DISCUSSION AND CONCLUSIONS

The information obtained from the excavations at Site 7K-C-360 and Dover Downs has implications for a number of research issues in the study of prehistoric archaeology. Each of these research issues is discussed below.

REGIONAL PALEO ENVIRONMENTS

Stratigraphic, geomorphological, and pollen data from 7K-C-360 and Dover Downs Hill A provide insight into local and regional paleoenvironments. Soils data from 7K-C-360 show a relatively thick profile indicating episodes of Late Pleistocene/Early Holocene Columbia Formation deposits (Jordan 1964) and somewhat later lacustrine deposits. Evidence also indicates Middle Holocene episodes of aeolian deposition at this site. However, soils data from Dover Downs Hill A show a relatively thin profile at this site that includes the Columbia Formation and lacustrine deposits but little to no evidence of later Holocene aeolian deposited sediments. A more detailed discussion of the geomorphological studies conducted at these sites appears in Appendix III and IV.

Radio-carbon dated material from the lacustrine deposits near 7K-C-360 produced a date of 15,780 B.P. (Appendix III). Pollen samples taken from above and below this dated material show that pine and spruce were dominant arboreal species with non-arboreal species consisting of sedges, grasses, fresh water plants, and mosses (Appendix III). These results are consistent with those recorded for the Late Glacial environments at the Dill Farm site (7K-E-12), a Low Coastal Plain site in Kent County, Delaware, and from a series of samples taken near the mouth of the Chesapeake Bay (Custer 1989:38-51).

Later episodes of deposition at 7K-C-360 most likely resulted from aeolian processes. These post-lacustrine deposits were not able to be dated, but projectile points located in these levels suggest that the deposits occurred sometime between 6300 B.C. and A.D. 1000, which would correspond to episodes of dry climates noted for the Middle Atlantic during the Holocene (Custer 1984a, 1984d). Aeolian sediments dating to between 3000 B.C. and A.D. 1000 were noted at several sites in the marsh environs of New Castle County, Delaware in the vicinity of 7NC-E-6A, Area 2B (Custer 1982), and at Abbott Farm near Trenton, New Jersey (Stewart 1981, 1983). These events are associated with hot/dry climatic shifts that are believed to have occurred during the Middle Holocene (Curry and Custer 1982). Aeolian deposits at 7K-C-360 are overlain by modern palustrine deposits. Materials from these sediments produced a radio-carbon date of 780 B.P. (Appendix III).

Site 7K-C-360 is located on a well-drained knoll surrounded by poorly-drained Fallsington loam soils (Matthews and Ireland 1971). Although a wetland environment surrounds the site, the knoll itself is relatively broad and would likely have been vulnerable to temperature and climate stresses during the Middle Holocene. Episodes of warm and dry climates prevailing during this period would have desiccated some of the local vegetation and denuded sections of the local landscape. Exposed surface soils would then have been transported by aeolian processes and deposited in other nearby locations. Such circumstances would account for aeolian sediments apparent in the profile at 7K-C-360.

The Dover Downs site, Hill A has a Late Pleistocene/Early Holocene depositional history that is similar to that of 7K-C-360 up through the lacustrine environment. However, analysis of core samples taken from the floodplain and swamp area adjoining Muddy Branch indicate that sometime after this period a floodplain developed in the vicinity of Dover Downs Hill A. There was no material suitable for radio-carbon dating in this lithoface and soil profiles show a great degree of disturbance in these soil horizons, thus rendering the use of diagnostic

artifacts as time-markers of the change in environmental conditions impractical. Following the floodplain environment, the modern palustrine wetland developed similar to that at 7K-C-360. Unlike 7K-C-360, however, there is an absence of aeolian deposited sediments at Dover Downs Hill A.

Dover Downs Hill A is located on a small well-drained knoll surrounded by poorly-drained Othello silt loam soils (Matthews and Ireland 1971). These soils support a variety of wetland species that maintain moisture effectively even during dry seasons (Matthews and Ireland 1971). The area of the knoll on which the Dover Downs site, Hill A is located is relatively small, whereas the surrounding wetlands are quite extensive. During the hot and dry climatic episodes of the Middle Holocene, it is likely that this area remained moist and maintained the vast majority of its vegetation cover, and was therefore not as susceptible to the erosion and aeolian transport of surface soils as was 7K-C-360. Therefore, the small size of the Dover Downs Hill A knoll and the soil type in the surrounding wetlands contributed to a rather stable depositional environment at this site resulting in the relatively thin soil profile and the absence of aeolian deposited sediments.

Site 7K-C-360 and Dover Downs Hill A are located in similar topographic environments close enough to each other to have experienced the same paleoenvironmental histories. However, evidence suggests that, in fact, these sites diverged in their formation processes and that the characteristics that each site possesses evolved differently under the same general environmental conditions. These results underscore the findings of Brush (1982) who observed that local edaphic factors play an important role in formation processes and can help to explain differentiation in local and regional paleoenvironmental histories.

REGIONAL SETTLEMENT PATTERNS AND ADAPTATIONS

Given the mixing of components at the 7K-C-360 and Dover Downs sites, it is not possible to identify discrete Paleo-Indian, Archaic, or Woodland components of these sites. However, on the basis of tool types and artifact distributions at the sites, as well as topographic and paleoenvironmental attributes of the site locations, and their proximity to other site types in the area, these sites are best characterized as "staging/processing" camps similar to the Hawthorn site (7NC-E-46), located in the Interior Swamp Zone of New Castle County (Custer and Bachman 1984). These sites are transient camps, larger than procurement sites but smaller than base camps, where some degree of lithic reduction, tool refurbishing, and animal procurement and processing took place throughout various periods of prehistory.

Several sites located east and northeast of the Dover Downs sites contain Paleo-Indian Period projectile points, including Dalton/Hardaway, Kirk and Palmer varieties. These sites (7K-C-86A, 86C, 7K-C-87, 7K-C-88, and 7K-C-90) are macro-band base camps that were surface collected by Andrew Leitzinger and Christopher Chapman (Custer, Bachman, and Grettler 1986; Appendix II). In addition to Paleo-Indian artifacts, these surface assemblages also contain diagnostic tools from the Archaic through Woodland II periods. Among the Archaic artifacts recorded for these sites were bifurcate base and Stanly/Neville projectile points. In addition to the sites in the Muddy Branch drainage, base camp sites also exist along Dyke Branch to the east and northeast of Site 7K-C-360. These sites (7K-C-339, 7K-C-341, 7K-C-342, 7K-C-40, and 7K-C-94), in addition to several small procurement sites, small base camps, and a procurement/processing site in the near vicinity (Custer, Bachman, and Grettler 1986; Bachman, Grettler, and Custer 1988) were found to contain diagnostic artifacts dating only to the Woodland I and Woodland II periods. Among the Woodland I artifacts identified at these sites and the previously discussed macro-band base camp sites are those associated with the Clyde Farm/Barker's Landing, Wolfe Neck and Webb complexes. Finally, several sites along the Dyke and Muddy Branch drainages contain triangular points and Minguannan ceramics dating to the Woodland II Period.

Only one of the sites under discussion in this report, Dover Downs Hill A (7K-C-365A) contains diagnostic artifacts of the Paleo-Indian Period. The Paleo-Indian Period in the Middle Atlantic region has been characterized as one focused largely on hunting (Gardner 1974, 1977, 1979, and 1983). The prevailing climatic conditions following retreat of late Pleistocene glaciers (Ogden 1977; Carbone 1976; Bernabo and Webb 1977) would have resulted in replacement of open grassland settings with closed boreal forests. This change would have had a dramatic effect on the distribution of faunal species. Any remaining browsing and grazing species as well as forest-adapted game species would have been drawn to poorly-drained swampy areas and perennial or seasonal drainages (Custer 1984a). Paleo-Indian settlement systems would, therefore, be centered around game attractive locales where food could be procured; lithic outcrops where raw material for the manufacture of hunting and processing tools could be procured; and dry elevated areas where camps could be established (Custer 1986; 1989). It is believed that Paleo-Indian bands consisted of small groups of nuclear, and perhaps extended families, that were highly mobile but flexible enough to fission when necessary so as not to over exploit an area.

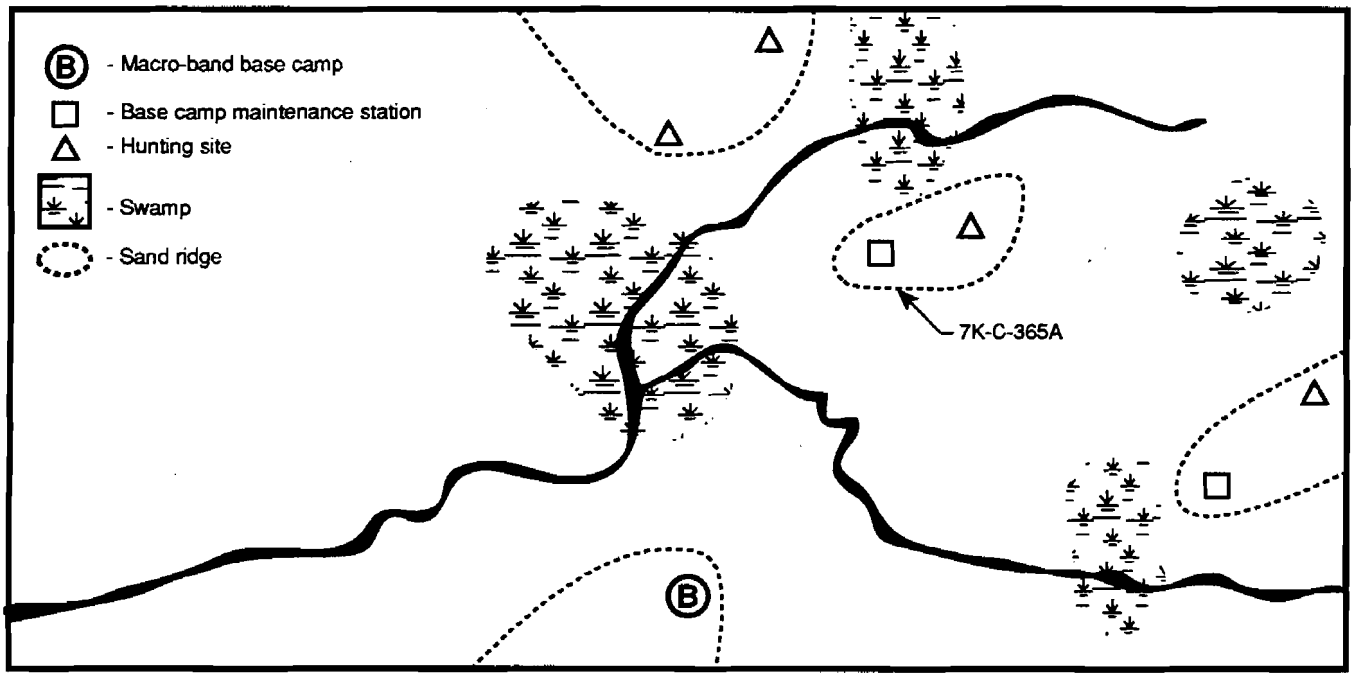
Based on his work on the Flint Run Paleo-Indian complex, Gardner (1974, 1977, 1979, 1983) defined a typology of functional site types for this period. These types include quarry sites (consisting of primary or secondary outcrops); quarry reduction stations, located close to quarry sites where raw materials obtained from the quarries were taken for further reduction into more easily transportable bifaces; base camps for habitation and the late or finishing stages of tool production; base camp maintenance stations which are located in resource rich areas close to a base camp where plant and animal procurement and processing would take place; outlying hunting sites located a greater distance from base camps; and isolated point finds. Paleo-Indian groups would move in cyclic fashion among these site types as needs and environmental conditions dictated.

Because the Mid-Drainage Zone of central Delaware offered fresh water and swampy conditions favorable to plant and animal species, this area would have been appealing to Paleo-Indian hunters and gatherers. Sporadic areas of dry sandy knolls, such as the one on which the Dover Downs site, Hill A is located, would have also facilitated exploitation of these needed resources. However, sources of lithic materials would have been scarce in central Kent County, Delaware. Therefore, it is unlikely that the Dover Downs site would have functioned in a quarry related capacity. Rather, the Dalton-Hardaway and Palmer/Kirk projectile points in the Dover Downs Hill A assemblage suggest that the site was most likely used for procurement purposes. Furthermore, although it is not possible to associate non-diagnostic tools in the assemblage with a discrete Paleo-Indian occupation, the presence of multi-purpose tools and processing tools of cryptocrystalline materials indicate that this site most likely functioned as a base-camp maintenance station in Paleo-Indian times where hunting and processing activities would have been engaged. With the larger Paleo-Indian base camps located farther to the east of the site, it is likely that the Dover Downs site, Hill A served in a support capacity for the larger base camps to which task groups would make forays. These groups may have procured animal, and perhaps plant, resources at the transient camp, and then returned with the resources to the base camp. A proposed settlement system model for the Paleo-Indian Period is shown in Figure 129.

The Dover Downs site, Hill A assemblage also contains diagnostic artifacts of the Archaic Period. These artifacts consist of a bifurcate base projectile point and a Stanly projectile point. Site 7K-C-360 also contained five bifurcate base projectile points diagnostic of the Archaic Period. Although adaptations in the Archaic Period were not dramatically different from those in the Paleo-Indian Period, some changes did occur that are reflected in the archaeological record. Moderating climatic conditions introduced some seasonal variation which facilitated the spread of mesic hemlock and later oak forests (Carbone 1976:76). These changes introduced more edible plants into the environment which reduced the dependence on hunting and increased the exploitation of plant resources. This alteration of adaptation is

FIGURE 129

Paleo-Indian Non-Quarry Settlement Pattern



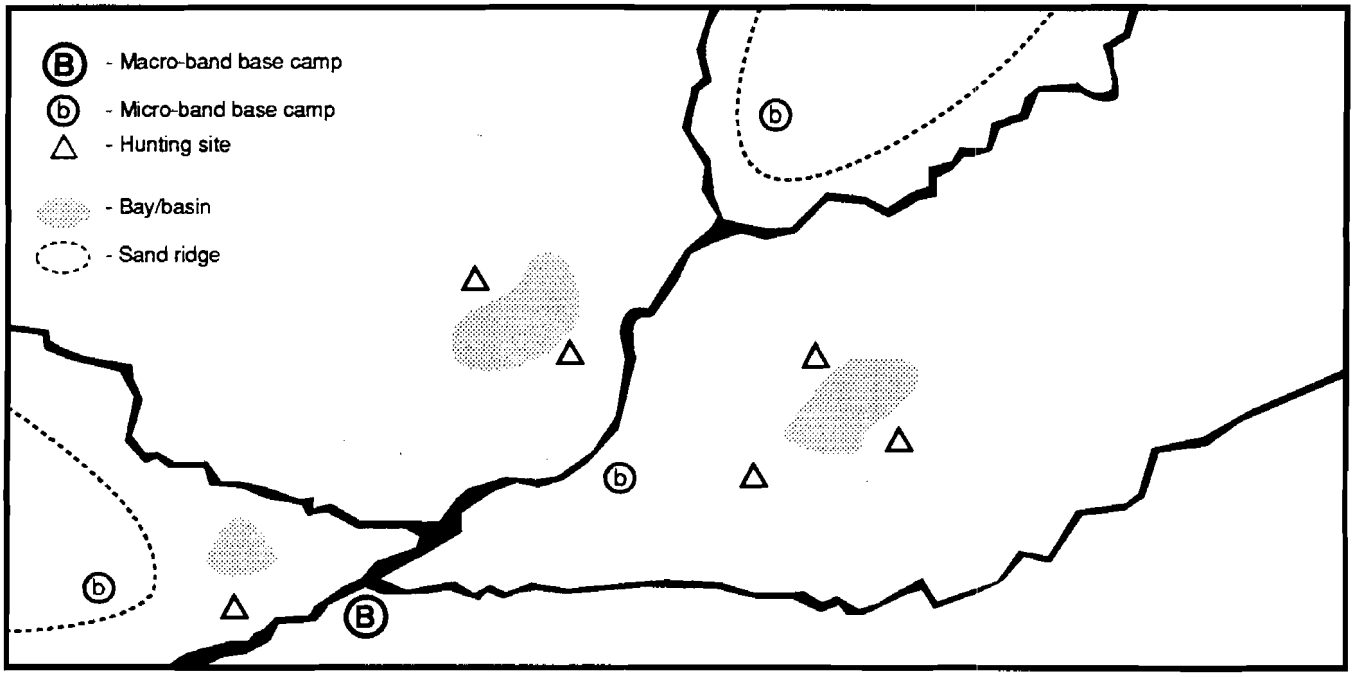
reflected in the presence of plant processing tools in artifact assemblages dating to the Archaic. Although such tools are not present among the 7K-C-360 assemblage, two grinding stone fragments and a mortar/anvil are present in the Dover Downs Hill A assemblage and may have been associated with the Archaic occupation.

Another effect of the broadening exploration of Archaic environments was the utilization of a wider variety of raw materials for the manufacture of stone tools which were being procured in a serial fashion (Custer, Cavallo and Stewart 1983). Some of these newly exploited raw materials included non-local types such as rhyolite, a felsic material which outcrops in central Pennsylvania and western Maryland (Stewart 1980, 1984a, 1984b), and argillite, which outcrops in central New Jersey and southcentral Pennsylvania, as well as quartz and quartzite which were available in local cobble beds. Although the Archaic points in the Dover Downs Hill A and 7K-C-360 assemblages were primarily made from cryptocrystalline materials, one of the bifurcate points from 7K-C-360 was made of non-local felsic rhyolite. In addition, both sites' assemblages contain high percentages of quartz and quartzite debitage as well as tools made from these materials.

Once again, the only artifacts that can be directly ascribed to Archaic occupations of these sites are the bifurcate base and Stanly projectile points. Also, as was the case for the Paleo-Indian occupation of Dover Downs Hill A, this site's location and that of 7K-C-360 on dry elevated areas in the vicinity of moist, swampy conditions were game attractive locales suitable for procurement activities. The presence of numerous butchering and processing tools among the assemblages suggests that procurement and processing activities as well as some tool refurbishing may have also been carried out at these sites during their Archaic occupations. Gardner (1980; as cited in Stewart and Cavallo 1991) has theorized that settlement systems of the Middle Archaic would have included such staging/processing sites within their catchment configuration. On the other hand, the presence of plant processing tools at Dover Downs Hill A in addition to a few pit features of unknown function could indicate that this site functioned as a base camp that would have been revisited on a seasonal basis. However, the overall low quantity of artifacts and the absence of habitation features makes this function unlikely. With base camp sites containing Archaic Period bifurcate base and Stanly/Neville points located in the near vicinity of the Dover Downs site, Hill A, it is likely that this site served in a similar support

FIGURE 130

Archaic Drainage Divide Settlement Pattern

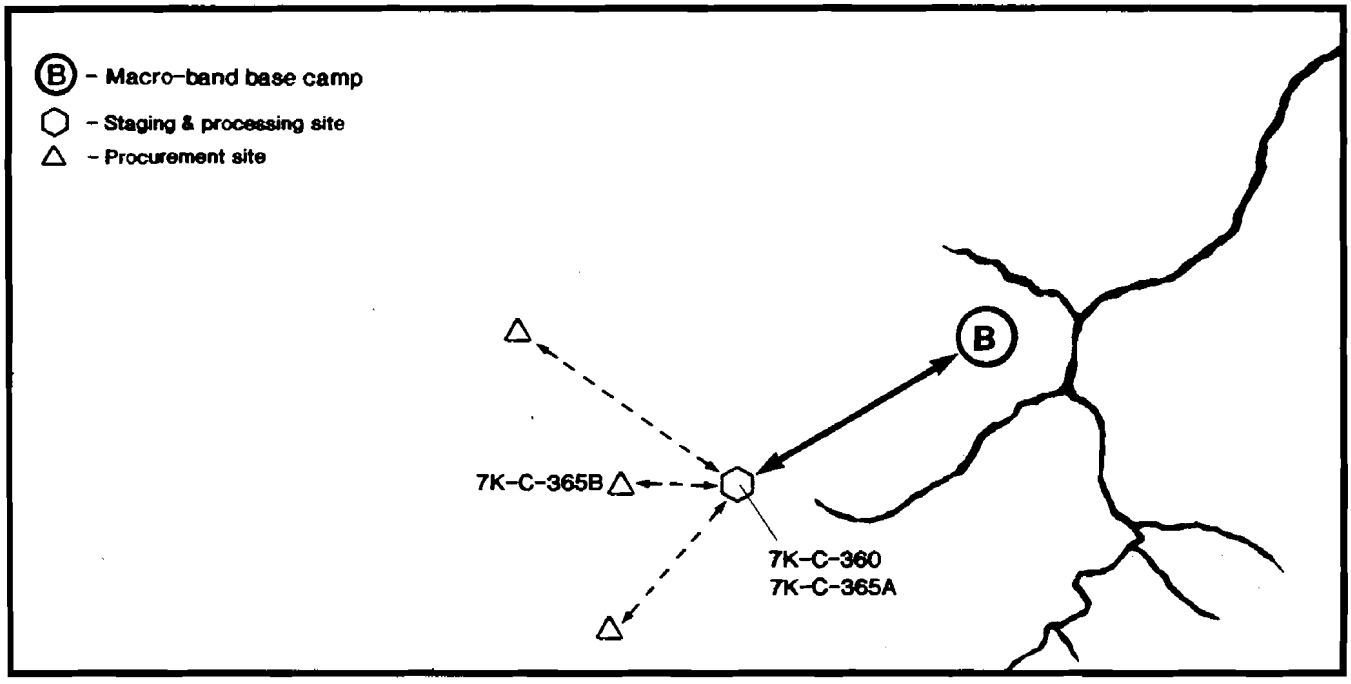


capacity during the Archaic Period. Although no such Archaic Period artifacts were found at base camps in the immediate vicinity of Site 7K-C-360, it is likely that such camps do exist but have not yet been identified, and Site 7K-C-360 would also likely have served these larger base camps in a support capacity for procurement and processing purposes. A proposed settlement model for the Mid-Drainage Zone during the Archaic Period is shown in Figure 130.

Changing environmental conditions continued into the Woodland I Period, including a dramatic warming trend that lasted through much of its first quarter, followed by cyclical changes in temperature and moisture that prevailed through approximately the first two-thirds of the period (Custer 1984a, 1986, 1989). The dry conditions that would have accompanied the warming trend would have necessitated location of camps near reliable sources of surface water. In addition to the circumscription imposed by the changes in climate and temperature, other effects included a broadening diversity of faunal communities, the introduction of more edible plant species and the expansion of existing vegetation communities. These changes, along with the development of trade and exchange networks, facilitated a trend towards greater sedentism in settlement practices.

One response to the evolving environments of the early Woodland I complexes (Clyde Farm/Wolfe Neck) was a general increase in the size of macro-band base camps and a reduction in the variety of macro-band base camp locations. A further effect of these changes is a proliferation of procurement sites in rich resource settings that could support the seasonal occupation of the larger base camps. The Dover Downs site, Hill B, located on a sandy knoll surrounded by swampy terrain, would have been an appealing procurement station during that time. It is likely that a work group from a nearby base camp occupied Dover Downs Hill B as a staging area where cobbles procured from nearby cobble beds and cores carried into the site were reduced to make flakes for the production of stone tools. The presence of projectile points, broadspears, and other processing tools in the Hill B assemblage suggest that during the course of this occupation, animal resources were also procured from nearby locales and processed at the site. The presence of a hearth and stone bowl fragments suggest that the occupation may have lasted for a number of days. After these tasks were completed, finished or nearly finished stone tools, possibly as well as bone and wood tools, and perhaps food resources would have been carried back to the larger base camp. A proposed settlement model for the Clyde Farm Complex in the Low Coastal Plain is shown in Figure 131.

FIGURE 131
Clyde Farm Complex Settlement Model



Settlement patterns of the Clyde Farm Complex persist into the Wolfe Neck Complex to which materials from the Dover Downs site, Hill A date. The settlement model shown in Figure 131 would also apply to the Wolfe Neck Complex. The broadspears present in the earlier Clyde Farm site assemblages are absent from Wolfe Neck site assemblages, and steatite bowls have been replaced by crushed quartz-tempered, net- and cord-impressed Wolfe Neck ceramic wares. The development of these new ceramic technologies facilitated storage of processed plant foods, while eclectic procurement of alternative lithic resources, particularly those that were locally available, reduced the necessity of frequent long distance forays to sources of primary lithic outcrops. These factors helped to reinforce the trend towards more sedentary lifestyles (Custer 1984a).

A possible trend suggested by the artifact assemblages from all of the sites under discussion involves an apparent shift to a greater emphasis on expedient chipped stone technologies. This trend is suggested by the high proportion of expediently manufactured flake tools, which only crudely approximate formal tool types in the assemblages. Parry and Kelly (1987) have observed that this trend toward an emphasis on expedient technology emerges concurrently with the development of more sedentary settlement practices. During the highly mobile systems in effect during the earlier Paleo-Indian and Archaic periods, a highly curated, multi-purpose formal tool technology that could serve a variety of lithic tool needs was most practical. However, once groups lived in more settled communities, the need for complex and portable tools diminished. Although such tools remained important, Parry and Kelly (1987) argue that the emphasis switched to expediently manufactured tools produced from locally available cobbles. An emphasis on locally available materials would have further reinforced the trend toward settled communities. Although Parry and Kelly focused their discussions on settled village communities, the high proportion of expedient artifacts from the 7K-C-360 and Dover Downs sites suggest that this emphasis may also apply to somewhat less permanent seasonal occupations.

Parry and Kelly (1987) further contend that even in locations where raw materials are not readily available, sedentary populations continue to make expedient tools and make regular trips to quarries to secure materials that could be stockpiled at (seasonal) residential base camps. As will be discussed in more detail later, such stockpiling is suggested at Hill B where numerous cores of primary quartzite were reduced. Previous research on sites in central Delaware (Custer 1984c) has revealed similar patterns in the caching of argillite bifaces during the Barker's Landing Complex. The presence of argillite in points and bifaces from Dover Downs Hill A and 7K-C-360 may also be products of such embedded procurement systems where lithic caches represent a group's anticipation of future needs (Binford 1979).

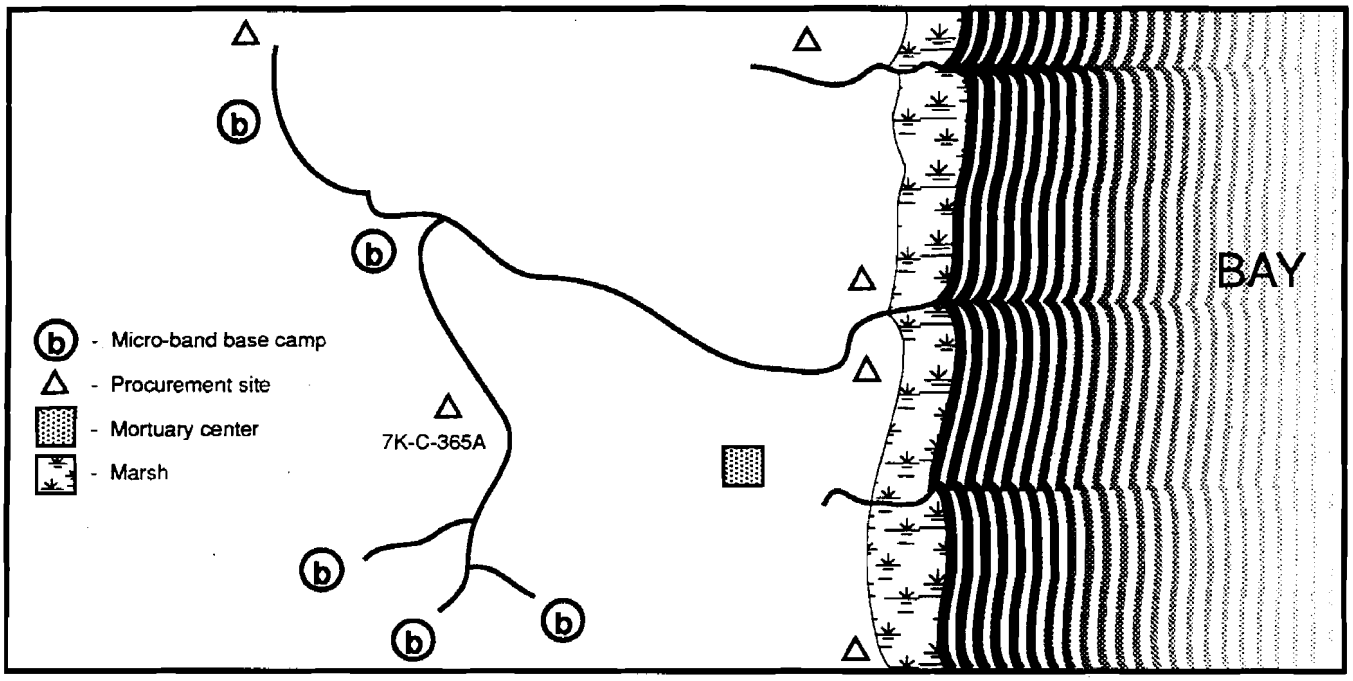
Moderating climatic conditions of the later Woodland I Period would have favored the spread of oak-pine forests in the Low Coastal Plain which would have supported deer, turkey and possibly water fowl populations. In addition, the rate of sea level rise would have sufficiently stabilized to sustain the proliferation of estuarine-adapted species. These prevailing characteristics of the Sub-Atlantic Episode would have relieved the stresses of the earlier Sub-Boreal Episode and alleviated the conditions that led to the circumscription of settlement locales. Although the basic Woodland I settlement patterns of the earlier complexes continue into the Delaware Park Complex, a significant reduction in the number of macro-band base camps is noted for the Webb Complex. Alleviation of the conditions that fostered circumscription may have resulted in some degree of devolution into simpler settlement patterns as is indicated by an increase of micro-band base camps during this time period. The presence of a Hell Island ceramic sherd at the Dover Downs site, Hill A indicates an occupation of this site dating to the Delaware Park or Webb complexes. A possible Webb Complex base camp (7K-C-94) is situated on Muddy Branch to the east of Dover Downs Hill A. It is possible that Dover Downs Hill A is a micro-band base camp in the Webb Complex system, but it is more likely that the site served as a transient camp for the procurement and processing of plant and animal products that would have supported one of the small or large base camps farther along the drainage. A proposed settlement model for the Webb Complex is shown in Figure 132.

Environmental conditions of the Woodland II Period were essentially modern in character, enabling a variety of plant, animal, and estuarine resources to flourish. Processing and storage of wild plant products enabled increased sedentism at Woodland II Period sites of the Minguannan and Slaughter Creek complexes (Custer 1986).

Minguannan Complex settlement patterns for the Low Coastal Plain are not well understood, although data from the Piedmont Uplands and the High Coastal Plain indicate that macro-band base camps were somewhat larger during this period than those associated with Woodland I occupations (Custer 1989). There are even fewer data available on micro-band base camps and procurement sites of the Minguannan Complex in the Low Coastal Plain. Minguannan Complex micro-band base camps have been located on the Appoquinimink River in the High Coastal Plain on high bluffs overlooking a series of tidal marshes (Custer, Bachman, and Grettler 1986). Minguannan Complex procurement sites, generally containing both Woodland I and Woodland II artifacts (Custer, Catts, and Bachman 1982; Bachman and Custer 1983), have been associated with poorly drained woodlands and the heads of small streams. It is likely that moderately high areas such as the Dover Downs Hill A and Hill B knolls would have been favorable small base camps or procurement sites in the Low Coastal Plain. The presence of triangular points at both of the Dover Downs sites and Minguannan ceramics at the site Hill A indicate that Woodland II groups, including those associated with the Minguannan Complex, did in fact inhabit the Low Coastal Plain of Delaware. It is likely that these sites served in similar transient procurement/processing capacities during the Woodland II Period as in earlier periods of prehistory. Further evidence of such a configuration exists in the assemblages from a macro-band base camp complex located to the east of the Dover Downs sites (7K-C-86) which also contains a few Minguannan ceramic sherds in addition to triangle points.

FIGURE 132

Webb Complex Settlement Model



In sum, the settlement pattern of the Minguannan Complex in the Low Coastal Plain of Delaware appears to be a continuation of the Woodland I pattern with a lower number of macro-band base camps and a higher number of micro-band base camps (Custer 1986). However, there remains too little site information from the Low Coastal Plain to infer a settlement model for the Minguannan Complex.

Since no artifacts diagnostic of particular cultural complexes were present in the 7K-C-360 site assemblage, it is not possible to infer this site's role in specific settlement systems. However, its identification as a transient site for procurement and processing purposes in a supportive capacity to nearby base camps would apply to all periods of prehistory.

LITHIC TECHNOLOGY AND LITHIC RESOURCE USE

The lithic resource use at Site 7K-C-360 and the Dover Downs sites can be compared to patterns from other local and regional sites in order to understand prehistoric settlement patterns and group movements. Previous UDCAR/DelDOT studies have compared sites with a primary occupation dating to the Woodland I Period (eg. Catts, Hodny, and Custer 1989; Riley et al. 1993), and an extensive body of lithic resource data has been assembled. Table 35 shows the comparative lithic resource data and Figure 133 shows the sites from which they are derived. A difference-of-proportion test was used to compare percentages of cortex, cryptocrystalline use, and quartz and quartzite use among all of the sites. The difference-of-proportion test was applied to evaluate percentage differences due to the varied sizes of the artifact assemblages shown in Table 35. Results of the previous comparisons are noted and described in Catts, Hodny, and Custer (1989:249-256:Appendix II) and in Riley et al. (1993:Appendix IV). Results of the comparisons with the Dover Downs sites, 7K-C-360, and additional sites are described below and in Appendix V.

Table 36 lists the sites in rank order by percentage frequencies of cortex, cryptocrystalline use, and quartz and quartzite use. Sites with no significant differences in percentages are joined by brackets.

TABLE 35

Comparative Lithic Resource Use

Site	Function	Total Artifacts	Cortex %	Crypto-crystalline %	Quartz/ Quartzite %	Reference
7K-C-360	Hunting/staging	2,287	30	56	41	—
7K-C-365A	Hunting/staging	2,537	38	51	46	—
7K-C-365B	Lithic reduction	8,130	4	5	94	—
7S-G-123	Cobble reduction	164	54	65	23	Custer and Mellin (1990)
7K-C-194A	Macro-band base camp	1,796	25	53	38	Riley et al. (1993)
7K-C-204	Macro-band base camp	124	27	54	37	Riley et al. (1993)
7K-C-359	Micro-band base camp	160	26	63	33	Riley et al. (1993)
7K-C-363	Procurement	133	21	76	19	Riley et al. (1993)
7K-C-364	Staging/processing	1,742	32	56	39	Riley et al. (1993)
7NC-D-100	Procurement	293	41	51	46	Shaffer et al. (1988)
7NC-D-3	Quarry reduction	368	0	51	38	Custer, Ward, and Watson (1986)
7NC-D-5	Quarry reduction	94	0	60	32	Custer, Ward, and Watson (1986)
7NC-E-9	Micro-band base camp	4,090	14	79	18	Custer et al. (1990)
7NC-E-46	Hunting/staging	10,512	20	22	69	Custer and Bachman (1984)
7NC-D-54	Cobble reduction base camp	1,288	28	32	59	Custer et al. (1981)
7NC-D-55A	Cobble reduction base camp	132	45	16	69	Custer et al. (1981)
7NC-D-55B	Cobble reduction base camp	2,304	29	8	88	Custer et al. (1981)
7NC-A-17	Hunting/staging	279	9	23	71	Custer and Hodny (1989)
7NC-A-2	Base camp	845	38	18	67	Custer and De Santis (1985)
36LE4	Lithic reduction	306	0	1	97	Custer (1992)

TABLE 36

Summary of Lithic Resource Use Patterns

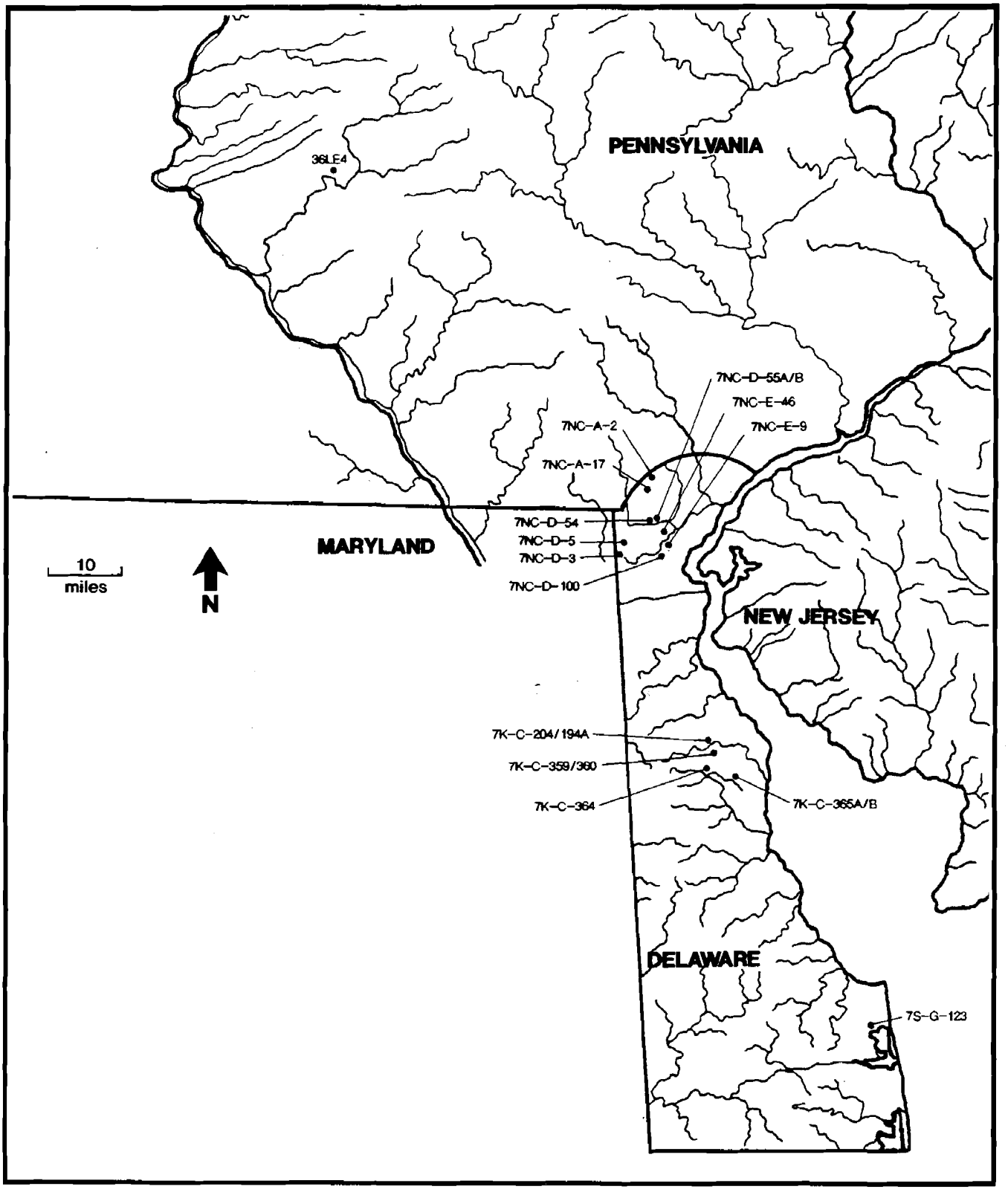
Site number	Cortex
36LE4	Lithic reduction-0%
7NC-D-3	Quarry reduction-0%
7NC-D-5	Quarry reduction-0%
7K-C-365B	Lithic reduction-4%
7NC-A-17	Hunting/staging-9%
7NC-E-9	Micro-band base camp-14%
7NC-E-46	Hunting/staging-20%
7K-C-363	Procurement-21%
7K-C-194A	Macro-band base camp-25%
7K-C-359	Micro-band base camp-26%
7K-C-204	Macro-band base camp-27%
7NC-D-54	Cobble reduction base camp-28%
7NC-D-55B	Cobble reduction base camp-29%
7K-C-360	Hunting/staging-30%
7K-C-364	Hunting/staging-32%
7NC-A-2	Base camp-38%
7K-C-365A	Hunting/staging-38%
7NC-D-100	Procurement-41%
7NC-D-55A	Cobble reduction base camp-45%
7S-G-123	Cobble reductiion base camp-54%

Site number	Cryptocrystalline
36LE4	Lithic reduction-1%
7K-C-365B	Lithic reduction-5%
7NC-D-55B	Cobble reduction base camp-8%
7NC-D-55A	Cobble reduction base camp-16%
7NC-A-2	Base camp-18%
7NC-E-46	Hunting/staging-22%
7NC-A-17	Hunting/staging-23%
7NC-D-54	Cobble reduction base camp-32%
7NC-D-100	Procurement-51%
7NC-D-3	Quarry reduction-51%
7K-C-365A	Hunting/staging-51%
7K-C-194A	Macro-band base camp-53%
7K-C-204	Macro-band base camp-54%
7K-C-364	Hunting/staging-56%
7K-C-360	Hunting/staging-56%
7NC-D-5	Quarry reduction-60%
7K-C-359	Micro-band base camp-63%
7S-G-123	Cobble reduction base camp-65%
7K-C-363	Procurement-76%
7NC-E-9	Micro-band base camp-79%

Site number	Quartz and Quartzite
7NC-E-9	Micro-band base camp-18%
7K-C-363	Procurement-19%
7S-G-123	Cobble reduction base camp-23%
7NC-D-5	Quarry reduction-32%
7K-C-359	Micro-band base camp-33%
7K-C-204	Macro-band base camp-37%
7K-C-194A	Macro-band base camp-38%
7NC-D-3	Quarry reduction-38%
7K-C-364	Hunting/staging-39%
7K-C-360	Hunting/staging-41%
7NC-D-100	Procurement-46%
7K-C-365A	Hunting/staging-46%
7NC-D-54	Cobble reduction base camp-59%
7NC-A-2	Base camp-67%
7NC-D-55A	Cobble reduction base camp-69%
7NC-E-46	Hunting/staging-69%
7NC-A-17	Hunting/staging-71%
7NC-D-55B	Cobble reduction-88%
7K-C-365B	Lithic reduction-94%
36LE4	Lithic reduction-97%

With regard to cortex percentage, which is an indicator of cobble resource utilization, Site 7K-C-360 falls into a category of sites that show moderately high frequencies of cortex among their lithic assemblages. This category includes several sites from the Mid-Drainage Zone of central Delaware (7K-C-363, 7K-C-194A, 7K-C-359, 7K-C-204, and 7K-C-364) that date primarily to the Woodland I Period (Riley et al. 1993). Additional sites in this category include two cobble reduction base camps from the Fall Line Zone (7NC-D-54 and 7NC-D-55B) and one hunting/staging site (7NC-E-46) located in Churchman's Marsh, just south of the cobble

FIGURE 133
Lithic Assemblage Sample Site Locations



rich Fall Line Zone. The association of 7K-C-360 with cobble reduction sites indicates that locally available cobbles were important sources of raw material for the lithic needs of the site's occupants and played a significant role in the activities that took place at the site. The cobbles would likely have been carried into the site from deposits along the Delaware shore or stream valleys of nearby drainages.

The Dover Downs site, Hill A ranks with a group of sites that register the highest cortex percentages. This group consists of sites from cobble rich areas in the Piedmont, including another hunting/processing base camp (7NC-A-2), the Fall Line, and southernmost Delaware, and indicates that such secondary resources were greatly important to the groups that occupied Dover Downs Hill A.

The association of both 7K-C-360 and 7K-C-365A with other hunting/processing sites that contain moderately high to high frequencies of cortex in their lithic assemblages exemplifies the embedded procurement systems described by Goodyear (1979) and Binford (1979) in which travel to secondary lithic outcrops is carried out in association with other activities (Custer and Galasso 1983; Custer, Cavallo, and Stewart 1983). The range of artifacts in the assemblages from both sites indicate that hunting, butchering, hide-working, and bone and stone tool production activities took place at these sites. A similar range of activities is suggested by the assemblages from 7NC-E-46 (Custer and Bachman 1984) and 7K-C-364 (Riley et al. 1993), two hunting/processing sites grouped with 7K-C-360, and 7NC-A-2 (Custer and De Santis 1985), a hunting/processing site grouped with Dover Downs Hill A.

With regard to the use of cryptocrystalline materials versus quartz and quartzite materials at 7K-C-360 and Dover Downs Hill A, Table 36 shows that both of these sites register relatively high percentages of cryptocrystalline materials among their lithic assemblages. Furthermore, these sites are grouped together with two primary jasper reduction sites (7K-D-3 and 7K-D-5) that are located near Chestnut Hill in northwestern Delaware in the vicinity of the Delaware Chalcedony Complex outcrops. Also included in this group are several other central Kent County, Delaware sites.

Dover Downs Hill A and 7K-C-360 are also ranked together and included in a group of sites registering the lowest percentages of quartz and quartzite use. The nearest primary outcrops of quartz and quartzite are located in the Pennsylvania Piedmont in Lancaster, Chester, and Bucks counties, and near Trenton in Mercer County, New Jersey (Custer and Galasso 1980), a relatively great distance from Dover Downs and 7K-C-360. Although secondary cobbles of these materials are present in the Low Coastal Plain of Delaware, it would be unlikely that cobbles of these materials would be plentiful in this area. On the other hand, the Delaware Chalcedony Complex, though also located some distance from sites in central Kent County, is reasonably accessible for the regular procurement of primary cryptocrystalline materials and could also be the source of secondary cobbles in the Low Coastal Plain large enough for the manufacture of small to medium size tools. Therefore, the association of the Dover Downs site, Hill A and 7K-C-360 with sites showing high cryptocrystalline use and low quartz/quartzite use is likely due to the availability of cryptocrystalline cobble materials in the Low Coastal Plain of Delaware and/or the relative accessibility of primary outcrops of the Delaware Chalcedony Complex rather than a preference for specific material types. No such preference is clearly indicated for specific tool types in these assemblages, except perhaps for projectile points which are almost all made from cryptocrystalline materials.

The Dover Downs Hill B assemblage exhibits a very different pattern of raw material use from that of Dover Downs Hill A and 7K-C-360. This site ranks with a group of sites that reflect the lowest frequencies of cortex. This group of sites includes two primary jasper reduction stations (7NC-D-3 and 7NC-D-5) located in the vicinity of Chestnut Hill in northwestern New Castle County, Delaware and the Long Site (36LE4), a quartzite reduction station, located in western Lebanon County, Pennsylvania. Hill B's association with sites that

show a total absence of cortex among their lithic assemblages indicates that the raw materials utilized at Hill B were procured from primary outcrops. The dominant raw material type at Hill B was quartzite, the nearest source of which is the Piedmont area of southeastern Pennsylvania and in the Coastal Plain of central western New Jersey (Custer and Galasso 1980).

With regard to the use of cryptocrystalline materials versus quartz and quartzite materials at Hill B, this site is significantly different from all other sites in the comparison and registers a very low percentage of cryptocrystalline material among its lithic assemblage. However, the Dover Downs site, Hill B ranks in the category of sites with the highest quartz/quartzite usage. The only other site in the comparison with a similar pattern of quartz/quartzite usage is the Long site (36LE4). The Long site lithic assemblage contains absolutely no cortex, indicating that the site's assemblage originated from primary outcrops, mainly of quartzite. These outcrops have not been identified but are expected to be located close to the site. No such quartzite outcrops are known anywhere in the near vicinity of the Dover Downs site, Hill B; therefore, the quartzite cores that provided flakes for the manufacture of stone tools at Hill B would have to have been transported from its source of origin and brought into the site. As previously discussed, the nearest sources of primary quartzite to Dover Downs would be the Piedmont Uplands of southeastern Pennsylvania and the Coastal Plain of central western New Jersey.

Another possible explanation for the relative abundance of primary quartzite cores and a concentration of quartzite cobble cores at Hill B is that these resources were cache items from a nearby base camp. As will be discussed later in this section, this caching practice was employed by Barker's Landing Complex populations who would transport large early stage bifaces of argillite, presumably from primary source locations in the area of central western New Jersey and southeastern Pennsylvania to distant base camps in central Delaware where lithic resources of large size and good quality were relatively scarce. These caches would then secure the lithic needs of groups travelling long distances for seasonal visits or for the acquisition of coastal resources. Likewise, groups traveling from the Piedmont, where primary quartzite is plentiful, to lithic poor central and southern Delaware may also have transported blocky quartzite cores for purposes of caching and thereby securing their lithic needs during seasonal visits or special forays.

It would appear that the primary strategic aspect of caching such resources would be to ensure the availability of raw material in a lithic poor environment. However, the apparent preference for quartzite over other raw materials should also be addressed. Quartzite may have been the material of choice either because its attributes of toughness and in duration make it more suitable for certain tasks or simply because quartzite was the material most accessible and familiar to the group or groups passing through Hill B from their point of origin. Quartzite seems to have been used at Hill B primarily for the manufacture of bifaces and projectile points of both narrow- and broad-bladed variety. Such tools made of quartzite would be useful for chopping, gouging and gross cutting of wood, bone, and animal tissue. In addition to the primary cores, several locally available quartzite cobbles were also used to manufacture bifaces. Therefore, primary and secondary quartzite cores at Hill B may represent a lithic caching strategy for groups traveling a great distance from primary outcroppings, and/or they may represent a preference for this particular material type in the manufacture of special purpose tools.

When all of the sites listed in Table 36 are considered as a whole, they can be classified into groups based on the use of cobble materials as revealed through cortex percentage and cryptocrystalline percentage (Table 37). The cortex percentage is divided into two categories based on the groups shown in Table 36 (low < 28%, high > 27%). The cryptocrystalline percentage is divided into three categories (low < 27%, medium > 26% and < 52%, high > 51%) based on the groups shown in Table 36.

Both the Dover Downs site, Hill A and Site 7K-C-360 fall into the category of sites with high cortex/high cryptocrystalline use. These sites include another hunting/staging site from the

TABLE 37

Lithic Resource Use Classification

	Cortex	
Cryptocrystalline	**High**	**Low**
High	**7K-C-365A (Hunting/staging)** **7K-C-360 (Hunting/staging)** 7K-C-364 (Hunting/staging) 7NC-D-100 (Procurement) 7S-G-123 (Cobble reduction base camp)	7NC-E-9 (Micro-band base camp) 7K-C-359 (Micro-band base camp) 7K-C-204 (Macro-band base camp) 7K-C-194A (Macro-band base camp) 7NC-D-3 (Quarry reduction) 7NC-D-5 (Quarry reduction) 7K-C-363 (Procurement)
Medium	7NC-D-54 (Cobble reduction base camp)	
Low	7NC-A-2 (Base camp) 7NC-D-55A (Cobble reduction base camp) 7NC-D-55B (Cobble reduction base camp)	**7K-C-365B (Lithic reduction)** 36LE4 (Lithic reduction) 7NC-A-17 (Hunting/staging) 7NC-E-46 (Hunting/staging)

Mid-Drainage Zone of central Delaware (7K-C-364) where the manufacture of expedient tools from locally available cryptocrystalline cobbles was an important activity, a procurement site (7NC-D-100) from the southern margin of the Fall Line where cryptocrystalline cobbles were utilized, and a cobble reduction base camp in southeastern Delaware (7S-G-123) where the reduction of secondary cobbles, largely of cryptocrystalline materials, was the primary activity.

The Dover Downs site, Hill B falls into the category of sites registering low cortex/low cryptocrystalline use. These sites include the Long site (36LE4), a lithic reduction base camp in western Lebanon County, Pennsylvania; the Hockessin Valley site (7NC-A-17), a hunting/staging site in the Piedmont Uplands of New Castle County, Delaware where primary quartz and quartzite were preferred for the manufacture of expedient tools; and the Hawthorn site (7NC-E-46), a hunting/staging site in the Churchman's Marsh area of New Castle County, Delaware, where curated tool kits of primary materials were supplemented by expediently manufactured flake tools mostly from quartz and quartzite cobbles.

In sum, the data suggests that, in general, cryptocrystalline materials were preferred at both of the staging/processing sites (7K-C-360 and Dover Downs Hill A). Furthermore, they suggest that the likely sources of the cryptocrystalline materials were both primary outcrops of the Delaware Chalcedony Complex and secondary cobbles available along the Delaware shore. The data also suggest that quartzite was the preferred material at Dover Downs Hill B. The source of the quartzite is unknown, but appears to have been largely from primary sources, the closest of which would be located in the Pennsylvania Piedmont.

In addition to cryptocrystalline and quartz/quartzite materials among the lithic assemblages of 7K-C-360 and the Dover Downs sites, another conspicuous material present among projectile points from 7K-C-360 and the Dover Downs site, Hill A is argillite. Very little argillite is present in the assemblage from Hill B. The nearest primary outcrops of argillite occur in the Upper Triassic Lockatong Formation of the Newark Group in central New Jersey and southeastern Pennsylvania (Didier 1975). Argillite is a material that weathers rapidly; therefore, it is unlikely that cobbles of this material large enough for the manufacture of stone tools would be available in the Low Coastal Plain of Delaware (Custer and Galasso 1980). Therefore, it is believed that the argillite used in the manufacture of bifaces at Dover Downs and 7K-C-360 was either received in trade or procured from primary sources.

Comparison of the Dover Downs and 7K-C-360 sites with other sites in the local area, as well as more distant sites, helps to illuminate patterns of argillite utilization. Sites used in the comparative analysis are listed in Table 38. The sites listed in Table 38 were chosen for use in the analysis because they have stone tool assemblage data recorded in such a manner as to make them comparable to the Dyke and Muddy Branch sites. They were also chosen because they highlight certain special patterns of lithic resource use in the region.

TABLE 38

Sites Used in Comparative Analyses

Shady Brook Site (28ME20 and 28ME99) - Located in the Fall Line area near Trenton, this site was investigated as part of the archaeological studies of the Abbott Farm National Landmark. The site is a transient camp on the upland bluffs with a significant Late Archaic/Early Woodland component (Louis Berger and Associates 1986).

Barkers Landing Site (7K-D-13) - This site is located in central Delaware and is a large base camp site that is the type site for the Late Archaic Barker's Landing site (Custer 1984c).

Coverdale Site (7K-F-38) - Located in the Low Coastal Plain of Delaware, this site is a large base camp with an extensive Late Archaic/Early Woodland component (Custer 1984c).

Caryatid and Eckert Farm Sites (28-BU-276 and 28-BU-115) - Located in the Inner Coastal Plain of New Jersey, these two transient camps were studied as part of the Route 38 Corridor Project (Watson and Custer 1990a).

The Green Valley Site Complex (7NC-D-54, 7NC-D-55B) - Located in the Fall Line of Northern Delaware, these sites are cobble reduction base camps (Custer, Sprinkle, Flora, and Stiner 1981).

Clyde Farm Site (7NC-E-6A) - Located adjacent to a large tidal marsh in the Delaware Fall Line, the Clyde Farm site is a large base and the type site for the Late Archaic Clyde Farm Complex (Custer 1982).

Dairy Queen Site (7NC-D-129) - Located in Northern Delaware, this site is a small transient camp located on a low knoll within a poorly drained woodland (Custer, Watson, Hoseth, and Coleman 1988).

Hawthorn Site (7NC-E-46) - Located in the Delaware Fall Line Zone adjacent to a low order stream, this site is a transient camp, or procurement/staging site (Custer and Bachman 1984).

Table 39 shows the summary statistics on the use of argillite versus non-argillite materials for Site 7K-C-360, the Dover Downs sites, two sites from the Low Coastal Plain in Delaware, two sites from the Inner Coastal Plain of New Jersey, and one site from the New Jersey Fall Line. Table 40 shows statistics on the use of various raw materials for the manufacture of projectile points for the above-noted sites as well as for a sample of sites from the Fall Line Zone in Delaware. Table 41 shows similar data for biface manufacture, and Figure 134 shows the location of the sites and raw material sources noted in the text.

In terms of the use of argillite for projectile points, 7K-C-360 and Dover Downs Hill A are most similar to the Coverdale site, a central Delaware Mid-Drainage Zone base camp, and the Eckert Farm site, a New Jersey Inner Coastal Plain transient base camp. Both of these sites are located some distance from primary and secondary sources of argillite. Other sites used in the comparison, such as the Caryatid site, also located in the New Jersey Coastal Plain west of the Eckert Farm site, and the Barker's Landing site, also located in the Mid-Drainage Zone of central Delaware, show extremely high percentages of argillite projectile points among their assemblages, even though they, too, are situated some distance from available sources of this material.

Earlier interpretations of the Barker's Landing Site Complex (Custer 1984a, 1984c) suggested that the intensive focus on argillite in the Delaware Coastal Plain was thought to be the result of either a trade and exchange network or direct procurement system (Figure 135). Accumulations of argillite which were stored, or cached, at Barker's Landing Complex sites are thought to represent storage of excess raw materials for future use or sociotechnic functions (Custer 1984a:111-113). Watson and Custer (1990a, 1990b) have since suggested that all of these sites in the Delaware and New Jersey Coastal Plain, and possibly the Fall Line, may be included within the wandering range of the same social groups, and that these social groups would visit the primary and/or secondary argillite sources in the vicinity of present-day Mercer County, New Jersey or perhaps Bucks County, Pennsylvania, fill their tool kits with argillite bifaces, and proceed south towards the Delmarva Peninsula. Figure 136 shows a diagram of this potential wandering range. In the course of these sojourns, argillite tools would be discarded in amounts relative to the groups' proximity to the argillite outcrops. For example, Watson and Custer (1990a) argue that groups that occupied the Caryatid and Eckert Farm sites would have recently visited an argillite outcrop and could, therefore, afford to be somewhat profligate in

TABLE 39

Argillite and Cryptocrystalline Use

	Caryatid		Eckert Farm		Shady Brook		Coverdale		Barker's Landing		7K-C-360		Dover Downs Hill A		Dover Downs Hill B	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Points																
Argillite	33	87	5	29	26	93	70	36	30	75	6	30	5	38	1	13
Non-Argillite	5	13	12	71	2	7	124	64	10	25	14	70	8	62	7	87
Bifaces																
Argillite	73	75	6	43	35	59	32	45	114	95	3	10	4	17	1	4
Non-Argillite	24	25	8	57	24	41	38	55	6	5	26	90	20	83	22	96
Flake tool/core																
Argillite	16	24	7	24	9	15	No Data		0	0	1	1	0	0	1	3
Non-Argillite	50	76	22	76	52	85	No Data		35	100	68	99	50	100	28	97
Debitage																
Argillite	848	32	408	11	2045	41	No Data		No Data		32	2	30	1	1	.01
Non-Argillite	1798	68	3215	89	2887	59	No Data		No Data		2022	98	2314	99	8052	100

TABLE 40

Comparative Lithic Material Use - Projectile Points

Site		Quartzite	Quartz	Jasper	Chert	Argillite	Other	Total
7K-C-360	#	1	0	8	3	6	2	20
	%	5	0	40	15	30	10	
7K-C-365A	#	0	0	2	4	5	2	13
	%	0	0	15	31	38	15	
7K-C-365B	#	3	0	2	1	1	1	8
	%	37.5	0	25	12.5	12.5	12.5	
Caryatid	#	0	4	1	0	33	0	38
	%	0	11	3	0	87	0	
Eckert Farm	#	1	2	4	4	5	1	17
	%	6	12	24	24	29	6	
Shady Brook	#	0	1	0	1	26	0	28
	%	0	4	0	4	93	0	
Barker's Landing	#	0	0	0	6	30	4	40
	%	0	0	0	15	75	10	
Coverdale	#	8	17	23	37	70	39	194
	%	4	9	12	19	36	20	
7NC-D-54	#	3	12	6	2	0	0	23
	%	13	52	26	9	0	0	
7NC-D-55B	#	5	8	4	2	0	2	21
	%	24	38	19	9	0	9	
7NC-E-6A (2A)	#	6	3	3	3	4	1	20
	%	30	15	15	15	20	5	
7NC-D-129	#	2	3	2	1	3	0	11
	%	18	27	18	9	27	0	
7NC-E-46	#	8	15	21	0	6	11	61
	%	13	25	34	0	10	18	

TABLE 41

Comparative Lithic Material Use - Bifaces

Site		Quartzite	Quartz	Jasper	Chert	Argillite	Other	Total
7K-C-360	#	4	3	9	6	3	4	29
	%	14	10	31	21	10	14	
7K-C-365A	#	0	8	9	0	4	3	24
	%	0	33	37.5	0	17	12.5	
7K-C-365B	#	13	2	3	3	1	1	23
	%	57	9	13	13	4	4	
Caryatid	#	2	12	6	4	73	0	97
	%	2	12	6	4	75	0	
Eckert Farm	#	0	6	2	0	6	0	14
	%	0	43	14	0	43	0	
Shady Brook	#	2	12	2	8	35	0	59
	%	3	20	3	14	59	0	
Barker's Landing	#	0	4	0	2	114	0	120
	%	0	3	0	2	95	0	
Coverdale	#	5	15	7	8	32	3	70
	%	7	21	10	11	46	4	
7NC-D-54	#	1	9	7	0	0	0	17
	%	6	53	41	0	0	0	
7NC-D-55B	#	6	5	1	0	0	0	12
	%	50	42	8	0	0	0	
7NC-E-6A (2A)	#	2	4	6	2	1	1	16
	%	13	25	37	13	6	6	
7NC-D-129	#	0	4	5	2	1	1	13
	%	0	31	38	15	8	8	
7NC-E-46	#	6	9	8	1	4	7	35
	%	17	26	23	3	11	20	

their use of argillite. In terms of the Barker's Landing and Coverdale sites where several large cache blades of argillite were found, Watson and Custer (1990a) have suggested that these same social groups that were visiting primary and secondary outcrops north and east of the Peninsula were also visiting sites in central Delaware where they were storing tools for use when the group returned to one of the more distant sites within the wandering range. Mobile hunters and gatherers of the Eastern Subarctic use similar caching strategies in the course of their yearly wandering pattern (Fitzhugh 1972).

In terms of the use of argillite for bifaces, the pattern diverges somewhat from that seen among the various assemblages for projectile points. The Dyke and Muddy Branch sites show a much lower frequency of argillite bifaces than do the other sites in the comparison. Furthermore, except for the Coverdale and Barker's Landing sites, for which there is no available data, the Dyke and Muddy Branch sites also show a much lower frequency of argillite debitage. These data indicate that the argillite points at 7K-C-360 and Dover Downs Hill A were carried into those sites in finished or nearly finished form, and that very little, if any, manufacturing of new tools from argillite took place. Instead, the assemblages from these sites indicate that discarded points and bifaces were being replaced with quartz/quartzite and cryptocrystalline materials, largely from locally available secondary cobbles. Therefore, the discarded argillite points at 7K-C-360 and Hill A likely represent the remnants of the argillite items in the tool kits when the groups were returning north to replenish their kits with fresh argillite from the New Jersey or Pennsylvania outcrops.

FIGURE 134

Site Locations and Raw Material Source Locations

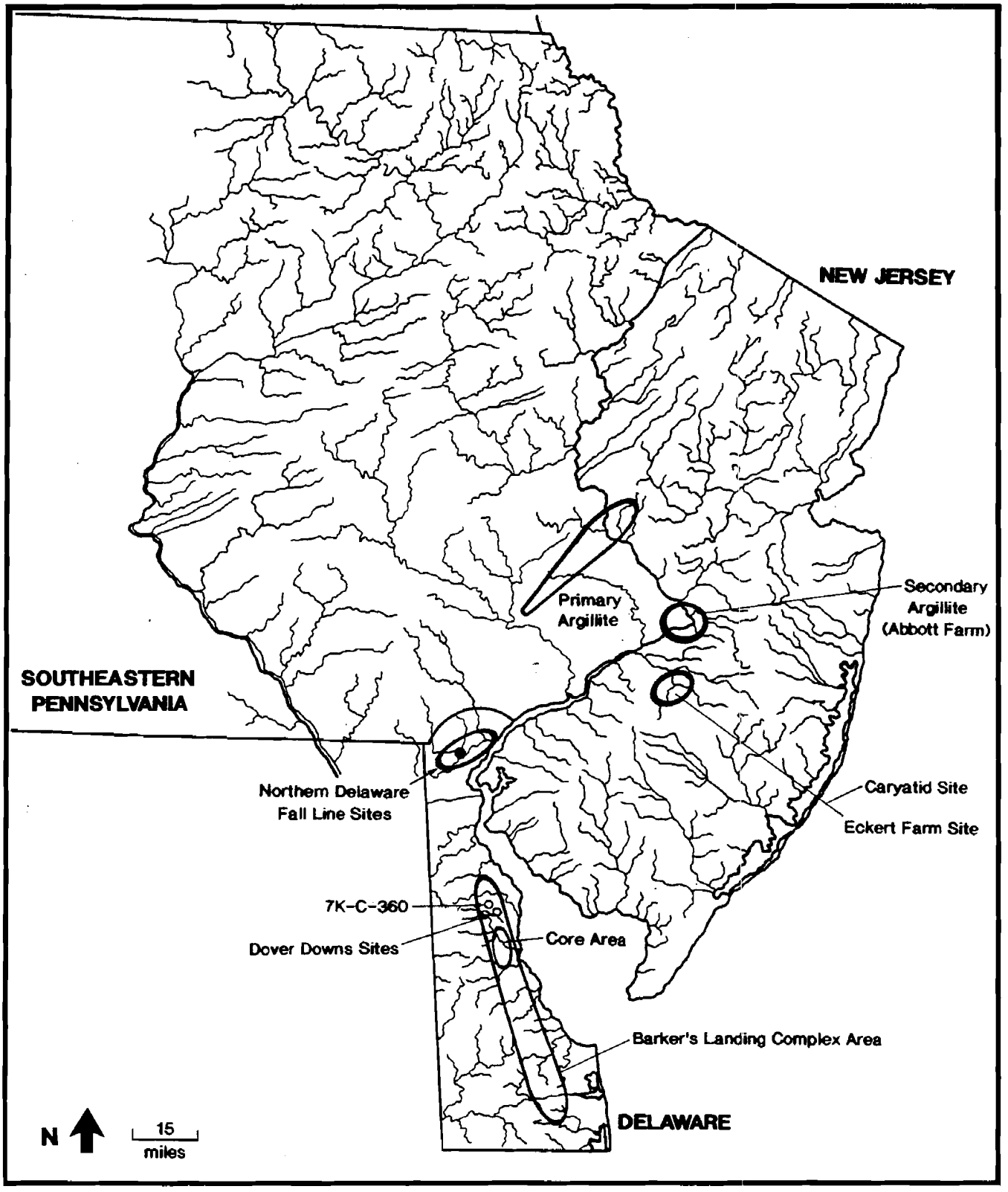


FIGURE 135

Argillite Exchange/Direct Procurement System

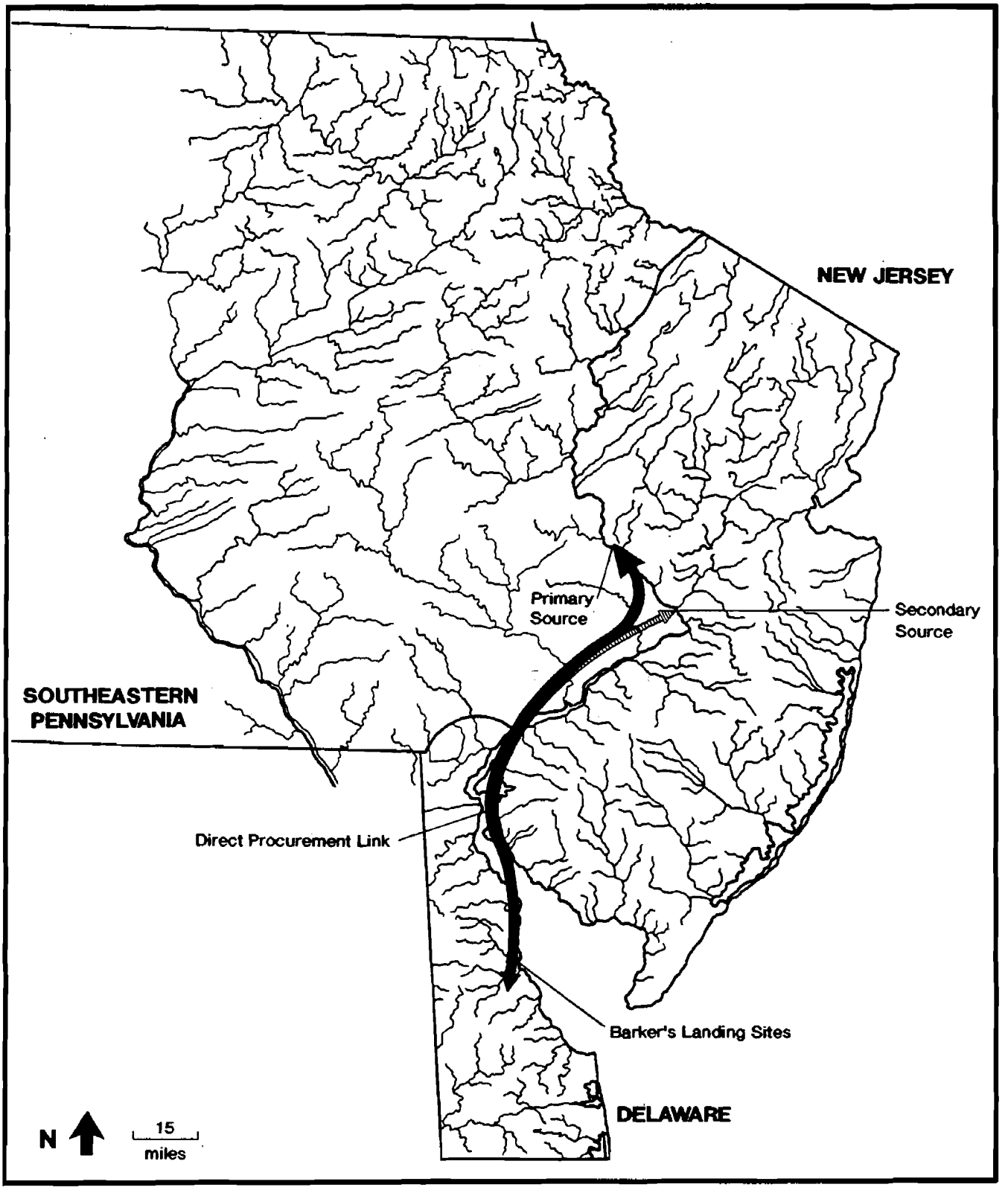
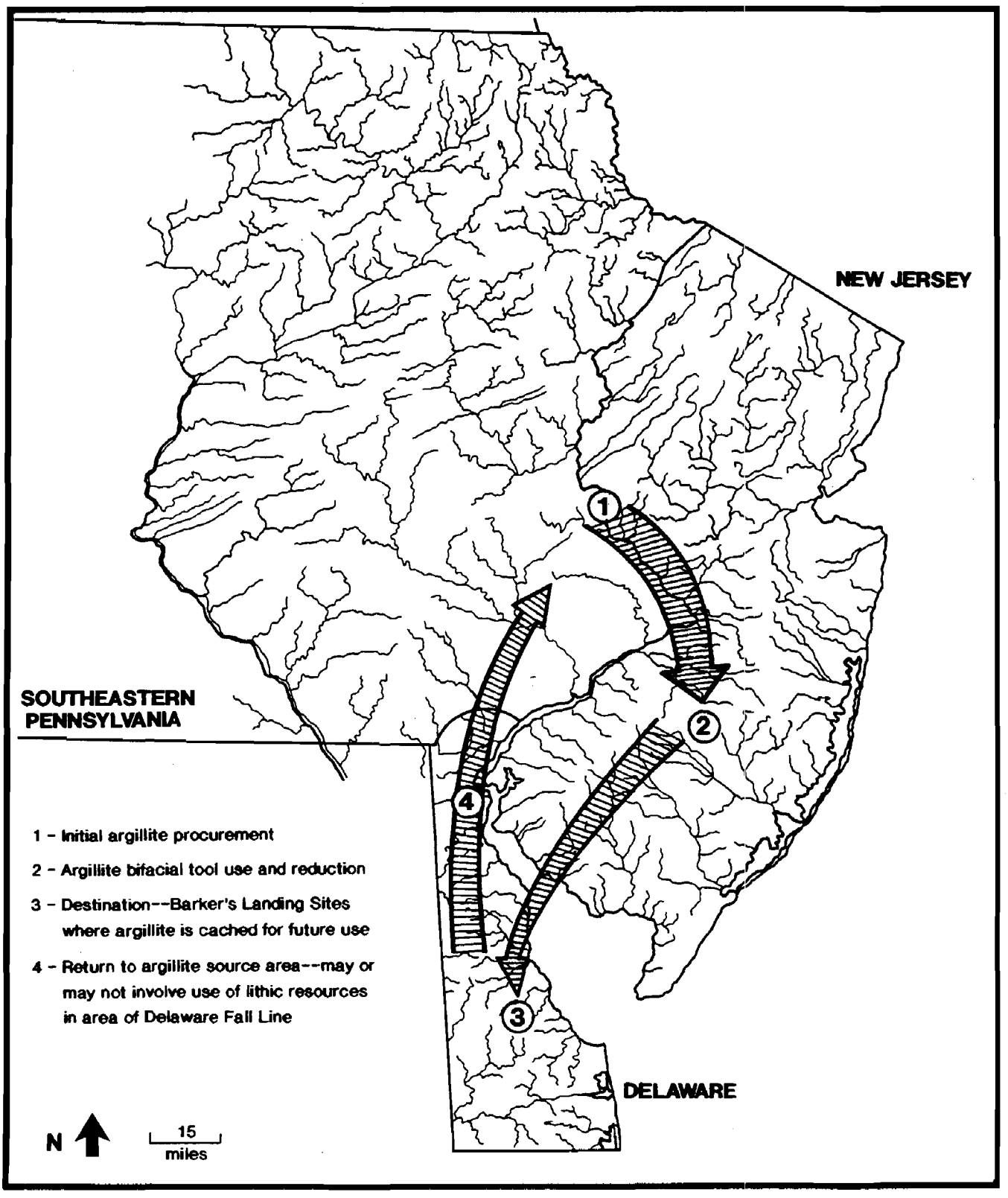


FIGURE 136

Hypothetical Wandering Range for Late Archaic/Early Woodland Groups



The Dover Downs site, Hill B shows less intensive use of argillite than the other sites, and most closely resembles the Hawthorn site (7NC-E-46) in terms of argillite utilization. The Hawthorn site, located in the Churchman's Marsh area of northern New Castle County, Delaware, is situated in relatively close proximity to both primary cryptocrystalline outcrops of the Delaware Chalcedony Complex and the cobble rich secondary deposits along the Fall Line Transition Zone. Therefore, non-local materials such as argillite would not have been necessary for the day-to-day activities of groups situated among a host of alternative lithic resources. Among the artifacts recovered from Hill B were broad-bladed projectile points, including one made from argillite, fragments of steatite, and a long, narrow ironstone stemmed point, all of which are associated with Clyde Farm/Barker's Landing complexes. These characteristics would indicate that the Hawthorn site (Clyde Farm Complex), the Barker's Landing site, and Hill B were all contemporaneous and all potentially visited by the same group or groups. The absence of higher percentages of argillite at Hill B may simply be the result of the specialized activities, almost exclusively involving quartzite, that took place at this site.

In sum, the data suggests that argillite was an important part of the projectile point assemblages at 7K-C-360 and Dover Downs Hill A, and that these sites may have been part of the same wandering range that included Barker's Landing Complex sites in central Delaware and the primary and secondary argillite outcrops of central New Jersey and southeastern Pennsylvania. It further appears that the occupants of 7K-C-360 and Dover Downs Hill A may have been on their way back north toward the argillite outcrops to replenish their depleted bifacial tool kits. These data provide little additional information on argillite utilization at Hill B, which is likely due to the specialized activities at Hill B involving the single material type of quartzite.

The presence of multi-purpose cryptocrystalline tools as well as finished points and late stage bifaces of non-local primary materials in the assemblages from the Dyke and Muddy Branch sites, particularly 7K-C-360 and Dover Downs Hill A, indicates that the occupants of these sites were arriving with curated tool kits consisting mainly of bifaces. There are few blade-like flakes among the assemblages as would be expected from groups utilizing prepared cores; however, crudely manufactured unifacial tools in the assemblages suggest that locally available secondary cobbles played a strategic supplementary role in the activities at 7K-C-360 and Dover Downs Hill A.

As previously discussed, Parry and Kelly (1987) suggest that groups employing an expedient technology continue also to engage in direct procurement of primary raw materials. However, they argue that as populations become more sedentary, these long distance forays to procure high grade materials for the production of formalized tools become less cost effective in terms of travel distance and effort required to locate and extract suitable materials. Furthermore, Parry and Kelly (1987) contend that a formalized tool technology requires a greater investment in training. On the other hand, expediently produced flakes with unretouched edges and crudely fashioned unifacial flake tools take less time to manufacture, require little skill, and offer a variety of flake types that can be useful for a variety of immediate tasks. Therefore, for more settled groups, there was too little benefit to be gained from a strong reliance on a formalized tool technology. The vast array of unretouched utilized flakes and quickly manufactured facsimiles of formal tool types in the assemblages from Dover Downs Hill A and 7K-C-360 may represent a shift in technology from the highly formalized technology associated with a highly mobile settlement system to the quickly and less carefully made tools that could be produced and used on an "as needed" basis.

The Hill B assemblage suggests a different pattern of lithic resource utilization. The abundance of a variety of types and sizes of quartzite flakes in the Hill B assemblage, mainly from primary sources, suggests a preference for core-based technology at this site. The low incidence of cortex on flakes from the Hill B assemblage suggests that cores of primary quartzite were being carried into the site and that secondary resources played only a minor role.

Furthermore, the group occupying Hill B could afford to be more profligate in their use of the bountiful quartzite material in their possession.

Some aspects of the differential resource utilization patterns seen at 7K-C-360, Dover Downs Hill A, and Dover Downs Hill B are more apparent when these assemblages are systematically compared to those from other sites. The distribution of attributes used to study the debitage from the Dyke and Muddy Branch sites was compared to the distribution of the same attributes for debitage assemblages from the Fifty site and the Crane Point site. The Fifty site is a Late Paleo-Indian/Early Archaic hunting and processing site in the Shenandoah Valley of Virginia (Carr 1975, 1986) where primary lithic resources are readily available. The artifact assemblage from this site was determined to have derived from cores. The Crane Point site is a comparably dated base camp site on the Eastern Shore of Maryland (Lowery and Custer 1990) where lithic resource availability is low. The artifact assemblage from this site was determined to have derived from bifaces. Tables 42-46 show the distribution of attributes for a sample of 100 flakes from each of the three Dyke and Muddy Branch sites and the Fifty site, and a sample of 50 flakes from the Crane Point site. Table 47 shows a comparison of percentage values among the sites for the flake attributes. Examination of Table 47 shows that some differences exist in the distribution of attributes among the various assemblages. In order to assess the significance of the differences, a difference-of-proportion test (Parsons 1974:445-448) was applied to the percentage data, and a difference-of-means test (Parsons 1974:441-445) was applied to the data where means and standard deviations were available. Table 48 shows the results of the difference-of-proportion test between the Crane Point site and the Dyke and Muddy Branch sites, and Table 49 shows the results of the difference-of-proportion test between the Fifty site and the Dyke and Muddy Branch sites. A more detailed explanation of the methods used to analyze the debitage attributes is contained in Appendix II.

When flake types are considered, both Dover Downs Hill A and Dover Downs Hill B show high percentages of complete flakes similar to those registered for the Fifty site. The prevalence of complete flakes in the core-derived assemblage from the Fifty site is consistent with earlier studies (Magne 1981; Gunn and Mahula 1977) which suggested that the emphasis on the flake as a product of core reduction, without the need to be concerned with biface reduction, produces fewer broken flakes. Although the sample from 7K-C-360 contained a substantial portion of complete flakes, there is, nevertheless, a significant difference between its assemblage and the Fifty site sample assemblage. Furthermore, there is a high incidence of distal flakes in the 7K-C-360 sample which is significantly different from both the Fifty sample and the Crane Point sample.

The proportions of cortex in the samples from both 7K-C-360 and Dover Downs Hill A appear to be quite similar to each other but significantly different from Dover Downs Hill B, the Fifty site, and Crane Point. Furthermore, the incidence of cortex at 7K-C-360 and Dover Downs Hill A is relatively high. Since the Fifty site assemblage is composed exclusively of primary materials, no cortex would be expected on the debitage in its assemblage, and since the Crane Point assemblage is primarily composed of bifaces, little cortex would be expected on debitage from this sample. However, the presence of numerous cobble derived unifacial tools in the assemblages from 7K-C-360 and Dover Downs Hill A suggest that locally available secondary resources were important for the lithic needs of the occupants of both sites. The sample data underscores this pattern of secondary lithic resource utilization. The sample from Dover Downs Hill B shows a relatively low incidence of cortex on debitage but is, nevertheless, significantly different from that of the Fifty site sample. On the other hand, the Dover Downs Hill B assemblage cortex percentages are similar to those from Crane Point. Although other evidence suggests that the Dover Downs Hill B debitage was largely derived from primary cores and the Crane Point debitage was largely derived from bifaces, there is evidence of some cobble resource use at both sites to supplement the dominant components of the tool kits. These supplementary practices might explain the similarity of cortex percentages in both samples.

TABLE 42

Debitage Attribute Frequencies, Site 7K-C-360

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	41	< 2 cm	76	Triangular	14	Present	18
Proximal	13	2 - 5 cm	24	Flat	8	Absent	37
Medial	7	> 5 cm	0	Round	33	No observation	45
Distal	39			No observation	45		
		Scar count				**Directions count**	
Cortex		Mean	= 2.01	**Remnant biface edge**		Mean	= 1.55
Present	33	Standard deviation	= 1.71	Present	2	Standard deviation	= 1.14
Absent	67			Absent	98		

*Based on a sample of 100 flakes

TABLE 43

Debitage Attribute Frequencies, Dover Downs Site, Hill A (7K-C-365A)

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	55	< 2 cm	86	Triangular	12	Present	26
Proximal	23	2 - 5 cm	14	Flat	19	Absent	52
Medial	12	> 5 cm	0	Round	47	No observation	22
Distal	10			No observation	22		
		Scar count				**Directions count**	
Cortex		Mean	= 2.56	**Remnant biface edge**		Mean	= 2.01
Present	36	Standard deviation	= 1.89	Present	2	Standard deviation	= 1.14
Absent	64			Absent	98		

*Based on a sample of 100 flakes

TABLE 44

Debitage Attribute Frequencies, Dover Downs Site, Hill B (7K-C-365B)

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	53	< 2 cm	41	Triangular	7	Present	14
Proximal	26	2 - 5 cm	53	Flat	25	Absent	65
Medial	6	> 5 cm	6	Round	47	No observation	21
Distal	15			No observation	21		
		Scar count				**Directions count**	
Cortex		Mean	= 1.81	**Remnant biface edge**		Mean	= 1.77
Present	16	Standard deviation	= 1.54	Present	1	Standard deviation	= 1.34
Absent	84			Absent	99		

*Based on a sample of 100 flakes

TABLE 45

Debitage Attribute Frequencies, 44WR50

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	63	< 2 cm	49	Triangular	10	Present	10
Proximal	19	2 - 5 cm	46	Flat	35	Absent	72
Medial	4	> 5 cm	5	Round	37	No observation	18
Distal	14			No observation	18		
		Scar count				**Directions count**	
Cortex		Mean	= 1.33	**Remnant biface edge**		Mean	= 0.73
Present	0	Standard deviation	= 1.22	Present	3	Standard deviation	= 0.60
Absent	100			Absent	97		

*Based on a sample of 100 flakes

TABLE 46

Debitage Attribute Frequencies, Crane Point

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	9	< 2 cm	6	Triangular	20	Present	28
Proximal	27	2 - 5 cm	44	Flat	6	Absent	7
Medial	6	> 5 cm	0	Round	9	No observation	15
Distal	8			No observation	15		
		Scar count				**Directions count**	
Cortex		Mean	= 3.00	**Remnant biface edge**		Mean	= 2.00
Present	4	Standard deviation	= 0.34	Present	10	Standard deviation	= 0.57
Absent	46			Absent	40		

*Based on a sample of 50 flakes

When flake sizes are compared, the samples from 7K-C-360 and Dover Downs Hill A are once again similar to each other, but are statistically different from both Crane Point and the Fifty site in terms of small and medium flakes. Neither of these samples contain any large flakes, which is consistent with the sample from Crane Point. Both samples contain a significantly higher percentage of small flakes than either Crane Point or the Fifty site. This difference may be attributable to the small size of the cobbles being reduced at the Dyke and Muddy Branch sites and to at least some degree of bipolar cobble reduction.

The Dover Downs Hill B sample is similar to the Fifty site sample in terms of all three size categories. There is a fairly even distribution of small and medium size flakes, and only a very small percentage of large flakes at both sites. It is interesting that the characteristics of core reduction at Dover Downs Hill B, located a great distance from lithic outcrops, so closely mirror those at the Fifty site, located quite close to primary outcrops.

A difference-of-means test conducted by Lowery and Custer (1990) on samples from the Fifty and Crane Point sites showed that flakes from the Fifty site have significantly fewer flake scars on their dorsal surfaces than those from Crane Point. Similarly, the flake scars on the dorsal surfaces of the flakes in the Fifty sample come from significantly fewer directions compared to the Crane Point sample. Therefore, scar complexity is more strongly indicative of biface reduction, while scar simplicity is more strongly indicative of core reduction. When the difference-of-means test was applied to the Dyke and Muddy Branch sites in comparison with the Fifty and Crane Point sites, the Dyke and Muddy Branch sites were found to be significantly different from the Fifty site in terms of the number and directions of flake scars. The results are

TABLE 47

Comparison of Debitage Attribute Frequencies

Variable	7K-C-360	7K-C-365A	7K-C-365B	44WR50	Crane Point
Flake type					
Complete	41%	55%	53%	63%	18%
Proximal	13	23	26	19	54
Medial	7	12	6	4	12
Distal	39	10	15	14	16
Cortex					
Present	33	36	16	0	8
Absent	67	64	84	100	92
Size					
<2 cm	76	86	41	49	12
2-5 cm	24	14	53	46	88
>5 cm	0	0	6	5	0
Platform shape					
Triangular	14	12	7	10	40
Flat	8	19	25	35	12
Round	33	47	47	37	18
No observation	45	22	21	18	30
Remnant biface edge					
Present	2	2	1	3	20
Absent	98	98	99	97	80
Platform preparation					
Present	18	26	14	10	56
Absent	37	52	65	72	14
No observation	45	22	21	18	30

TABLE 48

Results of Difference-of-Proportion Tests for Debitage Attribute Data

Variable	Crane Point / 44WR50	Crane Point / 7K-C-360	Crane Point / 7K-C-365A	Crane Point / 7K-C-365B
Flake type				
Complete	5.20	2.82	4.32	4.10
Proximal	4.38	5.35	3.80	3.38
Medial	1.85	1.03	0.00	1.28
Distal	0.32	2.86	1.07	0.16
Cortex				
Present	2.86	3.35	3.66	1.36
Absent	2.86	3.35	3.66	1.36
Size				
<2cm	4.43	7.42	8.77	3.61
2-5 cm	4.95	7.42	8.77	4.23
>5cm	1.61	0.00	0.00	1.77
Platform shape				
Triangular	4.33	3.59	3.95	4.96
Flat	2.98	0.79	1.08	1.85
Round	2.38	1.93	4.54	3.46
Remnant biface edge				
Present	3.48	3.83	3.83	4.21
Absent	3.48	3.83	3.83	4.21
Platform Preparation				
Present	6.11	4.76	3.61	5.40
Absent	6.11	4.76	3.61	5.40

Significant difference = 1.96

TABLE 49

Results of Difference-of-Proportion Tests for Debitage Attribute Data

Variable	Fifty/ 7K-C-360	Fifty/ 7K-C-365A	Fifty/ 7K-C-365B
Flake type			
Complete	3.11	1.15	1.43
Proximal	1.16	0.69	1.19
Medial	0.93	2.09	0.65
Distal	4.01	0.87	0.20
Cortex			
Present	6.29	6.63	4.17
Absent	6.29	6.63	4.17
Size			
<2cm	3.94	5.59	1.14
2-5 cm	3.26	4.94	0.99
>5cm	2.26	2.26	0.31
Platform shape			
Triangular	0.87	0.45	0.76
Flat	4.65	2.55	1.54
Round	0.59	1.43	1.43
Remnant biface edge			
Present	0.45	0.45	1.01
Absent	0.45	0.45	1.01
Platform Preparation			
Present	1.63	2.94	0.87
Absent	4.97	2.91	1.07

Significant difference = 1.96

shown in Table 50. When the means were compared to those from the Crane Point site, 7K-C-360 also registered a significant difference for both attributes. Furthermore, the Dover Downs sites were also shown to be significantly different from Crane Point in terms of the number of scars on the dorsal surfaces of the sample flakes. However, these sites were similar to Crane Point in terms of the directions of those scars. The fact that the Dyke and Muddy Branch sites are largely different from both the Crane Point and Fifty sites in terms of scar complexity may again be due, in some part, to the use of small cobbles and pebbles for the manufacture of bifaces and flake tools at these sites. It would have been necessary to decortify these materials to a large extent before they could be fashioned into usable tools. The process of decortication would likely have resulted in flakes containing more scars in more directions than would reduction of primary cores but probably less than would be manifested on flakes resulting from the reduction of bifaces.

When platform shape is considered, all three Dyke and Muddy Branch sites appear to be more similar to the Fifty site, although there are nevertheless significant differences among the sampled assemblages. Site 7K-C-360 is similar to Crane Point in terms of flat and round platforms. Since biface technology dominated at Crane Point, this would place 7K-C-360 in association with biface technology. However, triangular shaped platforms are more strongly associated with biface technology, and there is a statistical difference between this category of flakes at 7K-C-360 and the same platform type at Crane Point. Site 7K-C-360 is more similar to the Fifty site in terms of triangular flakes. Therefore, 7K-C-360 is more closely aligned with the Crane Point site but may not have been as dominated by biface technology as the Crane Point site. The distribution data shows that cobble core technology played a fairly important role at the site.

The Dover Downs site, Hill A is more similar to the Fifty site, except in terms of flat platforms, in which it is more similar to the Crane Point site. Flat platforms are more closely associated with core technology. However, round platforms are also associated with core

TABLE 50

Results of Difference-of-Means Test for Debitage Attribute Data

Attribute	Fifty/ 7K-C-360	Fifty/ 7K-C-365A	Fifty/ 7K-C-365B	Crane Point /7K-C-360	Crane Point /7K-C-365A	Crane Point /7K-C-365B
Scar number Test statistic	3.24 (p < .0027)	5.47 (p < .000001)	2.44 (p < .0164)	5.57 (p < .000001)	2.26 (p < .0244)	7.38 (p < .000001)
Scar directions Test statistic	6.37 (p < .000001)	9.94 (p < .000001)	7.08 (p < .000001)	3.22 (p < .0014)	.072 (p > .96)	6.37 (p > .1471)

technology, and are particularly prevalent where cobble cores are being reduced. The Dover Downs Hill A assemblage shows a high incidence of round platforms and is similar to the Fifty site sample. Therefore, in terms of platform shape, Dover Downs Hill A is more closely aligned with a primary core site but this technology was most likely supplemented at Dover Downs Hill A with cobble core reduction.

The Dover Downs site, Hill B sample is similar to the Fifty site in terms of all three platform shapes. Since lithic reduction was the dominant activity at the site and since the cores being reduced were mainly primary material, the similarity of the samples would be expected. In terms of platform preparation and remnant biface edge, attributes which are strongly associated with biface reduction, 7K-C-360 and the Dover Downs site are similar to the Fifty site.

In sum, the sites are more similar overall to the Fifty site and reflect an emphasis on core technology. These results are consistent with other data that suggest that the reduction of primary quartzite cores was the major activity at Hill B. The differences can be attributed largely to the fact that expedient technology employing the use of cobble cores was quite important at Dover Downs Hill A and 7K-C-360, and in part to the fact that some degree of biface reduction was also taking place at these sites.

In conclusion, the excavations at 7K-C-360 and Dover Downs recovered significant archaeological information on a variety of topics including local paleoenvironments, the organization of lithic technologies, local and regional settlement patterns, and possible patterns of group movement throughout the central Middle Atlantic region. Furthermore, the patterns of behavior apparent at these sites underscore the interrelationships among these bio-cultural elements and the effects they have had on change and adaptation in central Delaware. The information gleaned from the controlled excavation of these sites provides a good foundation for understanding prehistoric adaptations in the Lower Coastal Plain of Delaware. Further research in this area is needed to enable a fuller understanding of the complexities of prehistoric life.