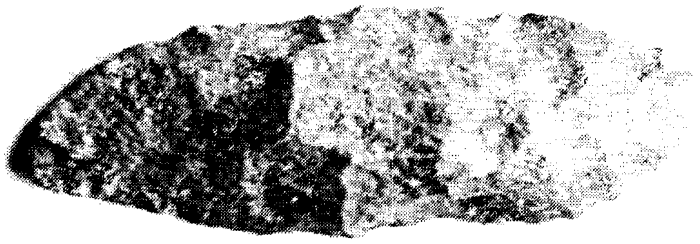


Plate 9
**Biface**
Photograph of a biface discovered during early survey work at the site; see figure 14 for a drawing

# 7. TOOL MORPHOLOGY AND CHRONOLOGY

ARTIFACTS MAY BE CLASSIFIED in a number of different ways, depending on the specific research questions addressed. Morphological classifications are useful, however, in establishing chronology and facilitating comparisions with other sites. In this report, the artifacts are presented from the bottom up, and are grouped by soil zone. (FIGURES 28-39). Cores are illustrated in a separate series (FIGURES 41-43) in the same order. Interpretations are offered together with descriptions, in order to present a coherent picture of what was found and how the authors interpreted their findings.

LOWER ZONE III

Burin (ER 159dd): One 4 cm long jasper cortex flake was recovered from the lower part of Zone III which had a pointed tip created by typical burin flakes. Such tools were probably used for carving or incising wood or bone tools.

Flake scraper or knife (ER 159z): This 3.7 cm long jasper flake has been reworked along part of one edge to form a sharp cutting or scraping edge.

The small number of tools recovered from lower Zone III makes it difficult to characterize the activities which took place during the occupation. The absence of projectile points or point fragments suggests that the site was used for procurement activities other than hunting.

MIDDLE ZONE III

Side-scraper (ER 86v): This well-made chert unifacial side-scraper shows polish on the reverse side, suggesting use on a comparatively soft material.

Again, the small number of tools recovered from this zone makes it difficult to characterize the activities which took place during the occupation. The absence of projectile points or point fragments suggests that the site was used for procurement activities other than hunting.

UPPER ZONE III

End-scraper (ER 159n): This heat-treated jasper non-cortex flake appears to be in the process of being shaped as an end-scraper.

Utilized flakes (ER 125cc): Utilized flakes are unifacial scrapers which have not been intentionally shaped. Instead, the sharp edge of a flake is used for cutting or scraping purposes. In the process, small flakes are removed from the working edge, making it possible to distinguish these tools from flakes which have not been used. One chert utilized flake was recovered from Upper Zone III.

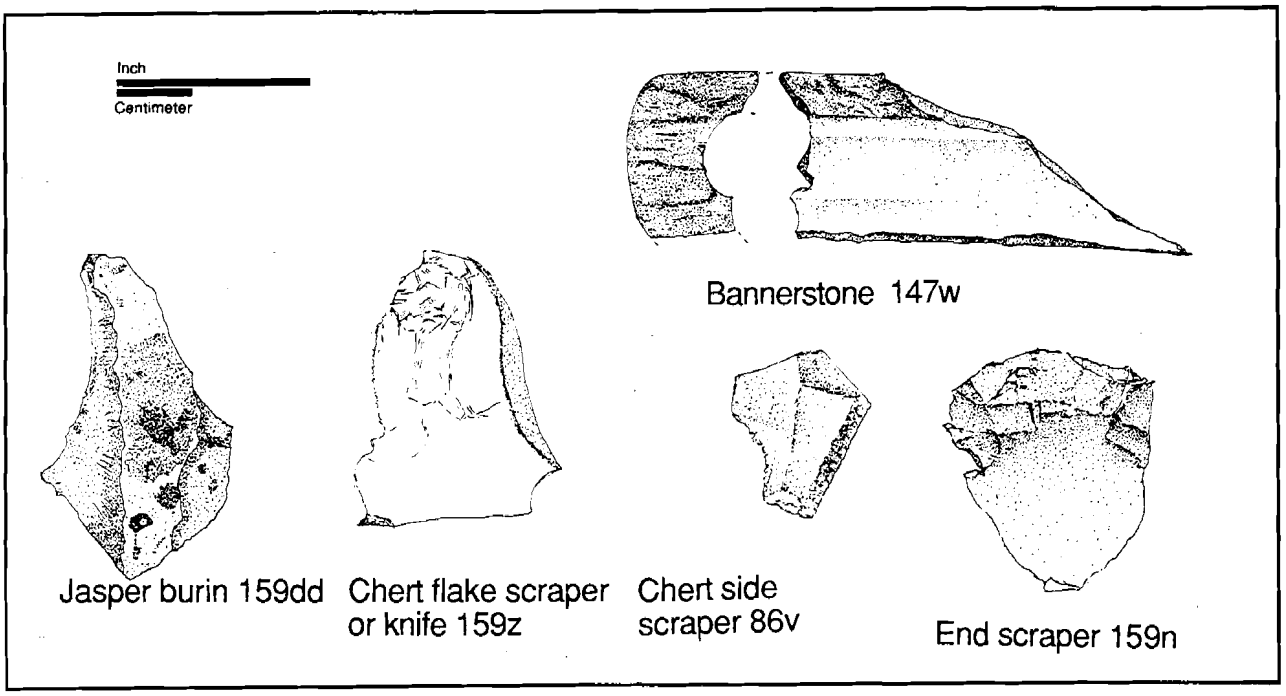



Figure 28
**Artifacts from Zone III**

Bannerstone (ER 147w): A single fragment of a banded slate bannerstone was recovered from the upper part of Zone III. Bannerstones have been reported by Coe in deep levels.

Grinding stone (ER 157n): A large flat cobble, probably quartzite, was recovered from the upper part of Zone III. The only evidence of use is polish on one flat surface. (FIGURE 29)

Although the number of tools recovered from Upper Zone III is larger than the number recovered from lower levels, it remains difficult to characterize the activities which took place during the occupation. The absence of projectile points or point fragments suggests that the primary use of the site was for procurement activities other than hunting, but the bannerstone fragment suggests that some hunting may have taken place. The presence of a grinding stone, rare in such early levels, suggests that processing of plant materials may have been one activity.

LOWER ZONE II

Palmer Points (ER 79z, 89ii): One chert base and one complete jasper point attributable to this Late Paleo-Indian notched point type were recovered from the base of Zone II, at or just above the interface with Zone III. The complete example has clearly been reworked, while the base fragment may have been broken during manufacture. This point style is considered the earliest of the notched types (including Palmer, Amos, and Kirk points) which follow the fluted styles and precede the bifurcate style (Coe 1964; Broyles 1971; Custer 1989:87; Gardner 1974). Broyles (1971:45) suggests a date before 10,000 B.P. Snow (1980:168) reports that ". . .the Richmond Hill site on Staten Island produced a date of 9360 B.P. ± 120 [I-4929] associated with Palmer Corner-Notched and Hardaway points." However, Chapman (1976:5) feels that the notched points are not Palmer, but Kirk variants. Zone II artifacts are illustrated in figure 30, on page 55.

Late Stage Biface (ER 135q): A single converging stemmed biface with a

straight base in a late stage of manufacture was recovered from the base of Zone II. This biface appears to have been made from a jasper pebble little bigger than the projected tool, and to have been discarded when a thinning flake ended in a hinged fracture. There are remnants of cherty cortex on both surfaces, and some of the pebble surface is still present at the tip.

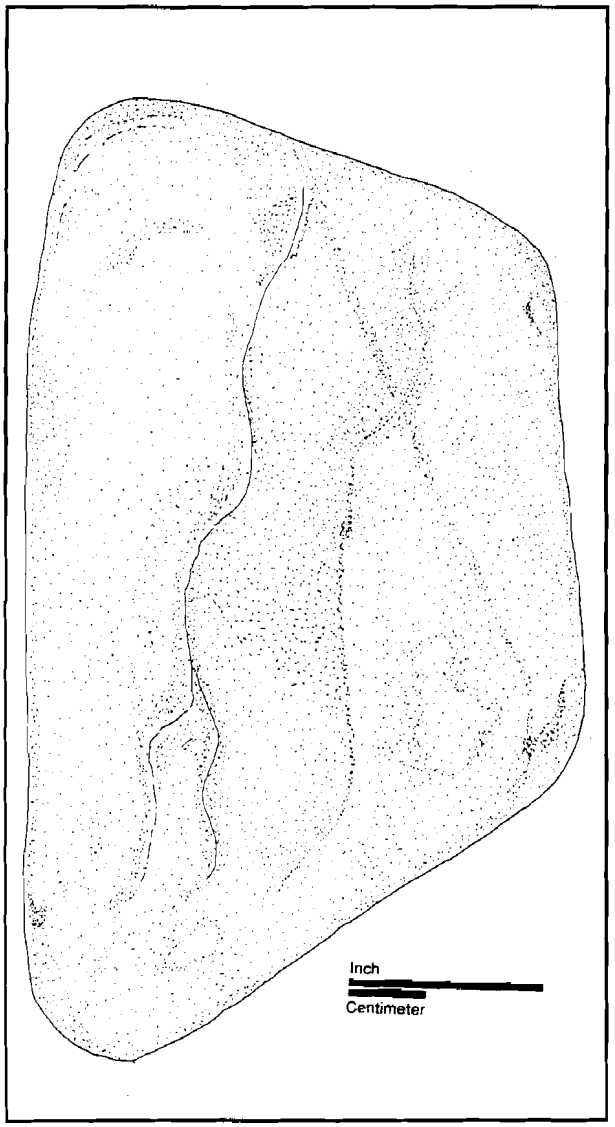



Figure 29
**Grinding stone from ER 157n**

Utilized flakes (ER 76w, 79w): Two jasper utilized flakes were recovered from Lower Zone II.

Biface fragments (ER 80z, 126q): In addition to the tools described above, fragments of two bifacial tools were recovered from the base of Zone II.

The majority of the tools recovered from Lower Zone II were bifaces or biface fragments. This suggests that the replenishment of a hunting-related tool kit was the primary activity during this occupation.

MIDDLE ZONE II

Early Stage "Biface" (ER 150j): Although this quartzite tool is actually unifacial, it appears to be a biface in a very early stage of manufacture from a 90 mm long flake. One end of the flake has been worked on one side. At the unmodified end, a medial ridge formed by two long flake scars is visible.

Utilized flakes (ER 86v, 98o, 98p, 100j, 176l): Six utilized flakes were recovered from Middle Zone II, of which four were jasper and two chert.

Scrapers (ER 99p, 82j): Both unifacial jasper flake tools have been intentionally reworked along one or more edges.

Biface fragments (ER 88oz, 90y): In addition to the tools described above, fragments of two bifacial tools were recovered from the middle of Zone II.

Stone Sphere (ER 90bb): This unusual object has been pecked and polished. It is difficult to determine the material, but it appears to made from a fine-grained material, possibly quartzite. A similar object was found at the Dover Downs site Hill A at 40 to 50 cm below the surface (Riley and Custer n.d.).

The dominant activity reflected in the tool assemblage from Middle Zone II has to do with cutting and scraping activities, although it is not clear what was being processed in this manner. Some tool manufacture clearly was taking place, but this does not appear to be hunting-related.

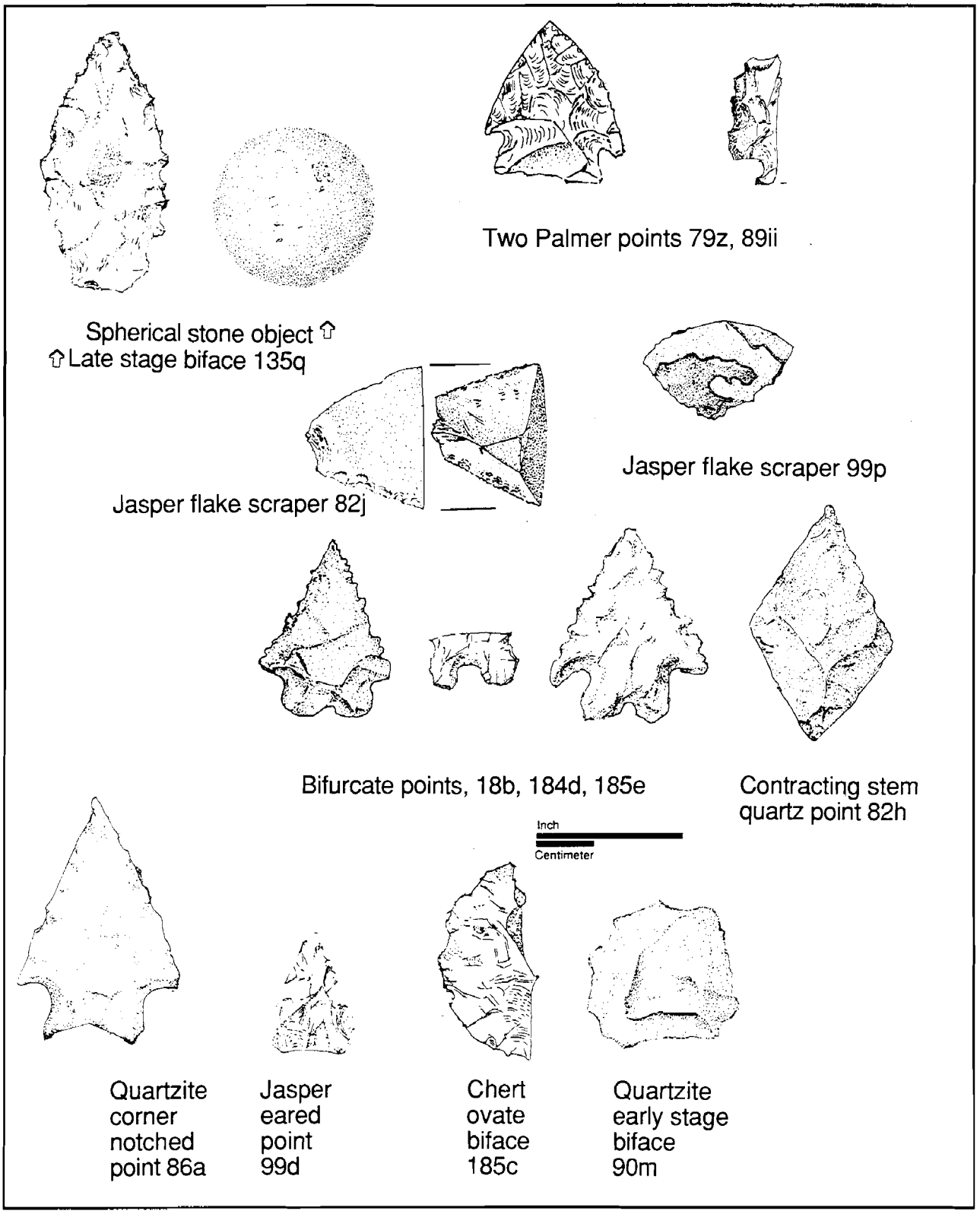



Figure 30
**Artifacts from Zone II**

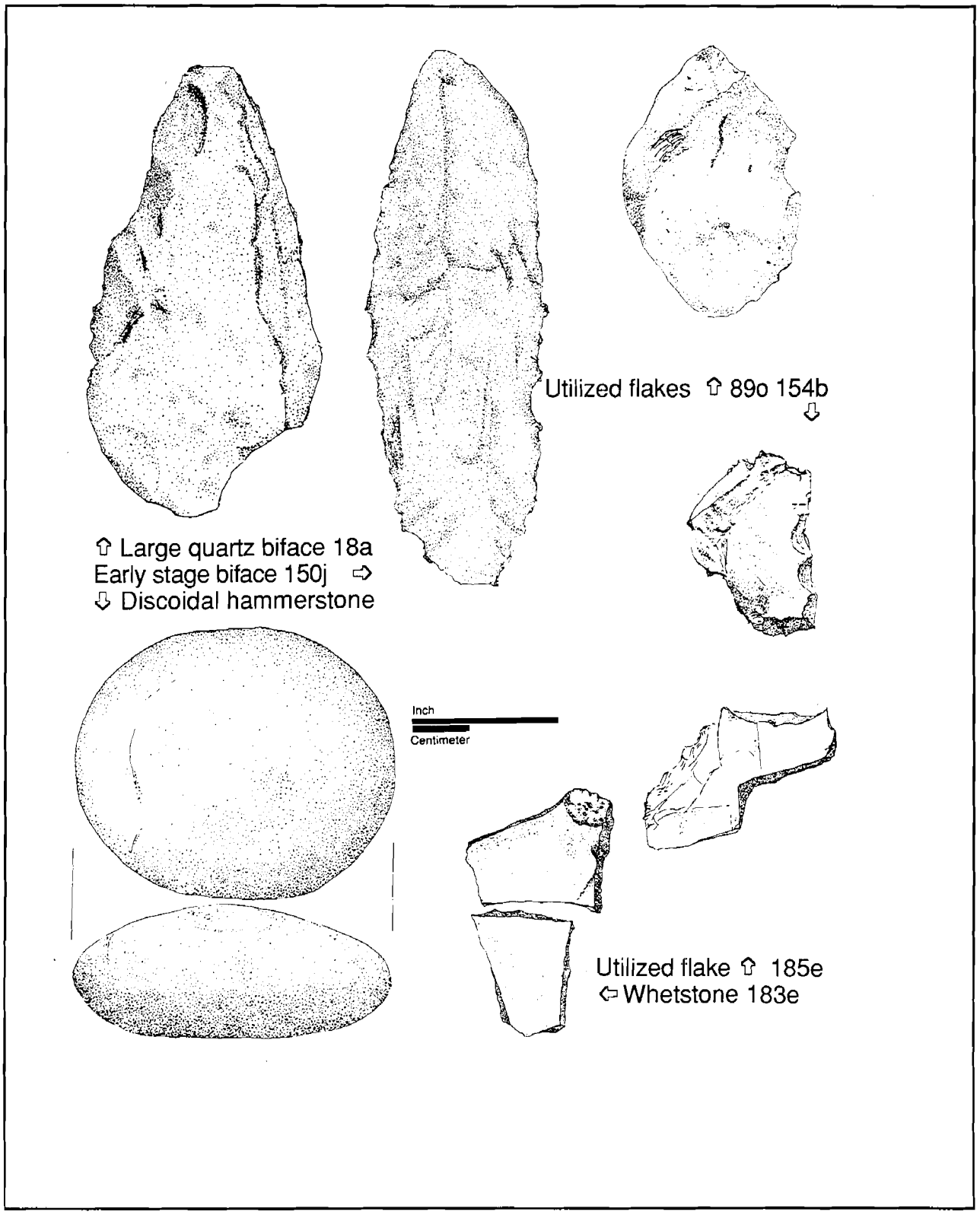



Figure 31
**Artifacts from Zone I**

UPPER ZONE II

Bifurcate Points (ER 18b, 184d, 185e): Three Archaic Period bifurcate points were recovered from the upper 10 cm of Zone II. One complete jasper example and one chert base fragment came from excavated contexts. A second complete point (rhyolite) was recovered from the slope surface less than 20 cm north of ER 19 and less than 10 cm below the base of Zone I.

This distinctive projectile point style is characterized by a notched base. Chapman (1976:6-7) reports radiocarbon dates ranging from 8830 B.P. to 8160 B.P. At least three distinct bifurcate types have been defined that appear to have temporal significance (Broyles 1971:59, 69, 73, 75), and Chapman identified five bifurcate variants from the assemblage at the Rose Island site (Chapman 1975:110-114). However, the assemblage from the Blueberry Hill site is too small to attempt further refinement.

Contracting Stemmed Point (ER 82h): A single quartz contracting stemmed point was recovered in the upper part of Zone II. While this point bears some elements in common with the Archaic Period point style Morrow Mountain, the contracting stem style is highly variable, and appears to have been in use through much of the Woodland I Period (Custer 1989:144-157). Contracting stemmed points are quite frequent in Zone I, and it is possible that this point is associated with the larger assemblage.

Corner Notched Point (ER 86a): This well-made quartzite corner notched point resembles points classified as either Neville (Dincauze 1976) or Stanly (Coe 1964), which date to the Archaic Period. Chapman (1976:7-8) reports dates ranging from 5860 B. C. to 5065 B. C. However, there is also some resemblance to points recovered from the Hawthorn site (7NC-E-46), dating to 2250 B. C. The notches are ground, and the base is concave.

Eared Point (ER 99d): This small jasper triangular point has faint side-notching and a ground base. It appears to belong to the eared type defined by Kinsey (1972:420-421). Kinsey suggests that this type may be related to Archaic Period types such as the Brewerton Eared Triangle (Ritchie 1971:18).

Ovate Biface (ER 185c): The base of a chert ovate biface was recovered from the top of Zone II. Although ovate forms have been reported from a number of sites, the temporal position is not clearly understood. It may be a late stage biface form.

Biface fragments (ER 152d, 187b): Two bifacial tool fragments were recovered from the top of Zone II.

Utilized flakes (ER 89o, 98f, 154b, 185e, 187d): Five utilized flakes were recovered from Upper Zone II, of which two were jasper, one chert, and two quartz. One of the quartz tools (ER 89o) uses the pebble cortex as part of the working edge. The chert tool (ER 185e) was made on a rather thick flake, and is fragmentary. The jasper tool from ER 154b, on the other hand, is a thin flake with a well-developed working edge. On the tool from ER 98f, the working edge shows signs of grinding.

Early stage biface (ER 90m): This bifacially worked quartzite fragment appears to be a broken early stage biface.

Discoidal hammerstone (79q): Although a number of pebbles recovered from the excavations at all levels showed evidence of battering, very few had been used as hammerstones for any extended period of time. This discoidal quartzite hammerstone has been extensively battered over all surfaces.

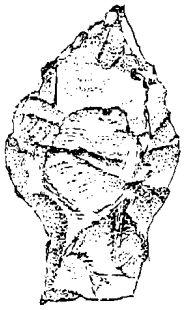
Whetstone (ER 183e): One surface of this thin, tabular fragment of fine-grained sandstone has been smoothed, and displays very fine parallel striations over part of the surface. We suggest that it was used to smooth bone tools.

The tools recovered from Upper Zone II reflect a wide variety of activities. This variety may be the result of occupation over as much as 5,000 years, during which time little or no soil deposition took place to separate the different occupations.

Bifurcate point 182 Corner-notched points 182, 184

Inch
Centimeter

Side notched point 102

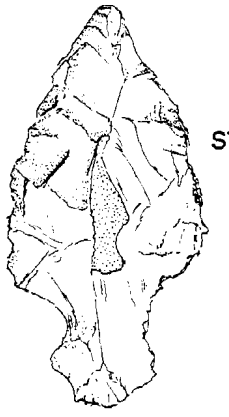


Chert stemmed biface 128

Argillite stemmed biface 181

Quartzite stemmed biface 182

Inch
Centimeter



Jasper stemmed biface 184

Figure 32
**Artifacts from Zone I**

ZONE I

Bifurcate Point: (ER 182) A single fragment of what appears to have been a heat-fractured bifurcate point was recovered from Zone I (facing page). A single basal lobe and the notch between the stem and the blade are recognizable.

Corner Notched Points (ER 182, 184): Two jasper corner notched points were recovered from Zone I. Both resemble the corner notched point from upper Zone II, and appear to be related to notched points from the Hawthorn site. One has been reworked as an end scraper, and the other has been heat damaged.

Side Notched point (ER 102): A single chert side notched point was recovered from Zone I. This point was recovered from the base of the old plow zone in mottled soil at about 35 cm below the surface.

Stemmed bifaces (ER 128, 181, 182, 184): This group, consisting of two complete tools and two fragments, shows considerable variation. From ER 128, an assymetrical straight stemmed chert biface was recovered. This tool shows some retouch along both sides of the blade. The jasper biface from ER 184 has a constricted stem, and cortex on both faces. This tool was apparently used as a perforator or drill, because the tip is worn smooth. The example from ER 182 consists of the base and shoulders of a broad bladed quartzite point with a short stem. This tool may have been damaged in manufacture. The final example, from ER 181, is the stem of an argillite biface. The stem appears to have been constricted below the shoulder, but the blade and shoulders are missing. Stemmed projectile points are found throughout the Woodland I Period.

Contracting Stemmed bifaces (ER 94; 97, 155; 174; 179; 181; 181; 183): This biface category is highly variable, and consists of points with stems that converge to a v-shaped or sharply rounded base, and defined shoulders forming an oblique angle with the blade (Griffith and Artusy 1976:25). Two specimens (from ER 174 and ER 155) are made of heat-treated jasper. One of these is very well made, while the other appears to have been in a late stage of manufacture when broken. Three examples (from ER 97, ER 179 and ER 181) are made of quartz. On one, the stem has been broken off below the shoulders. The example from ER 97 is a late stage biface. The single quartzite specimen (ER 183) is well-made, with a long, pointed stem. The final two examples (from ER 94 and ER 181) are made of argillite. One is complete, while the blade has been broken from the other.

Most of the specimens from the Blueberry Hill site assigned to this category appear to fall within the Rossville type described by Stephenson and Ferguson (1963:145), Ritchie (1971:46), and Kinsey (1972:435-436). Ritchie attributes this point style to "the very late Archaic, Transitional and Early Woodland periods" (Ritchie 1971:46). In the Delaware chronology, this would correspond to most of the Woodland I period, approximately 3000 B. C. to 100 B. C. Kinsey (1972:436) cites a series of radiocarbon dates between 520 B. C. and 100 B. C., and assigns the Rossville type to the early part of his Middle Woodland period. On the other hand, Custer (1989:144-151) has suggested that Rossville and other converging stemmed point styles belong to a highly variable group of stemmed points in use throughout most of the Woodland I period.

Leaf-shaped biface (ER 95): A single, assymmetrical leaf-shaped biface was recovered from Zone I, above Feature 4. This tool may be a variant of the contracting stem form, but without defined shoulders.

Lanceolate biface (ER 154): A single lanceolate biface was recovered from this site, probably from Zone I, although this is not certain because it fell from the east wall profile after the unit had been excavated. This tool has slightly excurvate edges, rounded shoulders, straight base, and is made from a fossiliferous chert . The edges, tip, and shoulders are heavily ground, but polish is not apparent on the blade faces.

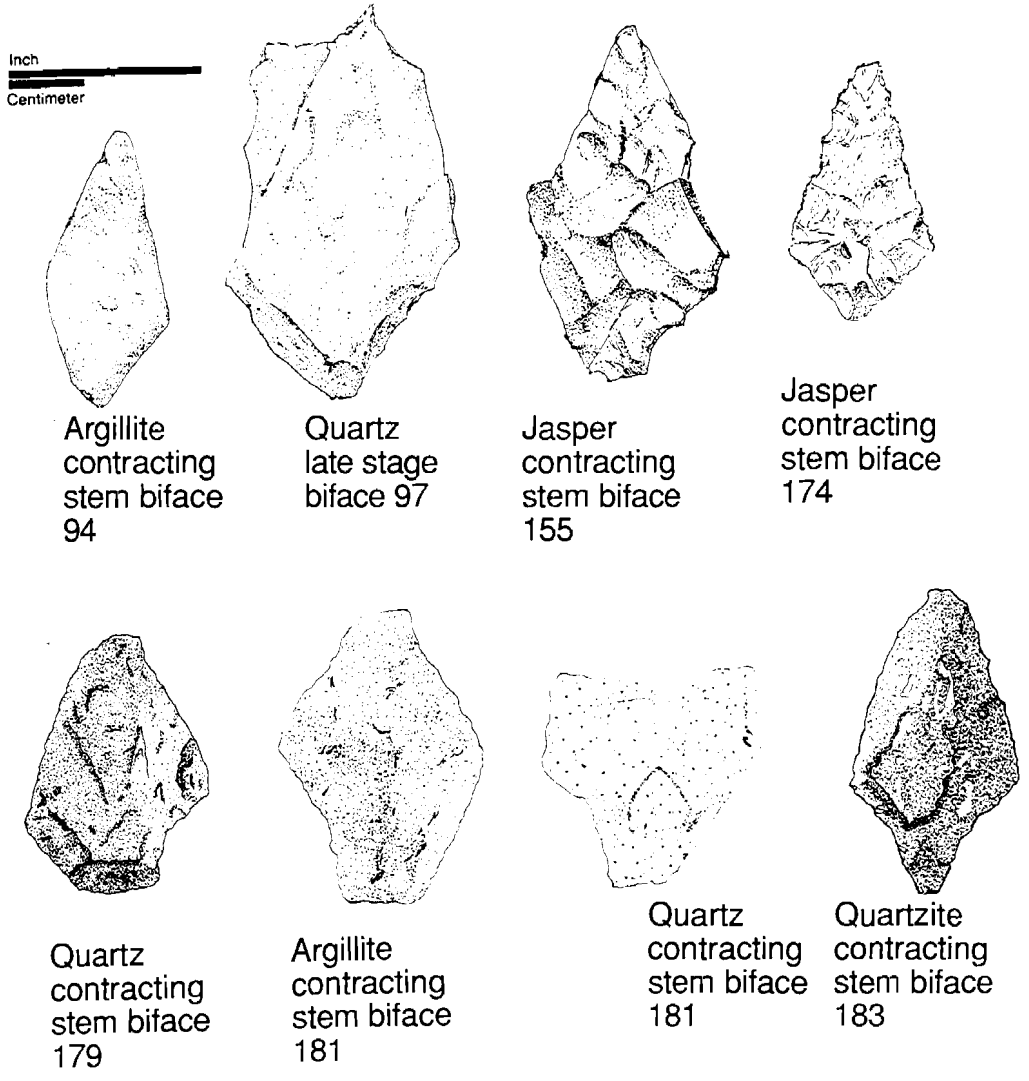



Figure 33
**Artifacts from Zone I**

In Delaware, lanceolate point forms are most clearly associated with the late Woodland I period, especially as expressed at the Island Field site. Elsewhere in the Middle Atlantic, lanceolate forms may be associated with the Accokeek and Selby Bay complexes of the Chesapeake Bay (Wright 1973) and the Middlesex and Meadowood phases of New York (Ritchie 1969), dating as early as 800 B. C.

Similar wear is found on the edges of a thin, fossiliferous chert tip from ER 88. It is not possible to determine with certainty the form of the base to which the tip was once was attached.

Triangular point (ER 99): A single small, equilateral triangular point was recovered from Zone I. This jasper example appears to have been broken in manufacture. Small triangular points similar to this one are associated with late Woodland I contexts such as the Island Field cemetery, as well as with Woodland II contexts.

Reworked biface fragment (ER 182): This heat-treated jasper tool appears to be a tip fragment which has been reworked as a scraper along one broken edge.

Pebble-based biface (174): This is an early stage biface produced from a thin chert pebble. Pebble surface is present on both faces of the tool. On one side, the pebble surface has been removed with a series of broad, flat flakes. On the other side, one edge has been completed, including a shallow notch. On the other edge, attempts to reduce the chalky cortex have resulted in a series of hinge fractures, probably causing abandonment of the tool. This early stage biface closely resembles the stemmed biface drill from ER 184, which was also based on a pebble, and which displays the same plano-convex cross-section.

Large bifaces (ER 18a, 82): Joining fragments of a large quartzite biface in a mid to late stage of manufacture were recovered from the base of Zone I in ER 82, adjacent to Feature 1, a small platform hearth. This implement appears to have been made on a large flake. It probably broke during manufacture. This biface is similar in size and shape to the two quartz bifaces found in ER 18a at the interface between Zones I and II during the Phase I study.

Large biface (ER 18a): Two large quartz bifaces in a late stage of manufacture were recovered at the interface of Zones I and II while squaring the edge of ER 19 prior to excavation. One biface has a convex base and the other has a straight base.

Drill (ER 187): The heavily ground tip of a quartz biface was recovered from ER 187, and appears to have been used as a drill. Fracturing appears to have occurred as a result of a twisting motion. The wear is similar to that on the tip of the stemmed biface recovered from ER 184.

Biface fragments (ER 75, 76, 78c, 81, 81b, 83, 85, 85c, 88, 90l, 94, 97, 100, 126, 170, 178): In addition to the tools described above, fragments of 19 bifacial tools were recovered from Zone I.

Burins (ER 19b, 184, 187): Three jasper flakes were recovered from Zone I which had pointed tips created by typical burin flakes. Two are smaller than 2 cm, while the third is approximately 4 cm long. Such tools were probably used for carving or encising wood or bone tools.

Utilized flakes (ER 78, 80, 86, 92, 94, 126, 154, 173): Nine utilized flakes were recovered from Zone I, of which five were jasper, three were chert, and one was quartz.

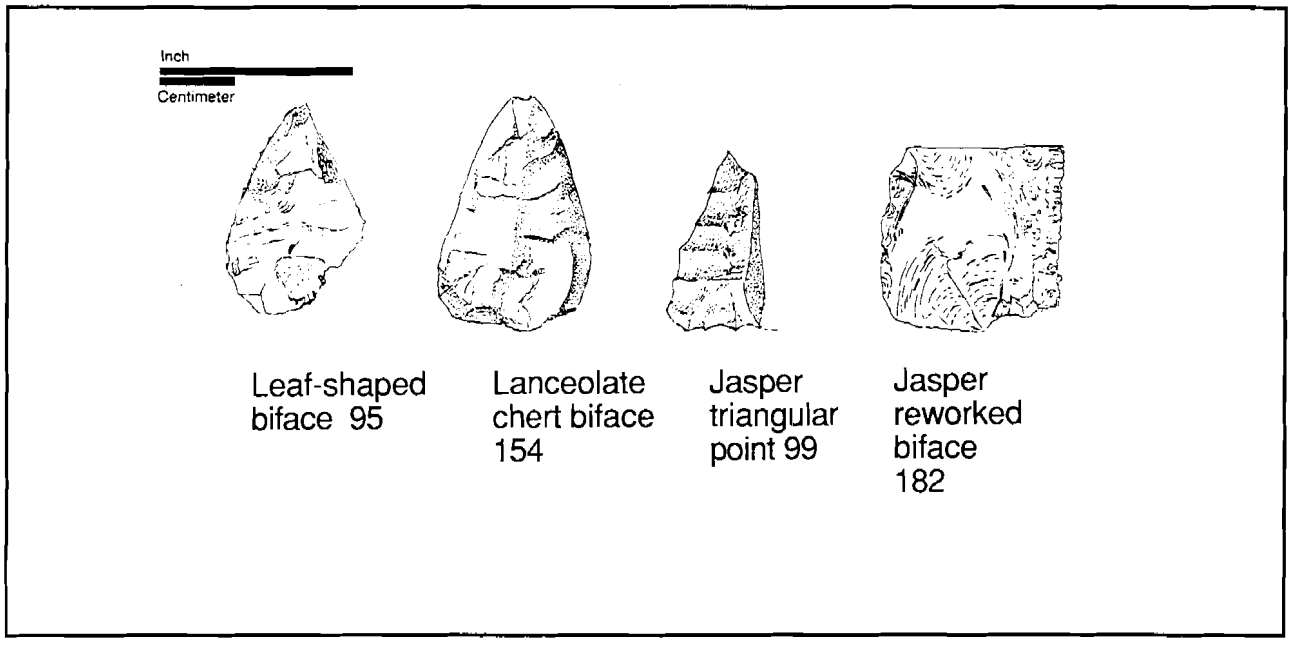



Figure 34
**Artifacts from Zone I**

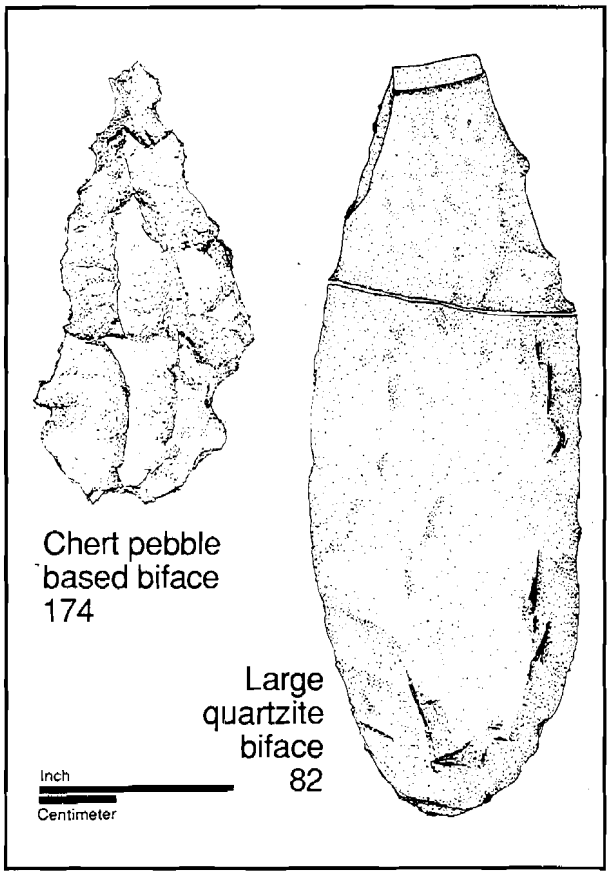



Figure 35
**Artifacts from Zone I**

Strike-a-light (ER19b): This large jasper flake displays crushing and polishing typical of use as a strike-a-light.

Steep-edged scrapers (ER 85c, 128, 174, 183): Four unifacial scrapers were recovered from Zone I which have high angle working edges. Two (ER 174, 183) can be referred to as end-scrapers because the working edge is perpendicular to the long axis of the flake. A third (ER 128) has been used on three of four edges. This tool displays a high degree of polish, particularly on the edges of flake scars. These three tools are quite small, less than 2 cm. long. The fourth (ER 85c) is a very thick, 4 cm long cortex flake with a series of step-fractured flakes removed from the thick end. This tool may have been used as a plane for heavy woodworking, while the three smaller tools were used for more detailed work.

Bifacial end-scraper (ER 78b): This ovate tool made on a chert flake has been termed a bifacial end scraper because it exhibits some bifacial flaking along the two longer edges, but the rounded shorter end is polished on the flake edges, and the working edge is ground (compare with the description

of the edge wear on the lanceolate biface from ER 154 and the biface tip from ER 88).

Wedge (ER 90c): This is a wedge-shaped quartz split cobble tool with a crushed and step fractured edge.

Heavy unifacial scrapers (ER 93, 185): Three heavy unifacial scrapers were recovered from this level. One (ER 93) was made on a chert cortex flake. The working edge shows some evidence of resharpening. A quartz scraper was also recovered from ER 93.

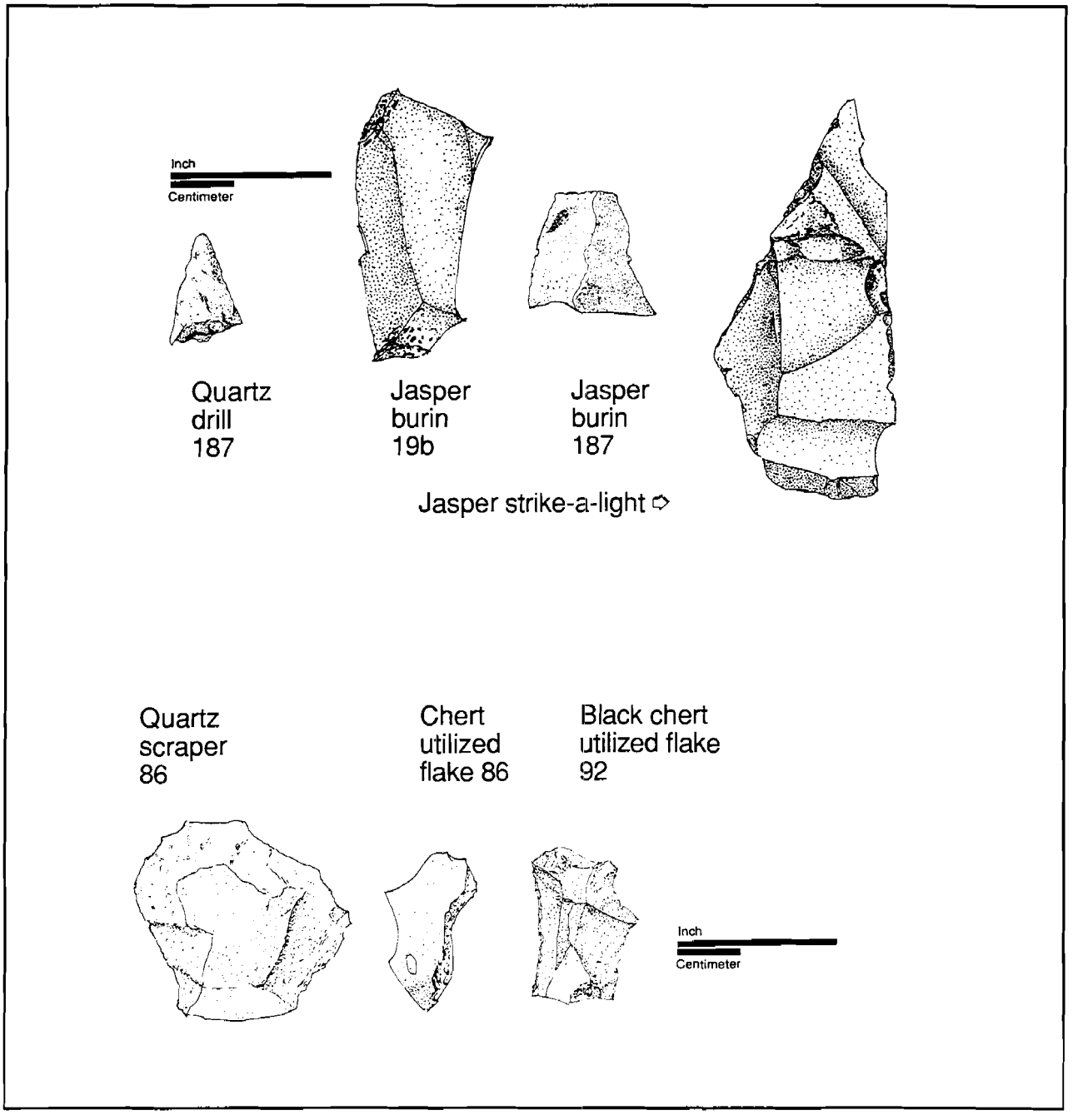



Figure 36
**Artifacts from Zone I**

The third tool was made on a large quartzite cortex flake from which several broad flakes were removed to produce a serrated edge.

Early stage biface (ER 155): This bifacially worked quartz fragment appears to be a broken early stage biface.

Grinding stones (ER 173, 182) Only two clearly identifiable grinding stones were recovered from Zone I. The first is a fine-grained quartzite cobble which has been used repeatedly as a grinding stone. The convex shape of the grinding surface suggests that this was a mano to be used as the upper stone with a larger mortar on the bottom. The upper, non-grinding surface retains the cobble cortex, and appears to be highly polished. The second is fire-cracked, but the fragment is large enough to identify a flat, heavily-ground surface with a central pit. This tool may have been used first as a grinding stone, and later reused as an anvil for cracking or crushing nuts.

Although only two recognizable grinding stones were recovered from this level, the material is the same as many of the fire-cracked rock fragments from the site. A number of fire-cracked rock fragments may have been grinding stones before they were used in a hearth.

Slate projectile point stem (ER 174): This beveled and polished slate fragment resembles the stems of slate projectile points (cf. Snow 1980:fig. 5.7).

Slate pendant fragments (ER 77): This artifact consists of two very thin refitted fragments of black slate with a small perforation. The edges are ground, and the break extends through the perforation.

The tools recovered from Zone I reflect a wide variety of fairly specialized activities. The heavy scrapers and wedge may indicate woodworking activities, while the bifacial tools with ground edges suggest that resistent materials such as bone were being cut or scored. The large number of projectile points indicates that hunting and/or tool kit replenishment may have been a major activity. Tool manufacture is also suggested by the large number of cores recovered from this level.

FEATURE 3

Hammerstone (ER 173m): This oval quartzite cobble has been heavily battered on the ends, indicating use as a hammerstone.

Biface fragment (ER 174bb.2): A single serrated point tip was recovered from the fill of Feature 3.

FEATURE 4

Contracting stem bifaces (ER 78c, 81e): Two contracting stem bifaces were recovered from Feature 4, which was identified based on the distribution of Marcey Creek sherds. The smaller of the two (ER 81e) is argillite, and appears once to have been symmetrical with straight blade edges, oblique shoulders, and and a pointed stem. The tip is now broken, and hinge fracturing on one edge.has removed the shoulder along one side.

The larger example is quartzite, with an assymetrical blade and rounded shoulders. Unsuccessful attempts to reduce the thickness of the blade have resulted a hump on one side with traces of pebble surface, and hinge fracturing along one edge.

End scraper (ER 77h): This fine-grained quartzite scraper is not as steeply edged as the steep-edged scrapers described for Zone I. It is broken longitudinally.

Utilized flake (ER 78k): A single quartz utilized flake was recovered from Feature 4.

FEATURE 5

Discoidal biface (ER 169p): This jasper tool has a sinuous edge and a biconvex cross-section. Edge wear is evident in two locations, indicated on the drawing, and consists of small-scale crushing resulting in a blunted, but not ground, edge.

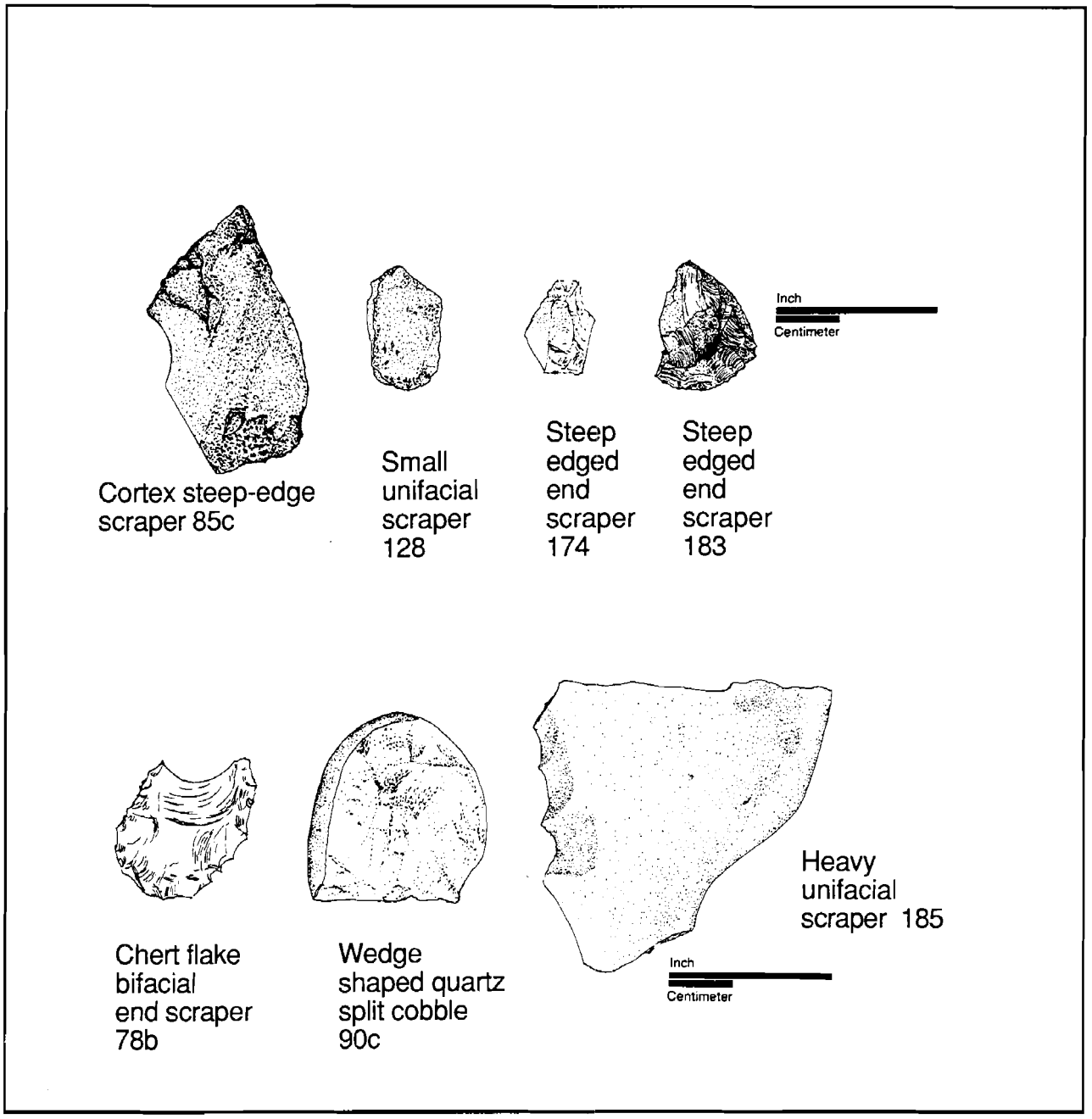



Figure 37
**Artifacts from Zone I**

Early Stage Bifaces (ER 167r, 168aa): The tool from ER 167r is a small heat altered jasper biface in a very early stage of preparation. Cortex is present on one face. The heat reddened biface tip from ER 168aa came from a broad, thin biface in an early stage of preparation. There are several small pot-lid fractures on the surface.

FEATURE 6

Stemmed Point (ER 148d): This rhyolite basal fragment is slightly constricted below the blade, and resembles stemmed types attributed to the Woodland I Period (Custer 1989:144-157). It is consistent with the presence of Mockley ceramics in this feature.

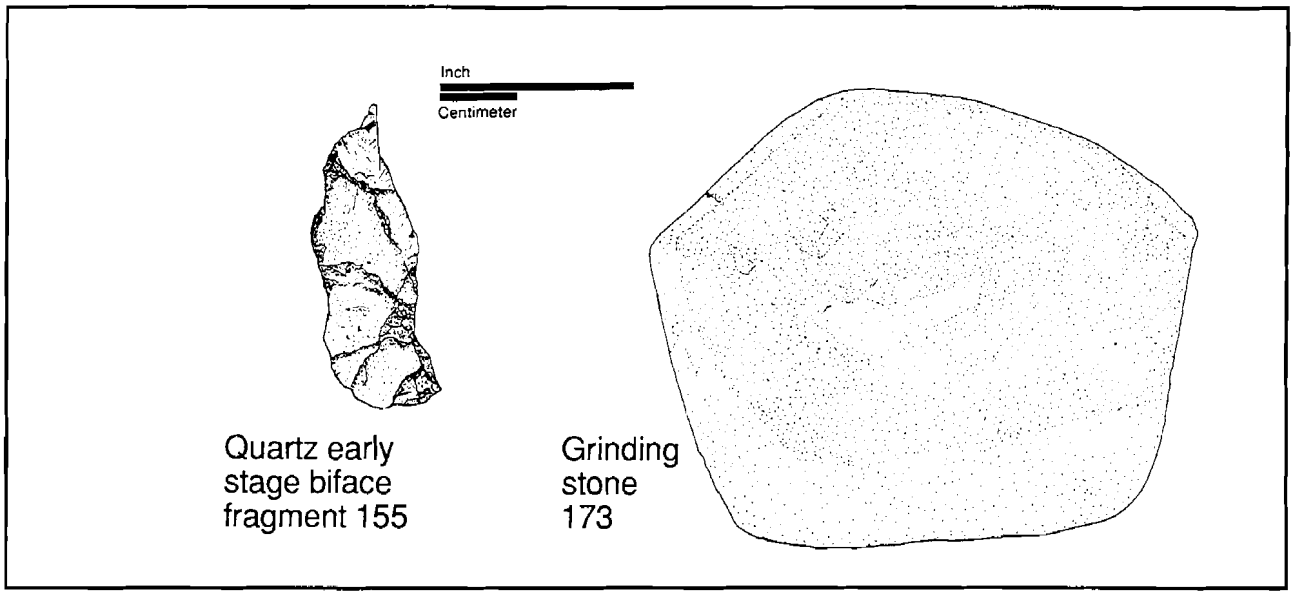



Figure 38
**Artifacts from Zone I**

CERAMICS

At the Blueberry Hill site, ceramics were recovered only from Zone I and from Features 4 and 6. Archaeologists have concluded that ceramics were introduced to the Delmarva Peninsula around 1200 B. C. Ceramic types recovered are described below.

Marcey Creek Ware (1200 B.C. - 900 B.C.): Marcey Creek Ware is a smooth surfaced ceramic that is tempered with crushed steatite. This ware is one of the earliest ceramic types in the Middle Atlantic area. The flat base and slab-built walls contrast with the conoidal base and built-up walls of later ceramic types. At the Blueberry Hill site, Marcey Creek sherds are found exclusively in and around Feature 4 (FIGURE 6, page 22)

Wolfe Neck Ware (700 B.C. - 400 B.C.): This ceramic type is characterized by a coarse paste tempered with crushed quartz. The surface may be cordmarked, net impressed, or smoothed, although smoothing generally does not occur over an entire vessel.

Coulbourn Ware (400 B.C. - 100 B.C.): Coulbourn Ware is tempered with crushed clay or potsherds. Coulbourn net-impressed is more common than the cord-marked variety, and may be net-impressed on the interior as well.

Wilgus Ware (300 B.C. - A.D. 250): Wilgus Ware is a net-or cord-impressed ceramic with both clay an shell temper. It is both temporally and technologically transitional between the Coulbourn and Mockley types.

Mockley Ware (A.D. 100 - A.D. 1000): Mockley Ware has a coarse paste tempered with large fragments of crushed shell. The surface may be either net-impressed or cord-marked. Vessels made after about A.D. 450 tend to have thinner vessel walls. At the Blueberry Hill site, the distribution of Mockley ceramics was used to define Feature 6.

Hell IslandWare (A.D. 600 - A.D. 1000): Hell Island Ware has a fine-grained paste with crushed quartz temper. Surfaces may be cord-marked or fabric-impressed. Paddling generally appears to have been done when the vessel was leather hard, rather than wet, and the cording is usually more widely spaced than on earlier ceramic types. Net-impressing rarely, if ever, occurs. The rims

of cord-marked vessels are frequently flattened and cord-marked.

Townsend Ware (A.D. 1000 - A.D. 1600): This is a shell-tempered type with a fine-grained paste and fabric-impressed surfaces. Unlike earlier ceramic types, Townsend Ware is frequently decorated around the rim. This decoration is in the form of geometric patterns produced by incising lines or by pressing a piece of cord or a cord-wrapped stick into the surface of the clay. In general, the more elaborately decorated vessels appear to be earlier than those decorated with parallel lines.

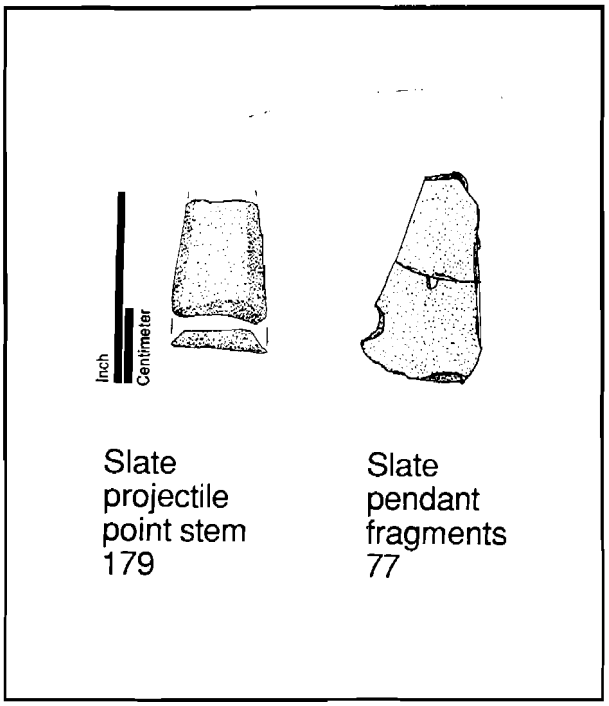



Figure 39
**Artifacts from Zone I**

SITE CHRONOLOGY

Although there are very few temporally diagnostic artifacts in the assemblage from Blueberry Hill, those that were recovered occurred at critical points in the soil profile. These artifacts provide an opportunity to define temporal brackets for each of the archaeological zones. This in turn makes it possible to relate the events of each zone to the cultural chronology for the region and to the environmental events defined by the geomorphological and pedological studies. These relationships are summarized in Figure 45. The archaeological evidence is discussed below.

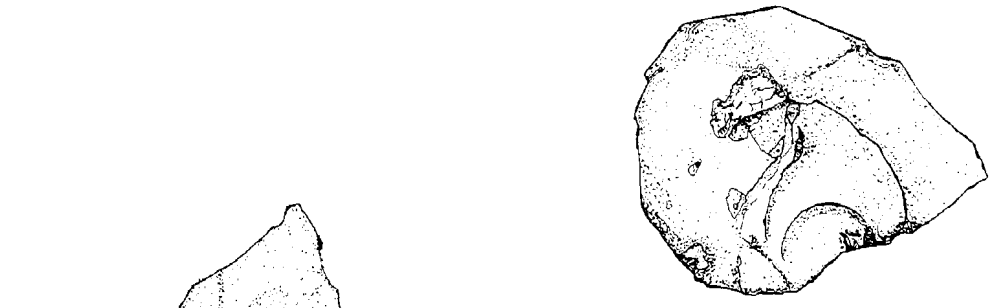
No temporally diagnostic artifacts were recovered from Zones V, IV, or III. However, the presence of a complete Palmer projectile point at the base of Zone II indicates that Zones V, IV, and III had formed before about 10,000 B.P. The few artifacts in the upper part of Zone V may have originated in Zone IV, and Zone IV may have accumulated before human occupation first occurred at the site. The presence of artifacts in Zone IV, however, indicates that this zone was exposed at the surface until after the first human groups entered the Delmarva Peninsula some 14,000 years ago. Zone III began to accumulate soon thereafter. The presence of thin lamellae in Zone III suggests that the surface was stable for perhaps 1500 years after the accumulation of Zone III was complete and before the accumulation of Zone II began.

Zone II accumulated between about 10,000 B.P., when the Palmer projectile point style was in use, and about 8,000 B.P., the end of the temporal range for bifurcate points. The surface at the top of Zone II was stable or eroding for some 5,000 years, during which time the site appears to have been only sporadically occupied, as indicated by the presence of only three projectile points which can be clearly attributed to this period.

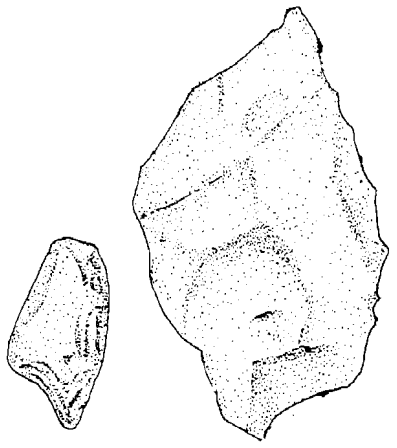
Zone I appears to represent both accumulation and occupation after about 3000 B.P. Ceramics of all time periods are restricted to this zone or to features which originate in this zone.

LITHIC DEBITAGE

The term lithic debitage is used here to refer to a variety of debris from the use of stone (for example, fire-cracked rocks) or from the manufacture or use of stone tools, particularly flakes and cores. Selected characteristics of debitage can be used to examine changes in cultural preferences or site function through time.



Black chert core
from deep feature
75zz



Argillite
biface
fragment
81e

Quartzite
biface fragment
78c

Quartzite
end
scraper
77h

Rhyolite basal
stem fragment
148d
*Feature 6*

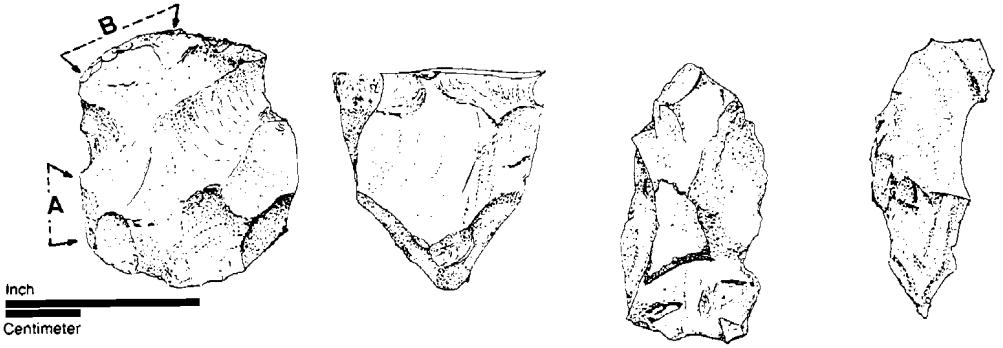
*Artifacts from Feature 4*

Jasper
discoidal
biface 169p

Jasper
early stage
biface 168aa

Jasper
heat altered
biface 167r

Black chert
cortex flake
169m




*Artifacts from Feature 5*

Figure 40
**Artifacts from features**

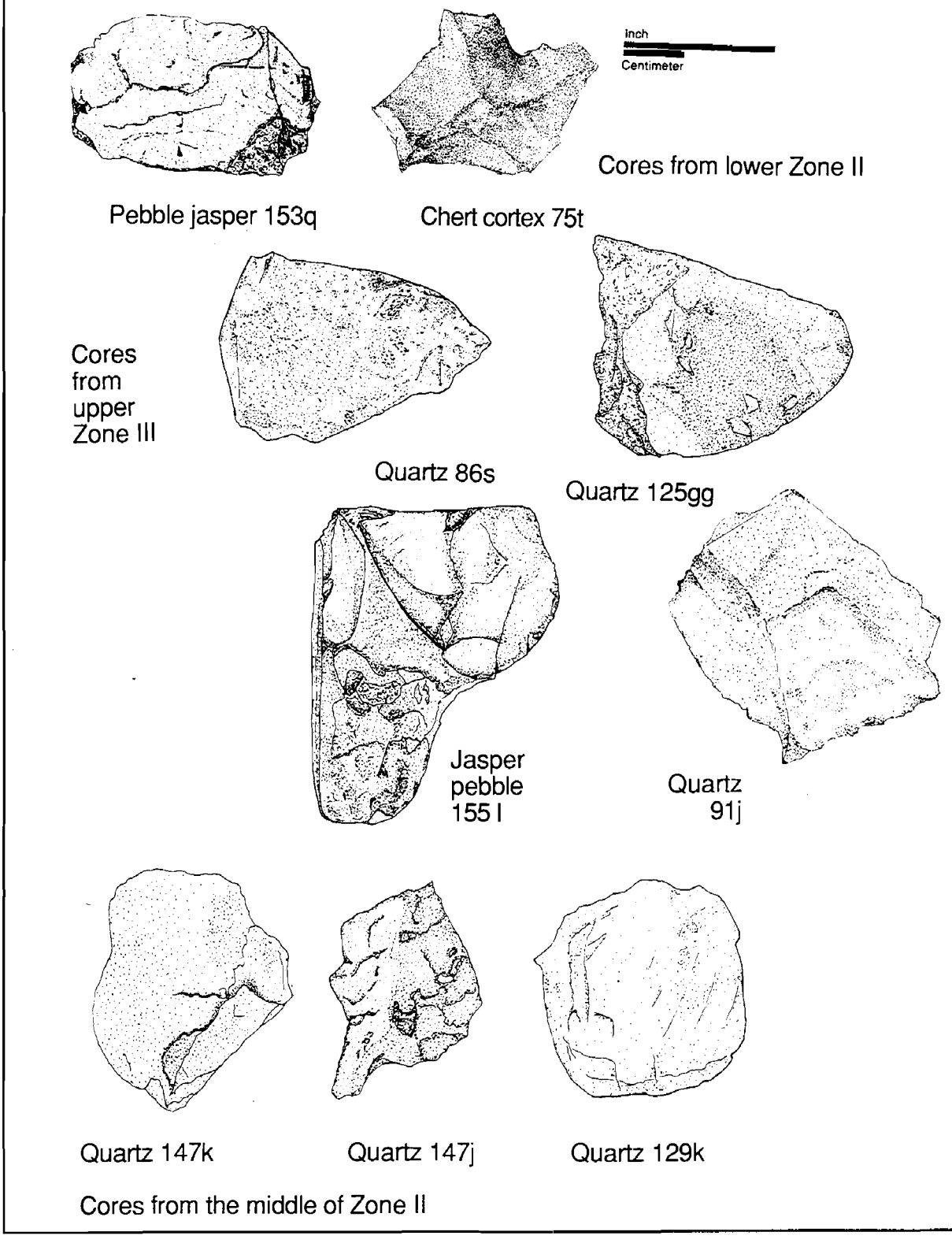



Figure 41
**Cores from Zone III (above) and middle Zone II**

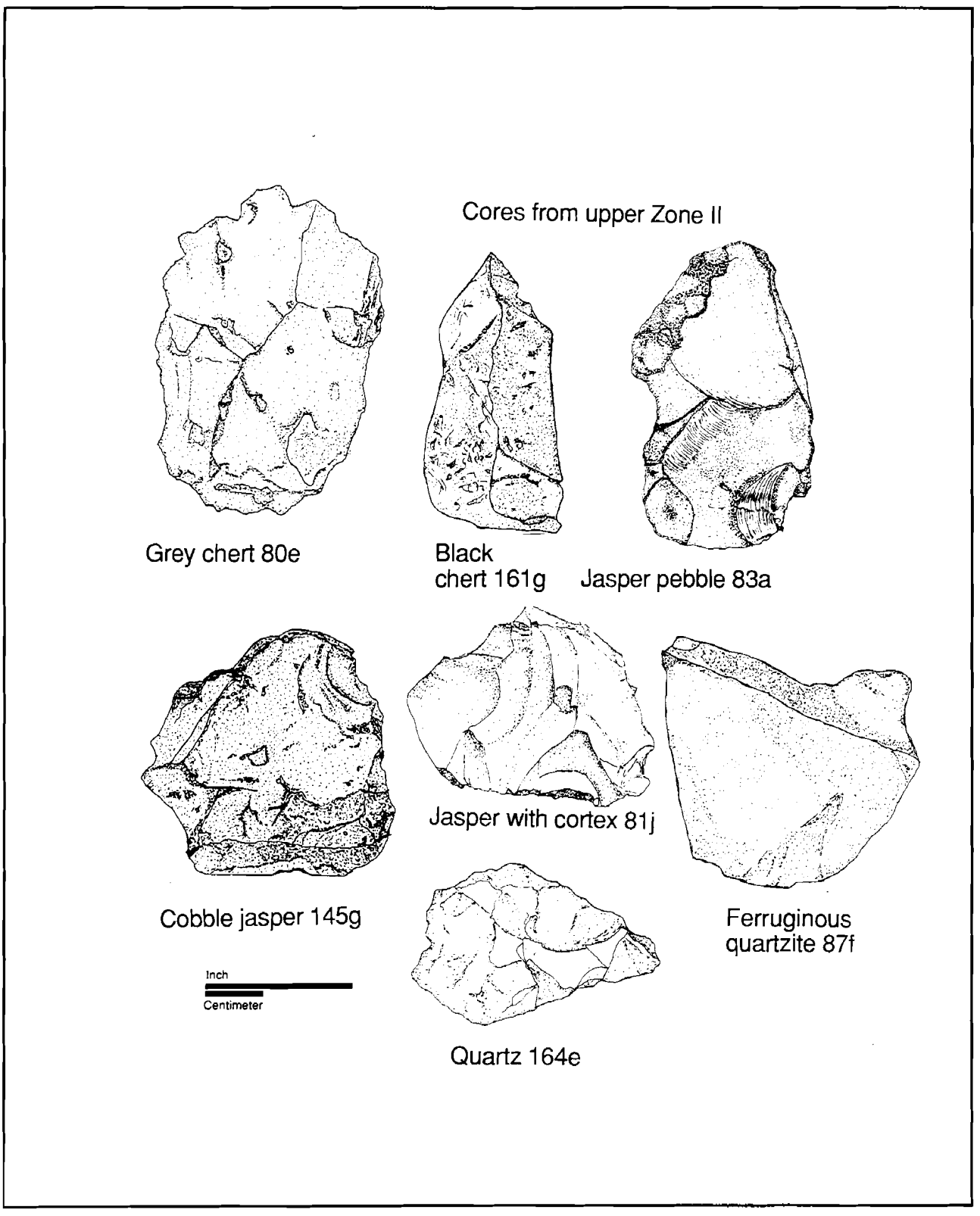



Figure 42
**Cores from the upper part of Zone II**

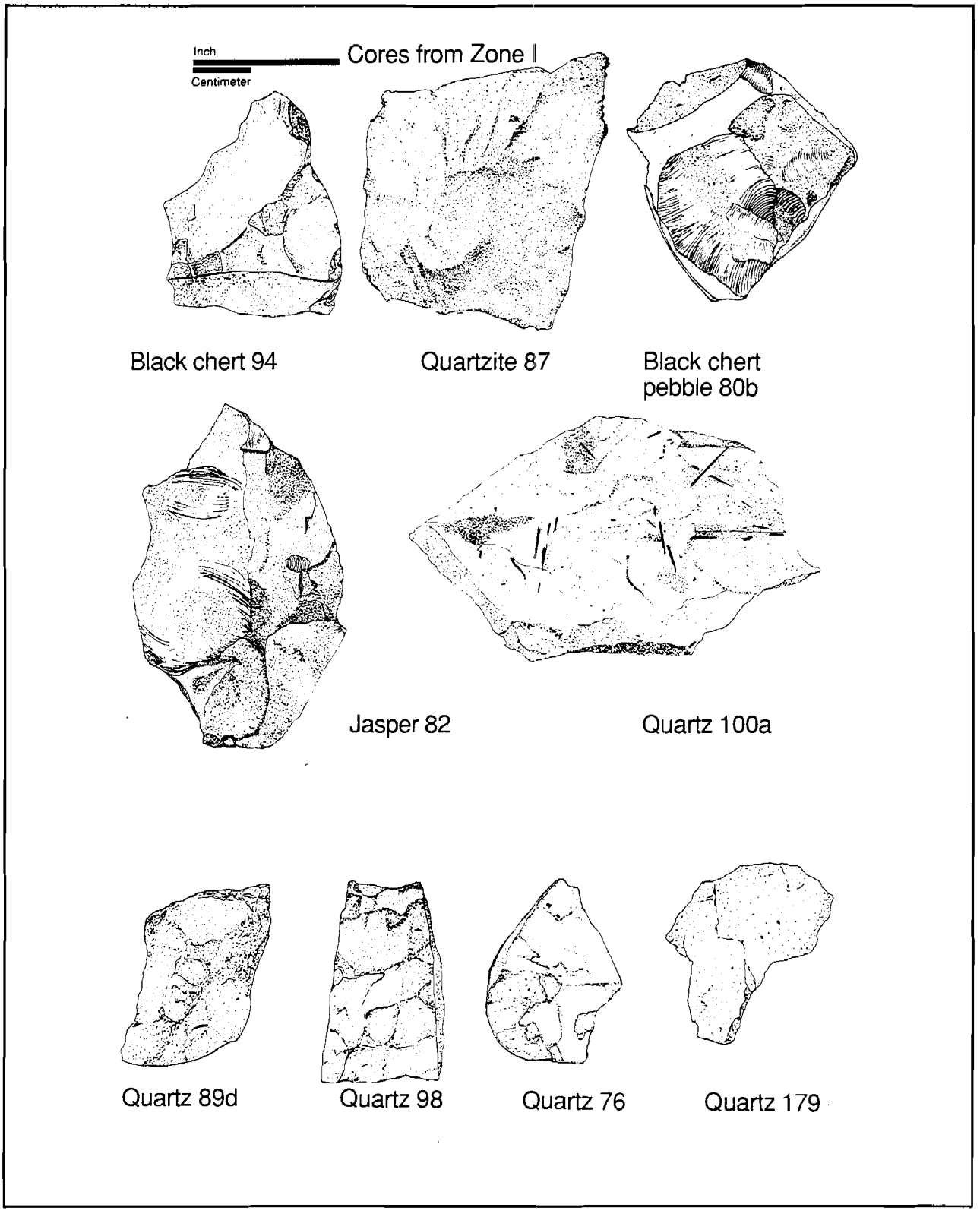



Figure 43
**Cores from Zone I**

REGIONAL POINT TYPES AND LITHIC PREFERENCES

| Point Type | Quartz | Quartzite | Jasper | Chert | Rhyolite | Argillite | Total |
|---|---|---|---|---|---|---|---|
| | 3 | 0 | 25 | 16 | 0 | 0 | 44 |
| Clovis | 7% | 0% | 57% | 36% | 0% | 0% | |
| | 0 | 0 | 18 | 13 | 0 | 0 | 31 |
| Mid-Paleo | 0% | 0% | 58% | 42% | 0% | 0% | |
| | 0 | 0 | 5 | 4 | 0 | 0 | 9 |
| Dalton-Hardaway | 0% | 0% | 56% | 44% | 0% | 0% | |
| | 3 | 3 | 57 | 32 | 3 | 2 | 100 |
| Palmer | 3% | 3% | 57% | 32% | 3% | 2% | |
| | 0 | 0 | 48 | 48 | 4 | 0 | 100 |
| Amos | 0% | 0% | 48% | 48% | 4% | 0% | |
| | 10 | 3 | 7 | 46 | 28 | 6 | 100 |
| Kirk Notched | 10% | 3% | 7% | 46% | 28% | 6% | |
| | 8 | 3 | 12 | 16 | 42 | 19 | 100 |
| Kirk Stemmed | 8% | 3% | 12% | 16% | 42% | 19% | |
| | 75 | 2 | 143 | 125 | 36 | 2 | 383 |
| Bifurcate | 20% | 1% | 37% | 33% | 9% | 1% | |

## LITHIC PREFERENCE THROUGH TIME

Changes in lithic preference for projectile points through time are well documented. The table above shows the lithic distributions for point types diagnostic of the time periods represented by Zones II, III, IV, and V (adapted from Custer 1989:Table 11 and Table 20). The fluted projectile point types (Clovis, Mid-Paleo, and Dalton-Hardaway) were produced almost exclusively from cryptocrystallines, predominantly jasper.

The period of use for these point types corresponds to the time periods represented by Zones III, IV, and V. The flakes recovered from these levels were also predominantly jasper and chert. This suggests either that the flakes from these levels resulted from the manufacture or resharpening of projectile points, or that the preference for jasper and chert was carried over to the production of other flaked stone tools.

Jasper and chert are also the predominant lithic types used for Palmer points, which are found at the bottom of Zone II at the Blueberry Hill site, although small numbers of points were made from quartz, quartzite, rhyolite, and argillite. In the flakes recovered from the lower part of Zone II, however, jasper occurs only in small quantities. Chert is the dominant material, but quartz is the second most frequent material.

The middle part of Zone II appears to correspond to the time period represented by the Amos and Kirk point styles. Small numbers of Amos points were made from rhyolite, but jasper and chert again predominated. During the time period represented by the Kirk point types, jasper was considerably less popular than earlier. The use of rhyolite, on the other hand, increased significantly, and was the dominant material for Kirk stemmed points. Quartz was used more frequently than during earlier time periods, but was not a dominant lithic type.

The flake debris from the Blueberry Hill site for this time period displays a rather different picture of lithic preferences. The reduction in the use of jasper is reflected in the lithic assemblage. Rhyolite, on the other hand, is never more than a very minor constituent. Chert and quartz are the dominant lithic types in the flake assemblage.

Bifurcate projectile points are associated with the upper part of Zone II. Custer's figures for the Delmarva Peninsula (Custer 1989:139) indicate that by the beginning of the Archaic Period, jasper had returned to dominance as the preferred lithic material for projectile points. Chert was used almost as frequently. At the Blueberry Hill site, however, chert and quartz continued to dominate the flake assemblage.

## SAMPLE OF THE LOCAL LITHIC RESOURCE

These specimens were collected in the vicinity of the site, and from the cobble bed on Maidstone Branch immediately upstream from the site.

| Pounds | Ounces | Type | Pounds | Ounces | Type | Pounds | Ounces | Type | Pounds | Ounces | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 5 | quartzite | 1 | 5 | quartzite | 0 | 9 | quartzite | 0 | 5 | quartz |
| 7 | 0 | quartzite | 1 | 4 | quartzite | 0 | 9 | quartz | 0 | 5 | chert |
| 6 | 9 | sandstone | 1 | 4 | quartzite | 0 | 9 | quartzite | 0 | 5 | quartz |
| 6 | 0 | quartzite | 1 | 2 | quartzite | 0 | 8 | quartz | 0 | 4 | quartz |
| 6 | 0 | quartz | 1 | 4 | chert | 0 | 8 | quartz | 0 | 4 | quartz |
| 4 | 4 | quartz | 1 | 3 | quartz | 0 | 8 | quartzite | 0 | 4 | quartzite |
| 3 | 3 | quartz | 1 | 2 | quartz | 0 | 8 | quartzite | 0 | 4 | quartzite |
| 2 | 5 | quartzite | 1 | 1 | quartzite | 0 | 8 | jasper | 0 | 4 | quartz |
| 2 | 3 | sandstone | 1 | 0 | quartzite | 0 | 7 | quartzite | 0 | 4 | quartz |
| 2 | 1 | quartz | 1 | 0 | sandstone | 0 | 7 | sandstone | 0 | 3 | quartz |
| 2 | 3 | quartzite | 0 | 12 | quartzite | 0 | 7 | quartz | 0 | 3 | quartz |
| 1 | 10 | quartzite | 0 | 11 | quartz | 0 | 7 | quartz | 0 | 3 | chert |
| 1 | 10 | quartzite | 0 | 11 | quartzite | 0 | 6 | quartz | 0 | 3 | quartz |
| 1 | 8 | quartz | 0 | 10 | quartzite | 0 | 6 | quartzite | 0 | 1 | quartz |

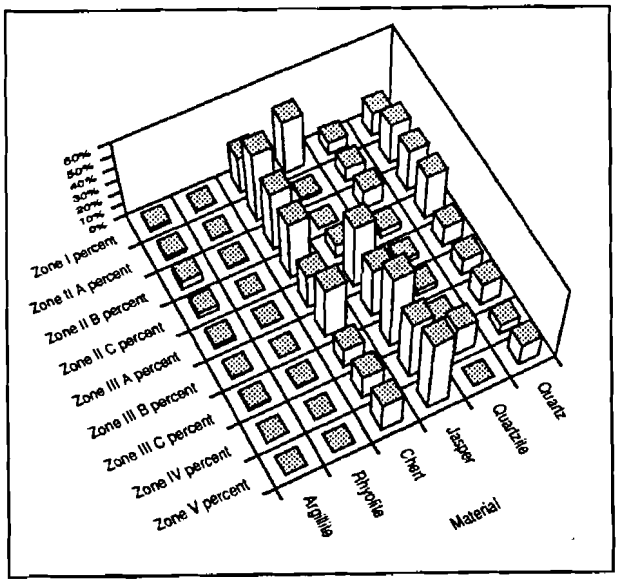
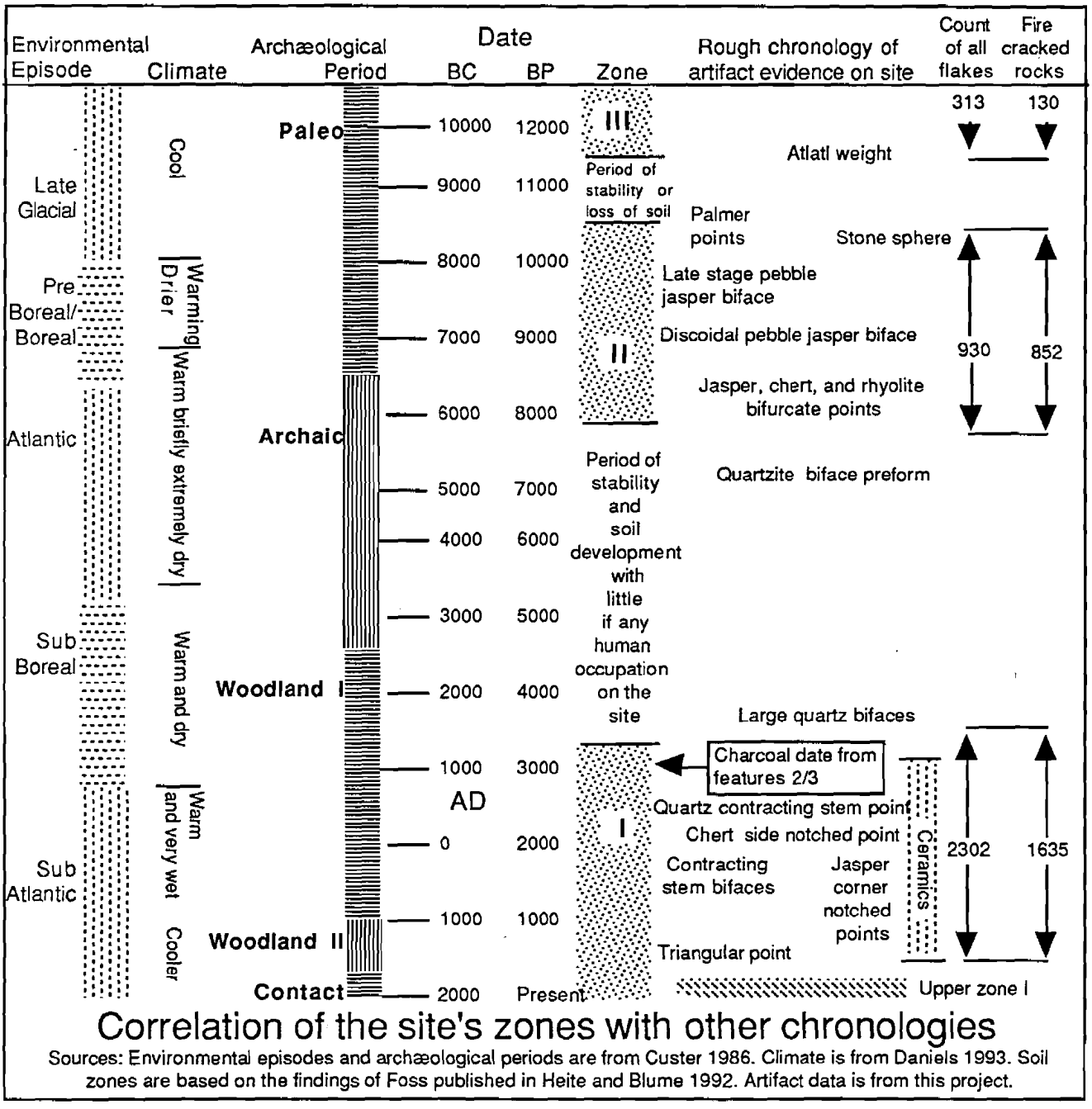



Figure 44
**Distribution of cores by lithic type**

In summary, the proportions of various lithic types in the flake debris in Zones V, IV, and III at Blueberry Hill paralleled the proportions used for fluted projectile points on the Delmarva Peninsula In Zone II, however, there are significant differences between the lithic utilization reflected in the Blueberry Hill flake debris and that reflected in projectile points. Two explanations for these differences are suggested. One possibility is that the lithic distributions at the site reflect lithic preferences for tools other than projectile points. Another possibility is that the flake debris reflects local lithic availability.

### LOCAL LITHIC AVAILABILITY

Quartz is the most common local material, readily available from cobble beds along minor streams. A short distance west of the site, on Maidstone Branch, the investigators discovered an exposure of cobbles, mostly quartz. A collection of cobbles in this bed produced specimens that weighed three or four kilograms, and one that weighed seven. The larger cobbles were mostly quartz, with several grades of quartzite and sandstone also present (Table, above).




Correlation of the site's zones with other chronologies

Sources: Environmental episodes and archæological periods are from Custer 1986. Climate is from Daniels 1993. Soil zones are based on the findings of Foss published in Heite and Blume 1992. Artifact data is from this project.

Figure 45
**Combined chronology**

In the sand pit which bordered the site, only pebbles were found. The only jasper was a small pebble. Chert was only slightly more common; the largest piece weighed less than a kilogram.

This survey of locally available lithic sources cannot be considered comprehensive. Nonetheless, it suggests that the proportions of different lithic types in the flake debris at the site reflects some degree of selection on the part of site residents, rather than local availability. On the other hand, it is also clear that during the late Paleo and early Archaic periods, the flake debris does not reflect projectile point lithic preferences.

From this analysis, it is not entirely clear why these differences occur. One possible explanation is that the lithic distributions at the Blueberry Hill site reflect preferences for tools other than projectile points. Another possibility is that some projectile points were made at the site, from selected materials available nearby. The small amount of jasper debitage in Zone II is the result of the scarcity of jasper in local cobble deposits. In Zone III, occupants may have brought jasper cores from some other location, or they may have selected more rigorously for jasper and chert. Zone I occupants of the site appear to have selected for jasper, but they also made substantial use of quartz and quartzite. Projectile points made elsewhere, particularly those from exotic materials like rhyolite, were, however, neither used nor repaired at the site.

TABULATION OF FLAKES BY SOIL ZONE AND LITHIC TYPE

| | QUARTZ | QUARTZITE | JASPER | CHERT | RHYOLITE | ARGILLITE | TOTAL |
|---|---|---|---|---|---|---|---|
| Zone I fraction | 0.1825 | 0.0921 | 0.4123 | 0.2811 | 0.0096 | 0.0226 | |
| Zone II A fraction | 0.3056 | 0.1056 | 0.0222 | 0.537 | 0.0056 | 0.0241 | |
| Zone II B fraction | 0.3158 | 0.1483 | | 0.4593 | 0.0144 | 0.0622 | |
| Zone II C fraction | 0.3425 | 0.0552 | 0.105 | 0.453 | | 0.0108 | |
| Zone III C fraction | 0.1754 | 0.0351 | 0.5965 | 0.1579 | 0.0175 | 0.0175 | |
| Zone IV fraction | 0.08 | 0.24 | 0.48 | 0.2 | | | |
| Zone V fraction | 0.1765 | | 0.5882 | 0.2353 | | | |
| Zone 1 count | 420 | 212 | 949 | 647 | 22 | 52 | 2302 |
| Zone IIA count | 165 | 57 | 12 | 290 | 3 | 13 | 540 |
| Zone II B count | 66 | 31 | | 96 | 3 | 13 | 209 |
| Zone II C count | 62 | 10 | 19 | 82 | | 8 | 181 |
| Zone IIIA count | 26 | 6 | 82 | 44 | 1 | 4 | 163 |
| Zone III B count | 12 | 4 | 37 | 39 | | 1 | 93 |
| Zone III C count | 10 | 2 | 34 | 9 | 1 | 1 | 57 |
| Zone IV count | 2 | 6 | 12 | 5 | | | 25 |
| Zone V count | 3 | | 10 | 4 | | | 17 |
| TOTAL | | | | | | | 3587 |

TABULATION OF FLAKES, BY SIZE AND LEVEL

| Material | Quartz < 2 cm | Quartz > 2 cm | Quartzite < 2 cm | Quartzite > 2 cm | Jasper < 2 cm | Jasper > 2 cm | Chert < 2 cm | Chert > 2 cm | Rhyolite < 2 cm | Rhyolite > 2 cm | Argillite < 2 cm | Argillite > 2 cm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zone I fraction | 0.8762 | 0.1238 | 0.783 | 0.217 | 0.8514 | 0.1486 | 0.8393 | 0.1607 | 0.9091 | 0.0909 | 0.5577 | 0.4423 |
| Zone IIA fraction | 0.8909 | 0.1091 | 0.7719 | 0.2281 | 1 | | 0.8966 | 0.1034 | | 1 | 0.6923 | 0.3077 |
| Zone IIA fraction | 0.8909 | 0.1091 | 0.7719 | 0.2281 | 1 | | 0.8966 | 0.1034 | | 1 | 0.6923 | 0.3077 |
| Zone IIB fraction | 0.803 | 0.197 | 0.7419 | 0.2581 | | | 0.9063 | 0.0938 | 1 | | 0.6154 | 0.3846 |
| Zone IIC fraction | 0.963 | 0.037 | 0.8462 | 0.1538 | 1 | | 0.9878 | 0.0122 | | | 0.5 | 0.5 |
| Zone IIIA fraction | 0.9231 | 0.0769 | 0.6667 | 0.3333 | 0.939 | 0.061 | 0.8182 | 0.1818 | | | 0.75 | 0.25 |
| Zone IIIB fraction | 0.8333 | 0.1667 | 0.25 | 0.75 | 0.8649 | 0.1351 | 0.9231 | 0.0769 | | | 1 | |
| Zone IIIC fraction | 1 | | 1 | | 0.9412 | 0.0588 | 1 | | | 1 | 1 | |
| Zone IV fraction | 1 | | 1 | | 0.9167 | 0.0833 | 0.8 | 0.2 | | | | |
| Zone V fraction | 1 | | | | 0.9 | 0.1 | 1 | | | | | |
| Zone 1 count | 368 | 52 | 166 | 46 | 808 | 141 | 543 | 104 | 20 | 2 | 29 | 23 |
| Zone IIA count | 147 | 18 | 44 | 13 | 12 | 0 | 260 | 30 | | 3 | 9 | 4 |
| Zone IIB count | 53 | 13 | 23 | 8 | 0 | 0 | 87 | 9 | 3 | | 8 | 5 |
| Zone IIC count | 52 | 2 | 11 | 2 | 10 | 0 | 81 | 1 | | | 4 | 4 |
| Zone IIIA count | 24 | 2 | 4 | 2 | 77 | 5 | 36 | 8 | | | 3 | 1 |
| Zone IIIB count | 10 | 2 | 1 | 3 | 32 | 5 | 36 | 3 | | | 1 | |
| Zone IIIC count | 9 | | 2 | | 32 | 2 | 9 | | | 1 | 1 | |
| Zone IV count | 2 | | 6 | | 11 | 1 | 4 | 1 | | | | |
| Zone V count | 3 | | | | 9 | 1 | 4 | | | | | |

## VERTICAL DISTRIBUTION OF CORES

(Percentage within level and count)

| | Quartz | Quartzite | Jasper | Chert | Rhyolite | Argillite | Total |
|---|---|---|---|---|---|---|---|
| Zone I | 58.33% | 4.17% | 16.67% | 20.83% | | | |
| | 14 | 1 | 4 | 5 | | | 24 |
| Zone II A | 30.00% | 20.00% | 30.00% | 20.00% | | | |
| | 3 | 2 | 3 | 2 | | | 10 |
| Zone II B | 25.00% | 37.50% | 37.50% | | | | |
| | 2 | 3 | 3 | | | | 8 |
| Zone II C | | | 100.00% | | | | |
| | | | 3 | | | | 3 |
| Zone III A | | 100.00% | | | | | |
| | | 1 | | | | | 1 |
| Zone III B | | | | | | | |
| | | | | | | | 0 |
| Zone III C | | 100.00% | | | | | |
| | | 1 | | | | | 1 |
| No cores were found in zones IV and V. | | | | | | | |
| Total | | | | | | | 47 |

## DISTRIBUTION OF CORTEX AND NON-CORTEX FLAKES

Percentage difference, above, and different counts, below.

| Material: | QUARTZ | | QUARTZITE | | JASPER | | CHERT | | RHYOLITE | | ARGILLITE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | cortex | non-cortex | cortex | non-cortex | cortex | non-cortex | cortex | non-cortex | cortex | non-cortex | cortex | non-coretex |
| Zone I | 26.90% | 73.10% | 27.83% | 72.17% | 46.47% | 53.53% | 21.01% | 78.99% | | 100.00% | | 100.00% |
| | 113 | 307 | 59 | 153 | 441 | 508 | 117 | 440 | | 22 | | 52 |
| Zone II A | 20.00% | 80.00% | 24.56% | 75.44% | 66.67% | 33.33% | 30.24% | 69.76% | | 100.00% | | 100.00% |
| | 33 | 132 | 14 | 43 | 8 | 4 | 88 | 203 | | 3 | | 13 |
| Zone II B | 21.21% | 78.79% | 35.48% | 64.52% | | | 25.00% | 75.00% | | 100.00% | | 100.00% |
| | 14 | 52 | 11 | 20 | | | 24 | 72 | | 3 | | 13 |
| Zone II C | 18.52% | 81.48% | 23.08% | 76.92% | 30.00% | 70.00% | 25.61% | 74.39% | | | | 100.00% |
| | 10 | 44 | 3 | 10 | 3 | 7 | 21 | 61 | | | | 8 |
| Zone III A | 15.38% | 84.62% | | 100.00% | 42.68% | 57.32% | 27.27% | 72.73% | | 100.00% | | 100.00% |
| | 4 | 22 | | 6 | 35 | 47 | 12 | 32 | | 1 | | 4 |
| Zone III B | 16.67% | 83.33% | 50.00% | 50.00% | 54.05% | 45.95% | 35.90% | 64.10% | | | | 100.00% |
| | 2 | 10 | 2 | 2 | 20 | 17 | 14 | 25 | | | | 1 |
| Zone III C | 10.00% | 90.00% | | 100.00% | 51.35% | 48.65% | 22.22% | 77.78% | | 100.00% | | 100.00% |
| | 1 | 9 | | 2 | 19 | 18 | 2 | 7 | | 1 | | 1 |
| Zone IV | | 100.00% | 50.00% | 50.00% | 66.67% | 33.33% | 40.00% | 60.00% | | | | |
| | | 2 | 3 | 3 | 8 | 4 | 2 | 3 | | | | |
| Zone V | | 100.00% | | | 30.00% | 70.00% | | 100.00% | | | | |
| | | 3 | | | 3 | 7 | | 4 | | | | |

CORES

Cores occur late in the site's history. With two exceptions, all were found in zones II and I. Most numerous were quartz and jasper. Chert cores appear in the latest layers (Table, page 76; Figures 40-42). The small sample size does not permit meaningful statistical analysis of cores' vertical distribution.

PREFERENCES AND TOOL MANUFACTURE

The character of the flake debris from a site can provide information on the tool manufacturing processes in operation when the site was occupied. In stratified sites, changes or continuities in tool manufacture through time can also be examined.

A first step in making most stone tools is removal of cortex, which is the weathered exterior of the cobble or pebble. If a high proportion of the flakes at a given site or in a given level include cortex, then we can conclude that primary tool manufacture from pebbles or cobbles took place at the site. If, on the other hand, the proportion of cortex flakes is low, we can conclude that the early stages of tool manufacture, in which the cortex is removed, may have taken place elsewhere.

At the Blueberry Hill site, only 10% to 35 % of the quartz, quartzite, and chert flakes in all levels included cortex. On the other hand, 30% to 67% of the jasper flakes included cortex. This suggests that only primary shaping of jasper tools was performed at the site, but more complete processing of quartz, quartzite, and chert occurred.

It is possible, however, that the differences between jasper and the other lithic types in the proportion of cortex to non-cortex flakes is the result of the size of the locally available cobbles. If the local jasper cobbles were about the size of the desired tool, and the basic shape of the tool was formed during decortication, then the number of non-cortex flakes required to finish the tool would be smaller than if the cobble were significantly larger than the tool. The late stage biface from ER 135q (FIGURE 30) is an example of a tool made from a jasper pebble close to the size of the intended tool.

In summary, then, there is a suggestion that local lithic sources were used for tool production throughout the use history of the site. However, it is also clear that the local lithics were used selectively, and that lithic preferences varied through time. Nonetheless, the size of the cobbles available for each lithic type influenced the manner in which tools were made from the cobbles.

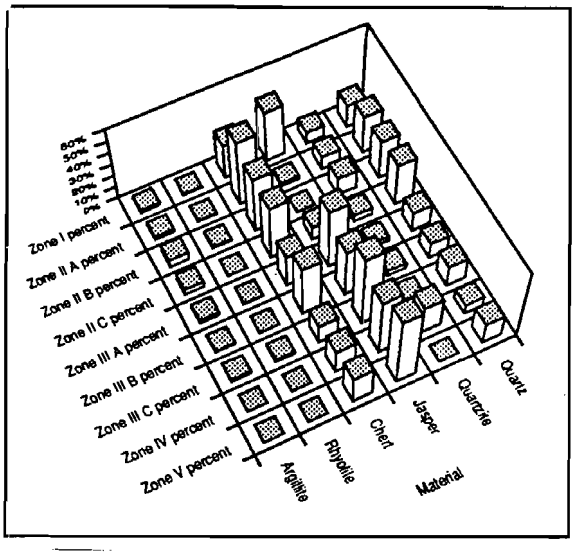



Figure 46
**Distribution of flakes by lithic type**