11. SUMMARY AND CONCLUSIONS

THE MULTI-DISCIPLINARY APPROACH used to study the Blueberry Hill site, in combination with the temporal definition provided by the stratified context, makes it possible to describe in some detail the various episodes of settlement at the site. In the discussion which follows, information from the archaeological, pedological, geological, and palynological studies are combined to paint pictures of life at the site through time.

When the first human groups arrived at Blueberry Hill, perhaps as early as 14,000 B.P., the rolling topography had been comparatively stable for the previous 7,000 years or so. The water-filled basin to the west and the stream valley to the east provided a diverse and attractive stopping place for the occasional family group traveling through the Saint Jones watershed. At times, the visitors exploited the nearby cobble deposits to produce tools to use at the camp or to replace tools that had been lost or discarded at other camps. The climate was cool and wet, and sometimes the storms were severe enough that gullies formed in the hillsides. The topsoil at the camp (represented by Zone IV) was extensively eroded. Little remains from these first visits to Blueberry Hill, in part because of this erosion.

Quite suddenly, around 11,000 to 12,000 years ago, the level of precipitation dropped, at least for a brief period of time. The dry conditions must have resulted in some devegetation, perhaps as a result of forest fires, because 30 cm or more of sand was deposited on Blueberry Hill. Despite the drought conditions, small groups continued to visit the site. These groups manufactured tools from local cobble deposits and processed plant materials. Bone and wood tool manufacture may also have taken place.

After a period of perhaps 1,500 years, during which the site surface was fairly stable, æolian sediments were again deposited on Blueberry Hill, beginning about 9,300 years ago. Drier conditions are indicated. Extensive amounts of charcoal in the floodplain sediments indicate that forest fires may have increased. Over the next thousand years, another 30 cm or more were added to the surface of the site. The artifacts recovered from these deposits indicate that each time the site was visited, the function of the site may have been different. Early in this period of æolian deposition, the site was occupied for hunting and toolkit refurbishment. Later use of the site focused on some kind of processing that required cutting and scraping.

By about 8,000 years ago, sand deposition on Blueberry Hill had halted, although æolian sediments appear to have continued to accumulate in the floodplain. Sporadic occupations over the next 5,000 years have left evidence of a number of activities, although hunting and toolkit refurbishment appear to have been important.

For an uncertain period of time just before 3,000 years ago, some additional sediments were deposited at Blueberry Hill. These deposits were later disturbed by early European cultivation, so that it is not possible to determine when deposition began and ended. During or after this period of deposition, at least one family or extended family group settled at Blueberry Hill long enough to require the construction of semi-subterranean house pits. Two such houses were built at the site, one deep and one shallow. The differences in depth may indicate that the site was occupied over several seasons, with the shallow pithouse occupied during the warmer months, and the deeper pit during the winter. The manufacture or repair of contracting stemmed points and knives may have been associated with this occupation.

Periodically through the Woodland Period, small groups returned to Blueberry Hill, but none seem to have occupied the site for long. One group, which visited during the Carey Phase about 1,500 years ago,

accumulated enough of something to require a storage pit. Because the soil in which the remains of these visits were deposited was later disturbed by cultivation, it is difficult to determine which of the many activities indicated by the artifacts were performed by what groups.

Although no one lived on Blueberry Hill during the historic period, evidence of the activities of people living nearby have been preserved in the deposits. The thickened A horizon at the site was the result of æolian deposition following forest clearing and cultivation. Changes in agricultural technology are recorded in the plow scars. More recently, the soil particles lofted into the air by dirt bikes and ATV's have been blown onto the site, adding further layers of sand to the surface.

RELATION TO SPECIFIC QUESTIONS

At the outset, the investigators adapted six general questions from the state plan to apply to the project site. These six general questions were a useful framework to integrate site-specific work into larger regional surveys.

1. What was the internal structure of the site, and how did that structure change through time?

Activity areas were exceptionally well defined at Blueberry Hill. Partly because of æolian deposition, we were able to sharply define these areas.

During most of prehistory, the site was organized close to the edge of the valley, concentrated at the highest point. Distributions of flakes and fire-cracked rock fragments indicate that fires were clustered along the edge of the stream side of the slope, while other activities occurred farther from the edge.

As æolian processes changed the shape of the hilltop and location of the edge of the bank, the focus of occupation on the site moved. The earliest part of the Paleo-Indian period, before the dune formed, was found at the grid south end of the site. The latest summit, at grid north, contained a concentration of Woodland-period evidence. Two house pits, one deep and one shallow, were located near this end of the site. Both were occupied about 1000 B.C, and almost certainly were associated with deeper indoor storage pits at one end.

2. What depositional contexts can be identified, and how do they relate to human utilization of the site?

The geologic history of the site is characterized by periods of rapid accumulation of sand, punctuated by periods of stability and soil development. This was not a popular campsite; the rate of occupation in the project area could have been as infrequent as one visit every 500 years.

3. How did the environmental setting of the site change through time, and how did the changes relate to human utilization of the site?

Human utilization of the site changed through time. In the earliest levels, there is no evidence for terrestrial game hunting. Changes in lithic preference through time are parallel to evolutions observed elsewhere in the region.

4. How did the site's occupants exploit the lithic resources that were available to them?

Quartz, sandstone, and quartzite cobbles, readily available nearby, constituted the overwhelming majority of the lithic material on the site. These materials were used and discarded without curation.

Pebble jasper, on the other hand, was selected and husbanded. A good expression of this activity is the biface that contains cortex on both faces (FIGURE 32).

5. What was the function of the site?

This was a procurement site, but the exact objective of the procurement activity cannot be defined at all times. Hunting and vegetable resource recovery both are indicated.

Stone tools were made here, including at least two manufacturing episodes during the Paleo-Indian period that exploited pebble jasper. During the Archaic and Woodland I periods, local sources of quartz and quartzite cobbles were used by toolmakers on the site.

During some visits to the site, the occupants performed other tasks, including woodworking, cutting and scraping, and seed or nut processing.

6. *What can this site tell us about the prehistoric chronology of human occupation on Delmarva?*

A lack of distinctive diagnostic artifact types and scarcity of charcoal diminished the role of this site in defining prehistoric artifact chronology. Nonetheless, the site produced considerable information about activity areas at very early periods.

For the Paleo period, the site is useful because it represents a site that probably was not related to hunting. Much of what we know about the Paleo period in Delmarva has been derived from chance surface finds of projectile points. Finding Paleo people "at home" is unusual.

SPECIFIC SIGNIFICANT DISCOVERIES

The most significant discovery at the Blueberry Hill site is the recognition that sites are not necessarily used in the same ways each time they are visited. Another important insight is the recognition that reoccupation of sites, even in what appear to be desirable locations, may be as infrequent as once in 500 years. These observations have important implications for settlement pattern studies.

The opportunity to look at individual Paleo-Indian settlements is, in and of itself, a significant discovery, although the implications will be difficult to evaluate until more such sites have been studied. A non-hunting Paleo site is significant because so few are known.

In respect to pebbles, the site raises more questions than it answers. Pebble concentrations associated with activity areas raise questions about their functions. Since these concentrations contained both reddened and unaltered pebbles, it is difficult to conclude that the pebbles all were used in cooking.

Some of the pebble clusters may have been gastroliths from the gizzards of fowl that were eaten by site inhabitants. The literature relating to gastroliths in American sites is sparse, but they have been reported from other parts of the world. There clearly is room for further research into prehistoric gizzards; in southwestern sites, gastrolith analysis has made it possible to identify activity areas relating to fowl culture (Rohm 1971:106).

ENVIRONMENTAL MODELS

Environmental models are used to assist in explaining why certain locations are chosen for settlement and others are not. The Blueberry Hill site possesses a number of environmental characteristics which are thought to be associated with Paleo-Indian settlements, including its location on a bluff overlooking the confluence of two streams. Nonetheless, it was not intensely occupied. However, this may be more a function of the low density of population during that time period than of inadequacies in the model.

Narratives which outline the environmental history of the region are also models which seek to integrate and explain information from a variety of locations. The various studies conducted as part of the Blueberry Hill project make it clear that, even in a very small area, no one location preserves the entire story. Furthermore, the story preserved in a small area may not be entirely consistent with the regional history. For instance, a localized forest fire in an area with unconsolidated sandy soils may facilitate a sequence of æolian erosion and deposition during a period that is not particularly dry in regional terms.

RELATION TO PREDICTIVE MODELS

The state management plan for historic sites warned that "unplowed sites on the edges of poorly drained settings and in wooded areas fringing water courses take on special importance." (Custer 1986: 215) Blueberry Hill underlined this cautionary note. While some of the site certainly is gone, the surviving five meters closest to the edge of the valley were intact enough to provide at least a representative sample.

Within this narrow band were several complete activity areas, arranged in a way that suggests intentional positioning by the valley edge. This discovery suggests that future researchers should look for remains in

such locations, even if adjacent plowed fields exhibit no evidence for a site.

UTILITY OF DATA

Data from this site will be useful to future researchers. This is one of the few excavated small, deeply-stratified æolian sites in the area. Similar sites in the nearby Dover Downs area can provide useful comparative data.

Perhaps the most important contribution of this research is that the deposits at this site make it possible to look at individual prehistoric visits to the site. On unstratified sites, where artifacts from all visits are compressed into a single deposit, it is difficult to determine whether each visit had a different purpose, or whether the same activities took place on every visit. At Blueberry Hill, it is clear that, at least during the Paleo and early Archaic Periods, some visits were different from other visits.

INADEQUACIES OF DATA

Because of the sandy soil, organic preservation was almost nonexistent. Blood residue tests revealed nothing measurable, and no prehistoric bone survived except a few carbonized bits.

The decision to strip away some of the topsoil created problems. While some cost savings were realized, the loss of half the Zone I units caused difficulties interpreting spatial distributions.

When the materials were analysed, the uppermost layer was almost absent from the distribution maps. This lack of symmetry between the two sides of the site was more than an æsthetic distraction. We found that we needed surface distribution data from all units, if we were to identify disturbances and provide comparable data from all levels. As it is, the Woodland and Historic periods are missing from half the site.

UTILITY OF METHODS

Extremely small cells allowed the investigators to draw a fine-grain picture of activity areas that were not readily apparent, and to distinguish between adjacent features (FIGURES 60-61). Even though they increased the volume of paperwork, units containing small cells did not require appreciably more time to dig than units with larger subdivisions.

Even though the disposal of some topsoil caused problems, the resulting exposure of a sizable area of cultivation marks proved useful. It was possible to assess movement of the hedgerow with its associated burrowing-animal damage, and to interpret the evolving effect of cultivation on the site.

Agricultural disturbance was found much closer to the valley edge than we had expected. This discovery should caution future investigators to the possibility of disturbance far inside a wooded hedgerow fringe than had been expected.

Since cultivation has had considerable direct and indirect negative impact upon both historic and prehistoric site preservation, future researchers would be well-advised to study in detail the agricultural dimensions of any site.

INADEQUACIES OF METHODS

Although the methods used to excavate the Blueberry Hill site have provided very detailed information on site structure, some improvements are possible. At Blueberry Hill, each excavation unit was dug from top to bottom in a continuous process. However, the excavation of blocks of adjacent units to comparable levels so that large areas of each zone were exposed at one time could mean that features would be recognized in the field more easily. Excavation of adjoining blocks in a way that maintains a common surface could also make it easier to visually correlate levels and soil zones across the site.

UN-ANSWERED QUESTIONS

Every site has its "mystery artifact" that never is quite explained. At Blueberry Hill, the mystery was a perfectly spherical pecked stone object (FIGURE 30) that has a parallel from another site nearby; both were found in a Paleo-Indian context.

The role of pebbles has not yet been satisfactorily explained. Heat-reddened pebbles clearly correlate with activity areas, but their function still awaits interpretation. The near-congruity of pebble distribution with jasper flakes, notably in the bottom of

Zone III, suggests that the pebbles had a cultural function, but their distribution is not related to that of fire-cracked rocks (FIGURES 49,50).

The absence of fluted points in Zone III has made it difficult to provide firm dates for the beginning and end of that episode of deposition.

RECOMMENDATIONS

The discovery of so much undisturbed material on the edge of a sand pit should cause us to revise our evaluations of some sites. Many old borrow pits were excavated up to wooded valley fringes, leaving berms along watercourses. We have demonstrated that these berms might contain remarkably complete sites, and should be examined whenever they are to be affected.

RECOMMENDED CHANGES TO CONTEXTS

Small, infrequently occupied sites like Blueberry Hill are unlikely, by themselves, to provide information which requires changes in existing contexts. However, as a group, these sites have the potential, when stratified, to contribute to a more complete understanding of settlement systems, the structure of specialized activity areas, artifact chronology, and environmental change.

RECOMMENDED CHANGES TO PRIORITIES

Rapid growth of subdivisions within the newly-designated Dover metropolitan statistical area is a major threat to sites, particularly this type of stratified inland procurement site. Development will follow Scarborough Road, into the inland drainage divide zone where Paleo sites are known to occur, and where stratified sites like Blueberry Hill may also be present. Efforts should be made to identify and test these sites, and perhaps to encourage their preservation through pro-active methods, such as open-space dedication.

Historically, large, dense sites with multiple sub-surface features have been given priority for mitigation. However, small, infrequently occupied sites like Blueberry Hill offer unique opportunities to study discrete activity areas without interference from earlier or later occupations. This internal segregation will, in turn allow archaeologists to look at related complexes of artifacts used at the same time, rather than looking at individual tools without information on the context in which they were used.

Westward movement of Dover subdivisions will have a serious impact on cultural resources from all periods.

FUTURE RESEARCH DIRECTIONS

Recent studies of sites and groups of sites with deep æolian deposits (Custer and Mellin 1991, Blume n.d., this report) demonstrate that these contexts provide important opportunities to study site structure and activity-specific debris patterns through time. These studies, however, represent only a beginning. Additional studies are needed to determine the best methods of identifying, preserving, excavating, and analysing such sites.

DISPOSITION OF MATERIALS

Site materials and records were turned over to the Island Field museum, under the accession number 90-23.