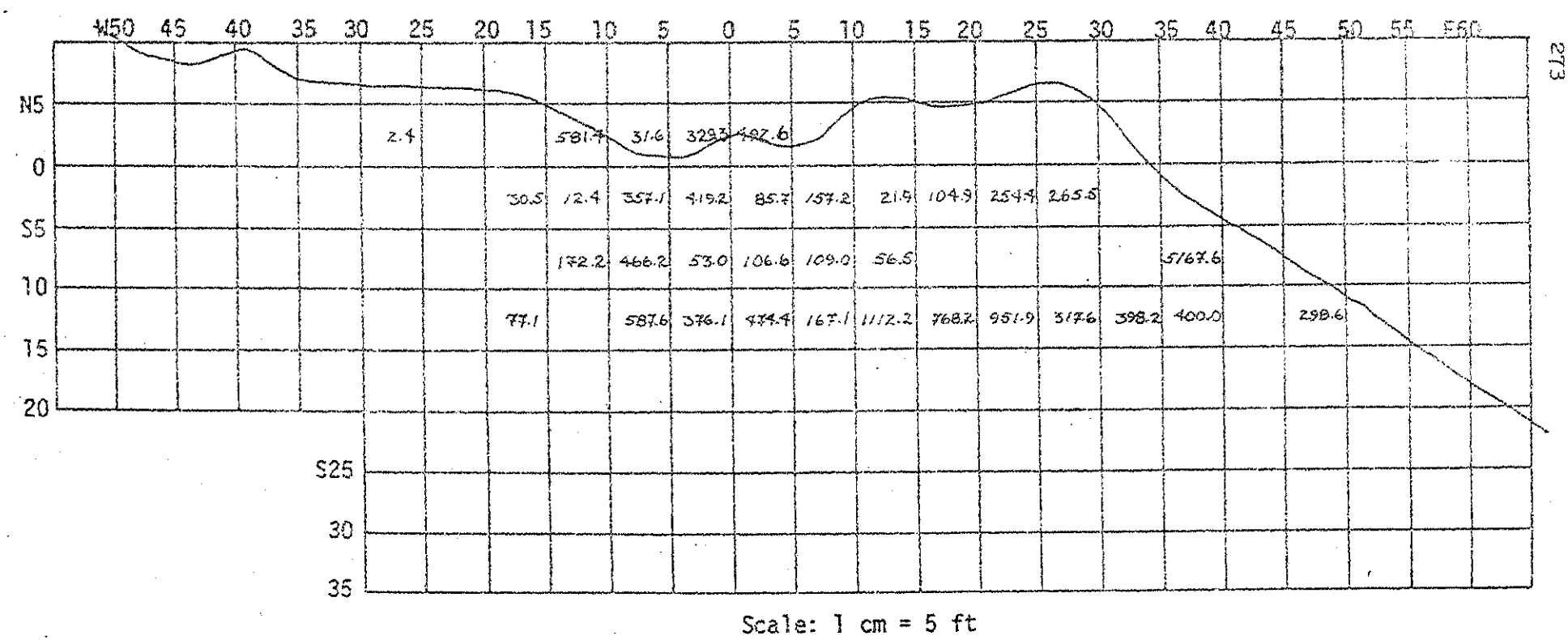
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Late Archaic (Master Level 6)



Scale: 1 cm = 5 ft

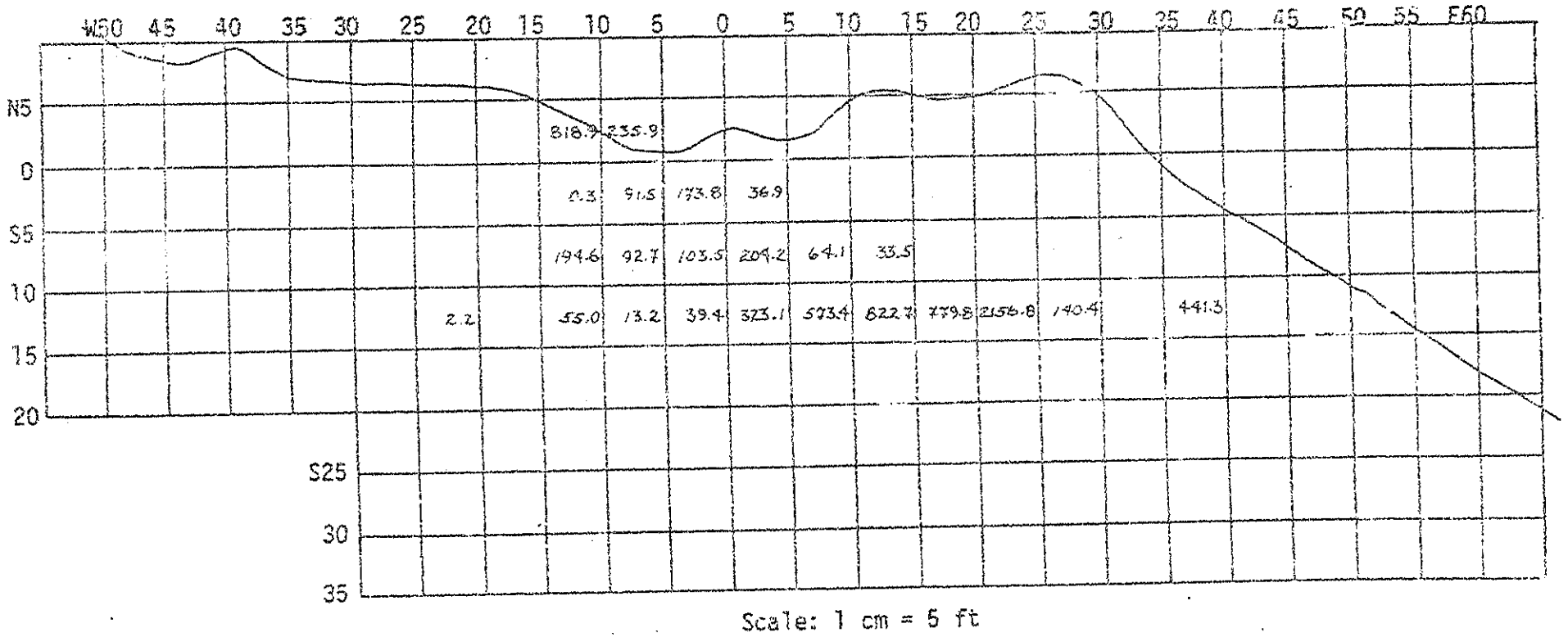
Figure 6

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Middle Archaic (Master Level 7)



Scale: 1 cm = 5 ft

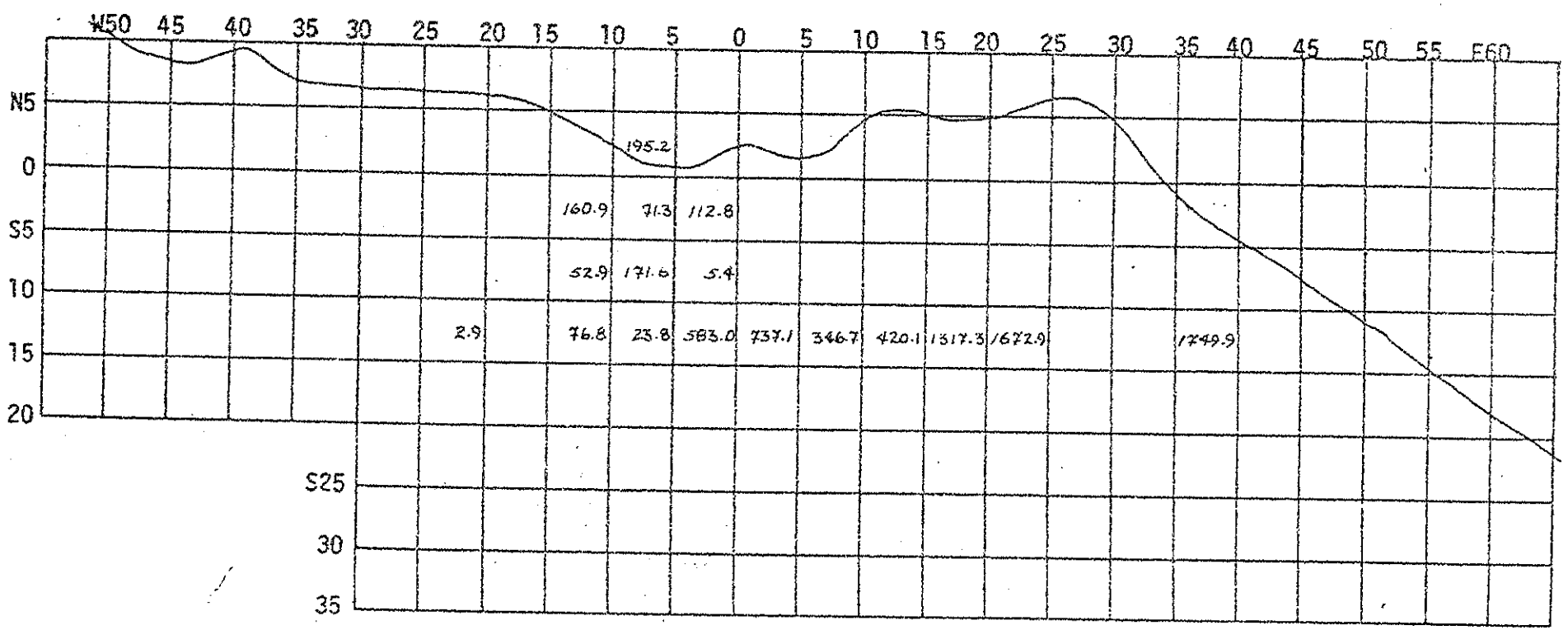
Figure 7

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: UNMODIFIED BONE (Weight in Grams)

PERIOD: Early Archaic (Master Level 8)



Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: BONE (Weight in grams)

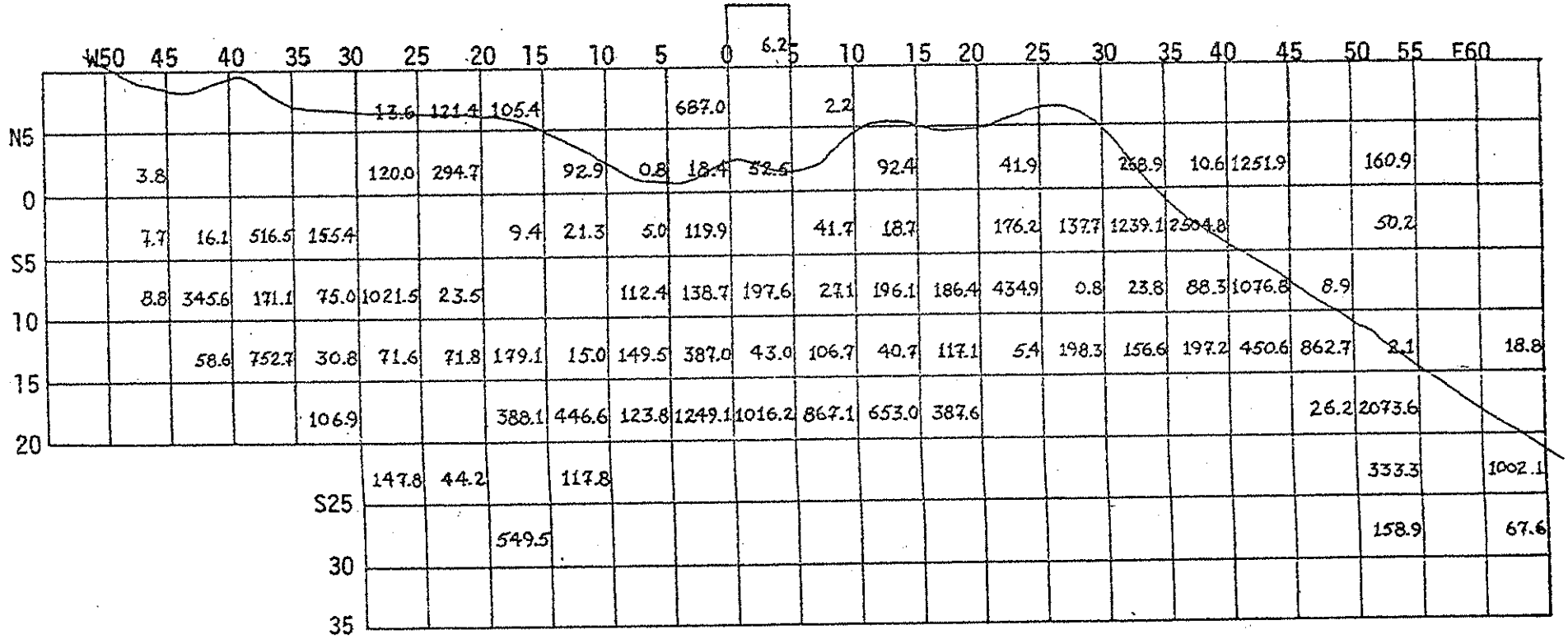
DATE: _____

LEVEL and/or PERIOD: MASTER LEVEL INDETERMINATE

RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

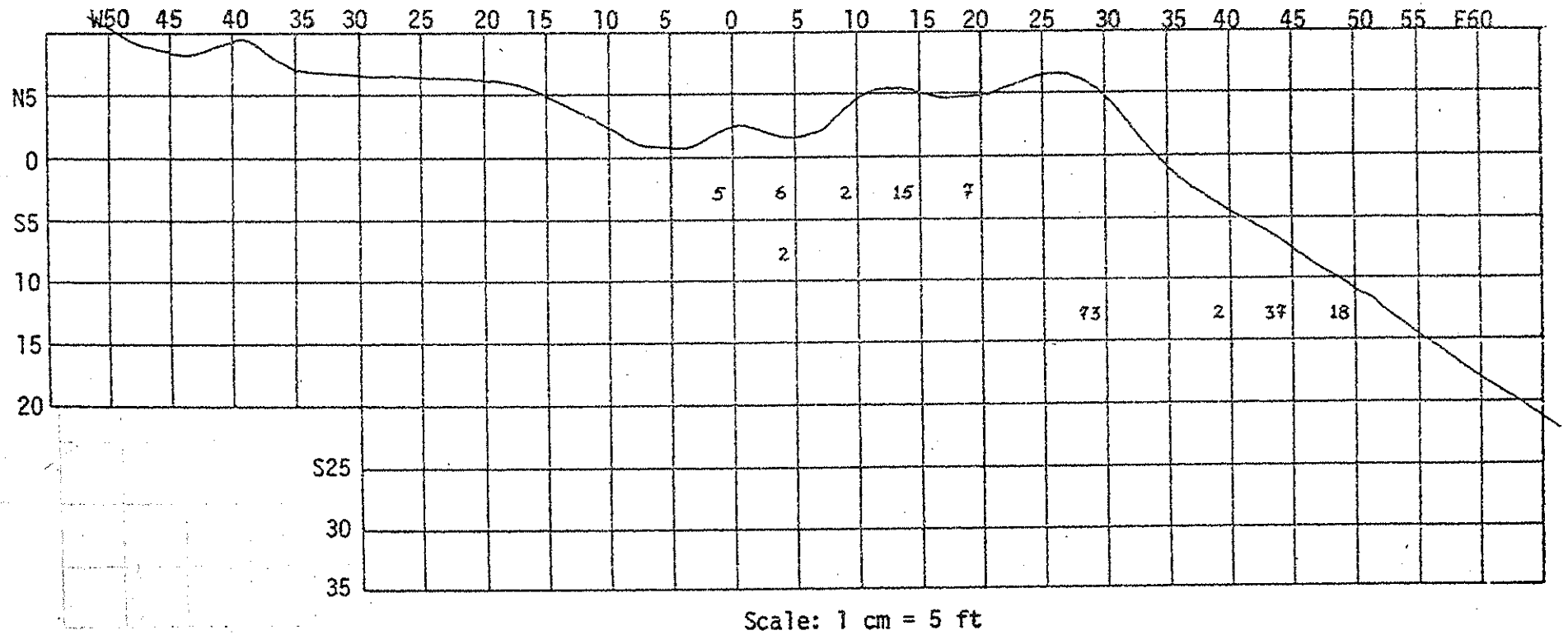
36Hul SHEEP ROCK SHELTER
MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces) DATE: _____

LEVEL and/or PERIOD: MASTER LEVEL 1 - Historic Period RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



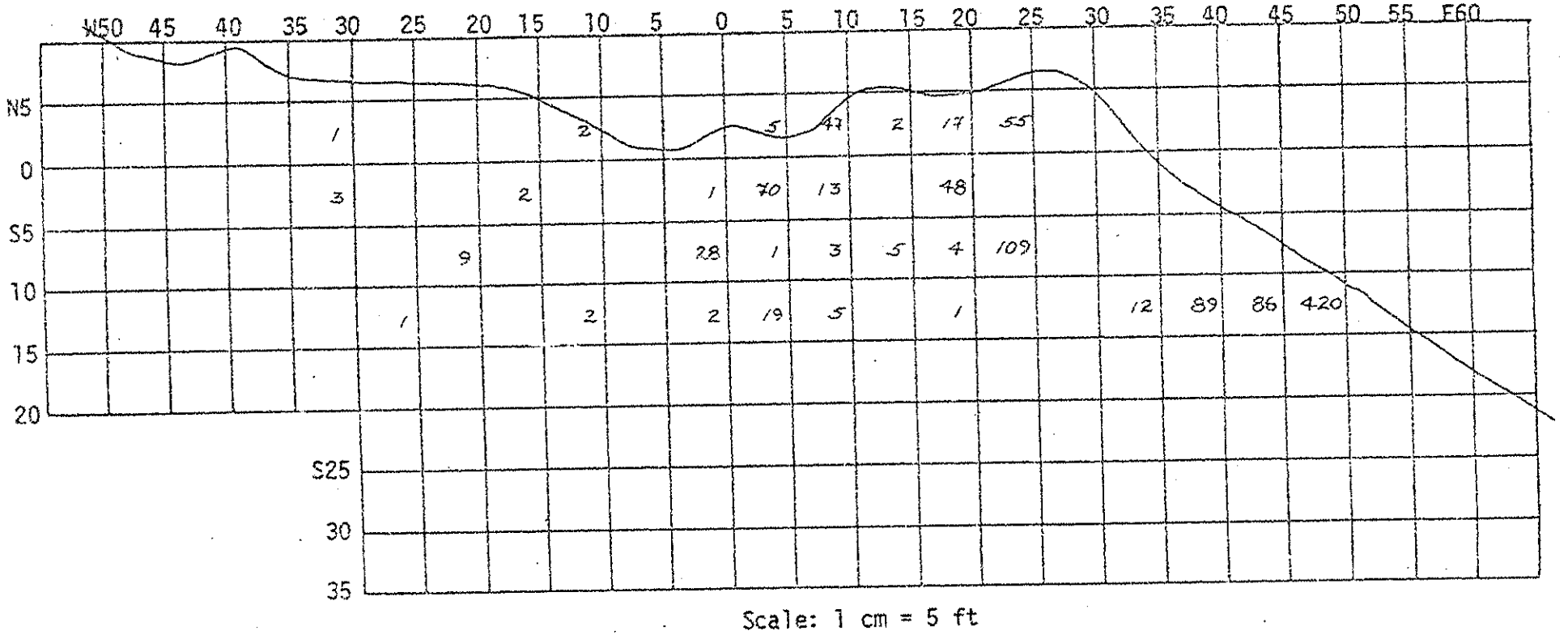
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Late Woodland (Master Level 2)



Scale: 1 cm = 5 ft

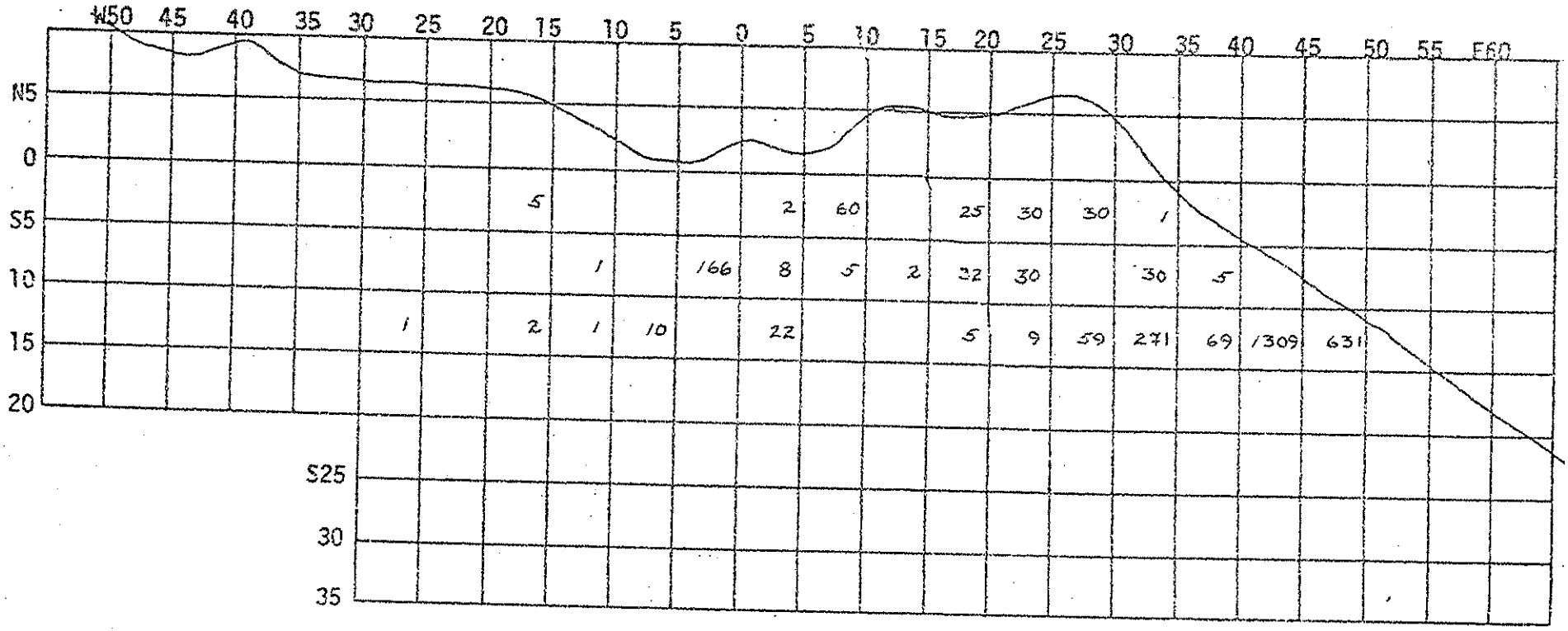
36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Early & Middle Woodland (Master Levels 3 & 4)

Figures 12 & 13



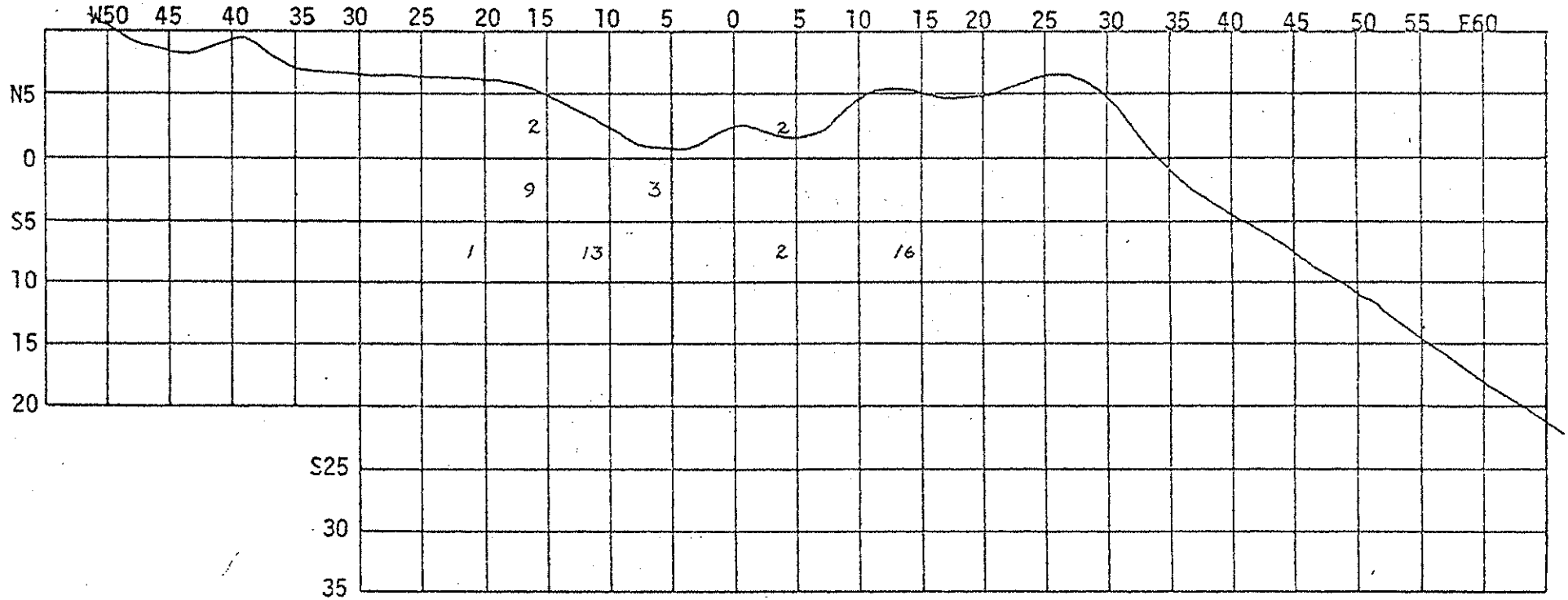
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Transitional (Master Level 5)



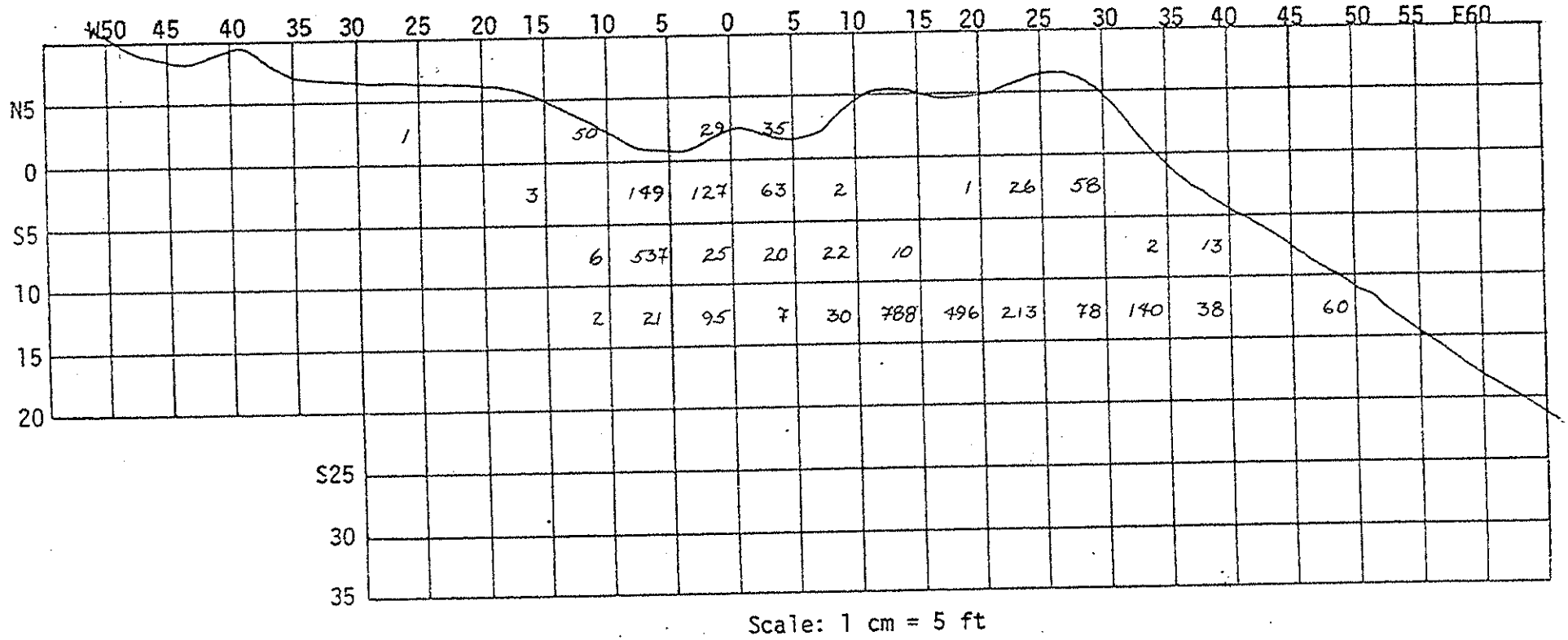
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Late Archaic (Master Level 6)



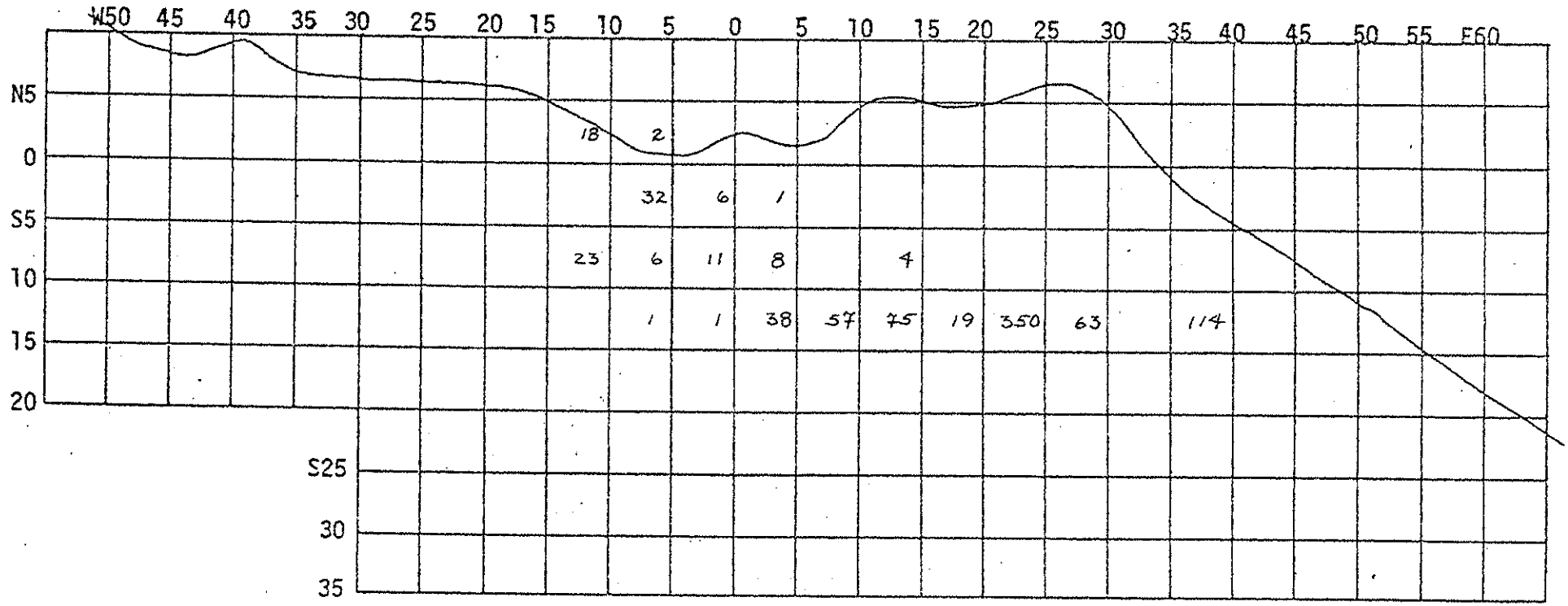
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Middle Archaic (Master Level 7)



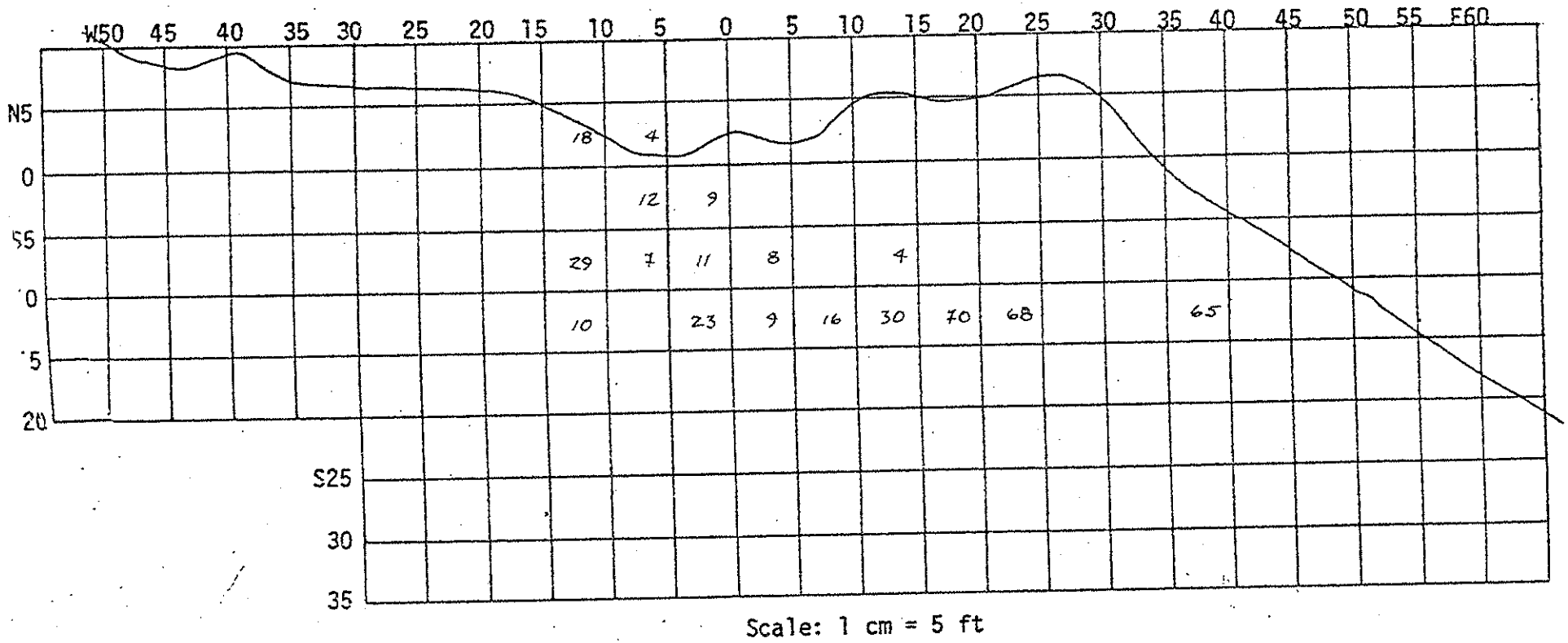
Scale: 1 cm = 5 ft

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces)

PERIOD: Early Archaic (Master Level 8)



Scale: 1 cm = 5 ft

36Hul SHEEP ROCK SHELTER

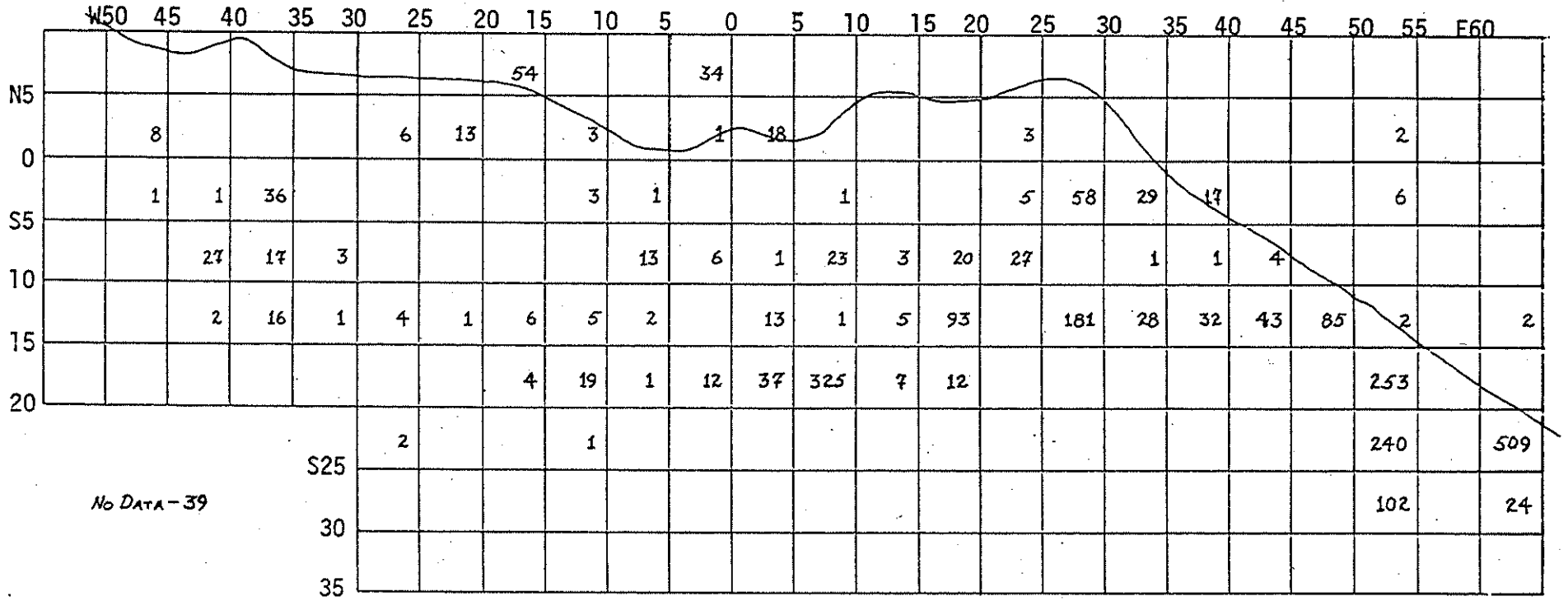
MATERIAL DISTRIBUTION

MATERIAL: BURNED BONE (Number of Pieces) DATE: _____

LEVEL and/or PERIOD: MASTER LEVEL INDETERMINATE RECORDER: _____

BD (if applicable): _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Figure 18

APPENDIX I

BONE REFUSE FROM THE SHEEP ROCK SITE
HUNTINGDON COUNTY, PENNSYLVANIA (36Hul)

1961 Excavation
by Pennsylvania State Museum

by

John E. Guilday and Don P. Tanner
Carnegie Museum

Faunal List and Discussion

Supplementary to ANIMAL REMAINS FROM THE SHEEP ROCK SHELTER, HUNTINGDON COUNTY, PENNSYLVANIA by Guilday and Parmalee.

Manuscript submitted to W. F. Kinsey, Nov. 7, 1960

October 2, 1961

EDITOR'S NOTE

The enclosed faunal list and discussion were never published, although they have been available since 1961. The existence of this material was brought to our attention by John Guilday in 1967, and has been included in this preliminary report as an appendix to Rehm's article through the courtesy of the authors.

AMPHIBIANS

Species		
Bufo sp.	toad	27
Rana or *Bufo*	frog and/or toad	111
Rana sp.	frog	20

FISH

Catostomidae sp.	suckers	42
Ictalurus sp.	bullhead catfish	4
Alosa sapiddisima, shad		10
Anguilla bostoniensis, eel		2
Semotilus or *Leucosomus*	fallfish or chubb	6
fish, unidentified		61

REPTILES

Sternotherus odoratus, musk turtle		63
Terrapene carolina, box turtle		22
Graptemys geographica, map turtle		7
Chelydra serpentina, smapping turtle		9
Crotalidae	rattlesnake/copperhead	13
Colubridae	non-poisonous snakes	161

BIRDS

Meleagris gallopavo, wild turkey		27
Bonasa umbellus, ruffed grouse		13
Ectopistes migratorius, passenger pigeon		116
ducks, sp.		6
woodpeckers, sp.		6

BIRDS (Cont'd.)

owl, small	1
bird, unidentified, large	16
bird, unidentified, small	156
pheasant?	1

MAMMALS

Blarina brevicauda, short-tailed shrew	3
Scalopus aquaticus, eastern mole	12
Sciurus carolinensis, gray squirrel	7
Sciurus sp. probably gray squirrel	44
Tamiasciurus hudsonicus	1
Glaucomys volans, flying squirrel	204
Tamias striatus, chipmunk	15
Pitymys pinetorum, pine mouse	1
Peromyscus sp., deer mouse	9
Neotoma floridana, wood rat	21
Cricetidae, sp. mouse	7
Ondatra zibethicus, muskrat	1
Erethizon dorsatum, porcupine	1
Castor canadensis, beaver	2
Ursus americanus, bear	3
Procyon lotor, raccoon	17
Urocyon cinereoargenteus, gray fox	5
Lynx cf. rufus, bobcat	2
Martes pennanti, marten	1
Mustela sp. weasel	1
Lutra canadensis, otter	2

MAMMALS (Cont'd.)

Mephitis mephitis, skunk.	2
Cervus canadensis, elk.	9
Odocoileus virginianus, deer.	564
Sus scrofa, domestic hog.	1

DISCUSSION

In contrast to the report on the 1958/59 excavating at Sheep Rock (Guilday and Parmalee,*), where each bone fragment was meticulously counted, the figures in this report represent estimates. They may not be actually correct, but they were careful estimates and are relatively comparable. It is interesting to note that they are in complete agreement with the results obtained from the previous work.

Two mammals are recorded here that were not represented in the 1958/59 collections -- the red wquirrel and the domestic hog. The red squirrel was expected. The hog jaw from W15S15 174" BD, medium gravel, was apparently a modern intrusive.

The flying squirrel/rabbit ratio confirms that from the 1958/59 collection. Upper agricultural levels, rabbits relatively common, lower non-agricultural levels, rabbit relatively scarce. See Guilday and Parmalee, 1965, p. 4 for discussion of the ecological reason for this.

BLOCK A		BLOCK B	
Woodland -- 40 - 80"		Archaic -- 100 - 130"	
Rabbit	53	Rabbit	35
Flying squirrel	43	Flying squirrel	161

* Animal remains from the Sheep Rock Shelter (36Hul), Huntington County, Pennsylvania. Pennsylvania Archeologist, XXXV (1): 34 - 49.

Below 100" Indian refuse became relatively scarce and owl refuse increases proportionately. This would seem to represent an intermittent occupation during archaic times and be in accord with the results of the bone refuse study of the 1958/59 excavation.

BLOCK A			BLOCK B	
Woodland -- 40 - 80"			Archaic -- 100 - 130"	
		PROBABLE INDIAN REFUSE		
deer	2398	down	166	
elk	7	down	2	
fox	4	down	1	
raccoon	13	down	4	
turkey	20	down	7	
fish	99	down	24	
		PROBABLE OWL REFUSE		
rabbit	53	down	35	
flying squirrel	43	up	161	
chipmunk	7	up	8	
snake	47	up	127	
bird	48	up	151	(minus turkey)
		INDIAN AND OWL REFUSE PROBABLY		
muscrat	9	same	9	
squirrel	24	up	27	(minus flying squirrel)
pass. pigeon	25	up	91	
woodchuck	2	up	8	

Two human fragments, a symphysis pubis and a toe bone recovered from W10S10, 4.5, "B". A complete turtle shell cup reconstructed from fragments in square E00S15, Level 6/1, 62 - 67" BD (Woodland Period).

INITIAL ANALYSIS OF CHARCOAL MATERIALS FROM SHEEP ROCK SHELTER - 1967 FIELD SEASON

by

George Drobnock

ABSTRACT

This chapter is concerned with the preliminary laboratory analysis of the charcoal samples recovered from Sheep Rock Shelter (36Hul) during the 1967 excavation season. The techniques involved in this analysis, and the selection of those samples best suited for further analysis are discussed.

ACKNOWLEDGMENTS

I sincerely thank the members of the field school, but especially, my advisor, Lorraine Willey, for her help in establishing the format of this paper.

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INTRODUCTION

A total of 39 charcoal samples were recovered from Sheep Rock Shelter during the 1967 field season. This paper will supplement the charcoal analysis undertaken by John Azer (1967:825-863) by describing these new samples and by defining several new methods of examining samples.

LABORATORY PROCEDURES

The laboratory procedures discussed in this section apply to all samples analyzed.

Each sample was first examined with a magnifying glass for such contaminants as rootlets and large particles of imbeded soil. Soil affects the weight of the charcoal, while rootlets carbonize within it and update it.

Some samples were composed of chemically reduced or carbonized roots with the appearance of charcoal. According to Dr. Michels, two of seven samples sent to the University of Michigan following the 1966 season were reduced root samples.

To isolate such samples this year, each sample was sectioned longitudinally under a microscope. In a carbonized root sample, the root fibers -- approximately 1/10 millimeter long and reddish-bronze in color -- run parallel to the sample's grain. With this method, three of the 39 samples were found to be reduced roots; all others were charcoal.

This method of isolating samples of carbonized roots has the disadvantage that charcoal samples containing only rootlets which have grown into them in the site, could also, by chance, have root fibers running parallel to the grain.

In the second step of analysis, all samples were weighed on pre-weighed sections of foil, with the measurement carried out to the second decimal place when necessary. If the sample had been properly wrapped in foil in the field, it was then wrapped again in foil. Samples which had been wrapped in plastic bags in the field were weighed and listed as contaminated by improper handling.

There was much discussion at this year's field school about the best methods for handling charcoal in the field. While some feel that samples are not contaminated in any way by placing them in plastic bags, others, Azer (1967) and Robbins (1965) among them,

recommend that samples be carefully wrapped in foil or a glass container with a metal lid to ensure the accuracy of the C-14 dating.

For each sample, a 3" by 5" card was prepared listing:

1. Field number
2. Provenience
3. Texture
4. Depth below datum
5. Type of contamination
6. Date of collection for large samples over eight grams

The samples were then stored in labeled boxes in the laboratory.

The summary of laboratory procedures for treating and packaging charcoal samples, then, is as follows:

1. Samples were cleaned of contamination
2. Examined for carbonized roots
3. Weighed
4. Rewrapped
5. Identified on a 3" by 5" card listing:
   a. Field number
   b. Provenience
   c. Texture
   d. Depth below datum
   e. Weight in grams
   f. Type of contamination
   g. Date of collection

CRITERIA USED IN SAMPLE EVALUATION

The criteria used to evaluate the samples are the same as those defined by Azer (1967). They include texture, extrinsic factors, and location of the sample in the site.

Texture

Texture was classified as:

Fine -- less than 1/8 inch in diameter
Coarse -- 1/8 to 1/2 inch in diameter
Chunk -- over 1/2 inch in diameter

Extrinsic Factors

Extrinsic factors range from soil, such as sand, ash, or others, to rootlets, shell, bone and other extraneous material.

Location of the Sample in the Site

A master stratigraphic profile of the site exhibiting the location of all charcoal samples which have been submitted for radiocarbon dating can be found as an appendix of Dutt's chapter on site stratigraphy elsewhere in this volume. In addition, a summary of fire and ash areas recorded at Sheep Rock Shelter during the 1966 and 1967 field seasons can be found in the report on features by Green elsewhere in this volume. Table 1 of this chapter lists the 46 charcoal samples and gives their provenience.

SELECTION OF CHARCOAL SAMPLES FOR RADIOCARBON DATING

The carbon samples listed below were selected on the basis of (1) quantity (with one exception all samples are in excess of 30 g.), (2) stratigraphic provenience (all samples are post Archaic and pre Late Woodland -- as far as could be determined by the third criterion), and (3) associations (all samples were chosen so as to provide chronometric information concerning the Transitional, Early Woodland and Middle Woodland occupational phases at the site, as determined from single component units of material culture -- diagnostic lithic and ceramic materials).

It should be noted that none of the samples can be said to derive from Transitional occupational components with certainty (no definitively Transitional hearths have been located in the site, though a presumably Transitional level has been provisionally identified based on diagnostic artifact distributions). The most likely components to be identified are Early Woodland based on diagnostic Meadowood and Juniata Stemmed points and several types of Early Woodland pottery. As with the Transitional, no definitively Middle Woodland carbon samples are available, though hearths which are presumably Middle Woodland in date have been tentatively identified. Unfortunately, no carbon samples have been recorded for these hearths.

The six samples described below were submitted for radiocarbon dating to the University of Michigan on February 27, 1968. This constitutes the second series of samples processed by the University of Michigan, and brings the total of radiocarbon dates for Sheep Rock Shelter to thirteen. The first seven samples were dated last year, and are reported elsewhere (Michels 1967:863). On the basis of the first group of samples we were able to establish the chronology of the Archaic and Late Woodland periods; the series of samples described below are intended to clarify the chronology of the Early and Middle Woodland components of the site.

Description of Samples Submitted for Radiocarbon Dating

A66.01.1955: Charcoal Sample

Provenience:	Square W15S05; 66-72 inches BD
Grams:	11
Texture:	Chunk
Contamination:	No evident contamination
Cultural Period:	Early or Middle Woodland

A66.01.6469: Charcoal Sample

Provenience:	Square E20S05; 70-84 inches BD
Grams:	34
Texture:	Coarse
Contamination:	Root contamination; polyethelene contamination
Cultural Period:	Early or Middle Woodland

A66.01.6511: Charcoal Sample

Provenience:	Square E20S00; 72 inches BD
Grams:	93
Texture:	Coarse to powder
Contamination:	Dirty and root contamination
Cultural Period:	Early or Middle Woodland

A66.01.6670: Charcoal Sample

Provenience:	Square E00S15; 78-84 inches BD
Grams:	24
Texture:	Coarse
Contamination:	Possible root contamination
Cultural Period:	Early or Middle Woodland

A66.01.6907: Charcoal Sample

Provenience:	Square E25S15; 79 inches BD
Grams:	79
Texture:	Chunks
Contamination:	Dirty, slight root contaminaton, polyethelene bag
Cultural Period:	Early or Middle Woodland

A67.01.0385: Charcoal Sample

Provenience:	Square E45S15; 95-96 inches BD
Grams:	128
Texture:	Coarse
Contamination:	Root contamination
Cultural Period:	Early or Middle Woodland

CONCLUSIONS

The techniques used for initial analysis of the charcoal samples from the Sheep Rock Shelter site (36Hul) have been described. While it is understood that alternative methods for analyzing charcoal samples are known, the present format devised by Azer was considered the most practical in the time alloted for preparing the charcoal for dating.

Table 1

CHARCOAL SAMPLES FOR 36Hul COLLECTED DURING THE 1967 FIELD SEASON

Catalogue Number	Sample Weight in Grams	Depth Below Datum (in inches)	Excavation Square
A67.01.0035	16.00	80 to 110	E45S15
A67.01.0065	0.50	117 to 122	E45S15
A67.01.0096	3.60	186	E05S15
A67.01.0209	12.65	113	E45S15
A67.01.0300	14.85	64 to 67	E35S15
A67.01.0324	5.60	109	E40S15
A67.01.0354	25.00	64 to 67	E35S15
A67.01.0374	1.02	133 to 136	E60S30
A67.01.0385	128.90	95 to 96	E45S15
A67.01.0408	1.50	156 to 180	W05S15
A67.01.0429	32.10	119 to 122	E10S15
A67.01.0509	13.70	110	E10S15
A67.01.0510	35.30	99 to 119	E10S15
A67.01.0609	32.10	110 to 116	E45S15
A67.01.0617	1.10	110 to 116	E45S15
A67.01.0729	4.10	65 to 68	E30S15
A67.01.0730	14.10	68 to 71	E30S15
A67.01.0781	2.00	130	E35S15
A67.01.0782	47.05	98 to 119	E45S15
A67.01.0803	11.60	58 to 61	E35S15
A67.01.0829	5.90	178 to 182	W05S15
A67.01.0851	6.30	114 to 117	E40S05
A67.01.0984	1.50	94 to 97	E10S15
A67.01.1040	13.30	61 to 64	E35S15
A67.01.1115	7.85	120 to 123	E10S25
A67.01.1117	12.50	29	E10S15
A67.01.1152	1.20	167	E00S15
A67.01.1260	4.05	175	E20S10
A67.01.1312	13.00	Cleanup	E45S15
A67.01.1353	17.30	104 to 107	E15S15
A67.01.1383	1.00	112 to 115	E50S30
A67.01.1421	2.90	145 to 148	E60S25
A67.01.1509	45.00	78 to 84	E05S15
A67.01.1549	1.00	91 to 94	E05S20
A67.01.1571	6.00	99	E50S25
A67.01.1581	4.50	76 to 79	E40S15
A67.01.1634	4.00	Cleanup	W15S15
A67.01.1645	0.20	145 to 148	E60S15
A67.01.1711	3.90	67 to 76	E40S15

Appendix I

REPORT ON DATED RADIOCARBON SAMPLES

by

Joseph W. Michels

Table 1 of this appendix lists the results of dating for the six samples submitted to the University of Michigan Laboratory at the end of the 1967 Field Season, together with the original seven dates previously reported in Volume Two of the Sheep Rock Report (Michels 1967:863). As mentioned by Drobnock, the primary objective in dating the second series of samples was to clarify the chronology of Master Levels 5, 4 and 3 with the hope that we could document the presence of Transitional, Early and Middle Woodland occupations chronometrically.

The results were gratifying in that our objective was achieved. Sample A66.1.6907 came from Master Level 5, which we believed to be the Transitional component at the site. It was dated as 1270 BC ± 160. The Transitional phase is reported in the literature as extending from 1500 BC to 1000 BC (Griffin 1967), and our date falls neatly into that range.

Samples A66.1.6469 and A66.1.6511 were recovered from Level 3, and confirm the presence of a Middle Woodland phase at the site. The Early Woodland phase runs from 1000 BC to 0 AD (Griffin 1967) and the Middle Woodland phase begins at 0 AD and extends to 1000 AD (Ibid). The latter sample (AD 60 ± 140), taking its error factor into consideration, documents the occupation of the site at the interface between the Early and Middle Woodland periods. The other sample (320 AD ± 140) falls entirely within the early part of the Middle Woodland period.

The other three samples were drawn from upper levels that exhibited heavy pitting. The purpose was to ascertain the range of time during which this type of disturbance was going on. The dates - two in the Late Woodland and one in the Historic period - when added to two previous protohistoric and one previous Late Woodland date have assisted us in clarifying the extent of mixture in various areas within the upper two levels.

When we examine Table 1 of this appendix, we can make the following general observations. First, the thirteen dates currently in our possession overwhelmingly support the chronological integrity of the eight master profile levels as described by Bebrich and Willey in this volume (see pages 56-58). This is an important observation since it permits us to rely on these master levels in the analysis of our large volume of artifact, feature, and ecological remains. Secondly, the dates document the extraordinary length of time during which occupation of the shelter occurred, at the same time, they suggest that the shelter received more or less continuous use during the nine thousand year span revealed by the dates. This latter observation is based on the fact that all phases recognized for the Northeastern United States from the Archaic to the Historic period are represented in the series of 13 dates.

TABLE 1

Summary List of All Radiocarbon Dates *

Master Profile Level	Sheep Rock Catalogue No.	Michigan Lab. No.	Date	Period
Level 1	A66.1.1955	M-2081	1870 AD±100	Historic
Level 2	A66.1.6699	M-1903	1690 AD±100	Protohistoric
Level 2	A66.1.6458	M-1905	1600 AD±100	Protohistoric
Level 2	A66.1.6670	M-2084	1490 AD±100	Late Woodland
level 2	A66.1.2967	M-1904	1460 AD±100	Late Woodland
Level 2	A66.1.0385	M-2086	1450 AD±100	Late Woodland
Level 3	A66.1.6469	M-2082	320 AD±140	Middle Woodland
Level 3	A66.1.6511	M-2083	60 AD±140	Early/Middle Woodland
Level 5	A66.1.6907	M-2085	1270 BC±160	Transitional
Level 6	A66.1.6588	M-1907	1850 BC±180	Late Archaic
Level 6	A66.1.6568	M-1906	2350 BC±180	Late Archaic
Level 7	A66.1.4431	M-1908	5100 BC±250	Early/Middle Archaic
Level 8	A66.1.6438	M-1909	6920 BC±320	Early Archaic

* Description of each sample and information on specific provenience can be found in Azer 1967:840-842 and in Drobnock 1968:

A SUPPLEMENTARY REPORT ON THE LITHIC ARTIFACTS FROM THE SHEEP ROCK SHELTER

by

Carl A. Bebrich

ABSTRACT

Lithic materials recovered subsequent to Volumes I and II of the Preliminary Report in general conform to those previously described. The present report reassesses this work in light of new materials and findings and considerably expands upon cursorily treated materials described earlier. Radiocarbon dates have confirmed the long sequence of occupations postulated on the basis of stylistic affinities among projectile points at this and other sites. These reflect a complex history of culture contact networks of varying magnitude and geographic heterogeneity ranging over a 9000 year period. Associations with at least 19 distinct complexes are recognized: Kirk, LeCroy, early Upper Ohio Valley Laurentian, Brewerton, Squibnocket, Bear Island, Rossville, Savannah River, Susquehanna, Perkiomen, Frost Island, Meadowood, Snyders, Fox Creek, Jack's Reef, Clemson's Island, Owasco, Shenk's Ferry and Susquehannock.

ACKNOWLEDGEMENTS

For their advice, assistance, encouragement and cooperation the author heartly extends his appreciation to Bettye Broyles, Don Dragoo, Robert E. Funk, Barry C. Kent, Joseph W. Michels, William A. Ritchie and Ira F. Smith.

Through the courtesy of Mr. Ralph Houck of the Pennsylvania State University, the Sheep Rock point collection was transported to the 1969 meetings of the Society for Pennsylvania Archeology in Warren, Pennsylvania, for examination by several authorities in eastern archeology. The author was unfortunately unable to attend the meetings, but Dr. Robert E. Funk graciously prepared a written resume of various opinions regarding the archeological affinities and chronometric placement of many of the Sheep Rock point types. These comments have been included in the present report and are cited as personal communications. Any inaccuracies and/or misrepresentations are fully the responsibility of the author.

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INTRODUCTION

The purpose of this report is to provide a comprehensive formal description of lithic artifacts from the Sheep Rock Shelter with respect to the dimensions of space, time and form. It is considered a sequel to and updating of the author's earlier report in light of new materials and findings, with particular attention being paid to the non-projectile point artifacts which were only cursorily treated in the Preliminary Report. Integration of the data is held to a minimum and will be dealt with extensively in a forthcoming paper. As such, the objective of this report is two-fold: 1) to examine the collection in detail so as to provide a rich descriptive base upon which future work in the Ridge and Valley Province can draw for comparative data; and 2) to delineate the culture-historical sequence of these materials, based on stylistic similarities among projectile points in order to determine the number, sequence and direction of culture contact networks represented. In conjunction with this latter objective a re-evaluation of the projectile point classification is included.

As the stratigraphy of the site has been completely re-examined (ref: the stratigraphy chapter of this volume), it is appropriate that a re-evaluation of the stratigraphic distribution of the various artifact classes should also be included in this report.

PROJECTILE POINTS

A total of 26 projectile points have been added to the collection since the Preliminary Report was published. These include both stemmed-notched and triangular varieties spanning nearly the entire occupational history of the site. Six points previously classified as knives (Former Types N, O & P), all of which are Levanna triangles (Funk: personal communication), were transferred to the projectile point functional category, even though at least one speciman was used as a knife. Two additional points belonging to the Fox Creek stemmed variety (Funk 1968: 1-7) were also reclassified from the knife to the projectile point category. Reclassification of projectile points to other functional categories has affected only point types 38 and 41, as discussed below. The net effect of acretion and loss is to bring the total projectile point inventory to 193. specimens.

The definition of new types, although few in number, and the collapsing and reclassification of already defined types based on new considerations, have forced the question of the value of revamping the existing typological construct into some more systematic framework,

e.g. chronological, thereby reordering the types and redesignating them. Notwithstanding the heruistic value of having congruence between the sequence of typolcgical designations and their actual chronometric order, a decision was made to maintain the present designations and to add to them as became necessary in order to prevent the otherwise inevitable confusion that would ensue from disparities in earlier and later versions of the classification. Thus former type designations are retained and new ones added; none is dropped. In those cases where two or more former types are now grouped together, note is made of the fact in the type discussions which follow below.

One further point of clarification remains regarding the use of established type names. In both the previous and present reports these have been used only to draw attention to strong stylistic similarities between some Sheep Rock projectile point types and certain well-established varieties in the literature. It is not the author's intention to imply that groups inhabiting the type and related sites were responsible for the materials found at the Sheep Rock Shelter, but rather that strong stylistic similarities are a manifestation of intergroup contact involving the exchange of ideas and sometimes objects. The absorption and expression of these ideas in material form is a selective process which plays a key role in stylistic radiation.

Regarding use of the term "type", as used here it designates a distinctly definable form and violates the condition demanded by some that a type must constitute two or more specimens, and the more stringent condition that a type must include an assignable cultural context. Thirteen of the 48 types discussed below constitute unique specimens, two of which could not be assigned a definitive cultural context.

All of the projectile points have undergone attribute analysis using a modified version of the attribute list presented in the Preliminary Report. The modification concerns primarily characterization of the haft element, which receives here a more systematic and, it is hoped, less ambiguous treatment. Both the revised attribute list and individual point attribute characterizations are provided in Appendices I and II, respectively.

In the following discussion, data acquired subsequent to the Preliminary Report (hereafter abbreviated as PR) are presented and cultural affinity is re-evaluated wherever necessary. Previous discussion of the types is referenced in all cases, as are the photo reproductions accompanying this chapter.

Type 1 (Plate 1: 1 and 2) Page 445

Kirk serrated (PR Vol. 2, p. 571). Type 1 has been radiocarbonated at the Sheep Rock Shelter to between B.C. 6920 ± 320 (M - 1909) and B.C. 5100 ± 250 (M - 1908). Both of these dates were secured from decayed organic matter (probably tree roots) rather than burned carbonaceous material. It is therefore possible and indeed likely that they post-date by some hundreds of years the stratigraphic units with which they are associated. Irrespective of this consideration, stratigraphic interpolation of individual point loci suggests an approximate date of 6000 B.C., which is in good agreement with Coe's estimate of 5000-6000 B.C. (1964:70). More secure dating of this point style has recently been obtained at the St. Albans site in West Virginia where an occupation unit containing Kirk Corner-Notched points was dated at B.C. 6980 ± 160 (Y - 1538) radiocarbon years (Broyles 1967: 19).

Stratigraphic Distribution: Type 1 is restricted to Master Level 8. It marks the first appearance of any point form in the stratigraphic sequence.

Type 2 (Plate 1: 3-8)

Raystown Stemmed (PR Vol. 2, p. 572). Four new specimens have been added to this type, bringing the total to six. The general description of the type is revised to accommodate the new specimens which further clarify its salient features and range of variation.

General Description: Points of Type 2 are small to medium sized in all major dimensions and are stemmed. Average length/width ratio is 1.9: 1, with the point of maximum thickness occurring between the shoulders. Blade outline is ovate in all cases. In transverse section the points are either plano-convex or biconvex, generally the latter. The longitudinal section is biterminally asymmetrical in all specimens and is plano to biconvex in outline. Shoulders are generally well developed and form obtuse angles with the blade and lower subelement of the haft. The stem is characteristically short and sub-rectangular in outline, expands slightly towards the base and is offset at a slight angle from the longitudinal axis in most specimens. The base is generally convex in outline and irregular in form; concave bases are the exception. Both the stem and base are unground in all specimens. Distal zones of juncture are angular, medial zones rounded and proximal zones either rounded or angular.

Workmanship is generally rough; Five of the six specimens are made of Bald Eagle jasper; the sixth point was fashioned from Onandaga chert.

Stratigraphic Distribution: Type 2 was found only in the lower strata of Master Level 7.

Age and Cultural Affinity: Based on its stratigraphic distribution relative to radiocarbon dates and diagnostic artifacts (in particular, point Types 3 and 4, Type 2 is assigned an early Middle Archaic date of 4000-5000 B.C. A search of the literature failed to produce a comparable established point type. First hand examination by Broyles, Dragoo, Funk and Ritchie further supported this finding (personal communication). The points are believed to be strongly affiliated to Workman Site Projectile Point Type 6 (Bebrich and Morgan 1970: 207) and to represent a regional variety and a developed form of a stemmed point tradition which includes Kirk, LeCroy, Kanawah and Stanly variants. The Workman Site specimens differ from those of the Sheep Rock Shelter in two respects: (1) bases are predominantly concave rather than convex; (2) length/width ratios are significantly different. Of the two sets of specimens those from the Workman Site bear a greater resemblance to the last named and most recent member of the tradition, the Stanly Stemmed point. It is significant that it is precisely the above two criteria which also differentiate the Sheep Rock specimens and Stanly Stemmed point. Such differences could be a product of either or both space and time. Since the Workman and Sheep Rock sites are in greater geographical proximity to each other than either is to the Doerschuk Site (where the Stanly Stemmed point was first defined) it is likely that time is a significant factor in reducing the observed differences. For this reason it is believed that Type 2 of the Sheep Rock Shelter is a still later variety of the stemmed point tradition identified above than either the Workman Site Type 6 or the Stanly Stemmed point.

Type 3 (Plate 1: 9-11) *Fig. 445*

(PR Vol. 2, p. 573). One new specimen was added to this type. The only obvious way in which it differs the two previously described specimens is in thickness, which is about half that of the others. The high calibre of workmanship and the rectangular configuration of the half-stem-base complex are diagnostic features of this type. A distinctive property of this complex is the size - asymmetry of the shoulders: one is always slightly larger than the other; the ratio of the two shoulder (distal-medial) lengths averages about 1.4: 1.

Stratigraphic Distribution: Type 3 was found only in the upper strata of Master Level 7.

Age and Cultural Affinity: Although Funk and Ritchie are disinclined to apply the term "Laurentian" to manifestations lacking gouges, ground slates and plummets (Funk personal communication), the term as used above implies affinity to a geographically localized tradition linking the Middle and Late Archaic periods, an early manifestation of which (ca. 4000-3000 B.C.) includes points of this type.

Type 4 (Plate 1: 12 and 13)

(PR Vol. 2, p. 574). In Broyles opinion (personal communication), the Sheep Rock Shelter specimens are not Halifax points, as indicated previously. With this opinion the author concurs. The designation was based on what at the time appeared to be three concordant lines of evidence. First, the Sheep Rock Shelter specimens bear a strong morphological resemblance to Holland's (1955: 169, 171, Plate 28a, Plate 30a) types I and M, both of which are accepted by Coe (1964: 110) as Halifax points. It should be observed that Holland's specimens exhibit a greater range of morphological variability, particularly in regard to the configuration of the haft-stem-base complex, than the type specimens shown by Coe (ibid: 109, Fig. 105A). Second, on the basis of stratigraphic interpolation, the Sheep Rock Shelter specimens occupy a late Middle Archaic provenience in accord with the radiocarbon date of B.C. 3484 ± 350 (M-523) secured from a Halifax occupation unit at the Gaston site in North Carolina (ibid: 97). Third, with the possible exception of the Otter Creek point (Ritchie 1961: 40-41, 94-98), comparable established types to both the east and north are lacking.

This view failed to take into consideration findings from the Upper Ohio Valley. State Archaeologist Barry Kent (1970: 41) has recently suggested that this type probably is a product of proto-Laurentian influence deriving from western Pennsylvania, citing Dragoo's 1959 study of the Upper Ohio Valley based on the Dixon and Rohr rockshelter excavations. Resemblance of the specimens of Sheep Rock Shelter Type 4 to some of those recovered from Levels 4 and 5 of the Rohr rockshelter cannot be denied, and their stratigraphic association with Type 3, which is also believed to be of Laurentian affiliation, lends support to Kent's hypothesis.

It would appear, therefore, that a number of very similar point styles were widespread throughout the Middle Atlantic, Northeast and Ohio Valley areas during the late Middle Archaic period, possibly including in addition to those already mentioned the Big Sandy and Otter Creek points. All of these styles could be viewed in terms of a type-variety system in which the Big Sandy, Halifax, Sheep Rock Shelter Type 4, the early Laurentian side-notched points of the Upper Ohio Valley and the Otter Creek points are seen as regional and/or temporal varieties of a basic type which is characterized by (1) broad, shallow side-notches with predominantly angular distal zones of juncture and rounded medial and proximal zones of juncture; (2) a generally subconcave base outline; and (3) a high incidence of haft and/or basal smoothing.

Type 4 strongly resembles side-notched specimens of Type 13 and probably represents an early form in a developmental sequence involving the two point styles. It should also be noted that an analogous argument could be made for Type 3 and Types 5, 8 and 23, with Type 3 holding an early position (coeval with Type 4) in a Laurentian corner-notched point developmental sequence. The two series (side-notched and corner-notched) taken together suggest a greater overall continuity in the culture history of the Sheep Rock Shelter area during the late Middle and early Late Archaic periods (ca. 4000-2000 B.C.) than either series alone.

Stratigraphic Distribution: Both specimens of Type 4 were recovered from the upper strata of Master Level 7.

Late Archaic

Type 5 (Plate 1: 14 and 15)

Brewerton Corner-Notched (PR Vol. 2, p. 575). In the Preliminary Report the author suggested that "Types 5 and 8 share many features in common and ... may be genetically related." The type status given to the two groups of points was based on two considerations: (1) What appeared to be a clear stratigraphic separation suggesting a substantial difference in chronometric provenience; and (2) a significant formal difference in blade outline. Reanalysis of the stratigraphy (Bebrich and Willey, this volume, p. 66) demonstrated that the first consideration was entirely without foundation: the "clear stratigraphic separation" vanished, and it was found that Types 5 and 8 occupied horizontally distinct loci within the same stratigraphic context. As for the second consideration, the difference in blade outline is no longer regarded as sufficient grounds for a type distinction. This difference is now believed to relate to a change in the function of the points of Type 5 (perhaps to hafted drilling or incising implements). In effect, a spatial-functional difference between two sets of points of the same type had been mistaken for a temporal-stylistic one. For a discussion of age and cultural affinity see Type 8.

Stratigraphic Distribution: Both specimens of Type 5 were found in Master Level 6.

Type 6 (Plate 1: 16 and 17)

(PR Vol. 2, p. 575). Complete provenience is known for only one specimen of this type: Master Level 2. Although the grid square from which the second specimen was recovered is unknown, the recorded depth strongly suggests a Master Level 7 origin. A thorough search of the literature failed to produce a comparable established type. In the Upper Ohio Valley points resembling these have been assigned a generalized Archaic date (Mayer-Oakes 1955: 147). At the Sheep Rock Shelter one specimen (for which provenience is incompletely known) was found during "clean up" of a Middle Archaic component. The second specimen was found in a Late Prehistoric context. Morphological considerations, however, favor a Transitional period assignment for both specimens. The stratigraphic location of the first is accounted for by slumpage of a sidewall and subsequent cleanup of the debris at the base of the excavation unit. The provenience of the second specimen is probably the result of redeposition, either following deep pitting of the rock shelter or through importation of the point from another site location during Late Prehistoric times.

Type 7 (Plate 1: 18)

LeCroy (PR Vol. 2, p. 576). According to Broyles (personal communication), this specimen compares favorably with the LeCroy type of West Virginia and the North Carolina Piedmont. Until recently its stratigraphic provenience was considered anomalous, as it appeared to be out of context in relation to the type's 6300 B.C. chronometric provenience at the St. Allans site (Broyles 1966: 26-27). Re-evaluation of the structure of the Sheep Rock deposit has helped to clarify the problem, such that an Early Archaic date is no longer out of the question. Ancient river erosion had created a tilted recessed terrace in the laminated shale which by Early Archaic times had filled in with weathered shale chips, silt and other natural debris to the level of the leading edge of the terrace. At the same time, large rockfall had accumulated on the surface of the terrace at the rear of the shelter producing an elevated bench in relation to the gentle southward slope of the Early Archaic living floor. It was on this bench that the LeCroy point was found. Subsequent (Middle Archaic) accumulation brought the level of the deposit to slightly in excess of the height of the bench, thus accounting for the point's apparent Middle Archaic association.

Stratigraphic Distribution: The single specimen of this type was recovered from the uppermost statum of Master Level 8.

Late Archaic

Type 8 (Plate 1: 19-24; Plate 6: 47)

Brewerton Corner-Notched (PR Vol. 2, p. 577-578). This type has been radiocarbon-dated at the Sheep Rock Shelter to B.C. 2350 ± 180 (M-1906), a date secured from an extensive hearth complex forming part of a Brewerton living floor.

Stratigraphic Distribution: Seven of the nine specimens of Type 8 were found in Master Level 6 in association with a living floor; one specimen was recovered from Master Level 2 and its context is believed to be the result of deep pitting of the site during Late Prehistoric times. The provenience of one specimen is unknown.

Late Archaic

Types 9 and 10 (Plate 1: 25 and 26, respectively)

Brewerton Side-Notched (PR Vol. 2, p. 578 - 579). Although formerly distinguished, Types 9 and 10 are now combined on the basis of size and workmanship. Neither at the Sheep Rock Shelter nor at any other site to the author's knowledge have these two varieties of Brewerton points been demonstrated to occupy consistently different

contexts. Dragoo (personal communication) feels that Types 8, 9 and 10 strongly resemble notched forms he attributes to Laurentian manifestations in the Upper Ohio Valley.

Stratigraphic Distribution: Both points were recovered from Master Level 6.

Type 11 (Plate 1: 28)

Susquehanna Broad Spearpoint (PR Vol. 2, p. 579-580). This specimen strongly resembles points of both the Brewerton Corner-Notched and Susquehanna Broad Spear types. Resemblance to the former is based on symmetry of all elements, base outline, flaking type and pattern on the blade and base, base/blade width ratio and material. Resemblance to the latter is based on length/width ratio of the blade, absence of well-defined barbs, configuration of the haft-stem-base complex and size and form of the proximal zones of juncture.

Provenience is of no help in deciding betwenn the two types, as both Brewerton and Transitional period points were found in the same stratum in contiguous squares. In this area of the site (W15-20/500 x W15-20/505) the two horizons (Late Archaic and Transitional) are stratigraphically distinct in so far as soils are concerned; but some uplifting of the older Brewerton and other Late Archaic forms has occurred.

Thus the assessment of cultural affinity must be based on morphological considerations alone. Such considerations favor a Transitional assignment in contradistinction to the author's previous Brewerton designation. In particular, notches tend to be broad rather than narrow; shoulders project distally from the medial axis rather than horizontally or proximally; proximal zones of juncture are broadly angular (almost forming obliquely oriented intermediate subelements) rather than slightly rounded; length/width ratio of the blade falls within the range of variation of the Susquehanna Broad Spear type and only on the upper end of the Brewerton distribution.

Chronometric dating of the Susquehanna Broad Spear complex has not been firmly established. When first defined, Witthoft (1953:4) suggested a date of about 1000 B.C., later revised to an initial date of 1500 B.C. (McCaun 1962: 55). Still later Ritchie (1959; 1965: 156) reported radiocarbon dates for two related complexes in New York, the Frost Island phase (B.C. 1250 ± 100 (Y-1274) and the Orient phase (c. 1050-750 B.C., based on a series of five radiocarbon determinations), believed to either overlap with (Frost Island) or post date by some centuries (Orient) Susquehanna manifestations in Pennsylvania. He concludes that in New York the Transitional period ranges from about 1300 to 1000 B.C. (Ritchie 1965: 149). More recently, Kinsey (1968: 245-247) obtained a date of B.C. 1720 ± 100 (Y-1826) for the Lehigh complex of the Transitional period at the

Peters-Albrecht site in the Upper Delaware River Valley in Pennsylvania, thus providing strong support for Witthoft's claim of an earlier occurrence of the Susquehanna Soapstone Culture in Pennsylvania. Additional support comes from a radiocarbon date of B.C. 1720 ± 120 (Y-2587) recently obtained at the Miller Field site on the New Jersey side of the Upper Delaware River Valley (Kraft 1969: 32). If Witthoft's largely unitested hypothesis that the Susquehanna Soapstone Vessel complex is antecedent to as well as contemporaneous with the Lehigh and Perkiomen complexes is correct, then these radiometric findings indicate that his estimated chronology for the Transitional cultures should be revised and that the Susquehanna complex may date from the earliest centuries of the second millenium B.C. A tentative range may therefore be conservatively set at 1800 (± 100)-1000 B.C., with Type 11 holding an early position in this range.

Stratigraphic Distribution: The single specimen of this type was recovered from Master Level 5.

Type 12 (Plate 1: 27;)

Perkiomen Broad Spearpoint (PR Vol. 2, p. 580). In his field notes for the square in which this specimen was found, Witthoft refers to the point as a Perkiomen Broad Spear, in contradistinction to this author's previous Brewerton classification, which is now discarded. Indeed, it conforms in almost every essential detail to Witthoft's (1953: 16-19) definition of the type, including (1) grinding on all edges of the haft-stem-base complex, (2) plano-triangular transverse section of the blade and (3) manufacture from Jasper (Bald Eagle rather than Pennsylvania jesper in this case). The critically misleading feature of the point is its considerably reworked blade.

The Perkiomen complex is one of several believed by Witthoft (1953: 18-19) to have derived from the Susquehanna Soapstone Vessel complex and to date from the same general time period (ca. 1500-1000 B.C.). Recent excavations at the Miller Field site in the Upper Delaware River Valley of New Jersey have yielded the only radiocarbon date for this complex, B.C. 1720 ± 120 (Y-2587) (Kraft 1969: 32). This date is almost identical to that obtained by Kinsey (1968: 245-247) for a Lehigh component at the Peters-Albrecht site in the same general area (B.C. 1720 ± 100 (Y-1826)) and lends support to the argument for a revision of Witthoft's estimated chronology for the Transitional Cultures, as outlined under Type 11

Stratigraphic Distribution: The single specimen of this type was recovered from Master Level 5.

Late Archaic Type 13 (Plate 1: 29-35)

Hellgramite Point (PR Vol. 2, p. 580). This type was found in vertical proximity to (above and below) a deposit radiocarbon-dated at B.C. 2350 ± 180 (M-1906) and is believed to be fully contemporaneous with Brewerton Type 8 points discussed above.

Stratigraphic Distribution: Seven specimens were recovered from Master Level 6, one specimen from Master Level 2. This last specimen may have been introduced into the deposit during Late Prehistoric or Historic times.

Late Archaic Type 14 (Plate 1: 36 and 37)

Brewerton Eared-Notched (PR Vol. 2, p. 581). See age and cultural affinity section under Type 23.

Stratigraphic Distribution: Both specimens of Type 14 were recovered from Master Level 6.

Type 15 (Plate 1: 38 and 39)

(PR Vol. 2, p. 582). No comparable examples for this type were found in the literature. Both points are morphologically identical and were found in contiguous Terminal Archaic to Transitional contexts. The blade outline of one specimen is sharply incurvate above the shoulders where numerous hinge fractures indicate considerable reworking of the blade, perhaps for use as a drill. The equally weak development of the shoulders on the second specimen may also be a function of reworking of the blade. Irrespective of the original form of the blade, the broad, expanding basally outflaring stem, the ground condition of the base and haft elements, the use of rhyolite and the multifunction-adapted, stylistically uniform haft-stem-base complex are all common features of Transitional period points. Spatial association of the type, both vertically and horizontally, with established Transitional forms at the Sheep Rock Shelter further supports this interpretation. Estimated chronometric provenience is 2000-1500 B.C.

Stratigraphic Distribution: Both specimens of Type 15 were recovered from Master Level 5.

Late Archaic Type 16 (Plate 1: 40 and 41)

(PR Vol. 2, p. 583). Pentagonal points, either in the form of blanks or finished pieces, constitute elements of at least three major complexes: (1) Brewerton, which includes a relatively large, roughly-prepared contracting stem variety (Ritchie 1961: 28); (2) the major complexes of the Transitional period in Pennsylvania (Susquehanna, Perkiomen and Lehigh), in which pentagonal points served as blanks (Witthoft 1953: 28); (3) Jack's Reef, in which a small well-executed parallel-sided variety is a diagnostic element (Ritchie 1961: 28). Both morphological and stratigraphic considerations favor a Brewerton designation for the Sheep Rock Shelter specimens and a Late Archaic date of 2500-2000 B.C.

Stratigraphic Distribution: Both specimens were recovered from Master Level 6.

Late Archaic Type 17 (Plate 1: 42-43)

Rossville (PR Vol. 2, p. 584). As previously discussed. Stratigraphic evidence suggests a date of 2000-1700 B.C. for these points.

Stratigraphic Distribution: Two specimens were recovered from Master Level 5; one specimen was found in Master Level 4 where Levels 4 and 6 are contiguous.

Late Archaic Type 18 (Plate 2: 1 and 2)

Wading River (PR Vol. 2, p. 585). Though smaller in size, in general form these points resemble the Bare Island Type A defined by Kinsey (1959: 115). Type 18 bears an even stronger resemblance to the recently defined Wading River point (Ritchie 1965b: 136-137; 1969: 241-242), with which the Bare Island series intergrades (Ritchie 1969: 242). The Wading River point is a diagnostic of the Squibnocket Complex of the New England coast but ranges inland and southward into the Middle Atlantic region. This type was radiocarbon-dated at the Hornblower II site in Martha's Vineyard to B.C. 2190 ± 100 (Y-1529) and at the Sylvan Lake Rock shelter in the Hudson Valley to B.C. 2210 ± 140 (Y-1536). These dates accord very well with the stratigraphic provenience of Type 18 at the Sheep Rock Shelter where they were found in a mixed stratigraphic unit containing both Brewerton Corner-Notched (Type 8) and several varieties of Transitional points (Types 11, 15, 19 and 20) and overlying a Brewerton living floor radiocarbon-dated to B.C. 2350 ± 180 (M-1906). The mixing is attributed to

a Transitional hearth dug into the underlying Late Archaic deposit, which, it is believed, originally contained the Type 18 points.

Stratigraphic Distribution: Both specimens of Type 18 were recovered from Master Level 6.

Late Archaic

Type 19 (Plate 2: 13 and 14)

Savannah River (PR Vol. 2, p. 585). Broyles (personal communication) has identified one of the two specimens of this type (Plate 2: 14) as a Savannah River point while holding some reservations about the other (Plate 2: 13), largely because of its outflaring stem. This assignment is fully compatible with the points' stratigraphic context, which is interpreted to be Terminal Archaic to Transitional in date (ca. 2000 B.C.).

Stratigraphic Distribution: These specimens were found in Master Levels 6 and 5 near the interface of the two levels in each case.

Type 20 (Plate 2: 3)

Susquehanna Broad Spearpoint (PR Vol. 2, p. 586). As previously discussed.

Stratigraphic Distribution: The single specimen of this type was recovered from Master Level 5.

Type 21 (Plate 2: 4-9)

Frost Island (PR Vol. 2, p. 587). The points of Type 21 compare very favorably in all respects with those of the Frost Island complex defined by Ritchie (1965: 155-163). At the Sheep Rock Shelter they appear to be in a stratigraphic context intermediate between Transitional Types 15/20 and 30/35 and contemporaneous with Types 12, 25 and 28. Whether these relative stratigraphic relationships reflect real temporal differences is not certain at this time. The Frost Island phase has been radiocarbon-dated at the O'neil site in New York to B.C. 1250 $\pm$ 100 (Y-1274), a date consistent with stratigraphic findings at the Sheep Rock Shelter where a similar date of B.C. 1270 $\pm$ 180 (M-2085) was obtained from a small hearth lacking definitive associations but believed to be associated with the Frost Island phase component (Bebrich and Willey, p. 57-58 and 65, this volume).

Stratigraphic Distribution: Type 21 has a rather wide vertical distribution, with two specimens having been recovered from Master Level 5, one specimen from Master Level 4 and two specimens from Master Level 2. All of the points are believed to have derived from Master Level 5. The provenience of the points recovered from Master Level 2 is the product of deep pitting of the western end of the site during Late Prehistoric times. The assignment of one specimen to Master Level 4 is an artifact of stratigraphic reconstruction: the specimen was found at the interface of Master Levels 4 and 6, and the lack of a sufficient quantity of diagnostic materials disallowed the clear definition of a Transitional component in this area of the site (E10510).

Late Archaic Type 22 (Plate 2: 10-12, 15 and 16)

Bare Island (PR Vol. 2, p. 588-589). According to Funk (personal communication), these points compare favorably with Bare Island and related forms (Kinsey's Bare Island Type A and Ritchies Wading River point), an observation in good agreement with stratigraphic and associational evidence at the Sheep Rock Shelter. In the Preliminary Report the author mistakenly assigned them to the Lamoka type-cluster, an appellation herewith discarded. In contrast to Lamoka points, specimens of Type 22 have well worked bases and are generally more carefully prepared. The stratigraphic provenience of the three specimens from Master Levels 5 and 6 (believed to represent the original context of all of the points of this type) suggests a post-Brewerton and pre-Transitional chronometric provenience (ca. 2000-1800 B.C.).

Stratigraphic Distribution: Two specimens of this type were recovered from Master Level 6, one specimen from Master Level 5 and two specimens from Master Level 2. The remaining two specimens were recovered during a general cleanup of the site and lack stratigraphic provenience. All of the points are believed to have derived from the interface of Master Levels 5 and 6.

Late Archaic Type 23 (Plate 2: 18-20; Plate 6: 49)

(PR Vol. 2, p. 589). While these points and those of Type 14 in some ways resemble such forms as Brewerton Corner-Notched, Eared-notched and Side-notched points, Funk (personal communication) cautions that it would be unsafe to refer them to New York Laurentian influence. To this list may be added Types 9-10 and 13. All of these forms are stratigraphically closely associated with Types 8, 16 and 18 and with an extensive hearth complex radiocarbon-dated at B.C. 2350 ± 180 (M-1906).

One specimen of Type 23 (Plate 6: 49) was reworked into a hafted end scraper.

Stratigraphic Distribution: Three specimens were recovered from Master Level 6; the remaining point was taken from a Late Prehistoric context in Master Level 2 and its provenience is probably the result of deep pitting of the site during this period.

Late Archaic

Type 24 (Plate 2: 21 and 22)

Genesee (PR Vol. 2, p. 589-590). These points were previously affiliated with the Genesee type on the basis of similarity in size, shape, proportions, thickness and workmanship, all of which properties compared more or less favorably with the New York type, as defined by Ritchie (1961: 24-25, 77). According to Funk and Ritchie, however, these specimens appear to more closely resemble the Savannah River type (personal communication). It is difficult for the author to reconcile this observation with the at least equally obvious differences between the Sheep Rock Shelter specimens and those of the Savannah River type, as defined by Coe (1964: 44-45), particularly in regard to preparation of the stem and base. Moreover, they are certainly very different from the Type 19 Savannah River point identified by Broyles. Since the New York Genesee and North Carolina Savannah River types are approximately coeval in time (the former radiocarbon-dated to between B.C. 2013 ± 80 (Y-459) and B.C. 1723 ± 250 (W-545) at the Frontenac Island site and the latter to B.C. 1944 ± 250 (M-524) at the Gaston site), and since specimens having affinities with virtually all of the major Transitional complexes are to be found at the Sheep Rock Shelter, the combining of modes of two or more point varieties, as may be manifested in Type 24, should not be unexpected.

Stratigraphic Distribution: Both specimens of this type were recovered from Master Level 6.

Type 25 (Plate 2: 23 and 24)

Susquehanna Broad Spearpoint (PR Vol. 2, p. 590). As previously discussed.

Stratigraphic Distribution: One specimen of this type was recovered from Master Level 4 and the other from Master Level 3. Both are believed to have been deposited sometime during the accumulation of Master Level 5.

Type 26 (Plate 2: 25-27)

(PR Vol. 2, p. 591). As previously discussed.

Stratigraphic Distribution: Two specimens of this type were recovered from Master Level 4; the third was found in a disturbed context in Master Level 3.

Type 27 (Plate 2: 28 and 29)

(PR Vol. 2, p. 592). As previously discussed.

Stratigraphic Distribution: Both specimens of this type were recovered from Master Level 3.

Type 28 (Plate 2: 30)

(PR Vol. 2, p. 593). As previously discussed.

Stratigraphic Distribution: This specimen was recovered from Master Level 3. The point is believed to have originally been deposited in Master Level 5 and to have redeposited during the preparation of a deep Middle Woodland hearth.

Type 29 (Plate 2: 31-40)

Juniata Stemmed (PR Vol. 2, p. 593). Stratigraphic evidence at the Sheep Rock Shelter suggests that Type 29 may have persisted into Middle Woodland times (the specimens shown Plate 2: 39 and 40 have morphological properties in common with some Middle Woodland points of this area and derive from a stratigraphic context which suggests a Middle Woodland origin). Although widespread throughout the western drainage of the Susquehanna River, the type has not been previously formally defined or named. It is hereafter referred to as the Juniata Stemmed point and is considered a predominant and diagnostic style of the Early Woodland period (ca. 1000-500 B.C.) in this area.

Stratigraphic Distribution: Four specimens of Type 29 were found in Master Level 4, five in Level 3 and two in Level 2. One specimen lacks stratigraphic provenience. Most, if not all of the specimens, probably derive from Master Level 4.

Type 30 (Plate 2: 41 and 42)

(PR Vol. 2, p. 594). The author now holds a less decisive view concerning the cultural affinity of the specimens of this type. It was suggested in the Preliminary Report that Type 30 is a variant of the Perkiomen Broad Spearpoint defined by Witthoft (1953: 16-20) and discussed by Ritchie (1961: 42-43; 1965: 153-154). In form it approximates more closely the New York examples of the Perkiomen point from which Type 30 deviates principally in the form of the blade. Even allowing for this factor, however, the similarity of these points to those within the modal range of the Perkiomen Broad Spear is still not great. Some similarities in the configuration of the haft-stem-base complex of Type 30 and Type 29 (Juniata Stemmed) are also recognized, and it is therefore possible that Type 30 is an Early Woodland point variety. Unfortunately, its stratigraphic provenience is of no help in clearifying chronometric origin, as two of the specimens were found in a disturbed Late Woodland context (resulting from deep Susquehannock pitting of the site) and vertical provenience of the third specimen (Plate 2: 42) is unknown. All, however, clustered around Square W10S10, which is well within the circumscribed activity area of Transitional period occupation at the site (see p. 81, this volume), and around which several specimens of Type 29 (Plate 2: 31-33, 35-37) with similar vertical proveniences were recovered.

Stratigraphic Distribution: Two of the points were recovered from disturbed contexts in Master Level 2 (one from a pit and the other from a deep hearth); vertical provenience is lacking for the third specimen, and it is arbitrarily assigned to Master Level 4, from which it is believed all of the points originated.

Type 31 (Plate 2: 44)

Snyders Notched (PR Vol. 2, p. 595). As previously discussed.

Stratigraphic Distribution: One specimen was recovered from Master Level 3; the second specimen was found in a Late Prehistoric pit in Master Level 2.

Type 32 (Plate 2: 45)

Juniata Stemmed (PR Vol. 2, p. 596). Although deviant in configuration of the haft-stem-base complex, its proportions and rough appearance argue for inclusion in Type 29 (Juniata Stemmed).

Stratigraphic Distribution: This point was found in a Late Prehistoric hearth in Master Level 2 and is believed to have originally been deposited in Master Level 4.

Type 33 (Plate 3: 1 and 2)

(PR Vol. 2, p. 596-597). A search of the literature failed to reveal a comparable established type with which these points may be associated. One of the specimens (Plate 3: 1) is remarkably similar to a point excavated from the Cain mound in New York (Ritchie 1965: 219 (Plate 74: 5)). According to Ritchie (Ibid: 221), "The Cain mound cannot be identified with any well-defined cultural manifestation. It probably belongs to the late Hopewellian time period...," a single radiocarbon date for which (A.D. 160 ± 80 (Y-1276)) has been obtained from the Lewiston mound in New York (Ibid: 216).

According to Broyles (personal communication), if the base of the damaged second specimen (Plate 3: 2) were complete and slightly subconcave she would classify it as a Kanawah point.

The two points were classified together on the basis of edge treatment of the blade (both are serrated and articulate with the haft in angular zones of juncture) and configuration of the stem (both are rectangular). They differ principally in orientation of the shoulders (acute vs. oblique) in treatment of the base (absence vs. presence of retouch) and in blade outline (ovate vs. incurvate).

The author is inclined to agree with Broyles and suggest that the latter specimen is not indigeneous to the site. The former specimen, on the other hand, is believed to be indigeneous to the rockshelter and to have been moved out of context by Late Prehistoric pitting of the deposit. The above-cited radiocarbon date is consistent with ceramic findings of the site, although definitive association of this point with the Sheep Rock Cordmarked ceramic type cannot be established.

Stratigraphic Distribution: Both specimens were recovered from Master Level 2.

Type 34 (Plate 3: 3)

(PR Vol. 2, p. 597). Type 34 probably dates to either the late Middle Woodland or early Late Woodland period. Its cultural affinity, however, is unknown as no comparable established type could be found in the literature. It is differentiated from the Middle Woodland specimen of Type 33 (Plate 3: 1) by its larger size, by absence of serration of the blade, and by the absence of facial retouch of the blade (which is a function of the biplano cross section of the flake blank from which the point was fashioned). In all other respects, including lack of retouch of the base, and configuration of the haft-stem-base complex, the two points are very similar, and the type distinction may, therefore, be unwarranted.

Stratigraphic Distribution: This specimen was recovered from a Late Prehistoric pit in Master Level 2 and is believed to derive from Level 3.

Type 35 (Plate 3: 4)

(PR Vol.2, p. 598). As previously discussed.

Stratigraphic Distribution: This specimen was recovered from Master Level 2 and is believed to have originally been depointed in Level 4 or 5.

Type 36 (Plate 3: 5)

(PR Vol. 2, p. 598-599). As previously discussed.

Stratigraphic Distribution: This specimen was recovered from Master Level 2.

Along with the addition of several new specimens to the triangular category, the entire triangular point collection has undergone a thorough reexamination resulting in some minor changes in descriptive criteria, reclassification of a few points and a general clarification of typological boundaries. As a result, some redundancy will be found in the triangular point type discussions which follow.

Type 37 (Plate 3: 7-11, 13, 15, 17, 22 and 38)

General Description: Type 37 is characterized by triangular or slightly ovate blades, straight subconcave bases, pressure-flaked surface treatment, moderate-small dimensions, and a distinctively small length/width ratio averaging about 1.1:1 and never exceeding 1.2:1. This latter feature is the type's only diagnostic property (i.e., which serves to distinguish it from all other triangular point types) and is a function of its basically equilateral form. In longitudinal section most examples are symmetrically or asymmetrically biconvex and are often biterminally asymmetrical. The transverse section is more often asymmetrically than symmetrically biconvex. Specimens of Type 37 are made of various grades of chert.

Stratigraphic Distribution: One specimen of this type was found in Master Level 1; 17 specimens were recovered from Level 2. The remaining specimen was found out of context in Master Level 6, probably as a result of sidewall slumpage.

Age and Cultural Affinity: Type 37 is very similar to the Levanna type defined by Ritchie (1961: 31) for the New York area where it made its first appearance around 700 A.D. in late Middle Woodland times. After 900 A.D. it became the dominant projectile point form and persisted throughout the Late Woodland period into the 14th century, a time span which may be postulated for the Sheep Rock Shelter. The type is particularly associated with Owasco culture, also represented at this site, and appears to have undergone a gradual modification towards a smaller and more isosceles form in later Owasco times (Ritchie 1965: 275-276). Though the historical sequence is somewhat different in Pennsylvania a similar pattern is observed at Sheep Rock.

Type 37 cannot be unequivocably identified with the Levanna type for two important reasons:

(1) Morphologically, although within the range of variation of the Levanna type, Type 37 is on the average smaller than a random sample of equilateral Levanna triangles. Moreover, the bases of most of the Sheep Rock specimens are straight rather than subconcave.

(2) It is not known to what extent points of the Clemson's Island variety may be included in Type 37, as the former have not been defined in the literature and due to the highly disturbed nature of the Late Woodland deposit at the Sheep Rock Shelter definitive associations between Clemson's Island pottery and points cannot be established.

Type 38 (Plate 3: 6, 12, 14, 16, 18-21, 36, 37, and 39)

General Description: In outline, blades of this type are distinctly more isosceles than in Type 37. Bases are predominantly subconcave, sometimes straight. The length/width ratio of these points averages 1.4:1, differing significantly from Type 37 (but not from Type 39), due principally to an increase in length relative to the width, which is virtually the same in both. In all cases surface treatment involves skillful pressure-flaking. Longitudinal and transverse cross-sections are almost always asymmetrically biconvex. Most specimens are made of a black, fibrous-interior, translucent chalcedony of high quality; others are made of various shades of light-gray, glassy chert.

Stratigraphic Distribution: Twelve specimens were removed from Master Level 2; the provenience of one specimen is unknown.

Age and Cultural Affinity: Type 38 is virtually indistinguishable from the Shenk's Ferry triangular points recovered from the Blue Rock site by Heisey and Witmer (1964: 20). Shenk's Ferry occupation dates to the Proto-Historic of about 1400-1550 A.D.

Type 39 (Plate 3: 23-34)

General Description: The predominant blade form of this type is triangular; occasionally, specimens may be ovate or incurvate. Base outline is somewhat variable but is most often subconcave or straight. Basal corners are either rounded or angular. Surface treatment generally involves skillful pressure-flaking. Type 39 has the largest length/width ratio of all the triangular variants, averaging about 1.5:1, and in a few very isosceles examples is as much as 2.3:1. However, in this parameter it is statistically distinct only from Type 37. Length and width comparisons present a different picture. In width, Type 39 is the smallest of the point types; in length it is indistinguishable from Type 37, while both are significantly smaller than Type 38. Most specimens tend to be a combination of biterminally-asymmetrical biconvex and asymmetrically biconvex in longitudinal section, and in transverse section all are asymmetrically biconvex. Gray, brown and black glassy cherts are the materials from which most specimens of this type are made. Occasionally, black chalcedony or a fine-grained chert is also used.

Stratigraphic Distribution: Twenty-four specimens of Type 39 were excavated from Master Level 2 and one specimen from Master Level 4. The provenience of three specimens is unknown.

Age and Cultural Affinity: This type corresponds to the Madison points described by Ritchie (1961: 33-34). It is a Late Woodland to Proto-Historic form diagnostic in the Northeast of Iroquoian occupation and is the culmination of a shift towards a more isosceles form from early Owasco to Late Iroquois (Ibid.; Ritchie 1965:275-276). In central and eastern Pennsylvania the type is most closely associated with the Historic Iroquois Susquehannocks. Type 39 is virtually indistinguishable from the group of Susquehannock triangular points recovered from the Blue Rock site by Heisey and Witmer (1964: 20).

Type 40 (Plate 3: 37-39)

(PR Vol. 2, p. 605). Specimens of this type have been reclassified to Types 37 and 38 for lack of evidence at the Sheep Rock Shelter suggesting a unique cultural context for the points and the lack of defined complexes elsewhere which demonstrate the

validity of this type. Only in one trait, base outline, do these points differ from the respective types to which they have been assigned. One specimen (Plate 3: 38) is now included in Type 37; the remaining specimens (Plate 3: 36, 37 and 39) have been assigned to Type 38.

Stratigraphic Distribution: Three specimens were recovered from Master Level 2. One specimen was found out of context in Master Level 6, probably as a result of side wall slumpage.

Type 41 (Plate 3: 40-46)

(PR Vol. 2, p. 605). This type has undergone considerable modification as the result of reclassification of several specimens to other functional categories. Many of the specimens included in the type because of their approximately triangular geometric form were reclassified as retouched flakes and/or tool rejects. Three specimens of more regular form possessed prepared graver bits and were transferred to the Incising Tool category. The specimens retained in Type 41 are those which it is believed could have functioned as projectile points and lack evidence of use in other capacities. Re-evaluation of the stratigraphic distribution of these latter specimens and their dimensional properties suggests that they probably are the products of more than one culture-historical context and may be poorly prepared forms of the triangular types already discussed.

Stratigraphic Distribution: Ten specimens were recovered from Master Level 2; one specimen was found in Master Level 3; the provenience of one specimen is unknown.

Type 42 (Plate 3: 47-49)

(PR Vol. 2, p. 608). This point variety (former Knife Type N) was reclassified from the Knife functional category and includes three points of identical morphological composition. The type is characterized as relatively large, with a triangulo-ovate blade outline, biconvex longitudinal and transverse sections and subconcave base with rounded proximal zones of puncture. Surface treatment is noticeably bolder than found among specimens of Types 37-39. Lateral edges are occasionally slightly irregular. Length/width ratio averages about 1.5/1.

Stratigraphic Distribution: All three specimens of this type were recovered from Master Level 2.

Age and Cultural Affinity: Along with Type 43 Type 42 constitutes one of the larger, generally more isoceles varieties of the Levanna type defined by Ritchie (1961: 31, 87). The Levanna type first appeared in New York around 700 A.D. and became the dominant point form of the Late Woodland period after 900 A.D., persisting well into the 14th century. (Ritchie 1965: 275-276).

Type 43 (Plate 3: 50)

(PR Vol. 2, p. 608). This point form (former Knife Type O) was also reclassified from the Knife functional tool category and includes only one specimen. It is characterized as a relatively large triangular point with a triangulo-ovate blade outline which joins with a subconcave base in angular proximal zones of juncture. This latter property (angular blade-base articulation) is the only significant way in which it differs from Type 42. Both the longitudinal and transverse cross-sections are biconvex. Length/width ratio is 1.6/1.

Stratigraphic Distribution: The only specimen of this type was recovered from Master Level 2.

Age and Cultural Affinity: This point is probably another variant of the Levanna isoceles triangle (Ritchie 1961: 31, 87) and dates from the early Late Woodland period (ca. 700-1350 A.D.).

Type 44 (Plate 3: 51 and 52)

(PR Vol. 2, p. 608). This point type (former Knife Type P) is also reclassified from the Knife functional tool category, even though one of the two specimens shows heavy wear of the distal portion of both lateral edges of the blade. The type is characterized by an isoceles-ovate blade, concave base, rounded proximal zones of juncture and a rough appearance which is probably a function of the relatively poor quality of material. Both specimens of Type 44 are smaller than those of either Types 42 or 43 but considerably larger than any of the points of Type 37, the smallest of the Levanna varieties. In spite of the rough appearance, edge treatment is generally regular. Length/width ratio is the largest for any of the Levanna varieties and averages 1.8/1. Both the longitudinal and transverse cross-sections are asymmetrically biconvex.

Stratigraphic Distribution: One specimen of Type 44 was found in Master Level 1 and the other in Level 2. Both were found in the same square (E20S00).

Age and Cultural Affinity: Both stratigraphic context and cultural associations suggest a Susquehannock origin for these points dating from 1550 to 1580 A.D.

Type 45 (Plate 4: 27-29)

General Description: This is a medium-sized triangular point type with a length/width ratio ranging from 1.5/1 to 1.7/1 and averaging 1.6/1. Both the longitudinal and transverse sections are biconvex; one perhaps incompletely worked specimen is plano-convex in both sections. Blade outline is ovate and is slightly asymmetrical. The blade joins with the base in angular or slightly rounded zones of juncture. The base is straight in all cases. Edge form is regular along most edges and the margins have been systematically pressure retouched. Two specimens are made of fine-grained dark gray chert. The third specimen is made of Bald Eagle jasper. The blade asymmetry of specimens of Type 45 suggests that they may have been used as knives, as well as projectile points.

Stratigraphic Distribution: All three specimens of this type derive from the lower strata of Master Level 2.

Age and Cultural Affiliation: The stratigraphic contexts of these distinctive points indicates an early Late Woodland chronometric origin. The larger, isoceles variety of the Levanna triangle rarely exhibits the straight base and angular proximal zones of juncture found in these specimens. It is, therefore, suggested that they are the product of a different cultural group, probably Clemson's Island, as ceramics of this group are well-represented at the rock shelter and no other complex (besides Owasco-Carpenter-brook, which is also represented) is known for this time period. It is hoped that future studies of the Clemson's Island culture will clarify the morphological nature of associated triangular points.

Type 46 (Plate 3: 53 and 54)

Fox Creek Stemmed (PR Vol. 2, p. 609). This type (former Knife Type V) represents the last of the points to be transferred from the Knife functional category. It is characterized by a broad, moderately long ovate blade, borad shallow haft elements, weakly developed shoulders which join with the blade in angular distal zones of juncture and a straight base. The stem expands gently away from the longitudinal axis, flanging outward at the base with which it joins in angular zones of juncture. Length/width ratio averages 1.9/1. Both the longitudinal and transverse cross-sections are asymmetrically biconvex. Edge treatment is more or less regular even though surface treatment is quite bold.

One specimen is made of Bald Eagle jasper and the other of a fine grained gray chert.

Stratigraphic Distribution: Both specimens were recovered from Master Level 2.

Age and Cultural Affinity: This type closely resembles the Fox Creek Stemmed point recently defined by Funk (1968: 1-7). Formerly called the Steubenville Stemmed point (Ritchie 1961: 51-52), its chronometric provenience was a subject of considerable controversy, with estimates ranging from Early Archaic to Woodland times. Funk (1968: 1-7), however, has reported that points conforming to the Steubenville Stemmed type constitute a dominant style in the recently defined late Middle Woodland Fox Creek complex of New York. This provenience is based on the unequivocal association of the points with Middle Woodland ceramics at the Westheimer and Fredenburg sites. Radiocarbon dates of A.D. 410 ± 80 (Y-2350) and A.D. 450 ± 80 (Y-2349) were obtained from the Westheimer site, while the Fredenburg site yielded a date of A.D. 360 ± 100 (I-3442) for a component of this complex. According to Funk, "The ceramics evince relatively late connections with the Middle Woodland... but represent a developmental stage preceding the Kipp Island styles" (Funk 1968: 3).

At the Sheep Rock Shelter one of the specimens was recovered from a Late Prehistoric pit. The provenience of the second specimen suggests either a late Middle Woodland or early Late Woodland origin.

Type 47 (Plate 3: 55)

Jack's Reef Corner-Notched. This is a new type recently added to the collection.

General Description: The specimen is moderately large in length and width and is thin relative to other dimensions. Length/width ratio is 1.6/1. The blade is ovate-pentagonal in outline (i.e., one lateral edge is curved, the other angular) and is nearly biplano in transverse section. The longitudinal section is biplano. The upper subelement of the haft forms an acute angle with the blade and joins with it in angular distal zones of juncture. The stem expands outward rapidly towards the base, such that the lower subelement of the haft articulates with the base in angular proximal zones of juncture. The base is straight and evenly ground. Notches forming the haft are leveled. Preparation involved the skillful percussion flaking of the flake blank, which resulted in large overlapping expanding scars, followed by fine pressure retouch along the periphery of the blade and base. Formation of the notches was also accomplished by a pressure technique. The specimen is made of a fine grained opaque black chert.

Stratigraphic Distribution: The only specimen of this type was found in a disturbed context in Master Level 2 and is believed to derive from Master Level 3.

Age and Cultural Affinity: This specimen is a classic example of the Jack's Reef Corner-Notched type defined by Ritchie (1961: 26) and is a manifestation of the late Middle Woodland to early Late Woodland period encompassed by the Point Peninsula 2 and 3 complexes and by the early Owasco Carpenterbrook complex. The point was founed below and may be associated with a Clemson's Island hearth dating to the earliest part of the Late Woodland period. On stratigraphic grounds the context of the point is judged to be probably not older than late Middle Woodland, so that it appears to have been recovered from an appropriate context.

Type 48 (Plate 2: 43)

General Description: This specimen is moderately large in all dimensions. Length/width ratio is 1.7/1, and the area of maximum thickness occurs between the shoulders. In both longitudinal and transverse cross-sections the specimen is asymmetrically biconvex. Blade outline is ovate and symmetrical haft elements are moderately deep and broad and are symmetrical. The blade and haft join obliquely in angular distal zones of juncture. The upper subelement of the haft slopes proximally and joins at right angles with the lower subelement in rounded medial zones of juncture. The stem expands away from the longitudinal axis and joins with a straight base in nearly angular proximal zones of juncture. Both the upper and lower subelements of the haft are straight in form. The base is evenly chipped and unground. Edge treatment is even over most of the point. Secondary retouch of the surface of one face consists of discontinuous sets of parallel lamellar flakes. The opposite face is retouched primarily along the lateral edges. A remnant of the striking platform still remains along the distal portion of one lateral edge of the blade near the tip. The point is made of Flint Ridge, Ohio, chalcedony.

Stratigraphic Distribution: The single specimen of this type was found in a Late Woodland hearth in Master Level 2 and dug into the underlying Master Level 3 in which it is believed to have originally been deposited

Age and Cultural Affinity: A search of the literature failed to reveal a previously defined type with which this point may be identified. The author has observed similar points from both the western drainage area of the Susquehanna River and from Venango County, Pennsylvania. In the latter area, points of this type appear to date from late Middle Woodland to early Late Woodland times (Sue Ann Curtis: personal communication), as its stratigraphic context at the Sheep Rock Shelter suggests. Although made of different material, the specimens referenced below from the Gromiller Cave site on the Frankstown Branch of the Juniata River are excellent "look-a-likes" for this type (note especially the characteristic configuration and asymmetry of the haft-stem-base complex).

Reference: Stackhouse 1965, p. 115 Fig. 8, 2nd row from top, 2nd and 3rd specimens from left.

TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ML																										
1																										
2 a b						1		1					1								2	2	1			
3																									1	1
4																	1				1				1	2
5											1	1			2				1	1	3	1				
6					2			7	1	1			7	2		2	2	2	1			2	3	2		
7 a b		6	3	2		1																				
8	2						1																			
ID								1														2				
S-t.	2	6	3	2	2	2	1	9	1	1	1	1	8	2	2	2	3	2	2	1	6	7	4	2	2	3

TYPE	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		Sub-total	
ML																									
1											1							1							2
2 a b			2	2	1	1	2	1	1	1	12 5	12	24	3	7 3	1 2	1	1	1 2	2	1			(79) (17)	96
3	2	1	5	1	1							1			1							1			15
4			4										1												10
5																									10
6											1			1											36
7 a b																								(6) (6)	12
8																									3
ID			1									1	3		1										9
S-t.	2	1	12	3	2	1	2	1	1	1	19	14	28	4	12	3	1	2	3	2	1	1			193

Table 1. FREQUENCY DISTRIBUTION OF PROJECTILE POINTS BY MASTER LEVEL

NON-PROJECTILE POINT ARTIFACTS

The author's previous discussion of these artifacts was designed principally to inventory the variety manifested in the limited collection then available for study. It was not intended to serve as an adequate treatment of functional and morphological variation and made no attempt to explicate the cultural affinities of the forms discussed. These omissions are the subject of this section, which is intended to supercede the earlier discussion.

A thorough reanalysis of the stratigraphy of the rockshelter (Bebrich and Willey, this volume) has permitted an understanding of associational relationships, age and cultural affinity far beyond that which might have been attempted at the time of the Preliminary Report. An important conclusion of the reanalysis is that over most of the site's accumulational history the deposit exhibits a high degree of integrity, i.e., little mixing of major period stratigraphic units has occurred. Thus the site's long occupational sequence presents an important opportunity for the study of "assemblage" variation overtime within a single environmental zone.

Non-projectile point lithic artifacts are rarely given a high degree of systematic treatment and generally hold in the literature about the same relationship to projectile points that "other" clay artifacts do to pot sherds. Comparable formal and functional data on non-projectile point artifacts are skimpy in both quantity and quality. A projectile point may be a good time and cultural marker but knives, drills and other artifacts may be equally good markers, and these account for better than 75% of most shaped artifact assemblages. They, in addition, fill out the behavioral picture, of which the projectile point is only one aspect.

The principal objective of this section is to treat these so-called "non-diagnostic" forms with the same rigor as that applied to the projectile points in regard to both the description of morphology and the elucidation of age and, where possible, cultural affinity. The method of classification used here is as follows:

(1) Functional Classification

The lithic collection was first examined for range of variation in functional bits designed for specific classes of operations. A functional bit is defined as an edge and/or area of an artifact designed and/or used to accomplish a specific operation. An operational class consists of a set of specific operations which define the class; thus, we may speak of cutting as an operational class in which implements are used in the manner of a knife for such specific operations as wood cutting, bone cutting, meat cutting, fiber cutting, i.e., all the specific uses to which a knife might be put. These operations and the functional bits designed and/or used to accomplish them may be identified on the basis of morphological and wear properties

of the artifact (Frisson 1968; Semenov 1967; Wilmsen 1968). Such properties may include shape and location of the bit; and the kind, location, orientation and degree of wear. In this report we shall be concerned only with operational classes rather than specific operations, as identification of the latter is at this time incomplete.

Dealing, then, only with the level of operational classes, the range of functional bits identified in the collection is presented in Table 2. This table has been arranged according to two broad categories of activities, as defined by Binford and Binford (1966: 268): (1) Extractive and (2) Maintenance tasks. Extractive implements include those technomic artifacts used directly in the acquisition of subsistence items and raw materials. Maintenance implements include those technomic, socio-technique and ideo-technique artifacts used (1) in the preparation of subsistence items for distribution and consumption, (2) for the processing of other raw materials and (3) in a group context for identification, for the definition of status and role and for ceremonial and ritual functions. With respect to the Sheep Rock Shelter lithic artifact collection the first (extractive) category is concerned only with food procuring items such as projectile points, net sinkers, gun flints and hoes. The second (maintenance) category includes three groups of artifacts: (1) those involved in food processing; (2) those involved in the processing of raw materials (such as wood, bone, shell, stone, etc.); and (3) those which define status and identify roles of group members and those items involved in ceremonial and ritual activities (e.g., shamanistic gear), all of which are here termed paraphenalia.

In Table 2 maintnenance classes, with the exception of Paraphenalia, have been alphabetically rather than functionally ordered, since the operational contexts of some of the tool classes overlap to varying degrees, and it is sometimes impossible to assign a primary or secondary functional context to a particular class as a whole. For example, knives may be used as both food processing and raw material processing tools, and it cannot be said that they function primarily in one or the other context, although in particular cases a knife may function as one or the other, or sequentially as both. Paraphenalia comprise a reasonably discrete class of items, although chopping tools and knives may sometimes serve a status or ritual-ceremonial objects. Potentially, of course, all maintenance items may become involved in ritual-ceremonial activities, especially those of a mortuary nature, but primary and secondary functional contexts can normally be assigned to most items so involved.

Artifact Reuse

Theoretically a single implement may be used for one or more functional operations of greater or lesser similarity. The degree to which the operations to be performed are different in kind or nature the more likely it is that the working areas and/or edges will be morphologically different, either through intentional shaping or through use, in order to meet functional requirements of the tasks.

Table 2

CLASSIFICATION OF FUNCTIONAL BITS

Functional Category and Class	Operational Class
Extractive Classes	
Projectile Points	Piercing (Perforating, cutting)
Point Tips	Piercing (Perforating, cutting)
Gun Flints	Ignition (Hunting)
Hoes	Hoeing (Horticulture) (chopping)
Sinkers	Weighting (Fishing)
Maintenance Classes	
Technomic Items	
Abrading Stones	Abrading-Smoothing-Polishing (Sharpening)
Anvil Stones	Knapping (Crusing)
Chisels	Chiseling (Gouging, Splitting)
Chopping Tools (Adze, Axe and Celt)	Chopping
Cores	Knapping
Drills	Drilling (Perforating)
Gouges	Gouging (Splitting)
Hammer Stones	Knapping (Crushing)
Hearth and Boiling Stones	Heating-Cooking
Incising Tools	Incising (Etching, Engraving)
Knives	Cutting
Pebbles	Game Playing or Afunctional
Pounders	Crushing
Retouched Flakes	Cutting-Scraping
Scrapers	Scraping
Sinew Stones	Gutting
Paraphenalia (Socio-Technic and Ideo-Technic Items)	
Gorgets	Ornamentation-Status
Mica	Ritual-Ceremony
Ochre	Ritual-Ceremony
Quartz Crystals	Ritual-Ceremony

Thus the reuse of an implement for a new operation may involve either the use or modification of an old bit or the fashioning of a new one. It is possible that a tool may function with two different bits simultaneously, involving different portions of the implement, or by modification of the same bit area sequentially. More frequently, however, different objects are used for separate operations. When the same object is used for two different operations, generally it will be modified to suit the new task, and most often such a change can be detected. Thus broken projectile points may occasionally be fashioned into hafted scrapers, or broken bifacial knives into hafted incising and gouging instruments, and the sequential modification can, in general, be identified. The spatial-structural context of which such an implement was a part would, of course, reflect the most recent task in which it was involved, and it is therefore important that sequential modification be recorded and properly interpreted.

Sequential modification may also be more specific in nature. The history of a particular artifact's use with respect to a single operation may involve occasional reworking to maintain its functionality. Such reworking may alter the morphology of the implement to a greater or lesser extent, depending on the nature of the task, the size and shape of the blank at each stage of reshaping and the material of which it is made. Morphological types based on sequential variation within a group of items designed for a single kind of operation are primarily of technological interest and add little to our knowledge of function.

In the taxonomy presented here attention has been focused on temporal variation in the form and function of items. No attempt has been made to differentiate technological types, and to the author's knowledge only one has been included among the types described. Specific data concerning variation in the form and degree of use wear are included in the descriptions of the morphological types comprising the various functional classes. A summary of the general criteria used in the isolation of functional classes of items is presented below.

General Criteria Used in the Isolation of Functional Classes of Items

Projectile Points: bilaterally symmetrical pointed bit lacking lateral edge and surficial wear but sometimes including intentional or unintentional haft wear consisting of abrasion and/or smoothing of the basal and notch elements; a tendency to bifacial symmetry of transverse section; generally small size.

Gun Flints: bilaterally symmetrical transverse bit exhibiting small hinge fractures, powder burns and thermal alteration of the bit area. A tendency to bifacial asymmetry of transverse section; generally small size.

Hoes: bilaterally symmetrical broad, straight or convex, transverse bit exhibiting longitudinal scouring and/or smoothing on both faces along the entire width of the item in the area adjacent to the working edge; beveling of the bit area; a tendency to bifacial asymmetry of transverse section; generally large size.

Sinkers: intentional or unintentional smoothing of notches and smoothed peripheries and/or surfaces as a result of draging on sandy or rocky river bottoms; a tendency to bilateral and bifacial-transverse symmetry; small to large size.

Abrading Stones: scouring, smoothing, polishing and/or faceting of the edges and/or surfaces of fine grained stones such as siltstone or claystone; bilateral and bifacial-transverse asymmetry; small to medium size.

Anvil Stones: pecked, crumbled and pitted surfaces of relatively massive, resistent stones; bilateral and bifacial-transverse asymmetry.

Chisels: bilaterally symmetrical, straight or convex transverse bit exhibiting hinge fractures and/or smoothing along the working edge; battered proximal surface; a tendency to bilateral asymmetry in transverse section; generally small size.

Chopping Tools: bilaterally symmetrical, straight or convex, transverse bit exhibiting longitudinal smoothing and/or polishing and occassional small flake scars along the working edge, intentional or unintentional smoothing of the proximal portions of lateral edges for or as a result of hafting; a tendency to either bifacial symmetry or strong asymmetry in transverse section; relatively massive.

Cores: polyhedral shape with numerous zones of percussion and associated negative bulbs of percussion on one or more surfaces; highly variable size.

Drills: bilaterally symmetrical, elongated, pointed bit exhibiting transverse scouring and/or smoothing of the distal portions of lateral edges; intantional or unintentional smoothing of the proximal portions of the lateral edge for an as a result of hafting; a tendency to bifacial symmetry in transverse section; generally small size.

Gouges: bilaterally symmetrical convex transverse bit, exhibiting longitudinal scouring and/or smoothing of the ventral surface; intentional or unintentional smoothing of the haft area; slim biplano to concavo-convex transverse section; generally small size.

Hammer Stones: crumbled surfaces along areas of sharp curvature on shaped or unshaped pebbles; shaped specimens generally smaller and more regular in form, sometimes including centrally located, shallow unfacial or bifacial pits for gripping; generally massive.

Hearth and Boiling Stones: reddened, ash smudged, thermally altered surfaces of otherwise unmodified rocks; generally massive.

Incising Tools: bilaterally symmetrical, pointed, projecting wedge-like or faceted transverse bit exhibiting small flake scars and/or smoothing along the working edge.

Knives: longitudinal scouring, smoothing and/or bifacial flake scars along one or more convex lateral edges; intentional or unintentional smoothing of proximal lateral edges on hafted specimens; a tendency to bilateral asymmetry and bifacial-transverse symmetry of the blade; cutting edge situated parallel with or slightly oblique to the longitudinal axis.

Pebbles: strictly speaking, this is more a morphological than a functional class, since the function(s) of the included items, if any, are poorly understood; it is suggested that they may have been game playing and counting devices and/or items intended for use as cores.

Pounders: massive, blunt transverse bit exhibiting longitudinal flake scars along adjacent lateral surfaces and/or a battered working surface; generally massive; sometimes hafted.

Retouched Flakes: this is a broad morphological class which includes items used in a variety of technomic maintenance tasks and the by-products of such tasks; the items share in common only the fact that they all: (1) possess secondary retouch and (2) are of indeterminate technomic functions.

Scrapers: convex, straight or concave bits exhibiting small unfacial flake scars and/or transverse smoothing of the working edge and directly adjacent dorsal surface; generally small to medium size; a strong tendency to bifacial asymmetry in transverse section.

Sinew Stones: straight or slightly convex bits exhibiting deep scouring of the working edge and directly adjacent dorsal and ventral surfaces.

Paraphenalia: The functional interpretation of the classes of this maintenance sub-category is based on morphology, site context and analogy from ethnographic and archaeological contexts reported elsewhere. All of the items included in these classes relate to the socio-technic and ideo-technic aspects of culture (Binford 1962) and thus would not be expected to exhibit use wear properties.

(2) Morphological Classification

Each functional class was visually sub-divided into one or more morphological types on the basis of distinctive combinations of attributes characterizing various elements, sub-elements, areas and edges of the items assigned to the various classes.

An attribute system consisting of defined attribute sets was used in the formal characterization of variation within the Projectile Point functional class. Each set is designed to characterize a different morphological variable or aspect of items belonging to this class, and attributes in each set represent one of the two or more possible expressions that the variable may take. This attribute system is more fully discussed in Appendix I.

Explicitely defined attribute systems have not been developed for the non-projectile point functional classes. Instead, a corpus of descriptive terms in large measure borrowed from the projectile point attribute system, was used in the descriptive characterization of the functional-morphological types isolated according to the procedures set down above. While in general the meanings of these terms are made clear in the context of their use, it may prove useful to provide a few definitions.

Distal Portion: the areas and/or edges of an item opposite the flake blank striking platform, or the area opposite that of the haft, the latter taking precedence when present; generally, but not always, includes the bit.

Proximal Portion: the areas and/or edges of an item including the flake blank striking platform, or the area of hafting, the latter taking precedence when present.

Zone of Juncture: any relatively restricted area of the lateral edge of an item involving the articulation of two elements or sub-elements, such as the zone of convergence of two lateral edges (forming a point or tip) or the zones of juncture articulating two lateral edges with a connecting (distal or proximal) edge.

Longitudinal Axis: an imaginary line drawn between the median points of the distal and proximal edges of an item and running its length.

Transverse Axis: an imaginary line drawn perpendicular to the longitudinal axis and running the width of an item.

Working Edge/Area: the functional bit of an implement.

(3) Stratigraphic Analysis

Each morphological type was subjected to stratigraphic analysis in order (a) to ascertain age and cultural affinity and (b) to resolve ambiguities encountered during typological classification. The guiding principle employed in step 3b was that in a long culture-historical sequence distinct form types generally occupy distinct horizontal and/or vertical loci. Step 3b also served an additional purpose in evaluating stratigraphic integrity.

Analysis of the distribution of temporally diagnostic forms has permitted partioning of the deposite into eight Master Levels representing chronometric periods ranging from the Early Archaic to the Historic period, as summarized on pages 56-58 of this volume. In addition, Master Levels 2 and 7 have subsequently been partioned into two sub-levels each: Master Levels 2a and 2b, and 7a and 7b, representing the late Late Woodland (ca. 1350-1580 A.D.), the early Late Woodland (ca. 700-1350 A.D.), the late Middle Archaic (ca. 4000-5000 B.C.) and the early Middle Archaic (ca. 3000-4000 B.C.) periods, respectively.

The type descriptions which follow are organized according to the classification of functional bits presented above. Each type within the functional classes is first fully described and, second, discussed with respect to stratigraphic distribution, spatial clustering (if any), age and cultural affiliation when these data could be ascertained. A summary of stratigraphic distribution and dimensional data (including length, width, thickness, weight and, when appropriate, length/width ratio) are provided in Tables 4-9 following the Functional Class discussions.

EXTRACTIVE ITEMS

POINT FRAGMENTS

Thirty-eight point fragments were recovered which could not be specifically classified as to Projectile Point, knife or drill type. These have been grouped into two categories: those belonging to the triangular point tradition (Type 1) totaling 12 specimens, and those belonging to the stemmed-notched point tradition (Type 2), including 26 specimens. Their frequency distribution by Master Level is presented in Table 6.

GUNFLINTS (Plate 6:39 and 40)

Included in this category are two specimens prepared on microblade flakes with a truncated parallel-ovate outline and straight "base". The ventral side is characteristically flat and only minimally retouched along one or both lateral edges, while the dorsal side is worked over its entire surface, giving the piece a plano-convex transverse cross-section. "Bases" are trimmed on both specimens, and both are powder-burned from use.

In chapter 2 (p. 27) of this report, Witthoft refers to one of these specimens as "...a French rifle flint of the late 1700's..." Since both specimens are morphologically and materially identical, the second example is assigned the same origin. Both specimens were recovered from the western end of the site in the upper-most stratum of Master Level 2 overlying a deep Susquehannock midden.

Dimensional and distributional data are summarized in Tables 6 and 9.

HOES (Plate 8: 7)

This tentative category includes one very large and thin lobate specimen with biplano longitudinal and transverse cross-sections. The working edge is convex in outline and joins with an excurvate blade in rounded distal zones of juncture. The lateral and distal edges have been steeply retouched, resulting in bold overlapping expanding flake scars. The proximal end is a broken surface and has not been retouched. Neither face has received shaping of any kind. The specimen is made of micaceous shaley siltstone. This material in general, and this specimen in particular, is ill-suited to the chopping or pounding of resistent materials, as sharp edges would crumble and the piece would disintegrate under the impact of heavy blows. The only wear observed on the specimen is burnishing found along the proximal portions of the lateral edges, indicating that the specimen was intended to be hafted. It is suggested that the piece may have been designed for use as a hoe. A remarkably similar specimen, also inferred to be a hoe, was recovered from the Shenk's Ferry site in Lancaster County, Pennsylvania (Cadzow 1936: 59, Plate 12B). Dimensional and distributional data are summarized in Tables 6 and 9.

This functional interpretation is consistent with the specimen's stratigraphic provenience: the peice was recovered from the upper-most stratum of Master Level 2 and dates to the Late Prehistoric period (ca. 1350 - 1580 A.D.). Most, if not all, of the abundant remains of cultivars from the site were recovered from this master level, including a very large quantity of maize husks. The fact that no use wear was observed in the bit area suggests that either the implement had never been used or had been reworked just prior to abandonment or loss in the deposit. The observed haft wear is not inconsistent with either possibility, as the smoothed lateral edges could be the product of hafting or preparatory treatment prior to hafting.

Experimental work with stone hoes by Sonnenfeld (1962: 61) indicated that use wear generally extended one to two inches proximally from the working edge in those cases where the bit was not steeply beveled, and somewhat less for steeply beveled bits. Moreover, the wear was obvious and distinctive. Thus, reworking of the bit would require the removal of an inch or more of the length of the specimen in order to eliminate any traces of former use, assuming that, as in this case, the reworking was accomplished by flaking rather than abrading and/or crumbling. This is more than enough removal to establish a functional bit, and as there is some evidence to suggest that prehistoric knappers were economical in their processing of tools (e.g., Frisson 1968: 149-155, Wilmsen 1968: 987), it is unlikely that the specimen under consideration had ever been used. Thus the wear observed in the haft area was probably preparatory to rather than a result of hafting.

SINKERS

Eighteen artifacts in the collection are identified as net and/or line sinkers. These form three natural classes based on morphology and material (steatite, pebble and discoidal sinkers) and have been classified into four morphological types, as follows:

Class	Number of Specimens	Type Designation
Steatite Sinkers	2	1
Pebble Sinkers	3	2
Discoidal Sinkers		
Small	4	3
Large	9	4-5

Dimensional and distributional data are summarized in Tables 4 and 7, respectively.

Steatite Sinkers

Type 1 (Plate 5: 1 and 2): includes two specimens made of steatite. Both are small in size and relatively light in weight, biplano in longitudinal and transverse cross-sections, quadrilateral in outline and radially grooved at both ends. The radial grooves are more deeply cut from the sides (where they are V-shaped) than from the faces, and their preparation was probably accomplished with a bifacially flaked knife. The light weight of both specimens suggests use as line rather than net sinkers.

One specimen was recovered from Master Level 5 and the other from Master Level 4; both are believed to have been originally deposited in Master Level 5. The Type 1 sinker is also believed to represent a component of a Frost Island assemblage of the Transitional period and to date to about 1250 B.C. (Ritchie 1965: 156).

Pebble Sinkers

Type 2 (Plate 5: 4) includes three medium-sized relatively heavy specimens. All three are river pebbles and are unmodified except for concoidal notches prepared on opposite ends of the pebbles by two blows directed to either side of the notch area. The specimens also tend to be flat in cross-section but are variable in outline. All are made of sandstone and two have been thermally altered.

All three specimens were recovered from Master Level 2. Their cultural affinity, however, is uncertain and age can only be roughly placed at 700-1500 AD., i.e., post Middle Woodland to pre-Susquehannock.

Discoidal Sinkers

Within the disc class of sinkers size, edge treatment, the presence/absence of notching and shape are the only properties which vary in any significant manner. All are biplano in cross-section and are made of various grades of siltstone.

Weight, as an integrated measure of size, is bimodally distributed, such that two non-overlapping size classes can be defined: small and large.

Edge treatement varies in two ways: rough and smooth. Rough edges are the result of peripheral flaking of the disc blank into the desired shape; smooth peripheries are the result of edge abrasion subsequent to primary shaping by peripheral flaking. Smoothing may be intentional or incidental and will be discussed further below. Some specimens have undergone both types of treatment.

The discs may also be subdivided on the basis of the presence or absence of peripheral notching. The variation in notch morphology observed among the specimens appears to relate to the nature of the material used rather than to stylistic considerations. Thus, the softer calcereous and micaceous shaley siltstones have V-shaped notches with rounded zones of juncture, while the harder more compact siltstones tend to fracture more concoidally and have continuously rounded notches. In general, the former are prepared by abrasion and the latter by flaking.

Shape also varies in two ways: specimens tend to be either round or quadrilateral.

Three morphological types of discoidal sinkers are distinguished on the basis of systematic combinations of attribute variations among the above attribute classes: (1) small, (2) large-unnotched and (3) large-notched. Attribute characterization of the specimens is presented in Table 3 following the type descriptions.

There is an almost perfect pointive relationship between peripheral smoothing and notching: specimens having smooth peripheries are notched, while specimens having rough peripheries are unnotched. Viewed in functional terms, notches are required for the secure hafting of specimens with smooth peripheries.

It is suggested that discs with smooth and notched peripheries were the desired end-product and that specimens deviating from these specifications are blanks or unfinished items. Preparation involved the rough shaping of suitable material at the place of origin. The blanks thus formed were distributed by demand, with finishing of the tools being accomplished at locations of use as required.

The differences in smoothing and notching observed among the specimens thus relate to manufacturing rather than stylistic considerations, and their use as typological criteria should be restricted to technological considerations alone. That these differences are not functionally significant is suggested by the more or less isomorphic spatial distribution of the finished and unfinished specimens; if the two categories were used in different functional contexts their distributions would be expected to vary accordingly. Thus the distinction between Types 4 and 5 below is basically a technological one.

Type 3 (Plate 5: 5 and 6): includes four relatively small specimens which are quadrilateral in outline. All are notched except for one unfinished specimen. Those made of soft material (three of the four specimens) also have smooth peripheries which were first flaked into shape and then ground smooth either intentionally or through use. The fourth specimen received only flaking around the periphery but does give some evidence of use smoothing along the lateral edge. Diagnostic criteria for the type are its small size and quadrilateral form. Two of the specimens are made of calcareous shaley siltstone; the fourth specimen is made of shaley siltstone lacking either calcareous or micaceous components.

All four specimens were recovered from the upper strata of Master Level 2 and are believed to be of Susquehannock origin (ca. 1550-1580 A.D.), two of the specimens having been found in exclusive association with pottery of that group.

Type 4 (Plate 5: 9 and 10): includes four relatively large specimens which are more or less circular in outline. All of these specimens lack notches and have rough (flaked) peripheries. All are made of soft shalely siltstone lacking calcareous and micaceous components.

All four specimens of Type 4 were recovered from the upper strate of Master Level 2 and are believed to be of Susquehannock origin. Two of the specimens (including Plate 5: 10) were recovered from the base of a Susquehannock hearth overlying a Shenk's Ferry hearth (both identified on the basis of associated pottery). A third specimen was found among a mixed lot of shell and qrit-tempered sherds.

Type 5 (Plate 5: 3, 7 and 8): includes five relatively large notched specimens, all of which have a circular (although irregular) outline. All have smooth peripheries, including one naturally smooth discoidal river stone and four peripherally flaked and ground specimens. Notches are both rounded and V-shaped. Those which are V-shaped have been ground that way, and those which are rounded generally have been flaked that way. Three of the five specimens are made of hard siltstone, including one with ground notches. The remaining two specimens are made of soft, micaceous shalely siltstone, and both have ground notches.

Four of the five specimens were recovered from the upper strata of Master Level 2; the fifth specimen was found in Master Level 1. Four specimens were unequivocably associated with Susquehannock pottery and date to ca. 1550-1580 A.D.

Table 3

Descriptive Properties of Sinker Types 3-5

Catalog No.	Size (Weight) S-small L-large	Edge Treatment S-smooth(ground) R-rough(flaked)	Notching A-absent R-round V- v-shaped	Shape Q-quadraleteral R-round	Material Hardness S-soft H-hard	Type
6. 55	S	S	A(unfinished)	Q	S	3
6.2168	S	R	R(flaked)	Q	H	3
6.2320	S	S (flaked &ground)	V(Flaked & ground)	Q	S	3
6.3388	S	S (flaked &ground)	V(Flaked & ground)	Q	S	3
6.2271	L	R	A	R	S	4
6.2318	L	R	A	R	S	4
6.2319	L	R	A	R	S	4
6.4643	L	R	A	R	S	4
6.2141	L	S (flaked &ground)	V (ground)	R	S	5
6.2264	L	S (natural)	R (flaked)	R	H	5
6.2317	L	S (flaked &ground)	V (ground)	R	H	5
6.2321	L	S (flaked &ground)	R (flaked)	R	H	5
6.5609	L	S (flaked &ground)	R(flaked & ground)	R	S	5

Age and Cultural Affiliation

In the discussions of Types 3, 4 and 5 it was suggested that each is of Susquehannock origin, based in part on some fairly secure associations of the discs with shell-tempered pottery. However, other contexts were ambiguous and offered the possibility that some of the discs might be Shenk's Ferry products. Both old and new excavations at the Shultz site along the lower Susquehanna River lend support to the contention that all of the discs are of Susquehannock origin and that the above morphological types do not constitute components Shenk's Ferry assemblages. The Shultz site consists of two knolls, one of which was occupied by the Susquehannock and the other by one or more Shenk's Ferry groups. Cadzow (1936) conducted excavations on both knolls, but primarily in the Susquehannock settlement, and recovered a quantity of discs corresponding to the above descriptive types (although they are given differing functional appelations). As excavations on the Shenk's Ferry knoll were far less than adequate, it was not clear at the time if the absence of discs in these early excavations was an artifact of inadequate sampling or of their true absence. Recently, more extensive excavations have been conducted on both knolls, and, again, discs were recovered only from the Susquehannock settlement area (Samuel Casselberry: personal communication, 12 December 1970). Thus, in terms of age the use of discs such as Types 3, 4, and 5 appears to be restricted to the protohistoric period of ca. 1550-1650 A.D. Cultural affinity in the central and eastern Pennsylvania area lies with the Susquehannocks.

Function

The objects described under Types 3, 4 and 5 have received widely differing functional designations in the literature, including such titles as game (Chunkey) discs, pot covers and net sinkers (Cadzow 1936: 191, 194-196) as well as spindle whorls (Kahler 1956: 166-170). Informally, discs such as those of Type 4 have also been referred to as hoe blades. However, aside from Kahlers experimental argument, there has been no systematic attempt to test these ascertions. Data from the Sheep Rock Shelter provide an important opportunity for testing at least three of these ascertions (use as hoe blades, spindle whorls and net sinkers), and for speculating about the remaining two (use as game discs and pot lids).

If the discs were used as hoe blades we should expect them to exhibit a bit area having characteristic wear properties. For an activity such as hoeing, unless the soil were of homogeneously fine texture, we would expect the bit area to exhibit both a smooth and striated surface as well as some use chipping along the edge of the bit, and the striations would be oriented perpendicular to the edge. None of the Sheep Rock specimens exhibit these properties. Those that have smooth peripheries appear to have been intentionally and uniformly shapped that way rather than having acquired this property entirely through use. Moreover, the entire periphery, and not just one segment of it, has been smoothed, further suggesting that the smoothness is a desired rather than acquired property.

As for their use as spindle whorls, we would expect that the discs covary in distribution with the raw materials of spinning and weaving activities, i.e., we would expect the discs to show a more or less isomorphic distribution with the materials from which fibres are extracted, with the fibres themselves (in form of tufts used in the preparation of yarn) and with the yarn prepared from the fibres; to a lesser extent spindle whorls might also covary with the secondary products of spinning, including cordage, netting and fabric, since these items enter into activities unassociated with spinning and weaving. All of these materials are in abundance at the Sheep Rock Shelter. Their distribution with respect to the discs, however, is discrete (nonisomorphic), as shown in figure 1. The only significant association is found on the east end of the site where a piece of netting and a Type 3 disc were found together (the other pieces of cordage and yarn were found in a crevice in the rock ledge above the deposit). Thus, it would appear that, in contradistinction to Kahler's (1956: 166-170) experimental work, the discs bear no relation to late Prehistoric spinning activities.

With respect to the third ascertion (use as net sinkers), we would expect the discs to covary to some extent with the "kitchen" activities involving the processing of fish and to be unassociated in distribution with the storage of fish and the disposal of fish products. This hypothetical model precisely describes the distributional relationships observed for fish scales and bones and the discs and pebbles classified as net sinkers, as shown in figure 2. (The pebbles were included in this figure because due to late Prehistoric pitting of the deposit, individual strata are unreliable indicators of association. It was therefore decided to include all Late Woodland (Master Level 2) fish remains and all objects classified as net sinkers. Errors of inclusion would tend to mask any inherent relationship between the two sets of items and [illegible] favor the Null hypothesis. Thus, any relationship found in spite of this conservative treatment is probably a reliable one). Figure 2 shows (1) there are three clusters of fish remains; (2) two of the clusters (those in the central and east parts of the site) involve low to medium counts of remains, while the third cluster (on the west end of the site) involves very high counts; and (3) the discs and pebbles strongly covary with the central and eastern clusters and are unassociated with the western cluster. Feature data (see the S10 Master Profile) indicate that the western cluster is associated with a pit used either for storage (of dried fish) or for refuse disposal. Thus the distributional evidence strongly favors a fishing-oriented functional interpretation. That the discs were used as sinkers for nets used in fishing is suggested by the close association of one of the discs with a piece of netting on the eastern end of the site. A similar association was encountered by Stewart (Kahler 1956: 167) along the Susquehanna River near Lock Haven, Pennsylvania, where he found the remains of a fish-net associated with several discs and some flint knives.

36Hu1 SHEEP ROCK SHELTER

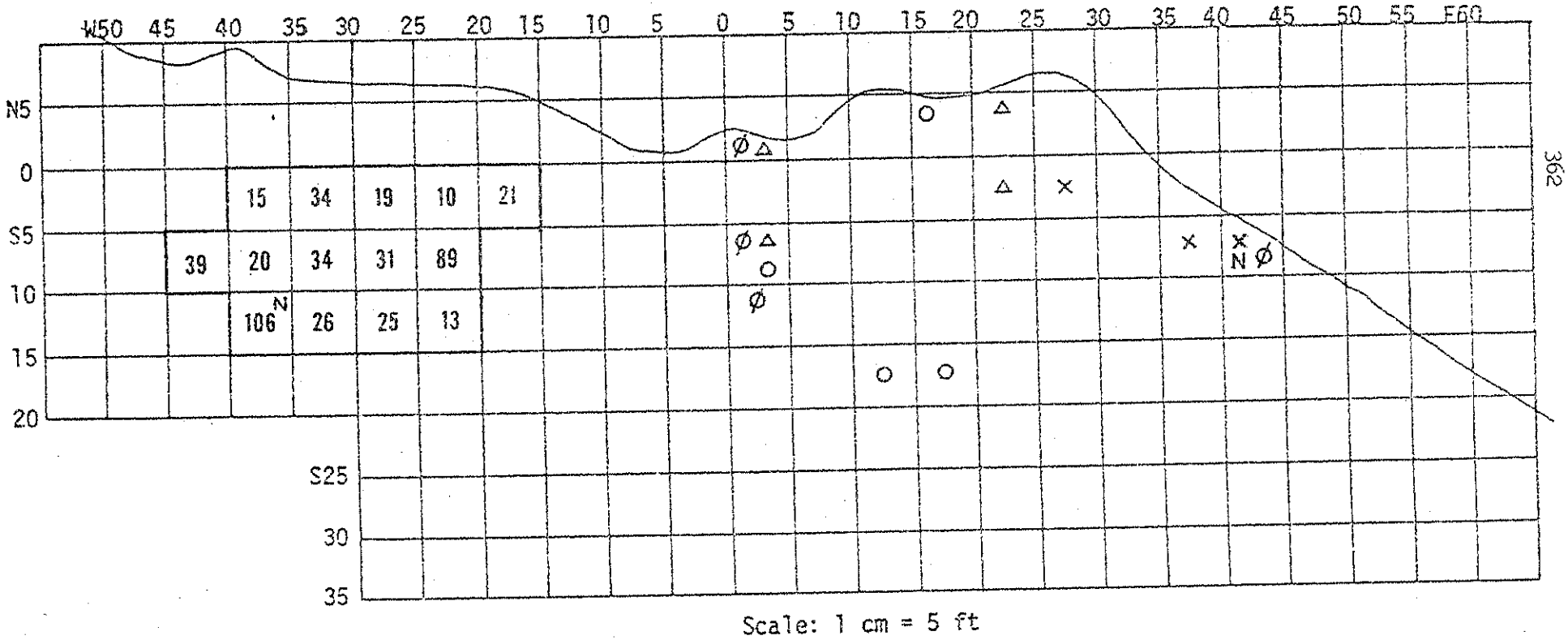
MATERIAL DISTRIBUTION

MATERIAL: SINKERS AND FIBER PRODUCTS

PERIOD: LATE WOODLAND

× Pebble Sinker
Ø Small Disc Sinker
O Large Disc Sinker (Unnotched)
△ Large Disc Sinker (Notched)
N Remains of Net

Numbers Within Grid Squares Indicate Quantity Of Fiber Products (Yarn and Cordage)



Scale: 1 cm = 5 ft

Figure 1. COMPARATIVE DISTRIBUTION OF NET SINKERS AND YARN, CORDAGE AND NET REMAINS

36Hu1 SHEEP ROCK SHELTER

MATERIAL DISTRIBUTION

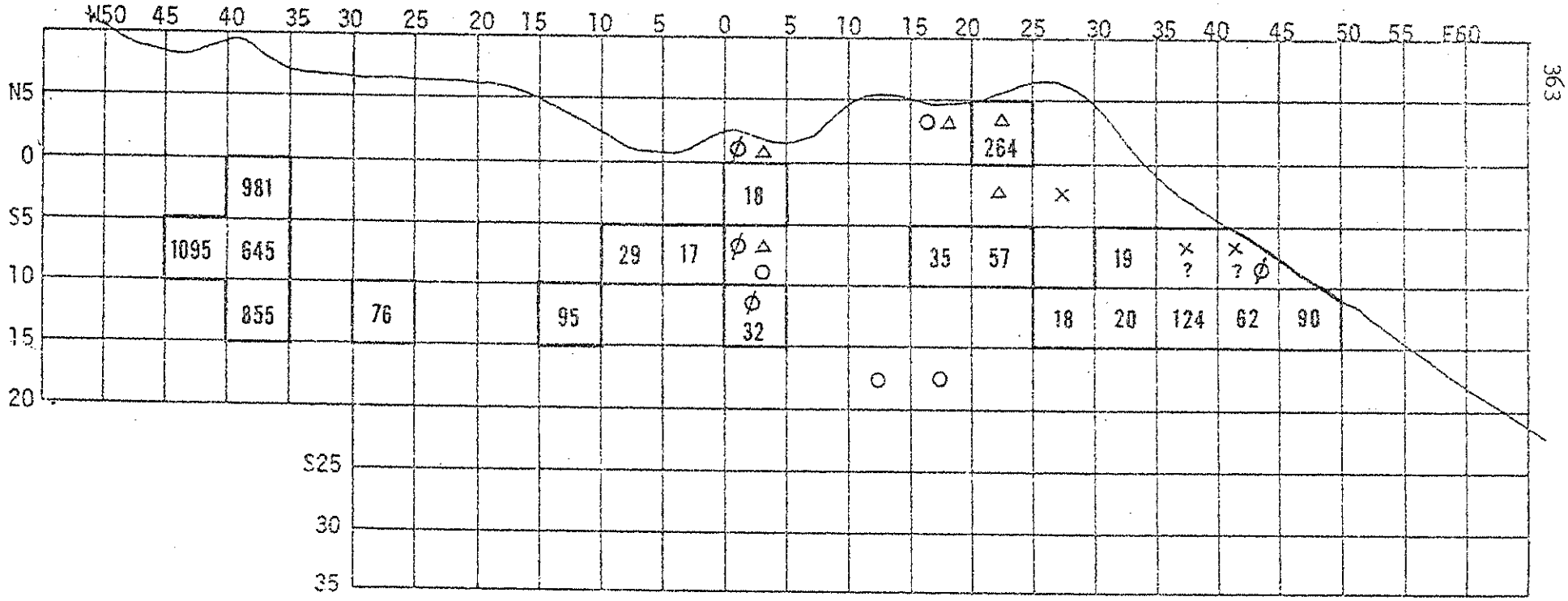
MATERIAL: SINKERS AND FISH SCALES

PERIOD: LATE WOODLAND

× Pebble Sinker
Ø Small Disc Sinker
○ Large Disc Sinker (Unnotched)
△ Large Disc Sinker (Notched)

Numbers Within Grid Squares Indicate Quantity Of Fish Scales

(Only Squares With 10 Or More Scales are Included)



Scale: 1 cm = 5 ft

Figure 2. COMPARATIVE DISTRIBUTION OF NET SINKERS AND FISH SCALE REMAINS

Similar objects have been found in Venango County, Pa., where they have been recovered from both rockshelters and open air sites. According to Sue Ann Curtis (personal communication: 10 December 1970), the discs are differentially distributed on the basis of size: larger discs tend to be associated with open air sites along sizable waterways, whereas morphologically similar but smaller discs tend to be found in rock shelters in back water areas drained by small creeks. Presumably, the size of discs is at least in part related to the depths of streams and the rate of current, with large discs being used in the deeper faster moving waters and the smaller discs in the shallower slower moving waters. This explanation accounts for the smaller size of the Sheep Rock specimens as compared to those from the Shultz site.

As for the use of these objects as game discs and potlids, the Sheep Rock specimens are probably too irregular in outline to function adequately in the manner suggested by Cadzow (1936: 193) on the one hand, and on the other are probably too small to have functioned as pot covers.

MAINTENANCE ITEMS

ABRADING STONES

This functional category includes nine artifacts of amorphous shape having areas and edges which are polished and/or show striations and scoring interpreted as the result of abrading, smoothing or polishing. These are grouped into two classes, smoothing stones and honing stones. Dimensional and distributional data are summarized in Tables 5 and 9.

Smoothing Stones

Type 1 (Plate 8: 1 and 2) includes seven specimens having polished and/or striated areas and edges. Most of these are believed to have been used in the smoothing of pottery during manufacture, in addition to other smoothing functions. All of the specimens are made of claystone.

Three of the specimens were recovered from Master Level 2 (Late Woodland), two from Level 4 (Early Woodland) and one from Master Level 7 (Middle Archaic); the provenience of one specimen is unknown.

Type 2: includes one relatively large specimen with a shallow groove measuring 11-14 millimeters across, 67 millimeters in length and 5 millimeters in depth worn into one face. The item is a roughly circular sandstone river pebble with a biplano transverse section and is otherwise unaltered. The groove is smoother than the exposed surface of the stone and is believed to have been used as a shaft smoother.

The specimen was recovered from the uppermost stratum of Master Level 2 and was found associated with shell-tempered Susquehannock sherds. The groove in the specimen is nearly identical to that on a similar artifact assigned the same function by Witthoft and found in the Susquehannock midden of the Eschelman site in Washington Boro, Pennsylvania (Witthoft 1959: 123, Fig. 19D).

Honing Stone

Type 3 (Plate 8: 5): includes one specimen with numerous deeply scoured grooves on both faces and probably used for the sharpening of bone implements such as awls. A small hole has been worn through the center of the specimen. The item is made of green siltstone.

The single specimen of this type was recovered from Master Level 3 and is believed to be of Middle Woodland origin (ca. 500 B.C.-700 A.D.). At the Eva site in Tennessee, stones of similar material

with identical markings are also classified as awl sharpeners (Lewis and Lewis 1961: 72, Plate 31 d, e and f). These specimens, however, date to a much earlier horizon of 4000-5000 B.C. but were associated with a well-developed bone tool complex.

ANVIL STONES

This category includes nine specimens of large size and amorphous shape showing shallow pitted depressions or clusters of pock marks on one or more surfaces indicative of use as anvil supports. All of the specimens are sandstone river cobbles. Four specimens were used as hearth stones. It is likely that not all such stones recovered from the excavations were saved or cataloged. Dimensional and distributional data are summarized in Tables 6 and 9.

CHISELS (Plate 6:15 and 16)

Included in this functional category are two items which are sub-rectangular in outline and have been shaped to the extent that they cannot be considered preforms. Substantial areas of the flake blank remain unworked, however, and the shaping primarily involved the bit area and adjacent lateral edges. One of the specimens (Plate 6: 16) is biplano in longitudinal section and bitriangular in transverse section. This specimen appears to have been hafted by the socket technique, as its proximal end and adjacent lateral edges have been smoothed. The sub-convex distal (bit) end shows evidence of heavy use resulting in several hinge fractures, most of which are on one face of the bit.

The other specimen (Plate 6: 15) has considerably more unworked surface area, yet has received continuous secondary marginal retouch along one face of the bit and one lateral edge. This specimen may or may not have been hafted, and a thick unretouched stricking platform still remains at the proximal end. In longitudinal section it is biplano and in transverse section it is plano-triangular. A small amount of burnishing was observed on the working edge of the bit. The specimens are made of gray and black cherts of poor to medium quality, respectively. Dimensional and distributional data are summarized in Tables 6 and 9.

The specimens were found within ten feet of one another on the eastern end of the site in the upper strata of Master Level 2. They are believed to date to the Late Prehistoric period (ca. 1350-1550 A.D.) and to be of Shenk's Ferry origin.

CHOPPING TOOLS

Included in this category are eleven heavy-duty maintenance tools comprising several related functional classes and their preforms, as follows:

	Type Designations	Number of Specimens
Adze	1	1
Axe	2	1
Celt	3-7	7
Bifacial Preform	8,9	2

Dimensional and distributional data are summarized in Tables 4 and 7.

Adzes

Type 1 (Plate 7: 1): includes one relatively small specimen with a plano-convex longitudinal section and an asymmetrically bi-convex transverse section. The blade is slightly ovate in outline and continuously rounded at the proximal end. The distal (bit) end is sub-convex in outline and joins with the blade in rounded distal zones of juncture. Surface treatment includes primary chipping only, involving the production of broad, overlapping expanding flake scars, and transverse abrasion of the ventral side and both faces in the area directly adjacent to the working edge. All flake scar ridges on both faces of the tool have undergone burnishing, which is incidental to and a by-product of use. The working edge is only lightly burnished and has acquired a few small use scars. The proximal end has been heavily ground in both a longitudinal and transverse direction. The specimen is made of a coarse-grained black chert.

The single specimen of this type was recovered from Master Level 5 and is believed to constitute an element of a Transitional period Frost Island assemblage. The Frost Island phase has been radiocarbon-dated at the O'Neil site in New York to B.C. 1250 ± 100 (Y-1274). A nearly identical date of B.C. 1270 ± 180 (M-2085) was obtained at the Sheep Rock Shelter from a small hearth unfortunately lacking definitive associations, but situated in the appropriate stratigraphic context and believed to be a product of Frost Island occupation at the site.

Axes

Type 2 (Plate 7: 9): includes one large specimen with a truncated-ovate outline and plano-convex longitudinal and transverse sections. Only the marginal areas of the convex side have been systematically

retouched by primary flaking. The other side appears to be the natural ventral surface of a flake blank struck from a large river cobble.

A shallow channel, which is most-developed on the dorsal side, has been pecked and ground into both faces about one-quarter the distance from the proximal end. The notches formed at the margins are moderately deep (8-10 mm). Shoulders are oblique and join with the ovate blade in broadly rounded distal zones of juncture. One notch is continuously rounded and the other angular. The lower sub-element of the haft expands outward towards the proximal end and joins with vertical intermediate sub-elements in broadly rounded intermediate zones of juncture. The sub-concave, unretouched base joins with the intermediate sub-elements in rounded proximal zones of juncture. The striking platform constituting the base is oriented obliquely to the ventral side of the flake blank. The distal-most portion of the blade has been heavily chipped through use.

Type 2 was recovered from a Susquehannock pit in Master Level 2 and is believed to be a product of that group dating to about 1550-1580 A.D.

Celts

Type 3: includes one small lobate specimen with a truncated expanding-ovate longitudinal section and an asymmetrically biconvex transverse section. The specimen is prepared on an irregular thick flake blank which has received bifacial marginal retouch along the distal half of the lateral edges and along both sides of the working edge. The medial portions of both faces have received obliquely oriented abrasion, while the area adjacent to the distal edge (bit) has been transversely abraded. The proximal end consists of the original striking platform remnant from which several flakes were longitudinally struck along the lateral edges in order to diminish the width of the proximal portion of the specimen. The working edge is convex in outline and joins with the expanding blade in nearly angular distal zones of juncture. The bit is highly burnished and has acquired a few tiny chipping scars from use. The specimen is made of a coarse-grained gray-black chert.

The single specimen of this type was recovered from an upper stratum of Master Level 8 and dates to the latter part of the Early Archaic period (ca. 6000 B.C.).

Type 4 (Plate 7: 3): includes one small sub-rectangular specimen with biconvex longitudinal and transverse sections. The specimen is truncated-ovate in outline, and the blade contracts to a continuously rounded proximal end. The distal (bit) end is slightly convex and joins with the blade in nearly angular distal zones of juncture. Surface treatment includes both primary and secondary chipping along the margins, involving in both cases the production of overlapping expanding flake scars, and transverse abrasion of the

medial portions of both sides, including the areas adjacent to the working edge. Most of the flake scar ridges have undergone some degree of burnishing which is incidental to and a by-product of use. The working edge is only lightly burnished and has received a small number of tiny use scars. The specimen is made of coarse-grained black chert.

Type 4 was recovered from Master Level 5. In general form and in workmanship and material it is identical to Adze Type 1 above and is believed to constitute another element of the same Frost Island assemblage dating to about 1270 B.C.

Type 5 (Plate 7: 5-7): includes three sub-rectangular and lobate specimens with biconvex or biplano longitudinal sections and biplano or asymmetrically biconvex transverse sections. Blade outline varies from triangulo-ovate to rectangulo-ovate. The distal (bit) end is sub-convex and joins with the blade in well-rounded, and in one case angular, distal zones of juncture. The proximal end of one specimen (Plate 7: 6) still retains the striking platform of the core from which the flake blank was struck; the proximal end of another specimen (Plate 7: 5) is only minimally retouched and is continuously rounded; the proximal end of the third specimen is nearly completely reworked, is convex in outline and joins with the blade in rounded proximal zones of juncture. The striking platform of this latter specimen is located on a lateral edge adjacent to the proximal end, indicating that the flake blank was transversely struck, unlike the first specimen (Plate 7: 5), which was longitudinally struck. No attempt was made to rework the striking platform of the transversely struck specimen. Surface treatment in all cases included only rough primary flaking of the margins, involving the production of bold, overlapping, expanding flake scars. The medial areas are characteristically unworked by any technique. The area of one face adjacent to the bit of the specimen shown in Plate 7: 6 has been obliquely abraded. The working edge of another specimen (Plate 7: 7) has acquired heavy use burnishing. All three are made from sandstone river pebbles.

Two of the specimens were recovered in close proximity to one another on the western end of the site in Master Level 5; the third specimen was found in a disturbed context (rodent den) in Master Level 2. All three specimens are believed to have originally been deposited in Level 5 and to constitute elements of the same Frost Island assemblage to which Types 1 and 4 above belong. The Frost Island occupation at the site dates to about 1270 B.C.

Type 6 (Plate 7: 8): includes one large sub-rectangular specimen with biplano longitudinal and transverse cross-sections. The blade is slightly excurvate in outline and tapers gently to the broad slightly convex proximal end which joins with the blade in rounded proximal zones of juncture. The entire working area has been destroyed through use but probably had a similar configuration. The specimen appears to have been shaped solely by abrasion of a natural stone of appropriate size and configuration. The lateral edges were

longitudinally abraded, while the two faces and proximal edge were transversely abraded. The specimen is made of a hard, compact shale-like siltstone.

This specimen was broken during use and one of the fragments discarded to a location "outside" of the shelter and beyond the scope of the Master Profiles; unfortunately, no other remains of a diagnostic nature were found associated with the fragment. The other remnant, however, was found in Master Level 4 in association with an Early Woodland hearth. The chronometric provenience of Type 6 is estimated at 1000-500 B.C.

Type 7 (Plate 7: 2): includes one small sub-rectangular specimen with a plano-convex longitudinal and transverse section. The bit, however, is biconvex in longitudinal view. The specimen is truncated-ovate in outline, and the blade contracts to a continuously rounded proximal end. The distal (bit) end is slightly convex and joins with the blade in slightly rounded distal zones of juncture. The specimen was first pecked into shape and then ground and polished over most of its furface; only the marginal and proximal surfaces remain "unfinished." The working edge is burnished and has received a few small chipping scars from use. The specimen is made of a coarse-grained green stone.

The single specimen of this type was recovered from the upper-most stratum of Master Level 2 in association with Preform Type 9 below and a Susquehannock pot and dates to about 1550-1580 A.D.

Bifacial Preforms

Type 8 (Plate 7: 12): includes one medium-sized triangulo-ovate specimen with plano-convex longitudinal and transverse cross-sections. The flake blank has received only primary shaping, principally on the dorsal side (opposite the "bulb of percussion"), consisting of very bold and broad concoidal and expanding flake scars. The blade is ovate and joins with the base in rounded proximal zones of juncture. The flake blank was transversely stuck (i.e., perpendicular to the longitudinal axis), and a remnant of the striking platform, which is obliquely oriented to the ventral face, is present along the proximal portion of one lateral edge. The specimen is made of shalely siltstone.

The single specimen of this type was recovered from an upper stratum of Master Level 6 and dates to the Terminal Archaic period (ca. 2200-1800 B.C.).

Type 9 (Plate 7: 10): includes one large sub-rectangular specimen with asymmetrically biconvex longitudinal and transverse cross-sections. The specimen is a natural river stone which has undergone a minimal amount of primary flaking, principally along one lateral edge and at the distal and proximal ends. The working area was in the process of being pecked into the desired shape when the item was deposited. The bit is convex in outline and joins with the blade in well-rounded distal zones of juncture. The blade tapers gradually to a continuously rounded proximal end. The specimen is made of a green stone material identical to Celt Type 7 above.

The specimen was recovered from the upper-most stratum of Master Level 2 in association with Celt Type 7 and a Susquehannock pot and dates to the Late Prehistoric period (ca. 1550-1580 A.D.).

CORES

Included in this functional category are the cores used for the manufacture of flake blanks and the by-products resulting from their preparation and use. The 79 specimens have been classified into six morphological core types, following the classifactory scheme developed by Kowta (1961: 349-360), and three types of by-products, as described below. Formal distinctions between types are based on (1) outline, (2) number and location of working surfaces and their orientation to the artifacts' longitudinal axes and (3) stage of processing. Dimensional and distributional data are summarized in Tables 4 and 7.

Single Platform Polyhedral Cores

Type 1: includes two specimens of polyhedral form in transverse section with a single prepared striking platform oriented at right angles to the longitudinal axis. Both specimens have a length/width ratio of about 2/1.

Both specimens were recovered from the upper strata of Master Level 2 and date to the Late Prehistoric period (ca. 1550-1580 A.D.).

Double Platform Polyhedral Cores

Type 2: includes five specimens with a roughly rhomboidal transverse cross-section and two opposing striking platforms oriented at right angles to the longitudinal axis. With one exception, the specimens are wider than they are long.

Three of the specimens were recovered from the upper strata of Master Level 2 (ca. 1550-1580 A.D.); two other specimens were found in the Late Middle Archaic strata of Master Level 7 (ca. 4000-3000 B.C.).

Single Platform Tabular Cores

Type 3: includes six tabular specimens with a biplano quadrilateral transverse section and a single striking platform oriented at right angles to the longitudinal axis.

Two specimens were recovered from Master Levels 2 (upper strata: ca. 1550-1580 A.D.), 6 (ca. 2500-2000 B.C.) and 7 (ca. 5000-3000 B.C.).

Double Platform Tabular Cores

Type 4: includes three specimens differing from Type 3 only in having two opposed striking platforms rather than one.

Two of the specimens were recovered from the upper strata of Master Level 2 (ca. 1550-1580 A.D.); one specimen was found in a late Middle Archaic stratum of Master Level 7 (ca. 4000-3000 B.C.).

Single Platform Triangular Cores

Type 5: includes one specimen of roughly triangular configuration with a single striking platform at one of the corners. Because of imperfections in the material its use as a core was abandoned; the piece later functioned as a hammerstone.

The single specimen of this type was recovered from Master Level 3 in a context dating between 1 and 700 A.D.

Multi-Platform Triangular Cores

Type 6: includes one specimen of triangular outline with flakes having been struck from both its sides and corners.

The specimen was recovered from Master Level 4 and dates to the Early Woodland period (ca. 1000-500 B.C.).

Core Nuclei: Ovate

Type 7: includes twelve small, relatively thick, ovate-shaped, multi-faceted specimens, a few of which have received secondary retouch for use in other functional capacities.

Two-thirds of the specimens were recovered from the upper strata of Master Level 2 (ca. 1550-1580 A.D.); two were found in Master Level 3 (ca. 500 B.C. - 700 A.D.); one specimen was recovered from an early Middle Archaic stratum in Master Level 7 (ca. 5000-4000 B.C.); the provenience of another specimen is unknown.

Core Nuclei: Conical

Type 8: includes ten relatively small specimens which generally converge to a point from the striking platform so as to form a polyhedral cone when viewed in longitudinal section.

Seven of the specimens were recovered from the upper strata of Master Level 2 (ca. 1550-1580 A.D.); one specimen each was found in Master Levels 3, 7 and 8.

Core Shatter

Type 9: includes 39 relatively large angular specimens which are the by-products of the preparation and use of cores. Not included in this class is the very abundant small shatter resulting from the

manufacture of flake blanks and the shaping of tools. This latter material has been included with and is presently undifferentiated from the flake detritus.

Over half of the specimens of Type 9 were recovered from Master Level 2, a percentage consistent with the relative distributions of the other core artifacts. Counts of 2-5 were also obtained from Master Levels 5-7. The provenience of six specimens is unknown.

DRILLS

Seven morphological varieties of drills, including bar, expanded-stem, notched and triangular variations, are recognized in the collection. These include 13 specimens, the dimensional and distributional properties of which are summarized in Tables 5 and 8 following the type descriptions. Observations on wear properties are generally lacking, since the working portions of most of the specimens are absent. The functional classification is therefore based for the most part on morphology and by analogy from similar forms reported elsewhere. It is recognized that most, if not all, of the specimens described could have, and probably did, function as perforators as well as drills.

Bar Drills

Type 1 (Plate 6: 1-4): includes four bar-like specimens lacking specialized modification for hafting. Longitudinal sections tend to be biplano and transverse sections strongly biconvex. Blades are lenticular and are either expanding-ovate or parallel-contracting in outline. Two sub-varieties are distinguished on the basis of differences in the form of the proximal end: (1) parallel-expanding and (2) contracting. In the first sub-variety (Plate 6: 2 and 4) blades are parallel-sided and expand very slightly just before joining with a convex base in angular or slightly rounded proximal zones of juncture. In the second sub-variety (Plate 6: 1 and 3) the proximal portion of the blade contracts gradually and is continuous with the convex base. Two of the four specimens (Plate 6: 1 and 2) are lightly burnished along the base and adjacent proximal portions of the blade, a property probably resulting from socketed hafting. One specimen is made of eastern Pennsylvania rhyolite; the other three speciemsn are made of poor to medium quality cherts.

Specimens of Type 1 show a bimodal stratigraphic distribution coincidental with the two sub-varieties discussed above. Specimens of sub-variety (1) were recovered exclusively from the base of Master Level 2, while those of sub-variety (2) were recovered from Master Levels 3 and 4. Thus the parallel-expanding sub-variety appears to date to the terminal Middle Woodland-early Late Woodland period (ca. 500-1350 A.D.) and the contracting sub-variety to the Early and Middle Woodland periods (ca. 1000 B.C. - A.D. 300). In view of the small samples involved, however, the postulated change in

style over time needs to be tested against (presently lacking) independent evidence.

Type 2 (Plate 6: 5): includes only one specimen with a contracting-ovate blade and a concave base. In longitudinal section it is biterminally-asymmetrical biconvex and in transverse section asymmetrically biconvex. The lateral edges of the blade are slightly irregular and have received continuous secondary marginal retouch. The blade joins with the base in rounded proximal zones of juncture. The concave base was prepared by two blows, one directed to each face, giving the appearance of a notch or bifurcation, a feature shared with a specimen of Projectile Point Type 2 (Plate 1: 4) found a few feet away in the same stratigraphic unit.

The specimen was recovered from a lower stratum of Master Level 7 and dates to between 4000 and 5000 B.C.

Expanded-Stem Drills

Type 3 (Plate 6: 6): includes one relatively large specimen with a parallel-ovate blade, the proximal portion of which expands to 1.5 times the blade width before joining with a straight, well-ground base in broadly rounded proximal zones of juncture. The lateral edges of the proximal portion have also been ground. The lateral edge of the blade has received discontinuous secondary marginal retouch and is regular in edge treatment. The piece was probably hafted in the same manner as projectile points. The specimen is made of rhyolite.

The single specimen of this type was recovered from a Susquehannock pit in Master Level 2 on the far western end of the site and is believed to have been redeposited from an underlying Transitional period component. Steatite vessel fragments and a Type 21 projectile point (Plate 2: 7) of Frost Island affiliation were also found in the pit.

Type 4 (Plate 6: 11-13): includes three specimens with incurvate blades and straight bases. In longitudinal section they are biconvex or biplano, and in transverse section they are asymmetrically biconvex. The lateral edges are mildly irregular and have received discontinuous secondary marginal retouch. The expanded proximal portion of the blade joins with the unground base in angular or slightly rounded proximal zones of juncture. The specimens are made of medium to high grade gray cherts.

All three specimens of Type 4 were recovered from the far eastern end of the site, two from the basal portion of Master Level 2 and the third from a disturbed context in the upper portion of the same level. In both form and workmanship the proximal portions of these specimens strongly resemble the projectile points of Type 45 (Plate 4: 27-29), with which they are horizontally and vertically associated. Thus, they are assigned an early Late Woodland chronometric provenience (ca. 700 A.D.) and are believed to be of Clemson's Island origin.

Type 5 (Plate 6: 8): includes one small specimen with an ovate-incurvate blade and broken straight base. In longitudinal section the specimen is transversely truncated-ovate and in transverse section biconvex. The lateral edge of the blade is evenly chipped and has received continuous secondary marginal retouch in a manner identical to that found on Late Prehistoric triangular points. Both lateral edges are lightly burnished but lack evidence of use chipping. It is suggested therefore, that this specimen was used for perforating. The specimen is made of high quality gray-brown chert.

The single specimen of Type 5 was recovered from a Susquehannock pit in Master Level 2 and is believed to be a product of that culture. Chronometric provenience is placed at 1550-1580 A.D.

Notched Drills

Type 6 (Plate 6: 7): includes one medium-sized side-notched specimen with an incurvate blade and smoothed sub-concave base. In both longitudinal and transverse sections the specimen is asymmetrically biconvex. The blade joins with oblique shoulders in rounded distal zones of juncture. Haft elements are symmetrical, continuously rounded and smoothed. The lower sub-element of the haft joins with the base in broadly rounded proximal zones of juncture. The base is just slightly wider than the blade at the distal zones of juncture. The lateral edges of the blade are evenly chipped and burnished and have received discontinuous secondary marginal retouch. The specimen is made of rhyolite.

The single specimen of this type was recovered from a Susquehannock pit on the far western end of the site and is believed to have been redeposited from an earlier Transitional period component dating to 1800-1000 B.C. The haft-stem-base complex is distinctively Broad Spear in appearance, and the piece may be either a reworked Susquehanna Broad Spear point or a primary tool product belonging to the same complex.

Triangular Drills

Type 7 (Plate 6: 9 and 10): includes two small specimens with incurvate blades and concave bases. In both longitudinal and transverse sections they are biconvex. Lateral edges tend to be slightly irregular and have received discontinuous secondary marginal retouch. The blade joins with the base in angular or rounded proximal zones of juncture. The proximal portions of both specimens are bilaterally asymmetrical. The specimens are made of medium grade brown and gray cherts.

One specimen was recovered from an upper stratum of Master Level 2 and the other from the base of a nearby deep Susquehannock pit. Both speciemsn strongly resemble triangular points of the Late Prehistoric period (ca. 1350-1580 A.D.). They are of either Shenk's Ferry or Susquehannock origin.

GOUGES (Plate 4: 42)

Included in this category is one specimen the function of which is not entirely clear. The specimen is broken and subsequently reworked Type 18 knife illustrated in Plate 4: 42. Apparently, both the blade and base were broken during use with respect to the implement's primary functional context (knife). Modification after breakage involved longitudinal trimming of the blade, using the broken end as a striking platform for the removal of several broad expanding flakes in order to produce a thin cross-section. The flakes thus removed all end in hinge fractures. The edge of the secondary bit is lightly burnished. Chipping scars in the form of small hinge fractures were observed on both faces of the bit. It is not clear if these are a product of manufacture or of use. Presumably the piece functioned as a hafted gouge or chisel.

The specimen was recovered from Master Level 3 and dates to the latter part of the Middle Woodland period (ca. 300-700 A.D.). Dimensional and distributional data are summarized in Tabls 6 and 9.

HAMMER STONES

This functional category includes 20 specimens classified into two groups, pitted and unpitted hammer stones. Dimensional and distributional data are summarized in Tables 6 and 9.

Type 1: includes eighteen oval and oblong specimens having the pocked wear pattern on one or more areas of sharp curvature characteristic of hammerstones. All are utilized river cobbles made of sandstone.

The specimens are unevenly distributed throughout the Master Levels, with nearly 75% having been recovered from the upper strata of Level 2; counts of one or two occur in Levels 5 through 8. None were recovered from Master Levels 3 and 4.

Type 2: includes two unificially pitted specimens. Both are river cobbles made of sandstone. It is possible that the specimens may have been used as nut stones, but nut remains are conspicuously absent from the area surrounding the stones, and the specimens were physically associated with the debitage of knapping. Moreover, both show the wear properties described above under Type 1.

Both specimens were found in an upper stratum of Master Level 2 and date to the Late Prehistoric period (ca. 1550-1580 A.D.).

HEARTH AND BOILING STONES

Ninety-one stones weighing from less than 25 grams to more than eight kilograms show the characteristic properties of exposure to fire, including reddened, ash-smudged and cracked surfaces. Unfortunately, not all such stones recovered during the site's long

history of excavation were saved or recorded, and this collection can be regarded only as indicative of patterns of distribution. Unbroken specimens fall into four discrete weight classes (25-125 gm; 175-275 gm; 450-525 gm; 875-8200 gm), while the broken specimens, as would be expected, show a continuous decline in frequency from small to large weight intervals. Presumably the two smaller "unbroken" weight categories generally functioned as boiling stones, while the larger categories functioned in a more stationary capacity as hearth stones. With few exceptions the stones are situated in or very near to recorded hearths. Thirty-two additional rocks (the sample cataloged) not indigeneous to the site were recovered during the excavations, all of which show no evidence of use in any capacity. However, they do show similar weight and spatial distribution patterns similar to the hearth and boiling stones and are believed to have functioned generally in the same capacity.

INCISING TOOLS

Twenty-two items in the collection show wear properties and/or specialized modification indicative of use as incising tools. These are classified into two general categories, gravers and burins, and are further subdivided into 8 types based on distinctive morphological properties as follows:

	Type Designations	Number of Specimens
Gravers		
Utilized Flake	1	2
Retouched Flake	2,3	4
Notched	4	1
Triangular	5,6	13
Burins		
Single Blow	7	1
Gouge "single blow"	8	1

Dimensional and distributional data are summarized in Tables 4 and 8.

The term "graver" is restricted to those tools which have a natural or prepared bit suitable only for engraving. The bit is pointed rather than chisel-like (as is characteristic of burins) and when intentionally prepared is the product of the same flaking technology used to form the barbs, tips and other angular sub-elements of projectile points, knives, drills, hafted scrapers, and so forth.

The preparation of a burin bit involves a different and distinctive flaking technique whereby a chisel-like edge is produced by longitudinal rather than transverse spalling of the flake blank or preform edge.

Depending on the number and direction of the burin facets thus formed, a wide range of specialized engraving, carving, and shaving tools can be prepared, and it is on the basis of these properties and the form of the flake blank or preform that Burkitt (1933: 59-64) formulated the comprehensive framework for the descriptive classification of burins utilized in the present study.

Utilized Flake Gravers

Type 1 (Plate 6: 35 and 36): includes two naturally pointed specimens which are lenticular polyhedral pieces of shatter. The pointed distal ends of both specimens are burnished, and the distal portion of one lateral edge of the specimen shown in Plate 6: 36 has also acquired numerous small chipping scars through use. The specimens are made of fine-grained gray and black cherts.

One specimen was recovered from a Susquehannock pit in Master Level 2; the provenience of the other specimen is unknown. Both are believed to be of Late Prehistoric origin (ca. 1350-1580 A.D.).

Retouched Flake Gravers

Type 2 (Plate 6: 31): includes one sub-rectangular specimen with a small blunt beak centrally located along one of the lateral edges. The piece has been unifacially marginally retouched along the three adjacent lateral edges. The bit is lightly burnished from use. The specimen is made of a refractory fine-grained brown chert.

The single specimen of this type was recovered from an upper stratum of Master Level 2 and dates to the Late Prehistoric period (ca. 1350-1580 A.D.).

Type 3 (Plate 6: 32-34): includes three small flake gravers prepared by marginal retouch near the intersection of two lateral edges, producing a small beak for fine incising work. One of the specimens (Plate 6: 34) appears to have been prepared on a broken utilized flake side scraper. The bits of all specimens show burnishing and/or small chipping scars acquired during use. The specimens are made of high quality gray-brown and black cherts.

All three specimens were recovered from the upper strata of Master Level 2 and date to the Late Prehistoric period (ca. 1350-1580 A.D.).

Notched Gravers

Type 4 (Plate 6: 30): includes one relatively large specimen prepared on a broken stemmed knife belonging to Type 19. The broken blade has been reshaped into a beaked graver. The bit is centrally

located on the longitudinal axis of the blade, the lateral edges of which converge incurvately on the bit. The bit is lightly burnished. The specimen is made of rhyolite.

The stratigraphic provenience of the specimen is unknown. On the basis of stylic similarities to Knife Type 19, however, type 4 is believed to date to the terminal Middle Woodland-early Late Woodland period (ca. 500-1350 A.D.). Cultural affiliation is uncertain.

Triangular Gravers

Type 5 (Plate 6: 18 and 19): includes two specimens representing specialized adaptations of triangular points of the Levanna type or related forms. Both specimens are made of gray Onandaga chert.

The specimens were recovered from opposite ends of the site, one from a Susquehannock pit on the west end and the other from an early Late Woodland stratum in Master Level 2. This latter specimen was associated with several sherds of the Carpenter Brook cord-on-cord pottery variety (Huner 1967: 478-479) which dates to the beginning of the second millenium A.D. (ca. 1000-1100 A.D.) (Ritchie 1969: 275).

Type 6 (Plate 6: 20-29): includes eleven utilized and retouched triangular points fragments of Shenk's Ferry and Susquehannock origin. In general, the graver bit consists of a basal corner of a broken triangular point sometimes retouched to produce a sharp projecting beak. Two of the specimens are similar in form to Projectile Point Type 41 and may be reworked poorly made points of that variety. All of the illustrated specimens have their bits oriented vertically.

The bits of most of the specimens show burnishing and/or small chipping scars acquired during use. Nine of the eleven specimens are made of medium to high quality cherts; the two remaining specimens are made of black, translucent, fibrous-interior chalcedony, the material most commonly used in the manufacture of Shenk's Ferry triangular points (Type 38).

All of the specimens of this type were recovered from the upper strata of Master Level 2. They form three well-separated clusters located on the far western, central and far eastern portions of the site. All date to the Late Prehistoric period (1350-1580 A.D.) and are probably the remains of both Shenk's Ferry and Susquehannock occupants.

Single Blow Burins

Type 7 (Plate 6: 38): includes one reworked specimen originally belonging to Knife Type 18. After the blade of the knife suffered a transverse fracture, the specimen was fashioned into a single blow

burin (Burkitt 1933: 62), using the break as a striking platform from which four longitudinal burin spalls were removed along one lateral edge in two, possibly three, phases of modification. The first phase involved the dislodging of two parallel spalls 21 mm in length in nearly the same planes; the second phase followed with the production of a single broad facet 17 mm in length. An additional spall possibly dislodged at a later time measures 5 mm in length. The burin face of the specimen is moderately burnished. The specimen is made of a medium grade black chert.

The single specimen of this type was recovered from Master Level 3 and probably dates to the latter half of the Middle Woodland period (ca. 100-700 A.D.).

Gouge "Single Blow" Burins

Type 8 (Plate 6: 37): includes one bifacially shaped specimen with a roughly triangular outline and polyhedral bit formed by the removal of three burin spalls side-by-side but in slightly different planes about the longitudinal axis of the piece, thus corresponding to what Burkitt (1933: 62) terms a gouge "single Blow" burin. The specimen shows both burnishing and small chipping scars on the bit. The piece is made of Onandaga chert.

The single specimen of this type was recovered from Master Level 6 and is believed to have been found out of context as a result of side-wall slumpage. The specimen is believed to be of Late Woodland origin.

KNIVES

The 21 typological varieties of cutting implements discussed below comprise 58 specimens grouped into two general categories, flakes and bifaces, which are further subdivided into six classes based on kind of modification and form, as follows:

Category and Class	Number of Specimens	Number of Types	Type Designations
Flake knives			
utilized flakes	4	1	1
marginally retouched flakes	11	1	2
Bifacial Knives			
lunate	2	1	3
ovate	22	10	4-13
triangular	7	4	14-17
stemmed-notched	11	4	18-21

Dimensional and distributional data are summarized in Tables 5 and 8.

Flake Knives: Utilized Flakes

Type 1 (Plate 4: 1): includes four flakes which are unaltered except for the presence of small use (chipping) scars along both faces of one or more lateral edges.

As might be expected, Type 1 has a wide stratigraphic distribution: one specimen was recovered from Master Level 8 and is associated with one of the earliest occupation units (ca. 7000-8000 B.C.); another specimen was recovered from Master Level 7 and is also associated with a hearth and living floor dating to 3000-4000 B.C.; the two remaining specimens were taken from Master Level 2 and date to the Late Woodland period (ca. 700-1580 A.D.).

Flake Knives: Marginally Retouched Flakes

Type 2 (Plate 4: 2): includes eleven flakes with convex cutting bits prepared by bifacial chipping of a lateral edge.

Specimens of Type 2 are stratigraphically widely distributed: one derives from a Kirk occupation unit in Master Level 8; another (Plate 4: 2) from a late Middle Archaic (ca. 4000-3000 B.C.) living floor in Master Level 7; three specimens were recovered from Master Level 6 and are associated with a Brewerton living floor dated to B.C. 2350 ± 180 (M-1906); six specimens were found in Master Level 2 and probably date from both the early and late phases of the Late Woodland period (ca. 700-1580 A.D.).

Bifacial Knives: Lunate

Type 3 (Plate 4: 7 and 8): includes two small specimens with a length/width ratio ranging from 1.9/1 to 2.8/1. In both longitudinal and transverse cross-sections they are biconvex. Both specimens are biterminally symmetrical and bilaterally asymmetrical, with the straight and convex lateral edges joining in well-rounded distal and proximal zones of juncture. Surface treatment exhibits light to moderate relief, and secondary retouch is present in a small to moderate amount. Edge treatment is fairly regular. Use scars were observed on both specimens. The knives are made of fine-grained gray chert.

Type 3 was found only in Master Level 2. Unfortunately, both specimens were recovered from disturbed contexts and their cultural affinity is imprecisely known. They may date to either the early or late phases of the Late Woodland period (ca. 700-1580 A.D.).

Bifacial Knives: Ovate

Type 4 (Plate 4: 3-6): includes four small to medium sized specimens with a length/width ratio ranging from 1.5/1 to 2.3/1 and averaging 2.0/1. In longitudinal section specimens are symmetrically

and asymmetrically biconvex, and in transverse section they are asymmetrically biconvex. The specimens manifest a greater degree of biterminal than bilateral symmetry. Both distal and proximal zones of juncture are well-rounded. The distal and proximal ends of two of the four specimens are constricted. Surface treatment is bold in all cases; one specimen (Plate 4: 5) is incompletely worked and still retains a striking platform remnant on its proximal end. Edge form is slightly irregular. Use scars and burnishing are conspicuous by their absence. Specimens of Type 4 are made of coarse-grained gray and black chert.

All four specimens of this type were recovered from Master Level 4. Three of the specimens cluster in and around a small hearth in E_{10} S_{10}; the fourth specimen (the unfinished piece shown in Plate 4: 5) has no definitive associations. Type 4 is believed to date from the Early Woodland period (ca. 1000-500 B.C.) and to be affiliated with Projectile Point Type 29 (Juniata Stemmed).

Type 5 (Plate 4: 9 and 11): includes two relatively small specimens, one (Plate 4: 9) with delicately retouched serrated lateral edges; the other (Plate 4: 11) also delicately retouched but without serrations. The former has a length/width ratio of 1.6/1 and is made of a fine-grained black chert. "Pot lids" (thermally produced fractures) are present on both faces.

The latter specimen has a length/width ratio of 1.2/1 and is also made of a fine-grained black chert (probably from a different source however). One face of this specimen is incompletely worked and still retains a calcareous crust. Although the edge treatment of this specimen is somewhat irregular, there does not appear to have been any attempt to produce a serrated bit. In longitudinal and transverse cross-sections both knives are asymmetrically biconvex. Both specimens exhibit small use scars.

The serrated specimen is definitely associated with a Kirk occupation component in Master Level 8. The second specimen was foundin astratum overlying this component in Master Level 7 and is believed to be a product of the Kirk occupation, which is estimated to date between 7000 and 6800 B.C., based on chronometric findings at the St. Albans site in West Virginia (Broyles 1966: 39-40).

Type 6 (Plate 4: 10): includes one medium-sized specimen with a length/width ratio of 1.4/1. It closely approximates the form of a lunate with rounded zones of juncture. In both longitudinal and transverse cross-sections the specimen is plano-convex. It is boldly flaked and has received a sparing amount of secondary retouch. Use scars and burnishing were observed on the convex bit. The specimen is made of dull, grainy calcareous chert.

Type 6 was found associated with an extensive hearth and living floor at the base of Master Level 7, with which the Raystown Stemmed point (Projectile Point Type 2) is also associated. Estimated chronometric provenience is 4000-5000 B.C.

Type 7 (Plate 4: 12, 14, 15 and 18): includes five specimens of medium to large size with a length/width ratio ranging from 2.0/1 to 2.6/1 and averaging 2.3/1. All specimens are both biterminally and bilaterally asymmetrical (i.e., the distal or bit end is nearly always pointed, while the proximal end is broadly roundly; and one lateral edge (the cutting edge) is always more excurvate than the other). Longitudinal and transverse cross-sections are generally asymmetrically biconvex, ocassionally plano-convex. Surface treatment is generally bold and edge form mildly irregular. Secondary marginal retouch is sparse and discontinuous when present. Burnishing acquired during use is in evidence on all of the chert specimens, and small chipping (use) scars were observed on the limestone knife. Four of the five specimens are made of coarse-grained gray or black chert; one specimen is made of black limestone. This type differs from Types 5 and 6 in possessing a greater length/width ratio, larger size and biterminal asymmetry associated with a pointed distal end.

All five specimens were found in the upper strata of Master Level 6 and tightly cluster in and around W10 S15. Their stratigraphic context suggests that they date from Late to Terminal Archaic times (ca. 2500-1800 B.C.) and that they may be associated with a Brewerton living floor radiocarbon-dated to B.C. 2350 ± 180 (M-1906).

Type 8 (Plate 4: 13): includes one large specimen with a length/width ratio of 1.9/1. In longitudinal section it is biterminally-asymmetrical biconvex and in transverse section symetrically biconvex. In overall configuration the specimen is asymmetrical (both biterminally and bilaterally) and is triangulo-ovate in outline. Proximal zones of juncture are rounded, and the proximal end or "base" and all other lateral edges are irregular in edge form. Surface treatment is bold and secondary marginal retouch from use was found on the knife's convex cutting edge. This specimen is made of a medium grade, somewhat refractory chert. Morphologically, Type 8 differs from previous knife types primarily in its larger size and its basically triangular configuration.

This specimen was recovered from the eastern end of the site in Master Level 6 and was found in association with Projectile Point Type 22, a relative of the Bare Island Type A and Wading River types (Kinsey 1959: 115; Ritchie 1969: 241-242). Estimated chronometric provenience is 2300-2100 B.C., based on radiometric findings at the Sylvan Lake rockshelter in the Hudson Valley and the Horblower II site in Martha's Vineyard (Ritchie 1965: 135).

Type 9 (Plate 4: 16 and 17): includes two medium-sized specimens with a length/width ratio ranging from 2.5/1 to 2.8/1. In longitudinal section both specimens are biconvex, while in transverse section they are asymmetrically biconvex. The proximal portion Type 8 tends to be more "pointed" (less broadly rounded) than observed in Type 7, resulting in a more symmetrical biterminal configuration. Type 9 is only slightly bilaterally asymmetrical. Surface treatment is even bolder than found in Type 7 and secondary retouch is lacking altogether. Edge form is irregular principally

on the cutting edge which exhibits light to heavy burnishing acquired from use. One specimen is made of eastern Pennsylvania rhyolite and the other of coarse-grained black chert.

Both specimens of Type 9 were recovered from the uppermost strata of Master Level 3 in close proximity to one another on the eastern end of the site. Two radiocarbon dates were secured from a stratum underlying those in which the specimens were found: A.D. 60 ± 140 (M-2083) and A.D. 320 ± 140 (M-2082). Type 9 thus dates to the latter part of the Middle Woodland period. Its cultural affiliation, however, is uncertain at this time.

Type 10 (Plate 4: 19 and 20): includes two relatively small specimens with a length/width ratio ranging from 1.4/1 to 1.6/1. In longitudinal section specimens of Type 10 are symmetrically biconvex and biterminally-asymmetrical biconvex; in transverse section they are asymmetrically biconvex. Like Type 9 these specimens possess a nearly symmetrical biterminal and bilateral configuration; however, the proximal end is more rounded than the distal end. Surface treatment is bold and secondary marginal retouch absent. Both specimens exhibit light burnishing on the bit and one specimen possesses a few small use scars in addition to burnishing. Morphologically, Type 10 differs from Type 9 principally in length, width and length/width ratio.

Both specimens were recovered from the upper strata of Master Level 2 and presumably date from the latter part of the Late Woodland period (ca. 1350-1580 A.D.). Since the entire Late Woodland deposite was greatly disturbed by the Late Prehistoric Susquehannock inhabitants, it is possible that these specimens may date to the earlier part of the Late Woodland period (ca. 700-1350 A.D.). Cultural affiliation is indeterminate.

Type 11 (Plate 4: 22): includes one relatively thick and long specimen with a length/width ratio of 2.7/1. In longitudinal section it is prominantly biterminally-asymetrical biconvex, and in transverse section asymetrically biconvex. The general configuration most closely approximates that of Type 7, from which it is to be distinguished by a much greater thickness and larger length/width ratio. Surface treatment is very bold and secondary marginal retouch absent. Edge form is irregular. Light chipping and heavy burnishing of the bit have resulted from use. The specimen is made of an unidentified fine-grained non-chert material.

This specimen was found in the same context as Type 10. It dates to the Late Woodland period (ca. 700-1580 A.D.), probably the latter part (ca. 1350-1580 A.D.), and may be of Shenk's Ferry origin.

Type 12 (Plate 4: 21 and 23; PR Vol. 2, p. 417, Figure 6a and 6b): includes three medium to large sized specimens with a length/width ratio ranging from 1.9/1 to 2.1/1 and averaging 2.0/1.

In longitudinal section the specimens are symmetrically biconvex and in transverse section asymmetrically biconvex. Both the distal and proximal ends tend to be broadly rounded (the latter more so than the former). All three specimens are approximately biterminally symmetrical and bilaterally asymmetrical; the bit edge has a strongly-developed curvature as compared with the opposite lateral edge. Surface treatment is bold and one specimen (PR Vol. 2, p. 417 Figure 6a and 6b) has received a sparing amount of secondary marginal retouch. Light use burnishing was observed on one specimen and small use scars on another. Two specimens are made of coarse-grained dark brown and black cherts; the third specimen is made of black, translucent, fibrous-interior chalcedony.

The specimens of Type 12 were found at widely separated points in the site either at or near the surface and are believed to be of Susquehannock origin (ca. 1550-1580 A.D.).

Type 13 (Plate 4: 24): includes one small specimen with a length/width ratio of about 1.6/1. Both the longitudinal and transverse cross-sections are symmetrically biconvex. Although the specimen is fragmentary, its configuration is believed to be very similar to Type 10, from which it differs substantially in size, surface treatment and material; Type 13 is considerably smaller and thinner, has received extensive secondary marginal retouch and is made of fine-grained, waxy gray chert.

Both the material and fine surface treatment are identical to that found among Late Prehistoric triangular points and this chronologic interpretation is supported by the specimen's stratigraphic provenience: it was recovered from the uppermost stratum of Master Level 2 and is believed to be of Susquehannock origin (ca. 1550-1580 A.D.).

Bifacial Knives: Triangular

Type 14 (Plate 4: 30 and 31): includes two relatively small and very thin specimens with a length/width ratio ranging from 1.3/1 to 1.7/1. Both specimens are biplano in longitudinal section and asymmetrically biconvex in transverse section. Blade outline is asymmetrically ovate. The blade joins with a straight or subconvex base in angular or slightly rounded proximal zones of juncture. Both specimens exhibit broad, shallow primary flake scars supplemented by systematic but discontinuous marginal retouch. Edge form is regular on one specimen and somewhat irregular on the other. The base of the specimen shown in Plate 4: 30 is smoothed. Both specimens exhibit a small amount of burnishing. Specimens of Type 14 are made of fine-grained, lustrous gray and black chert.

Both specimens of this type were recovered from Master Level 4 and were found in spatial proximity to Projectile Point Type 26 (Meadowood), with which they are believed to be affiliated.

Type 15 (Plate 4: 25 and 26): includes two medium-sized specimens, one of which has a length/width ratio of 2.0/1; the other specimen (Plate 4: 26) was too fragmentary for accurate reconstruction but is believed to have manifested similar proportions and to have been slightly larger in length and width. Type 15 is symmetrically or asymmetrically biconvex in longitudinal section and symmetrically biconvex in transverse section. Blade outline is parallel-ovate and symmetrical. The blade joins with a straight base in angular proximal zones of juncture. Surface treatment consists of overlapping expanding primary flake scars. One specimen exhibits little or no secondary retouch, while the other (Plate 4: 26) is continuously retouched along the lateral edges of the blade; the former specimen also exhibits a few small use scars. Both specimens are made of differing varieties of Flint Ridge, Ohio, Chalcedony, one milky-white with a waxy surface, the other less lustrous and pinkish-white.

One specimen of Type 15 was recovered from Master Level 2 and the other from Master Level 3. Both are believed to be Hopewellion trade items of early Middle Woodland origin (ca. 500 B.C. to 200 A.D.) and to have been deposited at the site at the same time as Projectile Point Type 31 (Snyders), one specimen of which (Plate 2: 44) is made of the same material, or Type 48, which is also made of the same material.

Type 16 (Plate 4: 32 and 33): includes two relatively large specimens with a length/width ratio ranging from 1.9/1 to 2.2/1. Both specimens are virtually biplano in longitudinal section and plano-convex or asymmetrically biconvex in transverse section. Blade outline is ovate and bilaterally asymmetrical, with the edge opposite the bit being straight along two-thirds of its length and the bit edge continuously curved over its entire length. The blade joins with a straight base in rounded proximal zones of juncture. Surface treatment consists of broad, shallow primary flake scars (generally in greater quantity on the convex face) supplemented by discontinuous secondary retouch. Edge form is irregular. Burnishing acquired during use is present on both specimens, and a few small use scars were observed on the bit of the larger of the two fragments (Plate 4: 33). One specimen is made of Onandaga chert and the other of translucent, fibrous interior, black chalcedony.

Both specimens were found in Master Level 2 and are believed to date to the latter part of the Late Woodland period (ca. 1350-1580 A.D.). Cultural affiliation is imprecisely known, and they may be of either Shenk's Ferry or Susquehannock origin.

Type 17 (Plate 4: 34): includes one small specimen with a length/width ratio of 2.4/1. Both the longitudinal and transverse sections are symmetrically biconvex. Blade outline is excurvate and is bilaterally symmetrical. The blade joins with a straight base in angular proximal zones of juncture. Surface treatment consists of broad, shallow, concoidal primary flake scars supplemented by a liberal

amount of continuous secondary marginal retouch. Edge form is slightly irregular on both the base and lateral edges of the blade. Small use scars are present on the bit portion of the lateral edges of the blade. The specimen is made of a fine-grained, lustrous semitranslucent gray chert.

Type 17 was recovered from Master Level 2 and is believed to be of Late Prehistoric origin (ca. 1350-1580 A.D.), as its workmanship and material are typical of that found among triangular points of this period. It is suggested that Type 17 is of Susquehannock origin.

Bifacial Knives: Stemmed-Notched

Type 18 (Plate 4: 41-43): includes three medium-sized specimens with a length/width ratio ranging from 2.2/1 to 2.8/1 and averaging 2.5/1. In both longitudinal and transverse sections they are either symmetrically or asymmetrically biconvex. Blade outline is ovate and is believed to be approximately symmetrical (the blade element of all three specimens has been greatly reworked and the reconstruction should be viewed as likely but not certain). The blade articulates with the haft in oblique angles and broadly rounded distal zones of juncture. Haft elements are broad and continuously rounded and are smoothed. The stem expands away from the longitudinal axis and joins with a straight or slightly convex base in well-rounded proximal zones of juncture. The base has been smoothed on all specimens. Blade/base width ratio (taken at the distal and proximal zones of juncture, respectively) averages 1.1/1. Surface treatment is bold and consists of broad, overlapping, expanding primary flake scars supplemented by discontinuous lateral retouch. Edgeform is slightly irregular. Heavy burnishing was observed on the bit of the only specimen (Plate 4: 43) which still retains a portion of the original blade. Two specimens are made of coarse-grained black and brown-to-black chert; the third specimen is made of rhyolite.

As mentioned above the blades of all of the specimens have undergone considerable reworking. In one case (Plate 4: 42) the piece was refashioned into a gouge; another (Plate 4: 43) into a burin; and the third (Plate 4: 41) into some unidentifiable but probably similar functional type. The morphology of these secondary functional bits is discussed under the burin and gouge functional categories, respectively.

Two of the specimens were recovered in close proximity to one another from Master Level 3 and the third from a lower stratum of Master Level 2. All are believed to have been deposited during late Middle Woodland times (ca. 400-700 A.D.). Their cultural affinity is not clear at this time, but they are believed to relate to a poorly understood set of related complexes found on this time level on both sides of the Appalachian Plateau.

Type 19 (Plate 4: 37-39): includes three medium to large-sized specimens with a length/width ratio ranging from 1.4/1 to 2.4/1 and having a modal value of 2.2/1. In longitudinal section specimens of Type 19 are either symmetrically or asymmetrically biconvex; in transverse section they are symmetrically biconvex. Blade outline varies from slightly excurvate to parallel-ovate to ovate and is slightly asymmetrical. The blade joins with the very weakly-developed upper subelement of the haft in broad oblique angles and angular or rounded zones of juncture. Haft elements are very broad and shallow. The stem descends from the medial zones of juncture parallel with the longitudinal axis for some distance before flanging outward to join with the straight or slightly subconvex base in well-rounded proximal zones of juncture. The base is not smoothed. Surface treatment is bold and consists of broad, shallow overlapping expanding primary flake scars supplemented by a sparing amount of discontinuous secondary retouch. Edge form is irregular. Two specimens exhibit light burnishing of the bit. The smallest specimen (Plate 4: 39) has undergone considerable reworking of its blade. Two specimens are made of coarse-grained black chert and one specimen of rhyolite.

All three specimens of Type 19 were recovered from the lower strata of Master Level 2 (two of which - Plate 4: 37 and 38 - were found in the same context) and are believed to date to the early Late Woodland period. Their cultural affinity, however, is uncertain at this time.

Type 20 (Plate 4: 35, 36 and 40): includes three medium to large-sized specimens with a length/width ratio ranging from 2.0/1 to 3.0/1 and having a modal value of 2.9/1. In longitudinal section two of the specimens are symmetrically biconvex and the third, the smallest of the three, biplano; in transverse section the former two are biconvex and the latter specimen is plano-convex. Blade outline is parallel-ovate or contracting ovate and is more or less symmetrical. The blade joins with the upper subelement of the haft in very broad oblique angles and angular distal zones of juncture. Shoulders are virtually absent (they consist of slight angular protrusions in the configuration of the lateral edge). Haft elements are extremely broad and shallow. The stem contracts slightly and joins with a subconcave base characteristically in one angular and one rounded proximal zone of juncture. The base has been smoothed in all cases. Surface treatment is bold and consists of broad, shallow concoidal and expanding primary flake scars supplemented by a sparing amount of discontinuous secondary retouch. Edge form is slightly irregular. Burnishing was observed on the lateral edges of two specimens. Two specimens are made of coarse-grained black chert, and the third specimen of rhyolite.

Two of the speciemsn were recovered in close proximity to one another from the upper strata of Master Level 2; provenience of the third specimen is unknown. The former two specimens were excavated from a deep pit at the back of the shelter on the eastern

end of the site (E30 to E40). The pit is believed to have been dug by Susquehannock occupants. It is unlikely that Type 20 is of Susquehannock origin, however, as extensive excavations at the Strickler, Shultz and other Susquehannock sites in the lower Susquehanna Valley have not yielded knives morphologically similar to Type 20 (Barry Kent and Ira Smith: personal communication). It is suggested that these specimens were redeposited from an older context during the Susquehannock pitting operation and that they probably derive from a Middle Woodland Fox Creek component dating to about 300-450 A.D. Type 20 is remarkably similar to specimens of the recently defined Fox Creek lanceolate point (formerly termed Steubenville Lanceolate (Ritchie 1961: 51-52; Funk 1968: 1-7), and is believed to have originally been associated with Projectile Point Type 46 (Fox Creek Stemmed). The Fox Creek complex has been radiocarbon-dated at the Westheimer site to A.D. 410 ± 80 (Y-2350) and A.D. 450 ± 80 (Y-2349), and at the Fredenburg site to A.D. 360 ± 100 (I-3442) (Funk 1968: 4). A similar date of A.D. 320 ± 140 (M-2082) was obtained at the Sheep Rock Shelter from a small hearth unfortunately lacking definitive associations but believed to be a component of the Fox Creek occupation at the Sheep Rock Shelter.

Type 21 (Plate 4: 44-46): includes three large lanceolate specimens with a length/width ratio ranging from 2.6/1 to 2.9/1 and averaging 2.8/1. In longitudinal section two specimens are slightly converging biplano and the third biconvex; in transverse section two specimens are symmetrically biconvex and the third asymmetrically biconvex. Blade outline is parallel-ovate and is bilaterally symmetrical. The blade joins with the upper subelement of the haft in oblique angles and rounded distal zones of juncture. Haft elements are continuously rounded. The stem expands outward slightly from the longitudinal axis before joining with a straight or slightly convex base in rounded proximal zones of juncture. Blade/base width ratio (taken at the distal and proximal zones of juncture) averages 1.4/1. The base of one specimen (Plate 4: 46) has not been completely worked. Surface treatment is bold and consists of broad overlapping expanding primary flake scars supplemented by secondary retouch only in the area of the base. Edge form is irregular. Two specimens exhibit heavy burnishing (and one of these two (Plate 4: 44) considerable longitudinal abrasion) along one or more lateral edges; a third specimen exhibits light burnishing of both lateral edges. One specimen is made of black argillaceous limestone, another of coarse-grained black chert and the third of a weathered, intensely thermally altered unidentified material.

All three specimens of this type were recovered from the lower strata of Master Level 2 and form a tight spacial cluster around a substantial hearth in E20 S05 and adjacent squares. Their context suggests a terminal Middle Woodland - early Late Woodland origin (ca. 500-800 A.D.). Cultural affiliation, however, is uncertain at this time.

PEBBLES

Two-hundred and ninety-six pebbles ranging in weight from 0.2 to 96 grams were recovered from the excavations. About 250 of these are of the kind that Witthoft (page: 22) describes as gizzard stones of owls and their prey, "...tiny white quartz river pebbles with polished surfaces, and occasional larger quartz pebbles ... (all) crop-stones from passenger pigeon and turkey." These range in weight from 0.2 to 7 grams. The remaining 46 specimens, with a weight ranging from 8 to 95 grams, owe their presence to human occupation of the site and are of uncertain function. They may have been used as game objects and tally stones.

POUNDERS

This category includes four artifacts exhibiting relatively blunt, battered surfaces suggesting use as pounding (crushing, mashing and shreading) implements. They have been classified into three morphological types, the dimensional and distributional data of which are presented in Tables 5 and 8.

Type 1 (Plate 7: 11): includes one relatively large sub-rectangular specimen which is biplano in both longitudinal and transverse cross-sections. Both ends have been battered, particularly the proximal end which has undergone considerable deterioration. This end appears to have been purposefully flaked to form a roughly quadrilateral blunt surface, as several large flake scars, one on each of the lateral surfaces and two or more on the ventral and dorsal sides, have been struck from the distal end. In addition, at least one broad flake was transversely removed from the distal surface to form the blunt bit. Two hafting grooves, one shallow and one deep, have been transversely scored into the lateral surfaces of the specimen about one-third the distance from the proximal end. The specimen is made of a hard, compact micaceous sandstone and has been thermally altered.

The specimen was recovered from an upper stratum of Master Level 2 and dates to the Late Prehistoric period (ca. 1350-1580). Associational evidence suggests that the implement is of Susquehannock origin.

Type 2: includes two relatively small round river pebbles which were used to crush shell. Neither appears to have been shaped to any significant degree, and both still retain small shell particles imbeded between the coarse grains composing the surface of the material.

Both specimens were recovered from the same square (W10S00) in Master Level 3 and were found associated with a large quantity of Sheep Rock Cordmarked pottery (Huner 1967: 470-471), a style which probably dates to the first century A.D.

Type 3: includes one large, circular bifacially pitted river stone. The entire peripheral surface of the stone has been either pecked and/or worn flat through use. Each side has been pecked in the center to a maximum depth of about 5 millimeters over a roughly circular area measuring approximately 20 millimeters in diameter. Both faces of the stone still retain a naturally smooth surface around the pitted zones. The periphery gives the appearance of having been used for pounding with the stone being gripped by the pits with the thumb and middle finger. Similar objects have been found in Venango County in association with macro-botanical remains and unassociated with the products of flint knapping remains (Sue Ann Curtis: personal communication, 15 December 1970). At the Sheep Rock Shelter the single specimen of this type was also found in association with a quantity of macro-botanical remains and unassociated with the products of flint knapping. It is suggested that the specimen was used for the processing of plant material, such as the pounding and shreading of bark or the crushing and mashing of nuts.

The specimen was found in a Susquehannock pit in Master Level 2 containing a variety of macro-botanical remains, including nut fragments.

Dimensional properties are as follows: Length (98mm); Width (92mm); Thickness (58mm); Weight (803gm).

RETOUCHED FLAKES

This category includes 44 marginally and bifacially retouched items, the functions of which could not be determined. Virtually all of the bifacial forms are fragmentary specimens which are either broken finished tools or aborted attempts to manufacture functional items. Marginally retouched flakes probably represent tools in process, completed forms and incidental debitage resulting from the reshaping of previously prepared forms. The specimens have been classified into three morphological types: (1) marginally retouched flakes, (2) bifacially retouched flakes and (3) incompletely roughed-out preforms and preform bifaces. Distributional data are summarized in Table 8.

Marginally Retouched Flakes

Type 1: includes nine specimens with multiple unifacial reticular flake scars and/or marginal retouch.

All except two of the specimens were recovered (in about equal proportions) from the upper and lower strata of Master Level 2; one each of the two remaining specimens was recovered from Master Levels 3 and 5, respectively. Thus, by far the greatest number of Type 1 specimens date to the Late Woodland period (ca. 700-1580 A.D.).

Bifacially Retouched Flakes

Type 2: includes 32 specimens with multiple bifacial flake scars.

About half of the specimens were recovered (in roughly equal proportions) from the upper and lower strata of Master Level 2; two specimens each were found in Levels 3 and 4; four specimens each were recovered from Levels 6 and 7; and 1 specimen was recovered from Master Level 8.

Incomplete and Broken Preforms

Type 3: includes three specimens which appear to be unfinished or broken preforms. All of these were recovered from Master Level 2.

SCRAPERS

Eighty-six artifacts in the collection are classified as scrapers on the basis of diagnostic wear and morphological properties. These have been grouped under three general categories, utilized flake scrapers, marginally retouched scrapers and bifacial scrapers, and are further subdivided into the ten morphological types described below, as follows:

Category and Class	Type Designations	Number of Specimens
Utilized Flake Scrapers	1,2	71
Marginally Retouched Scrapers		
End Scrapers	3,4	2
Side Scrapers	5-7	5
Bifacial Scrapers		
Corner - Notched	8	3
Stemmed	9	1
Lobate	10	4

Dimensional and distributional data are summarized in Tables 5 and 9.

Utilized Flake Scrapers

Type 1: includes five specimens classified as blades on the basis of having a length/width ratio exceeding 2/1 and more or less parallel sides. All of the specimens show the chipping use scars characteristic of scraping tools along one or more lateral edges.

One specimen of this type was recovered from a lower stratum of Master Level 7 (early Middle Archaic); two other specimens were found in Master Level 3 (Middle Woodland), one of which is a bladelet made of Flint Ridge, Ohio, chalcedony; another specimen was recovered from an upper stratum of Master Level 2 (Late Prehistoric); the provenience of the fifth specimen is unknown.

Type 2 (Plate 6: 43): includes 66 utilized amorphous flakes averaging about 30 millimeters in diameter. All show the usual chipping scars along one or more lateral edges resulting from use. The specimens are made of a wide variety of materials, the most popular of which is chert, but also including jasper, chalcedony and rhyolite.

The specimens are distributed throughout all of the Master Levels. Counts vary from 4 to 7 specimens for Levels 8 through 3, with one cluster for each Level except Master Level 4. By far the greatest number of specimens of this type, 33 in all, were recovered from Master Level 2, 11 of which were found in the lower strata and 22 in the upper strata of the Level. Although widespread throughout the site, they also show some tendency to cluster.

Marginally Retouched End Scrapers

Type 3 (Plate 6: 45): includes one relatively large specimen which is plano-concave in longitudinal section and trapezoidal in transverse section. The piece has been steeply retouched along the distal end to produce a convex bit. The flake blank is slightly curled and is thicker at both ends than in the midsection. The proximal end still retains the original striking platform. The specimen is made of coarse-grained brown chert.

The single specimen of this type was recovered from an upper stratum of Master Level 7 dating to about 4000-3000 B.C.

Type 4 (Plate 6: 41): includes one sub-rectangular specimen prepared from a biplanar tabular core, one end of which has been steeply retouched to produce a convex scraping bit. The specimen is made of a refractory fine-grained dark gray chert.

The single specimen of this type was recovered from a lower stratum of Master Level 6 and is associated with a Brewerton living floor radiocarbon-dated to B.C. 2350 $\pm$ 180 (M-1906).

Marginally Retouched Side Scrapers

Type 5 (Plate 6: 42): includes two relatively large amorphous specimens, on one lateral edge of which a steeply beveled, unifacial concave scraping bit has been prepared. The bits measure about 14 millimeters across by 5 millimeters deep. One of the specimens appears

to have been prepared on a broken bifacial blank with a truncated-ovate outline. The other specimen was prepared on an otherwise unaltered flake blank. Both specimens are made of dark red jasper.

Both specimens of Type 5 were recovered from the basal stratum of Master Level 6 underlying a Brewerton living floor radiocarbon-dated to B.C. 2350 ± 180 (M-1906). Estimated chronometric provenience is 3000-2350 B.C.

Type 6 (Plate 6: 44): includes two relatively large specimens with broad, unifacially prepared, steeply retouched convex scraping bits. Both specimens are prepared on amorphous flake blanks, and both are made of coarse-grained low quality cherts.

Both specimens were recovered from Master Level 4 which dates to the Early Woodland period (ca. 1000-500 B.C.).

Type 7 (Plate 8: 10): includes one large slab-like, sub-rectangular specimen, along one lateral edge of which a broad, deep bifacially-prepared notch has been fashioned. The notch measures about 30 millimeters across (maximum) and 11 millimeters deep, and the entire working edge has been smoothed and high spots lightly burnished from use. The specimen is made of a laminated sandstone river pebble and may have functioned as a bark and small branch stripper for the preparation of wooden poles measuring about an inch in diameter, such as might be used for drying racks.

The single specimen of this type was recovered from Master Level 6 and dates to the Late or Terminal Archaic period (ca. 2500-1800 B.C.).

Bifacial Scrapers: Corner-Notched

Type 8: (Plate 6: 47-49): includes three specimens prepared on the distal portions of broken corner-notched projectile points. The blades of all three specimens have been reworked into convex scraping bits. Two of the specimens are made of high quality fine-grained black cherts; the third specimen is made of black limestone.

All three specimens were recovered from Master Level 6 and are believed to be reworked forms of Projectile Point Type 8 (Plate 6: 47 and 48) and Type 23 (Plate 6: 49). The broken bases of the specimens shown in Plate 6: 48 and 49 have not been retouched, unlike their projectile point counter parts, suggesting that these forms may be specifically prepared for hafting and not reworked broken projectile points, as indicated above. The specimen's chronometric provenience is estimated at 2350-2000 B.C.

Bifacial Scrapers: Stemmed

Type 9 (Plate 6: 46): includes one specimen believed to have been prepared on a broken stemmed projectile point similar to Type 22. As with Scraper Type 8 above, the broken distal portion of the point has been reworked into a bifacially prepared convex bit. The specimen is made of a dark coarse-grained chert thermally altered subsequent to use.

The specimen was recovered from the upper-most stratum of Master Level 6 and is believed to have been deposited at the same time as Projectile Point Type 22 (ca. 2200-1800 B.C.).

Bifacial Scrapers: Lobate

Type 10 (Plate 6: 50-53): includes four relatively small specimens all having the form of a tear-drop. The broadly rounded distal end of two of the specimens (Plate 6: 51 and 52) have been heavily abraded, as if rubbed or glanced against a hard rough surface. The pointed proximal portions of the specimens show no signs of ware whatever. It is suggested that the specimens may have been used as strike-a-lights for the making of fire and that they were socketed on the end of a baton to increase the velocity of the glancing blow designed to send sparks from a coarse flint material into kindling. All of the specimens are made of fine-grained gray, brown and black cherts.

Two of the specimens were recovered from a Transitional period component in Master Level 5 (ca. 1800-1000 B.C.); the other two specimens were found in the lower and upper strata of Master Level 2, respectively. These latter specimens date to the Late Woodland period (ca. 700-1580 A.D.).

SINEW STONES

(Plate 8: 3 and 4): Included in this functional category are two relatively small, sub-rectangular celt-like implements which it is believed were designed to function as sinew stones for the pulling of gut. The outline of one specimen (Plate 8: 4) is quite irregular with asymmetrically-positioned scored concavities giving the piece a drawn-out S-like configuration. Scoring of both cavities is directed longitudinally. The proximal (bit) end contracts somewhat and joins with a straight transverse bit in rounded zones of juncture. The bit edge is continuously rounded and has numerous scored channels oriented parallel with longitudinal axis. In longitudinal section the piece is truncated-ovate and in transverse section it is biplano. Both faces have been smoothed. The specimen is made of locally available soft green shale.

Both specimens were recovered from the upper strata of Master Level 2 at well separated locations in the central portion of the site. They date to the late prehistoric period (ca. 1350-1580 A.D.) and may be of Susquehannock origin.

Dimensional and distributional data are summarized in Tables 6 and 9.

PARAPHENALIA

Included in this generalized functional category are personal ornaments and objects indicative of social role and status, as well as items used in ritual and ceremonial contexts. Dimensional and distributional data are summarized in Tables 6 and 9.

Gorgets (Plate 8: 7)

Only a single gorget fragment was recovered from the excavations. Although it is impossible to reconstruct its original outline, the piece was tabular (rectangular) in transverse section and had at least two biconically drilled holes 45 millimeters apart center-to-center, each with a 4 millimeter minimum diameter. The specimen is made of red shalely sandstone and does not appear to have been worked on either face, suggesting that it may have been in process when discarded. Gorgets function as personal ornaments and are indicative of social role and status.

The single specimen of this category was recovered from an upper stratum of Master Level 2 and is believed to be of Shenk's Ferry or Susquehannock origin (ca. 1350-1580 A.D.).

Mica (Plate 8: 6)

Four specimens of mica were recovered from the site, all except one of which is very small. Three of the specimens weigh 0.1 gram each and are less than a centimeter in average diameter; the larger specimen weighs 1.7 gram and measures about 68 by 37 millimeters across and is 1 millimeter thick. All four specimens are made of the muskovite variety and have no apparent specialized modification.

All of the mica specimens were recovered from the uppermost strata of Master Level 3 and date to terminal Middle Woodland-early Late Woodland times (ca. 500-1000 A.D.) and tend to cluster around Square E15S05. The mica probably functioned in ritual-ceremonial contexts, particularly those associated with mortuary activities.

Quartz Crystals

Three multifaceted clear and translucent white and rose quartz crystals of more or less regular geometrical configuration were recovered during the excavations. These may have functioned in ritual-ceremonial contexts as part of a shaman's "tool" kit.

Two of the specimens were recovered from Master Level 3 and one from Level 2; all are believed to have been originally deposited in the former. All three specimens cluster around Square W05S10 and probably date to the latter half of the Middle Woodland period (ca. 1-700 A.D.).

Ochre (Plate 8: 8)

Forty-one lumps of red ochre of variable size were recovered from the excavations. These range in weight from 0.4 to 133 grams, with a modal value of 4 grams. The largest specimen measuring 50x45x40 millimeters has two parallel grooves worn into one side and is the only lump that yielded evidence of specialized modification. Table 9 presents the weight distribution of the ochre lumps by Master Level.

A total of 292 grams of red ochre was recovered from the site. Of this total 25 grams lacked provenience information. Of the remaining 267 grams 20% (52 g) was recovered from the upper strata of Master Level 7 (ca. 4000-3000 B.C.), 48 grams of which was associated with Sheep Rock Woman and a newborn individual, (Burials 4 and 3: Smith 1967: 243-245; Saul page 207-215), suggesting that she may have died during or shortly after child birth. Nine percent (23 g) of the ochre was recovered from Master Level 6 (ca. 3000-1800 B.C.). By far the single largest amount recovered (55%) came from the upper strata of Master Level 3 (ca. 500 B.C.-900 A.D.). Seventeen percent (46 g) of the ocher was found in Level 2 (ca. 700-1580 A.D.), mostly in the upper strata. In virtually all instances of Master Levels 6 through 2 the ochre was again associated with human skeletal material interpreted to be the remains of interments. Presumably, the ochre was an offering and/or the remnants of material applied to the corpses as a rite of passage. Ninety percent (by weight) of the Middle Woodland ochre consisted of the large modified specimen described above, and it is highly likely in this instance that the ochre was applied as a paste or paint.

DIMENSION		Length (mm)	Width (mm)	Thick. (mm)	Weight (gm)	Length/ Width R.
FUNCTIONAL CATEGORY						
SINKERS						
Steatite	1	38-52	19-21	11-13	16-23	
Pebble	2	71-96	63-84	11-21	122-142	
Disc Small	3	59-78	50-71	6-10	32-62	
Disc L. Unnotch.	4	91-(107)	78-101	6-11	101-(140)	
Disc L. Notched	5	88-96	81-84	6-13	71-138	
CHOPPING TOOLS						
Adze	1	66	25	12	22	
Axe	2	129	88	27	404	
Celts	3	83	41	19	62	
	4	61	26	12	25	
	5	105-108	46-47	15-17	110-129	
	6	(156)	75	20	(350)	
	7	58	30	13	43	
Preforms	8	107	67	21	152	
	9	135	57	36	439	
CORES						
	1	31-35	18-31	17-19	16-59	
	2	38-53	27-50	15-29	18-58	
	3	27-53	25-34	10-22	8-24	
	4	24-63	23-45	12-28	9-94	
	5	51	48	17	58	
	6	60	36-55	15-22	30-58	
	7	24-35	13-32	9-16	4-14	
	8	19-32	13-21	7-14	2-10	
	9	19-46	19-36	11-17	5-25	
DRILLS						
	1	(48)-(75)	9-17	7-8	(4)-7	
	2	44	11	7	4	
	3	(88)	22	8	(12)	
	4	(47)-(64)	21-23	6-9	(4)-11	
	5	26	12	4	1	
	6	(48)	20	6	(5)	
	7	(30)-31	16-20	5-6	2	
INCISING TOOLS						
	1	30	13-16	8-9	2-3	
	2	25	32	6	6	
	3	18-24	16-19	5-7	2	
	4	43	28	10	10	
	5	24-25	19-25	5	2-3	
	6	13-24	11-27	3-6	1-2	
	7	34	20	10	8	
	8	21	17	7	2	

Table 4. SUMMARY OF DIMENSIONAL DATA

DIMENSION	Length (mm)	Width (mm)	Thick. (mm)	Weight (gm)	Length/ Width R.
FUNCTIONAL CATEGORY					
KNIVES					
Flake Utilized 1	58-71	23-38	10-23	15-37	NA
Flake Marg. Ret. 2	22-47	14-42	3-10	2-12	NA
Flake Lunate 3	25-28	10-13	5-6	2	1.9-2.8/1
Biface Ovate 4	32-(44)	18-23	7-9	3-6	1.5-2.3/1
5	31-(38)	24-25	6-7	5	1.2-1.6/1
6	42	30	10	14	1.4/1
7	(47)-(73)	26-36	7-10	12-(22)	2.0-2.6/1
8	(78)	40	9	(30)	1.9/1
9	(62)-(65)	23-25	9-10	(12)-(14)	2.5-2.8/1
10	32-(50)	29-32	9-12	10-(12)	1.4-1.6/1
11	(75)	28	15	(28)	2.7/1
12	54-(64)	27-32	8-10	14-(23)	1.9-2.1/1
13	(33)	(20)	5	(3)	(1.6)/1
Biface Triang. 14	(29)-(31)	18-23	3-4	(2)-(3)	1.3-1.7/1
15	(45)	22	9	(8)	2.0/1
16	(54)-(56)	26-29	6-7	(9)-(11)	1.9-2.2/1
17	(38)	16	5	(3)	2.4/1
Bif. Stem.-Not. 18	(50)-(67)	(22)-(24)	8-9	(10)-(14)	2.2-2.8/1
19	40-(72)	23-32	9-10	(9)-(24)	1.4-2.4/1
20	(48)-(86)	24-30	5-11	(7)-(23)	2.0-3.0/1
21	(78)-(81)	27-30	8-11	(20)-(25)	2.6-2.9/1
POUNDERS					
1	120	56	31	342	
2	45-58	37-45	28-34	59-113	
3	98	92	58	803	
SCRAPERS					
Utilized Flake 1	27-63	16-25	4-7	2-10	
2	16-48	9-35	3-11	1-12	
Marg. Ret. Flake 3	45	31	11	15	
4	46	35	13	29	
5	38-51	29-36	10-13	18-20	
6	31-55	17-35	6-15	3-20	
7	82	80	19	232	
Bifacial 8	15-26	20-23	5-7	3-5	
9	35	23	10	8	
10	18-26	14-16	6-7	2-3	
ABRADING STONES					
1	24-81	11-62	5-20	2-161	
2	86	69	30	220	
3	69	32	12	29	

Table 5. SUMMARY OF DIMENSIONAL DATA

DIMENSION	Length (mm)	Width (mm)	Thick. (mm)	Weight (gm)	Length/ Width R.
FUNCTIONAL CATEGORY					
ANVIL STONES	90-160	60-140	30-60	360-1500	
CHISELS	44-59	20-21	10-11	10-13	
GOUGE	34	23	9	6	
GUN FLINTS	(24)-25	16-17	6-7	3	1.5/1
HAMMER STONES					
1	39-116	38-68	21-59	141-539	
2	95-(100)	55-67	30-33	(232)-329	
HOE	164	104	15	378	
SINEW STONES	42-46	30	6-9	15-21	1.5/1
GORGET	50	43	7	26	
MICA	5-68	5-37	0.1-1	0.1-1.7	
OCHRE	4-50	4-45	4-40	0.4-133	
QUARTZ CRYSTALS	21-26	11-20	9-19	2-6	

Table 6. SUMMARY OF DIMENSIONAL DATA

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
POINT FRAGMENTS													
1		6	2	1		1	1				1	(12)	38
2	1	7	2	5	3	2	3		1		2	(26)	
SINKERS													
1					1	1						(2)	
2			3									(3)	
3		4										(4)	18
4		4										(4)	
5	1	4										(5)	
CHOPPING TOOLS													
1						1						(1)	
2		1										(1)	
3										1		(1)	
4						1						(1)	
5						3						(3)	11
6					1							(1)	
7		1										(1)	
8							1					(1)	
9		1										(1)	
CORES													
1		2										(2)	
2		3						2				(5)	
3		2					2	1	1			(6)	
4		1	1					1				(3)	
5				1								(1)	79
6					1							(1)	
7		7	1	2					1		1	(12)	
8		7		1				1		1		(10)	
9		18	4			2	4	3	2		6	(39)	
DRILLS													
1			2	1	1							(4)	
2									1			(1)	
3		1										(1)	
4		1	2									(3)	13
5		1										(1)	
6		1										(1)	
7		2										(2)	
HEARTH AND BOILING STONES		30	8	1	8	4	7	6	7	8	12		91

Table 7. FREQUENCY DISTRIBUTIONS BY MASTER LEVEL

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
INCISING TOOLS											1	(2)	
1		1										(1)	
2		1										(3)	
3		3									1	(1)	22
4												(2)	
5		1	1									(11)	
6		11										(1)	
7				1								(1)	
8							1						
KNIVES													
Flake Utilized													
1		2						1		1		(4)	
Flake Marginally Retouched													
2		4	2				3	1		1		(11)	
Lunate												(2)	
3		2											
Ovate												(4)	
4					4								
5									1	1		(2)	
6									1			(1)	
7							5					(5)	
8							1					(1)	
9				2								(2)	58
10		2										(2)	
11		1										(1)	
12	2	1										(3)	
13		1										(1)	
14					2							(2)	
15			1	1								(2)	
16		2										(2)	
17		1										(1)	
Stemmed-Notched													
18			1	2								(3)	
19			3									(3)	
20			2								1	(3)	
21			2								1	(3)	
POUNDERS													
1		1										(1)	
2				2								(2)	4
3		1										(1)	
RETOUCHED FLAKES													
1		4	3	1		1						(9)	
2	1	8	10	2	2		4	3	1	1		(32)	44
3		1	2									(3)	

Table 8. FREQUENCY DISTRIBUTION BY MASTER LEVEL

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
SCRAPERS													
Utilized Flake													
1		1		2					1		1	(5)	
2		22	11	7	4	5	7	3	1	5	1	(66)	
Marginally Retouched													
3								1				(1)	
4							1					(1)	
5							2					(2)	86
6					2							(2)	
7							1					(1)	
Bifacial													
8							3					(3)	
9							1					(1)	
10		1	1			2						(4)	
ABRADING STONES													
1		2	1		2			1			1	(7)	
2		1										(1)	9
3				1								(1)	
ANVIL STONES		2	1	1	1	2					2		9
CHISELS		2											2
GOUGES				1									1
GUN FLINTS		2											2
HAMMER STONES													
1		11	2			2	1	1		1		(18)	20
2		2										(2)	
HOE		1											1
SINEW STONES		2											2
GORGETS		1											1
MICA				4									4
OCHRE (in gm)		33	13	147			23	52					267
QUARTZ CRYSTALS		1		2									3

Table 9. FREQUENCY DISTRIBUTIONS BY MASTER LEVEL

DISCUSSION

Although analysis of some aspects of the lithic artifact collection is still in progress, a few integrative comments concerning the foregoing data may be offered at this time. These center largely on the chronological relationships of the projectile point types, as indicated by stratigraphic evidence from the Sheep Rock Shelter, and on the formal composition of "assemblages", as discussed below.

Chronological Ordering of the Projectile Point Types

In Table 10 the projectile point types discussed in the Preliminary Report (Vol. 2, p. 553-740) and in an earlier section of this chapter are ordered according to their stratigraphic origin.

Not included in the ordering are two point types (33 and 36, entitled "Miscellaneous" in Table 10) which are sufficiently anomolous in morphological makeup as to leave in considerable doubt their chronological origin.

The remaining 46 types have been ordered (1) according to the chronological periods of the Middle Atlantic and Northeastern Archaeological Sequence (each of which is chronometrically defined in the table); and (2) within each period according to their actual stratigraphic relationships, as determined from the site profiles presented in an earlier chapter and the Stratigraphic Profile Supplement accompanying this volume.

The principle used to determine stratigraphic sequence may be stated as follows: the lowest stratum in which items of a given morphological type are found, the presence of which cannot be explained by such disturbance factors as pitting and side wall slumpage, determine the stratum of initial appearance of the type. This principle is essentially a generalization of the one used to determine the lower boundary of the Master Levels discussed in an earlier chapter (p. 65) and is principally concerned with eliminating the effects of downward dislocation of items in determining sequence.

Downward dislocation was generally detected by one or both of two methods. First, downward dislocation would not be expected to be exhibited by all the members of a type, particularly a quantitatively abundant one; in virtually every case dislocation involved only one member of a type, the provenience of which was considerably out of line with the other members, and in many cases either the profiles or the field notes provided direct evidence of disturbance of the deposit linking the strata in which the type was found. The remaining cases involved specimens found during clean-up of the site following long periods of inactivity ranging from several months to several years, during which existing side walls had deteriorated and slumped.

Table 10 CHRONOLOGICAL ORDERING OF PROJECTILE POINT TYPES

Period	Type	Type Name, Affiliation or Descriptive Title
Late Woodland	39,44	Susquehannock
late (ca. 1350-1580 A.D.)	41	
	38/40	Shenk's Ferry
early (ca. 700-1350 A.D.)	34,42,43,41	Levanna
	45	Clemson's Island
Middle Woodland (ca. 500 B.C.-700 A.D.)	47	Jack's Reef Corner-Notched
	46	Fox Creek Stemmed
	31,34,48	Snyders Notched, Middle Woodland Stemmed and Corner-Notched
	27	Raccoon Side-Notched
Early Woodland (ca. 1000-500 B.C.)	29/32	Juniata Stemmed
	26	Meadowood
Transitional (ca. 1800-1000 B.C.)	30(?)	"Perkiomen" Stemmed
	35	Fish Tail
	21	Frost Island
	6(?),11,12,15,20,25,28	Susquehanna, Perkiomen Broad Spears
Late Archaic (ca. 3000-1800 B.C.)	19	Savanna River Stemmed
	17,24	Rossville, Genesee
	18,22	Wading River, Bare Island
	5/8,9/10,13,14,16,23	Brewerton (Corner-Notched, Side-Notched, Eared-Notched)
Middle Archaic		
late (ca. 4000-3000 B.C.)	3,4	Laurentian Corner-Notched and Side Notched
early (ca. 5000-4000 B.C.)	2	Raystown Stemmed
Early Archaic (ca. 7500-5000 B.C.)	7	LeCroy
	1	Kirk Corner-Notched
	33,36	Miscellaneous

Second, all specimens were examined with respect to temporal-stylistic considerations and stratigraphic context was checked against chronometrically diagnostic morphological data (drawn from other sites). Thus, inconsistencies could be internally detected and externally validated.

Table 10 reflects the sequence of initial appearance of the projectile point types. In some instances a number of types occupy the same rank position, indicating that no distinctions pertaining to order of appearance among the types so listed could be ascertained on stratigraphic grounds. In general, these instances are the product of (a) mixing of the contents of two or more strata and (b) initial appearance of two or more types in the same stratum.

In four instances, type numbers listed in Table 10 are separated by a slash (5/8, 9/10, 29/32 and 38/40), indicating that the designations now are no longer typologically distinguished. These revisions are discussed in an earlier section of this chapter dealing with the projectile points.

A few general conclusions may be drawn from Table 10. First, a long continuous culture-historical sequence is represented by the projectile point types, ranging over a period of some 9000 years from about 7500 B.C. (based on soil accumulation rate projected back from the earliest radiocarbon date of B.C. 6980 ± 320 (M-190) to the deepest occupation unit at 204 inches below datum) to about 1570-1580 A.D. (based on Kinsey's and Witthoft's chronologies for the Susquehannock component at the site, p. 13, p. 26-27, and on Huner's conclusions concerning the relative paucity of later Susquehannock ceramic varieties, p. 236). No major period of the Middle Atlantic and Northeastern Archaeological Sequance is without representation.

Second, excluding Type 35, the typological sequence supports conclusions concerning chronological relationships drawn from the combined results of numerous sites in the Northeastern and Middle Atlantic sub-areas, i.e., no significant incompatibilities were found. Type 35 is represented by a single specimen which was found in a highly disturbed context in Master Level 2a (late Late Woodland); its position in the sequence reflects a "best fit" placement based on both internal (intra site) and external (inter site) data.

Third, the direction of cultural affinities and presumably culture contact networks underwent a number of changes during the site's occupational history. During the Early Archaic and early Middle Archaic periods (ca. 7500-4000 B.C.), contact was exclusively with the Middle Atlantic states (particularly West Virginia, Virginia and North Carolina). This early time span is represented by Kirk and LeCroy points (Types 1 and 7) and by the Raystown Stemmed point (Type 2), which is believed to be a local style related through Workman Site Projectile Point Type 6 (Bebrich and Morgan 1968: 203-204) to the Stanly Stemmed point variety (for a discussion of these relationships see Type 2 under the heading "Projectile Points" in an earlier section of this chapter). At present, the Sheep Rock Shelter constitutes the

northern-most location in which Kirk points have been found in a dated living floor context, although scattered surface finds have been reported from eastern Pennsylvania and from southeastern New York (Broyles 1966a: 55; Robert E. Funk: personal communication 28 May 1969).

Around 4000 B. C. the direction of contact shifted toward the west to the early Upper Ohio Valley Laurantian, as suggested by Type 4. Laurentian contact is also indicated by Type 3. These two point forms, one side-notched and the other corner-notched, can be viewed as early manifestations of a cultural tradition linking the late Middle Archaic and Late Archaic periods, with later manifestations of the tradition including Brewerton corner and side-notched forms such as Types 5/8 and 13, which are believed to be genetically related to the earlier Types 3 and 4, respectively.

Thus, during Late Archaic times contacts shifted to the Northeast and were for the most part, if not exclusively, maintained with this sub-area during the Transitional and Early Woodland periods. An exception to this over-all trend is Type 19, one specimen of which was identified by Bettye Broyles (personal communication) as a Savanna River Stemmed point; with respect to the other specimen of this type she was less certain, and it is likely that Type 19 represents a local variant of the Savanna River style.

Affinities during Transitional times lay with every major complex of the period except Lehigh, extending from southeastern New York to southeastern Pennsylvania and west to the Appalachian Plateau. Contact during the Early Woodland period was first with the Northeastern Meadowood complex. Later in this period, manifestations at the Sheep Rock Shelter appear to have been more localized in nature and restricted to the western drainage of the Susquehanna River. This latter trend probably continued into early Middle Woodland times.

During the Middle Woodland period contacts with the Northeastern cultures were either re-established or continued, while at the same time contact with the Upper Ohio Valley was once again established, as indicated by Hopewellian trade pieces from that sub-area (Flint Ridge, Ohio, chalcedony) and the similarity of Type 31 to the Snyders Notched point style.

Contacts during the Late Woodland period alternated between the northwestern Middle Atlantic sub-area (as indicated by Clemson's Island Type 45 and Shenk's Ferry Type 38) and the Northeast (as indicated by the Owascoid Levanna Types 37, 42 and 43 and by Susquehannock Types 39 and 42).

The high frequency of shifting affiliations may in part be explained by demographic and settlement pattern considerations (Michels 1968) and by the site's geographic proximity to the confluence of the boundaries of the three above-mentioned sub-areas (Middle Atlantic, Ohio Valley and Northeast), as defined by Willey (1966:245).

Moreover, topographically the Ridge and Valley Province of Central Pennsylvania naturally channels communication, contact and migration in a northeast-southwest fashion along the eastern side of the Appalachian Plateau, with the ridge and valley system linking all three sub-areas.

Fourth, the abundance of stylistic affinities among projectile points with distant sources suggests that the Sheep Rock Shelter area was more a recipient than a donor of cultural information during most, if not all, of its history of human settlement.

Functional Variability Between Major Period Components

The analysis of assemblage variability has been handicapped by two factors: (1) difficulty in determining associations among cultural items and (2) the small size of recovered samples of cultural items. With respect to the first factor, excavation strategies throughout the site's excavation history were directed toward sampling the deposit rather than exposing entire living surfaces. Moreover, variability in data recording procedures considerably complicated efforts to reconstruct such units. As a result, identification of the co-associated items defining activity loci has been a time consuming process and is still in progress. The objectives of this intensive analysis are (1) to produce an inventory of the unit activities conducted at the site which involved lithic artifacts (manifested in the form of tool kits) and (2) stratigraphic integration of such units into composite sets constituting true assemblages.

With respect to the second factor, preliminary analysis of unit activities indicates that most are represented by very small samples of tools, making statistical comparison of units and composite sets of units impossible.

In lieu of the intensive analysis now in preparation, the lithic artifacts have been grouped by functional class and Master Level, as shown in Table 15, in order to permit a more general analysis of functional variability between major period components of the site. Table 15 presents (1) the frequency distribution of functional artifact classes by Master Level (corrected for vertical dislocation of chronologically diagnostic items) and (2) the percentage that each class contributes to total count of items for each Master Level.

Correction for vertical dislocation involved reassigning those dislocated items of each functional class whose stratigraphic origin could be determined to the appropriate Master Level. Some functional classes (Point Fragments, Abrading Stones, Anvil Stones, Cores, Hammer Stones, Hearth/Boiling Stones, Retouched Flakes and Scrapers) are chronometrically sufficiently "undiagnostic" in formal content as to preclude correction for dislocation.

Most of the remaining "diagnostic" functional classes, i.e., those classes including morphological types whose chronometric provenience could be established within Master Level limits, required few corrections. Corrected frequency distributions for the entire list of functional classes (with the exception of Pebbles) are presented in Tables 11-14. These tables are based on the uncorrected (original provenience) data presented in Tables 1 and 7-9, and on the age and cultural affiliation data presented in the descriptive sections of this chapter. Age and cultural affiliation information provided the chronometric data used to assign dislocated items to the respective Master Levels from which they are believed to have originally derived.

Table 15 is based on the data presented in the corrected tables (11-14). The percentage data presented in Table 15 were in turn used to construct cumulative percentage graphs (Figure 3) for Master Levels 2a through 8, which facilitate the analysis of functional variability between major period components of the site. In effect, the graphs represent a blending of all the unit activities conducted during the interval of time subsumed by each Master Level and are therefore termed "composite assemblages." Statistical comparison of these consolidated sets is impossible, since sample sizes are in most instances inadequate. Thus, in comparing the graphs it should be kept in mind that sampling error, as well as inherent relationships, may be operating to produce the particular profile configurations shown in Figure 3. Nevertheless, a number of observations and hypotheses may be offered concerning the graphs and their behavioral implications.

Simple inspection suggests that the profiles may be grouped into two broad types. Type I (including Master Levels 6 through 8) includes profiles with configurations which are relatively flat (horizontal) with respect to functional classes 2-10. Type II includes profiles with ascending slopes with respect to these same classes and a smoother overall configuration. Type II includes the profiles of Master Levels 2a through 5. Master Level 3 has been assigned to Type II for reasons to be discussed below.

The differences in the configurations of these Types reflect basic differences in the functional composition of the composite assemblages defining them. The composite assemblages for the Archaic Master Levels (6, 7a, 7b and 8) are, with three exceptions, exclusively composed of the following functional classes: Projectile Points, Point Fragments, Cores, Hammer Stones, Hearth/Boiling Stones, Knives, Scrapers and Retouched Flakes (the exceptions concern three of the composite assemblages, two of which also include a celt and the third a drill).

These composite assemblages can probably be best understood in the context of hunting and butchering activities. The relatively small quantity of lithic remains and the variety of projectile points (particularly during the Late Archaic period) suggest that human utilization of the shelter was highly sporadic and involved small social units with minimal internal social differentiation. The Late

TYPE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ML																										
1																										
2 a b																										
3																										
4																										3
5						2					1	1			2					1	6				2	
6					2			9	1	1			8	2		2	3	2	2			7	4	2		
7 a b		6	3	2																						
8	2						1																			
ID																										
S-t.	2	6	3	2	2	2	1	9	1	1	1	1	8	2	2	2	3	2	2	1	6	7	4	2	2	3

TYPE	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		Sub-total	
ML																									
1																									0
2 a b							2			1	19	14	28	1 3	7 4	3	1	2	3					(52) (33)	85
3	2				2			1												2	1	1			9
4		1	11	3		1																			20
5									1																16
6																									45
7 a b																								(5) (6)	11
8																									3
ID			1												1										2
S-t.	2	1	12	3	2	1	2	1	1	1	19	14	28	4	12	3	1	2	3	2	1	1			193

Table 11. CORRECTED FREQUENCY DISTRIBUTION OF PROJECTILE POINTS BY MASTER LEVEL

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
POINT FRAGMENTS													
1		6	2								1	(12)	
2	1	7	2	5	3	2	3		1		2	(26)	38
SINKERS													
1						2						(2)	
2			3									(3)	
3		4										(4)	18
4		4										(4)	
5		5										(5)	
CHOPPING TOOLS													
1						1						(1)	
2		1										(1)	
3										1		(1)	
4						1						(1)	
5						3						(3)	11
6					1							(1)	
7		1										(1)	
8							1					(1)	
9		1										(1)	
CORES													
1		2										(2)	
2		3						2				(5)	
3		2					2	1	1			(6)	
4		1	1					1				(3)	
5				1								(1)	79
6					1							(1)	
7		7	1	2					1		1	(12)	
8		7		1				1		1		(10)	
9		18	4			2	4	3	2		6	(39)	
DRILLS													
1			2	1	1							(4)	
2									1			(1)	
3						1						(1)	
4		3										(3)	13
5	1											(1)	
6						1						(1)	
7	2											(2)	
HEARTH AND BOILING STONES		30	8	1	8	4	7	6	7	8	12		91

Table 12. CORRECTED FREQUENCY DISTRIBUTIONS BY MASTER LEVEL

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
INCISING TOOLS													
1		2										(2)	
2		1										(1)	
3		3										(3)	
4											1	(1)	22
5			2									(2)	
6		11										(11)	
7				1								(1)	
8			1									(1)	
KNIVES													
Flake Utilized 1		2						1		1		(4)	
Flake Marginally Retouched 2		4	2				3	1		1		(11)	
Lunate 3		2										(2)	
Ovate 4					4							(4)	
5										2		(2)	
6									1			(1)	
7							5					(5)	
8							1					(1)	
9				2								(2)	58
10		2										(2)	
11		1										(1)	
12		3										(3)	
13		1										(1)	
14					2							(2)	
15				2								(2)	
16		2										(2)	
17		1										(1)	
Stemmed-Notched 18				3								(3)	
19			3									(3)	
20				3								(3)	
21			3									(3)	
POUNDERS													
1		1										(1)	
2				2								(2)	4
3		1										(1)	
RETOUCHED FLAKES													
1		4	3	1		1						(9)	
2	1	8	10	2	2		4	3	1	1		(32)	44
3		1	2									(3)	

Table 13. CORRECTED FREQUENCY DISTRIBUTION BY MASTER LEVEL

MASTER LEVEL	1	2 a	2 b	3	4	5	6	7 a	7 b	8	ID	Sub-total	Tot.
FUNCTIONAL CATEGORY													
SCRAPERS													
Utilized Flake													
1		1		2					1		1	(5)	
2		22	11	7	4	5	7	3	1	5	1	(66)	
Marginally Retouched													
3								1				(1)	
4							1					(1)	
5							2					(2)	86
6					2							(2)	
7							1					(1)	
Bifacial													
8							3					(3)	
9							1					(1)	
10		1	1			2						(4)	
ABRADING STONES													
1		2	1		2			1			1	(7)	
2		1										(1)	9
3				1								(1)	
ANVIL STONES		2	1	1	1	2					2		9
CHISELS		2											2
GOUGES				1									1
GUN FLINTS		2											2
HAMMER STONES													
1		11	2			2	1	1		1		(18)	20
2		2										(2)	
HOE		1											1
SINEW STONES		2											2
GORGETS		1											1
MICA				4									4
OCHRE (in gm)		33	13	147			23	52					267
QUARTZ CRYSTALS				3									3

Table 14. CORRECTED FREQUENCY DISTRIBUTIONS BY MASTER LEVEL

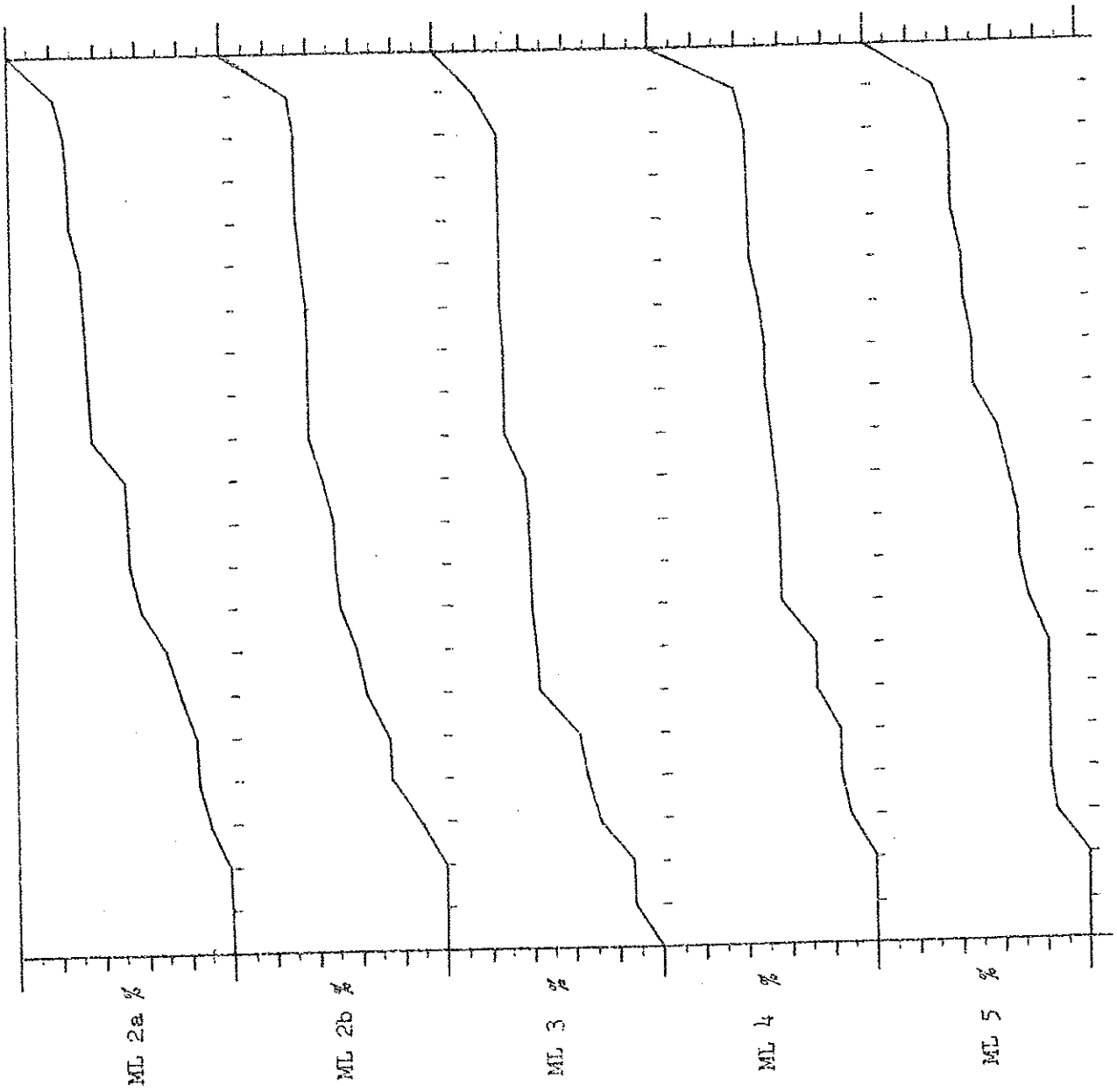
	N	2		251		104		56		51	
1 PROJECTILE POINTS				52	20.8	53	31.7	9	16.1	20	39.2
2 POINT FRAGMENTS				13	5.1	4	3.8	6	10.7	3	5.9
3 GUN FLINTS		2									
4 HOE				1	0.4						
5 SINKERS				13	5.1	3	2.9				
6 ABRADING STONES				3	1.2	1	1.0	1	1.8	2	3.9
7 ANVIL STONES				2	0.8	1	1.0	1	1.8	1	2.0
8 CHISELS				2	0.8						
9 CHOPPING TOOLS				3	1.2					1	2.0
10 CORES				40	15.9	6	5.8	4	7.1	1	2.0
11 DRILLS				3	1.2	5	4.8	1	1.8	1	2.0
12 GOUGES								1	1.8		
13 HAMMER STONES				13	5.1	2	1.9				
14 HEARTH/BOILING STONES				30	12.0	8	7.7	1	1.8	8	15.7
15 INCISING TOOLS				16	6.3	4	3.8	1	1.8		
16 KNIVES				18	7.1	10	9.6	10	17.9	6	11.8
17 POUNDERS				2	0.8			2	3.6		
18 RETOUCHED FLAKES				13	5.1	15	14.4	3	5.4	2	3.9
19 SCRAPERS				24	9.6	12	11.5	9	16.1	6	11.8
20 SINEW STONES				2	0.8						
21 PARAPHENALIA											
	ML										
	N			1		(13)		7			
1	%			(33)[Q] 0.4				12.5			
	N			(12.3)		(4.8)		(54.8)			
2a	%										
	N										
2b	%										
	N										
3	%										
	N										
4	%										

5	N			7	1				4	2		2	2	5		2		2			3	16	46
	%			15.2	2.8				8.7	4.3		4.3	4.3	10.9		4.3		4.3			6.5	34.8	
6	N	(23)		15	4		9		7	1			6	1							4	45	92
	%	(8.6)		16.3	4.3		9.8		7.6	1.1			6.5	1.1							4.3	48.9	
7a	N	(52)		4	3		2		6	1			8				1					5	30
	%	(19.4)		13.3	10.0		6.7		20.0	3.3			26.7				3.3					16.7	
7b	N			2	1		1		7			1	4								1	6	23
	%			8.7	4.3		4.3		30.4			4.3	17.4								4.3	26.1	
8	N			5	1		4		8	1			1	1								3	24
	%			20.8	4.2		16.7		33.3	4.2			4.2	4.2								12.5	

* Frequencies corrected for vertical dislocation of diagnostic items ("Non-diagnostic" classes are uncorrected). 679

Q Quantities enclosed by parentheses indicate grams of ochre and % ochre, respectively.

Table 15. COMPOSITE ASSEMBLAGE COMPOSITION BY FUNCTIONAL CLASS*


ML 2a %
ML 2b %
ML 3 %
ML 4 %
ML 5 %

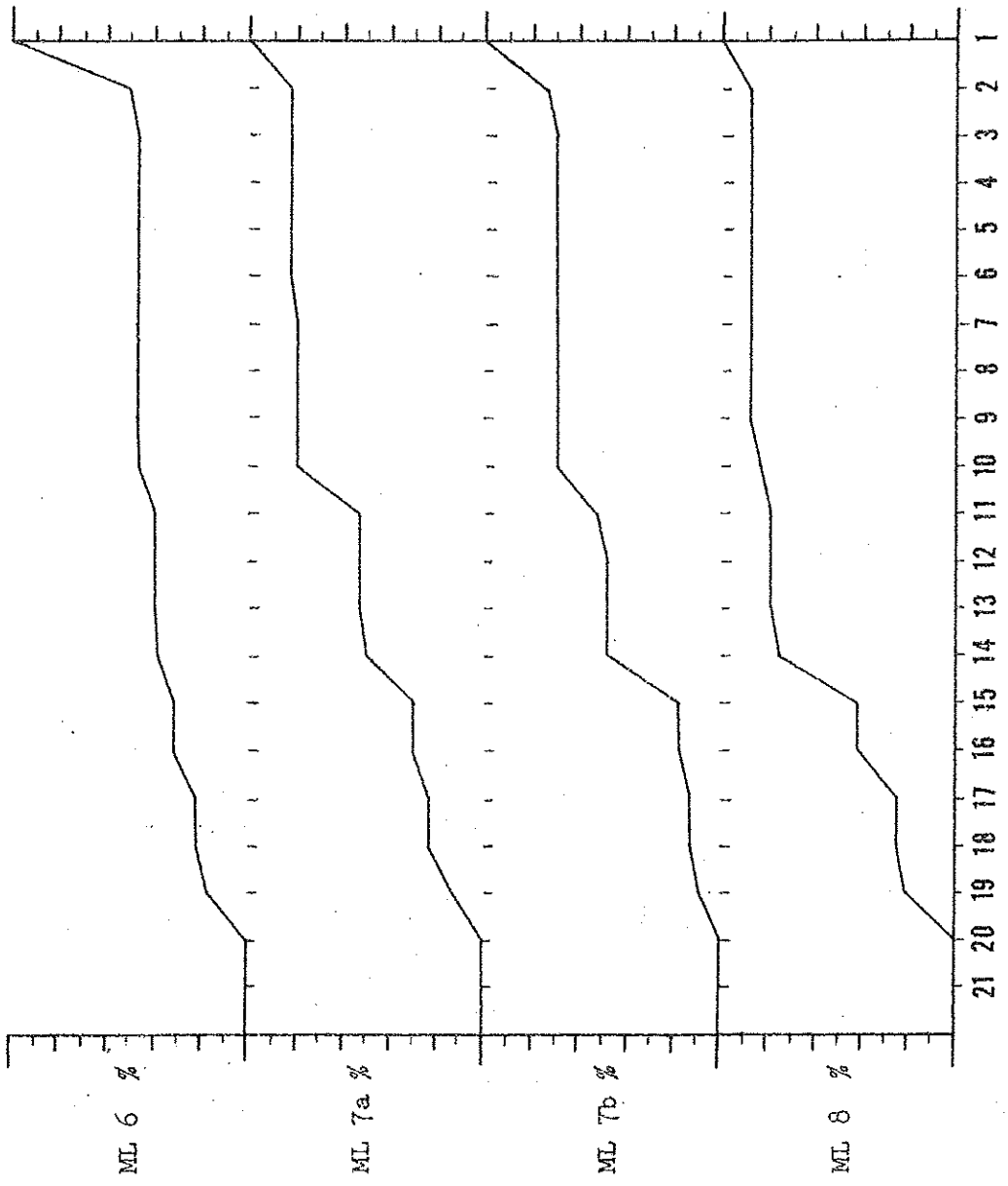


Figure 3. CUMULATIVE PERCENTAGE GRAPHS OF COMPOSITE ASSEMBLAGES BY FUNCTIONAL CLASS AND MASTER LEVEL

Archaic composite assemblage is distinguished from the other assemblages of the Archaic era in two respects: it includes (1) a greater quantity and variety of projectile points and (2) a greater variety of scraper types. Nearly 50% of the 92 items constituting this assemblage belong to the Projectile Point functional class, including 11 different culture-historical types (the greatest variety for any single period) as opposed to the 1-3 types found as elements of earlier composite assemblages. An unprecedented range of scraper types (including 6 varieties--by far the greatest in the entire history of the site) is also manifested by the Late Archaic composite assemblage. Bifacial and marginally retouched forms, as well as the usual utilized flake scrapers, are notable elements. These include concave, straight-edged and convex forms, suggesting a wide variety of scraping functions, including the preparation of drying racks for meat and the fashioning of wood and bone implements. Some scraper forms may also have been involved in the processing of hides.

In short, a greater range of work tasks associated with hunting activities appear to be manifested by the Late Archaic assemblage. To some extent these tasks are probably correlated with the thicker occupational midden which is so distinctive of this period, indicating a more complex site function and a lengthened occupational duration by at least one of the groups which utilized the rockshelter during this period.

Type II composite assembalges first appear in Master Level 5 and constitute the only type found in more recent levels. In addition to the functional classes of implements characteristic of Archaic assemblages, Type II assemblages also include an increasing variety of other functional classes. Abrading Stones, Chisels, Chopping Tools, Drills and Incising Tools all come to play an important role in shaping the configuration of composite assemblages during this time span and suggest a proliferation of maintenance tasks involving the use of wood and/or bone implements, structures, contraptions, etc. Fishing sinkers are found as elements of both the Transitional and Late Woodland assemblages (Master Levels 5, 2b and 2a), particularly the latter, which may also include hoes during the latest phases. The emergence of these additional functional classes describes a progressive trend toward broadening the range of extractive and maintenance tasks conducted at the site over time, tasks characteristic of a central base camp type of settlement in addition to work and transient camp activities.

The composite assemblage of Master Level 3 closely approximates those of the Archaic era for functional classes 2-10, but also includes classes characteristic of Type II assemblages. These include Gouges, Incising Tools, Pounders and Paraphenalia (other than ochre), suggesting tasks in addition to those associated with hunting, such as the manufacture of specialized wood and bone implements for domestic activities, the processing of plant materials and ritual or ceremonial practices. For this reason, the composite assemblage of Master Level 3 is included in Type II.

This short discussion summarizes some of the basic similarities and differences among the major period composite lithic assemblages of the Sheep Rock Shelter and attempts to integrate these findings within a behavioral frame of reference. As stated earlier, an intensive analysis of lithically-defined activity sets is now in progress. This analysis involves as a first step isolation of co-associated sets of items. When the analysis of associations among the lithic artifacts is completed, more precise statements concerning assemblage variability can be offered. In particular, the delineation and analysis of tool kits should permit (1) a refined understanding of the behavioral sets responsible for assemblage composition, (2) precise statement of the nature of site utilization over time and (3) reconstruction of the size and social composition of the groups that utilized the site during the past 9000 years.

APPENDIX I

POINT ATTRIBUTE LIST

This appendix presents the attribute list used for the description of the projectile point types discussed earlier in this chapter. It represents a reworking of the list (based on Binford: 1963) and used by the author for the analysis of projectile points from the Sheep Rock Shelter, as presented in the Preliminary Report (PR: 635-652). Some of the attribute classes contained in the earlier list have been ignored; others have been modified in order to further objectify the list and to reduce ambiguity within and between attribute classes. An entirely new attribute sub-system has been developed for description of the haft element, its sub-elements and their articulation with the base and/or tang and blade elements. All of the 193 points constituting the Sheep Rock Shelter collection have been coded according to the attribute list presented below, and the results of the attribute analysis are presented in Appendix II.

In the list below each attribute class is defined by alternative discrete attributes which are numerically coded. Preceding each attribute class in this list is a set of numbers enclosed by parentheses which specify the card column numbers in which an attribute code may be found in Appendix II. For example, Field Catalog Number occupies columns 2-5 of the machine punch card; Horizontal Provenience occupies columns 6-11.

Attribute classes were selected and defined in such a way as (1) to minimize data overlap (codifying for two or more attribute classes which defined essentially the same typological characteristic); (2) to maximize the possibility of reconstructing uncodified metrical characteristics from primary codified data; (3) to maximize objectivity, relevance, and completeness within the allotted 80 column space; and (4) to accommodate the wide range of morphological variability represented by projectile points from the Sheep Rock Shelter and the Workman Site.

In terms of the present study the list has functioned in two ways: (1) to provide comparable objective criteria for the written description of types and (2) to provide the unique characterization of each projectile point regardless of type. As similar data are collected elsewhere in the region they may provide the basis for the investigation of such problems as the evolution of style and sub-regionalization in stylistic variation indicative of corporate social groups.

For two reasons the data obtained through application of the list are incapable of yielding a statistically derived typology at the level of specificity presented in this chapter:

(1) comparable data are lacking in the literature of those areas of the Eastern United States which are significant for this study.

(2) the sample size of the Sheep Rock Shelter and Workman Site collections of points is insufficient to generate the recognized types.

As a result, the methodology used for the recognition of types followed a simple but time consuming procedure: look-a-like visual comparison of the Sheep Rock specimens with established types illustrated and defined in the literature. Conscious use was made of the criteria set forth in the attribute list of this appendix. In effect this procedure is a subjective way of increasing sample size sufficient to permit classification at the desired level of specificity (ideally so as to account for all of the points in the collection). This procedure is subjective to the extent that criteria not included in the attribute list are used in the comparison. On the other hand, it insures inclusion of relevant criteria which may not be included in the list. An effort has been made to define these criteria whenever used in the definition of types.

Point Morphology (Figs. 1-3)

Stemmed-notched points are viewed in terms of three major morphological areas and edges: the blade, the haft and the base. The blade constitutes those edges and surfaces of a point between the medial zones of juncture and the tip with the exception of the upper sub-element of the haft (see Figs. 2a and 2b). The haft constitutes those areas and edges between the blade and the base. Included here are the upper sub-element of the haft (the shoulder), the lower sub-element of the haft (forming the lower edge of the notch or lateral edge of the tang), the intermediate sub-element of the haft (if the point is side-notched), all zones of juncture along those edges from the distal to the proximal zones, and all surfaces between these edges and zones (or what is commonly referred to as the stem or tang). The base is the lateral edge connecting the proximal zones of juncture.

In this context the phrase "zones of juncture" is used in place of Binford's "points of juncture" (1963:196-197) because the edges on a projectile point often connect in an arc rather than a point, as his terminology would imply. This distinction between point and arc is known to have typological significance and the term "zone" is thus favored over "point." In all other respects, however, the concepts of juncture as used here are identical to those of Binford. Where measurements are concerned distances between zones of juncture are taken from the midpoints of arcs, as shown in Fig. 3.

The concept of haft element as used here differs from Binford's in that it is inclusive of what Binford defines as the haft and tang elements and the modified sub-element of the tang (here termed the upper and lower sub-elements of the haft), and the unmodified sub-element of the tang (here termed the intermediate sub-element of the haft) (Ibid.:197-198).

Point Morphology

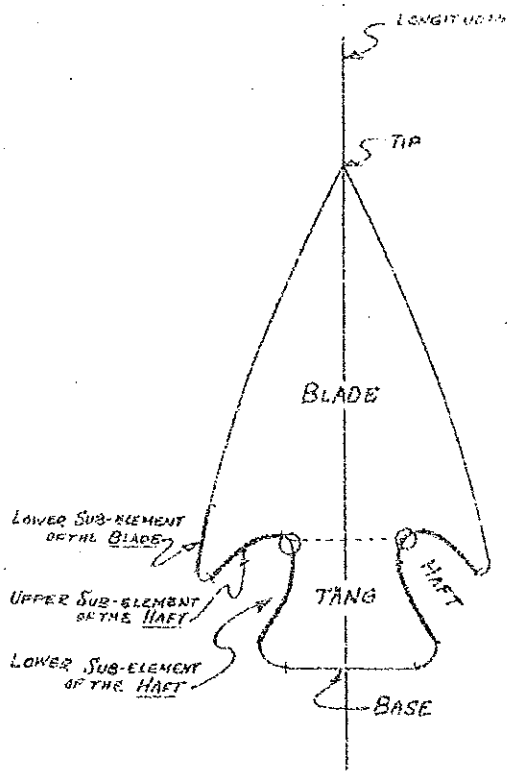


Fig. 1a: Corner-Notched Point

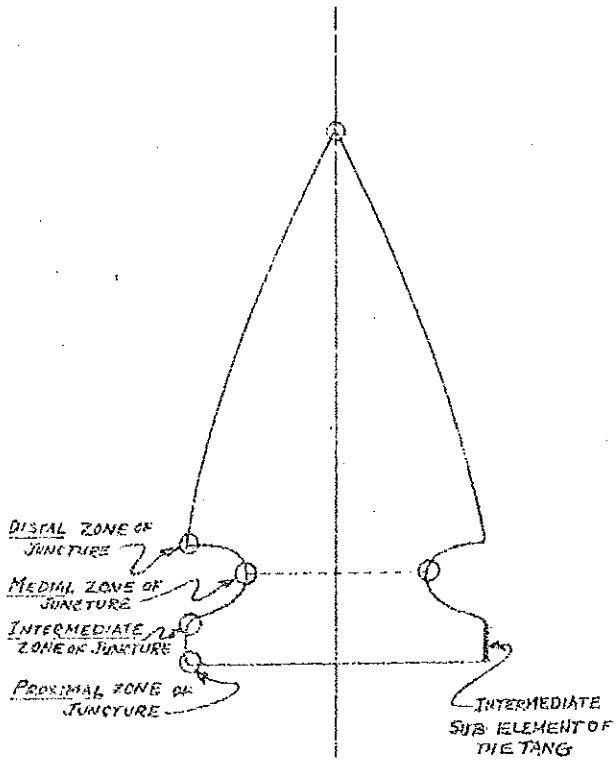


Fig. 1b: Side-Notched Point

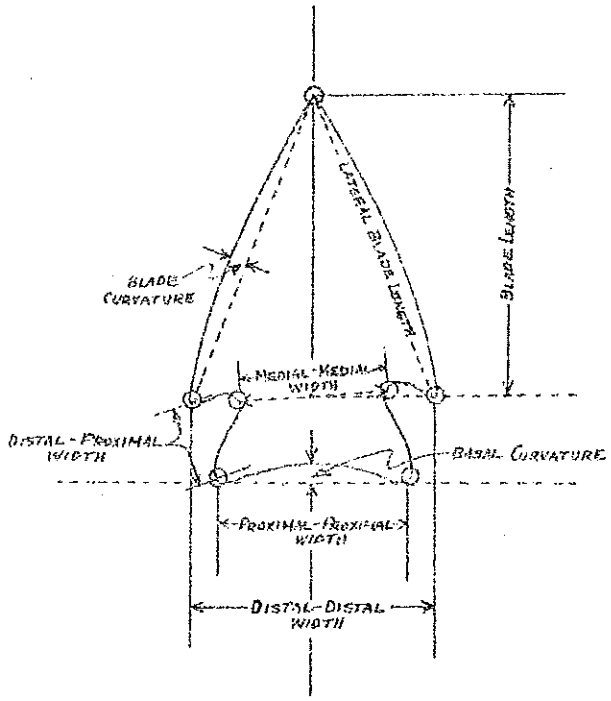
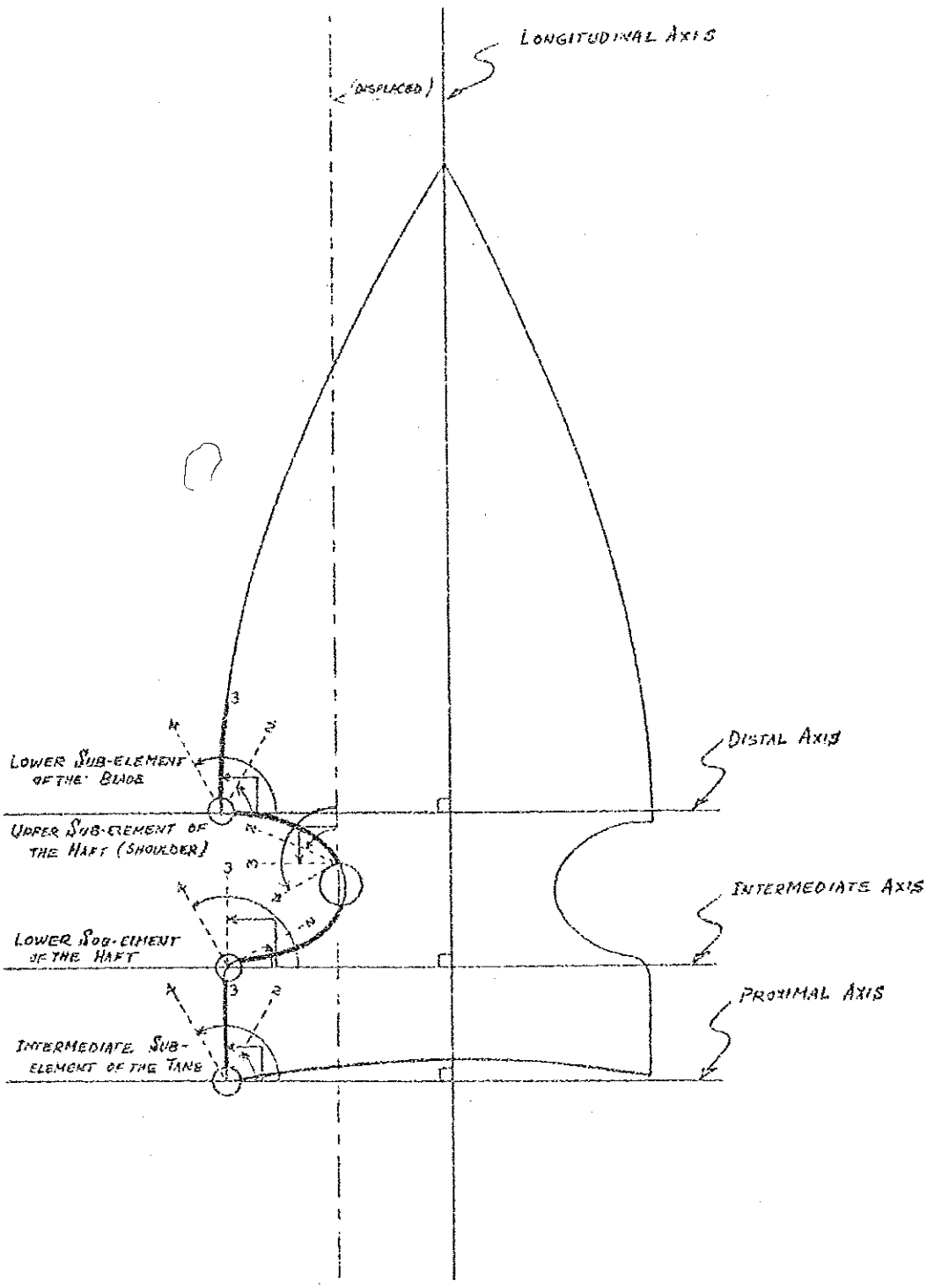


Fig. 2: Metric Attributes

Fig. 3 Orientation and Articulation of Sub-elements of the Blade, Haft and Tang



LEGEND

- ○ Zone of Articulation
- ——— Formal Sub element
- - - - Hypothetical Orientation (1, 2, 3)

As used here, the upper sub-element of the haft is the lateral edge joining the distal and medial zones of juncture (see Fig. 2b). In a similar manner, the lower sub-element of the haft joins the medial to the intermediate or proximal zones of juncture, depending on the presence/absence of an intermediate sub-element. When absent (as most frequently happens), the medial and proximal zones join directly.

Most of the stylistic variation manifested by stemmed-notched points is the product of formal variation in the configuration of the haft-stem-base complex, the combination of formal attributes characterizing the haft and base elements.

Triangular points lack the complicating features associated with the haft-stem-base complex. In effect, they constitute only the blade and base elements and proximal zones of juncture of these points and are therefore relatively simple in formal content.

POINT ATTRIBUTE LIST

Identification

(1) Collection Number: each site collection is given a unique number.

Code
6 - 1966 Sheep Rock Catalog
7 - 1967 Sheep Rock Catalog

(2-5) Field Catalog Number: artifact number assigned by original investigator.

Provenience

(6-11) Horizontal: excavation unit designation (grid square) in which the artifact was found.

(12-18) Vertical: depth of the artifact in inches below the zero datum plane.

Master Level

(22-23) The stratigraphic Master Level in which the artifact was found (see Bebrich and Willey this volume).

Dimensions

(25-26) Length: maximum length measured along the longitudinal axis (reconstructed for broken specimens).

(27-28) Width: maximum width.

(29-30) Thickness: maximum thickness.

(31-33) Weight: measured or estimated to the nearest gram (broken specimens are identified by an asterisk in column 33).

Point Characterization

Blade Element:

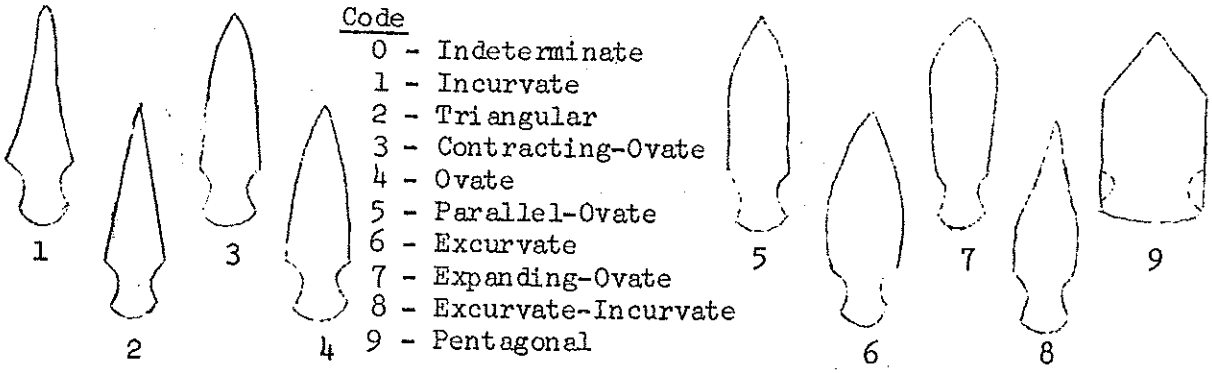
(35-36) Medial Length: the distance in millimeters along the longitudinal axis from the tip to a line joining the medial zones of juncture (see Fig. 2).

Code
00 - Indeterminate
01 - 99 - mm

(37-38) Curvature: the maximum perpendicular distance between the lateral edge of the blade and an imaginary straight line connecting the tip and the distal zone of juncture (or the proximal zone if the two are coincidental) (Fig. 2).

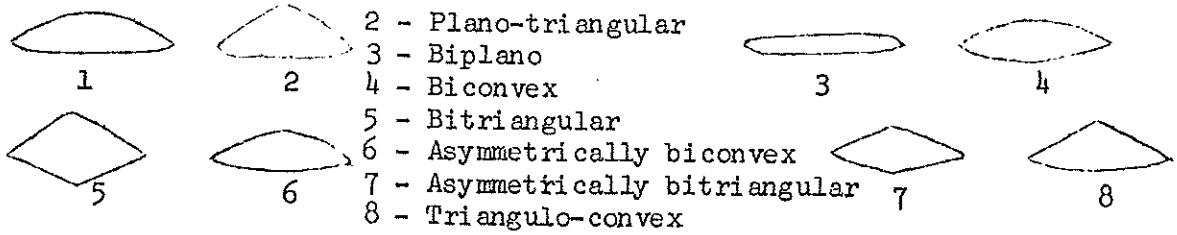
Code
0-8 - mm
9 - Indeterminate

(39) Blade Outline



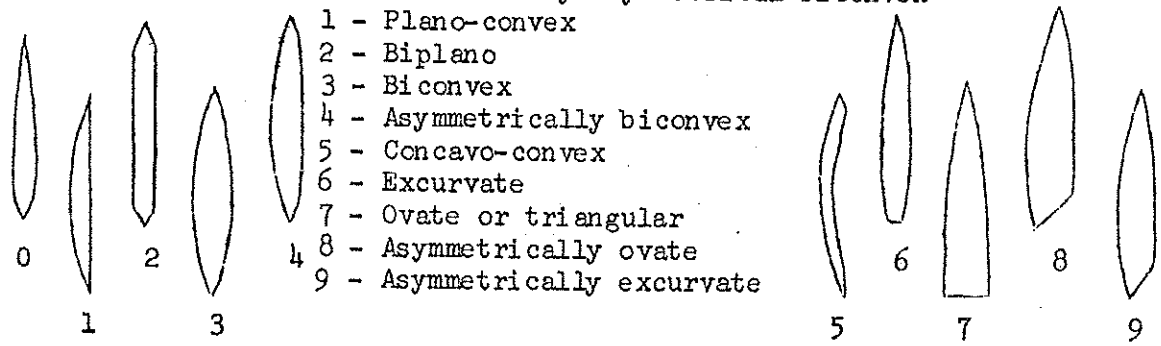
Code
0 - Indeterminate
1 - Incurvate
2 - Triangular
3 - Contracting-Ovate
4 - Ovate
5 - Parallel-Ovate
6 - Excurvate
7 - Expanding-Ovate
8 - Excurvate-Incurvate
9 - Pentagonal

(40) Transverse Section: observed at the midpoint of the blade.



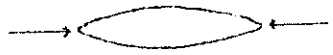
Code
1 - Plano-convex
2 - Plano-triangular
3 - Biplano
4 - Biconvex
5 - Bitriangular
6 - Asymmetrically biconvex
7 - Asymmetrically bitriangular
8 - Triangulo-convex

(41) Longitudinal Section: observed on the longitudinal axis of the point oriented vertically.



Code
0 - Biterminally asymmetrical biconvex
1 - Plano-convex
2 - Biplano
3 - Biconvex
4 - Asymmetrically biconvex
5 - Concavo-convex
6 - Excurvate
7 - Ovate or triangular
8 - Asymmetrically ovate
9 - Asymmetrically excurvate

(42) Bilateral Symmetry of the Blade



Code
0 - Indeterminate
1 - Symmetrical
2 - Asymmetrical

(43) Edge Form of the Blade

Code
0 - Indeterminate
1 - Irregular
2 - Irregular-Even Chipped (opposite lateral edges)
3 - Irregular-Even Ground (opposite lateral edges)
4 - Irregular-Serrated (opposite lateral edges)
5 - Even-Chipped (both lateral edges)
6 - Even-Ground (both lateral edges)
7 - Serrated-Even Chipped (opposite lateral edges)
8 - Serrated-Even Ground (opposite lateral edges)
9 - Serrated (both lateral edges)

(44) Type of Laterally Originating Secondary Retouch Scars

Code
0 - Indeterminate
1 - Absent
2 - Smooth lamellar scars
3 - Stepped lamellar scars
4 - Concoidal scars
5 - Triangular scars
6 - Expanding scars
7 - Angular expanding scars
8 - Ovate scars

(45) Placement of Laterally Originating Secondary Retouch Scars

Code
0 - Indeterminate
1 - Unilateral-Unifacial
2 - Unilateral-Bifacial
3 - Bilateral-Unifacial
4 - Alternating Faces-Bilateral
5 - Bilateral-Bifacial

(46) Pattern of Laterally Originating Secondary Retouch Scars

Code
0 - Indeterminate
1 - Continuous
2 - Discontinuous

(47) Hump: a bulbous surface projecting above one face of the point produced by hinge fracturing.

Code
0 - Indeterminate
1 - Absent
2 - Present

Haft Element (Fig. 3)

The haft element is characterized in terms of the form, articulation and orientation of four sub-elements: (1) the lower sub-element of the blade; (2) the upper sub-element of the haft (shoulder); (3) the lower sub-element of the haft (proximal portion of the notch); and (4) the intermediate sub-element.

Form is characterized in relation to the body of the point as concave (incurvate), straight or convex (excurvate).

Articulation refers to the manner in which sub-elements join at a zone of juncture as the point is viewed at arms length; point (angular articulation); arc (rounded articulation).

Orientation denotes the angle formed between a sub-element and a specified axis at a zone of juncture (see Fig. 3). Orientation of the lower sub-elements of the blade and haft and the intermediate sub-element is determined in relation to a transverse (distal, intermediate or proximal) axis. Orientation of the upper sub-element of the haft (shoulder) is determined in relation to an axis which passes through the medial zone of juncture and is parallel to the longitudinal axis. Three types of angles are differentiated: acute, perpendicular and oblique, corresponding to the angle formed by the respective sub-element and axis.

Form, Articulation and Orientation are coded for each sub-element as follows:

Form

Code
0 - Indeterminate
1 - Absent
2 - Concave
3 - Straight
4 - Convex

Articulation

Code
0 - Indeterminate
1 - Absent
2 - Point (angular)
3 - Arc (rounded)

Orientation

Code
0 - Indeterminate
1 - Absent
2 - Acute
3 - Perpendicular
4 - Oblique

Data for these observations are recorded in the attribute listing of Appendix II as follows:

Lower Sub-element of Blade

(48) Form

(49) Articulation (with the upper sub-element of haft if the point is notched; with the base if the point is not notched).

(50) Orientation (with respect to the distal transverse axis)

Upper Sub-element of Haft

(51) Form

(52) Articulation (with the lower sub-element of the haft)

(53) Orientation (with respect to the longitudinal axis)

Lower Sub-element of Haft

(54) Form

(55) Articulation (with the intermediate sub-element if present; with the base if the intermediate sub-element is absent)

(56) Orientation (with respect to the intermediate or proximal transverse axis)

Intermediate Sub-element of Haft

(57) Form

(58) Articulation (with the base)

(59) Orientation (with respect to the proximal transverse axis).

(60) Symmetry of the Haft

Code

Blank - Haft elements absent
0 - Indeterminate
1 - Symmetrical
2 - Asymmetrical

(61) Edge Form of the Haft Element

Code

0 - Indeterminate
1 - Even Chipped
2 - Even Ground
3 - Irregular

(62) Type of Retouch on the Haft Element

Code

0 - Indeterminate
1 - Single Scar Retouch
2 - Multiple Scar Retouch
3 - Both single and multiple scar retouch same haft elements
4 - Both single and multiple scar retouch different haft elements

(63) Preparation of the Haft Element

Code

0 - Indeterminate
1 - Obscuring lateral originating scars
2 - Obscuring basal originating scars
3 - Obscuring both lateral and basal originating scars
4 - Obscured by lateral originating scars
5 - Obscured by basal originating scars
6 - Obscured by both lateral and basal originating scars
7 - Obscuring lateral originating scars and obscured by basal originating scars
8 - Obscuring basal originating scars and obscured by lateral originating scars
9 - Neither obscuring nor obscured by lateral or basal originating scars

(64) Placement of Haft Element Retouch

Code

0 - Indeterminate
1 - Unifacial-unilateral

2 - Unilateral-bifacial
3 - Bilateral-unifacial
4 - Alternating faces-bilateral
5 - Bilateral-bifacial

Dimensions of the Haft Element (Figure 2): all measurements in millimeters.

(65-66) Distal - Distal

(67-68) Distal - Proximal

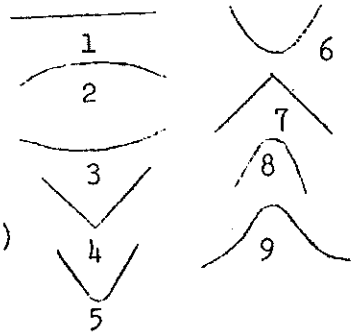
(69-70) Medial - Medial

(70-72) Proximal - Proximal

Base Element

(73) Outline

Code
0 - Indeterminate
1 - Straight
2 - Concave
3 - Convex
4 - Triangulo-convex (point)
5 - Triangulo-convex (arc)
6 - Parabolic
7 - Triangulo-concave (point)
8 - Triangulo-concave (arc)
9 - Recurvate-concave



(74) Curvature

Code
9 - Indeterminate
0-9 mm

(75) Bilateral Symmetry

Code
0 - Indeterminate
1 - Symmetrical
2 - Asymmetrical

(76) Edge Form

Code
0 - Indeterminate
1 - Unretouched - broken
2 - Striking platform present
3 - Retouched - even chipped

4 - Retouched - even ground
5 - Irregular - chipped
6 - Leterally truncated

(77) Placement of Scars

Code
0 - Indeterminate
1 - Absent
2 - Unifacial
3 - Bifacial

(78) Pattern of occurrence

Code
0 - Absent
1 - Continuous
2 - Discontinuous
3 - Patterned scar clusters
4 - Fortuitous scar clusters

(79-80) Typology: The number given to each type described in an earlier section of this chapter.

APPENDIX II

COMPUTER LISTING OF POINT ATTRIBUTE DATA

The following table presents attribute codes for the entire collection of projectile points from the Sheep Rock Shelter. The two rows of numbers set apart at the top of each page of the table designate column numbers 1-80 of the machine punch cards on which the attribute data have been coded. The attribute data for each point are coded on a single punch card and are presented as a horizontal row of alpha-numeric characters.

On each card, columns 1-5 specify the identification (collection and artifact) number of the coded specimen. Data fields within each card are defined in Appendix I by parenthetical numbers preceding the attribute class they designate.

Vertical lines have been drawn to partition the codes into major informational fields (Identification Number, Provenience and its sub-fields, Dimensional Data, Blade, Haft and Base characterization and, finally, Type designation). In column 22, the symbol # indicates that the Master Level given is a provisional assignment based on available data which was insufficient to make positive determination. The symbol ID in columns 22-23 indicates that the Master Level of the specimen is indeterminate. An asterisk in column 33 indicates that the specimen is fragmentary and its original weight (in grams) has been estimated.

The coded points are ordered by type number as assigned in the main body of this chapter. The type number may be found in columns 79-80.

ID#	PROVENIENCE	DIMENSIONS	BLADE	HAFT	BASE	TYPE
	1111111111222222222233333333344444444455555555556666666666777777777778					
	1234567890123456789012345678901234567890123456789012345678901234567890					
6 567	W10S05136-142R	8 46311012	2935460246112432233222111121112918112635143		1	
63926	W15S10141-148E	8 5526 7 9	3936466296112432233222111131112314 92233133		1	
61655	W10S20123-128R	7 5325 9 8*	4633466410000143243242311121191241215123311331		2	
62114	W15S15120-126J1	7 4222 8 6*	3534410256111432432333111111912011171191133		2	
66860	W15S15120-126.J1	7 5126 910*	3923460110001432432323111211912520121831233		2	
7 896	E20S15121-127E	7 3317 6 3	2022443216111432432423111211911710101131253		2	
71335	E20S15133-139L	7 4624 7 6*	3824440216111432333333111211912314191431253		2	
71944	E45S15154-160E	7 4324 4 5*	3723412216111432332331112119122131013311532		2	
61702	W05S10108-110E	7 5131 711*	4245462256121433433232111111113017 91910133		3	
64927	E00S15122-133E	7 5024 6 6*	4134662156111333333332111111112212 91610133		3	
7 792	E10S15125-128E	7 4825 5 5*	4133462156111323333232111111112412 81510135		3	
61681	W05S10108-118G	7 4123 8 7*	3522466415612142223243211112111221 6 82021133		4	
63221	W15S20120-123A	7 3119 7 4*	2512460124122422232432111111911814 71921133		4	
61716	W05S20115-115E	6 2922 7 4	2123840256121322232432111111 2214 81910153		5	
62402	W05S20100-100C	6 3420 7 4	2633840116121322232432111211 1814101710133		5	
62682	NODATA120-120ID	#7 4221 8 6	3314466421411242323243211122191191511211014		6	
65843	E50S20093-099ID	#2 4722 8 7	4113460256511422232432111231912316132010332		6	
67757	W20S00102-108I	8 2422 5 2	1933443192131422232333111111912215 81521332		7	
61729	W15S05084-090B	6 3421 4 5	2833466315612142223243211111191171 2 51610133		8	
61730	W20S10078-082G	6 3422 7 4	2611260156121432232432111111912115 62133153		8	
61737	W20S10078-084G	6 3324 6 4	2533466256121422232432111111912415 51810133		8	
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6  207E35S05059#064ID   #2  2320  4  2*  2300242126121422                    20101532 37
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65762E25S05060-060B      2 2417 3 1  2400243156121322                      1710133239
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65772E20S00063-063D3     2 2619 4 1  2500265154121322                      1921233239
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PLATES

Plate 1

1 - 2	Projectile Point	Type 1	(Kirk Corner-Notched)
3 - 8	Projectile Point	Type 2	(Raystown Stemmed)
9 -11	Projectile Point	Type 3	(Laurentian Corner-Notched)
12-13	Projectile Point	Type 4	(Laurentian Stemmed)
14-15	Projectile Point	Type 5	(Brewerton Corner-Notched)
16-17	Projectile Point	Type 6	(? Transitional)
18	Projectile Point	Type 7	(LeCroy)
19-24	Projectile Point	Type 8	(Brewerton Corner-Notched)
25	Projectile Point	Type 9	(Brewerton Side-Notched)
26	Projectile Point	Type 10	(Brewerton Side-Notched)
27	Projectile Point	Type 12	(Perkiomen Broad Spear)
28	Projectile Point	Type 11	(Susquehanna Broad Spear)
29-35	Projectile Point	Type 13	("Hellgramite" Point)
36-37	Projectile Point	Type 14	(Brewerton Eared Notched)
38-39	Projectile Point	Type 15	(Transitional Broad Spear)
40-41	Projectile Point	Type 16	(Brewerton Pentagonal)
42-44	Projectile Point	Type 17	(Rossville)

Type. Page 323 To 331

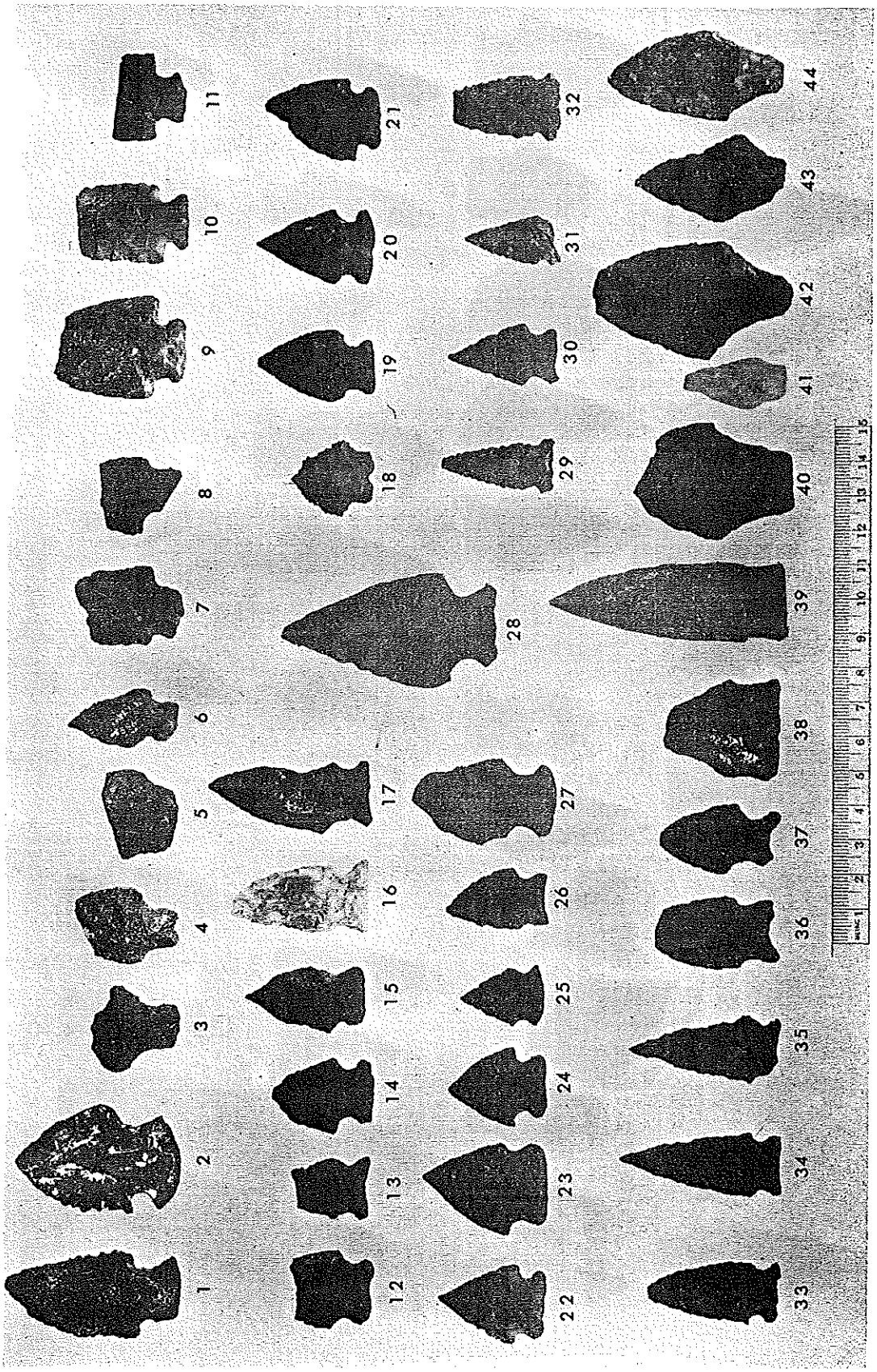

PLATE 1

PLATE 2

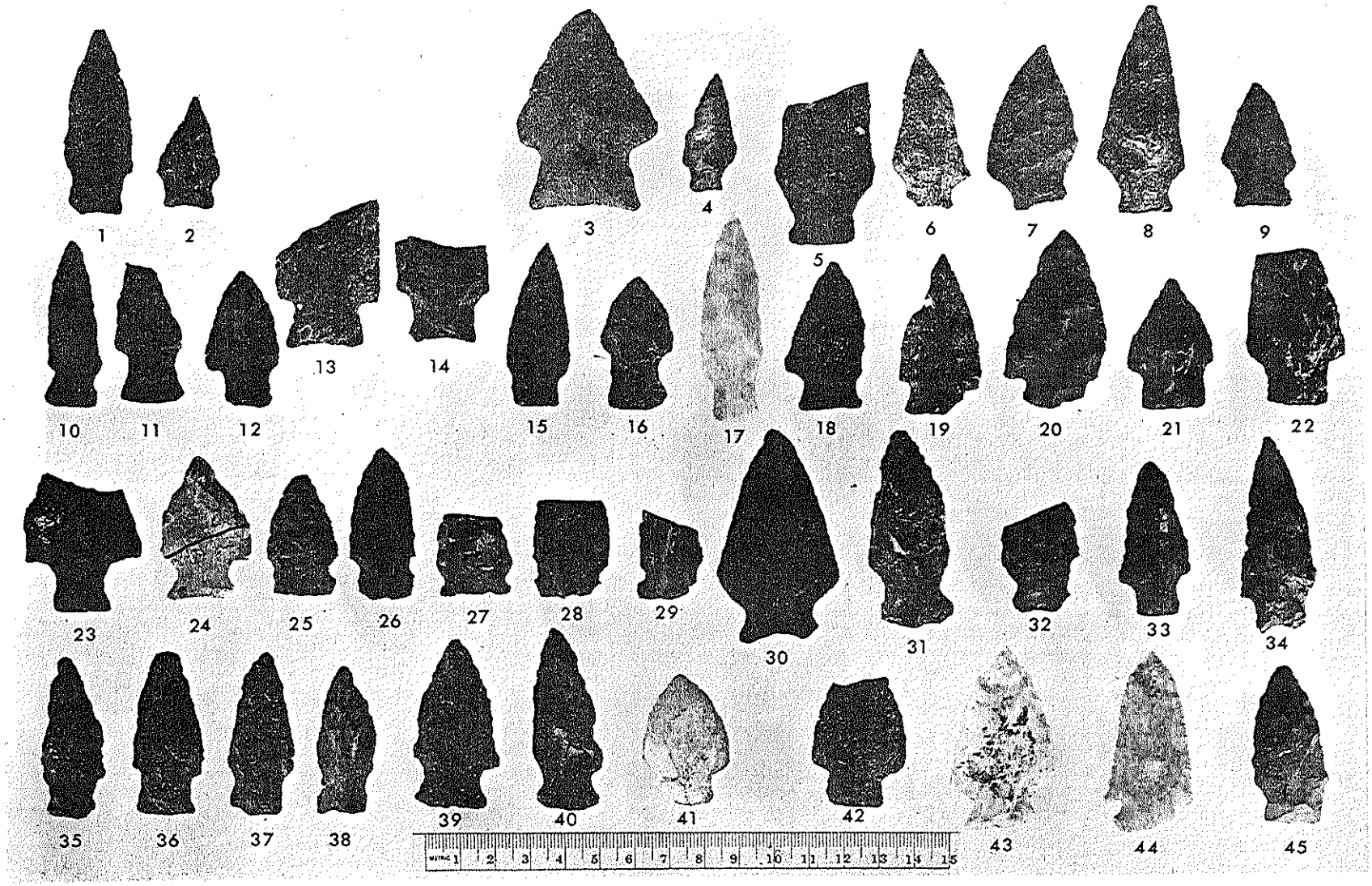
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Plate 2

1 - 2	Projectile Point	Type 18	(Wading River Point)
3	Projectile Point	Type 20	(Transitional Broad Spear)
4 - 9	Projectile Point	Type 21	(Frost Island)
10-12	Projectile Point	Type 22	(Wading River - Bare Island)
13-14	Projectile Point	Type 19	(Savanna River)
15-17	Projectile Point	Type 22	(Wading River - Bare Island)
18-20	Projectile Point	Type 23	(Brewerton Corner-Notched)
21-22	Projectile Point	Type 24	(Genesee)
23-24	Projectile Point	Type 25	(Transitional Broadspear)
25-27	Projectile Point	Type 26	(Meadowood)
28-29	Projectile Point	Type 27	(Raccoon Side-Notched)
30	Projectile Point	Type 28	(Susquehanna Broad Spear)
31-40	Projectile Point	Type 29	(Juniata Stemmed)
41-42	Projectile Point	Type 30	("Perkiomen" Broadspear)
44	Projectile Point	Type 31	(Snyders Notched)
45	Projectile Point	Type 32	(Juniata Stemmed)

Type - Page. 332 to 336

Plate 3

1 - 2	Projectile Point	Type 33	(Miscellaneous)
3	Projectile Point	Type 34	(Middle Woodland Stemmed)
4	Projectile Point	Type 35	(Fish Tail)
5	Projectile Point	Type 36	(Miscellaneous)
6	Projectile Point	Type 38	(Shenk's Ferry)
7-11	Projectile Point	Type 37	(Clemson's Island - Levanna)
12	Projectile Point	Type 38	(Shenk's Ferry)
13	Projectile Point	Type 37	(Clemson's Island - Levanna)
14	Projectile Point	Type 38	(Shenk's Ferry)
15	Projectile Point	Type 37	(Clemson's Island - Levanna)
16	Projectile Point	Type 38	(Shenk's Ferry)
17	Projectile Point	Type 37	(Clemson's Island - Levanna)
18-21	Projectile Point	Type 38	(Shenk's Ferry)
22	Projectile Point	Type 37	(Clemson's Island - Levanna)
23-34	Projectile Point	Type 39	(Susquehannock)
35	Projectile Point	NO SPECIMEN SHOWN	
36-37	Projectile Point	Type 38	(Type 40) (Shenk's Ferry)
38	Projectile Point	Type 37	(Type 40) (Levanna)
39	Projectile Point	Type 38	(Type 40) (Shenk's Ferry)
40-46	Projectile Point	Type 41	(Undesignated)
47-49	Projectile Point	Type 42	(Levanna)
50	Projectile Point	Type 43	(Levanna)
51-52	Projectile Point	Type 44	(Susquehannock)
53-54	Projectile Point	Type 46	(Fox Creek Stemmed)
55	Projectile Point	Type 47	(Jack's Reef Pentagonal)

Type - Page - 337 to 345

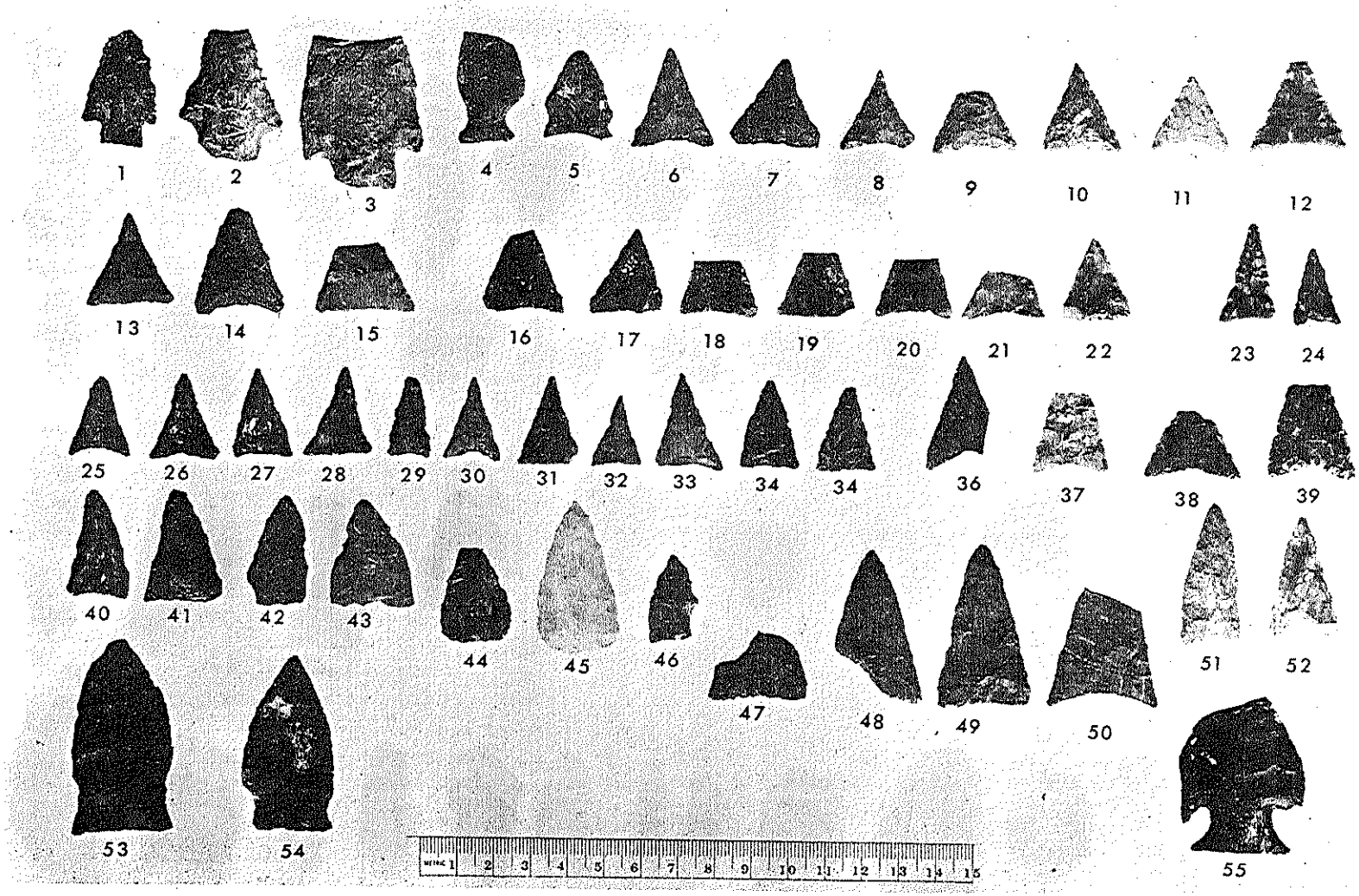
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PLATE 3

PLATE 4

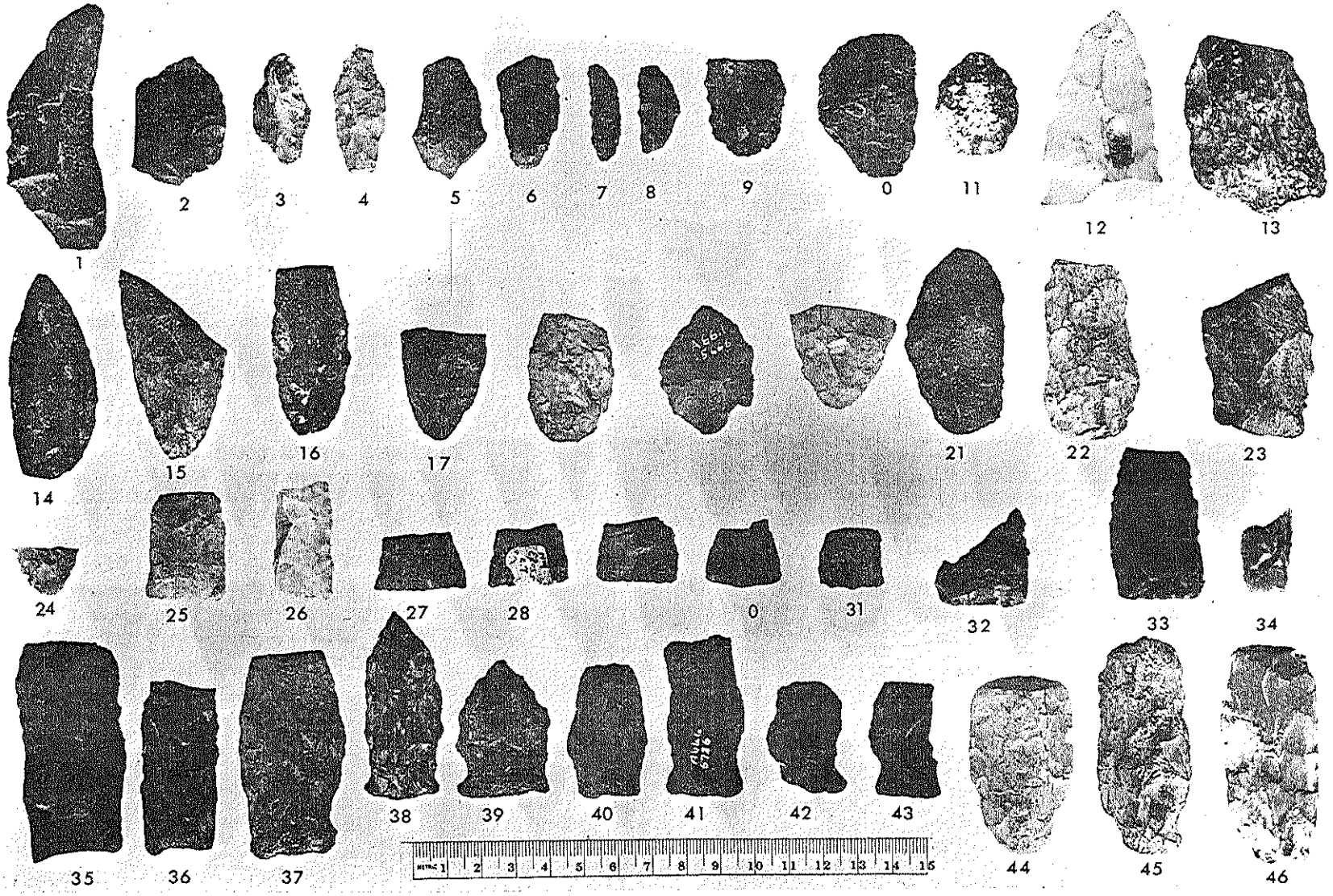
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Plate 4

1	Knife	Type 1	(Utilized Flake Knife)
2	Knife	Type 2	(Marginally Retouched Flake Knife)
3-6	Knife	Type 4	(Bifacial Ovate Knives)
7-8	Knife	Type 3	(Bifacial Lunate Knives)
9	Knife	Type 5	(Bifacial Ovate Knife)
10	Knife	Type 6	(Bifacial Ovate Knife)
11	Knife	Type 5	(Bifacial Ovate Knife)
12	Knife	Type 7	(Bifacial Ovate Knife)
13	Knife	Type 8	(Bifacial Ovate Knife)
14-15	Knife	Type 7	(Bifacial Ovate Knife)
16-17	Knife	Type 9	(Bifacial Ovate Knife)
18	Knife	Type 7	(Bifacial Ovate Knife)
19-20	Knife	Type 10	(Bifacial Ovate Knife)
21	Knife	Type 12	(Bifacial Ovate Knife)
22	Knife	Type 11	(Bifacial Ovate Knife)
23	Knife	Type 12	(Bifacial Ovate Knife)
24	Knife	Type 13	(Bifacial Ovate Knife)
25-26	Knife	Type 15	(Bifacial Triangular Knives)
27-29	Projectile Point	Type 45	
30-31	Knife	Type 14	(Bifacial Triangular Knives)
32-33	Knife	Type 16	(Bifacial Triangular Knives)
34	Knife	Type 17	(Bifacial Triangular Knives)
35-36	Knife	Type 20	(Bifacial Stemmed-Notched Knives)
37-39	Knife	Type 19	(Bifacial Stemmed-Notched Knives)
40	Knife	Type 20	(Bifacial Stemmed-Notched Knives)
41-43	Knife	Type 18	(Bifacial Stemmed-Notched Knives)
44-46	Knife	Type 21	(Bifacial Stemmed-Notched Knives)

Plate 5

1 - 2	Sinker	Type 1	(Steatite Line Sinkers)
3	Sinker	Type 5	(Large, Notched Disc Net Sinker)
4	Sinker	Type 2	(Notched Pebble Net Sinker)
5 - 6	Sinker	Type 3	(Small Notched Disc Net Sinkers)
7 - 8	Sinker	Type 5	(Large Notched Disc Net Sinkers)
9 - 10	Sinker	Type 4	(Large Unnotched Disc Net Sinkers)

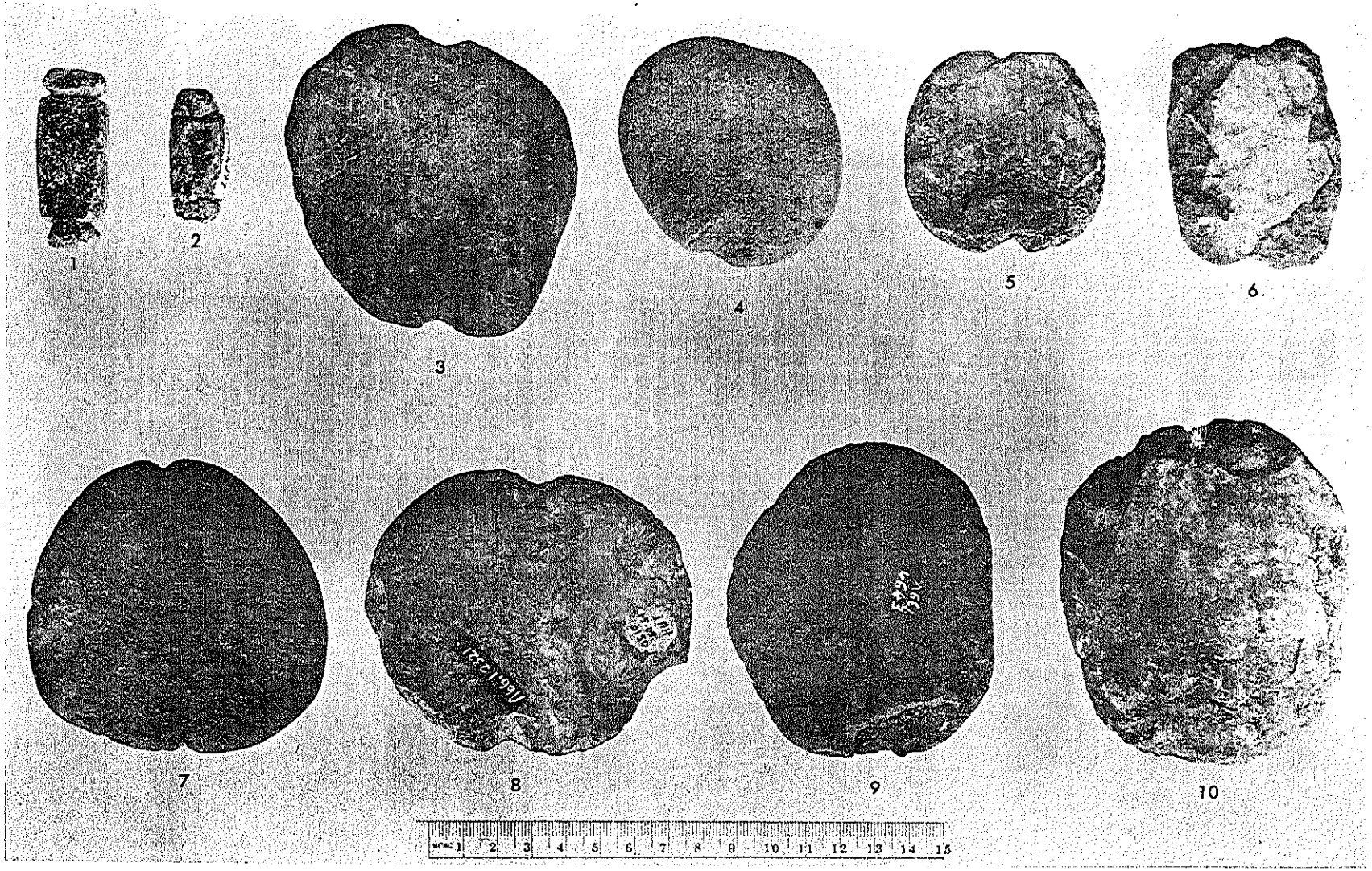

PLATE 5

PLATE 6

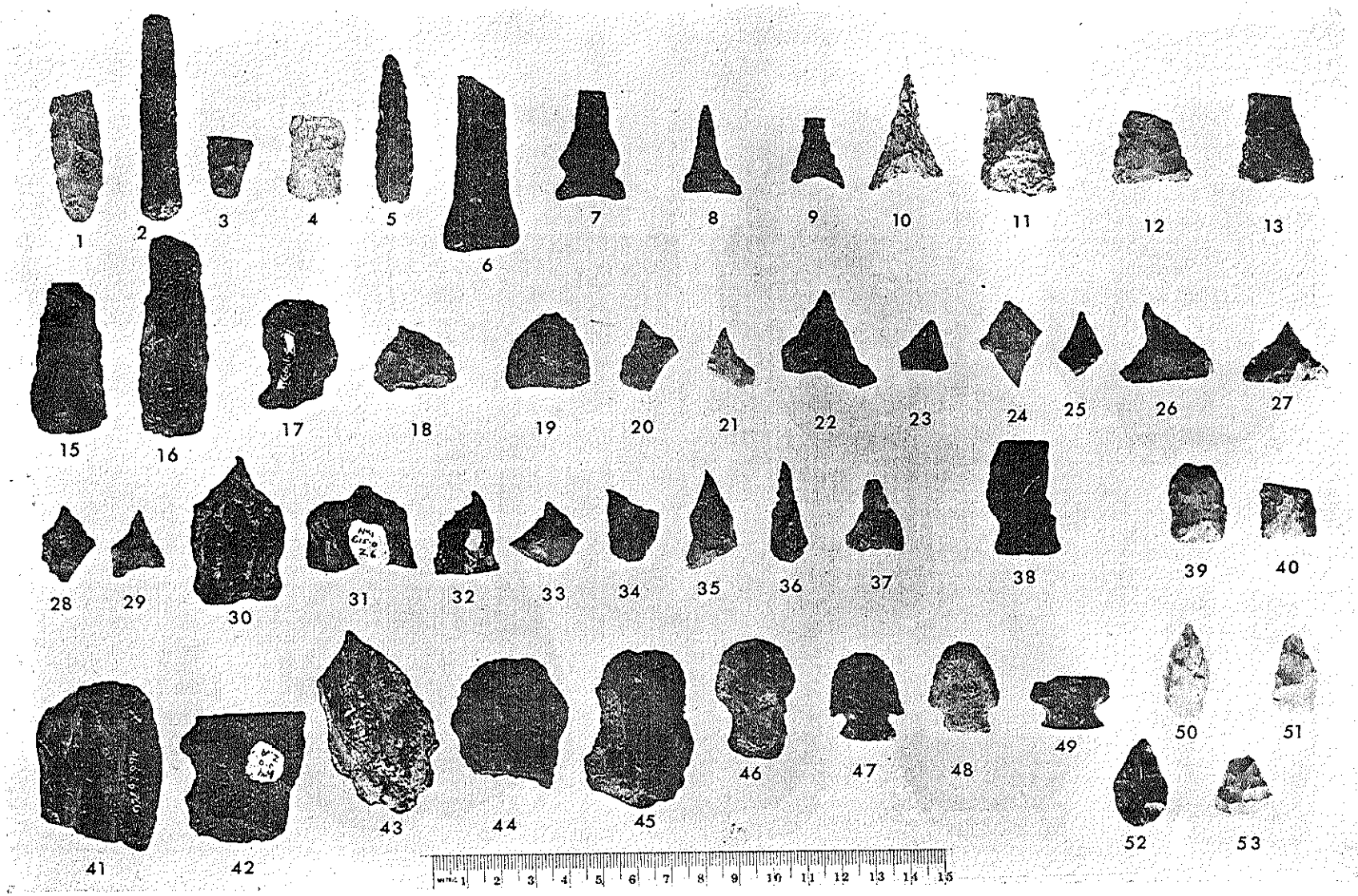
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Plate 6

1 - 4	Drill	Type 1	(Bar Drill)
5	Drill	Type 2	(Bar Drill)
6	Drill	Type 3	(Expanded Stem Drill)
7	Drill	Type 6	(Notched Drill)
8	Drill	Type 5	(Expanded Stem Drill)
9 -10	Drill	Type 7	(Triangular Drill)
11-13	Drill	Type 4	(Expanded Stem Drill)
14	Drill	NO SPECIMEN SHOWN	
15-16	Chisels		
17	Gouge	(Also Plate 4:42)	
18-19	Incising Tool	Type 5	(Triangular Gravers)
20-39	Incising Tool	Type 6	(Triangular Gravers)
30	Incising Tool	Type 4	(Notched Graver)
31	Incising Tool	Type 2	(Retouched Flake Gravers)
32-34	Incising Tool	Type 3	(Retouched Flake Gravers)
35-36	Incising Tool	Type 1	(Utilized Flake Gravers)
37	Incising Tool	Type 8	(Gouge "Single Blow" Burin)
38	Incising Tool	Type 7	(Single Blow Burin)
39-40	Gunflints		
41	Scraper	Type 4	(Marginally Retouched End Scraper)
42	Scraper	Type 5	(Marginally Retouched Side Scraper)
43	Scraper	Type 2	(Utilized Flake Scraper)
44	Scraper	Type 6	(Marginally Retouched Side Scraper)
45	Scraper	Type 3	(Marginally Retouched End Scraper)
46	Scraper	Type 9	(Bifacial Stemmed Scraper)
47-49	Scraper	Type 8	(Bifacial Corner-Notched Scrapers)
50-53	Scraper	Type 10	(Bifacial Lobate Scrapers)

Plate 7

1	Chopping Tool	Type 1	(Adze)
2	Chopping Tool	Type 7	(Celt)
3	Chopping Tool	Type 4	(Celt)
4	Thick Quartzite Flake	Possibly used as a Chopping Tool (Early Archaic)	
5-7	Chopping Tool	Type 5	(Celts)
8	Chopping Tool	Type 6	(Celt)
9	Chopping Tool	Type 2	(Axe)
10	Chopping Tool	Type 8	(Bifacial Preform)
11	Pounder	Type 1	
12	Chopping Tool	Type 8	(Bifacial Preform)

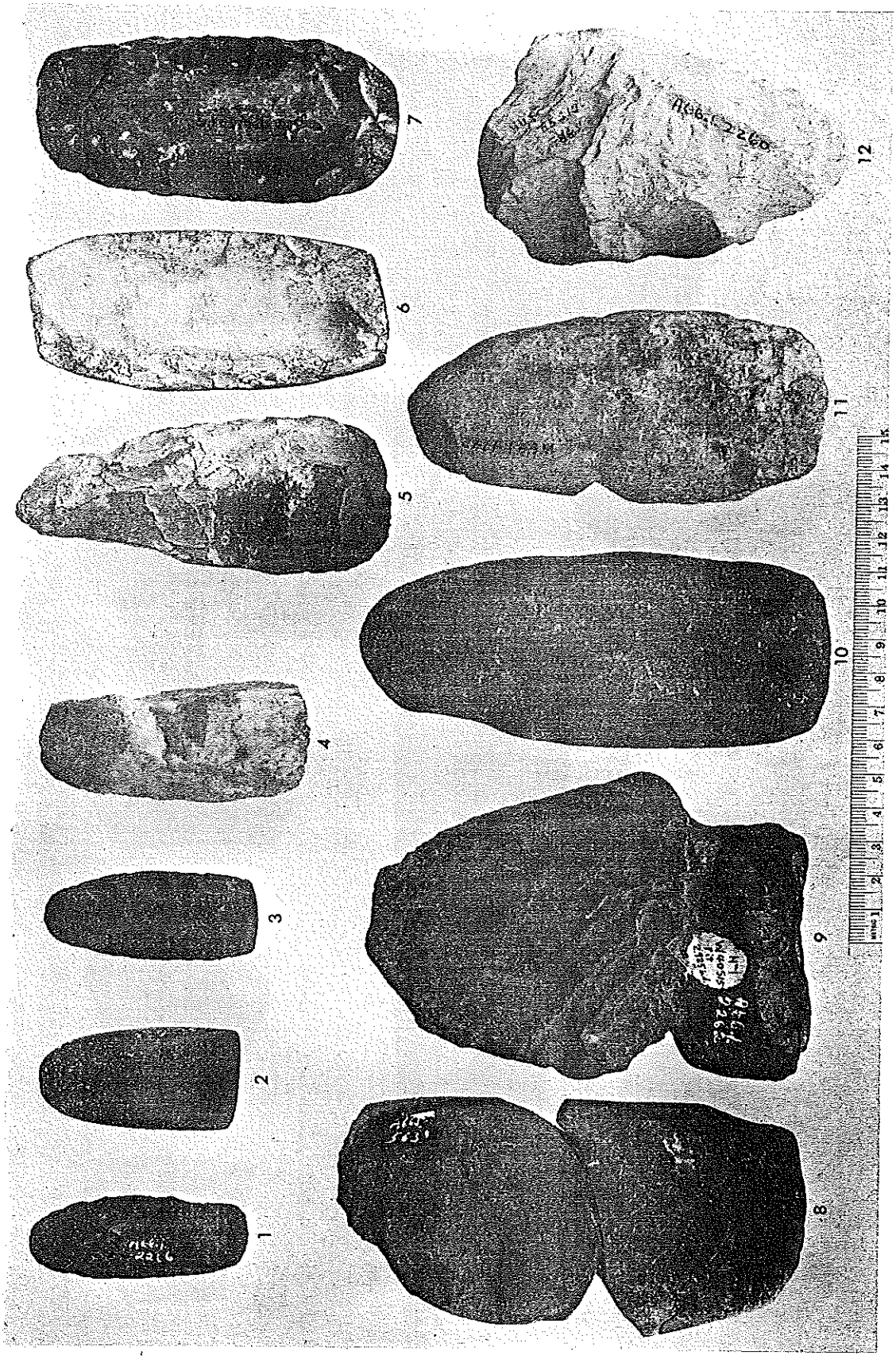

PLATE 7

PLATE 8

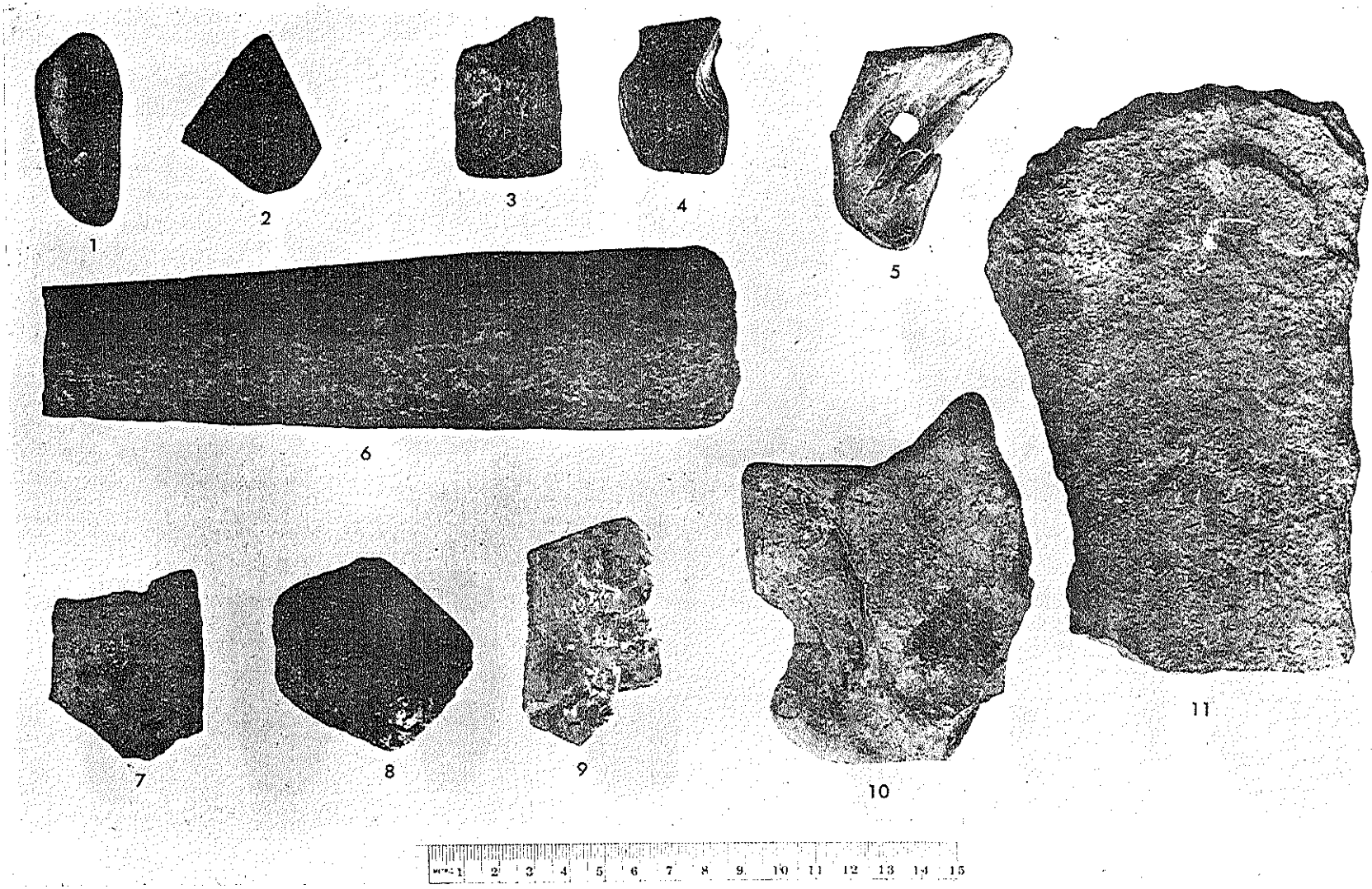

Plate 8

1-2	Abrading Stones	Type 1	(Smoothing Stones)
3-4	Sinew Stones		
5	Abrading Stone	Type 3	(Honing Stone)
6	Possible Grinding Stone or Pestle Fragment		
7	Paraphenalia (Gorget)		
8	Paraphenalia (Grooved Ochre)		
9	Paraphenalia (Mica Sheet)		
10	Scraper	Type 7	(Marginally Retouched Side Scraper)
11	Possible Hoe		

A BIOCHEMICAL ANALYSIS OF NATURALLY PRESERVED PREHISTORIC ZEA MAIZE

by

R.T. Turner

ABSTRACT

Preserved maize kernels obtained from the Sheep Rock Shelter were analyzed biochemically. The following analyses were performed: moisture, ether extract, crude fiber, ash, nitrogen, and total lipid. Both the experimental and control samples were run in duplicate. The results of the analysis indicated that the kernels were extremely well preserved. The indian corn appears to have been high in protein and low in fiber and fat.

ACKNOWLEDGMENTS

The author expresses appreciation for aid and criticism given to him by Dr. J.W. Shigley and Dr. C.O. Clagett whose assistance in preparing experiments and interpreting the results was invaluable.

Appreciation is also extended to the Biochemistry Department of the Pennsylvania State University for providing the space, equipment and chemicals necessary for the study.

The author also expresses his thanks to Dr. J.W. Michels for providing the preserved prehistoric maize kernels analyzed in this study.

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INTRODUCTION

The preserved maize kernels that were analyzed in this research project were unearthed at the Sheep Rock Shelter site (36Hul). Sheep Rock is a dry rock shelter, thus providing the conditions necessary for the preservation of organic material.

In order to insure a representative sample, the kernels chosen for analysis were distributed throughout the site. The number of kernels selected at any locale or depth was in proportion to the number found at that location. The control samples were obtained from the College of Agriculture of the Pennsylvania State University, and consisted of Pa Hybrid Number 290.

The kernels were analyzed by proximate methods which are used in agriculture to determine the quality of crops. They are useful in measuring the general components of food, ie. lipid soluble material, but they do not measure the specific chemical components.

Analysis of moisture, ether extract, crude fiber, ash, and nitrogen (protein) was performed, and the total lipid was also determined. The goal of this research project was multifold. First, it was important to determine whether the chemical composition of the preserved maize kernels had modified with time. If modification could be detected, it was important to determine which components had been affected and to what extent. Finally, if the composition appeared unmodified, the kernels could be compared to other strains of maize, and it would be possible to observe genetic differences between the preserved samples and the controls.

METHODOLOGY

Notes on Analytical Procedures.

A brief outline of the procedure used for each analysis will be given. All procedures were based upon those recommended by the Association of Official Agricultural Chemists (1965). The official methods of analysis were adhered to as strictly as practical.

All experimental samples were run in duplicate, as were the control samples. The duplicate control samples served a dual purpose: 1) to familiarize the experimentor with the procedures before risking irreplaceable samples; and 2) to have data which could be compared with the literature to help determine if unexpected experimental results were due to error.

Sampling and Grinding.

A total of thirty-three well preserved kernels, weighing twelve grams, were selected. The kernels were distributed throughout the dry area of the site and were chosen from each part of the site in proportion to the number found.

The composite sample was ground using a micro-Wiley mill while a standard Wiley mill was used for grinding the control sample. In both cases a one milimeter square screen size was utilized. Both the controls and the composite sample were well mixed in order to obtain an even distribution of material.

Procedures and Calculations.

Moisture. The percent moisture is a measure of the volatile component, mostly water, of the kernel. To determine moisture, duplicate two gram control and experimental samples were weighed out. The samples were dried in an oven at 110°C for five hours, then cooled to room temperature and reweighed. The percent moisture was determined from the difference between the initial and final weights:

$$\frac{\text{initial sample weight - final sample weight}}{\text{initial sample weight}} \times 100 = \% \text{ moisture}$$

Ether Extract. The residue from the moisture determination was used for the ether extract analysis. The percent ether extract is a measure of the ether soluble component, which is mostly lipid, of the kernel. Each sample and control was placed in an extraction thimble and distilled through it for sixteen hours. The resulting distillates, containing the ether soluble material, were trapped in extraction flasks. The ether was then evaporated and the percent ether extract was calculated from the increase in weight of the extraction flask:

$$\frac{\text{final weight extraction flask} - \text{initial weight extraction flask}}{\text{initial weight}} \times 100 = \%\ \text{ether extract}$$

Crude Fiber. The percent crude fiber is a measure of the undigestible material in the kernel. The residues from the ether extract determinations were digested for thirty minutes in 1.25% H_2SO_4. Then the solutions were filtered through a cloth filter, washed with water, digested for an additional thirty minutes in boiling 1.25% NaOH, and filtered and washed again. The residues were collected, dried in an oven at 110°C for two hours, cooled to room temperature and weighed. The weighed residues were ignited for thirty minutes at 600°C, cooled to room temperature, and re-weighed. The percent crude fiber was determined from the decrease in weight of the residue upon ignition:

$$\frac{\text{weight of residue after acid-base digestion} - \text{weight of residue upon ignition}}{\text{original weight of sample}} \times 100 = \%\ \text{crude fiber}$$

Ash. The percent ash is a measure of the mineral content of the kernel. Samples weighing two to four grams were measured into ashing dishes. The samples were ignited at 550°C in a muffle furnace for four hours, cooled to room temperature, and reweighed. The percentage ash is based upon the weight of residue following ignition compared to the original weight:

$$\frac{\text{weight ignited sample + dish} - \text{weight dish}}{\text{original sample weight}} \times 100 = \%\ \text{ash}$$

Kjeldahl Nitrogen. The protein component contains most of the nitrogen found within the kernel. By weight, 16 percent of the protein is nitrogen, therefore, a determination of the amount of nitrogen can be used as a measure of the total amount of protein. The Kjeldahl procedure was used to determine the amount of nitrogen present. This amount multiplied by the factor 6.25 serves as the measure of the total protein content.

Three steps were involved in this analytical technique:

1) Wet Ashing. Samples estimated to contain 0.5-1.0 mg Nitrogen were weighed onto filter paper disks and inserted wrapped into the necks of kjeldahl flasks. Five milliliters of a digestion mixture (40 ml concentrated H_2SO_4 + 60 ml H_2O + 3 gm red mercuric oxide), 200 mg K_2SO_4, and glass beads were added. The samples were digested on a digestion rack, cooled to room temperature and diluted with 5 ml of water.

2) Steam Distillation. The diluted, digested samples were poured into distillation chambers and seven milliliters of concentrated NaOH was added. An erlenmeyer flask with four milliliters of indicating boric acid was placed under each condensor, and steam was allowed to enter the distillation chamber. The indicator, in changing from

pink to blue showed that NH_3, which had been trapped during the wet ashing procedure, was present. Steam distillation was allowed to proceed for two minutes.

3) Ammonia titration. Standard 0.01 H_2SO_4 was prepared for the titration of the ammonia. The samples were titrated with the standard acid using the boric acid, added in step two, as the indicator. The calculation of the percent nitrogen was based upon quantitative titration of NH_3, resulting from wet ashing, with acid of known concentration:

$$\frac{\text{ml acid required for titration} \times \text{normality acid } (.116\ H_2SO_4) \times \text{molecular weight N}}{\text{weight sample}} \times 100 = \% \text{ nitrogen}$$

The percent protein was subsequently determined as follows:

$$\% \text{ nitrogen} \times 6.25 = \% \text{ protein}$$

Total Lipid. Using a gas-liquid chromatograph it is possible to separate and identify the fatty acids which make up the lipid component of the kernel. The procedure is divided into two parts:

1) Transesterification. Fifty milligrams of the residue from the ether extract was added to two milliliters of a sodium methoxide solution. The mixture was shaken periodically for ten minutes and then 0.2 ml of concentrated H_2SO_4 and one milliliter of water was added to stop the reaction. Four milliliters of chloroform was added to desolve the fatty acid esters. Two layers formed and the upper aqueous layer was discarded. The chloroform was then gently evaporated.

2) Injection into the Gas-Liquid Chromatograph (GLC). The residue from above was dissolved in ether and a five microliter sample was injected into the GCL. The conditions were as follows:

a) Type GLC - Varian aerograph series 200.
b) Column Type - EGS
c) Column Temperature - 185°C
d) Detector Temperature - 250°C
e) Injection Temperature - 250°C
f) Voltage - 150 milliamps
g) Gas Flow - 37 ml/min.

The relative percentages of the fatty acids were calculated from the area of the peaks recorded on the GCL:

$$\frac{\text{area of peak}}{\text{sum of areas}} \times 100 = \% \text{ fatty acid}$$

RESULTS AND INTERPRETATIONS

All weight measurements are in grams and are accurate to 0.0001 gram, while the results are expressed in percent original wet weight. Interpretation is made from comparison of the experimental samples with the controls and with literature data (Tables 7 and 8). The data, results, and interpretations of each analysis are considered independently.

Moisture.

Sample #	Pan weight	Initial pan + sample	Sample	Final pan + sample	Initial - final	Percent Moisture
Control 1	15.1857	17.1696	1.9739	17.0141	.1555	7.88
Control 2	14.3421	16.3380	1.9850	16.1808	.1572	7.92
Sample 1	17.2291	19.1398	1.9107	18.9838	.1560	8.16
Sample 2	14.5749	16.4281	1.8532	16.2752	.1529	8.25

TABLE 1. MOISTURE CALCULATIONS

The amount of water contained within the indian corn compared very closely to the control. This result was somewhat of a surprise since a necessary condition for preservation is dehydration. It was expected that exposure to a dry environment would result in loss of moisture. The corn, however, has been reexposed to air, and there is a good chance it may have taken up moisture during the grinding process.

Ether Extract.

Sample #	Extraction flask	Flask + extract	Extract	Original sample	Percent Ether Extract
Control 1	52.3830	52.4802	.0972	1.9739	4.96
Control 2	53.1801	53.2654	.0853	1.9859	4.30
Control 3	52.3842	52.4537	.0695	1.5660	4.40
Sample 1	54.4400	54.4658	.0542	1.9107	3.00
Sample 2	53.9884	54.0426	.0254	1.8532	1.40
Sample 3	54.4390	54.4764	.0374	1.5491	2.30

TABLE 2. ETHER EXTRACT CALCULATIONS

There was greater deviation than desired between duplicate samples for both the indian corn and the controls, therefore a third sample of each was run and the three values averaged. There was a significant difference between the indian corn and the control. While the control was well within the expected range, the indian corn was much lower than anticipated. The ether extract is primarily

lipid material and many lipids are relatively labile, being easily oxidized to a variety of substances, some of which are non-soluble in ether. It is therefore highly probable that the ether soluble material has decreased.

Crude Fiber.

Sample	#	Weight residue	Wt. after digestion	Difference	Original sample	Percent Crude Fiber
Control	1	16.2262	16.2098	.0164	1.9739	1.05*
Control	2	15.1895	15.1670	.0225	1.9859	1.41
Sample	1	16.1056	16.0824	.0232	1.9107	1.38
Sample	2	15.7625	15.7393	.0232	1.8532	1.36

*Sample boiled up into condensor

TABLE 3. CRUDE FIBER CALCULATIONS

The percent crude fiber in the indian corn agreed closely with the control and fell well within the expected range. Crude fiber is a measure of undigestible organic material such as cellulose. Material like cellulose is highly stable, therefore it is probable that the obtained crude fiber value is a true indication of the amount initially present.

Ash.

Sample	#	Dish weight	Weight ignited	Sample weight	Dish - ignited	Percent Ash
Control	1	19.6336	19.6776	3.2483	.0440	1.35
Control	2	19.4914	18.5298	2.8788	.0384	1.34
Sample	1	21.3479	21.4103	2.6099	.0624	2.31
Sample	2	23.8074	23.8702	2.6226	.0628	2.31

TABLE 4. ASH CALCULATIONS

The mineral content of the indian corn is very high. Indeed, it is well outside the expected range. The control, however, is well within the expected range which indicates that the test was preformed correctly. Furthermore, the duplicate indian corn samples gave results identical to one hundredth of one percent indicating that the value obtained is correct. With the information available, it cannot be determined whether the indian corn originally contained such a high mineral content or whether the minerals diffused in from the surrounding soil during the several hundred years that the corn has been buried. The fact that the mineral content of the indian corn, a Northern Flint, does not fall in the range expected for Flints tends to support the latter.

Kjeldahl Nitrogen.

Sample	#	Sample + paper	Paper	Weight sample	Titration	Percent Nitrogen	Percent Protein
Control	1	.2325	.1669	.0656	0.30 ml	*	*
Control	2	.2610	.1638	.0972	1.10 ml	1.98	12.4
Sample	1	.2829	.1688	.1141	1.35 ml	2.02	12.6
Sample	2	.2746	.1683	.1063	1.25 ml	2.00	12.5

*Sample boiled out of Kjeldahl Flask during wet ashing.

TABLE 5. NITROGEN AND PROTEIN CALCULATIONS

Both the indian corn and the control had high protein content but neither was out of the expected range. A significant error is possible in this determination because of the way in which protein is calculated. Since protein is determined by multiplying the percent nitrogen by a factor of 6.25, the amount of error, should it occur, is thereby increased proportionally. In spite of the inherent error, there was excellent agreement between the duplicate indian corn samples, indication that the protein values are correct. The data, therefore, suggests that the indian corn was quite high in protein.

Total Lipid.

Sample	Carbon 16 Palmitic	Palmitoleic	Carbon 18 Fatty Acids Steric	Oleic	Linoleic	Oxidation product
Ind. corn	25.8	2.3	3.2	51.4	17.3	yes
Control	9.9	1% trace	1% trc.	35.9	53.9	no
Expected*	8-10	1-2	1-4	30-50	34-56	no

*(Morrison and Boyd 1966)

TABLE 6. TOTAL LIPID CALCULATIONS

Fatty acids are important components of fat. When transesterified they can be separated on an EGS column by carbon number and degree of unsaturation (number of double bonds). The above process was performed on both the controls and the indian corn. It was expected that if lipid oxidation had occurred in the indian corn, the proportions of the various fatty acids would have been altered. The apparent percentage of the stable saturated fatty acids would be expected to increase because of the decrease in amount of labile unsaturated fatty acids. The above prediction was verified. The percentage linoleic acid (double unsaturated and most labile) was dramatically lower in the indian corn compared to the control. On the other hand, the proportions of the other fatty acids increases as predicted. A large irregular peak appeared after the solvent peak and presumably represents short chained fatty acids produced by oxidation of unsaturated fatty acids. The control exhibited no such peak.

Oxidation of Linoleic Acid

$$CH_3(CH_2)_4CH = CHCH_6CH = CH(CH_2)_7COOH \xrightarrow{O_2}$$

$CH_3(CH_2)_7COOH$
+ $CH_3CH_2CH = CH(CH_2)_7COOH$
short chained fatty acids

+ CH_3CH_2CHO not soluble in ether
+ $CH_3(CH_2)_4CHO$
+ $CH_3(CH_2)_4CH = CHCH_2CH$

Aldehydes (subject to further oxidations)

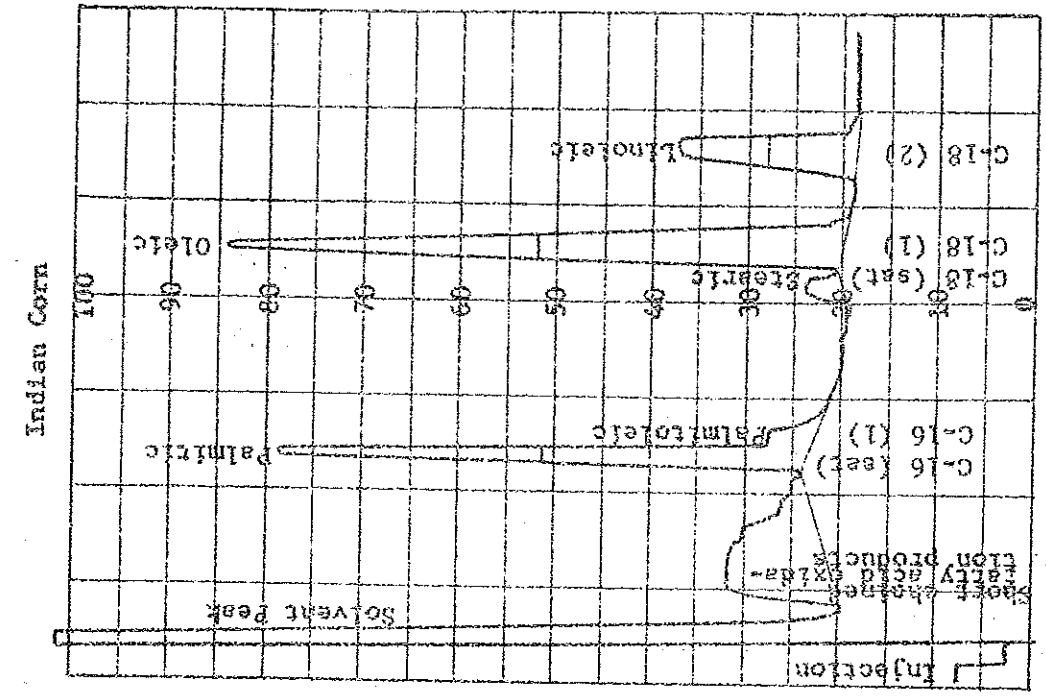
A variety of oxidation products are then possible, some of which are insoluble in ether. Oxidation could therefore account for the postulated decrease in ether extract. It must be stressed that the differences in fatty acid composition cannot be explained by oxidation alone. As of late, there has been selection for a higher percentage of polyunsaturated acids, therefore, there is no reason to believe that the indian corn would contain as much linoleic acid as contemporary strains. Palmitoleic and Oleic acids are capable of oxidizing, yet there was no evidence to suggest a great decrease in the amount present of these two acids. It can be concluded that at least some of the variation in fatty acid composition between the indian corn and the control is due to genetic difference.

Starch.

Starch is determined by simply summing the precent moisture, ether extract, crude fiber, ash, and protein, and then subtracting it from 100%. Starch content is highly variable and not very significant as a test. It should be noted, however, that both the controls and the experimental results fell well within the expected range.

	Control (in percent)				Sample (in percent)			
Experiment	1	2	3	Average	1	2	3	Average
Moisture	7.88	7.92		7.90	8.16	8.25		8.20
Ether Extract	4.92	4.30	4.40	4.50	3.00	1.37	2.30	2.20
Crude Fiber		1.41		1.41	1.38	1.36		1.37
Ash	1.35	1.34		1.34	2.31	2.31		2.31
Protein		12.4		12.4	12.6	12.5		12.5
Starch		72.6		72.5	72.6	74.2		73.4

TABLE 7. OVERALL RESULTS



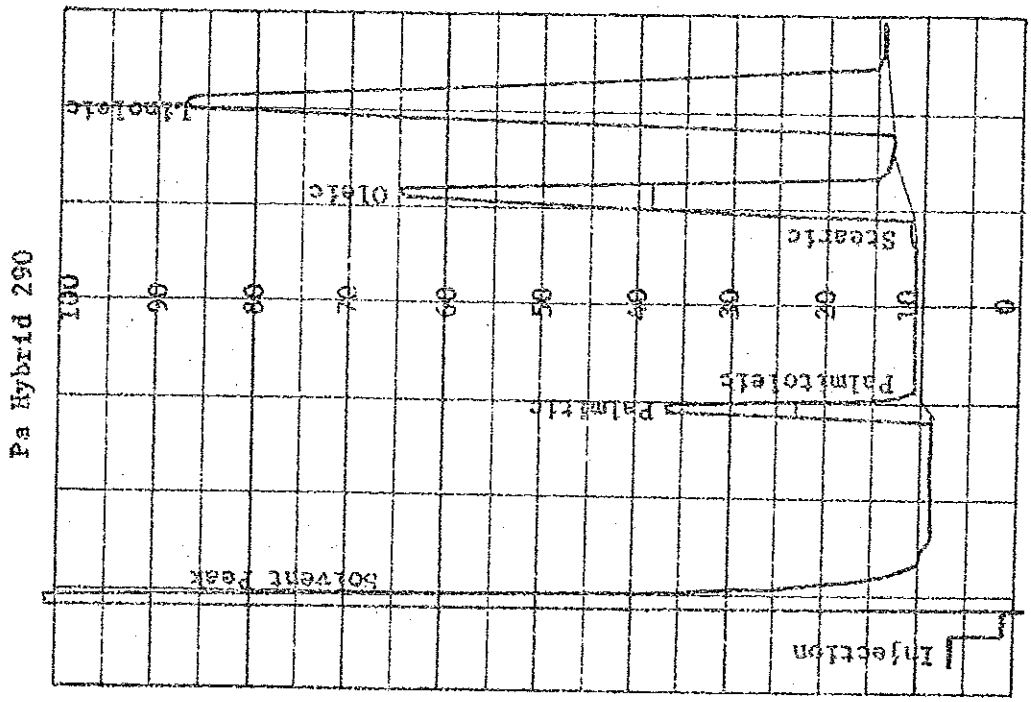


Figure 1. LIQUID - GAS CHROMATOGRAPH READINGS FOR PA HYBRID 290 AND INDIAN CORN

Literature*	Samples	Water	Protein	Fat	Starch	Fiber	Ash
Dent var.	86						
minimum		6.22	7.53	3.10	65.40	0.88	1.04
maximum		19.42	12.78	7.49	75.73	4.81	2.62
average		10.56	10.25	5.02	70.40	2.24	1.53
Flint var.	68						
minimum		4.53	7.00	3.40	64.95	0.67	1.03
maximum		19.60	13.65	7.13	76.74	2.88	1.92
average		11.31	10.52	4.99	70.09	1.65	1.44
Sweet var.	26						
minimum		5.98	9.45	3.76	61.78	1.46	1.42
maximum		10.86	15.31	11.90	72.35	5.24	2.35
average		8.82	11.62	8.13	66.72	2.79	1.92
Soft var.	5						
minimum		6.09	8.82	5.00	65.97	1.28	1.41
maximum		14.08	14.56	5.74	75.50	3.25	1.85
average		9.26	11.41	5.47	70.29	2.00	1.57

*(Winton 1932: 74)

TABLE 8. LITERATURE DATA

The indian corn is a strain of Northern Flint and should be very similar to other flint varieties. Consequently the interpretation of results is based upon comparison of experimental values with the flint varieties described in the above table. Other varieties of maize are given to show range of variation between strains.

CONCLUSIONS

The most striking find of this study was the stability of the chemical constituents of the preserved indian corn. Every determination gave results indicating that the component tested for existed in quantity within the preserved kernels, and indeed could not be differentiated in chemical behavior from the control. Even the lipid fraction, the only constituent showing significant decomposition, was found to contain some of its original fatty acids.

Moisture, crude fiber, nitrogen and starch of the indian corn fell within the expected range of a number of corn varieties. That is, the expected deviation between different samples taken from the same strain could account for the difference in values. However, it must be remembered that the indian corn was sampled such that few kernels were from the same crop. Therefore, they should give results closer to the average for the time period they represent, and deviations from the average values of other strains represents a genetic difference.

The indian corn appears to have been high in protein and starch and low in fiber. No conclusions can be drawn about the ash since not enough data is available to determine whether the high content was a result of diffusion of mineral into the kernels. Although some oxidation of fatty acids occurred (mainly linoleic acid) there is no reason to believe that the fat content was high, since many oxication products are still ether soluble.

Finally, the differences shown in the proportions of various fatty acids, between the control and the indian corn are not only a result of oxidation but are also indicative of genetic differences.

In conclusion, it appears that the research performed was sufficiently sensitive to show genetic differences between the corn unearthed at Sheep Rock Shelter and contemporary strains.

NOTES ON DOCUMENTATION AND DATA PROCESSING

by

Joseph W. Michels

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I extend my gratitude to Carl Bebrich, Michael Steffy, and Lorraine Willey for their work in designing the new catalog format and material code; to Lorraine Willey for compilation of the data and execution of the grid plats; and to Gabriele Michels for the computer programming necessary for the change of the old computerized catalog deck into the new format.

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INTRODUCTION

One of the advantages of a preliminary report in archeology is that it gives the author, or authors, an opportunity to describe in fullest detail the actual data collected, as well as the preliminary stages of analysis and interpretation. With the publication of this, the third volume of the Sheep Rock Report, over twelve hundred pages have been made available for the description of primary data and preliminary analysis. All of the authors realize the efforts that lie ahead in preparing for the publication of the final report. The contents of three volumes, plus reports of subsequent analysis, must be condensed into a single volume. Only data that serves vital illustrative needs can be included in raw form. Procedural information will be held to a minimum and the greatest amount of space will be reserved for the reporting of final results in the study of the many topics discussed in the preliminary reports. For the working archeologist, therefore, the final report will not replace the preliminary volumes but supplement them.

In this chapter several miscellaneous items of information are discussed under the general rubric "notes on documentation and data processing." Revisions in the coding procedures for the artifact catalog is the first topic.

CODING PROCEDURES FOR THE ARTIFACT CATALOG

The coding strategy used in computerizing the original Sheep Rock catalog (see Kilbride 1967:911) has been revised to permit more efficient storage of information derived from laboratory analysis. As specimens in a given material code category undergo final laboratory analysis (e.g. stone, ceramics) a revised punch card deck is prepared, and upon completion of all laboratory studies, the Sheep Rock catalog will be placed on magnetic tape for ease of handling. The following coding format is now being used:

1. ARTIFACT ACCESSION NUMBER: the first field shall designate the Accession Number, of which there are two parts, and will include columns 1-13 on the Artifact Catalog Card Form Layout sheets. The first seven (7) columns will include the Collection Number (A66.001 or A67.001), followed by a period in column 8 and the Artifact Number in columns 9-13 (A66.001.00741). This accession notation is in conformity with cataloging procedures at the William Penn Memorial Museum; the ultimate repository of the Sheep Rock collection.

2. FEATURE ASSOCIATION: the second field shall designate the Feature Association of the cataloged entry, if any. The field will utilize columns 14-17 and will always be designated numerically.

3. HORIZONTAL PROVENIENCE: the third field designates Horizontal Provenience which, in the case of Sheep Rock, constitutes the grid square. The field will utilize columns 18-32. For sheep Rock, only columns 18-23 are needed. The grid square designation will consist of the letter E, for East, or W, for West, followed by two (2) numerals, followed by the letter N, for North, or S, for South, followed by two (2) more numerals. (e.g. E05S05; W10S15; E20N05).

4. VERTICAL PROVENIENCE: the fourth field shall designate the Below Datum (BD) reading (Sheep Rock: given in inches; all other sites given in centimeters). The field will include columns 33-39 and will consist of three (3) numerals followed by a dash in column 36 (or by the number symbol # if the BD is "guesstimated"), followed by three (3) more numerals (e.g. 060-066, 132-138, 078#084, 112#118).

5. ORIGINAL EXCAVATION UNIT: the fifth field shall designate the Original Excavation Unit when the data is available. The field will include columns 40-43. The first column (col. 40) of the field shall always be assigned an alphabetic character (L=Level; Z=Zone; Y=Layer; V=Levels Excavated During the 1966 and 1967 PSU Field School Operations at Sheep Rock). The symbols L, Z, Y and V identify the names (Level, Zone, Layer, and 1966-1967 Levels) actually given the excavation units in the Daily Field Record and/or Excavation Unit Summary. The remaining three (3) columns shall constitute the excavation unit designation, which may consist of either letters and/or numbers. When a numbered excavation unit has a numerical sub-unit the symbol / (slash) shall separate the two sets of numbers.

6. PROFILE LEVEL: the sixth field shall designate the North-South Profile Level. The field will utilize columns 44-46, with the level designation (which constitutes the integration of original excavation units across the site) expressed as a letter in column 44, a subscript number, if the level has one, in column 45, and an asterisk (*) in column 46 if the letter in column 44 is lower case on the respective Stratigraphic Profile. The third column (col. 46) of this field may be designated in three (3) other ways as defined below:

\# Indicates that the Profile Level has been "guesstimated" on the basis of the relative position of the Original Excavation Unit to the assigned levels. The placement of this symbol (#) takes precedence over all others for column 46. If either of the next two (2) defined symbols occur in conjunction with the # symbol it is to be placed in column 45; otherwise it will be placed in column 46.

\+ Indicates that the level falls within a charcoal layer on the respective North-South Stratigraphic Profile.

\- Indicates that the level falls within an ash layer on the respective North-South Stratigraphic Profile.

7. MASTER LEVEL: the seventh field shall designate the final Master Level. the field will utilize columns 47-48 and will always be designated by 1 numeral when known. When "gussstimated" column 47 shall be designated by the symbol #.

8. MATERIAL CODE: the eighth field shall designate the Material Code of the remains. The field will utilize columns 49-50 and will always be expressed by two (2) numerals. Table 1 gives a listing of Material Codes.

9. MODIFICATION: the ninth field shall indicate whether the entry is modified or not (M=Modified; U=Unmodified) and shall be designated only after analysis. The field will utilize column 51.

10. QUANTITY: the last field of the coding form shall designate Quantity. The field will utilize columns 77-80, and the Quantity shall always be right-adjusted.

11. DESCRIPTIVE DATA: columns 52-76 are to be utilized as needed to record specific Descriptive Data resulting from the laboratory analysis of artifacts. A copy of any codes utilized in this field must be made a permanent part of the catalog. Such codes are currently being finalized for Sheep Rock specimens.

12. UNAVAILABLE AND UNOBTAINABLE DATA: if data for a specific field are obtainable, but not yet available for inclusion, the field shall be left blank for future utilization. IF DATA ARE UNOBTAINABLE (due to lost, incomplete or absent records) FOR A SPECIFIC FIELD, THE RESPECTIVE FIELD SHALL BE DESIGNATED ACCORDING TO THE FORMAT BELOW:

Feature Association: if this field is left blank No Feature Association shall be understood. If the catalog entry is known to have a Feature Association, but the precise Feature Number cannot be determined, the field is to be designated with the letters ND (Left adjusted), meaning No Data.

Horizontal Provenience: NO DATA

Vertical Provenience: NO DATA

Original Excavation Unit: ND (left adjusted)

Profile Level: ID (left adjusted), meaning Indeterminate.

Master Level: ID

Material Code: ND

Descriptive Data: NO DATA (left adjusted)

Quantity: ND (left adjusted)

Pennsylvania State University Laboratory of Anthropology (1969)

PSU

Page_____

CATALOGUE — THE SHEEP ROCK PROJECT

Accession Number (01–13)	Feature Association (14–17)	Horizontal SQUARE (18–23)	Provenience (not used) (24–32)	Vertical Provenience (33–39)	Original Excavation Unit (40–43)	PROFILE LEVEL (44–46)	MASTER LEVEL (47–48)	CODE MATERIAL (49–50)	Modific. (51)	ARTIFACT DESCRIPTION (52–76)	Quantity (77–80)
A66.001.00741	14	E05S05		060-066	V6	A2+	3	01	M		17

Figure 1 Sheep Rock Catalog Card Form Layout

01	STONE
02	CERAMICS
03	METAL
04	GLASS
05	STRUCTURAL REMAINS
06	WOOD
07	CHARCOAL
08	BOTANICAL
09	BONE
10	BURIAL
11	SHELL
12	FISH SCALES
13	FEATHER
14	FUR AND HAIR
15	LEATHER
16	TEXTILES, CORDAGE, AND BASKETRY
17	ARTIFACTS OF COMPOUNDED MATERIALS
18	COPROLITES
19	POLLEN CORE
20	SOIL SAMPLE
21	FLOTATION REMAINS
22	STEATITE
23	CLAY
24	SYNTHETICS
25	MISCELLANEOUS ORGANIC (ANIMAL)
26	MISCELLANEOUS ORGANIC (VEGETABLE)
27	PAPER & PAPER PRODUCTS
28	FOSSIL

Table 1 ARCHEOLOGICAL MATERIAL CODE (PSU 1968)

LOCATION OF EXCAVATION UNITS BY FIELD SEASON

Because so many different excavation teams have worked at Sheep Rock over the years, it is often difficult to determine which squares were excavated by each team. The following set of shelter grid plats (Figures 2 - 10) illustrate the location of excavation units for each season, and indicate who the principal investigators were in each case.

1967 FIELD SEASON SUMMARY OF ACTIVITIES

The students of the 1967 field school were divided into four crews, each with a graduate student crew chief. The crews rotated through four activities: (1) excavation of Sheep Rock Shelter, (2) excavation of the Workman Site, (3) Site Survey and test excavation of miscellaneous sites along the Raystown River, and (4) laboratory work. The calendar of crew rotation is given in Table 2.

The individual student experienced a full range of archeological field activities as a consequence of this rotational plan. Below is given a breakdown of the average amount of time spent on field school activities by one student.

Lectures and Practicums - 3 days
Administrative - 1 day
Orientation - 1 day
Excavation at Sheep Rock Shelter - 12 days
Excavation at several survey sites - 11 days
Laboratory operations - 3 days
Special Project laboratory work - 7 days
Closing-down activities - 1 day

The distribution of effort for the project as a whole during 1967 is given below.

Number of Man Days at Sheep Rock: 379
Number of Man Days at Workman Site: 329
Number of Man Days on Site Survey: 51
Number of Man Days for Routine Laboratory work: 99
Number of Man Days for Special Projects in Lab: 231

The work load was quite evenly distributed among the three major operations: Sheep Rock, survey, and laboratory work. This season constituted the final season of field work at Sheep Rock Shelter. The workman site, however, received subsequent attention during the summer of 1968 by the Juniata College Archeology Field School, and the results of both seasons will be published in the Workman Site report scheduled for completion in 1969. Laboratory work has continued on artifacts, field notes, and ecological samples throughout the academic years 1967-68, 1968-69, and 1969-70. By the end of the latter academic year four masters theses on Sheep Rock -- Lithic Artifacts, Perishable Artifacts, Features, Subsistence-oriented plant remains -- will have been completed by Penn State graduate students.

June 26 Student arrival; welcome and orientation lectures.
27 Registration and fee payments; final collation of preliminary report.
28 Tour of sites; pre-excavation activities.
29 Lectures and practicum sessions.
30 Lectures and practicum sessions.

July 3 Sheep Rock = C1 and C2; Survey A = C3; Survey B = C4.
4 Sheep Rock = C1 and C2; Survey A = C3; Survey B = C4.
5 Sheep Rock = C1 and C2; Survey A = C3; Survey B = C4.
6 Sheep Rock = C1 and C2; Survey A = C3; Survey B = C4.
7 Sheep Rock = C1 and C2; Survey A = C3; Survey B = C4.

July 10 Sheep Rock = C3 and C4; Survey A = C1; Survey B = C2.
11 Sheep Rock = C3 and C4; Survey A = C1; Survey B = C2.
12 Sheep Rock = C3 and C4; Survey A = C1; Survey B = C2.
13 Sheep Rock = C3 and C4; Survey A = C1; Survey B = C2.
14 Sheep Rock = C3 and C4; Survey A = C1; Survey B = C2.

July 17 Lab = C1; Sheep Rock = C2; Survey A = C4; Survey B = C3.
18 Lab = C2; Sheep Rock = C1; Survey A = C4; Survey B = C3.
19 Lab = C3; Sheep Rock = C1 and C2; Survey A = C4; Survey B = none
20 Lab = C4; Sheep Rock = C1 and C2; Survey A = none; Survey B = C3.
21 Project Day #1 (all students and staff in lab); MIDTERM EXAM ON Lectures. Sheep Rock Report, and Deetz Boo.

July 24 Sheep Rock = C3 and C4; Survey A = C2; Survey B = C1.
25 Sheep Rock = C3 and C4; Survey A = C2; Survey B = C1.
26 Sheep Rock = C3 and C4; Survey A = C2; Survey B = C1.
27 Sheep Rock = C3 and C4; Survey A = C2; Survey B = C1.
28 Project Day #2 (all students and staff in lab).

July 31 Lab = C1; Sheep Rock = C2; Survey A = C3; Survey B = C4.
Aug 1 Lab = C2; Sheep Rock = C1; Survey A = C3; Survey B = C4.
2 Lab = C3; Sheep Rock = C1 and C2; Survey A = none; Survey B = C4.
3 Lab = C4; Sheep Rock = C1 and C2; Survey A = C3; Survey B = none.
4 Project Day #3 (all students and staff in lab): 3/4 TERM EXAM on Service, Wallace, and Wheeler books.

Aug 7 Lab = C1; Sheep Rock = C3 and C4; Survey A = none; Survey B = C2.
8 Lab = C2; Sheep Rock = C3 and C4; Survey A = C1; Survey B = none.
9 Lab = C3; Sheep Rock = C4; Survey A = C1; Survey B = C2.
10 Lab = C4; Sheep Rock = C3; Survey A = C1; Survey B = C2.
11 Project Day #4 (all students and staff in lab).

Aug 14 Closing-down activities; = C1; Projects = C2, C3, C4.
15 Closing-down activities; = C2; Projects = C1, C3, C4.
16 Closing-down activities; = C3; Projects = C1, C2, C4.
17 Closing-down activities; = C4; Projects = C1, C2, C3.
18 Field School officially closes at noon; ALL PAPERS DUE.

Table 2 1967 ARCHEOLOGICAL FIELD SCHOOL CALENDAR

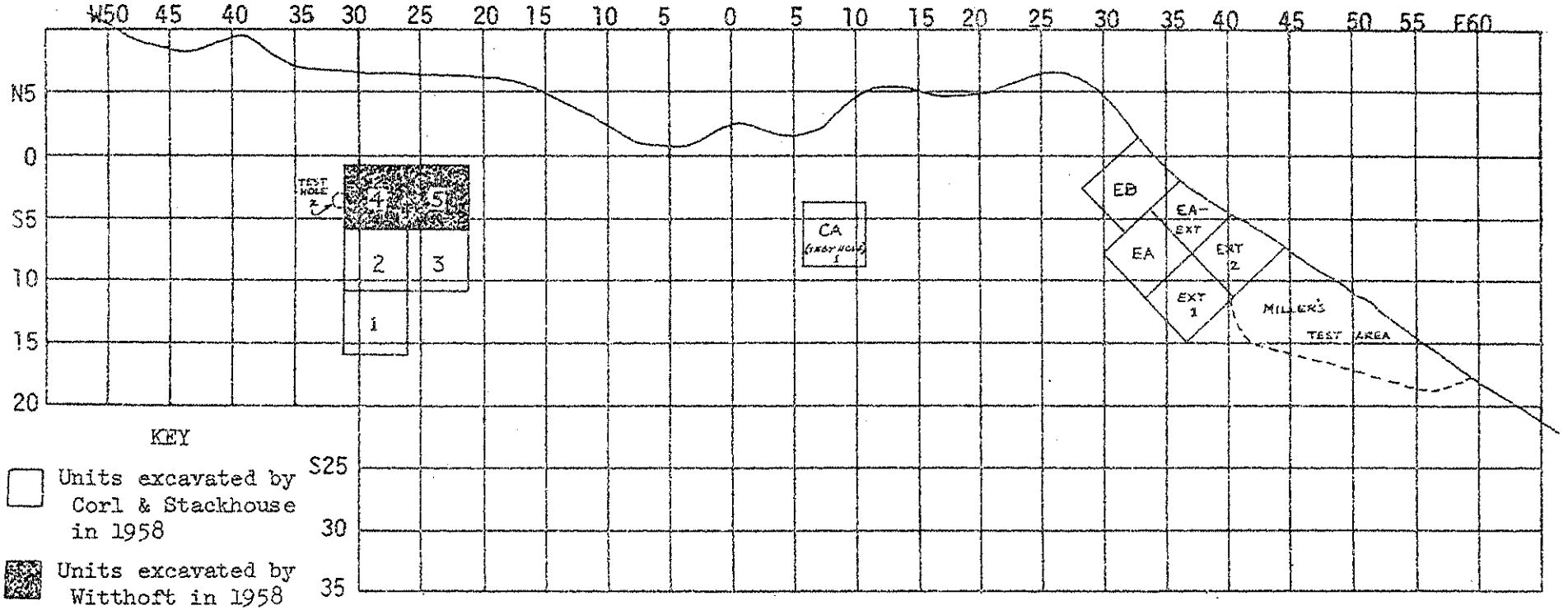
36Hu1 SHEEP ROCK SHELTER
EXCAVATED UNITS

EXCAVATOR: Corl and Stackhouse

DATE EXCAVATED: 1958

RECORDER:

OTHER PERTINENT INFORMATION: Both the original map by E. J. Stackhouse and conversations with Melville Corl led to the reassessment of the location of the units excavated in 1958.



Scale: 1 cm = 5 ft

Figure 2

36Hu1 SHEEP ROCK SHELTER

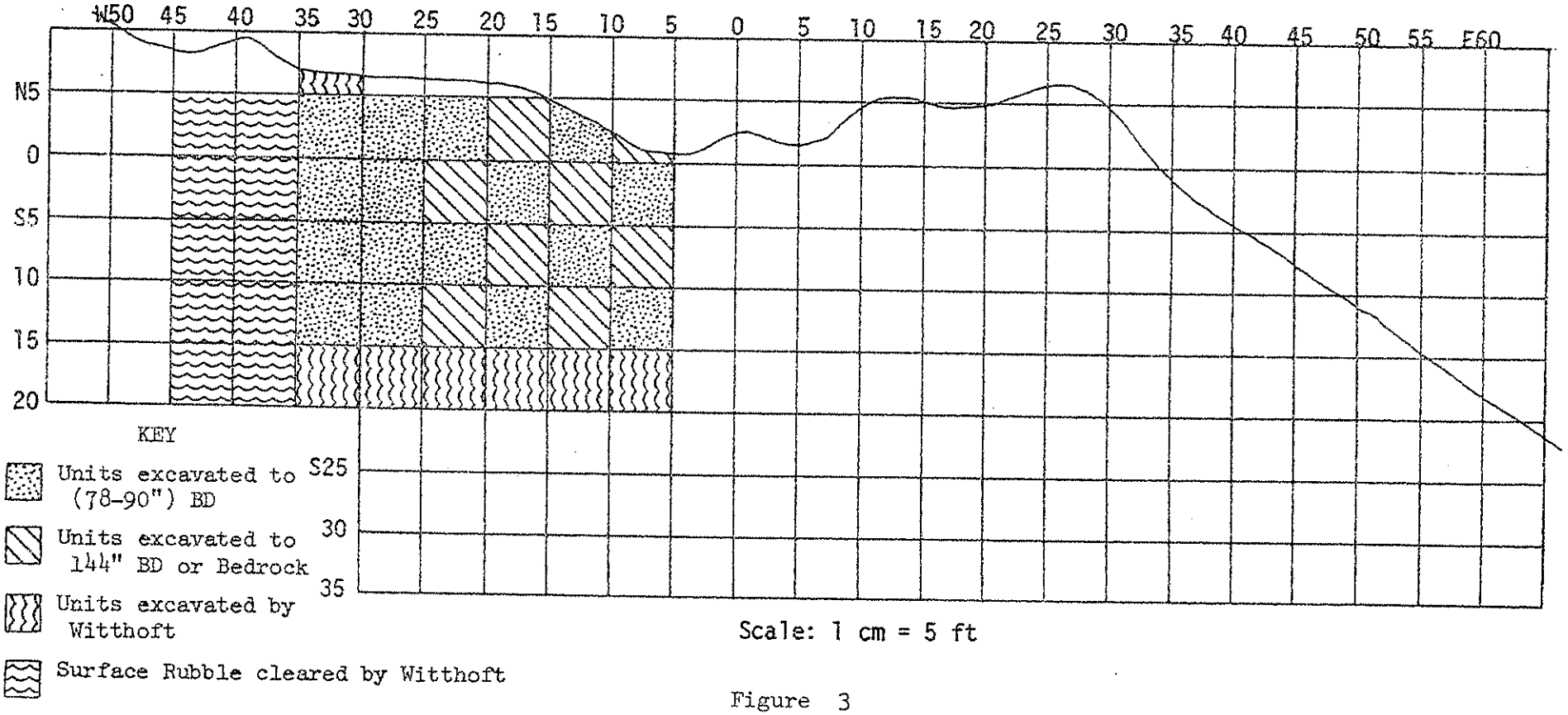
EXCAVATED UNITS

EXCAVATOR: Kinsey and Witthoft

DATE EXCAVATED: 1959

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 3

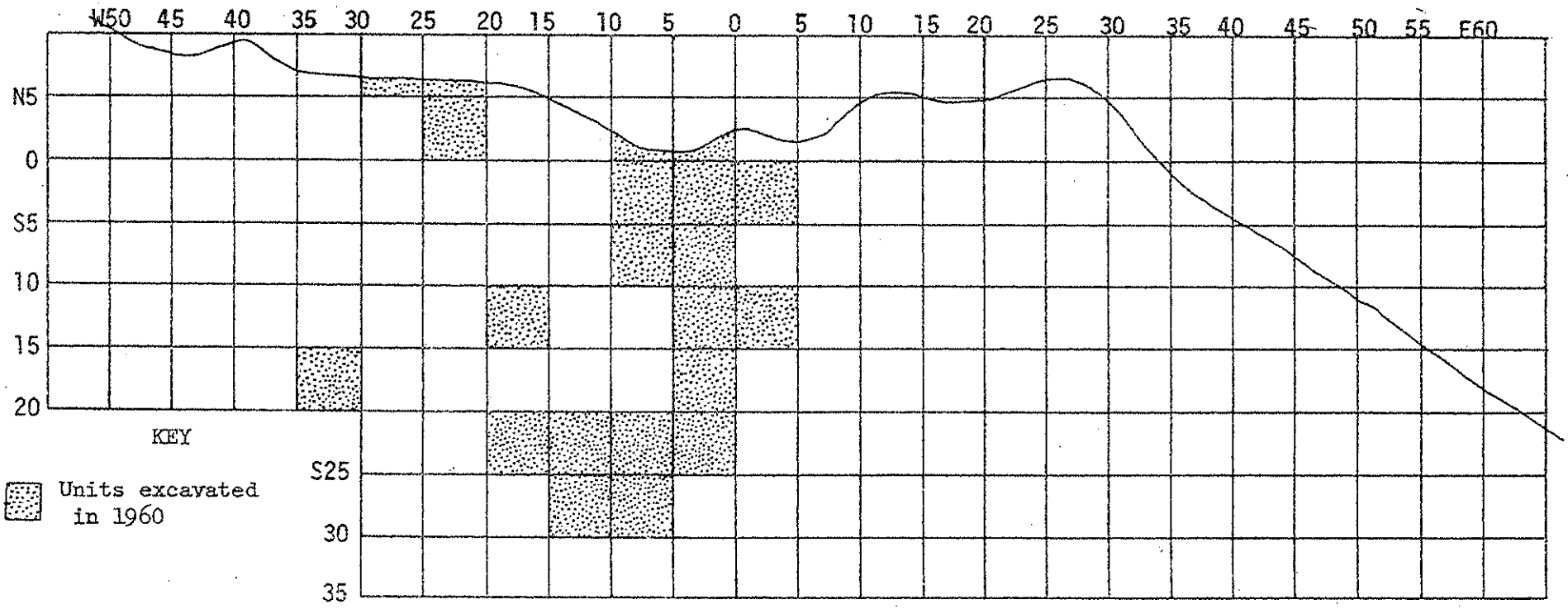
36Hul SHEEP ROCK SHELTER
EXCAVATED UNITS

EXCAVATOR: Witthoft

DATE EXCAVATED: 1960

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 4

36Hu1 SHEEP ROCK SHELTER

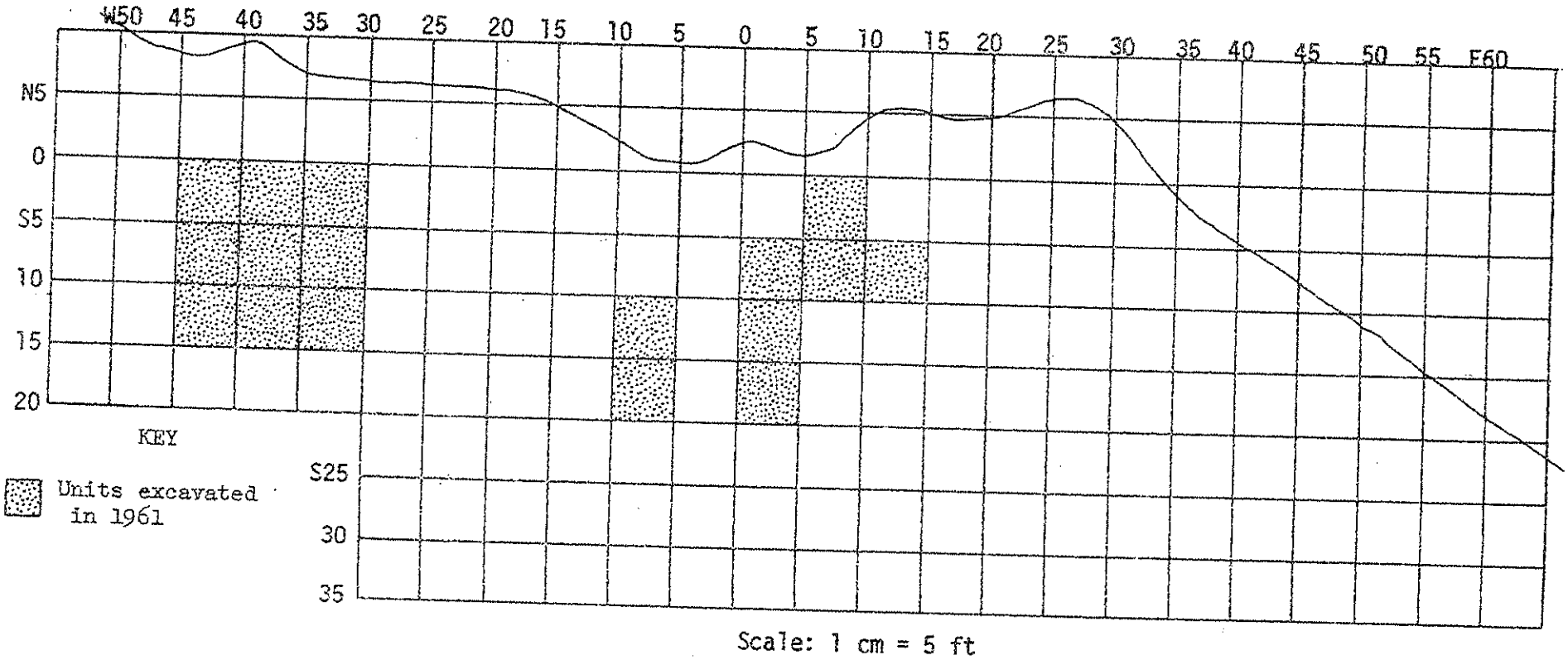
EXCAVATED UNITS

EXCAVATOR: Witthoft

DATE EXCAVATED: 1961

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 5

36Hu1 SHEEP ROCK SHELTER

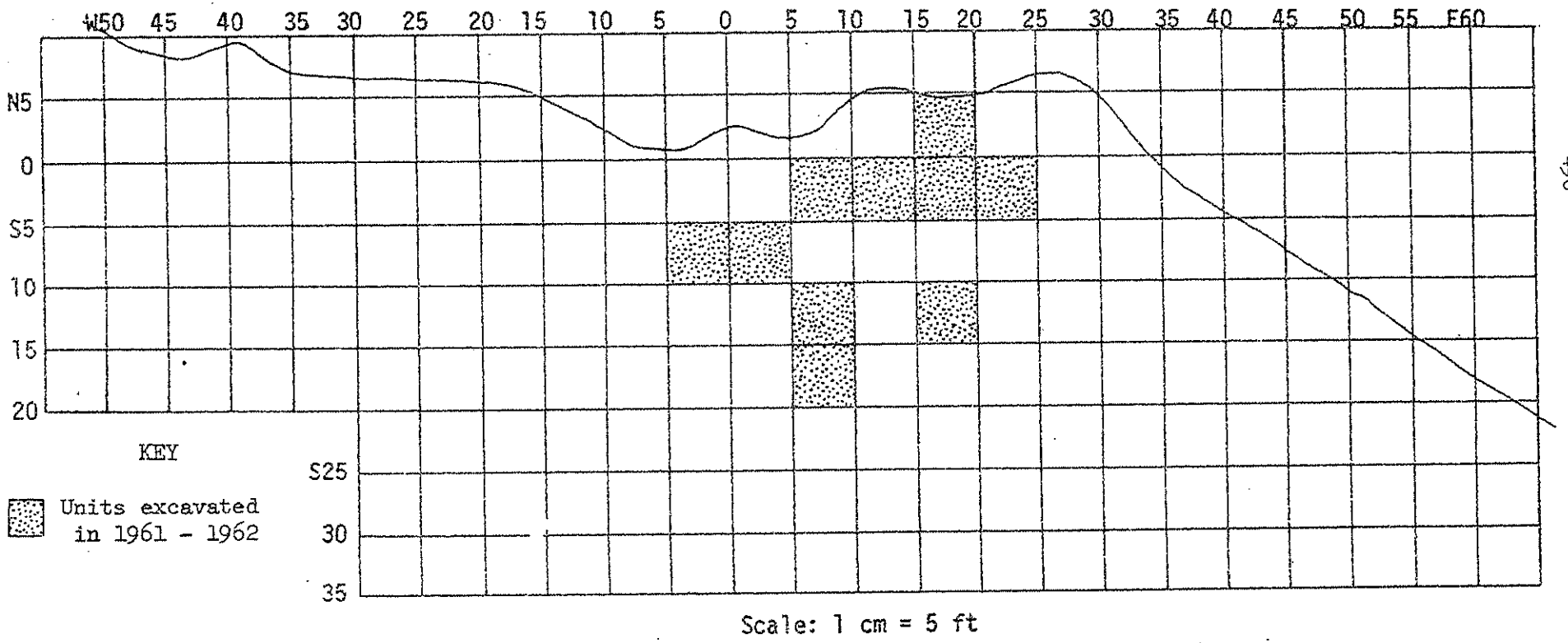
EXCAVATED UNITS

EXCAVATOR: Witthoft

DATE EXCAVATED: 1961 - 1962

RECORDER: _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Figure 6

36Hu1 SHEEP ROCK SHELTER

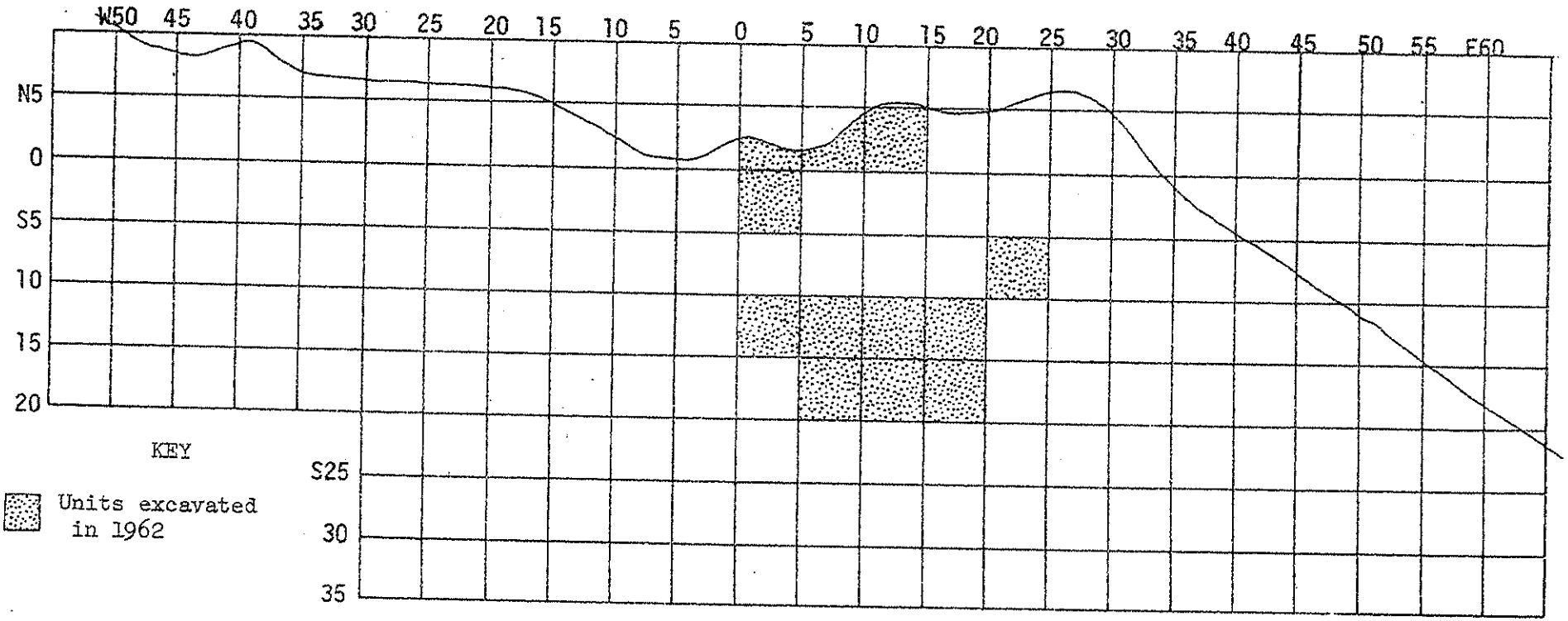
EXCAVATED UNITS

EXCAVATOR: Witthoft

DATE EXCAVATED: 1962

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 7

36Hul SHEEP ROCK SHELTER

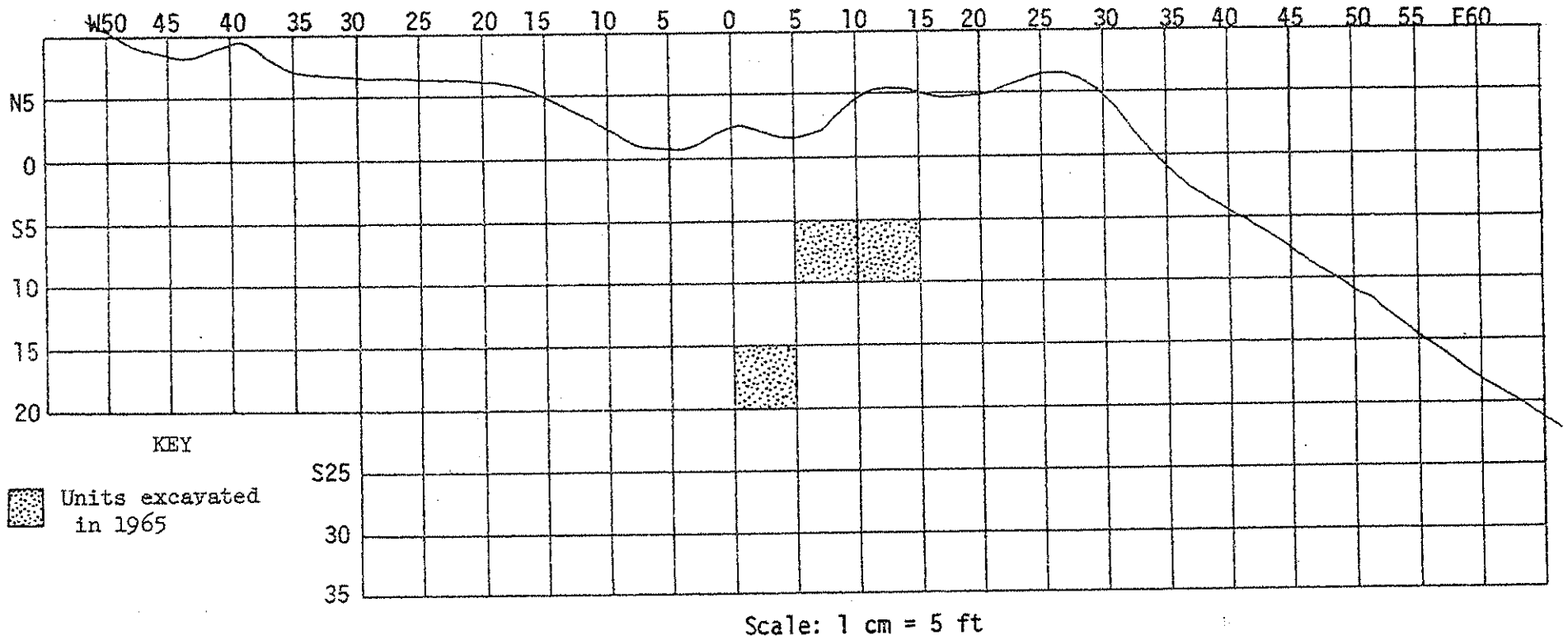
EXCAVATED UNITS

EXCAVATOR: Smith

DATE EXCAVATED: 1965

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 8

1962

36Hu1 SHEEP ROCK SHELTER

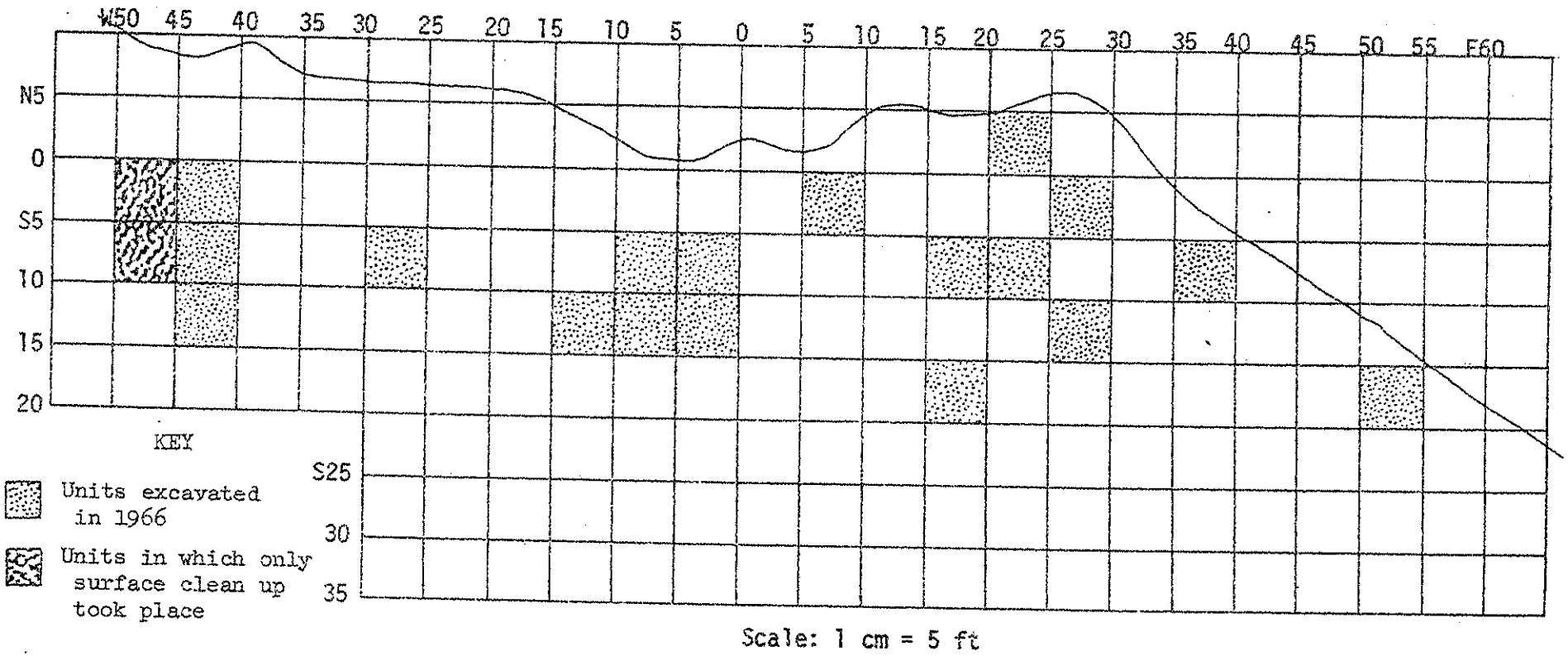
EXCAVATED UNITS

EXCAVATOR: PSU 1966 Field School

DATE EXCAVATED: 1966

RECORDER:

OTHER PERTINENT INFORMATION:



Scale: 1 cm = 5 ft

Figure 9

36Hu1 SHEEP ROCK SHELTER

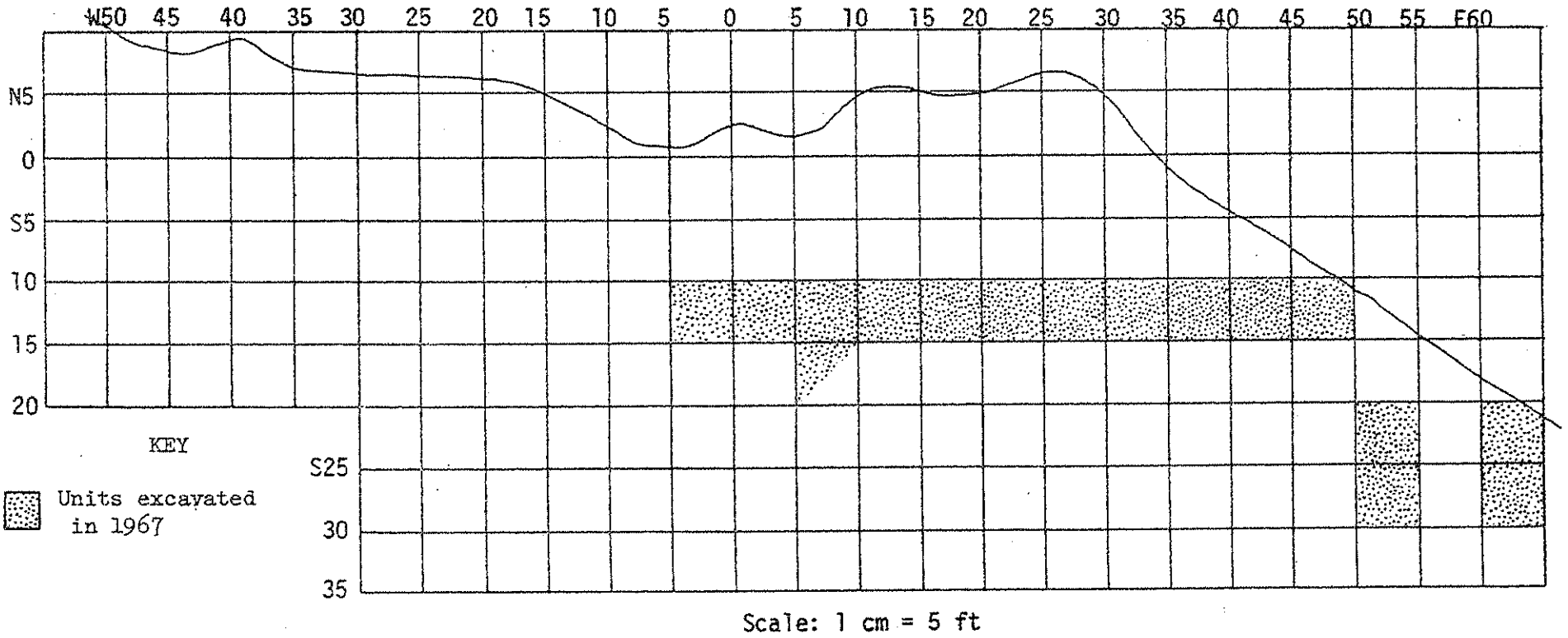
EXCAVATED UNITS

EXCAVATOR: PSU 1967 Field School

DATE EXCAVATED: 1967

RECORDER: _____

OTHER PERTINENT INFORMATION: _____



Scale: 1 cm = 5 ft

Figure 10

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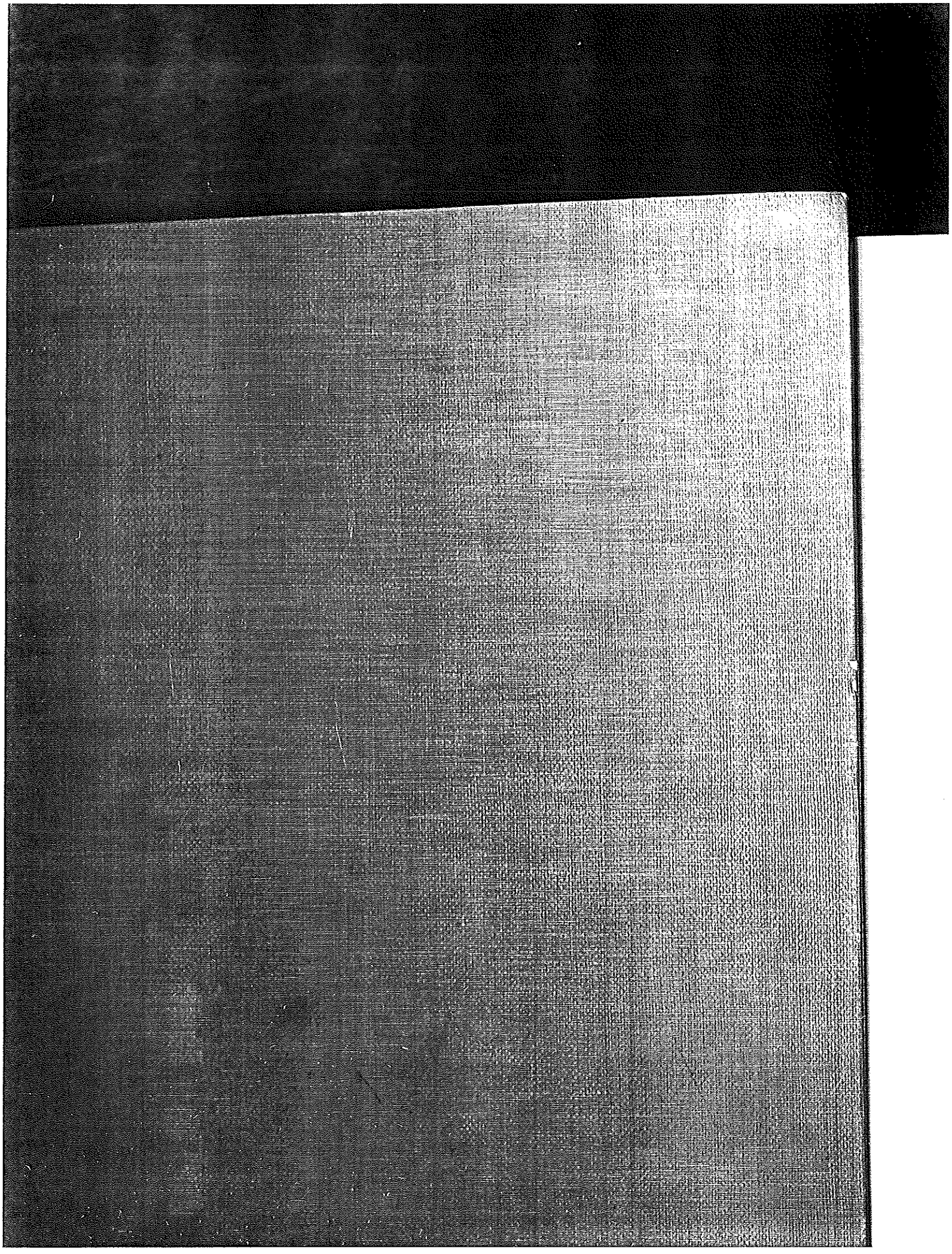
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