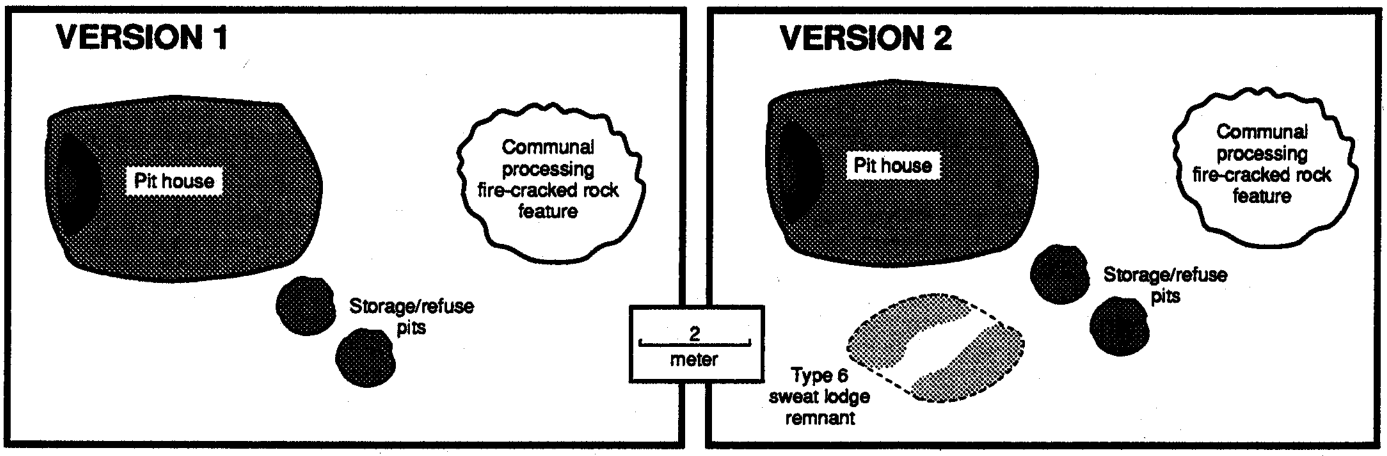
FIGURE 83

Snapp Household Clusters



Analysis of Overall Feature Distributions

The majority of the features encountered at the Snapp Site cannot be placed into any of the feature clusters discussed above (Figure 68). These features were clearly produced by prehistoric inhabitants of the Snapp Site, but their age and cultural affiliation are unknown. Because we do not know their age, it is difficult to discuss their cultural significance. However, some insights can be developed from studying their distributions.

When the undated features are considered in addition to the features that can be assigned to dated clusters, it can be seen that there is a relatively continuous distribution of pit features across the site (Figure 68). No area of the site seems to have been avoided for prehistoric settlement or excavation of pits for houses or storage/processing activities through time.

The only exception to this generalization is a large open area in the southwest corner of the site where there was a large plow zone concentration of fire-cracked rock (Figure 84) centrally placed among Clusters 4, 5, and 7. The absence of houses and other pit features in this area may have been due to the fact that the fire-cracked rock was part of large processing features that were repeatedly used by the site's various inhabitants. The accumulation of debris over time may have made this area of the site unsuitable for habitation. The fact that the clusters and features associated with the large fire-cracked rock concentration date from the later portion of the Clyde Farm Complex (as early as ca. 1200 B.C.) to the Late Woodland Period (as late as ca. A.D. 1550) suggests that this special activity area of the site had a considerably long time period of use. In studying similar fire-cracked rock concentrations and features at the Abbott Farm site in the Delaware River Fall Line area, Cavallo (1987) notes that many fire-cracked rock fragments seemed to show reuse during numerous separate occupations of the site. A similar situation may have occurred at the Snapp Site over a long period of time.

From the total of 212 prehistoric pit features, 117 (55%) are associated with houses (Table 5). If Type 6 features were also associated with houses, then 137 (65%) of the features are houses. Figure 84 shows the distribution of house features at the site, including those that could be associated with feature clusters. There is considerable overlap of the house features in all areas of the site. Associated storage/processing and refuse pits are also mixed among the houses. These general distributions reinforce the previously noted interpretation that the site was repeatedly occupied by small groups of people over a long period of time. The site clearly shows no planned community such as those seen at some sites in the Middle Atlantic region (e.g., - Kinsey and Graybill 1971).

The density of features at the Snapp Site initially conveys an impression of rather dense settlement, or at least a very intensive use of the site through time. Previous discussions of the feature distributions and feature clusters have shown that there was no dense settlement at the site. The analysis presented below shows that the impression of intensive use of the site may also be equally erroneous.

Table 24 shows the number of houses and other features that can be clearly associated with the three major dated time periods of occupations of the site. Approximately 80 percent of the dated features of all types, and the houses alone, can be associated with the Clyde Farm Complex occupation of the site with the remaining 20 percent evenly divided between the Webb Complex and Woodland II occupations. If the distribution of dated features among the three time periods is assumed to be representative of the distribution of all features at the site among these time periods, then projections of the total number of features per time period can be made (Table 25). The time span of each of the major occupations is also noted in Table 25. If it is assumed that each of the houses, and other features, represents one individual occupation of the site, then the number of occupations during each of the major time periods can be divided into the time span of the period to estimate the amount of time that elapsed between each occupation. These time spans are noted in Table 25 and range between three and 46 years.

TABLE 24

Dated Feature Occurence Through Time

TIME PERIODS	# OF DATED HOUSES (%)	# OF DATED FEATURES ALL TYPES(%)
CLYDE FARM COMPLEX	22 (81%)	44 (80%)
WEBB COMPLEX	3 (9%)	6 (10%)
WOODLAND II PERIOD	4 (10%)	5 (10%)

TABLE 25

Total Feature Density Through Time

	TIME PERIODS		
	CLYDE FARM COMPLEX	WEBB COMPLEX	WOOD-LAND II PERIOD
DATES	1200 - 700 BC	AD 600 - 900	AD 1000 - 1600
DURATION	500 years	300 years	600 years
PROJECTED # OF HOUSES	110	14	13
PROJECTED # OF FEATURES ALL TYPES	170	21	21
ELAPSED YEARS PER HOUSE	4	21	46
ELAPSED YEARS PER FEATURE	3	14	28

It should be clear that the assumption that each feature indicates a separate occupation of the site is very misleading. The recognition of feature clusters discussed in the previous section shows that each feature does not represent a single occupation. Thus, the assumption that each feature can be associated with a separate occupation of the site would grossly overestimate the number of occupations during any given time period. Nonetheless, even with the number of occupations of the site grossly overestimated, the most frequent use of the site, during the Clyde Farm Complex, would have been once every three years! During the Woodland II Period, the site would have been used at most once every 46 years using the estimation methods noted above. The main point of this application of misleading estimation methods is the fact that even when the number of occupations is grossly over-estimated, the Snapp Site appears to have been used relatively infrequently over time. This infrequent use over a long period of time still produced a rather large and impressive archaeological site. However, its large size and relatively dense accumulations of archaeological remains can be misleading when interpreting the intensity and frequency of the site's use over a long period of time.

The mix of house features and features with other functions across the site indicate that the basic settlement unit at the site during all periods of its occupation was the "household cluster" which is defined by Winter (1976:25) as a house and its associated storage, processing, and refuse disposal features. The reader should note that the "household cluster" defined here is different from the "feature cluster," discussed earlier, which was a set of household clusters occupied during a somewhat limited time interval, although not necessarily contemporaneously. A typical household cluster at the Snapp Site seems to have been autonomous with no signs of cooperative labor among households except for possible communal processing of some seasonally available resources.

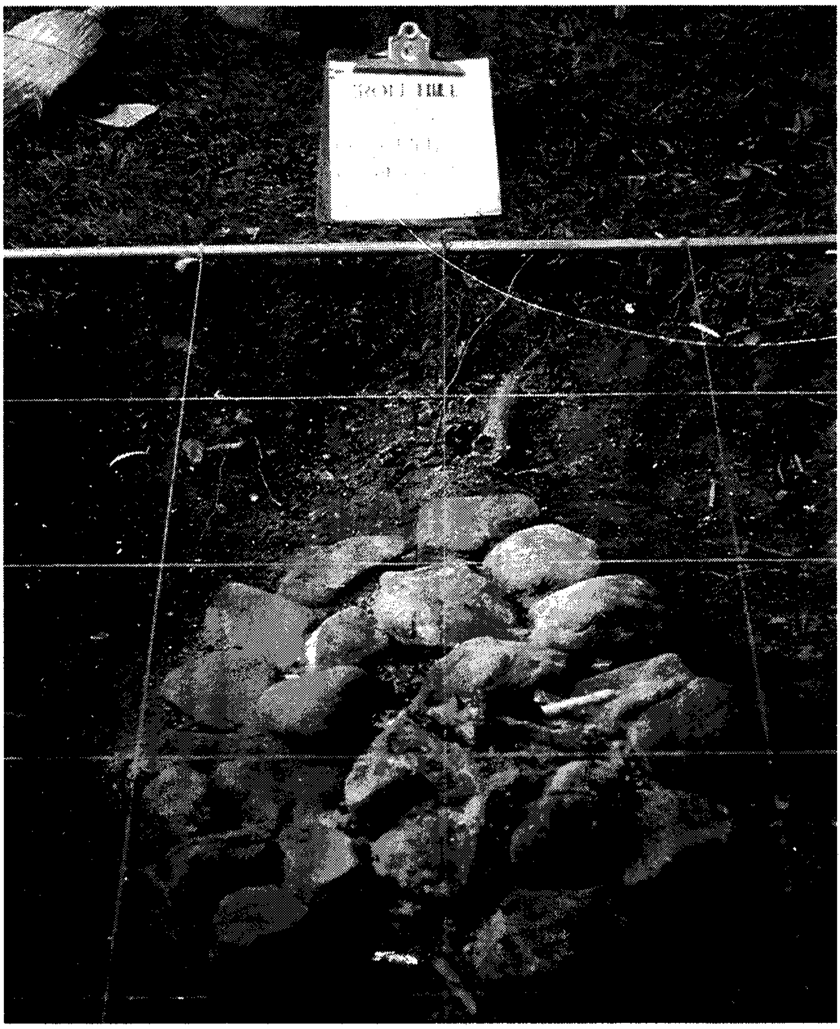
A final topic to consider in the analysis of general feature distributions at the site is the orientation of the houses. Orientations of the long axes of houses can be determined for 103 house structures. A north-south orientation is present for 55 houses (53%) and an east-west orientation is present for 48 examples (47%). The relatively equal distribution of the house orientations suggests that there was no real preference for placement of house openings in relation to prevailing winds or other environmental factors. This absence of consideration of such factors may have been due to the fact that the site was heavily wooded during its occupation with small areas cleared only in the immediate vicinity of the household clusters.

Analysis of Fire-Cracked Rock

One of the most striking characteristics of the Snapp artifact assemblage is the large quantity of fire-cracked rock fragments and cobbles recovered throughout the site. Over 800 kilograms of fire-cracked rock and 930 kilograms of whole cobbles were recovered from within the subsurface features. In order to better understand these artifacts, staff of the University of Delaware Center for Archaeological Research conducted a series of stone heating experiments. The goal of these experiments was to first, observe basic trends and effects of stone heating activities on lithic materials, and second, to create fire-cracked rock samples to use as comparative tools against the Snapp assemblage.

Fire-Cracked Rock Experiments. The stone heating experiments were performed in the Fall of 1992 at the Iron Hill Museum, Newark, Delaware. Approximately 60 samples of varying lithic materials, predominately whole quartz, quartzite, granite cobbles, and pieces of Iron Hill jaspers and limonites were heated in hearth pits (Plate 41). River cobbles used in these experiments were completely covered with cortex and varied in sizes and shapes. The average size of the cobbles was 15 centimeters

PLATE 41
Hearth Used in Fire-Cracked Rock Experiments



in diameter and 1.6 kilograms in weight. The Iron Hill jasper and limonite samples were collected from a primary outcrop, and consequently, had no cortex. The majority of the pieces consisted of large jasper fragments with large limonite inclusions and thin quartz veins. The color of the jasper and limonite prior to heating consisted of a mustard yellow brown. The thin quartz veins appeared clear to milky in color with fine even grains.

Stone platforms were constructed with the samples in the bottom of two hearth pits and fires were built on top of the platforms (Plate 41). The fuel source consisted of pine scraps and miscellaneous kindling collected on the premises of the Iron Hill Museum. Average temperatures of the fires ranged from 740 to 800 degrees Celsius. One fire, Hearth 1, was maintained as a control hearth and the other fire, Hearth 2, was maintained as a heat source for stones used in stone boiling experiments.

In Situ Stone Heating Experiments. Hearth 1 was used to observe the effects of stone heating in situ. This hearth was fed continuously for three hours and then left to cool overnight with the stones in situ. Considerable differences were observed between the jaspers and the river cobbles. Overall, when heated, the jasper/limonite samples changed from their original yellow-brown color to a deep red-maroon color, a result of iron ore oxidations. The first signs of discoloration in the samples were observed within 30 minutes, and many of the smaller pieces changed color completely within that time. The limonite areas of the samples seemed to change color more quickly than the jasper areas. Consequently, samples which contained more jasper than limonite took longer to discolor. After heating, the quartz veins of the samples turned white and consisted of a coarse grained or sugary texture.

Cracking and shattering of the jasper/limonite samples often occurred shortly after the sample turned color. Crackling and popping noises were observed as the samples "exploded" and many of the fragments were displaced. Later examinations of the remains showed that the stone tended to fracture in small blocky pieces and along the quartz veins or between limonite and jasper areas. Samples with more limonite tended to shatter more readily. Simple knapping of the pieces found that the heated remains held a sharp, but brittle edge which were easily broken. Knapping of the pieces was difficult to control.

Unlike the jasper/limonite samples, the quartz, quartzite and granites did not fracture, fissure or discolor as quickly. Only cobbles closest to the center of the hearth exhibited any alterations in three hours of heating. Spaulling of the cobble cortex was observed as well as hairline heat fissures and cracks. Cobbles which did split apart, broke into blocky fragments, often along the major axes. Compared to the jasper/limonite samples, the quartz, quartzite, and granite cobbles seemed to shatter in place. During the firing, no audible sounds or projection of broken fragments was observed. After a 24 hour cooling period, some additional cobbles, which had developed cracks during the firing, split along fracture lines and intact cobbles developed cracks. These results are most likely a result of drops in temperatures during the night.

Because the cobbles were completely covered with cortex, the insides of the cobbles were unknown prior to their firing. After heating, the insides of the cobbles were composed of large coarse crystal grains which were easily crumbled or smashed. Comparison of the fired cobbles, both whole and fragmented, to unfired cobbles found that the fired cobbles were more easily broken and cracked.

Stone Boiling Experiments. Fifteen of the cobbles used to construct the platform in Hearth 2 were subjected to stone boiling experiments. The cobbles, along with jasper/limonite samples, were heated for approximately one and a half hours and then submersed into a three-quarters full five gallon bucket of water (Plate 42). Only whole cobbles were submersed. Starting temperature of the water was 23 degrees Celsius. After the first stone was submersed, considerable steam, bubbling, and crackling in the bucket were observed. The cobble developed fissures. The overall temperature of the water rose from 23 degrees to 26 degrees Celsius within the first minute; however, the water immediately surrounding the cobble was roughly 90 degrees Celsius. Fourteen additional stones were submersed at one minute intervals. Similar results were observed for each cobble. The greatest rise in temperature occurred six minutes after the first stone was submersed and the temperature rose from 63 degrees to 83 degrees. After the seventh and eighth stone were submersed the temperature of the water reached 100 degrees Celsius and began to boil rapidly. Subsequent stones maintained this temperature. A peak of 104 degrees Celsius was reached after thirteen minutes. Large bursts of steam rose from the bucket continuously during the experiment.

PLATE 42
Stone Boiling Experiment

Examination of the stones after the experiment revealed that many of the cobbles had cracked, spaulled or split into numerous smaller pieces. Three cobbles submersed in the later period of the experiment did not exhibit any external alterations and were still whole. Although more fracturing of the cobbles had occurred when the cobbles were submersed into water as compared to just heating them, no differences in physical appearances were observed between the two experiments. Jasper/limonite samples were also placed in a separate bucket of water. The results of submersing heated jasper/limonite samples into water mirrored those observed for the river cobbles.

The stone boiling experiment was performed three additional times, first with completely new cobbles, second with whole and fragmented cobbles from the first trial which were then reheated, and third, with a mixture of new and reheated cobbles. These subsequent trials did not yield any unexpected results; however, stones which were reheated tended to crack and splinter into smaller fragments more readily than those which were not previously heated.

Discussion of Experiment Results. The data resulting from these simple experiments can be applied to the Snapp Site to provide tentative understanding of cracked rock recovered from the site. Like other stone heating experiments (Cavallo 1987; McDowell 1983), these experiments showed that while cracked rock can result from both heating stones and placing heated stones in cold water, the second method results in greater frequencies of fracturing and also smaller fragments. Based on this observation and site analysis, Cavallo (1987) concluded that many of the stone filled features excavated at Area B of the Abbott Farm Site, near Trenton, New Jersey, were remains of various stone boiling activities.

To attempt to determine the possibility of stone boiling remains at the Snapp Site, all fire-cracked rock fragments recovered from subsurface feature pits were measured using varied templates (Table 26). The majority of the fragments, 98.54 percent, were less than 15 cm in diameter and almost half were less than 5 cm in diameter. Although some of the fire-cracked rock in the Snapp assemblage may have been created as a result of stone boiling activities, there is little evidence based on the artifacts, and the stone heating experiments, to identify any of the stone filled features as definite remains of stone boiling activities. Because of the relatively consistent sizes of fire-cracked rock fragments and small carbon quantities among the features, differentiation of stone heating activities among stone filled features was difficult to discern.

TABLE 26

Fire-Cracked Rock and Cobble Size

FCR DIAMETER	COUNT	PERCENTAGE
<5 cm	2514	43
5 cm - 7.5 cm	2070	35
7.5 cm - 10 cm	803	13
10 cm - 12.5 cm	195	3
12.5 cm - 15 cm	94	1
15 cm - 17.5 cm	30	<1
17.5 cm - 20 cm	16	<1
20 cm - 22.5 cm	17	<1
22.5 cm - 25 cm	10	<1
>25 cm	10	<1
TOTAL	5759	100

Total FCR weight = 806.96 kg
Total cobbles = 1311
Total cobble weight = 938.54 kg
Average FCR per feature = 25.71
Range of FCR per feature = 0 to 440 fragments

The results of the experiments showed that while submersing heated stones into water created more cracked rock initially when compared to leaving heated stones to cool in place, heated rocks left in situ overnight also developed cracks and breaks. The experiments also showed that all rocks which had been heated became brittle and more easily broken. These findings suggest that in general, temperature changes can cause rocks which have been heated to become fragmented. The experiments also did not discover any visible physical differences between heated rocks which had been exposed to water and those which had not. Because of these findings, in situ cooling in conjunction with natural temperature changes, such as freezing and thawing, cannot be eliminated as possible causes for the large quantities of small fire-cracked rock fragments recovered from the Snapp Site. Moreover, the lack of differences between the rocks created by the two experiments also hinders identifying the activities, other than general stone heating, which resulted in the large quantity of small fragments of cracked rock.

Virtually all of the fire-cracked rock collected at the Snapp Site appeared to be quartz/quartzite type materials. Comparison of thermal alteration of these materials against the jasper/limonites, or cryptocrystalline, materials found the quartz/quartzite materials more durable. In fact, some of the cobbles used in the experiments remained intact for more than one heating. Whether or not this result was due to the presence of cortex on the river cobbles was not determined by the experiments; however, it can be suggested that perhaps quartz/quartzite type materials are more suitable or preferable for use in stone heating, especially stone boiling, activities.

Analysis of Ceramic Temper Production

As discussed earlier in this report, the Snapp ceramic assemblage contains a wide variety of experimental ceramic wares. One of the major characteristics of experimental ceramic wares is a shift from the earlier nearly exclusive use of steatite fragments as tempering agents in Marcey Creek ceramics, to the use of crushed gneiss, hornblende, quartz, and sand as tempers (Custer 1987; Wise 1975). While many of the experimental sherds in the Snapp assemblage are standard examples of these wares, such as Dames Quarter and Ware Plain, the assemblage is unique in that it also contains sherds which have combinations of tempering materials not previously noted for Delaware. These unusual combinations are steatite and crushed black stone (gneiss or hornblende) and steatite and clay. The first combination is interesting because it represents a continuity of ceramic technologies from the earlier steatite tempered Marcey Creek type to the somewhat later Dames Quarter black stone wares. Sherds tempered with both steatite and gneiss were recovered from Features 198, 7, 158/159, 234, and 35. Features 198 and 158/159 are both associated with identified Clyde Farm Complex feature cluster areas. Feature 198 is located in Cluster 1 and Feature 158/159 is in Cluster 5 (Figures 68, 76, 80; Plate 40).

Two features at the site, Feature 18 and Feature 230, contained ceramic sherds tempered with steatite and clay. Both Feature 18 and Feature 230 are located in Clyde Farm Complex cluster areas, Clusters 2 and 3, respectively (Figures 68, 77, 78; Plate 40). Microscopic examination of the sherds revealed small pieces of steatite embedded in the clay temper. It is possible that earlier steatite tempered Marcey Creek ceramic sherds may have been crushed and reused as temper material for new vessels. The discovery of these diverse tempering materials is interesting in that it shows that the variability of temper materials used in experimental wares was even more diverse than previously thought.

Results from the fire-cracked rock analysis also resulted in data pertinent to ceramic temper studies of the Snapp assemblage. Numerous large core-like fragments of possibly non-local lithic materials were recovered from some of the subsurface features of the site. The majority of these materials are various kinds of black gneisses and granites, although some steatite fragments and a small piece of micacious stone were recovered (Table 27). The pieces are blocky in shape and many have flat facets.

Microscopic examination of the ceramic sherd tempers found that some of the temper fragments closely resembled many of these cores (Table 28) and suggests that these cores may be remains of lithic materials used for temper in ceramic manufacturing. Figure 85 presents possible provenience associations between the lithic cores and the ceramic sherds; however, because of the small sizes of the fragments, positive identification of the temper materials was difficult, and these postulated relationships are problematic. Although the sherd-core associations are tentative, additional observations can be made.

TABLE 27
Features with Lithic Materials Possibly Used as Ceramic Temper

FEATURE	MATERIAL
82	Gneiss
83	Gneiss
93	Gneiss
102	Gneiss
135	Mica, gneiss
142	Gneiss
146	Gneiss
147	Gneiss
152	Granite
155	Quartz
163	Quartz
177	Gneiss or granite
181	Quartz
185	Quartz
190	Steatite, granite
191	Gneiss
195	Gneiss
202	Gneiss
216	Possible soapstone
220	Gneiss
224	Granite

Many of the associations occurred between features in close proximity to each other and some associations are found within feature cluster areas. Only one feature, Feature 147, a large house feature, contained a core which matched temper of ceramic found within the same feature. Only one core recovered from plow zone soils was considered for this analysis. A large piece of green steatite was recovered from plow zone test unit N270 E0. This material had considerable similarities with the large steatite temper fragments in the Marcey Creek vessel recovered from Feature 193/142 which was located roughly 5 meters northeast of the unit (Figure 85).

A small experiment was also conducted with some of the quartz cracked rock fragments created by the stone heating experiments. As described earlier, heating of the rocks resulted in cracked rocks with an internal structure which was easily crumbled. Small fragments of the experimental fire-cracked rock were crushed and ground. This resulted in fragments ranging from very fine (< 1mm in diameter) to coarser grains (~5 mm in diameter). These grains closely resembled many of the quartz and crushed rock temper found in crushed quartz temper type

TABLE 28
Associations Between Temper Materials and Ceramic Sherds

FEATURES WITH CERAMICS	CERAMIC TYPE	FEATURES WITH TEMPER MATERIALS	PROBABLE ASSOCIATION	MATERIAL
1	Marcey Creek	135	135	Mica
35	Dames Quarter	93	93	Gneiss
62	Dames Quarter	82, 93	82 or 93	Gneiss
143/192	Marcey Creek	T.U. N270 E0	T.U. N270 E0	Steatite
147	Dames Quarter	147	147	Gneiss
164	Marcey Creek	82	N/A	Steatite
198	Dames Quarter	202, 220, 93, 195	202	Gneiss
203	Dames Quarter	202	202	Gneiss
208	Dames Quarter	83, 195, 202, 102	202	Gneiss
214	Hell Island	102, 191	102	Gneiss
231	Hell Island	135	135	Gneiss

ceramics, such as Wolfe Neck, found at the site. Rudimentary pot making found the created grains easily incorporated into clays. The abundance of fire-cracked rock and presence of possible tempering materials, including fire-cracked quartz and quartzites, suggest that one of the stone heating activities conducted at the Snapp Site may have been related to the production of temper materials for ceramic manufacturing.

Analysis of Ceramic Technologies

Over 400 individual ceramic sherds were recovered from feature excavations in the cultivated field area of the Snapp Site. Many of these sherds could be identified by diagnostic types which span the time period from the early part of the Woodland I Period to the later portions of the Woodland II Period (Tables 6 and 7). Because of the relatively small sizes of the sherds, and also the lack of refits among the sherds, no general conclusions regarding minimum vessel counts or minimum vessel sizes of the various ceramic wares could be made for either the feature clusters or the overall site.

Over half of all sherds, approximately 55 percent, recovered from feature excavations originated from within Feature 142/193, a Type 2 feature in Feature Cluster 6 (Figure 68, Plate 40). These sherds are the remains of a single large Marcey Creek vessel (Plates 20 and 38). Examination of the partially reconstructed vessel indicates that the vessel stood at least 30 centimeters high; however, the diameter of the vessel could not be estimated from the reconstructed partial remains. The walls of the vessel averaged one centimeter thick. The paste of the vessel is heavily tempered with large fragments of steatite and many of the larger fragments average approximately five millimeters in diameter. Rim sherds and the single lug handle fragment (Plates 20 and 38) exhibit scalloping, and both the rim and lug handle appear to have been applied to the main body of the vessel. Although refits of base fragments to main sections of the vessel are tentative, the appearance and association of base sherds found with main sections of the vessel suggest that the original vessel had a flat slab bottom. Fracture lines of the sherds (Plate 43) indicate that the vessel's body is of coil construction and the coils are relatively wide averaging 11 centimeters to 12 centimeters in width. Interior and exterior surfaces of the vessel are smoothed and do not exhibit any decoration.

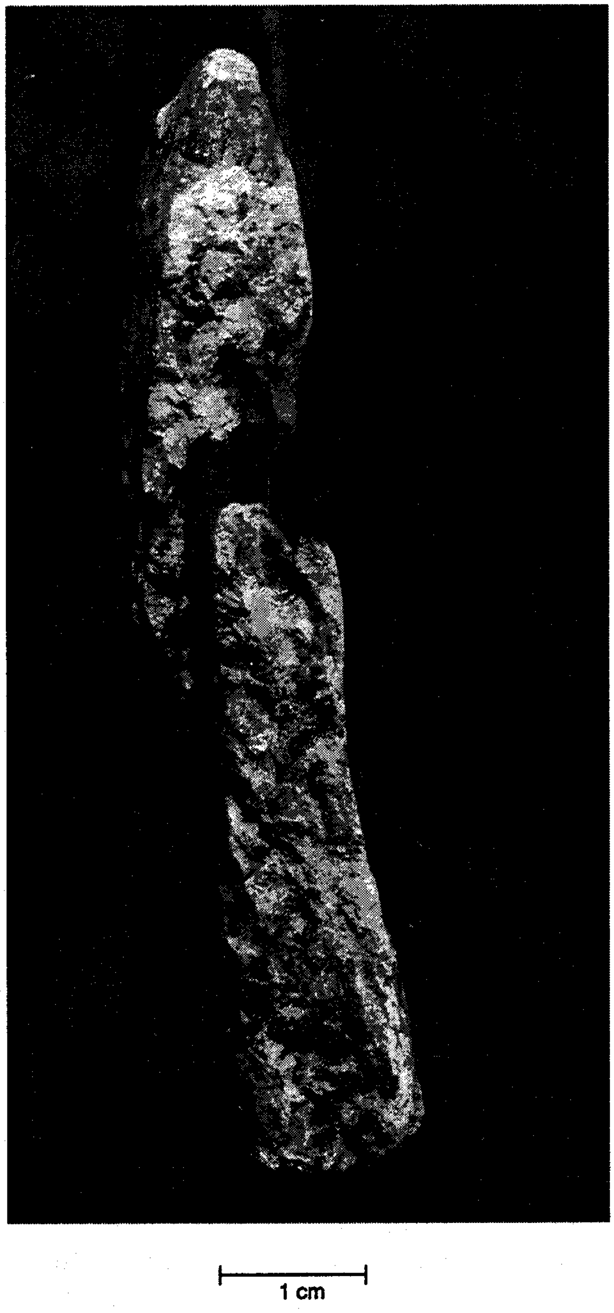
These attributes of the Marcey Creek vessel suggest that the vessel was constructed by building up large coils upon a flat slab base. The usual vessel construction method attributed to Marcey Creek potters is modeling where slabs of clay were placed upon a base and then were joined by smoothing the wet clay together to form the vessel's body (Custer 1987). Use of clay coils tempered with steatite is usually linked to Selden Island ceramics which have a conoidal shape, rather than the flat bottom and straight sides associated with Marcey Creek ceramics (Custer 1989:169-170). Selden Island ceramics are thought to be slightly younger than Marcey Creek ceramics and represent the fusion of crushed steatite tempered paste with new intrusive ceramic technologies including coiled construction, cord marking, and conoidal vessel shapes (Wise 1975). The new ceramic technologies are usually viewed as linked traits that were introduced into the Middle Atlantic region via diffusion from the Northeast or the Ohio Valley (Custer 1987; Brown 1986).

With its flat bottom and coiled construction, the Marcey Creek vessel from the Snapp Site is transitional between classic Marcey Creek and Selden Island pottery. The potter who produced the vessel used only <u>one</u> of the three "linked" ceramic traits, coiling, and added it on to the traditional flat-based construction. The use of only one of the new ceramic production technologies may indicate that their introduction was more gradual than originally thought. Some coiled, flat-bottomed vessels are known from the Ohio Valley (Grantz 1986:15), and the Snapp Site vessel may be an example of a similar technology. It is also possible that the coiled technology was a local independent invention added to existing flat-bottomed ceramic technologies. Whatever the case, the Marcey Creek vessel from the Snapp Site highlights the variability of ceramic technologies between 1200 and 700 B.C.

Basic attribute analyses, primarily the study of surface treatments, were also conducted on ceramic sherds not associated with the large Marcey Creek vessel of Feature 142/193. Because of the small quantity of sherds, approximately 45 percent of the entire ceramic assemblage (and less than 180 individual sherds), cross feature cluster comparisons were minimal based on the data collected from these analyses. Percentages presented in the following discussion exclude sherds associated with the vessel from Feature 142/193.

Darkened surfaces due to either usage or burning were observed in 13.97 percent of the sherds, excluding those associated with the vessel from Feature 142/193 . These sherds consisted primarily of Marcey Creek wares and were mainly recovered from features not located in any feature clusters. Smoothed surface treatments were present on 18.99 percent of the sherds and the majority of these sherds were also identified as Marcey Creek wares (approximately 82%). Sherds with smoothed surfaces were recovered from almost all of the feature clusters. The 21 Hell Island sherds, or 11 percent of smoothed ceramic sherds, were recovered from Feature 35 and may have been the remains of a single vessel. Only two sherds, or approximately one percent, exhibited net impressed surfaces. Both sherds were identified as Townsend wares and were recovered from Feature 195 and Feature 140.

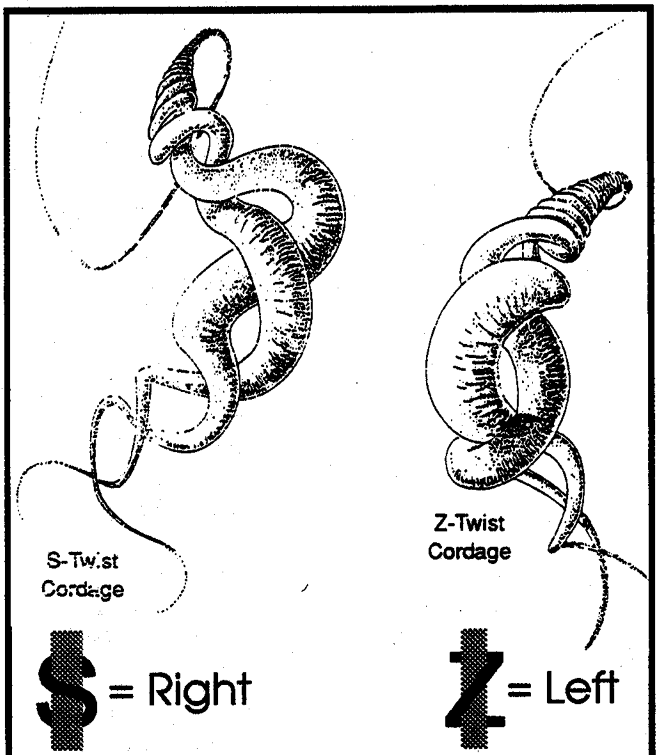
PLATE 43
Coil Break in a Marcey Creek Vessel (Feature 142/193)



Approximately 25 percent of the sherds exhibited cord marked surfaces. Cord twists (S-Twists or Z-Twists - Figure 86) were examined through clay impressions of representative samples of these sherds (Plate 44). All cords impressed upon the sherds were concluded to possess S-Twists, which

FIGURE 86

Varieties of Cordage Twists



Direction of twist, spin or weft slant and symbols employed in their description (after Hurley, 1979)

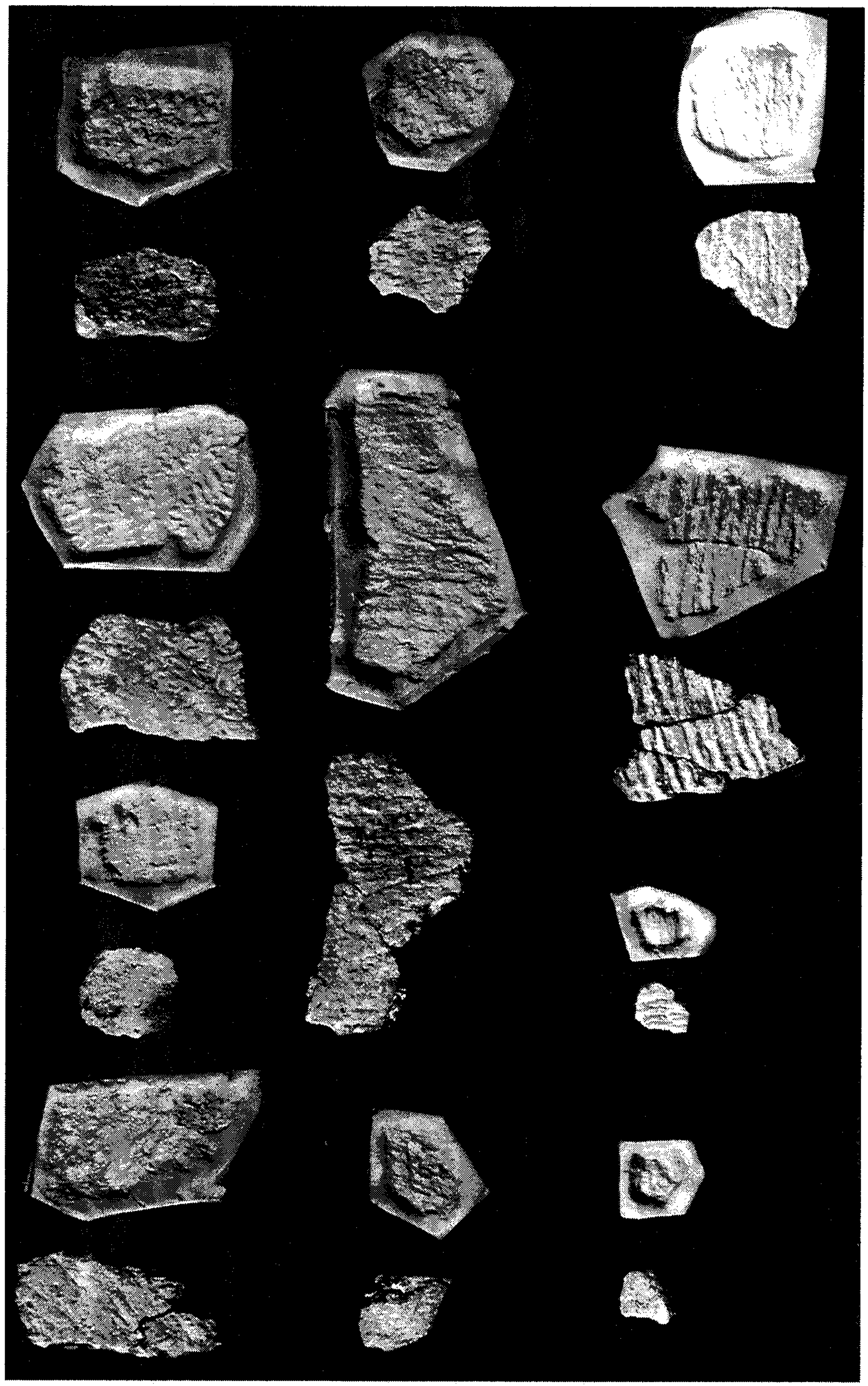
consequently, resulted in Z-Twist impressions on the sherd surfaces. The majority of the sherds with cord marked surfaces, approximately 65 percent, were recovered from Feature 200. These sherds were concluded to be the remains of a single Wolfe Neck vessel.

Analysis of Lithic Technologies

The lithic artifact assemblage from the Snapp Site includes artifacts derived from both well-defined and poorly defined temporal contexts. Because the overall time frame of the site's occupation spans the entire range of Delaware prehistory, the lithic assemblages from the plow zone and disturbed woodlot areas represent a variety of occupations. Previous research (Custer 1984, 1989; Lowery and Custer 1990) has shown that lithic technologies changed dramatically through prehistoric times on the Delmarva Peninsula. Therefore, analysis of the mixed assemblages would combine artifacts with many different manufacturing and use histories, and would not reveal much specific information about lithic technologies in the past. However, some basic data from the mixed assemblages will be noted. The greatest emphasis in the analysis, nonetheless, will be placed on lithic artifacts from well-defined temporal contexts.

PLATE 44

Cordage Impressions on Wolfe Neck Ceramic Sherds



Note: All show S-twist cordage.

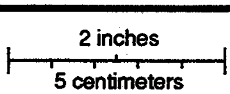


TABLE 29

Total Lithic Artifact Assemblage and Raw Materials

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	707(91)	809(117)	2477(461)	2464(922)	21(0)	49(0)	18(3)	29(12)	6574(1606)
UtilizedFlakes	3(1)	15(1)	78(12)	68(33)	15(0)	0	0	0	179(47)
Flake Tools	8(6)	17(3)	26(13)	27(14)	2(0)	1(0)	0	0	81(36)
Paleo-Indian Points	0	0	0	1(0)	0	0	0	0	1(0)
Archaic Points	0	0	0	0	0	0	0	0	0
Woodland I Points	0	4(0)	11(0)	6(0)	3(0)	4(0)	0	1(0)	29(0)
Woodland II Points	1(0)	1(0)	1(0)	1(0)	0	0	0	0	4(0)
Early Stage Biface Rejects	1(0)	6(2)	8(4)	7(4)	0	0	0	0	22(10)
Late Stage Biface Rejects	2(0)	1(0)	5(2)	3(2)	1(0)	0	0	0	12(4)
Other Bifaces & Fragments	1(0)	8(0)	13(0)	16(0)	0	3(0)	0	3(0)	44(0)
Miscellaneous Stone Tools	2(0)	5(3)	2(1)	16(12)	0	0	0	0	25(16)
Cores	7(2)	15(10)	11(9)	11(8)	0	0	0	0	44(29)
Total	732(100)	881(136)	2632(502)	2620(995)	42(0)	57(0)	18(3)	33(12)	7015(1748)

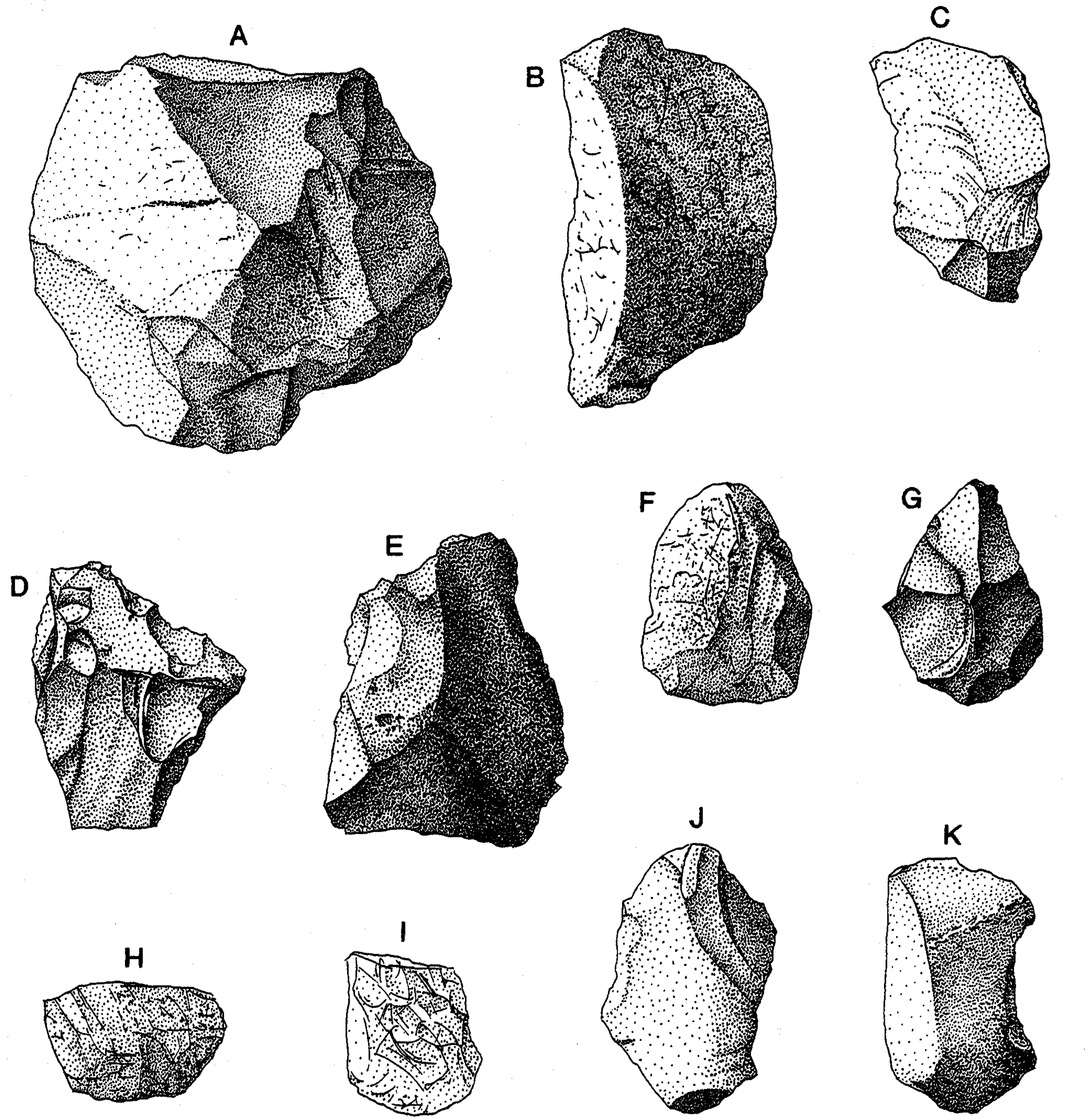
( ) - Artifacts with cortex

General Lithic Assemblage. Table 29 provides a summary catalog of the different lithic raw materials used to manufacture varied tool types within then entire Snapp Site assemblage. Tables 30 and 31 are derived from Table 29 and show the percentage of artifacts with cobble cortex in each tool category for each lithic type and the relative frequencies of raw material use in each artifact category.

Overall, cobble cortex is present on 25 percent of the total lithic assemblage indicating that the Snapp Site's inhabitants made use of the secondary cobble sources found in and around the site (Table 30). The highest cortex percentages are seen for flake tools, early stage biface rejects, and cores. These high values suggest generally that local cobble resources were being used to replenish tool kits brought to the site. Cobble cores were used to produce formalized flake tools ("flake tool" category in Tables 29 - 31), and also to manufacture flakes which were used as cutting and scraping tools without specialized edge shaping and resharpening ("utilized flakes" category in Tables 29 - 31). Figures 87 and 88 shows a sample of such cutting and scraping tools from undated contexts including a large blocky core (Figure 87A), unifacial side scrapers of various materials (Figure 87B-G), trianguloid end scrapers (Figure 87H-J), a concave side scraper (Figure 87K), bifacially retouched side scrapers (Figure 88A,B), and a slug-shaped uniface (Figure 88C). Cortex is present on many of these tools and its presence illustrates the point that many of the flake tools were made on flakes derived from cores like the one illustrated in Figure 87A.

FIGURE 87

Cores and Unifacial Scrapers from Undated Contexts

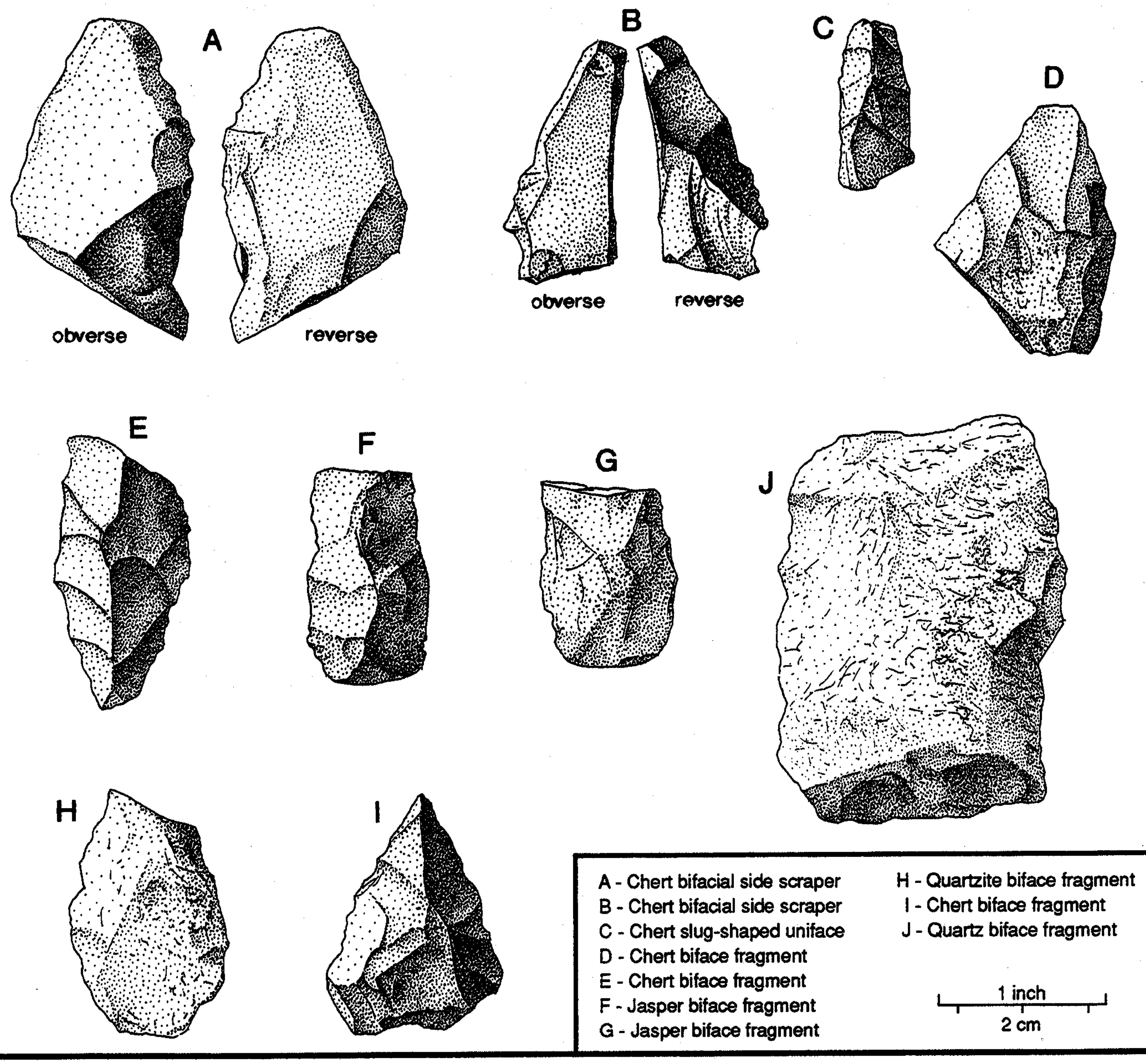


A - Quartzite core
B - Quartzite unifacial side scraper
C - Jasper unifacial side scraper
D - Jasper unifacial side scraper
E - Jasper unifacial side scraper
F - Quartz unifacial side scraper
G - Chert unifacial side scraper
H - Quartz trianguloid end scraper
I - Quartz crystal trianguloid end scraper
J - Jasper trianguloid end scraper
K - Chert concave side scraper

1 inch
2 cm

FIGURE 88

Bifacial Scrapers and Bifaces from Undated Contexts



A - Chert bifacial side scraper
B - Chert bifacial side scraper
C - Chert slug-shaped uniface
D - Chert biface fragment
E - Chert biface fragment
F - Jasper biface fragment
G - Jasper biface fragment
H - Quartzite biface fragment
I - Chert biface fragment
J - Quartz biface fragment

1 inch
2 cm

Figure 88 also shows a number of bifaces (Figure 88D-J) from undated contexts. Six of these bifaces (Figure 88D, F-J) show signs of cortex and, therefore, their derivation from secondary cobble sources. In some cases, the cortex is present on the proximal (basal) end of the bifaces (Figure 88F, G, I, J). Kalin (1981) has shown in experimental studies that the presence of cortex on proximal ends of bifaces is associated with the production of points and bifaces from small cobbles which are split in half lengthwise via bipolar percussion and then reduced. Geier (1990) has described archaeological specimens associated with bipolar reduction and Ritchie (1961:29) notes that remnant pebble cortex on point bases is a diagnostic trait of some stemmed point varieties. In addition to a biface technology based on bipolar reduction of cobbles, bifaces made from flakes are also present (Figure 88H), but are less frequent. In sum, the general undated biface assemblage shows a reliance on bipolar reduction of secondary cobbles.

TABLE 30

Total Lithic Artifact Assemblage - Cortex Percentage

Tool Type	Raw Materials							
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	13	14	19	37	0	0	17	41	24
Utilized Flakes	33	7	15	49	0	—	—	—	26
Flake Tools	75	18	50	52	0	0	—	—	44
Paleo-Indian Points	—	—	—	0	—	—	—	—	0
Archaic Points	—	—	—	—	—	—	—	—	—
Woodland I Points	—	0	0	0	0	0	—	0	0
Woodland II Points	0	0	0	0	—	—	—	—	0
Early Stage Biface Rejects	0	33	50	57	—	—	—	—	45
Late Stage Biface Rejects	0	0	40	66	0	—	—	—	33
Other Bifaces & Fragments	0	0	0	0	—	0	—	0	0
Miscellaneous Stone Tools	0	60	50	75	—	—	—	—	64
Cores	29	66	82	73	—	—	—	—	66
Total	14	15	19	38	0	0	0	36	25

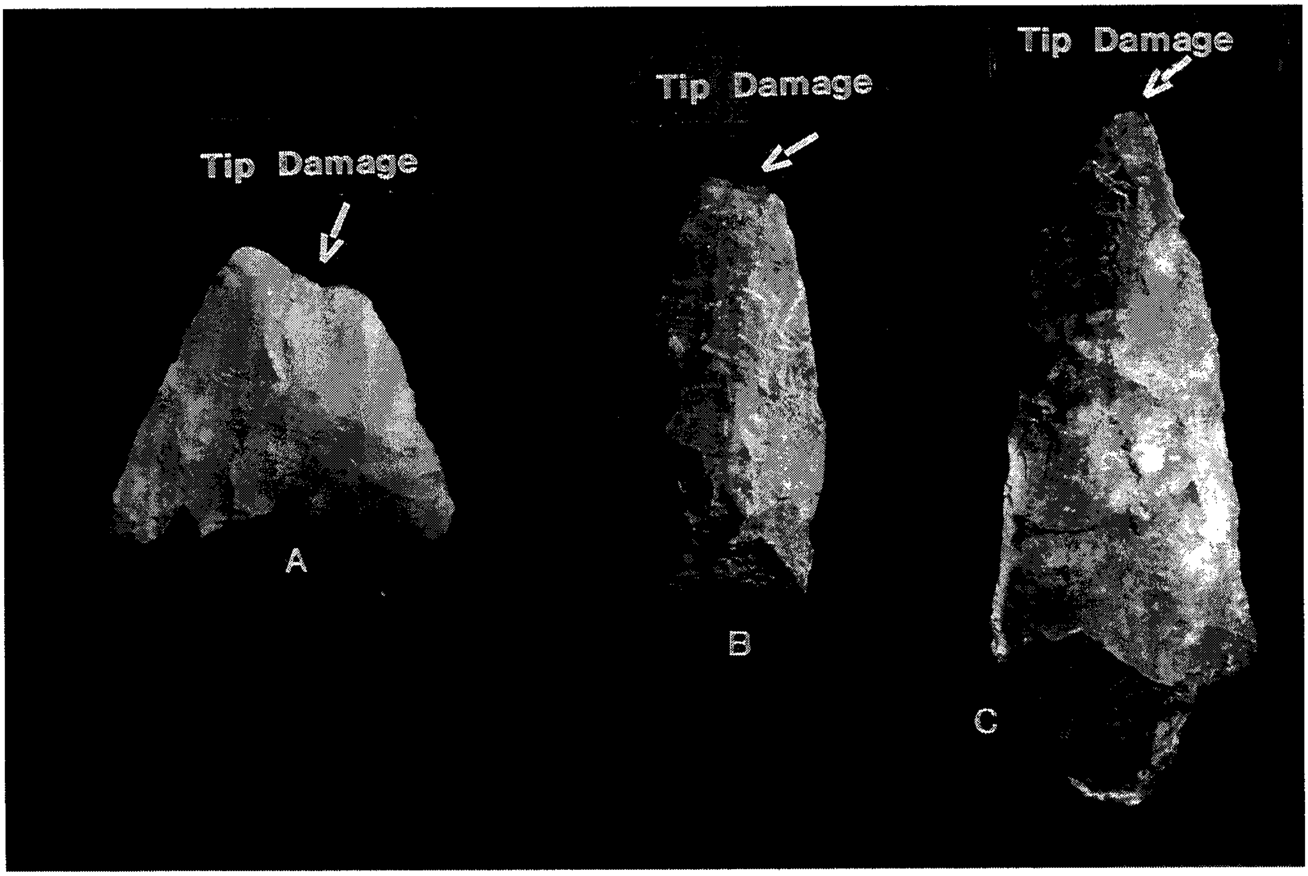
TABLE 31

Total Lithic Artifact Assemblage - Raw Material Percentage by Tool Type

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	11	12	38	37	<1	1	<1	<1	—
Utilized Flakes	2	8	44	38	8	—	—	—	—
Flake Tools	10	21	32	33	2	1	—	—	—
Paleo-Indian Points	—	—	—	100	—	—	—	—	—
Archaic Points	—	—	—	—	—	—	—	—	—
Woodland I Points	—	14	38	21	10	14	—	3	—
Woodland II Points	25	25	25	25	—	—	—	—	—
Early Stage Biface Rejects	4	27	36	32	—	—	—	—	—
Late Stage Biface Rejects	17	8	42	25	8	—	—	—	—
Other Bifaces & Fragments	2	18	29	36	0	7	—	7	—
Miscellaneous Stone Tools	8	20	8	64	—	—	—	—	—
Cores	16	34	25	25	—	—	—	—	—
Total	10	13	38	37	<1	1	<1	<1	—

PLATE 45

Examples of Projectile Point Tip Damage

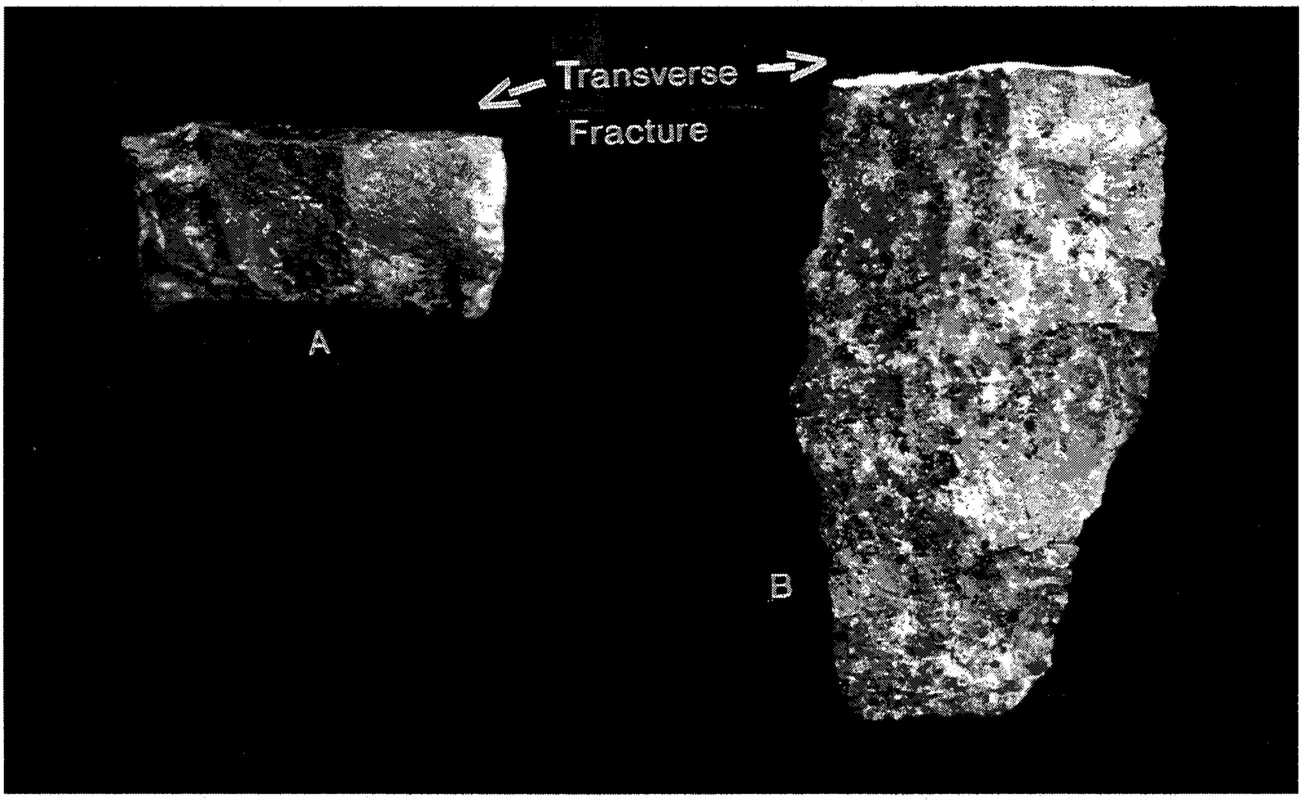


A - Jasper triangle - surface, woods
B - Chert Type B stemmed, N320 E0 - plow zone
C - Chert stemmed - Feature 235
.5 in
1 cm

Table 31 shows the percentage of lithic raw material use for each tool type among the general site assemblage. Cryptocrystalline chert and jasper are the most frequently used materials for almost all artifact types. The only exception occurs among the cores where quartz is the dominant raw material. The greatest variety of raw materials are used for projectile points and cores and this pattern of raw material use has been observed in other lithic assemblages (e.g., Custer 1989; Custer 1990). The data shown in Table 31 also underscores the importance of cobble resource use at the site because jasper and chert, the most commonly use raw materials, show some of the highest cortex percentages (Table 30).

An additional topic to discuss for the general lithic assemblage pertains to projectile points. Projectile points associated with dated feature clusters are discussed later in this report and only those points not associated with dated feature clusters are discussed here. Table 32 shows the correlations of point width and raw material with patterns of point breakage. Tip damage (Plate 45), which is indicative of point use as true projectiles (Odell and Cowan 1986), is present on 83 percent of the points less than 20 millimeters in width and on 58 percent of the points more than 20 millimeters in width. Application of the difference-of-proportion test (Parsons 1974) shows that this difference is statistically significant (test value=1.63, $.05<p<.1$). Therefore, in the general point assemblage from the Snapp Site, narrow

PLATE 46
Examples of Transverse Medial Fractures



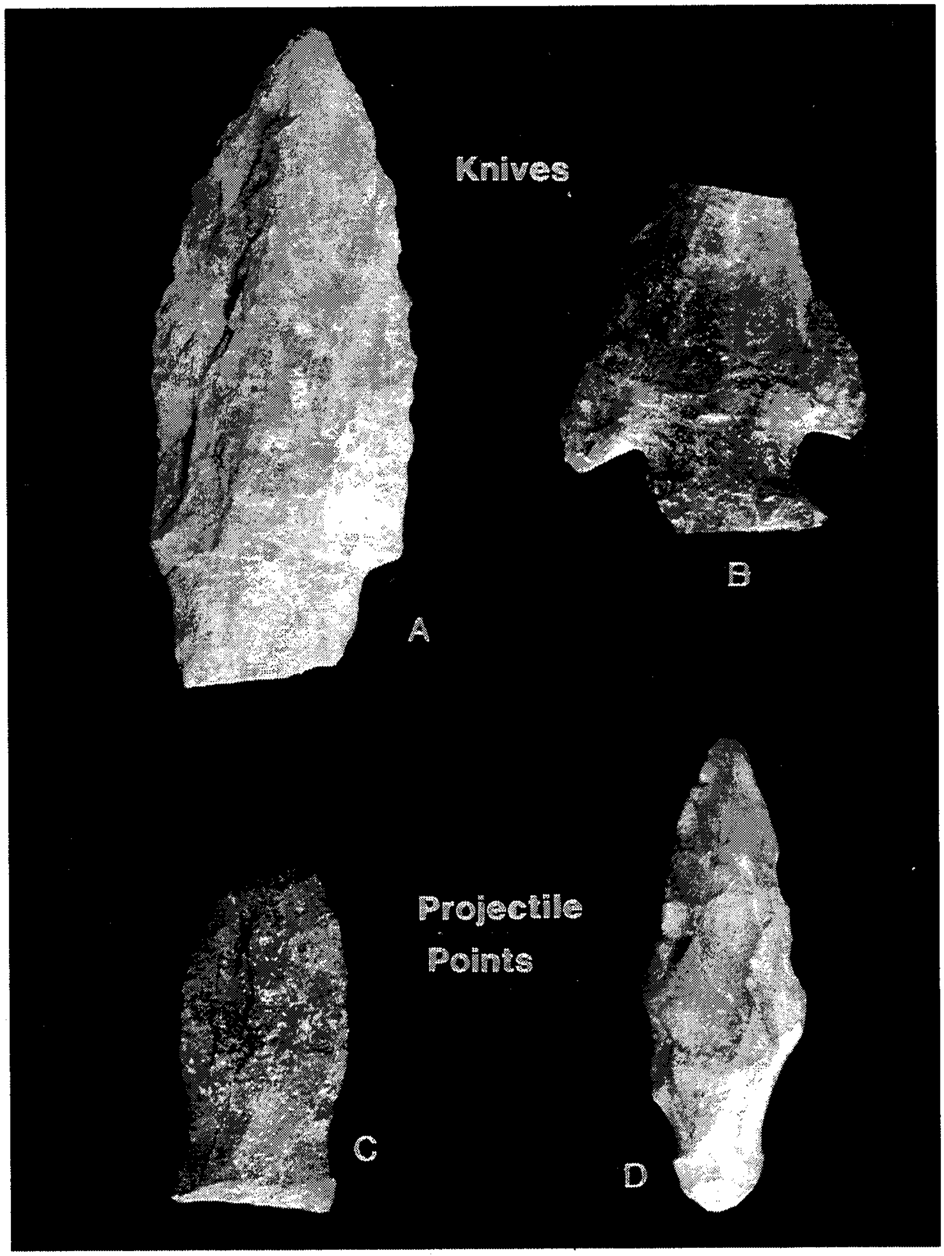
A - Jasper fluted point - N334 W34, Level 4 (woods)
B - Chert Type B stemmed - N348 W25, Level 2 (woods)
.3 in
.75 cm

points less than 20 millimeters in width more commonly functioned as projectile points than wider points more than 20 millimeters in width. This finding confirms similar studies of the relationships between point width and function (Custer 1991).

Transverse medial fractures (Plate 46), indicative of knife use (Truncer 1990), are also present in the assemblage and their frequency is noted in Table 32. Transverse medial fractures occur on broken point tips with tip damage (Plate 45) and the co-occurrence of these two breakage patterns, each associated with a different tool function, indicates that points were used for multiple functions including projectile points and cutting tools, such as hafted knives. Transverse medial fractures occur on 42 percent of the narrow blade points and 66 percent of the wider points. Application of the difference-of-proportion test in this case shows that the varied proportions are not statistically significant (test statistic = 1.41, P>.1). Thus, both wide and narrow points were equally likely to be used, and broken, as knives (Plate 47). The dual functions of these tools are probably due to the fact that no large and wide bifacial tools, over 40 millimeters in width, are present in the assemblage. Such wider tools, which were probably too large to function as projectiles, usually predominantly show signs of knife use (Custer 1991:69-71). Their absence in these assemblages probably created a situation where narrow-blade points had to function

PLATE 47

Functional Types of Projectile Points



A - Type E stemmed - Rhyolite (Feature 198)
B - Kirk/Palmer - Chert (N310 W10 - plow zone)
C - Fishtail - Chert (Feature 16)
D - Type B stemmed - Jasper (N300 E40 - plow zone)

1 in
5 cm

TABLE 32
Projectile Point Breakage Patterns

Point Width	Tip Damage Present	Tip Damage Absent	Medial Fracture Present
0-20 mm	20	4	10
20-40 mm	7	5	8
Raw Material			
Quartz	4	0	4
Jasper	10	5	5
Chert	14	1	5
Argillite	4	2	4

both as projectile points and knives. Wider tools may be absent from the assemblage because the local cobbles, which form the basis of much of the Snapp Site lithic technologies, are for the most part too small to manufacture bifacial tools more than 40 millimeters in width.

Table 32 also shows a cross-tabulation of raw materials and point breakage patterns. All of the quartz points and fragments show signs of both tip damage and transverse medial fractures indicating that points manufactured from this raw material were commonly used for multiple functions. Tip damage was very common for all of the remaining lithic raw materials, and difference-of-proportion tests show no differences among proportions of tip damage for all raw materials. Similar results occur when the proportions of medial fractures are compared. Therefore, there are no links among raw materials and projectile point functions. The absence of these links is probably due to the multiplicity of uses for individual points in the Snapp Site assemblage.

Table 33 shows the frequencies of raw materials use among the total projectile point and biface assemblages. In general, the proportions of raw material use are similar between the point and biface assemblages, except in the case of argillite and rhyolite. Neither of these raw materials are locally available, and there are higher proportions of points than bifaces for these materials. Presumably, the

TABLE 33
Lithic Raw Material Use for Points and Bifaces

Raw Material	Total Point Count	%	Total Biface Count	%	Total Point & Biface Count	%
Quartzite	1	3	4	5	5	4
Quartz	5	15	15	19	20	18
Chert	12	35	26	33	38	34
Jasper	8	24	26	33	34	30
Rhyolite	3	9	1	1	4	4
Argillite	4	12	3	4	7	6
Ironstone	0	0	0	0	0	0
Other	1	3	3	4	4	4
Total	**34**		**78**		**112**	

TABLE 34
Summary Tool Catalog

	Total Assemblage	Clyde Farm	Webb	Woodland II
Points/Knives	78	16(0)	1(0)	0
Late Stage Bifaces	12	7(1)	0	1
Early Stage Bifaces	22(16)	6(4)	1(0)	0
Drills	1(0)	0	0	0
Concave/Biconcave Scraper	10(7)	0	0	0
Bifacial Side Scraper	13(8)	5(2)	0	0
Unifacial Side Scraper	35(22)	17(12)	3(2)	2(1)
Tianguloid end Scraper	12(7)	3(1)	0	0
Slug-shaped Unifaces	4(4)	3(3)	0	0
Wedges	7(7)	2(2)	0	0
Primary Cores	15	4	0	0
Secondary cores	29	4	1	0
Denticulates	0	0	0	0
Gravers	0	0	0	0
Regular Utilized Flakes	157(119)	24(15)	5(4)	11(4)
Blade-like Utilized Flaks	22(10)	4(2)	0	0

Value in ( ) is number of tools with cobble cortex

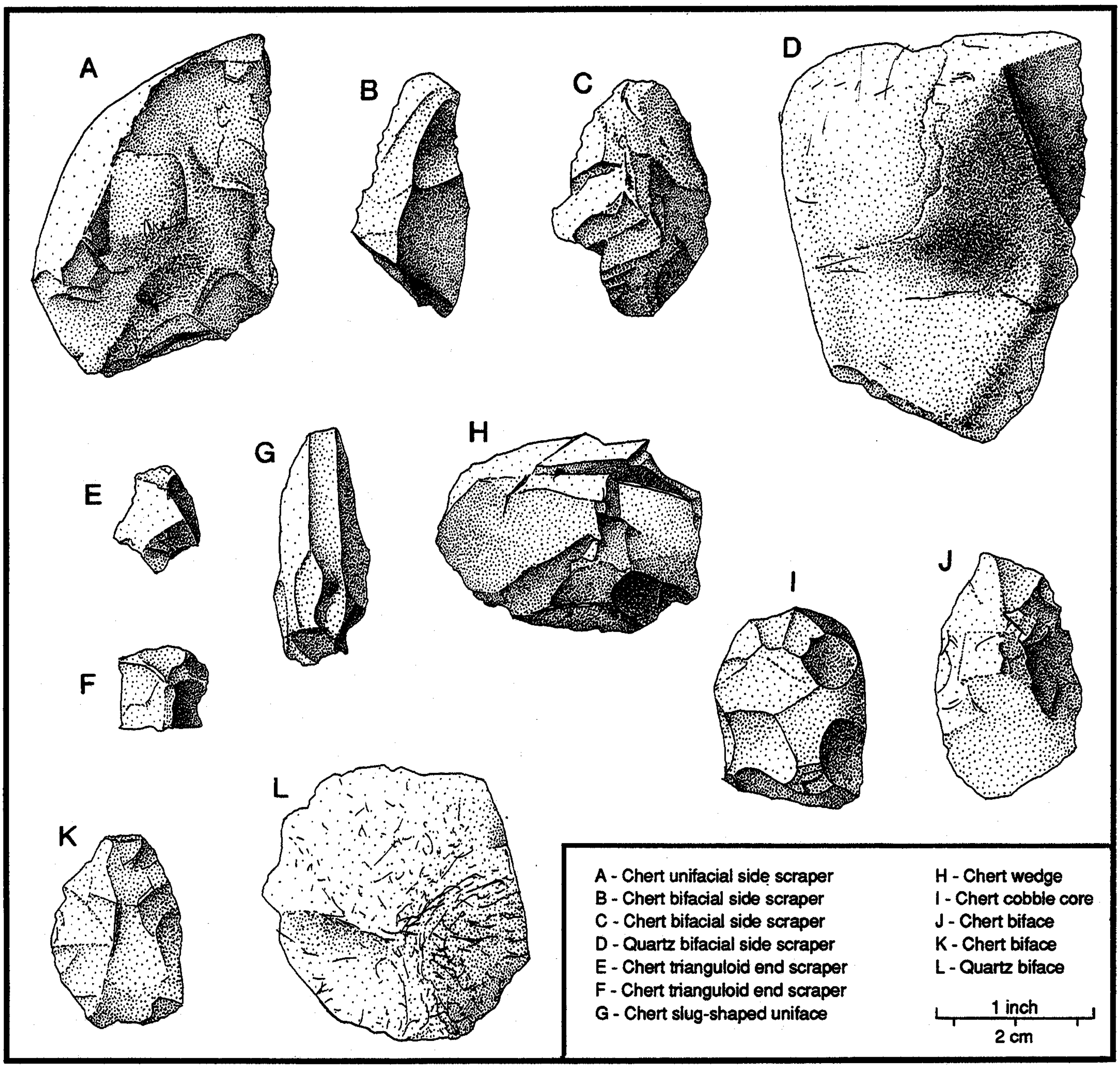
bifaces were more likely to be manufactured on site, whereas the points were brought to the site from elsewhere and discarded at the site when they were no longer useful. Therefore, it is understandable that the non-local raw materials are more frequently represented in the projectile point assemblages.

Table 34 provides a summary catalog of the main lithic tool types in the total lithic assemblage and in the Clyde Farm Complex, Webb Complex, and Woodland II assemblages. Because of the mix of the varied occupations, it is not useful to conduct a detailed analysis of the tool composition for the total site assemblage. However, it can be noted that almost all of the main tool categories are present except for denticulates and gravers. These specific tool types may be missing because other generalized flake tools were used for the functions usually associated with the specialized tool forms.

Clyde Farm Complex Lithic Assemblage. Table 35 shows a summary catalog of lithic artifacts from features in feature clusters that can be securely dated to the later portion of the Clyde Farm Complex. All feature clusters from this time period were lumped together for analysis because there were insufficient numbers of artifacts in the individual clusters. Tables 36 and 37 show the cortex percentages and raw material percentages by tool types based on the data in Table 35. In general, lithic artifacts from Clyde Farm Complex features comprise approximately 34 percent of the total lithic artifact assemblage from the site. Approximately 28 percent of the Clyde Farm Complex lithic artifacts show signs of cortex, and, consequently,the use of secondary cobble sources. This proportion is quite similar to the 25 percent noted for the entire lithic assemblage. The Clyde Farm Complex assemblage shows higher frequencies of artifacts with cortex, compared to the total assemblage, in the following artifact categories: utilized flakes, early stage bifaces, and cores. Figure 89 shows a sample of lithic tools from Clyde Farm features. Examples of tools with cortex include unifacial side scrapers (Figure 89A), bifacial side scrapers (Figure 89B, D), trianguloid end scrapers (Figure 89F), wedges (Figure 89G), and cores (Figure 89I).

FIGURE 89

Tools from Clyde Farm Complex Features



A - Chert unifacial side scraper
B - Chert bifacial side scraper
C - Chert bifacial side scraper
D - Quartz bifacial side scraper
E - Chert trianguloid end scraper
F - Chert trianguloid end scraper
G - Chert slug-shaped uniface
H - Chert wedge
I - Chert cobble core
J - Chert biface
K - Chert biface
L - Quartz biface

TABLE 35

Clyde Farm Complex Lithic Artifact Assemblage and Raw Materials

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	135(33)	247(53)	908(191)	900(340)	3	15(0)	6(1)	62(17)	2276(635)
UtilizedFlakes	0	3(1)	12(6)	13(6)	0	0	0	0	28(13)
Flake Tools	1(1)	3(1)	13(6)	13(6)	0	0	0	0	30(14)
Woodland I Points	0	2(0)	4(0)	5(0)	3(0)	2(0)	0	0	16(0)
Early Stage Biface Rejects	0	1(0)	4(3)	1(1)	0	0	0	0	6(4)
Late Stage Biface Rejects	1(0)	0	4(1)	2(0)	0	0	0	0	7(1)
Other Bifaces & Fragments	1(0)	0	4(1)	4(0)	0	0	0	0	9(1)
Miscellaneous Stone Tools	0	2(2)	0	6(4)	0	0	0	0	8(6)
Cores	0	4(2)	2(1)	2(1)	0	0	0	0	8(4)
Total	138(34)	262(59)	951(209)	946(358)	6(0)	17(0)	6(1)	62(17)	2388(678)

( ) - Artifacts with cortex

TABLE 36

Clyde Farm Complex Lithic Artifact Assemblage - Cortex Percentage

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	24	21	21	38	0	0	16	27	28
UtilizedFlakes	—	33	50	46	—	—	—	—	46
Flake Tools	100	33	46	46	—	—	—	—	47
Woodland I Points	—	0	0	0	0	0	—	—	0
Early Stage Biface Rejects	—	0	75	100	—	—	—	—	66
Late Stage Biface Rejects	0	—	25	0	—	—	—	—	14
Other Bifaces & Fragments	0	—	25	0	—	—	—	—	11
Miscellaneous Stone Tools	—	100	0	66	—	—	—	—	75
Cores	—	50	50	50	—	—	—	—	50
Total	25	23	22	38	0	0	17	27	28

TABLE 37

Clyde Farm Complex Lithic Artifact Assemblage - Raw Material Percentage by Tool Type

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	6	11	40	39	<1	<1	<1	3	—
UtilizedFlakes	—	11	43	46	—	—	—	—	—
Flake Tools	3	10	43	43	—	—	—	—	—
Woodland I Points	—	12	25	31	19	12	—	—	—
Early Stage Biface Rejects	—	16	66	16	—	—	—	—	—
Late Stage Biface Rejects	14	—	57	29	—	—	—	—	—
Other Bifaces & Fragments	11	—	44	44	—	—	—	—	—
Miscellaneous Stone Tools	—	25	—	75	—	—	—	—	—
Cores	—	50	25	25	—	—	—	—	—
Total	6	11	40	40	<1	1	<1	3	—

Quartz and quartzite lithic materials show higher frequencies of cortex when the Clyde Farm Complex assemblage is compared to the total assemblage. In general, the Clyde Farm Complex lithic assemblage shows that secondary cobbles played an important role in both bifacial and unifacial lithic technologies. Both cryptocrystalline (chert and jasper) and grainy materials (quartz and quartzite) were obtained from cobble sources.

Percentages of occurrence of cobble cortex on varied tool types are shown in Table 38. Very high percentages are noted for all tool forms except in the case of points/knives and late stage bifaces. These data indicate that Clyde Farm Complex residents of the Snapp Site were especially highly reliant on local cobble sources for all parts of their lithic tool kits. The low cobble cortex percentage for the late stage bifaces, points, and knives would indicate that these artifacts were probably not made at the site and were brought there as part of the transported tool kits of Clyde Farm Complex groups. Table 39 shows a crosstabulation of non-local and local raw material use with tool forms of the Clyde Farm Complex. Chi-square tests

TABLE 38

Cobble Cortex Percentages for Selected Tool Types - Clyde Farm Complex

Tool Type	Cortex Percentages
Points/Knives	0
Late Stage Bifaces	14
Early Stage Bifaces	67
Bifacial Side Scrapers	40
Unifacial Side Scrapers	71
Trianguloid End Scrapers	33
Slug-shaped Unifaces	100
Wedges	100
Cores	50
Regular Utilized Flakes	62
Blade-like Utilized Flakes	50

TABLE 39

Crosstabulation of Non-Local Raw Materials and Tool Types - Clyde Farm Complex

	Locally Available Raw Materials	Non-Local Raw Materials
Total Artifact assemblage *	2347	18
Points/Knives, Late Stage Bifaces	18	5
Total Tools *	107	0
Points/Knives, Late Stage Bifaces	18	5

* Not including points/knives and late stage bifaces

pertaining to the entire artifact assemblage (chi square=63.9, p<.001) and just the tool assemblage (chi-square=14.9, p<.005) both show a dependent relationship indicating that the points/knives and bifaces are more likely to be made of non-local materials, especially argillite and rhyolite. This finding supports the idea that the later stage biface tools were brought to the site as part of a transported and curated tool kit.

Figure 64 shows the assemblage of projectile points associated with Clyde Farm Complex features dating to the 1200 - 700 B.C. time period. Only one of the ten points with bases shows signs of cortex on its proximal end (Figure 64H) suggesting that these points were not manufactured from cobbles using bipolar production, as were a number of points in the overall site assemblage. Only one point (Figure 64B) is more than 20 millimeters wide and it is only 24 millimeters wide. This point also lacks tip damage and has slightly asymmetrical edges indicative of resharpening after knife use. Therefore, it probably represents a hafted knife rather than a projectile point, and is the only specialized hafted knife in the assemblage.

TABLE 40

Projectile Point Breakage Patterns - Clyde Farm Complex

Point Width	Tip Damage Present	Tip Damage Absent	Medial Fracture Present
0-20 mm	12	0	1
20-40 mm	0	1	1
Raw Material			
Quartz	1	0	1
Jasper	4	0	4
Chert	4	0	2
Argillite	2	0	0
Rhyolite	1	1	0

Table 40 shows the projectile point breakage patterns associated with varied point width and raw materials. All of the points less than 20 millimeters wide show tip damage and all were used as projectile points. There were 12 examples of tip damage associated with projectile point use in the assemblage (92%) and only seven examples of medial fractures associated with knife usage (53%). Most of the narrow bladed points were used primarily as projectile points;

TABLE 41

Webb Complex Lithic Artifact Assemblage and Raw Materials

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	23(6)	14(1)	41(5)	64(41)	1(0)	0	0	1(0)	144(53)
UtilizedFlakes	0	0	4(2)	1(0)	0	0	0	0	5(2)
Flake Tools	0	0	0	0	0	0	0	0	0
Woodland I Points	0	0	0	1(0)	0	0	0	0	1(0)
Early Stage Biface Rejects	0	0	1(1)	0	0	0	0	0	1(1)
Late Stage Biface Rejects	0	0	0	0	0	0	0	0	0
Other Bifaces & Fragments	0	0	0	0	0	1(0)	0	0	1(0)
Miscellaneous Stone Tools	0	0	0	0	0	0	0	0	0
Cores	0	1(1)	0	0	0	0	0	0	1(1)
Total	23(6)	15(2)	46(8)	66(41)	1(0)	1(0)	0	1(0)	153(57)

( ) - Artifacts with cortex

however, some were also used, somewhat less commonly, as knives. Several point tips with both transverse medial fractures from knife use and tip damage from projectile point use are present (Figure 68K-O), further documenting the fact that the narrow bladed points had multiple uses as points and knives. There is no apparent preference for certain raw materials for manufacturing these multi-purpose biface tools (Table 40). Nonetheless, it can be noted that neither of the argillite points showed signs of knife use. The sample of argillite points is too small to make any definite statement of its preferred use, however. In general, the Clyde Farm Complex point assemblage shows the same kinds of multiple uses as the overall site assemblage.

Table 34 provides a summary catalog of the different tool types present in the Clyde Farm Complex assemblage. A wide variety of tool forms are present and the only types from the general site assemblage that are missing in the Clyde Farm Complex assemblage are drills and concave/biconcave scrapers. The wide variety of tools is indicative of a base camp occupation. Cortex is present on all tool types, except points and knives, showing again the importance of local secondary lithic sources. It is especially interesting to note the presence of numerous tool forms, for example trianguloid end scrapers, slug-shaped unifaces (limaces), and some of the side-scraper forms, that are often noted by some researchers as diagnostic artifacts of the Paleo-Indian Period. The presence of these tool forms in a Clyde Farm Complex assemblage indicates that they are not particularly diagnostic of any time period, at least not in Delaware and the central Middle Atlantic region.

Webb Complex and Woodland II Lithic Assemblages. The lithic artifact assemblages from the Webb Complex and Woodland II Period clusters are rather small and, therefore, not suited to a wide range of analyses. Table 41 shows a summary catalog of the Webb Complex lithic artifact assemblage

TABLE 42

Webb Complex Lithic Artifact Assemblage - Cortex Percentage

Tool Type	**Raw Materials**								
	Quartzite	**Quartz**	**Chert**	**Jasper**	**Rhyolite**	**Argillite**	**Ironstone**	**Other**	**Total**
Flakes	26	7	12	64	0	—	—	0	37
UtilizedFlakes	0	—	50	0	—	—	—	—	40
Flake Tools	0	—	—	—	—	—	—	—	—
Woodland I Points	0	—	—	0	—	—	—	—	0
Early Stage Biface Rejects	0	—	100	—	—	—	—	—	100
Late Stage Biface Rejects	0	—	—	—	—	—	—	—	—
Other Bifaces & Fragments	0	—	—	—	—	0	—	—	0
Miscellaneous Stone Tools	0	—	—	—	—	—	—	—	—
Cores	0	100	—	—	—	—	—	–	100
Total	26	13	17	62	0	0	—	0	37

and Tables 42 and 43 show cortex percentages and raw material type percentages for individual artifact types based on Table 41. Tables 44 - 46 show the same data for the Woodland II Period assemblage. Summary tool catalogs for each of these two occupations are included in Table 34.

The Webb Complex and Woodland II Period assemblages show the same focus on secondary cobble lithic sources that was seen in the other assemblages discussed above. The similarity of cobble usage at this site spans more than 20 centuries and represents a long-term trend in lithic resource use. Cryptocrystalline materials are as common in these two assemblages as they were in the assemblages discussed earlier. The number of different tool forms is lower in these assemblages compared to the total assemblage and the Clyde Farm Complex assemblage (Table 34), but this difference is probably related to sample size. However, it is possible that the smaller sample size is due to a decreased intensity of settlement of the site in later portions of regional prehistory. In this case, the smaller range of tool types may indicate that the site was not utilized as a base camp. Instead it may have been used as a specialized procurement/processing site or transient camp in the face of decreased settlement intensity. Unfortunately, the lithic artifact assemblage is too small to allow the determination of a definitive answer.

A special lithic artifact from the Webb Complex assemblage that can be described is the large biface illustrated in Figure 61I and Plate 36. This biface is very similar to bifaces found in grave contexts at the Island Field Site, a Webb Complex cemetery in central Delaware (Custer, Rosenberg, Mellin, and Washburn 1990). The width/thickness ratio of this biface is 10:1 and it is very carefully crafted. There are some quartz impurities that run diagonally across the width of the biface and these impurities would have made it difficult to produce the large flakes which were needed to reduce the biface's thickness. There are no signs of any kinds of use wear on this biface, including the flake ridge polishing that is often seen on thin, wide bifaces like these (e.g., Cavallo 1983). Although this biface, with a length of 70

TABLE 43

Webb Complex Lithic Artifact/Assemblage - Raw Material Percentage by Tool Type

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	16	10	28	44	<1	—	—	<1	—
UtilizedFlakes	—	—	80	20	—	—	—	—	—
Flake Tools	—	—	—	—	—	—	—	—	—
Woodland I Points	—	—	—	100	—	—	—	—	—
Early Stage Biface Rejects	—	—	100	—	—	—	—	—	—
Late Stage Biface Rejects	—	—	—	—	—	—	—	—	—
Other Bifaces & Fragments	—	—	—	—	—	100	—	—	—
Miscellaneous Stone Tools	—	—	—	—	—	—	—	—	—
Cores	—	100	—	—	—	—	—	—	—
Total	15	10	30	43	<1	<1	—	1	—

TABLE 44

Woodland II Period Lithic Artifact Assemblage and Raw Materials

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	14(7)	29(6)	147(20)	105(39)	5(0)	13(0)	0	0	313(72)
UtilizedFlakes	0	1(1)	4(0)	6(2)	0	0	0	0	11(3)
Flake Tools	0	2(0)	0	1(0)	0	0	0	0	3(0)
Woodland II Points	0	0	0	0	0	0	0	0	0
Early Stage Biface Rejects	0	0	0	0	0	0	0	0	0
Late Stage Biface Rejects	0	0	0	0	0	0	0	1(0)	1(0)
Other Bifaces & Fragments	0	0	0	1(0)	0	0	0	0	1(0)
Miscellaneous Stone Tools	0	0	0	0	0	0	0	0	0
Cores	0	0	0	0	0	0	0	0	0
Total	14(7)	32(7)	151(20)	113(41)	5(0)	13(0)	0	1(0)	329(75)

( ) - Artifacts with cortex

TABLE 45

Woodland II Period Lithic Artifact Assemblage - Cortex Percentage

Tool Type	Raw Materials							
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	50	21	14	37	0	0	—	—	23
UtilizedFlakes	—	100	0	33	—	—	—	—	27
Flake Tools	—	0	—	0	—	—	—	—	0
Woodland II Points	—	—	—	—	—	—	—	—	—
Early Stage Biface Rejects	—	—	—	—	—	—	—	—	—
Late Stage Biface Rejects	—	—	—	—	—	—	—	0	0
Other Bifaces & Fragments	—	—	—	0	—	—	—	—	0
Miscellaneous Stone Tools	—	—	—	—	—	—	—	—	—
Cores	—	—	—	—	—	—	—	—	—
Total	50	22	13	36	0	0	—	0	23

TABLE 46

Woodland II Period Lithic Artifact Assemblage - Raw Material Percentage by Tool Type

Tool Type	Raw Materials								
	Quartzite	Quartz	Chert	Jasper	Rhyolite	Argillite	Ironstone	Other	Total
Flakes	4	9	47	34	1	4	—	—	—
UtilizedFlakes	—	9	36	55	—	—	—	—	—
Flake Tools	—	66	—	33	—	—	—	—	—
Woodland II Points	—	—	—	—	—	—	—	—	—
Early Stage Biface Rejects	—	—	—	—	—	—	—	—	—
Late Stage Biface Rejects	—	—	—	—	—	—	—	100	—
Other Bifaces & Fragments	—	—	—	100	—	—	—	—	—
Miscellaneous Stone Tools	—	—	—	—	—	—	—	—	—
Cores	—	—	—	—	—	—	—	—	—
Total	4	10	46	34	1	4	0	<1	—

millimeters, is somewhat smaller than the large bifaces, with lengths over 200 millimeters seen in graves at the Island Field Site, the careful craftsmanship evident in this biface, and its absence of use wear, suggest that it was not intended for every day use and may have had other non-utilitarian functions.

Flake Attribute Analysis. In order to identify any trends in lithic tool manufacturing at the Snapp Site, flake attribute analyses were conducted on flake samples from the feature cluster areas. No flake attribute analysis was undertaken using artifacts that could not be assigned to dated feature clusters because the artifacts from disturbed contexts would not yield meaningful data. A total of nine 50-flake random sample groups were extracted from the debitage assemblages of individual features or a combinations of features from each of the feature clusters, except for Feature Cluster 4 which did not yield enough flakes for these examinations.

Based on the works of Riley, Custer, Hoseth, and Coleman (1994), Verrey (1986), Magne (1981), and Gunn and Mahula (1977), a variety of flake attributes, specifically flake shape and size, platform shape and preparation, and the presences of cortex, biface edge remnants and flake scars, were tabulated to determine whether or not the flakes were results of biface reduction or core reduction activities. It should be noted that while no single flake attribute is definitive, examinations of the distributions of all of the flake attributes as a whole can allow for some conclusions regarding the lithic technologies which resulted in the debitage found at the site.

Cluster 1. Two samples, one from Feature 203 and a composite sample from the remaining features, were examined from Feature Cluster 1 (Figure 68). Distributions of the attributes for both samples are presented in Table 47.

The results of the flake attribute tests suggest that the majority of the flakes in the sample from Feature 203, a Type 6 feature, were results of biface reduction. The majority of the flakes tested, 82 percent, are complete or unbroken. While unbroken flakes have often been associated with core reduction as opposed to biface reduction, the majority of the flakes are also small, averaging 16.8 millimeters in diameter, suggesting that they were derived from either small cores, bifaces, or tool edge maintenance activities. The distributions of platform shapes of the flakes were slightly more conclusive. Flat platforms are more likely to result from core reduction processes compared to triangular platforms which are more characteristic of biface reduction activities, especially biface thinning (Gunn and Mahula 1977). Round platforms are more typical of either early stage biface reduction and decortication activities. Although the flake sample from Feature 203 contained some flakes with flat platforms (10%), the majority of the flakes in the sample had either triangular (22%) or round platforms (60%). The large proportion of flakes with cortex (50%) may account for some of the flakes with round platforms but at least 10 percent of the flakes with round platforms did not have cortex and can be suggested to have been a result of early stage biface reduction processes.

The flake attribute test results from the composite flake sample of Feature Cluster 1 (Table 47) closely resembles the distributions of Feature 203 and suggests a general tendency toward biface reduction for the overall feature cluster area. More broken flakes (32%) were identified in the composite sample than in the sample from Feature 203. The abundance of round and triangular platforms, 58 percent and 12 percent respectively, presence of prepared flakes (26%), and presence of flakes with biface edge remnants (8%) also strongly suggest biface reduction activities in this feature cluster area.

TABLE 47

Percentage Distribution of Flake Attributes

Attribute	Feature 203 (Cluster 1)	Cluster 1 (Composit)	Feature 153 (Cluster 2)	Feature 1 (Cluster 2)	Cluster 3 (Composite)	Cluster 5 (Composite)	Cluster 6 (Composite)	Feature 214 (Cluster 7)	Cluster 7 (Composite)
Flake Type									
Complete	82	68	78	88	72	90	60	68	72
Proximal	10	10	14	6	8	4	12	14	0
Medial	0	16	2	0	8	0	20	8	10
Distal	8	6	6	6	12	6	8	10	18
Cortex									
Presence	50	26	42	50	30	42	44	36	34
Absence	50	74	58	50	70	58	56	64	66
Platform Shape									
Triangular	22	12	6	10	6	4	4	8	6
Flat	10	8	14	12	16	8	2	20	10
Round	60	58	72	72	58	82	66	54	56
Unknown	8	22	8	6	20	6	28	18	28
Platform Preparation									
Presence	18	26	24	28	22	28	8	32	20
Absence	74	32	68	66	58	66	64	50	52
Unknown	8	22	8	6	20	6	28	18	28
Biface Edge Remnant									
Presence	6	8	10	10	6	4	2	14	4
Absence	94	92	90	90	94	96	98	86	96
Average Flake Size (mm)	16.8	19.3	15.85	17.5	14.8	17.6	14.4	14.75	13.6
Flake Size (mm)									
<10	34	4	8	4	12	4	24	14	16
10-15	48	24	38	22	46	44	30	38	52
15-20	16	30	46	46	28	22	26	36	20
20-25	2	28	2	24	8	26	14	6	10
25-30		8	2	4	4	4	4	6	2
30-35		2	2		2		2		
35-40		0							
40-45		4							
>45			2						
Total	100	100	100	100	100	100	100	100	100

To compare the two samples from Feature Cluster 1, difference-of-proportion tests were conducted for some of the flake attribute variables. Only the proportions of medial flakes and flakes with cortex differed significantly between two samples from Feature Cluster 1. The higher percentage of flakes with cortex in Feature 203 as compared to that from the composite sample may be a result of sampling. Because the composite sample was extracted from more than one feature, it may represent a larger number of biface reduction episodes than the sample from Feature 203. This observation is also reflected in the types of lithic materials represented in the samples. The sample from Feature 203 contained only jasper and chert flakes while the composite sample contained jaspers, cherts, quartz, and quartzites.

In sum, the results of the flake attribute tests conducted on flake samples from Feature Cluster 1 indicate a predominance of biface reduction activities over core reduction activities in this area of the site.

Cluster 2. Only one 50 flake sample, from Feature 153, a house feature, was selected from Feature Cluster Area 2 for testing (Figure 68). The results of the flake attribute tests show a mixture of both core reduction and biface reduction activities in this area of the site (Table 47).

The sample consisted of 78 percent complete flakes and 22 percent broken flakes. While the amount of complete flakes is high and is characteristic of core or cobble reduction processes, the presence of flakes with biface edge remnants (10%) and presence of flakes with prepared platforms (24%) are characteristics of biface reduction activities. All three platform shapes, triangular (6%), round (72%), and flat (14%), are represented in the sample and the abundance of round platforms may be attributed to decortication activities. The small size of the flakes, averaging 15.85 millimeters in diameter, indicate that the flakes did not result from reduction of large cores or bifaces.

In sum, it is apparent from the data that both core and biface reduction were conducted in this area of the site and that cobbles probably served as a lithic material resource for these activities.

Cluster 3. Two samples, one from Feature 1 and a composite sample of the remaining features, were extracted from Feature Cluster Area 3 (Figure 68) for flake attribute tests. The data resulting from the analyses indicate a mixture of core reduction and biface manufacturing technologies with a slight emphasis on biface reduction (Table 47).

Flake attribute tests of the sample from Feature 1 indicate that the flakes from this feature resulted from both core and biface reduction of cobbles. Complete flakes comprised the majority of the sample (88%) and are suggestive of core reduction activities. However, the presence of flakes with platform preparation (22%) and flakes with biface edge remnants (10%) and these attributes suggest biface reduction activities. The large percentages of flakes with cortex (50%) and flakes with round platforms (72%) indicate use of local cobbles as a lithic material resource for core and biface manufacturing. The percentages of flakes with triangular and flat platforms are close, 10 percent and 12 percent respectively, and do not indicate an emphasis of one technology over the other. The small sizes of the flakes, averaging 17.5 millimeters in diameter, show that the flakes were not derived from either large cores or bifaces.

Distributions of the various flake attributes of the composite sample of the feature cluster area closely resemble the sample from Feature 1 and these data are presented in Table 47. The data from the composite sample seems to show slightly more emphasis on biface reduction activities than Feature 1. A larger number of broken flakes was identified in the composite sample (28%). Flakes with no cortex were also more predominate (70%) and the average flake size was 14.8 millimeters in diameter. All three of these variables suggest that the flakes found in the composite sample may have resulted from biface reduction activities.

In order to compare the composite sample to the sample from Feature 1, difference-of-proportion tests were conducted on some of the flake attribute variables. While only three significant differences were observed, between the proportions of complete flakes, medial flakes and flakes with no cortex, these differences suggest a slightly greater tendency of biface reduction activities in the flakes from the composite sample than the flakes in the sample from Feature 1. Although both core and biface reduction technologies were present throughout the area, the composite sample better represents the entire feature cluster and it can be concluded that overall, biface reduction activities were slightly more predominant in Feature Cluster Area 3.

Cluster 5. Because none of the features within Feature Cluster Area 5 contained flake assemblages large enough for these examinations, only a composite flake sample was extracted for testing from this area. Flake attribute analyses of this composite sample indicate a mixture of both core reduction and biface reduction in this feature cluster (Table 47).

Almost all of the flakes in the sample were complete (90%) and the relatively large sizes of the flakes in the sample, averaging 17.5 millimeters in diameter, suggest core reduction. The majority of the platform shapes of the flakes were round, 82 percent and may be attributed to the cobble reduction as indicated by the presence of cortex on 42 percent of the flakes in the sample. Observations of flakes in the sample with biface edge remnants (4%) and platform preparation (28%) indicates some reduction of bifaces in this feature cluster area, although no individual distinctions between the lithic technologies can be identified for this feature cluster.

Cluster 6. The results of the composite flake sample from Feature Cluster 6 (Figure 68) are presented in Table 47. These results indicate that the flakes from this sample are primarily a result of biface reduction. Only 60 percent of the sample consisted of complete flakes. All three platform shapes, triangular (4%), round (66%), and flat (2%), are represented in the sample. The percentage of flakes with cortex (42%) is less than the percentage of flakes with round platforms. These findings suggest that at least 24 percent of the flakes with no cortex may have round platforms and these flakes may be results of early stage biface reduction activities. In addition, the presence of relatively small flakes, averaging 14.4 millimeters in diameter, also suggests that the flakes may be remains of biface reduction. Unfortunately, only 2 percent of the flakes contained biface edge remains and only 8 percent of the flakes exhibited signs of prepared platforms. Nonetheless, the presence of these attributes within the sample combined with the small flake sizes and amounts of broken flakes suggest that biface reduction activities seem to be more predominate in Feature Cluster Area 6 than core reduction activities.

Cluster 7. Two flake samples from Feature Cluster Area 7 (Figure 68) were extracted for flake attribute testing. Both the sample from Feature 214, a Type 11 feature, and the composite sample from the remaining features in the cluster, exhibited strong tendencies toward biface reduction activities (Table 47).

Although the flake sample from Feature 214 contains a substantial amount of flakes with flat platforms (20%), as compared to triangular platforms (8%), flakes with round platforms comprise the majority of the sample (54%). Because the occurrence of flakes with round platforms is greater than the percentage of flakes with cortex (36%), it can be suggested that many of these flakes may have resulted from early stage biface reduction. Distributions of other attributes within the sample also strongly suggest that the flakes from this feature may have been derived from biface reduction activities. In the sample, 32 percent of the flakes were broken, 32 percent of the flakes appeared to have prepared platforms, and 14 percent of the flakes contain remnants of biface edges. All three of these flake attributes are indicative of biface reduction and the percentages of these attributes within the assemblage is relatively high for all of the samples from the site.

Flake attribute distributions of the composite flake sample of the feature cluster area closely resembles the sample from Feature 214 and is also suggestive of biface reduction activities (Table 47). In order to determine any statistical similarities between the two samples, difference-of-proportion tests were conducted to compare some of the flake attribute variables. The results of the difference-of-proportion tests indicated that overall, aside from a significant difference between the proportions of proximal flakes between the two samples, the sample from Feature 214 and the composite sample of the cluster area are statistically the same. Although the flake attribute data do reflect evidence of general cobble reduction as well as biface reduction, the data suggests that overall, biface reduction activities were conducted in Feature Cluster 7.

Comparison of the Feature Clusters. Comparisons of the six composite flake samples from the feature cluster areas were conducted to attempt to identify any trends in lithic tool manufacturing among the feature clusters. Most importantly, these analyses were conducted to determine any significant similarities or dissimilarities among the four clusters dating to the Clyde Farm Period (Cluster 1, 2, 3, and 5) or among the three time periods (Clyde Farm Period: Clusters 1, 2, 3, and 5; Webb Complex: Cluster 6; and Woodland II: Cluster 7) represented by the feature clusters at the site. Difference-of-proportion tests were conducted for the same flake attributes used to compare the single feature samples with their associated composite features. The results are summarized in Figures 90 - 92 and allow for some tentative inferences.

Figure 90 presents the results of the difference-of-proportion tests for flake type. As was apparent in the raw percentage distributions (Table 47), these data reflect wide ranges and significant differences in the three types of broken flakes (proximal, medial, and distal), but no trends among the cluster samples are present. However, comparison of the flake shapes as the two basic groups; broken and complete, some more conclusive observations were possible (Table 47). Significant differences in flake shape are present between Cluster 1 and Cluster 5 and between Cluster 3 and Cluster 5. Although all three of the clusters were concluded to exhibit characteristics of both biface and cobble reduction, the flake attribute percentages suggest that Cluster 1 and Cluster 3 reflected more emphasis of biface reduction while Cluster 5 reflected a mixture of reduction activities. The significant difference reflected in the difference-of-proportion tests can be used to better identify the predominate lithic technology conducted in Cluster 5. The significant differences between Clusters 1 and 3 and Cluster 5 suggest that core or cobble reduction activities were more prominent than previously thought. It is also interesting to note that the distributions of broken and complete flakes of Cluster 5 are also significantly different than those observed in Cluster 6 and Cluster 7, which are more biface reduction oriented clusters.

Figure 91 presents the differences observed in the various platform shapes among the three clusters. Cluster 5 reflects a significant difference in the amount of flat platforms between some of the clusters. This observation also further supports a general tendency toward core reduction in this feature cluster.

No significant differences were observed in the presence or absence cortex on flakes or in the presence or absence of biface edge remnants among the clusters; however, Cluster 6 reflects significant differences in the proportion of flakes with prepared platforms (Figure 92). Comparison of the raw percentages of this cluster indicates that this cluster contains the least amount of flakes with prepared platforms.

In sum, flake attribute data were analyzed from 6 of the 7 feature clusters (Clusters 1-3, 5-7). All of the clusters except for Cluster 5, which dates to the Clyde Farm Complex occupation of the site, contained debitage primarily related to biface reduction. In contrast, Cluster 5 debitage is related to core reduction. The presence of both bifaces and flake tools with cortex on them in the overall site assemblage indicates that both biface and core reduction were taking place at the site in all of the

FIGURE 90

Difference-of-Proportion Test Results Among Feature Clusters - Flake Type

Complete Flakes

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	+	-	-			
6	-	-	+	+		
7	-	-	+	+	+	

Proximal Flakes

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	-	-			
6	-	-	-	-		
7	+	+	+	-	-	

+ = Difference

- = No difference

Medial Flakes

Feature Cluster	1	2	3	5	6	7
1						
2	+					
3	-	+				
5	+	+	-			
6	-	-	-	+		
7	-	+	-	+	-	

Broken vs. Complete

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	+	-	+			
6	-	-	+	+		
7	-	-	-	+	-	

clusters. The emphasis on biface reduction shown by the flake attribute data noted above indicates the biface reduction was the more common of the two activities, not that it was the only activity. It is also important to consider the fact that all of the flakes chosen for analysis came from features. The predominance of biface reduction debitage in the features could indicate that biface reduction more commonly took place in and around houses and related features, except for Cluster 5. It is also interesting to point out that debitage from all three major occupations of the site (Clyde Farm Complex, Webb Complex, Woodland II Period) showed a tendency toward biface reduction. These similarities in lithic technology and spatial use show continuities in activities at the site from Woodland I into Woodland II times.

FIGURE 91

Difference-of-Proportion Test Results Among Feature Clusters - Platform Shape

Triangular

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	-	-			
6	-	-	-	-		
7	-	-	-	-	-	

Flat

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	+	-			
6	-	-	+	-		
7	-	-	-	-	-	

Round

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	+	-	+			
6	-	-	-	-		
7	-	-	-	+	-	

+ = Difference   - = No difference

FIGURE 92

Difference-of-Proportion Test Results Among Feature Clusters - Presence/Absence of Cortex, Biface Edge Remnants, and Platform Preparation

Presence/Absence =Cortex

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	-	-			
6	-	-	-	-		
7	-	-	-	-	-	

Presence/Absence Platform Preparation

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	-	-			
6	+	+	-	+		
7	-	-	-	-	-	

Presence/Absence Biface Edge Renants

Feature Cluster	1	2	3	5	6	7
1						
2	-					
3	-	-				
5	-	-	-			
6	-	-	-	-		
7	-	-	-	-	-	

+ = Difference   - = No difference

TABLE 48

Results of Blood Residue Testing

Feature	Tools Tested	Tests
4	1	4
5	3	5
16	1	3
63	1	3
76	1	3
77	1	2
78	2	4
91	1	3
103	1	3
105	2	8
131	1	2
134	1	2
135	2	4
136	1	3
145	1	3
147	1	3
152	2	5
153	2	4
167	1	3
179	2	1
181	1	3
195	4	7
198	4	8
200	2	4
201	1	2
203	3	6
203	2	2
204	2	5
224	2	5
225	2	4
225	1	2
227	2	4
230	3	6
235	1	3
Total	**58**	**129**

Unit	Tools Tested	Tests
N 90 E 35	1	3
N230 W40	1	4
N270 E05	1	1
N290 E15	1	3
N320 E00	1	3
N330 W37	10	23
N331 W35	2	5
N331 W34	1	3
N331 W32	1	1
N332 W40	3	7
N332 W39	6	12
N332 W38	1	3
N332 W36	3	8
N332 W34	1	1
N332 W27	1	3
N337 W37	2	5
N341 W24	1	2
N341 W22	2	2
N342 W31	1	3
N343 W30	1	2
N344 W35	1	2
N434 W34	1	3
N344 W31	1	3
N346 W17	1	3
N347 W30	2	5
N348 W25	2	6
N349 W32	2	3
Total	**51**	**119**

Number of positive tests = 2
Semi positive test = 4
Negative tool tests = 243
Negative soil tests = 9

Total tests = 258

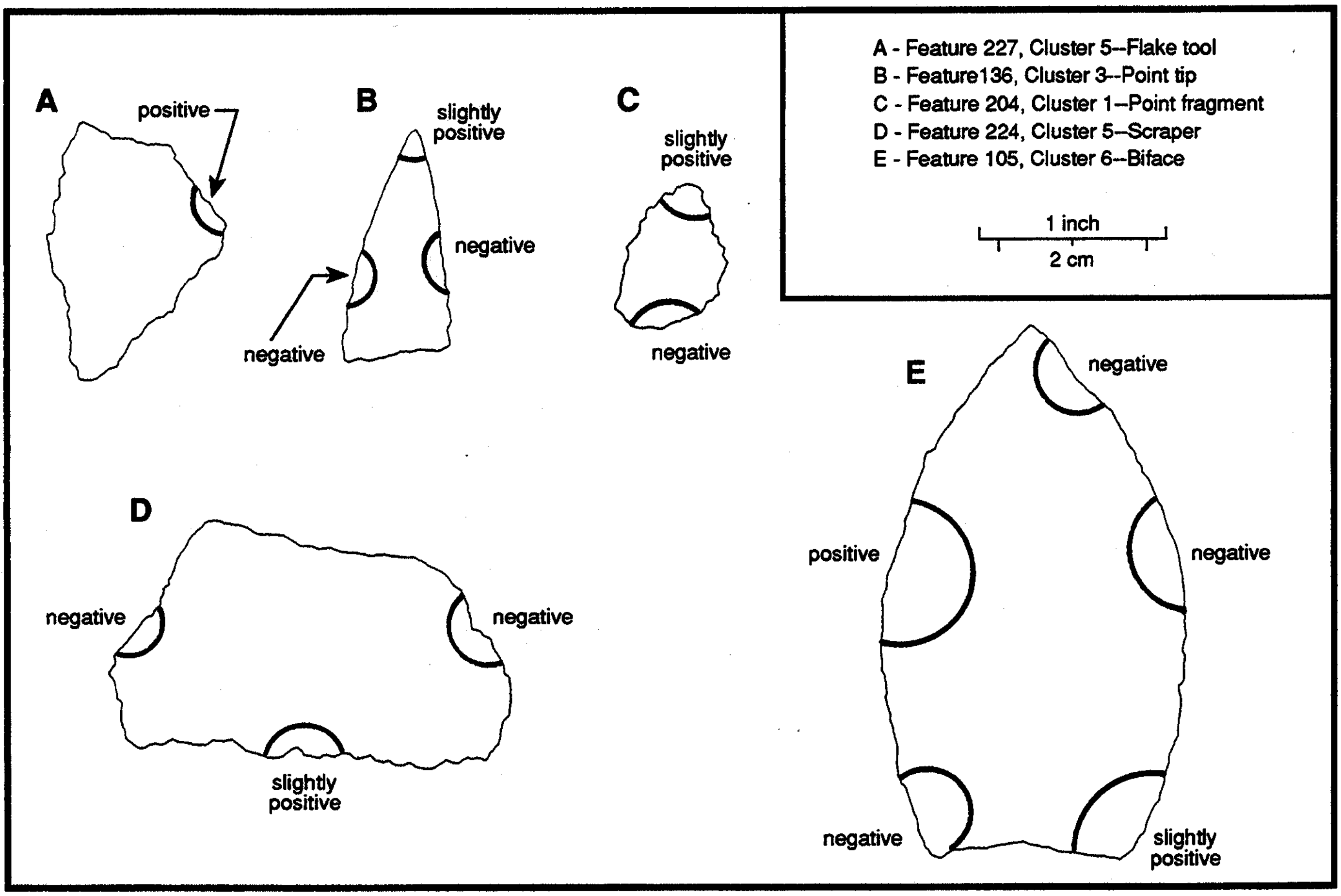
Tests on tools = 249
Soil tests = 9

Total tests = 258

Blood Residue Analysis

All tools from the site were subjected to blood residue testing procedures as described by Custer, Ilgenfritz, and Doms (1988). In addition to the tools, nine soil samples from the site were also tested to ascertain whether any contaminants, which would result in false positive results, were present at the site. Because these soil tests yielded negative results, the site was considered to have a low probability for containing contaminants and all results from tools testing could be considered to be accurate. A total of 249 tests were conducted on 110 tools (Table 48). Two tools, a chert flake tool from Feature 227

FIGURE 93
Tools Yielding Positive Blood Residue Reactions



(Feature Cluster 5) and the large biface from Feature 105 (Feature Cluster 6, Plate 36) yielded positive results (Figure 93A and 93E). Four additional tests, on tools from Feature 136 (Feature Cluster 3), Feature 204 (Feature Cluster 1), 224A (Feature Cluster 5) and again the biface from Feature 105 (Feature Cluster 6) (Figures 93B-E respectively), returned semi-positive tests. These results indicate that only very faint traces of hemoglobin remained on the tools. The presence of hemoglobin remains on these tools suggests that animal butchering may have occurred in Feature Clusters 1, 3, 5, and 6, but the small number of positive reactions and their faint nature make this conclusion somewhat tentative. The presence of blood on the biface is of interest because it shows little or no evidence of use as a tool. Unfortunately, reliable test of species identification for blood residues are not yet available to apply to this tool.

Analysis of Artifacts and Ecofacts from Flotation

At least one 5 liter soil sample was collected from each feature excavated at the Snapp Site for flotation analysis. Some of the smaller features, predominately structural posts from Feature Area 153, were collected as flotation samples in their entirety. Because of the vast number of flotation samples, over 1560 total samples, only a portion of these samples, approximately 49 percent, were selected for extensive flotation analysis. Features selected for flotation analysis included features with high artifact counts in screened feature soils or features with interesting functional uses such as hearths or house pit features. In addition, randomly selected soil samples were also examined to provide a general overview of the site. The remaining unanalyzed samples were retained as archive samples for future research.

TABLE 49

Micro-Flakes from Flotation Samples

	Quartzite		Quartz		Chert		Jasper		Rhyolite		Argillite		Ironstone		Other		Total	
Site	3 1.43%	255 6.82%	58 28.10%	542 14.50%	87 41.43%	1410 37.72%	61 29.05%	1450 38.79%	0 0.00%	15 0.40%	0 0.00%	32 0.86%	0 0.00%	9 0.24%	0 0.00%	25 0.67%	210 100%	3738 100%
C1	0 0.00%	70 9.83%	4 14.81%	81 11.38%	14 51.85%	229 32.16%	9 33.33%	319 44.80%	0 0.00%	2 0.28%	0 0.00%	1 0.14%	0 0.00%	3 0.42%	0 0.00%	7 0.98%	27 100%	712 100%
C2	2 1.77%	14 2.79%	37 32.74%	74 14.74%	39 34.51%	161 32.07%	35 30.97%	192 38.25%	0 0.00%	1 0.20%	0 0.00%	7 1.39%	0 0.00%	3 0.60%	0 0.00%	50 9.96%	113 100%	502 100%
C3	0 0.00%	23 4.37%	0 0.00%	48 9.13%	0 0.00%	280 53.23%	2 100.00%	168 31.94%	0 0.00%	0 0.00%	0 0.00%	1 0.19%	0 0.00%	6 1.14%	0 0.00%	0 0.00%	2 100%	526 100%
C4	0 0.00%	4 5.63%	0 0.00%	3 4.23%	1 33.33%	33 46.48%	2 66.67%	31 43.66%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	3 100%	71 100%
C5	0 0.00%	39 10.92%	1 11.11%	34 9.52%	5 55.56%	164 45.94%	3 33.33%	111 31.09%	0 0.00%	2 0.56%	0 0.00%	1 0.28%	0 0.00%	1 0.28%	0 0.00%	5 1.40%	9 100%	357 100%
C6	1 4.00%	23 15.97%	8 32.00%	14 9.72%	7 28.00%	41 28.47%	9 36.00%	64 44.44%	0 0.00%	1 0.69%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 0.69%	25 100%	144 100%
C7	0 0.00%	140 4.47%	0 0.00%	29 9.27%	7 77.78%	147 46.96%	2 22.22%	105 33.55%	0 0.00%	5 1.60%	0 0.00%	13 4.15%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	9 100%	313 100%

Micro-flakes Flakes > 1/4"

TABLE 50

Micro-Shatter from Flotation Samples

	Quartzite		Quartz		Chert		Jasper		Rhyolite		Argillite		Ironstone		Other		Total	
Site	1 2.86%	40 10.13%	20 57.14%	252 63.80%	1 2.86%	27 6.84%	12 34.29%	61 15.44%	0 0.00%	0 0.00%	0 0.00%	1 0.25%	0 0.00%	5 1.27%	1 2.86%	9 2.28%	35 100%	395 100%
C1	0 0.00%	22 26.83%	2 100.00%	46 56.10%	0 0.00%	5 6.10%	0 0.00%	4 4.88%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	5 6.10%	0 0.00%	0 0.00%	2 100%	82 100%
C2	0 0.00%	1 7.14%	5 55.56%	13 92.86%	0 0.00%	0 0.00%	4 44.44%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	9 100%	14 100%
C3	0 0.00%	1 14.29%	0 0.00%	5 71.43%	0 0.00%	1 14.29%	1 50.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 0.19%	0 0.00%	0 0.00%	1 50.00%	0 0.00%	2 100%	7 100%
C4	0 0.00%	1 12.50%	2 100.00%	7 87.50%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	2 100%	8 100%
C5	0 0.00%	2 4.44%	3 100.00%	29 64.44%	0 0.00%	14 8.89%	0 0.00%	10 22.22%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	3 100%	45 100%
C6	0 0.00%	1 7.69%	1 100.00%	4 30.77%	0 0.00%	2 15.38%	0 0.00%	6 46.15%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 100%	13 100%
C7	0 0.00%	1 6.25%	0 0.00%	9 56.25%	0 0.00%	2 12.50%	0 0.00%	4 25.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0%	16 100%

Micro-Shatter Shatter > 1/4"

Items recovered from flotated soil included wood charcoal, micro-debitage, two small beads (Figure 24), and small quantities of charred seeds, bone, and ceramic sherds; however, almost half of the samples examined, approximately 38 percent, contained either no cultural material or only wood charcoal weighing less than .1 gram. These samples were not included in the totals presented. All artifacts greater than 1/4 inch recovered from flotation samples were included with general artifact counts of the features.

Wood charcoal comprised the majority of material recovered from flotated soil samples. Average charcoal weight per sample (excluding samples with less than .1 gram of charcoal) for the overall site was .79 grams. Virtually all of this charcoal was not suitable for identification and analysis.

Micro-debitage, both flakes and shatter, collected from heavy fractions of flotated soil indicate that tool edge resharpening occurred at the site. Distributions of lithic material types within this assemblage closely resembled distributions in the debitage assemblage greater than 1/4-inch in size (Tables 49 and 50).

TABLE 51

Comparison of Micro-Debitage Among Features and Feature Clusters

Micro-Debitage

Debitage > 1/4"

Cluster 1	Flakes		Shatter	
198	**14.81%**	17.84%	**0.00%**	71.95%
203	**48.15%**	56.60%	**0.00%**	7.32%
204	**48.15%**	56.60%	**50.00%**	0.00%
205	**3.70%**	2.39%	**0.00%**	0.00%
206	**0.00%**	3.93%	**0.00%**	2.44%
207	**0.00%**	3.23%	**0.00%**	17.07%
208	**0.00%**	1.54%	**0.00%**	1.22%

Cluster 2****				
18	**0.00%**	0.60%	**0.00%**	0.00%
19	**0.00%**	0.00%	**0.00%**	0.00%
25	**0.00%**	0.00%	**0.00%**	0.00%
28	**0.00%**	0.47%	**0.00%**	0.00%
31	**0.00%**	0.00%	**0.00%**	0.00%
33	**0.00%**	0.00%	**0.00%**	0.00%
34	**0.00%**	0.00%	**0.00%**	0.00%
153	**100.00%**	85.46%	**100.00%**	100%

Cluster 3****				
135	**0.00%**	7.41%	**0.00%**	42.86
136	**100.00%**	5%	**100.00%**	

Cluster 4				
120	**66.67%**	47.89%	**0.00%**	0.00%
145	**33.33%**	29.58%	**0.00%**	12.50%
181	**0.00%**	18.31%	**0.00%**	37.50%
182	**0.00%**	4.23%	**100.00%**	50.00%
183	**0.00%**	0.00%	**0.00%**	0.00%

Cluster 5****	Flakes		Shatter	
147	**11.11%**	5.04%	**0.00%**	0.84%
155	**0.00%**	0.84%	**100.00%**	0.28%
156	**22.22%**	14.85%	**0.00%**	1.68%
158	**0.00%**	14.01%	**0.00%**	0.56%
160	**0.00%**	4.48%	**0.00%**	0.00%
161	**0.00%**	2.24%	**0.00%**	0.00%
162	**0.00%**	0.28%	**0.00%**	0.00%
164	**0.00%**	1.12%	**0.00%**	0.56%
165	**0.00%**	0.28%	**0.00%**	0.00%
167	**0.00%**	0.00%	**0.00%**	0.00%
168	**11.11%**	0.84%	**0.00%**	0.00%
170	**0.00%**	0.28%	**0.00%**	0.00%
175	**0.00%**	5.04%	**0.00%**	0.00%
222	**0.00%**	0.28%	**0.00%**	0.00%
223	**11.11%**	4.48%	**0.00%**	0.00%
225	**11.11%**	13.17%	**0.00%**	0.84%
226	**0.00%**	2.52%	**0.00%**	0.00%
227	**11.11%**	19.61%	**0.00%**	7.00%
229	**22.22%**	0.00%	**0.00%**	0.00%

Cluster 6****				
105	**8.00%**	15.97%	**0.00%**	0.00%
142	**92.00%**	54.17%	**100.00%**	46.15%
218	**0.00%**	6.94%	**0.00%**	0.00%

Cluster 7****				
103	**0.00%**	11.50%	**0.00%**	18.75%
106	**0.00%**	11.50%	**0.00%**	0.00%
195	**11.11%**	18.53%	**0.00%**	18.75%
196	**0.00%**	5.75%	**0.00%**	25.00%
214	**88.89%**	40.89%	**0.00%**	31.25%
220	**0.00%**	3.83%	**0.00%**	6.25%

****** Not all features in cluster represented in flotation analysis or samples contained no cultural material**

The majority of the micro-flakes consisted of chert (41%), jasper (29%), and quartz (28%), while over half (57%) of the micro-shatter consisted of quartz. Because of the vast quantity of fire-cracked rock recovered at the site, it must be noted that the high frequency of quartz in the micro debitage assemblage may also represent small fragments of fire-cracked rock.

Comparisons of micro-debitage assemblages to 1/4-inch debitage assemblages for each of the feature clusters at the site also yielded similar observations. Unfortunately, totals of micro-debitage within each feature cluster, and also within Feature Area 153 (Cluster 2), were too small to define any specific spatial concentrations of micro-debitage for the site; however, similarities between frequency distributions of micro-debitage and debitage > 1/4 inch are present among many of the features in feature clusters (Table 51).

TABLE 52

Features with Charred Floral Remains

** Cluster 1	Seeds	Nuts
198	5	5
203	1	0
204	1	0
205	4	1
207	15	0
Total	**26**	**6**

** Cluster 2	Seeds	Nuts
153	46	16
153 P02	1	0
153 P03	0	1
153 P11	1	0
153 P21	1	0
153 P30	3	0
33	8	
Total	**60**	**17**

** Cluster 3	Seeds	Nuts
230	3	4
Total	**3**	**4**

** Cluster 4	Seeds	Nuts
102	1	0
145	2	1
Total	**3**	**1**

** Cluster 5	Seeds	Nuts
147	2	0
156	1	0
158	0	1
160	4	1
165	1	0
175	1	0
225	0	1
227	3	0
Total	**12**	**3**

** Cluster 6	Seeds	Nuts
193	5	1
Total	**5**	**1**

** Cluster 7	Seeds	Nuts
196	1	0
214	5	0
220	8	2
Total	**14**	**2**

Of the 197 charred seeds and nuts recovered from flotation analysis, over 87 percent of this assemblage was unidentifiable (Table 4). The remaining 13 percent consisted of 19 different plant species and included chenopodium, greenbriar, ragweed, bayberry, raspberry, and dayflower (Table 4). A total of 45 individual features (including subfeatures of Feature Area 153), contained charred seeds or nuts; however, only three features contained identifiable charred remains. Slightly over half (56%) of all features containing charred plant remains were features contained within one of the seven feature clusters of the site. Feature Cluster 1 is especially well represented in that only two features, Feature 206 and Feature 208, did not yield any charred seed or nut fragments (Table 52).

In contrast, charred plant remains were recovered from only two features in Feature Cluster 2, Feature Area 152 and Feature 33. Over 70 unidentifiable and identifiable seed and nut fragments were recovered from various areas of House Feature Area 153 (Tables 4 and 52). These areas included open sections within the house feature as well as structural posts. Plant remains recovered included thimbleberry, greenbriar, chenopodium, smartweed, and dayflower (Table 4). A single Eastern Burningbush seed was recovered from Post 14. In addition to approximately 100 charred spores (not included in seed counts), a single flotation sample from Feature 33 in Cluster 2 yielded eight charred seeds of numerous species

TABLE 53
Uses of Plants from Flotation

PLANT	SEASON OF AVAILABILITY	USE	CITATION
Thimbleberry	Mid Summer	Medicinal (dysentary)	Tantaquidgeon 1972:120
Chenopodium	Fall-Winter	Food	Tantaquidgeon 1972:128
Bayberry	August-October	Aromatic	Peterson 1977:206
Ragweed	September	Medicinal	Tantaquidgeon 1972:29
Eastern Burningbush (Wahoo)	Late Spring-Summer	Medicinal (purgatory)	Sutton and Sutton 1988:394
Raspberry	Summer	Food	Tantaquidgeon 1972:78
Greenbriar	Early Spring-Summer	Food	
Smartweed	Summer-Fall	Medicinal	Erichsen-Brown 1979:473
Dayflower	Spring-Early Summer	Food	Medsger 1939:140

(Table 4). The close proximity of Feature 33 to Feature Area 153 and wide variety of seeds recovered from this feature suggests that Feature 33 may have functioned as a small storage or refuse pit for the feature cluster.

Because of the lack of concentrations of individual plant species at the site, most importantly high concentrations of charred remains, seasonal uses of plant resources by the inhabitants are difficult to discern. However, many of the plant types recovered from flotated soils at the site have known documented uses. Table 53 presents a summary of these uses for the charred seed types found at the site.