

## IX

### SYNTHESIS AND CONCLUSION

This chapter synthesizes the results of the data recovery program with specific reference to the project research design (Chapter IV). The research design explicitly proposed addressing themes of chronology, subsistence, settlement patterns, intrasite patterning, environmental adaptation, and technology, and there is much interrelation among these issues. To a greater or lesser extent, these research themes correspond to and crosscut a number of recommended research topics in the Delaware State Plan for Management of Prehistoric Resources (Custer 1986a). Where possible, the research findings are discussed with reference to the state plan as well as general models of prehistoric cultures in the surrounding Middle Atlantic region.

#### A. CHRONOLOGY

The excavations at Site 7S-F-68 have produced evidence that the site was used as early as the Paleoindian period and throughout the Archaic and Woodland periods. This study has employed the traditional divisions of the major cultural periods that are used across the Eastern Woodlands, in contrast to the framework developed for Delaware by Custer (1984, 1986b), which expands upon work by Gardner (1974, 1977). For example, in Custer's (1984) system, Early Archaic point types, such as Palmers and Kirks, are considered to be part of the Paleoindian period; and the Late Archaic, Early Woodland, and Middle Woodland periods are combined into a unit called "Woodland I." In the traditional Eastern Woodlands chronology, the Archaic period spans a period of seven millennia, roughly from 8,000 BC to 1000 BC, while it is reduced to a much shorter period of time in Custer's system, roughly 6500 to 3000 BC.

The earliest occupation of Site 7S-F-68, a Paleoindian component, is best represented by a quartz crystal late-stage biface that appears to be a fluted-point production failure. The fluted-point production failure was associated with a small assemblage of crystal quartz debitage and tools. Relatively little is known of Paleoindian occupation of the Delmarva Peninsula, and there was insufficient evidence at Site 7S-F-68 to describe a Paleoindian component. What is perhaps most remarkable at Site 7S-F-68 is the use of crystal quartz as a raw material, and it is notable that all of the fluted points from the Higgins Site in Anne Arundel County, Maryland, were manufactured from quartz (Ebright 1992).

In the Middle Atlantic region, there is a pressing need for basic information pertaining to the Archaic period chronology (cf. Wesler 1983). Although the excavations at Site 7S-F-68 did not produce a clearcut stratigraphic sequence or new radiocarbon dates for some of the poorly dated projectile point types that are widely distributed throughout the region, the recovery of a large sample of culturally diagnostic artifacts from the site permitted reconstruction of a site-specific chronology that may be compared to the regional chronological sequence.

The site chronology spans the entire Archaic period, with two intervals of intensive site occupation. The initial period of intensive occupation occurred during the Early Archaic, represented by various Palmer, Kirk, Decatur, and bifurcate-based points. Radiocarbon dates for these points suggest that the initial occupations occurred between circa 7800 and 5300 BC (Gleach 1987), and the earliest radiocarbon date for Site 7S-F-68 falls in this interval ( $7560 \pm 340$  years BP; Beta-56049). The second interval of intensive occupation spans the Late Archaic/Early Woodland period and is represented by a cluster of stemmed points. These points represent a variety of point types, many of which are widely distributed throughout the region but are not securely dated. Two of the radiocarbon dates from the site fall into this period of intensive site occupation ( $2640 \pm 110$  years BP [Beta-56051] and  $246 \pm 130$  years BP [Beta-56045]).

There is very limited evidence of site use during the period from circa 5300 BC to 4000 BC, an interval which falls in the Middle Archaic period. One rhyolite point with broad side notches and a heavily ground base was identified as an Otter Creek point, which is considered to be a Middle Archaic diagnostic (Ebright 1992). Primarily because of a scarcity of radiocarbon dates and stratigraphic evidence, there is disagreement among archaeologists regarding the Archaic period chronology in the Middle Atlantic region. In particular, the division between the Early Archaic and Middle Archaic periods is in dispute.

Some archaeologists, including Gardner and his students, see a cultural discontinuity between the corner-notched point phases and the bifurcate-based point phases, placing the latter in the Middle Archaic and setting a terminal date of circa 6500 BC for the Early Archaic (Custer 1990; Gardner 1987; Stewart 1990).

Others place the bifurcate phase in the Early Archaic, as is more commonly done in the Southeast, and bracket the Middle Archaic to the interval from circa 6000 BC to 4000 BC (Steponaitis 1980; Wanser 1982; Wesler 1983). While there are significant differences in technology between the bifurcate-based points and the Palmer and Kirk points, published radiocarbon dates and stratigraphic evidence indicate that there is considerable temporal overlap among these points. Therefore, the bifurcate-based points are included with the Palmer and Kirk points in the Early Archaic component at Site 7S-F-68.

Archaeologists in the Eastern Woodlands culture area have traditionally divided the Archaic into Early, Middle, and Late subperiods, notwithstanding the arguments of Custer (1984, 1986a) and others (e.g., Johnson 1986) that new chronological frameworks may be more appropriate. The traditional division of the Archaic into Early, Middle, and Late subperiods is particularly applicable to the Site 7S-F-68 chronology, as these divisions correspond roughly to the site's two intervals of intensive occupation (Early Archaic and Late Archaic), separated by an interval of relative abandonment or infrequent use (Middle Archaic).

As traditionally defined, the Archaic period represents the longest chronological unit of human occupation in the eastern United States, but very little is known about cultural development during the seven millennia that followed the end of the most recent ice age. Caldwell's (1958) primary forest efficiency model posits a period of increasing familiarity with the environment which allowed more efficient exploitation of seasonally abundant food resources and which ultimately permitted an increase in population and led to greater social complexity. Following this model, the Archaic has been viewed traditionally as a period of gradual, steady population increase. If one accepts the assumption that the number of diagnostic projectile points is directly related to population size, the results of excavation at Site 7S-F-68 do not support a model of gradual, steady population increase during the Archaic.

A similar paucity of Middle Archaic diagnostics was also noted at the Indian Creek V Site (18PR94), a gathering camp or base camp in Prince Georges County, Maryland (LeeDecker et al. 1991). There is also a general scarcity of radiocarbon dates that fall in the Middle Archaic period for the Middle Atlantic region (Gleach 1985, 1987). Rather than a stable or slowly expanding population, these site chronologies suggest a virtual depopulation during the Middle Archaic or a dramatic change in land-use patterns. Elsewhere in the Middle Atlantic Coastal Plain, Steponaitis (1980) and Wanser (1982) have noted an

apparent scarcity of components dating to the 6000-5000 BC interval. Particularly for the Coastal Plain region, one must also consider the possibility that evidence of Middle Archaic activity has been drowned by rising sea levels. These issues cannot be examined fully in the context of a single site report; however, the data from Site 7S-F-68 do not support the model of steady or gradually expanding population levels during the Archaic period.

Use of the site during the Woodland period is evident not only from a series of radiocarbon dates but also from the recovery of diagnostic points and ceramics. Four radiocarbon dates obtained from the site fall in the Woodland period, as it is traditionally defined:  $1960 \pm 70$  years BP (Beta-56050),  $1260 \pm 70$  years BP (Beta-56044),  $1140 \pm 60$  years BP (Beta-46395), and  $310 \pm 80$  years BP (Beta-56050).

The Woodland period diagnostic artifacts in the assemblage are most indicative of occupation or use of the site during the Late Woodland, or Woodland II, period. These artifacts include shell-tempered fabric-impressed sherds from only one or two vessels of Townsend/Rappahannock ware, and a triangular jasper projectile point. A few ceramic sherds with sand and grit temper may represent Early or Middle Woodland components. A group of twelve stemmed points comprise a variety of types whose temporal affiliation includes the Late Archaic to Early Woodland; among these are the Teardrop, Rossville, Koens Crispin, and Broadspire types. Given the regional point typologies, it is difficult to identify discrete Early or Middle Woodland (Woodland I) components.

Based upon palynological and geomorphological data for the Middle Atlantic region, Custer and Bachman (1984) have described the Woodland I period (ca. 3000 BC - AD 1000) as a time of "dramatic change in local climates and environments" in which "a pronounced warm and dry period" (i.e., a mid-postglacial xerothermic) began at approximately 3000 BC and persisted to approximately 1000 BC (Custer and Bachman 1984). During that period, the mesic oak-hemlock forests of the Archaic were replaced by more drought-resistant (xeric) oak and hickory forests and more abundant grasslands. Although these conditions resulted in the loss of some interior streams, continued sea level rise resulted in the creation of highly productive and large brackish water marshes in the coastal zone.

In turn, these shifts in climate, environmental conditions, and resource distributions are believed to have resulted in radical changes among resident prehistoric Native American populations, including a trend toward greater sedentism and more complex social organization. Major river floodplains and estuarine

swamp habitats became the primary resource zones and the locations of large residential base camps occupied on a multi-seasonal or year-round basis. In southern Delaware, there was an increase in the utilization of shellfish in the coastal areas, concurrent with an inland shift in the locations of macroband base camps along the tidal drainages. Within the Mid-Peninsular Drainage Divide zone, there is little evidence that site distribution patterns changed significantly from the preceding Archaic period (Custer 1986a), and the continuity in use of Site 7S-F-68 during the Archaic and Woodland periods suggests some similarity in the settlement patterns during both periods. However, the latter part of the xerothermic interval, corresponding to the Middle Woodland period as traditionally defined, may have been characterized by less frequent use of Site 7S-F-68, possibly as a result of a diminished carrying capacity for the surrounding wetland area.

Custer has characterized the Woodland II period (ca. AD 1000 - 1650) in Delaware as a period of increased sedentism, marked primarily by the development of horticulture. During this period, villages became larger and more permanent, and were typically located adjacent to areas with easily worked floodplain soils. In southern Delaware, the Slaughter Creek complex is characterized by the presence of Townsend ceramics, triangular projectile points, large macroband base camps and possibly fully sedentary villages with numerous food storage features. Most major sites assigned to the Slaughter Creek complex have been identified in the Delaware Shore, Mid-Drainage, and Coastal/Bay physiographic zones (Custer 1984, 1986a). The Late Woodland component at Site 7S-F-68 includes Townsend ceramics and a triangular projectile point, and would therefore be defined as a special resource procurement site within the Slaughter Creek complex settlement pattern.

## B. SUBSISTENCE

Excavation of Site 7S-F-68 has produced direct and indirect evidence of various types concerning subsistence patterns; however, the results illustrate many of the difficulties archaeologists face in the interpretation of prehistoric subsistence. The recovery of numerous projectile points provides indirect evidence that hunting figured prominently in the overall subsistence pattern; yet, the preservation of bone was virtually nil. Some information regarding subsistence was gained from analysis of residues adhering to the surfaces of stone tools, and perhaps equally importantly, some of the issues regarding the validity of various residue testing methods were addressed. Finally, a small but analytically significant botanical assemblage was recovered by flotation processing.

Analysis of the catchment area surrounding the site indicates that it would have provided a somewhat unique suite of subsistence resources. Located within the Mid-Peninsular Drainage Divide physiographic zone, the site occupies a low knoll or ridge that stands a few feet above a vast expanse of upland wetland areas. In addition to its flat topography and the slow-moving headwaters of the streams that empty into the Delaware and Chesapeake bays, the Mid-Peninsular Drainage Divide zone is an area of bay/basin features and swamps surrounded by sand ridges (Custer 1984, 1986a). Although the site is surrounded by a vast expanse of wetland areas, there is no visible stream channel in the vicinity. While the site itself occupies a well-drained ridge, formal analysis of the vicinity suggests that the site location was chosen to provide maximum access to resources in the nearby swampy woodland areas.

The vegetation of the swampy woodland areas surrounding the site is very dense, a setting that affords excellent cover for wildlife such as turtles, snakes, ducks, deer, bear, squirrel, rabbit, mink, otter, muskrat, turkey, and beaver. Deer and other browse-oriented species find this habitat especially attractive (Thomas et al. 1975). Numerous floral resources are available in wetland areas, providing a wide variety of seeds, roots, tubers, and leafy greens of known ethnographic use for food, medicine, and other purposes. Riverine and estuarine fauna such as mink, otter, weasel, waterfowl, shellfish, and anadromous fish would have been virtually absent from the catchment area surrounding Site 7S-F-68, but they were important subsistence resources in other physiographic zones.

Small, seasonally occupied sites in the Middle Atlantic region, such as Site 7S-F-68, have rarely provided direct archaeological information (i.e., dietary remains) pertaining to subsistence. These sites typically lack storage features or well-preserved midden deposits, and existing models of subsistence behavior are, for the most part, based on the inferred resources associated with individual site environments (Wesler 1985:219). In a large measure, Site 7S-F-68 fits the typical pattern of small upland sites in the Middle Atlantic region, in that the site lacked a well-preserved faunal assemblage. The assemblage provides relatively little direct subsistence information, but it does suggest that the diet may have included small birds the size of pigeon and quail. While there was no direct evidence for the use of specific fauna, the condition of the bone with regard to charring and burning suggested that the hearth areas at the site were not used for prolonged periods. The paucity of formal cooking areas in the site's feature inventory supports this interpretation.

An extensive program of residue analysis was undertaken in the hope that subsistence information could be gleaned from the stone tools recovered from the site. Overall, the results indicate that deer were an important resource to the groups that occupied the site, and that the overall subsistence pattern included a broad range of fauna, including large-game animals (deer, bear, and bison or possibly elk), small-game animals (rabbit, beaver or squirrel, and wolf or fox), and upland game birds (wild turkey or grouse or quail). A preference for upland game is evident, as is the lack of positive results for aquatic and riverine fauna such as duck and trout. Given the site's environmental context, the positive residue tests indicate that the site was used as a campsite for groups hunting upland game. When examined according to cultural periods, the findings conform to accepted notions of Archaic subsistence, but there are insufficient data to characterize Woodland faunal procurement patterns.

It must be noted that the techniques for residue analysis are relatively new and their analytical value is not yet fully understood. A two-stage program was designed for the Site 7S-F-68 assemblage, in order to evaluate the efficacy of the various testing methods available. The Level I (presence/absence) testing involved a total of 186 lithic artifacts, of which only seven tested positive—one biface and six pieces of debitage. A total of 50 specimens were submitted for Level II testing, including the seven that tested positive and eleven that tested negative during the Level I evaluation. The latter were specifically included in the Level II sample as a means of cross-checking the two techniques. The correlation between the Level I and Level II results was very low; only one of the artifacts that tested positive for presence of residue (Level I) had any reaction during the Level II testing. There are a number of possible explanations for the lack of agreement of results from the two techniques, but it is clear that presence-absence testing with chemstrips is not an effective method for predicting which artifacts will produce positive results at the family level.

A small amount of floral material was identified in the site assemblage, primarily by the use of flotation recovery techniques. The analytically significant sample includes five native plant types—cherry, hickory, sumac, sumpweed, and woodbine. Although only a small amount of floral material was recovered, the floral assemblage has important interpretive value. There is documented ethnographic use of both woodbine as a medicinal herb and sumac as a dye, medicinal herb, cordage and a smoking material. There is documented use of cherry both for food and as a medicinal, and hickory nuts were used as food and as a fuel for hot, smokeless fires. Sumpweed (*Iva*

*annua*) was one of the earliest domesticated plants in eastern North America, and it has been recovered from contexts dating as early as 7,000 BP (Smith 1992a, 1992b). It is also worth noting that other important starchy grains were recovered from the site area. Chenopodium, amaranthus, and knotweed were all present within the studied samples. Although they were not recovered in the charred state and are thus not considered analytically significant, it is possible that they were present and used during the prehistoric occupation of the site. Considering the entire assemblage of recovered botanicals, both charred and uncharred, there was a variety of starchy grains, herbs, nuts, and fruits available in the site area which could have been exploited by prehistoric groups.

Sumpweed was the most significant botanical material recovered from the site, and it was recovered from contexts associated with the Middle AU (Late Archaic/Early Woodland) and Late AU (Late Woodland). Sumpweed is an indigenous annual seed plant which played a prominent role in eastern North America in the transformation from gathering of wild plants to intensive agriculture. Sumpweed has been recovered from numerous archaeological contexts in the midwest riverine region of North America, and there is evidence of its extensive manipulation by prehistoric populations. Smith (1992a, 1992b) has reviewed the evidence and developed a general model of the processes leading to maize-centered field agriculture that was a primary trait of late prehistoric cultures throughout eastern North America.

Before 7000 BP, there is evidence for occasional use of various seeds, berries, and nuts by small foraging groups. During the following three millennia (circa 7000 - 4000 BP), hunter-gatherer settlements were concentrated in areas adjacent to abundant aquatic resources, which provided ample sources of animal protein. Through the continued reoccupation of seasonal campsites in these settings, "anthropogenic" habitats were created; various human activities such as the clearing of occupation areas, the building of shelters, drying racks, cooking areas, storage features, and the disposal of refuse would have created areas of enriched, disturbed soil that were quickly colonized by pioneer weed species. At this stage, while human groups were creating enriched anthropogenic habitats, or domestic localities, they also may have actively dispersed plants with recognized subsistence value or simply tolerated their growth at the margins of their occupation areas (Smith 1992a, 1992b).

During the period from 4000 to 3500 BP, three annual seed crops were brought under cultivation—sumpweed, sunflower, and goosefoot. At this stage, human groups would have actively encouraged the development of these species, by discouraging the

growth of competing species and possibly by the expansion of the anthropogenic habitat. Available evidence indicates that sumpweed was the first of the three indigenous seed crops brought under cultivation, and the evidence consists of the increasing length of the achene. For sumpweed, a mean achene length greater than 4 mm is viewed as a domesticated crop, and modern wild species have a mean length ranging from 2.5 to 3.2 mm (Smith 1992a, 1992b). The sumpweed sample recovered from Site 7S-F-68 certainly falls above the threshold length for the cultivated variety.

The final stage in the development of an agricultural complex was the deliberate planting and harvesting of plants within domesticalities. The earliest agricultural communities developed in the midwest during the period from 3000 to 1700 BP. In the Eastern Woodland, at least seven plants were cultivated by the earliest farming communities: these included goosefoot, knotweed, maygrass, little barley, sumpweed, sunflower, and gourd. A field agriculture system developed in the period from 1700 to 800 BP; maize first appeared in this period, but it did not become an important crop until the late prehistoric period, after 800 BP. While a maize-centered field agricultural system was a prominent feature of the late prehistoric subsistence pattern, the agricultural complex included many other cultigens, such as beans, squash, and amaranth, as well as many of the originally cultivated plants such as sumpweed, sunflower, goosefoot, maygrass, knotweed, and little barley. Thus, the emergence of maize agriculture was not a revolutionary development, but rather a continuation of a subsistence pattern that had developed over a period of thousands of years (Smith 1992a, 1992b).

At Site 7S-F-68, sumpweed was present in contexts dating to  $2460 \pm 130$  years BP (Feature 19),  $1020 \pm 70$  years BP (Feature 17), and  $310 \pm 80$  years BP (Feature 20). Feature 26 also contained sumpweed, but there was insufficient material from this context for a radiocarbon age determination. The contexts are representative of the period after the initial domestication of sumpweed, and suggest that sumpweed continued to play a role in the Middle Atlantic subsistence pattern from the Terminal Archaic through the Late Woodland/Contact periods. The environmental setting of Site 7S-F-68 appears to have provided an ideal habitat for sumpweed, as it favors areas where the soils are saturated for long periods, areas at the border of well-drained and poorly drained soils, and areas of disturbed ground (Asch and Asch 1978). With the continued reoccupation of Site 7S-F-68 from the Early Archaic period, and possibly the Paleoindian period, creation of a suitable anthropogenic habitat, or domesticality, would have occurred, and the expanse of poorly drained soils in the surrounding area would

have provided ample areas for the cultivation of large, dense stands of the plant. Moreover, the local sandy soils would have been ideally suited for simple hoe agriculture, similar to that of the natural levees along the major river systems of the midwest where the first agricultural communities developed in eastern North America (Smith 1992a, 1992b).

Sumpweed seed clusters could have been harvested simply by hand stripping or beating the clusters into baskets. Processing of sumpweed seed clusters would have required some method for removal of the hard, protective seed coat; such methods may have included use of a wooden mortar board or a milling stone (Smith 1992b). The lithic assemblage included a number of items that could have been used in plant food processing: a milling stone complex, represented by a mano and metate (Feature 22), and a number of cobble tools that exhibited wear as grinding stones (manos), nutting stones (pitted cobbles), and hoe blades or grubbing tools. Interestingly, most of these items were located in the South Excavation Block and are apparently associated with the Early AU contexts, which is most representative of the Early Archaic occupation. If this cultural association is correct, it would imply a very early focus on plant food exploitation at this site.

The traditional view in the Middle Atlantic region is that Paleoindian and Early Archaic subsistence behaviors were almost wholly dominated by hunting; however, some investigators have challenged that view (e.g., Kauffman and Dent 1982), citing the results of a few sites where systematic flotation recovery techniques have been applied. Many investigators (e.g., Carr 1974; Custer 1984; Gardner 1974) in the Middle Atlantic recognize that a significant shift in the settlement pattern occurred during the Early Archaic period, specifically the appearance of processing stations at the margins of wetland habitats (floodplains, marshes, and swamps). These microenvironments would have supported a broader variety of exploitable plant and animal species; hence they became favored site locations for the hunter-gatherer populations of the Early Archaic. While the traditional Archaic hunter-gatherer subsistence model posits seasonal gathering of plant foods, botanical material has rarely been recovered from archaeological contexts in the region, and the current understanding of Archaic subsistence largely emphasizes the importance of animal foods.

The preservation of botanical material at open sites in the Middle Atlantic Coastal Plain is unusual, although there have been some important exceptions, most notably at the Indian Creek V Site in Prince Georges County, Maryland (LeeDecker et al. 1991). The Indian Creek V Site was interpreted as a gather-

ing camp/processing site that was repeatedly visited for short periods to exploit seasonally available plant and animal resources. Flotation samples from the site contained 63 taxa representing a wide variety of fruit, tubers, starchy seeds, nuts, shoots, and leaves, and nearly all of the charred, native botanical specimens represented species of known ethnographic use. Flotation recovery at other sites in the Middle Atlantic region, including the present investigation of Site 7S-F-68, is providing more and more evidence of plant use among Archaic and Woodland populations.

### C. SETTLEMENT PATTERNS

Excavations at Site 7S-F-68 have produced evidence of occupation or use during each of the major periods of Delaware prehistory; as such, the site has contributed much information relevant to understanding the prehistoric use of the Mid-Peninsular Drainage Divide physiographic zone.

Based on the research of William Gardner and his colleagues in the Virginia Valley and Ridge province and neighboring areas, regional models of Paleoindian settlement patterns emphasize that the movements of small groups centered around high-quality cryptocrystalline lithic source areas. However, there are no comparable primary lithic source areas in the Coastal Plain, and although scattered finds of fluted points have been reported, it has been difficult to define a distinctive Paleoindian settlement pattern for this area.

In Delaware, Custer has noted a concentration of Paleoindian sites in the Mid-Peninsular Drainage Divide. Using LANDSAT satellite imagery to characterize the environmental composition of this zone, he determined that most Paleoindian sites were located at the margins of poorly drained areas. The Hughes complex of sites in Kent County is characterized by a series of Paleoindian sites located on low knolls of well-drained soil that are surrounded by poorly drained areas (Custer 1984, 1986a). This typical setting corresponds well to that of Site 7S-F-68, which suggests that the basic settlement model for the Hughes complex would extend throughout the Mid-Peninsular Drainage Divide zone.

Following Gardner, Custer's models for the overall Paleoindian settlement system in Delaware emphasize the importance of obtaining high-quality cryptocrystalline lithic materials. The limited evidence of Paleoindian activity at Site 7S-F-68 suggests the use of crystal quartz, rather than cryptocrystalline material such as chert or jasper. Site 7S-F-68 lies within a lithic-poor setting, lacking in both primary and secondary sources of lithic material suitable for stone tool manufacture. The crystal quartz that was used at

the site would have been available in the uplands north of the Fall Line and in secondary deposits south of the Fall Line, but it is most likely that a primary source was used, i.e., bedrock crystal. In central and northern Delaware, Custer argues that the Paleoindian settlement pattern was cyclical in nature, with individual groups periodically returning to a single lithic source. In an alternative model, which proposes serial settlement, it is suggested that groups would have replenished their lithic tool kits at a series of different lithic sources that were scattered across the landscape, while engaged in other procurement or exploitative activities (Custer 1984). The limited evidence of Paleoindian activity at Site 7S-F-68 is not clearly indicative of a serial or cyclical system for the southern Delmarva Peninsula, and more data is needed to address this issue.

Given the limited evidence of Paleoindian activity at Site 7S-F-68, it is likely that the site was used only on a short-term basis. The crystal quartz lithic assemblage suggests that activities associated with tool manufacture and processing of game were carried out at the site. In Custer's settlement model, the Paleoindian component at Site 7S-F-68 would be classified as a hunting site (Custer 1984, 1986a).

Following occasional or periodic visits by Paleoindian groups, Site 7S-F-68 appears to have been used most intensively during the Archaic and Woodland periods. In Delaware, Archaic and Woodland settlement patterns were generally characterized by seasonal movements through a series of habitats that provided various plant and animal foods at different times of the year. Different settlement types, distinguished by the group size and activities, were established during the annual round. The Archaic settlement pattern model includes macroband base camps, microband base camps and procurement sites (Custer 1984, 1986a). The lithic assemblage, the botanical assemblage, and the features suggest that Site 7S-F-68 functioned as a procurement site, rather than a base camp, during the Archaic and Woodland periods. The site appears to have been a short-term habitation area that was frequently reoccupied. The most common of the recognizable activities carried out at the site were chipped-stone tool production, tool maintenance, and the procurement and processing of foodstuffs. The large numbers of heavily resharpened and/or broken hafted bifaces indicate that much of the lithic reduction was geared toward refurbishing tool kits, specifically refitting projectiles with new points. These refurbishing tasks were apparently conducted in concert with exploitative and processing tasks, as represented by hafted bifaces, cobble tools, and unifacial tools. Neither the Archaic nor the Woodland occupations appear to have been of lengthy duration; rather, the lithic assemblage seems

to indicate that the site was frequently reoccupied but for short periods of time.

The initial period of intensive or frequent use of the site occurred during the Early Archaic. Custer has argued that in the Delmarva Coastal Plain a significant adaptive change occurred at the beginning of the Archaic, marked by a changing emphasis in site locations. Specifically, this settlement shift is seen as an increased emphasis on the swamp and marsh habitats that developed at the beginning of the Atlantic climatic episode (Custer 1984, 1986a). Investigations at Site 7S-F-68 do not support the idea of a shift in settlement locations, given the continuity in site use from the Paleoindian to the Early Archaic period. Instead, the data suggest increasingly intensive use during the Early Archaic of the wetland habitats that were previously exploited during the Paleoindian period. The addition of tools associated with plant food exploitation such as milling stones, grubbing tools, and hoes suggests that the Archaic populations became increasingly familiar with the resources of the wetland habitats and began to exploit a wider range of the available plant resources. While the wetland areas remained attractive to game animals, the availability of specific botanical resources would have been more predictable, and an expansion of the subsistence base to include a broader range of biotic resources would have supported larger populations.

Middle Archaic settlement models for the Middle Atlantic region are not well developed, and there is a lack of agreement regarding bracket dates for that period. Site 7S-F-68 contained limited evidence of Middle Archaic occupation, and little can be said of this component other than that it provides some evidence of continuity in the basic settlement pattern. The one Middle Archaic diagnostic point was a sidenotched rhyolite point assigned to the Otter Creek point type. Rhyolite accounted for a very small fraction of the lithic assemblage, and it is possible that all of the rhyolite is associated with the Middle Archaic component. Rhyolite is not available in the Coastal Plain, and the likely source of this material is the South Mountain area of northern Maryland and southern Pennsylvania. The presence of rhyolite at Site 7S-F-68 is most likely the result of either of two different procurement strategies: (1) direct procurement, perhaps linked to seasonal movements between the highlands and the Coastal Plain; or (2) indirect procurement, i.e., exchange networks. Through the Archaic period there is a pattern of increasing reliance upon locally available materials at the expense of "exotic" materials such as rhyolite. The absence of rhyolite after the Middle Archaic thus conforms to the traditional interpretation of the Late Archaic as a period of reduced settlement mobility and more restricted territories.

Late Archaic cultures in the Middle Atlantic Coastal Plain are characterized by increased sedentism and larger population aggregates. Custer (1984, 1986a) has described the change from Archaic to Woodland settlement patterns in Delaware as essentially a shift from mobile to more sedentary patterns, but he subsumes the traditional Late Archaic period into the Woodland I period. In that period, he has observed, the distinctive characteristics of the settlement system are (1) the presence of base camps along major drainages that supported much larger population aggregates and (2) a corresponding abandonment of sites in other locations. The intensification of settlement in the major riverine zones is seen as a response to the warm, dry conditions associated with the Subboreal climatic episode, which possibly decreased the carrying capacity of marginal areas that were exploited during the Atlantic climatic episode (Custer 1984, 1986a).

The excavations at Site 7S-F-68 do not support this model, at least that element of the model that posits abandonment of marginal areas. Located within the Mid-Peninsular Drainage Divide zone, the Site 7S-F-68 environment would be considered marginal because of its isolation from riverine resources. Its catchment area is dominated by seasonally flooded wetlands, but there are no nearby stream channels that would have supported the types of riverine resources (anadromous fish and shellfish) that were so intensively exploited at base camps along major drainages. Nonetheless, the site produced abundant evidence of frequent occupation during the Late Archaic period. The evidence suggests that Site 7S-F-68 continued to function as a seasonal procurement site where the groups exploited a variety of game and botanical resources.

Continuity in the settlement pattern from the Late Archaic through the Early and Middle Woodland periods is evident throughout the Middle Atlantic region, and this continuity of settlement patterns is perhaps the most compelling argument in support of Custer's (1984) chronology, which lumps the Late Archaic, Early Woodland, and Middle Woodland into a Woodland I unit. The Woodland I settlement pattern is similar to the Archaic model, and it includes the same types of sites, but the Woodland I macroband base camps are much larger than the Archaic macroband base camps. Radiocarbon dates indicate the continued use of Site 7S-F-68 through the Early and Middle Woodland period, but there is a lack of diagnostic ceramics associated with these periods.

The Woodland II settlement system also includes the same three basic site types, and the increased emphasis on cultivated foods in the diet presumably led to important changes in the Late Woodland or Woodland

II settlement patterns. In Delaware, Late Woodland settlement patterns were characterized by increased sedentism, which was reflected in larger villages located adjacent to areas of easily tilled soils, construction of more permanent structures, and increased use of food storage facilities (Custer 1984, 1986a). However, these changes appear to reflect a shifting emphasis in long established patterns rather than a fundamental shift. A review of data for the Late Woodland in the Delaware Valley and Upper Delmarva Peninsula concluded that there was a general continuity in settlement/subsistence systems from the Middle to Late Woodland periods (Stewart et al. 1983). The continued use of Site 7S-F-68 indicates that, despite a greater concentration of Late Woodland populations in the coastal zone and the lower reaches of major drainages, seasonal procurement sites in the Mid-Peninsular Drainage zone continued to be used.

There are different settlement models for the Late Woodland, based on variations in the seasonal movements between environmental zones. For southern Delaware, a number of settlement pattern models have been proposed for the Late Woodland Slaughter Creek complex (Thomas et al. 1975). The excavations at Site 7S-F-68 have produced evidence of a definite pattern of seasonal use, which has direct implications for the alternative settlement pattern models developed by Thomas et al. (1975). The site's botanical assemblage, consisting of hickory nuts, sumac, cherry, sumpweed, and woodbine, is most clearly indicative of use of the site during the autumn months. Hickory nuts are at their peak from late September through early October. Sumac fruits between August and October, although the root and stemstalk would be available all year. Cherry trees produce fruit in the early fall, from late August through September. Sumpweed achenes ripen around the middle of October. Ordinarily some hickory nuts would be available but in declining abundance when sumpweed is ready to harvest. Woodbine, which is in profusion during late summer (June through August), is the only one of the analytically significant botanicals recovered that deviates from the pattern of autumn procurement. These results are most consistent with Model 4 of Thomas et al. (1975), which posits that the Poorly Drained Woodland zone would have been most attractive for exploitation during the fall to late winter.

Analysis of the lithic assemblage also provided information pertinent to the issue of settlement patterns. Specifically, examination of the patterns of raw material procurement focused on the question of whether groups exploited secondary cobble sources that were available in the Coastal Plain or whether they preferred primary sources which were available

only above the Fall Line. This question is tied closely to the issue of cyclical versus serial settlement patterns. The types of cortex present on the lithic artifacts pertain directly to this question. Simply stated, the presence of cobble cortex implies exploitation of local secondary sources, while block cortex implies procurement of raw materials from somewhere at or above the Fall Line.

The presence of block and cobble cortex indicates that both primary and secondary sources were exploited by the groups that visited Site 7S-F-68, but the ratios show that secondary (cobble) sources were exploited more frequently than primary sources. This pattern is certainly not unexpected, given the site's Coastal Plain setting. The quartz assemblage most strongly expresses this pattern of local procurement, and is followed by jasper, chert, quartzite, chalcedony, and igneous/metamorphic materials. It is clear that cobble sources were exploited much more frequently than bedrock sources, especially for the most commonly used raw materials. This finding is at odds with Lowery and Custer's (1990) analysis of the lithic assemblage from the nearby Crane Point Site; they argued for the almost exclusive use of primary lithic sources, with these materials being transported onto the Delmarva Peninsula as bifacial cores.

This question of changing lithic procurement patterns through time can be addressed by examining the culturally diagnostic bifaces and by the deposits associated with the analytical units. Changing procurement patterns through time are evident in the biface assemblage: the possible Paleoindian component utilized crystal quartz; the Early Archaic component primarily utilized jasper and chert; the Middle Archaic component utilized rhyolite; the Late Archaic/Early Woodland component used more argillite than any other raw material; and the Late Woodland component utilized jasper. With the exception of rhyolite, argillite, and crystal quartz, all of these raw materials are available on the Delmarva Peninsula.

The Early AU is dominated by jasper, chert, vein quartz, and quartzite, and it is likely that the majority of these materials in the Early AU are related to the Early Archaic occupation. In the Early AU, cobble cortex is far more plentiful than block cortex, indicating a primary use of locally available cobble sources. It is likely that bedrock sources were exploited, but the lack of cortex does not provide direct evidence of bedrock procurement, since similar raw materials were locally available in secondary deposits. Middle Archaic groups, represented by the Otter Creek component, and Late Archaic/Early Woodland groups did bring nonlocal raw materials--rhyolite and argillite--onto the Delmarva. The same pattern of nonlocal procurement may also apply to the Paleoindian com-

ponent, with its utilization of crystal quartz. Overall, the Site 7S-F-68 assemblage is more comparable to that of the Paw Paw Cove Site (Lowery 1989) than the Crane Point Site (Lowery and Custer 1990); the lithic assemblage indicates that Early Archaic and other groups that used Site 7S-F-68 exploited cobble sources more intensively than bedrock sources, no doubt because secondary sources were closer and because they contained sufficient quantities of cryptocrystallines (chert and jasper) to make exploitation worthwhile.

#### D. INTRASITE PATTERNING

Site 7S-F-68 has been interpreted as a periodically revisited procurement site at which a limited variety of extractive and maintenance tasks were carried out. These activities included food processing, consumption, discard of waste, and tool manufacture and maintenance. Although these activities may be inferred individually on the basis of excavated features, tools, and waste material, activity-area reconstruction focuses on the spatial arrangement of these activities within the site.

While there was much overlapping of deposits from discrete occupational episodes and mixing of deposits between analytical units, internal site patterning was evident from various perspectives. First, there were many examples of diagnostic point types clustering in certain areas, indicating that individual occupational phases or episodes occurred within fairly restricted areas of the site. Second, there were a number of lithic raw material concentrations in well-defined areas of the site, indicating the presence of well-preserved refuse disposal areas. In some cases, concentrations of tools and debitage were identified adjacent to a hearth area, indicating that the hearth area was a focal point for activities within the site's primary habitation area.

There were a limited number and variety of feature types at the site. The feature inventory includes only one formal cooking/heating area, represented by a concentration of FCR, although other features suggest the presence of some informal cooking or heating areas throughout the site. Deposits associated with the Early Archaic occupations of the site were concentrated in the South Excavation Block and were apparently related to with the formal cooking/heating area. A plant food processing area represented by a mano and metate were also located in this part of the site. While the spatial analysis showed a consistent pattern of Early Archaic projectile points, debitage, and cobble tools in the South Block, it was also observed that the unifacial tools associated with these occupations were more widely distributed over the site area, possibly representing secondary activity areas

used for tasks such as hide processing. The Early Archaic use of a hearth area as a focal point of activities within a campsite conforms to a large body of ethnographic and excavation data for hunter-gatherer cultures (Binford 1983).

Although there was only limited evidence of Paleoindian occupation of the site, the assemblage of crystal quartz tools and debitage associated with this component was concentrated in a small area on the western margin of the site. Feature 21, an activity area consisting of a cobble chopper and hoe, was within this area of Paleoindian activity, but it is more likely associated with the Early Archaic component.

The distribution of Late Archaic/Early Woodland points and associated raw material concentrations within the site also exhibited a distinct spatial pattern. Most of these points and associated refuse were located in the North Excavation Block, suggesting a shift in the primary occupation area within the site. This part of the site did not contain a formal cooking area, but it did contain a number of charcoal concentrations that may represent informal cooking or heating areas. Identification of spatial patterning associated with the Late Woodland component was limited by the fact that the Late AU contexts had been subjected to various post-depositional disturbances, particularly historic cultivation, roadway construction, and use of the site as a cemetery.

#### E. ENVIRONMENTAL ADAPTATION

The environmental adaptation theme examines cultural response to environmental conditions, and it is closely related to the settlement pattern theme. The site occupies a low ridge surrounded by an expanse of poorly drained upland wetlands. Catchment analysis suggests that the critical factor in the choice of site location was to maximize access to these wetland habitats. The wetland environment would have been an attractive wildlife habitat, with numerous biotic resources that could have been exploited by hunting, foraging, and collecting. The site area did not afford access to lithic resources nor did it provide the type of riverine resources that were exploited in base camps located along stream and river channels.

Given the lengthy period during which the site was reoccupied and the region's paleoclimatic history, it was anticipated that the archaeological record might reflect cultural responses to changing environmental conditions. However, the data recovery program did not provide a significant opportunity to reconstruct the local paleoclimatic history, as a survey of the site area did not identify any suitable locations for extraction of pollen cores or other direct evidence of the changing prehistoric environments. Baseline data

from the surrounding region provide only a general context for understanding the local Holocene environmental sequence.

One of the most notable aspects of the archaeological record at Site 7S-F-68 is that it contains evidence of periodic short-term use during all major periods of Delaware prehistory. Thus, the central issue in addressing the environmental adaptation theme is understanding why this particular locale was periodically revisited over a period of nearly ten millennia, virtually the entire Holocene epoch, when profound cultural and environmental changes were occurring. Using regional environmental data and site-specific information about changing tool kits and subsistence patterns, this issue may be addressed by reference to a general model of cultural adaptation.

When the first Paleoindian groups visited the site, the local environment would have had an early postglacial character. While the regional environment would have been dominated by spruce and fir forests, the mosaic of wetland areas throughout the Mid-Peninsular zone would have offered numerous patchy microenvironments that were attractive to large game animals. The Paleoindian hunting station established at Site 7S-F-68 was no doubt one of many similarly positioned hunting stations, most of which have little or no visibility in the archaeological record. Establishment of a Paleoindian hunting station at Site 7S-F-68 marked the initial creation of an anthropogenic habitat. Modification of the site environment would have been limited at first, but at a minimum it would have required clearing of vegetation and deposition of refuse from the various maintenance and processing activities carried out at the hunting station.

The first intensive period of site use occurred during the Early Archaic, at a time when the regional environment passed through the Preboreal/Boreal and early Atlantic climatic episodes. This interval was marked by a gradual warming and the expansion of a northern hardwood forest at the expense of spruce, and regional models indicate a replacement of the cold-adapted species by a suite of fauna more adapted to warmer conditions. At Site 7S-F-68, the Early Archaic was marked by important changes in the tool kit, most notably the introduction of tools used for processing of plant resources--milling stones, grubbing tools, and hoes. This tool kit and the larger domestilocality associated with the Early Archaic component indicate that the anthropogenic habitat associated with the site would have expanded significantly.

These regional climatic changes associated with the Atlantic episode included a warming trend that was accompanied by an increase in precipitation, which in

turn led to an expansion of forests dominated by hemlock and later oak. Throughout the region, the warm, moist conditions of the Atlantic climatic episode are believed to have led to the formation and expansion of wetland habitats. Settlement pattern studies show an expansion of Early Archaic components (represented by bifurcate-based points) into wetland areas that are variously described as interior swamps, freshwater marshes, ponds, bay/basin features, and springheads (Custer 1984; Gardner 1987; Steponaitis 1980; Stewart 1990; Wanser 1982).

Typological evidence indicates use of Site 7S-F-68 throughout the Archaic period, although there is insufficient information to characterize a Middle Archaic occupation. The frequent use of the site during the Late Archaic occurred during the Subboreal episode, an interval of xerothermic conditions which led to an expansion of grasslands and the dominance of an oak-hickory forest type. Squirrel and turkey populations would have benefited from the dominance of nut-bearing trees such as oak and hickory, while species intolerant of dry habitats would have declined. At the regional level, a reduction in the rate of sea level rise occurred during the Subboreal episode allowed stable estuarine environments to form in the tidal areas of the Delmarva. With the formation of these tidal wetland marshes, the Delmarva Peninsula reached its peak carrying capacity, replete with waterfowl, shellfish, and marine fish (Carbone 1976; Custer 1984; Wesler 1985).

At Site 7S-F-68, a shift in the locus of the primary habitation site occurred during the Late Archaic, marked by the distribution of diagnostic points. It is uncertain whether this shift was a response to the regional environmental changes or related to anthropogenic changes in the site habitat. Subsistence data indicate that a domesticated variety of sumpweed was being exploited at the site during Late Archaic times. The domestication of sumpweed, a species that favors the marginal areas of wetlands and disturbed ground conditions such as would be found in anthropogenic habitats, suggests that prior human modification of the local environment had become the most critical factor of the site location by the Late Archaic. Amelioration of the xerothermic conditions at the close of the Subboreal permitted the establishment of modern forest conditions, which continued with minor fluctuations until European contact. At Site 7S-F-68, harvesting of a domesticated variety of sumpweed continued through the Late Woodland period, indicating a continuity in site function until the final replacement of the Native American population by European groups.

## F. TECHNOLOGY

Information pertaining to technology is available primarily from analysis of the lithic assemblage. Lithic technology is expressed directly in the tool production technologies that may be identified as distinct industries.

The Middle Atlantic region encompasses a diversity of geological and biological environments that occur in linear zones from the Appalachian highlands to the Atlantic coast. These zones are crosscut by major drainages, including the Delaware River, which terminates in the rich estuarine environments of the lower Delaware Bay. Above the Fall Line, there is a wide assortment of igneous, metamorphic, and sedimentary rocks. Below the Fall Line, these bedrock units are buried by massive sequences of fine sediments and gravels. The absence of bedrock lithic sources in the Delmarva Coastal Plain produced a situation in which the only raw materials that were readily available at Site 7S-F-68 for aboriginal tool production technology were redeposited cobbles and scattered deposits of ironstone.

The area surrounding Site 7S-F-68, including virtually all of the Mid-Peninsular Drainage Divide physiographic zone, falls within a lithic-poor zone, evidenced by the scarcity of cobbles deposits in the site area. Nonetheless, analysis of the lithic assemblage indicated that the groups that used Site 7S-F-68 relied heavily on locally available cobble sources, which contained a range of lithic materials. Four raw materials account for 95 percent of the lithic assemblage: jasper, chert, vein quartz, and quartzite. The dominance of these materials in the lithic assemblage is easily explained by their local availability in secondary deposits. Although these materials are all locally available, there are important differences in how they were used.

The biface industry is the most common industry, represented by hafted bifaces, unfinished bifaces, indeterminate bifaces, and a few miscellaneous types. The unfinished (i.e., early-stage, middle-stage, and late-stage) bifaces are believed to be hafted bifaces that were not completed because they were either rejected for some reason (e.g., breakage or severe hinge fractures) or the production process was halted so they could be stored (cached) and completed at a later date. It is clear that biface production at the site was based primarily upon secondary sources, and the low number of failures and rejects reflects the site's considerable distance from significant raw material sources. Several of the bifaces appear to have been used as knives or scrapers after they broke during production.

Four bifaces are notable in that they do not fit representative hafted bifaces or unfinished tools. One is a very large argillite biface that might more accurately be described as a crude bifacial core. Large flake scars on its surface suggest that large flakes were detached for the production of points. One of the other miscellaneous bifaces is a crudely flaked quartzite block that may have functioned as a chopper, and the other two are believed to be hoe blades or grubbing tools. Both of these exhibit a degree of edge rounding and polishing on their bits which supports interpretation of their use as digging tools. An alternative explanation is that they functioned as high-duty scrapers.

The flake-tool industry is represented by retouched flakes, utilized flakes, endscrapers, sidescrapers, and a denticulated flake. Expedient unifaces--utilized flakes and retouched flakes--were most commonly manufactured from jasper and chert, with a few made of chalcedony, quartz, argillite, igneous/metamorphic material, and indeterminate material. Given the analytical methods used for this study, it is possible that many flakes that were recorded as debitage may have been used briefly. This problem is probably most severe in the quartz assemblage because edge use is difficult to detect on quartz. A similar detection problem occurs with argillite, as evidence of use is obliterated by erosion. The formal flake-tool industry is represented by endscrapers, sidescrapers, and the denticulated flake. They were probably hafted and designed to be reused; like the expedient unifacial tools, most were manufactured from jasper and chert.

Three types of cores were identified: tested cobbles, polymorphic cores, and bipolar cores. Tested cobbles may or may not be related to flake-tool production. They are merely cobbles that had one to three flakes removed to inspect the suitability of the cobble, but they were not further reduced. Polymorphic (freehand) cores are cobbles that have had flakes detached in multiple directions; platforms were selected opportunistically and preparation of platforms appears to have been minimal. Bipolar cores were the most common type, and they had the lowest mean weight of the three core types. Bipolar cores are cobbles or pebbles that have had flakes detached by direct hard-hammer percussion on an anvil. Jasper accounts for the great majority of the bipolar cores, followed by quartz and chert. Because bipolar reduction is a technique for maximizing available raw materials, bipolar cores are typically smaller than polymorphic cores. Most flakes and shatter generated by this technique are suitable only for expedient flake tools. However, the popularity of jasper, quartz, and chert in bipolar reduction is directly linked to their fine-grained isotropic structure, which permits detachment of small flakes with clean, sharp, straight edges.

Flakes and chunks cannot be assigned to any single industry. They are general byproducts of chipped-stone tool production, and they constitute more than half of the assemblage. Jasper and chert account for three fourths of the assemblage by count and slightly less than half by weight. The roughly equal numbers of early reduction flakes and biface reduction flakes indicate that, in addition to some level of flake-tool production, both biface production and maintenance were common activities for the jasper and chert assemblage. The quartz assemblage differs in its lower number of biface flakes and higher number of pieces of block shatter; these differences are the result of different fracture mechanics--that is, quartz shatters more readily than chert and jasper. In addition, quartz apparently was more often used for the production of flake tools than for bifaces. The pattern of quartzite debitage suggests both flake-tool production and early- to middle-stage biface production. Rhyolite is only represented by biface flakes and flake fragments, while argillite is represented by these types and by early reduction flakes. The latter flakes indicate different patterns of procurement for argillite and rhyolite.

The assemblage contained only limited evidence of a formal groundstone industry; this was a small fragment of highly polished steatite. The informal groundstone industry (cobble tool industry) includes a number of cobble tools that represent various activities--an abrader, a metate, an anvil stone, two pestles, two manos, two pitted cobbles, seven hammerstones, and a cobble that may have been used as a chopper. The majority of these simple tools are made from quartzite cobbles, and it is likely that most of these cobbles were collected from the same secondary deposits used as a source area for the chipped-stone tools. The two largest cobble tools--a basalt metate and a siltstone pestle--may have been brought to the site from sources near the Fall Line because it is uncertain if cobbles of this size are available on the Delmarva Peninsula; these tools probably represent a plant processing unit. A number of cobble tools had evidence of multiple functions, and two cobble tools were recycled as cooking and heating stones, thus ending up as cracked cobbles in the FCR assemblage. The multiple functions and recycling of cobbles provides additional evidence of the paucity of lithic raw materials in the site area.