D. Site Preservation in Locus 2

A formal program of site preservation was recommended for a portion of Locus 2 located immediately adjacent to the project right-of-way. The preservation area is centered around Block 18, which was located between the bluff edge and the field edge (see Figure 16). This area had been selected for Phase II investigation as a result of high artifact densities from HRI's Phase I survey, which included the recovery of Hell Island ceramics (Woodland I) and a triangular projectile point (Woodland II).

The extended Phase II testing identified undisturbed soil horizons at the southern margin of the block. In this area, the stratigraphy in Unit 218 consisted of E-, Bw-, and Bt-horizons mantled by a thin layer of A-horizon organic material. The test units in Block 18 contained a very high density of lithic debitage, as well as Hell Island ceramics (circa AD 600 to 1000) and fire-cracked rock; significant concentrations of artifacts were present in the unplowed upper subsoil levels. This area was also notable for evidence of early Archaic or late Paleoindian occupation, in the form of a small, well-thinned projectile point recovered from the plowzone of Unit 214 (Plate 23). Manufactured from chert, this specimen exhibits blade-edge serrations and basal grinding. It is side-notched and has broad, quasi-rectangular basal tangs. In these respects, it resembles Early Archaic side-notched types, such as Taylor and Bolen, that are primarily found in the interior southeastern United States and date to circa 8000 to 7000 BC. However, there is a relatively late Kirk side-notched variant (McAvoy 1997) to which this point also might be compared.

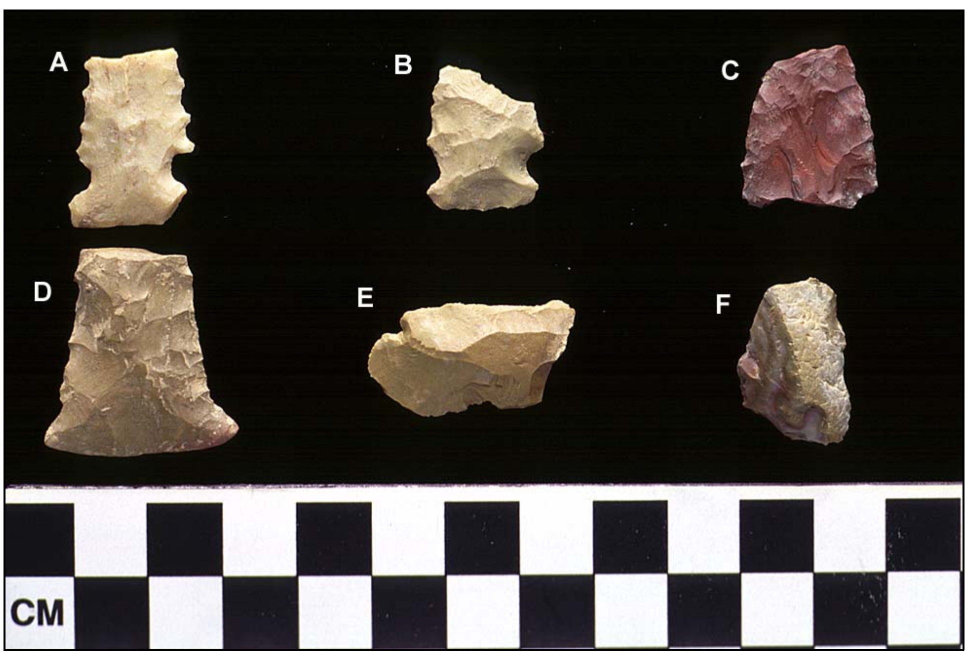


PLATE 23: Tools from Locus 2
A) chert Kirk serrated point, Cat. No. 97/59/12, B) jasper side-notched point, Cat. No. 97/59/40, C) jasper triangle point, Cat. No. 97/59/25, D) unidentified jasper point, Cat. No. 97/59/3, E) jasper utilized flake, Cat. No. 97/59/21, F) chert utilized flake, Cat. No. 97/59/4

The preservation plan included careful backfilling of the block, installation of permanent datum points, and construction of a fence around the area. Also, the site location was marked on DelDOT design plans so that contractors would be notified to avoid the area during construction, and a preservation easement was added to the deed of title.

E. Excavations in Locus 3

1. Overview

The Phase III archaeological investigations in Locus 3 were structured to answer basic research questions pertaining to chronology, subsistence, settlement patterns, technology, and environmental adaptation, as outlined in the state management plan for prehistoric resources (see Chapter III). In addition to addressing relevant sections of the state plan, the research design for data recovery was organized by results obtained during the Phase I and II testing. A graphic overview of the area investigated during Phase III excavations is presented in Figure 35.

Phase III investigations were supplemented by specialized analyses which yielded significant information about artifacts and an enhanced picture of the behaviors and subsistence activities of the people who resided there. For example, we were able to refine the understanding of how tools were used by employing high-resolution microscopy to view the types of wear damage left on tool edges during the performance of specific tasks. The minute striations and polishes evident on prehistoric tools were compared with the patterns of wear on replicated stone tools. These replicated tools were created by Berger archaeologists to be used upon a variety of materials, such as bone, wood, grass, and animal hide and flesh, which impart detectable and identifiable wear signatures (see Volume II, Appendix G).

Another specialized study examined tool surfaces for the presence of any animal residues left by hunting and butchering activities. This study, termed protein residue analysis, yielded important data on the kinds of animal species butchered at the Puncheon Run Site, such as American eel, gizzard shad, striped bass, Atlantic croaker, and deer. The identification of possible dietary species was also important because it clarified the question of seasonal site use. Gizzard shad and striped bass are spring spawning fish and their presence seems to indicate a springtime site occupation. Eels, in contrast, are autumn spawners, appearing in vast numbers during the fall and providing fishing populations with excellent opportunities for exploiting the run. Locus 3 thus appears to have been visited during different times of the year to take advantage of seasonal aggregations of a variety of prey animals.

There were three specific areas of interest for the Phase III testing in Locus 3:

- Feature 30 was identified during Berger's Phase II testing and was interpreted as a possible deep storage pit. Based on the similarities between Feature 30 and the silo-shaped pits in Block 14 at Locus 1, there seemed to be the potential for other pits to be clustered near Feature 30.

- Feature 32 was located by HRI and identified as a possible pit house. Putative pit houses have been identified at a number of sites in Delaware, although their origin is still under debate. Clarifying this issue was therefore of major importance in interpreting the social organization of groups visiting the Puncheon Run Site.

- Several intact hearth features and knapping stations were located in the area around Blocks 1, 2, 3, 5, and 6 during Berger's Phase II excavations. To test the assumption that hearths form the focal point of activities in residential sites (Binford 1983), an extensive search was made for an intact hearth in the northeast corner of Locus 3, with the aim to undertake a large block excavation around it. Ultimately, a 76-square-meter block was excavated around a large grinding stone (metate), for which the Metate block was named.

The following sections describe the archaeological data recovery investigations in each of these major areas. The chapter concludes with a summary discussion of various isolated pit features and lithic workshop areas excavated in Locus 3.

2. Metate Block

Phase II investigation in the northeastern area of Locus 3 had identified several intact hearth features and lithic workshop areas in subplowzone contexts, and this area appeared to have been the most intensively used portion of the entire Puncheon Run Site, based on quantities and variety of artifacts, debitage, and features. An important element of the Phase III investigation was to locate and investigate a well-preserved area containing features and artifacts. Phase III work began with the placement of scattered excavation units, which ultimately led to the discovery of Feature 36, a large grinding stone, or metate. This feature was selected as the focus of a block excavation designed to recover information about a "typical hunter-gatherer" camp site. Work at the Metate block ultimately encompassed a 76-square-meter excavation block (Figure 36), which contained, in addition to the grinding stone, three fire-cracked rock clusters and almost 8,000 chipped-stone artifacts.

Investigations in the Metate block are described below. The first section discusses the origins, development, and approximate ages of the soils in the Metate block and their relationship to the artifacts and cultural features within them, and proceeds to examine the natural and cultural processes which have altered the archaeological record. Succeeding sections describe the radiocarbon dates and prehistoric components, followed by a discussion and interpretation of behavioral patterns and activities as manifested in features and artifacts.

a. Soil Stratigraphy

The Metate block rests on a nearly level to gently sloping terrace of the St. Jones River situated between the elevations of about 3 to 5 meters (9 to 17 feet) above sea level. The upper 1 to 2 meters of the soil package consists of well-drained sandy loam soils developed in coarse-textured deposits. Soil development is generally weak to moderate, with a slightly clay-enriched argillic horizon present between about 40 and 60 centimeters below the surface; beneath the argillic horizon, soils are more coarse textured. Surface soils to a depth of about 25 centimeters have been incorporated by plowing into an organic-enhanced Ap-horizon (plowzone).

Explanations for the deposition of sediment have centered on alluvial processes originating in Pleistocene-age events. However, detailed pedological analysis indicates that aeolian processes were probably not a significant agent for the burial of the original landscape, based on the high frequency of large particles in the soil fraction. Wind-driven deposits tend to be finer-grained and do not account for the small pebbles and occasional gravels found throughout the soil profile. While the soil formation processes are complex, Holocene-age alluviation can probably be ruled out as a major factor in the formation of the terrace because of the low sediment load and flow rate of the St. Jones River over the last several millennia. The terrace landform thus appears to have been externally static throughout the Holocene, although biological processes, such as root, insect, and animal activities, have probably contributed to a great deal of internal mixing, thus limiting the extent of soil development. A detailed pedologic analysis is contained in Volume II, Appendix A.

b. Formation Processes

The vertical distribution of artifacts and cultural features is chiefly influenced by three factors: (1) point of deposition, (2) rate of burial by sedimentation, and (3) postdepositional disturbances (Schiffer 1983). Disturbances may refer to natural or cultural processes which can alter the position and context of the archaeological record in ways that are neither straightforward nor readily apparent. Natural processes include erosion, animal burrowing, root growth, tree falls, and freeze/thaw cycles, actions which can result in soil loss or soil mixing, often resulting in the compression of multiple cultural horizons into single undifferentiated strata, or the creation of phenomena that mimic man-made features. Some of these processes, tree falls and flood scouring for example, occur rapidly and in cataclysmic fashion, reshaping the landscape in sudden, discrete events. Other actions, such as insect burrowing and freeze/thaw displacement, affect soil horizons over the course of centuries and millennia. Many of these processes occur repetitively over hundreds and thousands of years, so their cumulative effects on the archaeological record may be quite significant.

Possible postdepositional disturbance to the archaeological record was gauged by investigating the relationship between artifact size and excavation level. In this case, mean flake size was used (Figure 37). Flake size is highest in the plowzone (Level 1), averaging almost 14 millimeters, and decreases steadily to a low of just over 7 millimeters in Level 7. The curve described by this plot is consistent with the model of artifact transport in sandy soils, which relates vertical displacement of artifacts inversely with their size; in general, downward movement increases as artifact size decreases (Nielsen 1991). The uniform decline in flake size by level suggests that the process responsible for this phenomenon was steady and long-term. The most likely mechanism is the reworking of the soil by insect, animal, and floral agents, collectively termed *bioturbation*. The sandy soils of Locus 3 are highly susceptible to these types of actions.

A fire-cracked rock refit study revealed little vertical displacement of cobble-size elements, confirming that large-scale disturbance of the soil horizons is not a significant factor (see Volume II, Appendix N). Most refits were within defined fire-cracked rock features, and horizontal refits (those within the same excavation level) far outnumbered vertical refits (those involving different excavation levels). Vertical displacement of relatively heavy elements, such as fire-cracked rock, is thought to be caused primarily by floral and faunal agency (bioturbation). The low frequency of vertical refits, therefore, suggests that the degree of postdepositional disturbance was low. Interestingly, when vertical displacement is present, the upper specimen is much more likely to be the smaller mass. This situation suggests that not all vertical migration is oriented downward, as suggested by sherd and debitage size sorting (see discussion below in Section E.2.f). Rather, it appears that within a certain size threshold (≈4-40 grams), artifacts may tend to drift upward through the soil matrix, most likely propelled by processes of freezing and thawing.

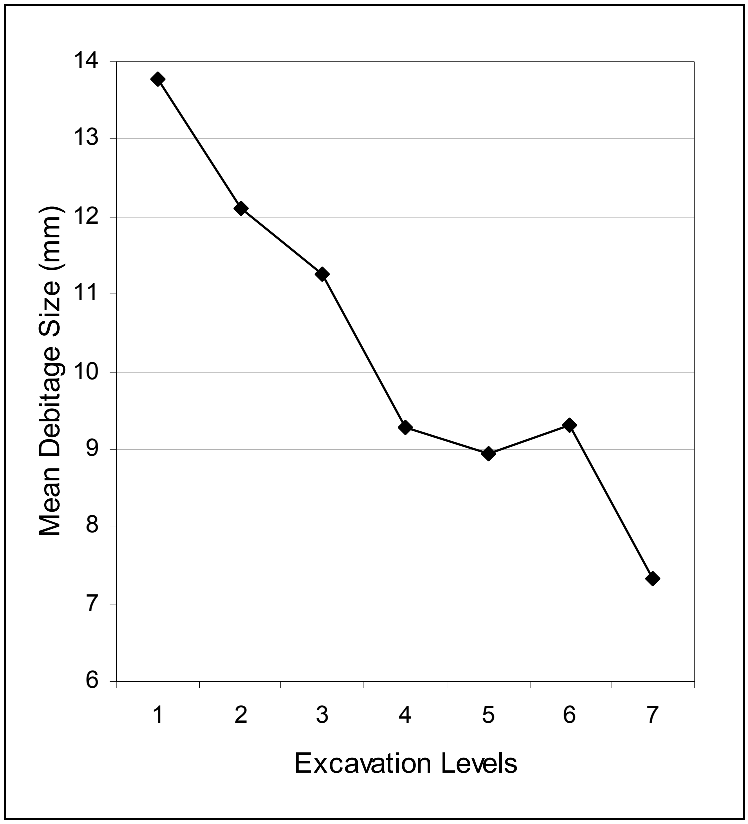


FIGURE 37: Mean Debitage Size by Excavation Level, Metate Block

Cultural activities taking place long after the prehistoric use and abandonment of a site also play a role in the patterns that are found among artifacts by displacing and mixing soil horizons. Cultivation, ditch-digging, and gravel-quarrying are responsible for much of the historic disturbances in Locus 3 of the Puncheon Run Site.

c. Radiocarbon Dates

Seven charcoal samples derived from feature and subsoil contexts in the Metate block were submitted for radiocarbon dating (Table 22). The radiocarbon samples from the Metate block yielded dates extending from the early Woodland I period (3000 to 2000 BC) to the middle Woodland I period (1500 to 1000 BC). All of the charcoal samples were recovered from approximately equivalent depths, around 30 centimeters below ground surface; this suggests that broadly separated occupational episodes were deposited on a fairly stable landscape. Geomorphological investigations (Volume II, Appendix A) indicate that the landscape surface was fairly stable since the late Pleistocene, with no significant Holocene-age sedimentation. This situation would preclude the formation of a clear stratigraphic sequence on the river terrace, as would be expressed in the chronologically ordered vertical placement of culturally diagnostic artifacts.

TABLE 22: RADIOCARBON DATES FROM THE METATE BLOCK

Context	Lab Number	Analysis	Radiocarbon Age	Calibrated Date
Unit 437, B-3	Beta-136097	Extended Count	4250±90 BP	3085-2585 BC
Unit 443, B-3	Beta-136098	Extended Count	4150±70 BP	2900-2490 BC
Unit 448, B-3	Beta-136099	Extended Count	3910±80 BP	2585-2145 BC
Unit 436, Fea. 97, B-3	Beta-131155	Radiometric	3820±70 BP	2470-2035 BC
Unit 397, Fea. 96, B-3	Beta-136096	Extended Count	3350±70 BP	1770-1485 BC
Unit 164, Fea. 96, B-3	Beta-131144	Radiometric	3330±60 BP	1745-1485 BC
Unit 410, Fea. 94, B-2	Beta-131146	AMS	2960±50 BP	1360-1010 BC

A temporal sequence, however, is apparent in the horizontal clustering of dates associated with individual hearth features (Features 94, 96, and 97). A sample from Feature 97 (Beta-131155) yielded a radiocarbon date of 3,820±70 radiocarbon years BP (Beta-13115), setting it within the early Woodland I period. Three other samples were retrieved within 1 meter of Feature 97, to the north (Beta-136098), east (Beta-136099), and south (Beta-136097). These samples likewise were assignable to the early Woodland I period, and three of four samples lie within two standard deviations of each other. From Feature 96, two charcoal samples were recovered in adjacent units that returned nearly identical dates (Beta-131144 and Beta-136096) of 3,330±60 and 3,350±70 radiocarbon years BP. In Delaware, these would be considered early to mid-Woodland I dates; anywhere else, they would be ascribed to the Terminal Archaic or Transitional period. Feature 94 yielded a single mid-Woodland I date of 2,960±50 radiocarbon years BP (Beta-131146). The evidence of a temporal divide between fire-cracked rock features, expressed by the radiocarbon dates, supports the notion that the Metate block landscape was externally static during the thousand or more years of seemingly intermittent occupational use.

d. Prehistoric Components

Twenty-three ceramic sherds with a cumulative weight of 51 grams were recovered from the Metate block. Most sherds are actually classified as *crumbs*, meaning that they are too small to have identifiable surface treatment, design, or ware type. Only six sherds were sufficiently intact to be classified by ware type. The small mean sherd size may be the product of plow crushing during the agricultural phase of site use. Sherds of Wolfe Neck ware (circa 700 to 400 BC) and a similar but probably somewhat more recent type were found in Levels 1 and 2, and Townsend ware (AD 1000 to 1600) was found in Level 1. The identifiable sherds were thus all located in the upper part of the soil column, within the plowzone or the first subsoil level, and they are probably not associated with the main occupation of this area.

The lithic assemblage includes 32 projectile points that can be classified by type. Of these, 27 (84%) are characterized as narrow-bladed stemmed points. Most of the points of this type have contracting stems, a form that has been variously called Poplar Island (Ritchie 1971), Piney Island (Kent 1970), and Type B stemmed or Type D stemmed in Delaware (Custer and Silber 1995). Spanning a wide date range, these point types are generally assigned to a time frame of between 2500 to 1 BC (Custer 1994). Minority types in the Puncheon Run sample are a straight-stemmed variety referred to as Bare Island (Ritchie 1971), or Type E (Custer and Silber 1995), and a slightly expanding stemmed point bearing some resemblance to Lamoka points (Ritchie 1971). Bare Island points are described as occurring at the same time as the Poplar Island type (Ritchie 1971), and Lamoka points are somewhat older (Justice 1987; Ritchie 1971; Wall 1995). At the type site, Lamoka Lake, they were radiocarbon-dated to about 4500 rcbp (Ritchie 1965), or about 3000 to 3400 cal BC.

The Metate block is distinguished from other zones of the Puncheon Run Site by its large quantity of stemmed projectile points (Plate 24), colloquially termed "Puncheon pebble points," many of which exhibit cobble cortex on the base or blade (see Volume II, Appendix M). Most, if not all, of these points are assumed to be derived from locally obtained cobbles and large pebbles, and for this reason are called "Puncheon pebble points." The Puncheon pebble points are thick points with contracting to straight stems. The shoulders are generally weakly formed, and the edges are minimally fashioned by pressure flaking. More than 70 percent of the sample exhibits remnant cobble cortex, usually on the base and in a few examples on the blade. Though this point type was recovered from a number of different contexts across the site, the largest number is from the Metate block of Locus 3. Across the site as a whole, these points occur at a rate of 1.9 per 1,000 artifacts; in the Metate block, they occur at a rate of 5.4 per 1,000 artifacts. Of those from the Metate block, nearly two-thirds (N=18) were made of jasper (Table 23). The distribution of pebble points creates an obvious divide between Locus 3 and the other loci, and suggests that use of this point may reflect access to diverse source materials or a differential pattern of landscape use by distinct populations.

TABLE 23: DISTRIBUTION OF PUNCHEON PEBBLE POINTS

RAW MATERIAL	CONTEXT: Metate Block	Fea. 30 Block	Other Locus 3	TOTAL
Jasper	18	.	7	25
Chert	7	2	3	12
Quartz	2	.	1	3
Siltstone	1	.	.	1
Argillite	.	.	1	1
TOTAL	28	2	12	42

The retention of cortex on points is commonly thought to reflect the exploitation of rather small cobble or pebble masses (Custer, Riley, and Mellin 1996:100). Because surface to volume ratios increase with decreasing spherical size, bifaces manufactured from small nodules should retain more remnant cortex than those manufactured from larger masses. In turn, the utilization of small nodules is attributed to raw material selection conditioned by a lack of local quarry stone. Because useful rock outcrops are absent from the central portion of the Delmarva Peninsula, native flint-knappers apparently learned to adapt their lithic needs to locally available secondary sources, such as streambed and glacial outwash cobbles, resulting in a preponderance of cobble/pebble-generated tools.

If cobble size were the primary variable in biface production, we might be inclined to view cortical retention simply as a product of the physical constraints of available lithic raw material. However, factors other than purely technical ones may play a role in the appearance of cortex on finished bifaces. Projectile point traits (e.g., position of notches, blade size, or stem shape) are sometimes described as diagnostic markers of a distinct cultural style denoting a shared social identity (Coe

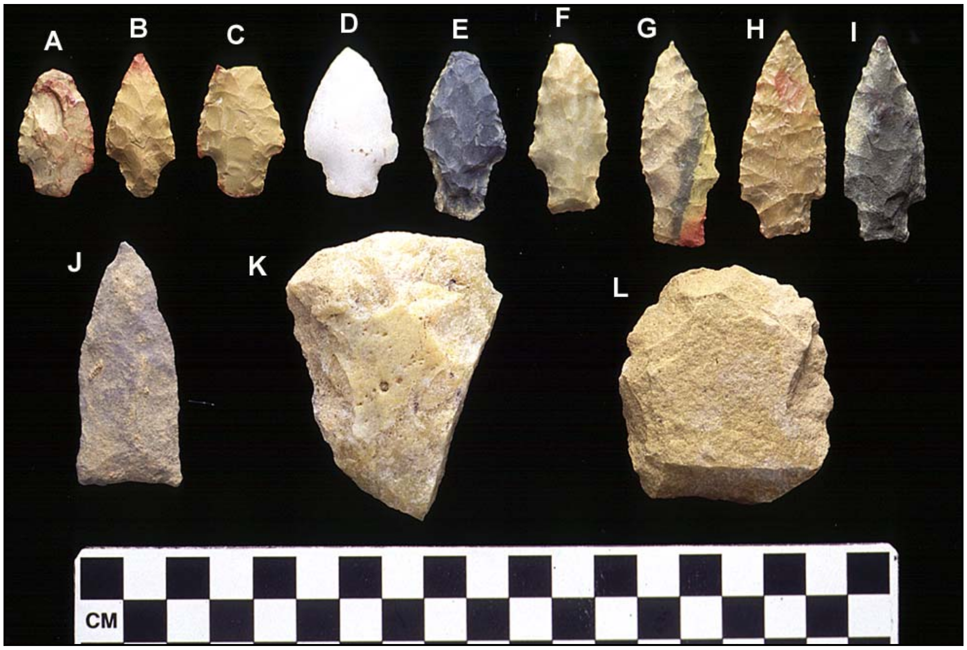


PLATE 24: Bifaces from the Metate Block

A) jasper stemmed point, Cat. No. 98/2/953, B) jasper stemmed point, Cat. No. 98/2/1000, C) jasper stemmed point, Cat No. 98/2/849, D) quartz stemmed point, cat. No. 98/2/831, E) chert stemmed point, Cat. No. 98/2/543, F) chert stemmed point, Cat No. 98/2/604, G) chert stemmed point, Cat. No. 98/2/781, H) jasper stemmed point, Cat. No. 98/2/787, I) chert stemmed point, Cat. No. 98/2/470, J) argillite Fox Creek point, Cat. No. 98/2/905, K) quartz early-stage biface, Cat. No. 98/2/823, L) quartz middle-stage biface, Cat. No. 98/2/1171

1964; Wiessner 1983). Wiessner has attempted to show that uniformity of style may be an expression of affiliation by transmitting information about the existence of groups and boundaries (1982:257). Projectile points may be well suited to this task because of their portability, ease of replication, and every-day use (Wiessner 1983:258). An example of possible stylistic behavior is unmodified basal cortex on projectile points, which Funk (1993:224) describes as ". . . a well-known Lamoka attribute." This narrow-stemmed point type is distributed from the Great Lakes east to the Hudson River Valley, and in New York dates circa 2500 to 1900 BC (Funk 1993:194). In contrast to the Middle Atlantic Coastal Plain, the center of the Lamoka culture area in New York State had access to numerous lithic outcrops of high-quality raw material. The retention of basal cortex on Lamoka points therefore does not appear warranted on technical grounds alone.

On the other hand, the base of a hafted projectile point, obscured from view by mastic, sinew, etc., would be a very poor place to load with shared-identity information—it is practically invisible. Signaling group identity to outsiders is a different aim from maintaining group identity by strict adherence to traditional rules for artifact production. The latter may result in group-specific stylistic peculiarities that are not evident to the artifact-makers on a conscious level—what Sackett (1982, 1985) has called "isochrestic" style.

What implications, if any, does this have for the sample of Puncheon pebble points? Wiessner comments that traits acting as shared symbols should ". . . undergo strong selection for uniformity and clarity . . ." (1983:257). In other words, artifacts exhibiting a common cultural style can be expected to have similar forms and closely correlated dimensions. In an ethnic- or clan-based group, similar values or learned traditions would be manifested in the lithic technology by the production of artifacts with some consistently distinct shape, size, or attribute.

An examination of the pebble points, however, reveals a very low correspondence between the metric traits of length, width, and thickness (Figure 38), indicating that overall form or proportion is not particularly consistent. The lack of uniformity among the pebble points suggests at least three possible explanations: (1) the set of points is not the product of a homogeneous population, (2) the form taken by a specific tool type is related more to the constraints of *function* and rock characteristics than to inherited *style*, or (3) variation within a cultural form is often the result of an individual's knapping ability and idiosyncracy (see Fiedel 1988).

The horizontal line describing the width to thickness ratios of the Puncheon pebble points (see Figure 38) is interesting because of the near total absence of a correlation. In other words, the two variables do not move together in any predictable manner; while the widths of the points range from 16 to 25 millimeters, their thicknesses are almost constant at 8 millimeters. Therefore, the thickness may be viewed as a diagnostic characteristic of this particular point type. In statistical terms, the distribution of point widths is highly skewed ($\gamma=39.2$), whereas that of thickness is highly centered ($\gamma=-0.4$). This provides a measure of the symmetry of the sample, or to put it in other terms, the degree of dispersion around its calculated mean. Highly skewed distributions result in mean values that do not always accurately reflect the sample population.

An examination of 21 Lamoka points from the Frontenac Island Site in New York (Ritchie 1971:83) indicates as little morphological correlation as the Puncheon pebble points. This high degree of intrasite variation is interesting as it comes from such a well-defined cultural type as Lamoka.

There are two related functional explanations for these observations. First, all of these points were intended to be hafted as the tips of thrown darts, and the dimensions of the dart shaft put a very inflexible constraint on point thickness. Inadequate or excessive thickness of a projectile point would also affect its ability to penetrate an animal's hide and might affect its weight, thus making the dart's performance in flight unpredictable. Second, points may have been resharpened after tip damage or dulling of blade edges. The flakes detached during resharpening, while thinning the blade of a now shorter point, would be unlikely to remove the medial ridge running down the point's main axis. Thus, the point's measurable maximum thickness would remain the same, even as its length and breadth decreased.

Yet, a culturally transmitted style does not necessarily have to take the form of a standardized size or shape. This reliance on metric traits as an indicator of cultural similarity may be an overly objective tendency of the western scientific outlook. There is a long history of debate in American archaeology about whether the stylistic types perceived by archaeologists were also recognized consciously by the people who made the artifacts, or are instead only an arbitrary analytical convenience. Members of a mobile band of hunter-gatherers in the Middle Atlantic Coastal Plain may have been less concerned about conspicuous replication of point types than about simply making a usable knife or blade. But form is determined by more than just function; Late Woodland people did *not* make their knives in these Late Archaic shapes, even though the cutting function of the tools had not changed. Artifact creation always involves some selection among arbitrary alternatives even if the artisans are not consciously making culturally meaningful, symbol-laden choices; this is what Sackett meant by isochrestic style.

Comparison of the raw materials represented in the debitage and the narrow-bladed stemmed points (Table 24) shows relatively little relationship between the small non-cortical debitage and pebble points with regard to raw material. Most puzzling are the amounts of jasper and quartz, which are nearly identical in the percentage of small non-cortical debitage but quite different in the percentage of points. However, given the small sizes of cobbles used at Puncheon Run, it may be misleading to examine only the non-cortical flakes, as one should expect that a significant amount of the small debitage would contain cortex. This assumption is partially borne out by the proportions of small cortical debitage in the Metate block assemblage, which are closer to the proportions of raw material used in the pebble points. Of course, archaeological interpretation is limited by what has been left at a site; at Puncheon Run, the inhabitants may have carried off most of the quartz artifacts that they worked on while tossing away much of the chert and jasper or caching them for future use.

Perhaps one reason why jasper was the preferred raw material for points was that it kept an edge longer than the quartz found locally, thus needing less frequent re-sharpening. If the quartz points

TABLE 24: RAW MATERIAL COMPARISON FOR SMALL DEBITAGE AND POINTS, METATE BLOCK

ARTIFACT TYPE	RAW MATERIAL							TOTAL
	Chert	Jasper	Rhyolite	Argillite	Quartz	Quartzite	Other	
non-cortical debitage, 6-10 mm (N=2,046)	32	32	1	1	27	3	4	100%
cortical debitage, 6-10 mm (N=378)	28	49	.	.	15	2	6	100%
narrow-bladed stemmed ("pebble") points (N=28)	25	64	.	.	7	.	4	100%

Note: Cell frequencies expressed as percentage of row total.

required more frequent rejuvenation, this might account for the disparities in ratio of debitage to points. Alternatively, this could reflect different mechanical properties of quartz versus cryptocrystalline materials (jasper and chert), with quartz producing much higher quantities of small debitage. In general, the points from the Metate block do not exhibit extensive re-sharpening. Kelly (1988) makes the point that extensive, repeated rejuvenation of bifaces is a consequence of raw material scarcity; we may infer from this that raw material procurement was not a particularly pressing problem at Puncheon Run.

e. Exotic Stone: Discussion

The co-occurrence of early Woodland I projectile points with Woodland I and II ceramic sherds underscores the mixing or overlapping of cultural components, making it difficult to delineate a temporal stratigraphy and separate the occupational episodes. It is possible to discern a rough temporal stratigraphy by focusing on specific data sets from the Metate block, especially raw material usage. Debitage constitutes the largest class of artifacts in the sample and is thus an appropriate vehicle for assessing cultural patterns of resource selection. Comparison of raw material frequencies reveals a significant difference between the vertical distributions of rhyolite and argillite and the other elements of the sample (Figure 39). The distributions of chert, jasper, quartz, and quartzite are relatively uniform between all levels, whereas rhyolite and argillite are highly clustered only in the plowzone, followed by small quantities in Levels 2 and 3, and fractional amounts in Levels 4 and 5. Rhyolite is absent from Level 6, and argillite is absent from Levels 5 and 6.

The uniformity of local raw materials (chert, jasper, quartz, and quartzite) across levels is interpreted as the product of the bioturbation processes responsible for soil mixing and artifact transport; this *biomantle* concept (Johnson 1993) is discussed more fully in Chapter V. This unif ormity is the expected pattern under an essentially static surface (minimal erosion or sedimentation), upon which all Locus 3 artifacts were originally deposited. As discussed above, the generally coarse textures of the Locus 3 soils provide a ready medium for downward size-sorting of debitage (see Figure 37). Under conditions of episodic sediment additions, in which artifact-laden layers are buried *in situ*, there would be no such clear trends in diminishing flake size with depth. These results argue for steady, long-term processes. These processes, operating over thousands of years, have thoroughly mixed most of the material into the soil profile; however, in contrast, rhyolite and argillite display little downward migration in the soil profile. Rather, rhyolite and argillite appear to "float" in the upper soil level. It seems that these materials were deposited in short-term episodes at a later date than the main occupations and are therefore less fully incorporated into the soil profile.

The disparate use of lithic raw materials is also significant from a cultural perspective. In contrast to the other raw materials, rhyolite and argillite are presumed to be from nonlocal sources. Whereas the acquisition of local material was a relatively simple task of sorting through cobbles and hauling them back to camp, the strategies and efforts involved in obtaining nonlocal material was considerably more complex. Direct acquisition in the form of long-distance travel is one means of securing highly desirable lithic materials, but journeys of this sort entail very high costs in the transport of raw materials (Seddon 1992:201). For this reason, forays for direct acquisition of lithic material were likely embedded in the yearly or seasonal round of residential moves by highly mobile hunter-gatherers (Andrefsky 1994; Binford 1979). In contrast, the indirect acquisition of lithic raw material relates to procurement strategies based on trade or exchange with "down-stream" groups closer to the source materials (Stewart 1989).

One characteristic of lithic raw material obtained from distant sources is its low frequency of remnant cortex (Johnson 1989:132). This characteristic results from measures aimed at reducing transport weight (and therefore costs) by trimming excess cortex (Andrefsky 1994:22) and from the flint-knappers' understanding that late-stage bifaces were more flexible and reliable as tools than early-stage bifaces or amorphous cores (Johnson 1989). Late-stage forms are not only highly

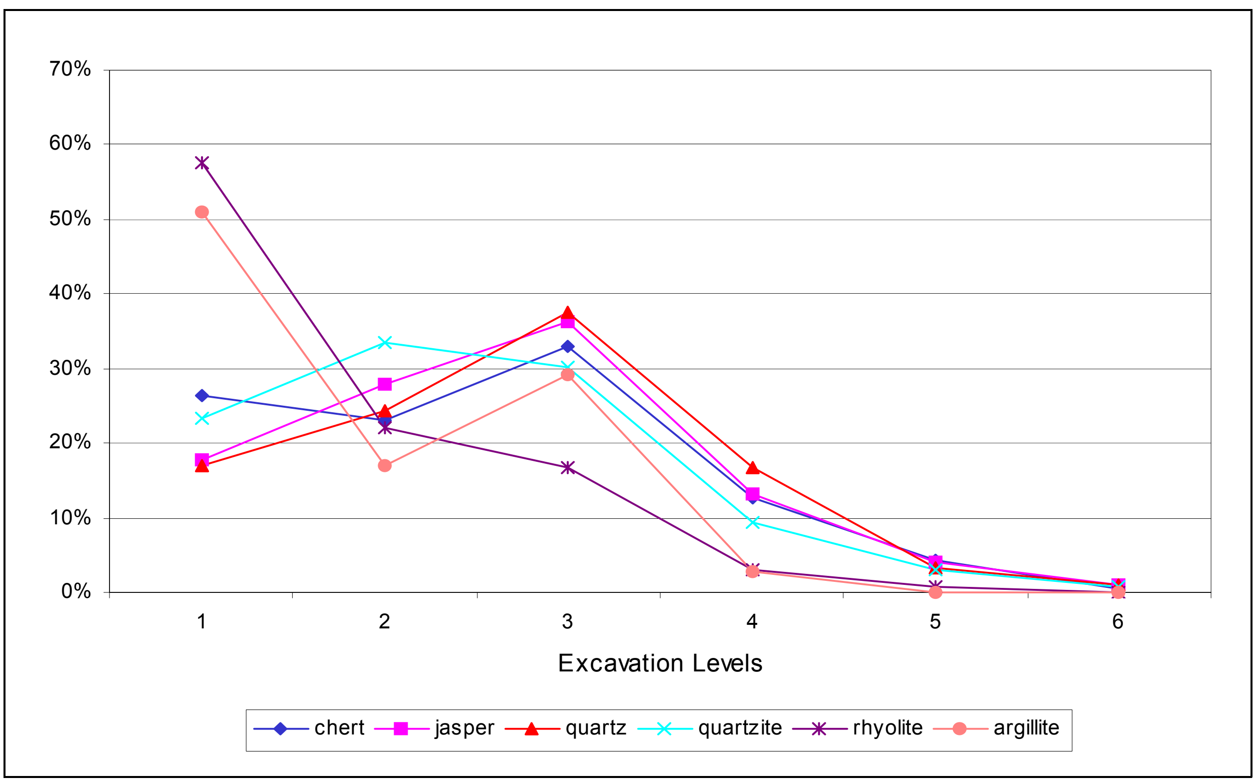


FIGURE 39: Vertical Distributions of Debitage by Raw Material, Metate Block

portable, but they are adaptable to a wider variety of technical needs. Late-stage bifaces are more reliable in the sense that they are already shaped and thinned, having progressed beyond the point where many early-stage and middle-stage bifaces suffer manufacturing failures due to internal fracture planes and inclusions. Data presented in Figure 40 reveal that rhyolite and argillite debitage from the Metate block exhibit significantly less cobble cortex than do the "big four" (chert, jasper, quartz, and quartzite), a finding consistent with the fact that these two raw materials are scarcely represented, if at all, in the secondary deposits in the Coastal Plain.

From the Puncheon Run Site the nearest rhyolite quarries are located in the Blue Ridge, some 180 kilometers (110 miles) to the northwest. Argillite is indurated mudstone or claystone, which because of its fine texture and hardness, can be flaked. Argillite sources have been found about 125 kilometers (75 miles) to the north near Trenton, New Jersey (Didier 1975). The distances involved are a possible measure of the regional interaction network through which goods and information were exchanged and of which the Puncheon Run Site was a part. The data from the Metate block suggest that more such imported material was used during later Woodland I (Middle Woodland) times than during the earlier Woodland I (Late Archaic) period. These data are therefore at odds with Custer's (1989) view that the Late Archaic of central Delaware was characterized by particularly heavy reliance on imported stone (see discussion in Chapter VIII). The ostensible contradiction may be the products of "apples and oranges" comparison of two distinctive, if contemporaneous, cultural systems. The Late Archaic of the Metate block belongs to the Narrow Stemmed Point complex, which had a preference for quartz and chert. Imported rhyolite and argillite were used preferentially by makers of Broadspear points, and this cultural complex is poorly represented at Puncheon Run.

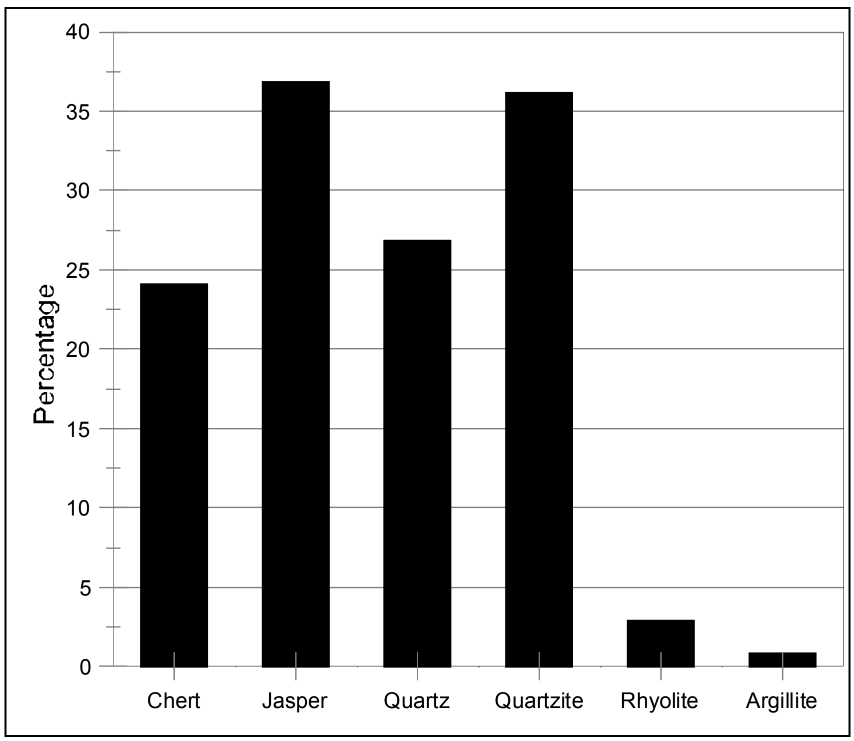


FIGURE 40. Cobble Cortex by Raw Material, Metate Block

f. Behavior and Function

Functional interpretations of a particular activity zone are derived from a number of sources, including feature and artifact morphology, identification of tool use, and subsistence data from flotation and protein residue analysis. Interpretations of site function based on the various data classes are discussed below.

1)   Features

Four features were identified in the Metate block: three hearths (Features 94, 96, and 97) and a large grinding stone (Feature 36). Features 94 and 97 are small clusters of 20 and 30 fire-cracked rock fragments, respectively, located near the excavation periphery (see Figure 36). Feature 96 is a large, centrally located fire-cracked rock cluster consisting of about 150 cobble fragments. Sixty-seven percent of the fire-cracked rock (by weight) is contained in Level 3, with 12 percent and 18 percent located in the plowzone (Level 1) and Level 2, respectively. The grinding stone, though an artifact, was also treated as a feature because it was essentially a fixed work station for food processing. A probable fourth hearth feature was detected in the post-excavation phase by computer-graphing of unplotted fire-cracked rock (Figure 41). This scatter of fire-cracked rock is located about 2 meters south of Feature 94. Using the same procedure, a secondary node of Feature 96 was detected southwest of the center of mapped fire-cracked rock. Whether this represents a separate hearth or a displaced portion of Feature 96 is not clear.

Near the center of the excavation block is a large rectangular slab of sandstone (Plates 25 and 26) from which the block derives its name. This grinding stone, or metate, is an unusual artifact to encounter in the outer Coastal Plain of Delaware because of its large size and weight. Although

PLATE 25: Metate (Feature 36) During Excavation, Unit 356, Locus 3

manos are an important part of the Coverdale Farm Site assemblage, few very large grinding platforms have been found on the Delmarva Peninsula. Feature 36 is therefore of special interest. Metates were primarily food-grinding tools, used with a handstone (mano, muller, or pestle) to reduce the amount of fiber in wild plants and to dehusk nuts and seeds (Wright 1994). Nutrients in seeds are encased in hard, indigestible husks that must be removed before consumption. Food-grinding also reduces the particle size of foods, which increases nutrient absorption by the digestive tract. In some cases, toxic substances can be removed or reduced in foods by a combination of grinding and soaking; tannin in acorns is one example. Metates thus played an important role in increasing the efficiency of food extraction among hunter-gatherers.

The Puncheon Run metate measures 45x31x11 centimeters and because of its large mass (32 kilograms) can be characterized as "site furniture," which is an artifact sufficiently large or heavy to be non-transportable. This does not imply that the metate could not be moved, for it was clearly brought to its present setting, but rather that movement was probably infrequent owing to the great effort that would have been involved. When viewed as an essentially immobile work station, the presence of the metate carries important information regarding the regional settlement pattern. Whether the metate originated from a quarry site in the Piedmont or was found locally, the task of hauling it to the banks of the St. Jones River must have been a significant effort, though one that was apparently justified in terms of its utility and efficiency in resource processing. An investment of this order suggests that the metate was intended for repetitive rather than single-episode or short-term use and thus has important implications, not only with regard to food processing technology, but also to the overall settlement pattern. Repetitive or recurring use of a site locale would be anticipated only if a group remained in a locale for extended periods or periodically returned to the locale to exploit a predictable resource. Of course, when an object has assumed such importance in the daily routine of food production and use of the landscape, its significance may well have extended beyond its basic technological application and may have been bound up in religious ceremony or ritual expression of a society's basic organizing principles of age, gender, and clan or tribal affiliation.

PLATE 26: Metate, Reverse Side

The metate exhibits grinding wear on both faces and is a type described as "flat/concave" (Adams 1999:482). This particular metate form has been shown experimentally to be highly efficient at grinding oily or water-soaked seeds. Adams concluded from her replicative studies (1999) that fine flour is easier to produce from wet/oily seeds than from dry seeds, and that the flat/concave metate form thus reflects a choice of processing technique as well as resource selection. As mentioned above, fine flour yields more nutrient intake than coarse meal and thus would have greater advantage for the consumer. Assuming the availability of appropriate resources, a large stone grinding surface could provide the means to efficiently process food into a high nutrient form. Such an implement would have enormous value for the creation of food surpluses to support a sedentary or semi-sedentary lifestyle. "Ownership" of this tool form also produces social value, in the sense that it allows greater participation in exchange networks based on the increased flow of durable produce (Bender 1985). Participation in these networks was not simply a means to obtain useful goods but generated social alliances that connected groups by ties of marriage and kinship. Thus utilization of a metate-like tool for resource processing may have had sound socio-cultural as well as economic benefits.

Clusters of thermally altered rock are assumed to be the product of hearth use or stone-boiler dumpings. The latter do not usually generate carbonized wood. Therefore, the presence of charcoal in Features 94, 96, and 97 suggests that they functioned as hearths. Hearths served many purposes, including the processing of food by cooking and smoking, tool preparation, heat, light, and security. It is assumed that these functions would have commonly overlapped.

A combination of native and non-native uncharred seeds was recovered from Features 36, 94, and 96 (see Volume II, Appendix C). The most common seed was carpetweed (*Mollugo verticillata*), an annual weed native to tropical America. Though presently naturalized to a wide geographic region, carpetweed is not thought to have been locally available during prehistory. Carpetweed was well represented in Feature 96 and in the vicinity around the metate (Feature 36). Small quantities were also found in the small hearth of Feature 94. The inclusion of a post-contact-era plant in subsoil feature deposits may be explained as the result of surface disturbances that permitted carpetweed seeds to penetrate beyond the upper soil layer; collectively the natural processes of soil mixing are referred to as *bioturbation* (Johnson 1993). The coarse texture of the soil may also have facilitated movement of the seeds into lower layers. If so, the native species are just as likely to have entered feature contexts in similar postdepositional fashion. While some of these native plants are edible or otherwise useful, we may never be really confident about their potential to indicate aboriginal collection and utilization. Potentially important native species that were recovered from the feature flotation samples include, pigweed (*Amaranthus* sp.), knotweed (*Polygonum* sp.), and wood sorrel (*Oxalis stricta*); however, all of these were recovered in a non-charred state. Very small quantities of thick-walled hickory nut remains were found in Feature 96.

Several tree species were identified from wood charcoal samples taken from Features 94 and 96, including red oak, white oak, American chestnut, black walnut, and non-specific members of hickory and southern pine. Although charcoal was present in all three hearth features, there were no indications of burned earth or soil staining.

The results from soil testing show only slight to moderate chemical enhancements of feature soils in the Metate block relative to control (non-feature) soils. The absence of strong chemical signatures at the Metate block may be the result of a) limited occupational activities, b) the removal of relevant chemical substances through long-term soil leaching, or c) or the activities associated with this area, which may have produced the types of chemical residues that would be measurable in the suite of tests used in this analysis. Organic matter, phosphorus, and barium show slightly elevated readings in the small hearths, Features 94 and 97. The larger hearth, Feature 96, yielded a somewhat higher value for phosphorus, which is one byproduct of fire ash. The higher phosphorus value may reflect a greater amount of wood fuel consumed by this feature, which is consistent with its larger cluster of fire-cracked rock. Feature 97, alone among the Metate block samples, yielded a moderate enhancement of potassium, reaching more than two standard deviations above the sampled mean. Potassium, like calcium, magnesium, and phosphorus, is a recycled nutrient that is essential for plants and animals. Its precise archaeological significance is not entirely clear; however, given the naturally deficient levels of potassium in the Locus 3 soils, these elevated levels may be viewed as a general indicator of cultural activity.

2) Artifacts

Artifacts, viewed as a residue of human activity, can be analyzed either in the aggregate to reveal patterned cultural behavior, or can be examined individually to extract evidence of functional use. On a macro-scale, pattern analysis examines the structure of a site to reveal the processes of internal community organization and the forms these processes manifest in the archaeological record. Organized behavior governed by social rules and traditions may generate recognizable spatial patterns among artifact classes, indicating discrete activity zones (Binford 1979, 1983). The archaeologist seeks to delineate areas of specialized activity as a prelude to the identification of specific behaviors. On the other hand, O'Connell (1987) has pointed out that through re-use of the same areas of the landscape, activity zones are often trampled upon and subject to other activities that can rearrange the original position of artifacts.

At the micro-scale, utilized tools can be examined for evidence of distinctive wear polishes and striations that form from working hide, meat, bone, wood, and other materials (Yerkes 1987). While one must bear in mind the effects of re-use and recycling of tools for different tasks, numerous studies on replicant tools have confirmed microwear analysis as a reliable method of obtaining data on tool use and function. An important element of the analysis for the Puncheon Run Site project was an edge-wear study which focused on tools from archaeological contexts and replication experiments (see Volume II, Appendix G).

a) Debitage

The most compelling patterns of artifact distributions are seen in the debitage. Isolating each raw material reveals a series of concentrations that are highly clustered around one or two points in space (Figures 42 through 47). The clearest display of patterning is in the debitage itself, with discrete clusters of quartz (Unit 422), jasper (Unit 399), chert (Units 371 and 391), argillite (Unit 387), and rhyolite (Units 410 and 353). The jasper cluster in Unit 399 contained 126 flakes and pieces of debitage. The mean count of jasper debitage per unit is 25 for the block. There were 139 quartz flakes and debitage in Unit 422, compared with a mean value of 23 per unit in the entire Metate block. Each one of these clusters could easily represent a single cobble reduction, if we take the datafrom experimental point replication as a model (see Volume II, Appendix M). The manufacture of those points produced debitage frequencies ranging from 150 to 394, with a mean of 214. Rather than analyzed separately by level, in this study the recovered material was considered by unit for statistical treatment. Analysis by unit is an appropriate approach for this area because of the limited extent of mid- to late holocene alluvial deposits, and the substantial degree of soil mixing through natural processes (e.g. insects, rodents, roots, and freeze/thaw), circumstances that would tend to blur the patterning of artifact placement within very narrow depositional sequences.

Clusters or spatial concentrations of debitage may be produced by (1) direct deposition or abandonment of waste from primary lithic reduction activities at the locus of production, or (2) secondary redeposition by gathering up and dumping reduction-generated debris (Hull 1987:773; Madsen 1992:193). The implications of these activities are quite different, yet distinguishing them can be difficult. One method of discriminating the two behaviors is to examine the debitage size grade distributions within the clusters. Under-representation of the smallest size grades may indicate that secondary redeposition has occurred. Some studies of refuse disposal behaviors have demonstrated an associated size-sorting effect, in which smaller debris is left at the point of manufacture (primary deposition), and larger debris is more often removed to an area of discard (or re-used), becoming a secondary deposit (Binford 1978; Metcalfe and Heath 1990:782). This process can result from deliberate cleaning and site maintenance, or may be the product of repeated movement, or traffic, across an activity area. In contrast, samples in which large debris is under-represented are less likely to be the product of secondary disposal because it is precisely these elements of the reduction sequence that would be most noticeable underfoot, or picked up for someuseful task, reused, and deposited elsewhere. In contrast to other areas of the site, small flakes are better represented in the Metate block because of the use of 3-millimeter (⅛-inch) screening.

To examine this question, analysis focuses on two clusters of debitage within the Metate block: a quartz cluster centered in Unit 422 (Figure 48) and a jasper cluster centered in Unit 399 (Figure 49). The jasper cluster in Unit 399 contained 126 flakes and pieces of debitage, and the mean count of jasper debitage per unit is 25 for the block. Unit 422 contained 139 quartz flakes and debitage, and the mean value per unit is 23 for the block. Figures 48 and 49 illustrate the distribution of debitage size grades for 1) the full Metate block sample, 2) the relevant raw material subset from that sample, and 3) the raw material cluster from Units 422 and 399, respectively. In both cases, the frequency of size grade 2 (6-10 millimeters) within each cluster is significantly higher than either the total sample for the Metate block or the individual raw material sample. Frequencies from size grade 1 (<5 millimeters) are insufficiently large to be statistically valid and will be ignored. The concentration of small debitage in both cases suggests that these clusters are intact primary deposits produced from lithic manufacturing activities. Although Shott (1994:102) explicitly cautions against assuming that the presence of small debitage or microdebitage is an indicator of primary depositional context, the very high rates of small-size debitage within these clusters is more easily explained by reference to primary manufacturing waste than by secondary discard activity.

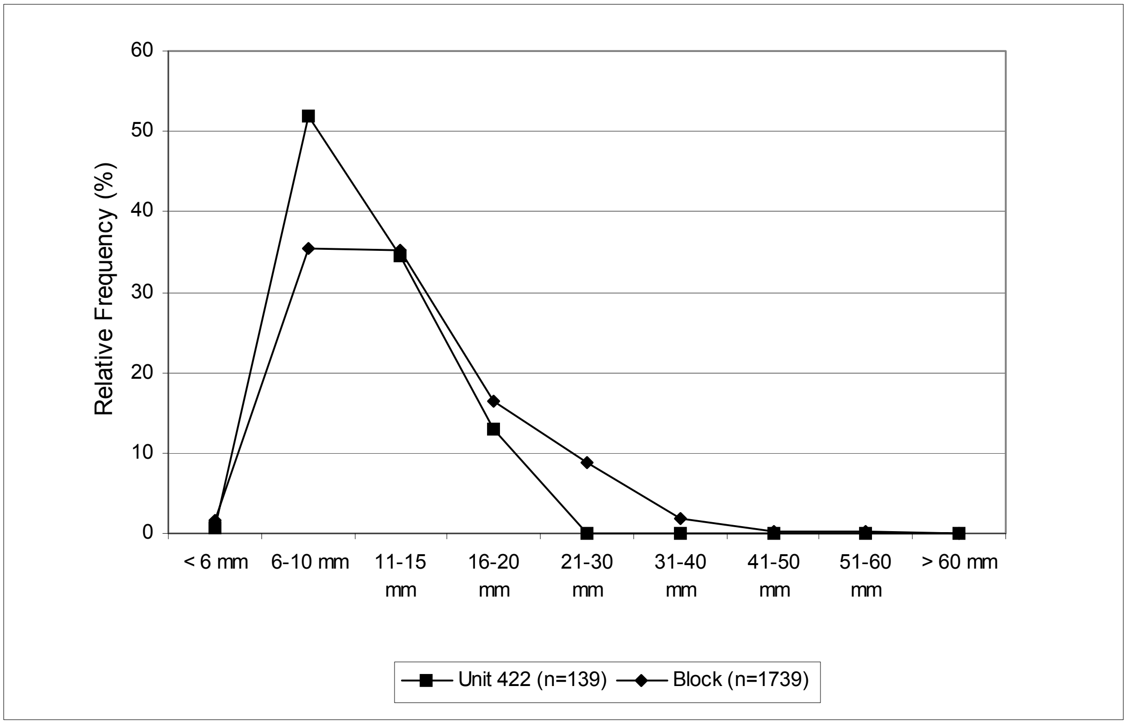


FIGURE 48: Size Distribution of Unit 422 Quartz Debitage Clusters Versus All Quartz Debitage in Metate Block

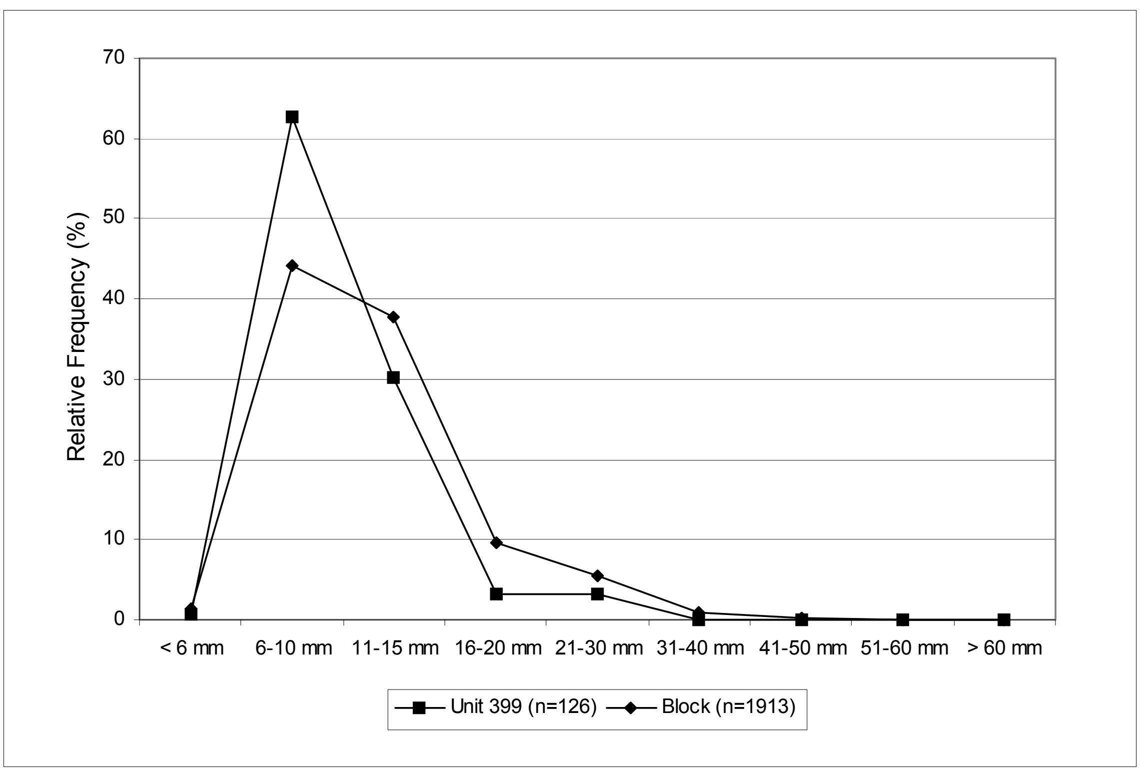


FIGURE 49: Size Distribution of Unit 399 Jasper Debitage Cluster Versus All Jasper Debitage in Metate Block

An additional point can be made about the jasper cluster in Unit 399. Secondary deposits are expected to be characterized by a higher proportion of large flakes and chunks than primary deposits because these elements are more easily culled for disposal (Metcalfe and Heath 1990:782). Consequently, the relatively low frequency of large jasper pieces from Unit 399 may indicate a primary deposit that was culled for large usable waste flakes. Interestingly, only three jasper cores were recovered in the excavation of the Metate block, two within 3 meters of Unit 399. Within the same radius, however, lay 11 jasper bifaces. Clearly, the major portion of jasper debitage within the Unit 399 cluster must have been derived from bifacial reduction activities associated with the large sample of bifaces from the Metate block. More specifically, the high percentage of small jasper flakes in the cluster appears to be the product of bifacial tool maintenance, an ongoing task within a subsistence regime that evidently relied heavily on the use of bifaces.

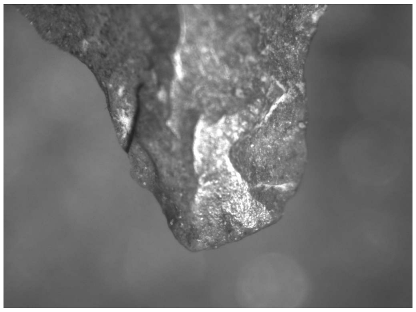
The quartz cluster sample (Unit 422) is also dominated by smaller flakes, indicating that this reduction activity may have focused on the rejuvenation of bifacial tools. In contrast to the jasper cluster, however, there are few cores or bifaces in close proximity. Quartz cores (N=13) and bifaces (N=14) were recovered from the Metate block, but they are nearly absent from the vicinity of Unit 422; only one quartz core and two quartz bifaces were found within a radius of 4 meters from the unit center. This distance is somewhat greater than the standard "toss zone" or "drop zone" that encircles a lithic work station as defined by Binford (1978:340) (drop zone as the area within arm's reach; toss zone as the area within about 1.5 meters to one's rear), but it is interesting to note that nearly all of the quartz cores and bifaces are within theoretical work zones around the three hearths.

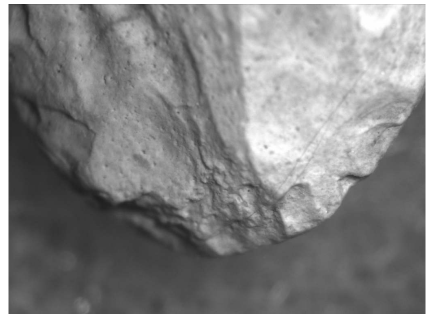
b) Pebble Points

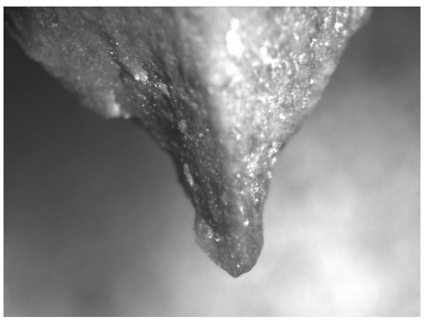
A majority of the pebble points analyzed for use-wear yielded evidence indicative of pierced soft material, such as hide and flesh, but there was evidence of a broad range of other uses such as cutting, scraping, and working of bone or wood (Table 25; Plate 27). The analysis does not distinguish between hand-held or projected bifaces. Three of the points (Catalog Nos. 98/2/614 [Unit 410, B-2], 98/2/913 [Unit 430, A-1], and 98/2/1186 [Unit 459, A-1]) exhibit distal impact fracturing, which suggests that these items were projected. Four pebble points display evidence of scraping activity, on soft, medium, and hard materials. Transverse blade fractures are evident on two of these tools that were evidently reused after breakage as hand-held hafted scrapers (Catalog Nos. 98/2/849 [Unit 356, B-3] and 98/2/912 [Unit 429, A-1]). On the basis of the edge-wear analysis, the pebble point sample is believed to primarily represent hunting implements hafted to spears that could have been either thrown or hand-held. Flenniken and Raymond (1986:607) reported that 70 percent of their sample of experimentally projected points suffered impact damage to the haft area or base. None of the Metate block sample exhibited breakage around the haft area or base, suggesting that these specimens were used as hand-held implements. This tool function is viewed as a possible method of spearing fish trapped by weirs or nets at low tide in the St. Jones River.

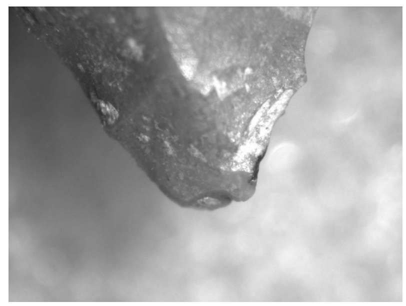
c) Bifaces

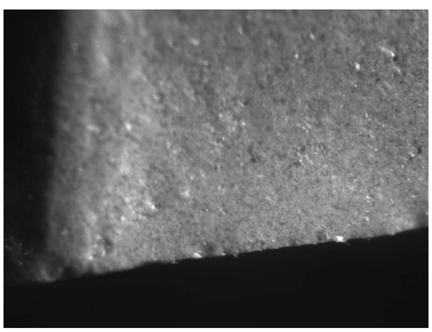
Of the unfinished (early-, middle-, and late-stage) bifaces recovered from the Metate block, slightly more than half are classified as early-stage types (Table 26). As the name implies, these specimens

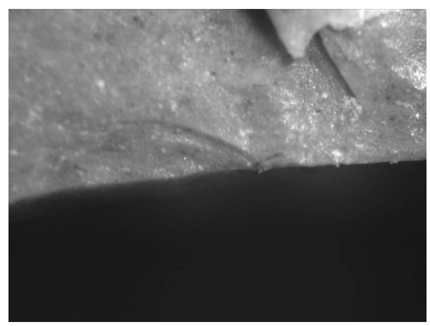

Piercing wear on projectile point
(Use-wear Specimen 67)

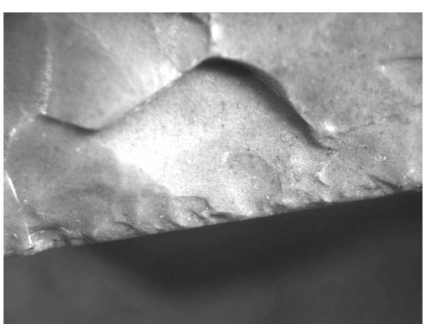

Piercing wear on projectile point
(Use-wear Specimen 73)


Piercing wear on projectile point
(Use-wear Specimen 80)


Piercing wear on projectile point
(Use-wear Specimen 81)


Scraping wear on projectile point fragment
(Use-wear Specimen 83)


Scraping wear on projectile point fragment
(Use-wear Specimen 84)


Scraping wear on projectile point fragment
(Use-wear Specimen 86)

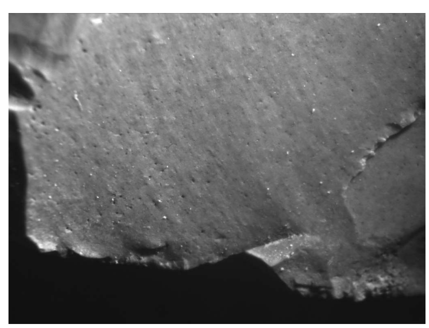

Scraping wear (hard wood or bone) on early stage biface
(Use-wear Specimen 93)

PLATE 27: Examples of Use Wear on Stone Tools from Puncheon Run

TABLE 25: USE-WEAR ANALYSIS OF TOOLS FROM THE METATE BLOCK

Tool Type	Raw Material	Context	Inferred Activity
Utilized Flake	chert	Unit 396, B-2	Cutting grass
Utilized Flake	chert	Unit 409, B-3	Cutting soft material
Utilized Flake	chert	Unit 425, B-3	Cutting soft-medium material
Utilized Flake	jasper	Unit 388, B-2	Scraping soft-medium material
Retouched Flake	chert	Unit 404, B-2	Scraping medium-hard material
Sidescraper	jasper	Unit 423, B-3	Scraping medium-hard material
Endscraper	jasper	Unit 405, B-3	Scraping soft material
Burin	jasper	Unit 370, B-4	Carving wood
Early-Stage Biface	chert	Unit 365, B-2	scraping
Early-Stage Biface	chert	Unit 382, B-3	inconclusive
Early-Stage Biface	jasper	Unit 362, B-2	scraping (wood?)
Early-Stage Biface	jasper	Unit 441, B-3	scraping, hard wood or bone
Late-Stage Biface	jasper	Unit 391, A-1	scraping hide
Late-Stage Biface	jasper	Unit 402, A-1	scraping and haft-wear
Late-Stage Biface	jasper	Unit 405, B-2	scraping, limited
Biface Fragment	chert	Unit 451, A-1	scraping?
Biface Fragment	jasper	Unit 439, B-3	cutting, limited
Projectile Point	chert	Unit 331, B-3	piercing
Projectile Point	chert	Unit 374, B-3	piercing
Projectile Point	chert	Unit 387, B-3	piercing
Projectile Point	chert	Unit 403, B-2	piercing
Projectile Point	chert	Unit 407, B-2	piercing
Projectile Point	chert	Unit 419, A-1	piercing
Projectile Point	chert	Unit 449, B-2	piercing
Projectile Point	chert	Unit 451, A-1	scraping
Projectile Point	chert	Unit 455, A-1	scraping
Projectile Point	chert	Unit 459, A-1	piercing
Projectile Point	jasper	Unit 353, B-3	piercing
Projectile Point	jasper	Unit 356, B-3	scraper
Projectile Point	jasper	Unit 356, B-3	scraper, possible
Projectile Point	jasper	Unit 362, B-3	piercing, possible scraping
Projectile Point	jasper	Unit 382, B-2	piercing
Projectile Point	jasper	Unit 391, A-1	piercing, haft-wear
Projectile Point	jasper	Unit 405, B-2	piercing, possible scraping
Projectile Point	jasper	Unit 407, B-3	piercing
Projectile Point	jasper	Unit 421, B-4	piercing
Projectile Point	jasper	Unit 423, A-1	piercing

TABLE 25 (continued)

Tool Type	Raw Material	Context	Inferred Activity
Projectile Point	jasper	Unit 426, A-1	piercing
Projectile Point	jasper	Unit 429, A-1	scraping, haft-wear
Projectile Point	jasper	Unit 430, A-2	scraping
Projectile Point	jasper	Unit 441, B-5	piercing, haft-wear
Projectile Point	jasper	Unit 442, B-4	scraping, limited

TABLE 26: BIFACE TYPES BY RAW MATERIAL, METATE BLOCK

BIFACE TYPE	RAW MATERIAL							TOTAL
	Chert	Jasper	Quartz	Quartzite	Rhyolite	Argillite	Other	
Early-Stage	2	4	9	2	1	.	.	18
Middle-Stage	1	1	.	2	.	.	.	4
Late-Stage	3	3	1	.	.	.	.	7
Point	10	22	2	1	.	1	1	37
Drill	.	.	.	.	1	.	.	1
Other	.	2	2	.	.	1	.	5
TOTAL	16	32	14	5	2	2	1	72

display little modification beyond initial decortication and preparation of a bifacial edge. Early-stage bifaces were sometimes discarded as rejects for further thinning due to uncontrolled fractures or impurities. Expedient use of these forms also occurs. Several early-stage specimens from the Metate block were apparently used as cutting or scraping tools based on evidence garnered from the use-wear analysis. A jasper early-stage biface (Catalog No. 98/2/506; Unit 391, Stratum A, Level 1) displayed signs of having been used to scrape soft material, and may have functioned as a flesher, or hide scraper. Another example (Catalog No. 98/2/942; Unit 437, Stratum B, Level 2) is a chert early-stage biface that exhibits striations typical of some kind of cutting activity. Hard material scraping is evident on a jasper early-stage biface that may have worked wood, bone, or antler (Catalog No. 98/2/994; Unit 41, Stratum B, Level 3).

Although only two quartz projectile points were recovered from the Metate block, nine quartz early-stage bifaces were found. This disparity may attest to the difficulty in shaping cobble quartz into desired tool forms. Many of these specimens may have been recycled into other uses, but because quartz is an extremely hard material and is particularly abrasion resistant, it is not an appropriate material for viewing use-wear patterns (Boudreau 1981; Hayden and Kamminga 1979).

d) Unifaces

Task requirements for basic subsistence activities such as meat and hide preparation led to the production of generalized cutting and scraping implements with unifacial edges. The retouched and utilized flakes are expedient tools that were struck from cores or bifaces and used to perform various cutting and scraping tasks with little or no prior modification. Often, these simple tools were produced and used for single tasks and then discarded after the task was completed.

Endscrapers and sidescrapers are more formalized tools with steep-angled edges that have the capacity to be resharpened and reused. Tools with edge angles greater than 50 degrees are believed to have been most efficient at working hard materials, such as bone, antler, and hardwoods (Cavallo 1987:113; Stewart 1994:64; Tringham et al. 1974). Tools with sharper edges would have been more appropriate for soft materials, such as meat, hide, and edible and usable plants. Three formal scrapers were identified from the Metate block. Catalog Number 98/2/635 (Unit 405, B-3) is a jasper endscraper with a prepared edge angle of 60 to 65 degrees. Catalog Number 98/2/796 (Unit 423, B-3) is a sidescraper, also manufactured from jasper, with an edge angle measuring between 50 and 55 degrees. The quartzite specimen (Catalog No. 98/2/1263) from Unit 465, Stratum B, Level 2 is a possible sidescraper. It is large compared to the average size of the Locus 3 scraper sample, and has a measured edge angle of 55 to 70 degrees. Use-wear analysis of the uniface sample from the Metate block (see Table 25) generally bears out the assumptions of edge angle and function (see Volume II, Appendix G). Cutting, scraping, and carving activities were inferred from the patterns of wear viewed on the eight cryptocrystalline unifaces that were examined.

With regard to the model of scraper form mentioned above, the jasper scraper from Unit 405 is an exception. A formal endscraper, it exhibits evidence of soft material scraper wear. A chert retouched flake tool from Unit 404 shows wear indicative of use on medium-hard material. The working edge angle of 60 to 65 degrees is consistent with the generalized model, as are the remaining specimens.

The range of behaviors and materials inferred from the use-wear analysis is broad and includes carving wood, cutting grass, cutting soft material, and scraping soft to hard material. This suggests that the Metate block was the focus of a number of subsistence activities, including working wood, collecting and processing wild grass, and butchering animals, based on the evidence of cutting and scraping marks from soft material.

e) Cores

Cores are the abandoned or exhausted remnants of lithic material from which a variety of stone tools are generated. An examination of core types within an assemblage may yield useful information about such topics as raw material procurement strategies, residential mobility, and technological organization. Twenty-eight cores classified into four core types were recovered from the Metate block during Phase II and III investigations (Table 27).

The core sample is noteworthy for two reasons. First, core frequency is significantly less than the number of recovered bifaces (N=72). Second, only a small percentage of the cores are bipolar types. The first point suggests that most bifaces and flake tools recovered from the Metate block were manufactured from relatively small cobble masses, generating decortication flakes, bifacial thinning flakes, and small shatter as the primary debris products, while leaving behind little that would be

TABLE 27: CORE TYPES BY RAW MATERIAL, METATE BLOCK

CORE TYPE	RAW MATERIAL Chert	Jasper	Quartz	Quartzite	Gun Hill Quartzite	TOTAL
Bipolar	1	.	1	.	.	2
Freehand	.	3	6	3	1	13
Flake	.	.	.	1	.	1
Tested Cobble	1	.	6	4	1	12
TOTAL	2	3	13	8	2	28

classified as "core." This situation is consistent with the current understanding of the Puncheon Run lithic landscape as a mosaic of stream cobble deposits that were heavily exploited for their usable raw materials. The low frequency of bipolar cores, however, appears to stand in contrast to the model of bipolar core efficiency in a lithic-sparse environment, as the Middle Atlantic Coastal Plain has been frequently described (Stevens 1998; Stewart 1987). The limited utilization of a bipolar core industry at the Metate block suggests that resident populations were neither overly constrained by raw material availability nor by small cobble size. The landscape surrounding the Puncheon Run Site had a relative abundance of cobble sources, and the Puncheon pebble points, which were among the most common tools used at the site, clearly show that the site occupants had mastered the technique of producing tools from small cobbles.

The Metate block contrasts in interesting ways with the Cobble Bar area, which is the primary quarry/reduction location in the Puncheon Run landscape. The Cobble Bar area contained four times the number of cores as did the Metate block, and a greater percentage of those, 67 percent as compared to 43 percent, were tested cobbles. Proportionally, cores made up only 0.4 percent of the total chipped-stone assemblage at the Metate block, compared with 10 percent at the Cobble Bar area. The core sample constituted 23 percent of the tool assemblage at the Metate block and 84 percent at the Cobble Bar area, indicating the relative importance of lithic procurement activities at the two areas. Freehand cores were twice as likely to make up the Metate block sample. Yet with these differences, bipolar reduction made up an equivalent proportion of the core sample from both areas.

Table 28 presents comparative data on bipolar core frequencies from a sample of regional sites. The Two Guys Site assemblage shows the highest use of bipolar core technology. To some degree, it is typical of sites within a Coastal Plain setting, where there is a conspicuous absence of cobble deposits. Moreover, the Two Guys Site was located in the Delaware's mid-peninsular drainage divide, a setting with very infrequent stream channels where cobble deposits would be exposed (LeeDecker et al. 1996). In this setting, maximization of resources would have been a strong incentive for those residents to practice a bipolar core technology. The high bipolar core use at the Sturgeon Pond Site near Trenton, New Jersey, on the other hand is attributed by Wall and Stewart (1996) to the contraction of trade networks and settlement territory during the Woodland II period, which placed a premium on maximizing available cobble sources.

TABLE 28: BIPOLAR CORE FREQUENCIES FROM SELECTED REGIONAL SITES

Site/Published Reference	Cores	% Bipolar
Puncheon Run, Metate Block (7K-C-51)	28	*7*
Whitby Branch (7NC-G-151), New Castle County, Delaware (Jacoby et al. 2001)	143	8
Drawyer Creek South (7NC-G-143), New Castle County, Delaware (Wall et al. 2001)	17	12
Indian Creek V (18PR94), Prince Georges County, Maryland (LeeDecker et al. 1991)	228	49
Lums Pond, Block A (7NC-F-18), New Castle County, Delaware (Petraglia et al. 1998)	30	53
Sturgeon Pond, North Block (28ME114), Mercer County, New Jersey (Wall and Stewart 1996)	59	68
Two Guys (7S-F-67), Sussex County, Delaware (LeeDecker et al. 1996)	54	76

The Lums Pond Site in New Castle County, Delaware, lies near the Piedmont/Coastal Plain transition, or Fall Line, and was within close proximity to bedrock sources of jasper and quartzite, as well as secondary cobble deposits. The recovery of argillite and rhyolite artifacts led the authors to conclude that middle Woodland I populations (circa 1300 BC) had a broad settlement territory, or at least interacted with other groups within this range. Given the potential abundance of lithic sources available to them, the reasons for the high rate of bipolar core use by these people are not clear, but it may reflect increased population pressures and competition with neighboring groups over ownership of the local quarries.

The Metate block at the Puncheon Run Site exhibits the lowest percentage of bipolar core use among the selected sites. The Metate block is not alone among Puncheon Run activity zones for low bipolar core use. The Puncheon Run Site as a whole registers a 9 percent rate for this type of core reduction. The Drawyer Creek South and Whitby Branch sites in southern New Castle County share many environmental characteristics with the Puncheon Run setting, including abundant cobble sources. This last factor, rather than simple cobble size, appears to be the most compelling reason for the paucity of bipolar core activity at these three Coastal Plain sites.

3) Residues

The protein residue data obtained from Metate block tools indicate the exploitation of aquatic and terrestrial prey species. Residues found on tool surfaces are identified as American eel, Atlantic croaker, striped bass, and white-tailed deer. The fish are common species found in Delaware Bay and tributaries, although their abundance near the shore varies seasonally. Atlantic croaker move into ocean waters in mid- to late summer to spawn, remaining there until spring, when they return to estuarine and riverine environments (Virginia Institute of Marine Sciences 1999). In the spring these bottom-feeding fish could have been available to prehistoric groups using weighted gill nets in the St. Jones River and near-shore Delaware Bay. Striped bass are anadromous fish that spawn up-river in spring and late summer and can be caught by nets, traps, or spears. American eel, in contrast, spawn seaward, providing prehistoric hunter-gatherers with a late summer and fall catch. Eels are caught in gill nets and traps.

Deer are known to display some seasonal movement to exploit available resources, but their annual home range is limited, on the order of 1 to 2 kilometers or less (Cavallo 1994). Starna and Relethford (1985) estimated pre-contact deer densities in New York State at approximately 5 to 10 per square kilometer, and coastal zone densities probably fall within this range. Estimates of modern deer densities in deer ranges in the northeast are on the order of 5.5 per square kilometer, but have been rising through the twentieth century (Storm and Palmer 2000). Deer often aggregate during winter months around scarce fodder within the shelter of dense cedar or pine woodlands. This behavior, referred to as "yarding," may have provided an advantageous setting for hunter-gatherers to obtain meat at the onset of the lean season. Because they are non-migratory, deer are potentially available as prey throughout the year. Evidence from dental growth lines suggests that deer were hunted year-round at Greenwich Cove, a coastal site in southern New England (Bernstein 1990).

The detection of fish protein residues on bifaces in the Metate block suggests that fish were brought there for butchering. The fire-cracked rock clusters suggest second-stage processing, such as cooking for immediate consumption and smoking for storage and future use. The same conclusions might apply to deer based on the identification of deer protein on tools recovered from Unit 333 and Unit 424. However, experiments with replicated stone tools demonstrated that proteins from deer antler batons can be transferred to the tools during the process of soft-hammer percussion (see Appendix I). Because it cannot be determined with complete certainty whether archaeological specimens that test positive for deer proteins are reacting to prey residues from butchering or baton residues from tool manufacturing, conclusions about deer consumption based on residue results must be tentative at best.

g. Conclusion

The Metate block was a dense concentration of stone tools and small ceramic sherds clustered around three hearths and a grinding stone situated near the junction of the St. Jones River and Puncheon Run. Excavators recovered a large quantity of bifacial knives and points that appear to be related to the capture and processing of animal species for food. A heavy, rectangular stone slab, or metate, was also found and shows evidence of having been used as a grinding platform. Foods typically ground prior to consumption were seeds, nuts, and tubers. Residue data from tool surfaces suggest that deer and several kinds of local fish were among the animals exploited by site visitors. The study of edge wear on tools advances the notion that the primary function of the pebble points was as hand-held implements, possibly spears, for piercing flesh. One interpretation of this finding is that these tools were used for fish spearing in the St. Jones River.

The proximity of the riverbank must have been a vital reason that this activity zone was used repeatedly, as it permitted easy access to the productive wetlands ecosystem and the Delaware Bay. Fish were not only abundant, but at spawning times were highly clustered and predictable resources in the St. Jones River and nearby wetlands. In good years, short periods of intensive fishing and processing by the entire community during spring and fall could produce enough preserved fish to carry the group through the "hungry season" of late winter and early spring. Perhaps, seasonal harvests reached the point that would support consumption on the scale of "feasting" or ritual consumption. Surpluses may have been transformed into exchange items. The waterways of coastal

Delaware not only permitted access to resources, but they also provided a means of transporting resources to camps for processing and of conveying goods and people within networks of regional exchange, reinforcing ties of kinship and political alliances.

Judging by the artifact frequency and overall density, the Metate block was the most intensively utilized activity zone at the Puncheon Run Site, perhaps reflecting the relative importance of fishing in the subsistence regime of the Woodland I groups visiting the site. The persistent use of the Metate block through much of this period suggests that this focus on aquatic resources was a long-term and resilient adaptation of the local Coastal Plain peoples.

3. Feature 30 Block

Feature 30 was identified during Berger's Phase II testing and was interpreted as a possible deep storage pit, the only one of its kind identified in Locus 3. Because it represented a unique feature type, this feature and the surrounding area was selected as a focus of the data recovery program. Excavations expanded from the original test unit in which Feature 30 appeared (Unit 156), to a 12x10-meter semi-contiguous block containing 64 1x1-meter units (Figure 50). Excavations revealed that Feature 30 was the largest of three closely spaced pit features (Features 30, 37, and 38). Features 30 and 38 are large parabolic-shaped pits with minimum volumes of 3,900 liters and 4,500 liters, respectively. Feature 37 is a flat-bottomed pit with surface measurements of approximately 400x300 centimeters. More than 1,700 artifacts were recovered from these features and the surrounding soils. Because these feature forms do not appear elsewhere within the site, the area is of particular interest for examining Native American landscape use.

a. Radiocarbon Dates

Four radiocarbon dates were obtained from the Feature 30 block, all from feature fill contexts (Table 29). Each sample consisted of carbonized wood recovered from feature fill. The disparate date ranges yielded by the assays strongly suggests contamination of some samples by soil disturbance

TABLE 29: RADIOCARBON DATES FROM THE FEATURE 30 BLOCK

CONTEXT	LAB NUMBER	ANALYSIS	RADIOCARBON AGE	CALIBRATED DATE
Unit 321, Fea. 30, A-8	Beta-136095	AMS	4,610±40 BP	3505-3340 BC
Unit 320, Fea. 30, A-8	Beta-131143	AMS	4,480±60 BP	3360-2925 BC
Unit 398, Fea. 38, A-1	Beta-131145	AMS	1,300±80 BP	AD 615-895
Unit 321, Fea. 30, A-3	Beta-131147	AMS	310±50 BP	AD 1455-1665

or intrusive root decay. The small size of the samples (all required AMS dating) contributes a certain level of imprecision to the analysis. Determining which, if any, of the assays are reliable is difficult, although one of the dates may be deemed accurate if it can be matched against the known date range of diagnostic artifacts found within similar contexts.

b. Prehistoric Components

1) Ceramics

The ceramic sample from the Feature 30 block consists of 32 sherds weighing 57.1 grams. Seven sherds were recovered from feature fill contexts; the remainder were from surrounding soil horizons. Only seven sherds could be assigned to identifiable ware types. One sherd was tempered with an unknown type of crushed stone, and it has been tentatively identified as one of the "experimental wares" of the 1000 to 700 BC period (Puncheon Run Type IV; see Volume II, Appendix H). The other six sherds were tempered with crushed quartz (Types VIa and VIb). Three sherds fit into the classic description of Wolfe Neck ware (700 to 400 BC). The others were thinner and more refined, possibly suggesting a date between those for classic Wolfe Neck ware and Hell Island ware (AD 600 to 1000). All of the identifiable sherds were recovered from nonfeature contexts. The small size of the identifiable sample does not support firm conclusions regarding the use and abandonment of the features, beyond a general indication of occupation in the Woodland I period.

2) Lithics

Twelve projectile points were recovered from the Feature 30 block, of which perhaps seven can be assigned to a diagnostic type. Two points belong to the narrow-blade contracting-stem tradition, similar to the Puncheon pebble points recovered from the Metate block. Both specimens are small, with a mean weight of 3.4 grams. Ritchie (1971) and Custer (1996) assign this type to a broad time range extending from the Late Archaic period to the Early Woodland (2500 BC to AD 1). A rhyolite Fox Creek point is datable to the Middle Woodland period from AD 400 to 900 (Dent 1995:239). Custer (1996) notes that nearly all Fox Creek points recovered in Delaware are made of rhyolite. Plate 28 illustrates a sample of the artifacts from the Feature 30 block.

A rhyolite point that might be typed as a Jack's Reef pentagonal point (Plate 28b) would be one of the rare examples of that variety from Delaware not manufactured of jasper. The atypical material alone suggests an alternative identification, and this point could be interpreted instead as a heavily reworked Fox Creek point. These Middle Woodland types have only slightly different chronological implications: the Fox Creek type dates to about AD 300 to 600, while Jack's Reef points date from AD 600 to 900 (Dent 1995:239). Another possible Jack's Reef notched point, made of jasper, was recovered from Feature 38 (Plate 28d). Attribution to this type would correlate nicely with the radiocarbon date from this feature. However, in several respects this is not a typical Jack's Reef point. Instead of the deep corner notches common for the variety in Delaware, this point is side-notched. A side-notched form, termed Raccoon Notched, has been identified at sites centered in the Wabash and Ohio River valleys in the Midwest, though a secondary distribution extends to New York, southern Ontario, and Pennsylvania (Justice 1987:219-220). Firm identification is uncertain, however, because this specimen does not appear to be as well made as most Jack's Reef notched points found in Delaware. The sample (N=7) of Jack's Reef corner-notched points from the Whitby Branch Site (7NC-G-151) in Odessa (Jacoby et al. 2001) exhibits a mean width to thickness ratio of 4 to 1; in contrast, the Puncheon Run example has a ratio of only 2.8 to 1, reflecting a thicker, cruder manufacture for the Puncheon Run examples. This point actually resembles Late Archaic

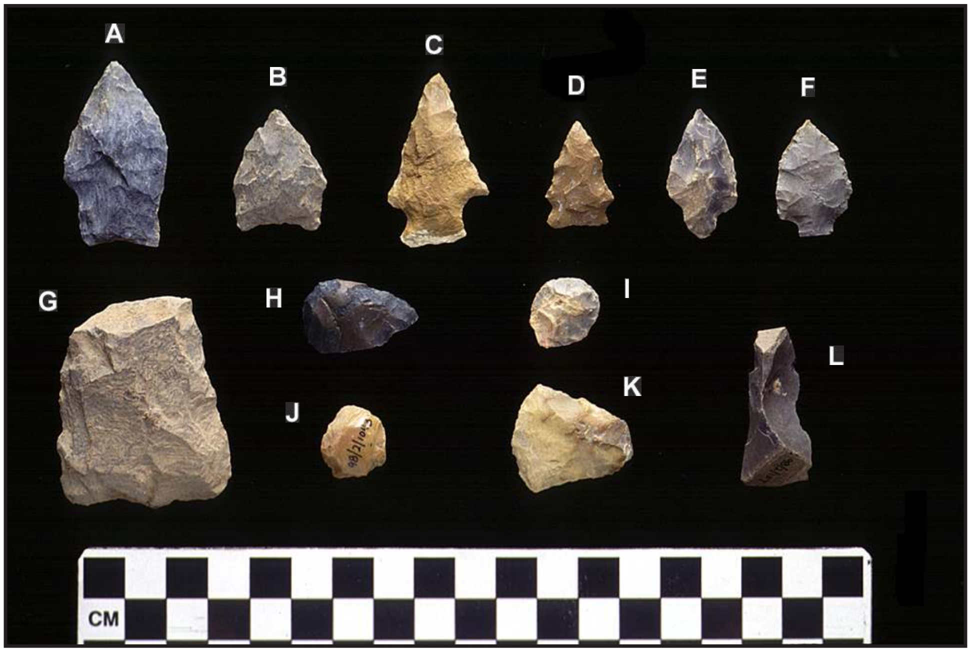


PLATE 28: Tools from the Feature 30 Block

A) Metarhyolite Fox Creek point, Cat. No. 98/2/498, B) Metarhyolite Jack's Reef pentagonal point, Cat. No. 98/2/1373, C) jasper stemmed point, Cat. No. 98/2/1352, D) jasper corner-notched point (poss. Jack's Reef), Cat. No. 98/2/520, E) chert stemmed point, Cat. No. 98/2/363, F) chert stemmed point, Cat. No. 98/2/1381, G) rhyolite middle-stage biface, Cat. No. 98/2/1355, H) chert endscraper, Cat. No. 98/2/1379, I) chert endscraper, Cat. No. 98/2/1377, J) jasper endscraper, Cat. No. 98/2/1043, K) chert endscraper, Cat. No. 98/2/193, L) chert utilized flake, Cat. No. 98/2/157

PLATE 29: Feature 30 Block During Excavation

Brewerton points more than any Middle Woodland type. The dates of circa 4500 rcbp (3500 to 3000 BC) from Feature 30 show that this part of the site was occupied at a time when such points were used, and the point's presence in Feature 38 may be the result of fortuitous inclusion in feature fill.

Rounding out the description of typed bifaces is an argillite base that may be a fragmentary triangular point. Triangular points are typically found in Late Woodland (Woodland II) contexts dating to after AD 800 (Ritchie 1971). A rhyolite late-stage biface with side notches was recovered from Feature 30 fill. This piece displays numerous step fractures on one face with a large unfinished mass toward the tip. In overall design this biface appears similar to such late Archaic period forms as the Brewerton series (Ritchie 1971). Its placement within Feature 30 is probably the result of post-depositional processes associated with the digging and subsequent filling in of the pit, since a late Archaic date would put it a few thousand years prior to the appearance of the people responsible for the creation of Feature 30.

c. Pit Features

The core of this activity area is composed of three large pit features, Features 30, 37, and 38, which are briefly described in this section. Volume II, Appendix K contains a more comprehensive discussion of these features.

1) Feature 30

Feature 30 was a large, steep-sided pit with a round bottom and an oval surface expression (Plate 29). The pit had surface measurements of 300x190 centimeters and a maximum depth below ground surface of 165 centimeters, yielding a minimum volume of about 3,900 liters. In terms of storage capacity, Feature 30 is several times larger than the storage pits located in Locus 1. The dozen silo-shaped pits in the Locus 1 cluster range in volume from 860 to 2,500 liters, with a mean volume of 1,375 liters. To provide a sense of how large this volume is, Feature 30, for example, could hold about 110 bushels of corn. Aside from its large size, Feature 30 is notable for its internal structure. In profile (Figure 51) the pit is clearly segmented between a highly homogeneous organic central fill and displaced or redeposited masses of B-horizon soil along the feature's northern and southern edges. The B-horizon masses are very symmetrical in appearance and have been interpreted as possible load-bearing ledges or steps. This argillic soil contains a greater concentration of clay-sized particles and is more compressible than the coarse-textured loam sand above and below it. Ledges could have supported wooden shelves for underground storage, and steps may have facilitated access into the large pit.

The size of Feature 30 and its internal structures accommodate an alternative interpretation of the feature as a *chiacosan*, or burial pit. Burial practices of the Lenape and Nanticoke Indians involved an initial period of interment, followed by reburial of the de-fleshed bones (Loskiel 1794). In this scenario, the hypothesized ledges could have functioned as supports for the dead. However, there is no direct archaeological evidence that Feature 30 was used as a burial pit—no human remains, funerary goods, or significant chemical signatures were recovered from the excavation. Various chemical signatures have been considered as possible indicators for human burials, including elevated levels of calcium, phosphorous, zinc, and copper, and a recent study has identified the ratio of zinc to copper as a key indicator, regardless of the concentrations of these elements (Beard et al. 2000). The soil chemistry of Feature 30 did not stand out with regard to any of these measures.

Feature fill contained nearly 130 manufactured artifacts, including several small ceramic fragments which were too small for identification. A variety of stone tools and manufacturing debris was contained in the Feature 30 fill. Among these were two projectile points and two untyped bifaces. Four cores were retrieved from the feature, including a quartz freehand core, chert freehand core, jasper tested cobble, and a jasper core tentatively classified as bipolar. The unifacial tool sample is composed of a chert endscraper and a jasper utilized flake. The endscraper exhibited use-wear characteristic of hide scraping. Two sandstone hammerstones round out the tool assemblage. In addition to the tools, 118 flakes were recovered in the fill, with 56 percent chert and nearly equal quantities of jasper, rhyolite, quartz, and quartzite. The high artifact content in this feature clearly distinguishes it from the clustered storage pits excavated in Locus 1 which yielded very little material culture. Also recovered were about 100 small fragments of calcined bone. The bone was identifiable only as small mammal remains.

2) Feature 37

Feature 37 was a shallow, flat-bottomed pit located 2 meters east of Feature 30, with surface measurements of approximately 400x300 centimeters. The maximum depth of the pit was 45 centimeters below ground surface, though average depth reached 30 centimeters. The southeastern portion of the pit was somewhat amorphous, and may have been disturbed by rodent activity. The feature contained about 450 artifacts, exhibiting a density significantly higher than elsewhere in the Feature 30 block. Among the artifacts recovered from within and near the feature were six formal scrapers, accounting for 40 percent of the 15 recovered from the entire site. Three positive protein residue reactions to eel and shad were obtained around the perimeter of Feature 37, suggesting that fish were filleted or descaled there. Clearly, this feature represented a specialized activity area.

Feature 37, with its flat bottom and broad outline (Figure 52), displays some of the characteristics of the prototypical "Delaware pit house" (Custer and Silber 1995, Custer et al 1996). This feature form has been interpreted by some researchers as a cold-weather residential structure. Often, features identified as a pit house included interior storage pits or sleeping ledges. No internal structures were detected within Feature 37, and definitive classification of this pit is unclear.

3) Feature 38

Feature 38 was similar in form and size to Feature 30, into which it tangentially intrudes. The feature measured 300x220 centimeters, with a maximum depth of 135 centimeters (Figure 53) and a volume of 4,500 liters. Internal structures were not as well defined as in Feature 30, but the north profile of Feature 38 revealed relocated B-horizon soil in contexts similar to those seen in Feature 30, suggesting the presence of ledges or steps. Feature 38 is interpreted as a large food-storage pit, although other functions, such as a *chiacosan* pit, are possible.

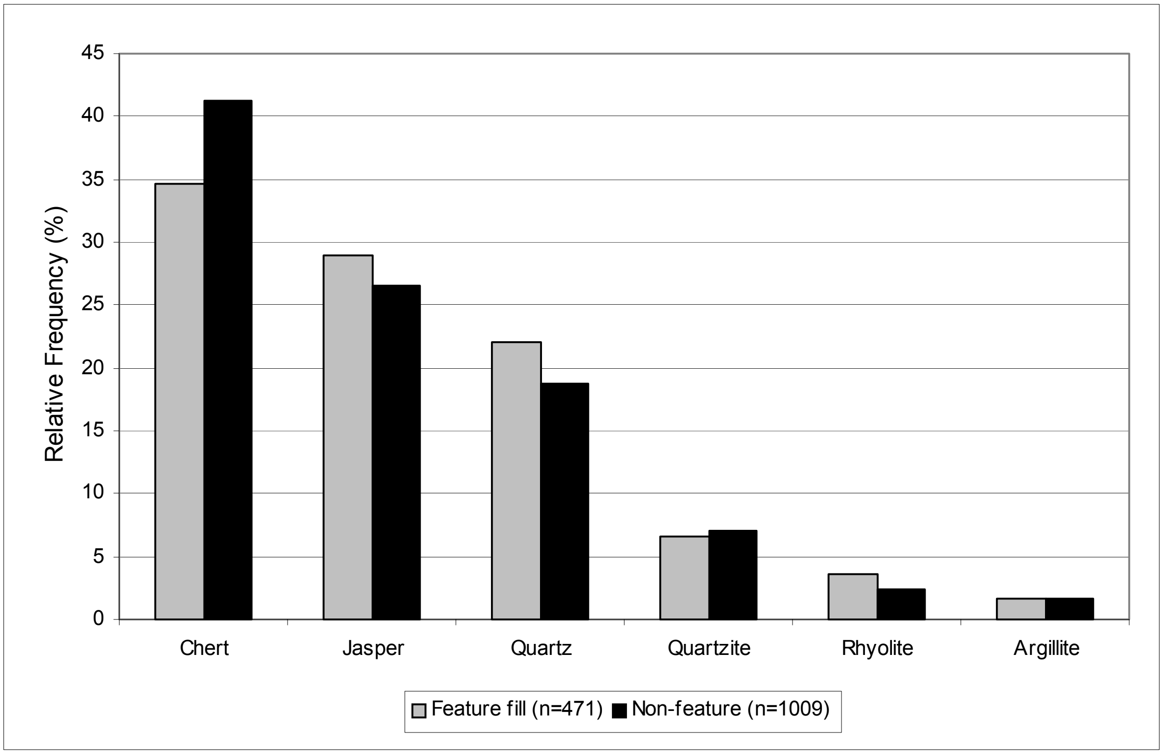


FIGURE 54: Raw Material Composition of Debitage Assemblages, Feature 30 Block

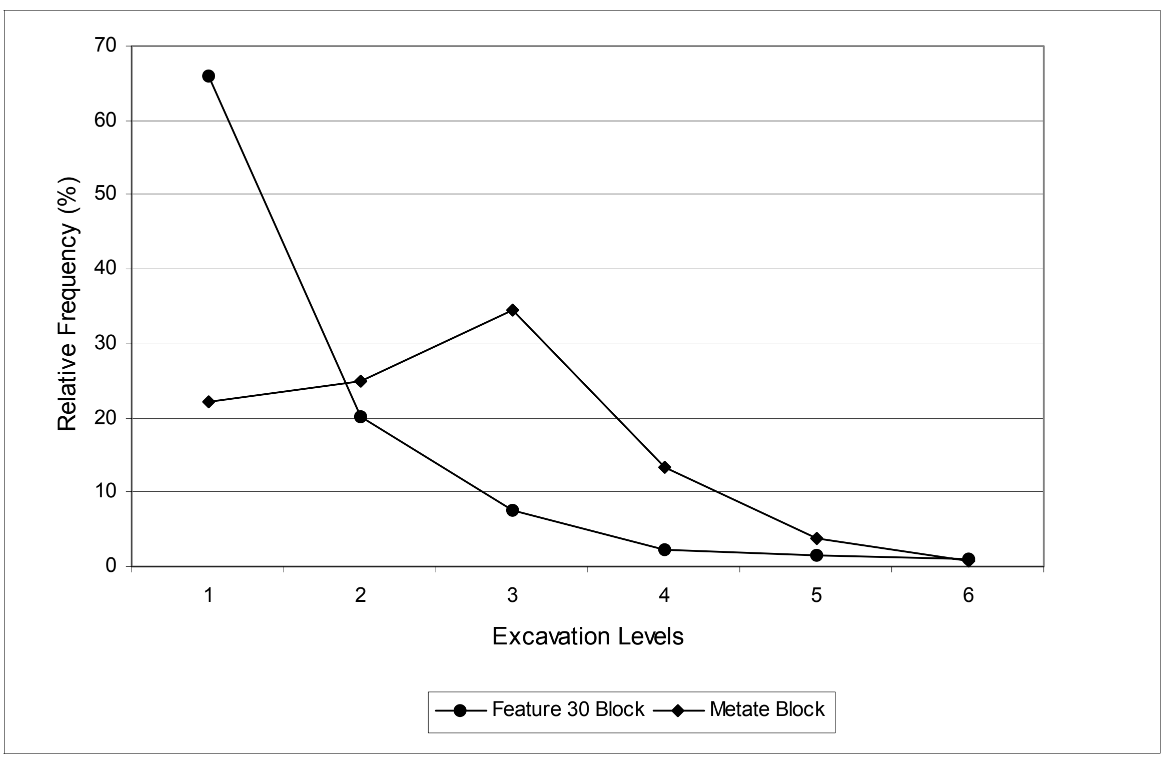


FIGURE 55: Debitage Frequency by Excavation Level, Feature 30 Block Versus Metate Block

interpreted as the result of longer exposure to natural postdepositional processes, particularly bioturbation, in the Metate block. Stated differently, the primary occupation of the Feature 30 block must be of more recent origin.

Nevertheless, Feature 30 produced two radiocarbon dates from Level 8 (Beta-131143 and Beta-136095) of about 4500 rcbp. These dates may pertain to the same Late Archaic occupation sequence that was responsible for the ca. 4300 to 3800 rcbp dates from the Metate block (see Table 22). This would also account for the Brewerton-like point found in Feature 38. Of course, the presence of small, untyped ceramic sherds in the Feature 30 fill is sufficient to demonstrate that the pit was dug some time after 3000 rcbp. The accumulation of chipping debris in the plowzone in the Feature 30 block is likely to be the product of a Middle Woodland occupation associated with the 1,330±80 BP date (Beta-131145). This proposed timing for the bulk of the lithic reduction activities in the Feature 30 block also barely coincides with the assigned dates of the recovered Fox Creek points, circa AD 300 to 600 (although, as discussed below, the debitage and bifaces represent quite different lithic preferences).

With a possible chronology for the Feature 30 block established, attention can be turned to the patterns of lithic raw material selection and tool use. Rock outcrops are rare on the Delmarva Peninsula south of Newark, Delaware, but native flint-knappers were able to fulfill most of their requirements for workable stone from locally exposed cobble deposits. Some of these cobble beds can be seen today in the Puncheon Run stream channel and in hollows created by tree falls. It is clear that pre-contact Native Americans must also have observed and utilized these cobble beds for their tool needs. The most common lithic raw materials recovered from Feature 30 block excavations were, in order of occurrence, chert (35%), jasper (25%), quartz (20%), and quartzite (8%). These materials are typical of the nodules in exposed cobble beds found onsite and along local streams. Minority raw materials consisted of rhyolite (2.8%) and argillite (1.7%). Table 30 presents data on the distribution of chipped-stone artifacts by raw material.

TABLE 30: LITHIC RAW MATERIAL PROPORTIONS OF CHIPPED-STONE ARTIFACTS AT THE FEATURE 30 BLOCK

ARTIFACT CLASS	RAW MATERIAL						
	Chert	Jasper	Quartz	Quartzite	Rhyolite	Argillite	Other
Biface (N=27)	18	18	26	4	22	11	.
Core (N=32)	25	47	19	9	.	.	.
Uniface (N=16)	50	38	6	.	6	.	.
Debitage (N=1,490)	39	27	20	7	3	2	2

Some observations about the raw material frequencies can be made. First, there is little correlation between the biface and the debitage samples with respect to raw material composition. Fully one-third of the bifaces are manufactured from rhyolite and argillite, yet these raw materials account for only a small fraction of the debitage sample. Chert and jasper on the other hand are underrepresented by bifaces compared with their debitage frequencies. There could be numerous causes for this situation. Different raw materials exhibit physical characteristics which often result in dissimilar flaking patterns. For example, at the Whitby Branch Site (7NC-G-151) near Odessa, Delaware, core reduction activities generated quartz and quartzite flakes that were on average two to three times the size of chert and jasper flakes, yielding a higher flake to tool ratio for the latter raw materials (Jacoby et al. 2001). Differences in raw material proportions between artifact classes could also result from contrasting patterns of use and discard, where the location of tool manufacture differs from the location of tool use or abandonment.

Another observation regarding lithic raw material selection concerns the absence of rhyolite or argillite cores. Both of these materials are nonlocal in origin and may have been obtained by long-distance trade. Lithic material obtained indirectly through trade or exchange often appears in the form of bifacial blanks decorticated prior to transfer (Johnson 1989; Stewart 1989).

No rhyolite or argillite cores were recovered from the Feature 30 block, but these materials were otherwise well represented in the lithic assemblage (see Table 30). When compared to the Metate block, the Feature 30 block had a much higher proportion of rhyolite and argillite bifaces and points, while debitage proportions are equivalent for the two areas, indicating a clear preference for exotic materials for bifaces and points at Feature 30. A chi-square test of the representation of raw materials used for points between the two feature areas demonstrates that points from the Metate and Feature 30 blocks are quite distinct (χ^2=12.29, *df*=1, *p*=.001).

Two possible, though not mutually exclusive, underlying factors may be suggested for this difference. First, the pattern may be a product of different populations with distinct *cultural* preferences for certain lithic raw materials. This may have taken the form of symbolic color preferences (Pietak 1999; Sahlins 1976) or traditions of place with regard to lithic sourcing. Second, the distributions may represent *functional* differences of raw material. Because of differing physical characteristics, raw materials may have been selected for specific performance capacities. Argillite, for example, is an easily worked raw material, but dulls quickly compared to chert or jasper when used upon hard material (Stewart 1987:37). The structure of an artifact assemblage can therefore be seen as a continuum between technical and socio-cultural considerations.

An interesting component of the Feature 30 assemblage is the sample of endscrapers. These tools are usually defined as formal, highly modified unifaces with edge angles greater than 50 degrees and a capacity for repetitive resharpening. Their blunt angle of their working edge has led many to believe that they were specifically fashioned to work hard materials, such as bone, antler, or wood (Cavallo 1987; Stewart 1994; Tainter 1979). However, use-wear analysis (see Volume II, Appendix G) of five endscrapers from Feature 30 indicates a repeating pattern of scraping of hide or other medium-soft material. Analysis of a selected sample of flake tools from this area revealed a range of inferred activities, including scraping or carving on hard and soft materials (Table 31). Formal scrapers of this sort were found only in Locus 3, and, of 15 recovered specimens, seven came from the Feature 30 block. Their spatial clustering suggests a correlation not simply between function and location, but also of timing. A common activity performed in a circumscribed locale was probably the product of a single group of people over the course of one or several seasonal visits.

TABLE 31: USE-WEAR ANALYSIS OF TOOLS FROM THE FEATURE 30 BLOCK

Tool Type	Raw Material	Context	Inferred Activity
Utilized Flake	chert	Unit 318, Fea. 30, A-1	wood shaving?
Utilized Flake	chert	Unit 319, Fea. 30, A-1	scraping medium-hard material
Utilized Flake	chert	Unit 380, Fea. 37, A-4	scraping
Utilized Flake	chert	Unit 453, Fea. 38, A-1	scraping medium-hard material
Utilized Flake	chert	Unit 468, Fea. 37, A-1	scraping or carving fresh wood
Utilized Flake	jasper	Unit 211, Fea. 30, A-1	cutting
Utilized Flake	jasper	Unit 211, Fea. 30, A-1	cutting
Utilized Flake	jasper	Unit 380, Fea. 37, B-5	shaving or carving wood
Utilized Flake	jasper	Unit 380, Fea. 37, A-7	inconclusive
Utilized Flake	jasper	Unit 472, Fea. 37, A-1	butchering flesh
Endscraper	chert	Unit 320, Fea. 30, A-3	scraping hide
Endscraper	chert	Unit 440, Fea. 37, A-8	scraping hide, haft-wear
Endscraper	chert	Unit 471, Fea. 37, A-1	scraping
Endscraper	chert	Unit 473, Fea. 37, A-2	scraping hide
Endscraper	chert	Unit 473, Fea. 37, A-3	scraping soft and medium materials
Late-Stage Biface	rhyolite	Unit 318, Fea. 30, A-3	basal grinding
Biface Fragment	chert	Unit 368, Fea. 30, B-2	cutting, limited
Projectile Point	jasper	Unit 472, Fea. 37, B-2	piercing
Projectile Point	rhyolite	Unit 315, Fea. 30, C-3	cutting

e. Conclusions

Several inferences can be made about the Feature 30 block. First, it is distinguished by a pair of deep, internally divided pits that may have served as long-term storage facilities. The proximity and similarity in shape, depth, and internal structure of Features 30 and 38 suggest that they were constructed and used by contemporaneous people making seasonal visits to the area for the purpose of collecting, processing, and storing food resources. Formal tool analysis indicates an emphasis on scraping activities within the area, some of which can be associated with hide processing. The activity area contains a suite of radiocarbon dates and a few diagnostic artifacts from throughout the Woodland I period, but the most likely timing of visits associated with the excavation and use of the deep pits is circa AD 500 to 900. This estimate is based on (1) the recovery of a Fox Creek and Jack's Reef point, (2) a date of 1,330±80 radiocarbon years BP (Beta-141145) from Feature 38, and (3) the absence of leaching from the well-defined pit outlines, which suggests an age of less than 2,000 years in the coarse-grained soils of Locus 3.

Storage pits have been associated with a range of cultural phenomena, including the development of social complexity, sedentism, and population increase (DeBoer 1988; Stewart 1975; Testart 1982). Surplus food was preserved and stored for periods of scarcity, sometimes hidden from aggressive neighbors, and frequently used as trade goods in exchange networks. Although researchers disagree on the causal relationship of storage facilities and increased sedentism, it is apparent that the capacity to produce surplus food for whatever aim is an indicator of developing complexity in the manipulation of labor. Storage capacity is thus a rough guide to the social complexity of a society, making the investigation of storage pits an important endeavor, regardless of the contents of the pits.

An interpretation of Feature 37 is more difficult because it lacked a distinct form and well-defined edges. Its amorphous shape was perhaps the product of a natural process, such as a tree fall, large animal burrow, or some combination of the two. However the feature and its periphery contained a high density of debitage, formal scrapers, and bifaces. In addition, the three positive protein residue reactions obtained from the Feature 30 block came from the Feature 37 periphery. The shallow, flat feature bottom and associated artifacts are somewhat suggestive of a pit house, and this interpretation cannot be conclusively ruled out. Though lacking any internal features, such as a storage pit and hearth (Custer 1994:46-64), often identified within such residential structures, or the external postmolds that are associated with residences in Piedmont sections of the Middle Atlantic region (Mueller and Cavallo 1995), Feature 37 clearly contains the elements of a specialized activity zone.

4. Other Features

Within Locus 3 the hearths of the Metate block and the large storage pits of the Feature 30 block received the majority of attention during data recovery. However, hearths and other feature types outside these areas were also investigated, including a small parabolic pit, a large amorphous pit/disturbance, and several chipping clusters.

a. Features 15, 16A, and 16B

Three medium-sized hearths were identified close together near the southern edge of Block 3. Features 15, 16A, and 16B contained about 50, 163, and 49 pieces of fire-cracked rock, respectively. Pit outlines were not detected in any of these clusters, and the fire-cracked rock is presumed to have been arrayed directly on the ground surface. No charcoal or burned nutshell was evident in the features. These three hearths were comparable to those identified in the Metate block, yet the associated lithic debris around these features was much less than that in the Metate block; debitage surrounding Features 15, 16A, and 16B is counted in the dozens rather than in the thousands, and the tools in the hearths and adjacent units include only three bifaces. The association of two pieces of steatite, or soapstone, with Feature 16A provides the only indication of the period of use for these features. Use of steatite for bowls predates the discovery of pottery, circa 1200 BC, placing Feature 16A, at least, in the same general time frame as the major occupation of the Metate block. (Features 16A and 16B are illustrated in Plate 15.)

b. Feature 32

Feature 32 was a large, shallow pit that resembling the type identified by Custer (1994) and others as a pit house. It was originally identified during HRI's 1995 Phase II investigation, with the excavation of four 1x1-meter units. Feature fill was detected extending to a maximum depth of 45 centimeters beneath the plowzone, in what can be described as a partial-basin shape. The feature was not fully excavated, but in plan it displays a somewhat linear pattern. Although not referenced in the HRI report, the feature was recorded on HRI's field drawing Number 61; in that drawing, a large anomaly labeled "tree disturbance" obscures much of the feature in south and east wall profiles.

During Berger's extended Phase II investigation, Block 3 was placed adjacent to the HRI units. No evidence of the pit was found during Berger's Phase II fieldwork, but a scatter of fire-cracked rock, investigated as Feature 15, was found in Block 3. As the HRI excavation data suggested that this was one of the best examples of a pit house, it was further investigated during the final data recovery program, with the expectation that confirmation of this feature as a residential structure would help define community settlement patterns in terms of the base camp model for the Woodland I period.

During final data recovery, Berger re-opened the HRI units, excavated an additional five units around it, and designated the anomaly as Feature 32 (Figure 56). HRI's interpretation of this feature as a pit house was based largely on three factors: (1) the identification of feature fill, (2) a fire-cracked rock cluster extending into the top feature level, and (3) the recovery of several tools and about 80 flakes. A review of HRI's documentation of this feature raised some questions of its identification as a pit house. First, HRI's descriptions of the feature fill (dark yellowish brown silty sand) were essentially the same as eluviated soils found within intact horizons at matching depths, which precluded unambiguous definition of the feature boundaries. An extensive tree disturbance in the center of the feature profile compounds the problem of defining the feature fill boundaries.

Another issue regarding the identification of Feature 32 as a pit house is the presence of an interior hearth, represented by the cluster of fire-cracked rock. Interior hearths have been noted as elements in some Delaware pit houses (Custer 1984), and this hearth was cited by HRI as a reason for interpreting Feature 32 as a pit house. These "hearth stones," however, were well above the floor of the feature, meaning that they were deposited after the feature had already begun filling in with sediment. The fire-cracked rock deposit would thus postdate the episode during which this feature (tree throw, animal burrow, or cultural pit) was open to the elements. The concentration of fire-cracked rock is one of several clusters, including Features 15, 16A, and 16B, identified in the vicinity of Feature 32.

Berger's expanded excavation failed to confirm the initial interpretation of Feature 32 as a semisubterranean pit house. Specifically, the Phase III excavation could not discern evidence for a living surface within the anomaly, nor, in the eyes of the most experienced excavators, could the feature fill be clearly separated from the surrounding intact E-horizon soils. The most likely origin of this feature was a natural disturbance, such as a tree throw.

Berger's investigations resulted in the recovery of several tools and approximately 250 flakes, along with fire-cracked rock, from the excavated units. Though clearly not associated with this noncultural anomaly, the tools and flake assemblage resemble others found in Locus 3 in size and composition, and are interpreted as a single-occurrence chipping station (see discussion of chipping stations below in Section d).

c. Feature 33

Feature 33 was a small, basin-shaped pit located between Blocks 1 and 2 in Units 337 and 354. The pit measured 50 centimeters in diameter and 30 centimeters in depth, with feature fill that was only somewhat more organic in color than the surrounding subsoil. Nevertheless, the feature outline was clear and appeared to be of cultural origin. Few flakes were recovered from the feature fill, but a

PLATE 30: Feature 4, Unit 118, Locus 3

Puncheon pebble point was found at the base of the pit in association with a small charcoal sample, which returned a date of 2,480±40 radiocarbon years BP (Beta-136091). The point yielded positive protein residue results for American eel, Bay anchovy, and deer (see Volume II, Appendix J). A concentration of debitage (N=182) was recovered from the two units surrounding the pit feature. Feature 33 is interpreted to have been a small storage or processing pit associated with a single- episode lithic reduction station (see discussion of chipping stations in the following section).

d. Chipping Clusters

A number of small, dense concentrations of lithic debris were identified in Locus 3, and a number of these were excavated during the Phase II and Phase III investigations. Because slightly different methodologies were employed during the excavation of the Metate block, this discussion focuses on the clusters from other parts of Locus 3.

Feature 4, located in Block 6, yielded several cores and bifaces, and 516 flakes. Measuring about 110 centimeters in diameter, Feature 4 was entirely contained within the topmost subsoil level (Plate 30). A second chipping cluster, containing 220 flakes, was found about 12 meters to the south in

Unit 447. This cluster was associated with a large cobble anvil or grinding stone weighing 15.6 kilograms and measuring 350 centimeters in length.

Feature 33 was a small pit measuring about 50 centimeters in diameter and 30 centimeters in depth; 190 pieces of debitage were recovered from the two units that contained the feature, but only eight pieces of debitage were recovered from the feature itself. Other clusters containing about 170 flakes each were identified in Units 77 and 89 (Block 5), and Unit 83 (Block 6). (No feature numbers were assigned to these clusters.) The pattern of discrete clusters of debitage, rather than a generalized distribution, is consistent with other evidence (e.g., the absence of pit house features), indicating that Locus 3 deposits were the product of cyclical but short-term procurement and processing behaviors.

The six chipping clusters (Features 4, 32, and 33, and Units 77, 83, and 89) are highly variable in their raw material compositions, yet they show remarkable similarity in flake size frequencies (Tables 32 and 33). The variance in raw material composition between the chipping clusters reflects the highly variable nature of the Columbia formation cobble deposits, which were the primary source of lithic tools in the Middle Atlantic Coastal Plain and at the Puncheon Run Site. Feature 4 stood out from the others because of the large amount of quartzite, which was only a minor constituent of the other features. A correlation analysis showed that the two features most similar to each other were Features 32 and 33; in both of these, quartz was the most common material. Jasper, the most common raw material for finished projectile points in Locus 3, especially the small, contracting-stemmed points, was not the most common material in any of the chipping clusters and made up only 17 percent of the total.

TABLE 32: SUMMARY OF PREHISTORIC ASSEMBLAGES, LOCUS 3 CHIPPING CLUSTERS

Artifact Class	Feature 4	Feature 32	Feature 33	Unit 77	Unit 83	Unit 89
Biface	4	1	1	3	.	.
Uniface	.	.	.	.	.	.
Core	9	3	.	3	.	.
FCR	1	106	4	14	3	.
Debitage						
<6 mm	3	.	.	.	.	.
6-10 mm	58	21	15	23	28	15
11-15 mm	211	69	80	80	80	65
16-20 mm	88	42	38	32	39	43
21-30 mm	70	38	47	22	25	28
31-40 mm	49	6	7	6	3	13
41-50 mm	23	2	3	5	.	4
51-60 mm	9	1	.	.	.	1
>60 mm	5	.	.	.	.	.
Debitage Total	516	179	190	168	175	169

TABLE 33: RAW MATERIAL OF DEBITAGE, LOCUS 3 CHIPPING CLUSTERS

Material	Feature 4	Feature 32	Feature 33	Unit 77	Unit 83	Unit 89
Chert	226	44	49	60	58	65
Jasper	56	40	27	39	52	26
Quartz	48	57	77	36	42	30
Quartzite	173	25	35	26	16	33
Other	13	13	2	7	7	15
Debitage Subtotal	516	179	190	168	175	169

Differences in raw material characteristics have been shown to sometimes play an important role in flake size variation independent of the reduction sequence or mode (Jacoby et al. 2001:7; Shott 1994:81). Fracture mechanics, material density, and impurities all contribute to the manner in which a rock will split apart when force is applied, resulting in patterned variations. For this reason some researchers have criticized the use of flake size as an inappropriate artifact attribute, preferring to apply formal traits (e.g., platform angle and preparation, flake scar count, etc.) to describe flake types within a reduction sequence. Nevertheless, flake size has been shown to accurately describe certain modes of lithic reduction when used in a mass assemblage (Ahler 1989; Patterson 1990). This approach was used on the Puncheon Run flake assemblage and proves useful for analyzing the Locus 3 chipping clusters. As noted, the differences in raw material in this context were not reflected in differences in flake size.

The flake size distributions in these clusters are all roughly similar to each other (Figure 57). In each case the peak in the distribution comes in the 11- to 15-millimeter range, with a relatively smooth decline on either side. The similarity in size frequency curves suggests that factors other than raw material composition are the critical determinants of flake size. For the Locus 3 chipping clusters, these other factors may include the learned limits of optimum cobble size and reduction behaviors common to procurement and processing camps. Comparing the flake assemblages from the chipping clusters with those from the assemblages generated by experimental replication of small, narrow-bladed stemmed points shows significant differences (see Volume II, Appendix M). In the experimental assemblages, the peak in almost all of the distributions comes in the 6- to 10-millimeter size range. A possible factor is the difference in the size of the screen used; for the experimental collections, 3-millimeter (⅛-inch) screen was used to recover material, whereas during the Phase II testing of Locus 3, 6-millimeter (¼-inch) screen was employed. However, even during the Phase III excavation of the Metate block, when 3-millimeter (⅛-inch) screen was used, the debitage assemblage still had a smaller proportion of small flakes than most of the experimental assemblages. The curve that comes closest to matching the debitage size distribution from the Metate block is from tool 9904, a chert early-stage biface.

A close look at Feature 4, the largest chipping cluster, can help explain this difference. Among the artifacts recovered from Feature 4 were six tested cobbles, three other cores, and four bifaces. Of the Feature 4 debitage, 50 percent had remnant cobble cortex, compared to 28 percent in the Metate block and 24 percent in the experimental assemblage. Therefore, the debitage from the chipping clusters probably represents an earlier stage of cobble reduction than the experiments; the person

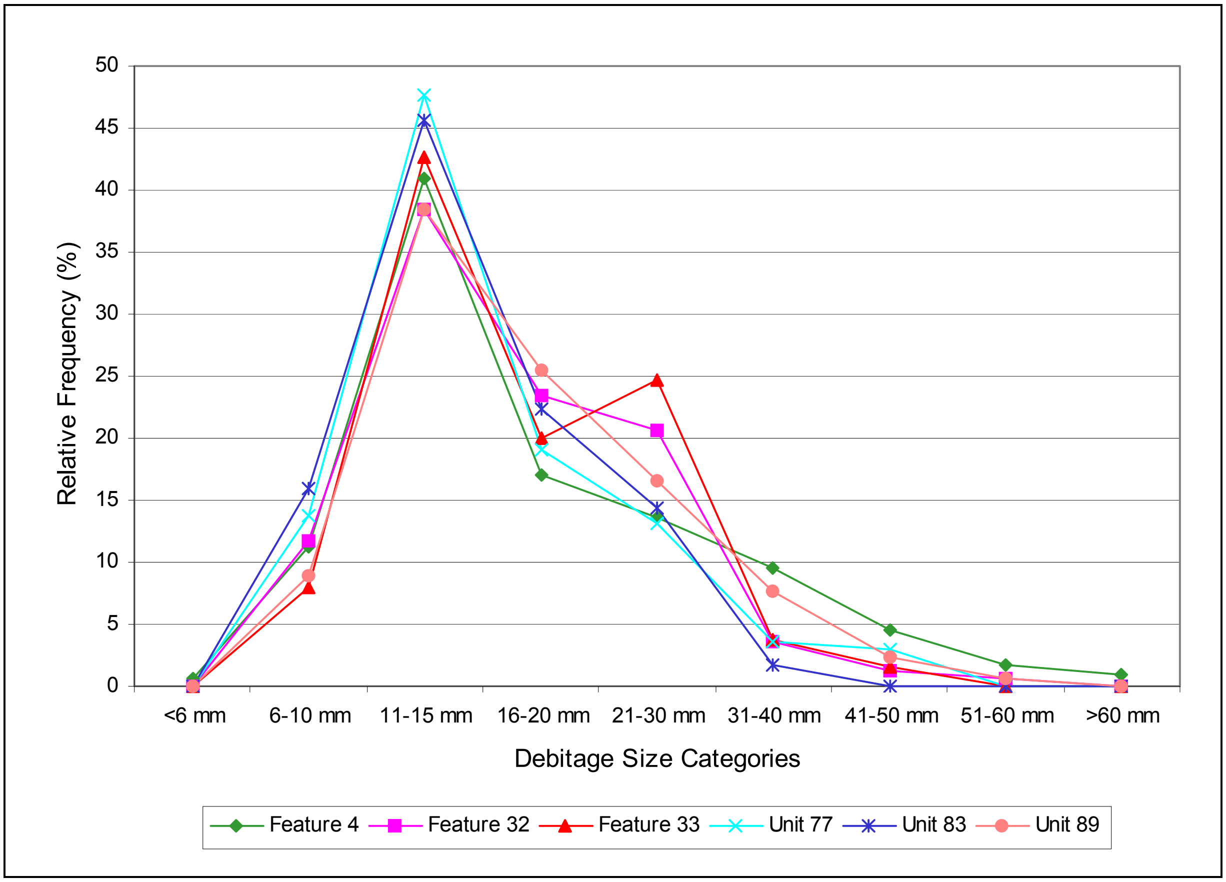


FIGURE 57: Debitage Size Frequencies by Size Categories for Locus 3 Chipping Clusters

who carried the cobbles to Feature 4 reduced relatively few of them to late-stage bifaces or finised points. Thus, the chipping clusters do not seem to represent episodes during which a single cobble was reduced to a point or late-stage biface.

Tools found in Locus 3 included a number of utilized flakes, some of which had been minimally retouched and some of which had been scarcely modified at all. The clusters reflect this reliance on a range of tools, from finished points to flakes. Therefore, the clusters may have been associated with some other activity, rather than simply the manufacture of formal stone tools. That is, the clusters may represent stations where expedient tools were prepared during, say, the construction of a shelter or the butchering of a deer.