INTRODUCTION

The purpose of this report is to describe the results of final archaeological excavations at the prehistoric Wrangle Hill Site (7NC-G-105), which is located north of Dragon Creek in the State Route 1 Corridor, New Castle County, Delaware (Figure 1, Plate 1). The Wrangle Hill Site was identified during a Phase I archaeological survey of the highway corridor in 1988 (Hodny, Bachman, and Custer 1989). Prehistoric cultural material was recovered in shovel test pit excavations at the site which is located at the confluence of two ephemeral streams (Figure 2). Further Phase II excavations were recommended to determine the extent and nature of the cultural remains at the site, and to determine the eligibility of the site for nomination to the National Register of Historic Places (36 CFR 60) under Section 106 of the National Historic Preservation Act (Kellogg et al. 1994:40-44). This report describes the results of these excavations, which were conducted by the University of Delaware Center for

Archaeological Research (UDCAR), between November 1991 and February 1992, for the Delaware Department of Transportation (DelDOT) and the Federal Highway Administration (FHWA) under Section 106 of the National Historic Preservation Act of 1966 and Section 138 of the Federal Highway Act.

Site Setting

The Wrangle Hill Site is located in the High Coastal Plain physiographic zone of eastern New Castle County, Delaware approximately 14 kilometers south of the Fall Line (Figure 3). The High Coastal Plain is underlain by Pleistocene-aged, Columbia Formation sediments extending south from the Piedmont zone in northern Delaware south to the Low Coastal Plain (Jordan 1964:40). The topography of the High Coastal Plain is gently rolling with elevation differences of up to 16 meters (50 feet) between ridges and streams. To the east of the site is the Delaware Shore Zone with extensive brackish and salt water marshes and small tidal streams flowing into the Delaware River. The elevation and environmental differences in northern Delaware are sufficient to cause differences in microclimate variability in the distribution of both plant and animal species (Braun 1967:246-247).

Streams that drain the High Coastal Plain are deeply incised and filled with a veneer of recent sediments that progressively thickens moving toward their confluences with the Delaware River (Kraft et al. 1976:13). To the west of the Wrangle Hill Site is the Drainage Divide Zone where poorly-drained

soils dominate (Matthews and Lavoie 1970), and the topography is more subdued. From the Wrangle Hill Site one would have easy access to tidal streams and marshes, and a mosaic of woodland microenvironments on contrasting areas of well-drained and poorly-drained soils. Those environmental settings would have offered a wide range of plant and animal resources for the site's prehistoric inhabitants.

The Wrangle Hill Site is situated above the intersection of Silver Run, a branch of Dragon Run, and a small ephemeral stream at the end of a long gentle slope (Figure 2). The slopes to the stream drainages are much steeper than the surrounding topography and modern farmers have left a band of trees on Silver Run (Plate 1). Matapeake silt loam soils, which cover about one quarter of New Castle County (Matthews and Lavoie 1970:28-29), dominate the vicinity of the site. At the site locality the soils are moderately eroded on 5 to 10 percent slopes. The site area was farmed for many years, but has been fallow for the past few years.

The Columbia Formation contains deposits of gravel that contain cobbles useful for stone tool making. The deeply-incised streams flowing from the High Coastal Plain to the Delaware Shore Zone often expose and concentrate cobbles. In addition, ground water fluctuations within the Columbia Formation has created beds of iron-cemented sandstone that are also available in the area of the Wrangle Hill Site (Kellogg et al. 1994:59-63). A Delaware Chalcedony Complex jasper outcrop (Custer 1989:56) is located in the vicinity of Iron Hill approximately 11 kilometers to the northwest.

Paleoenvironments

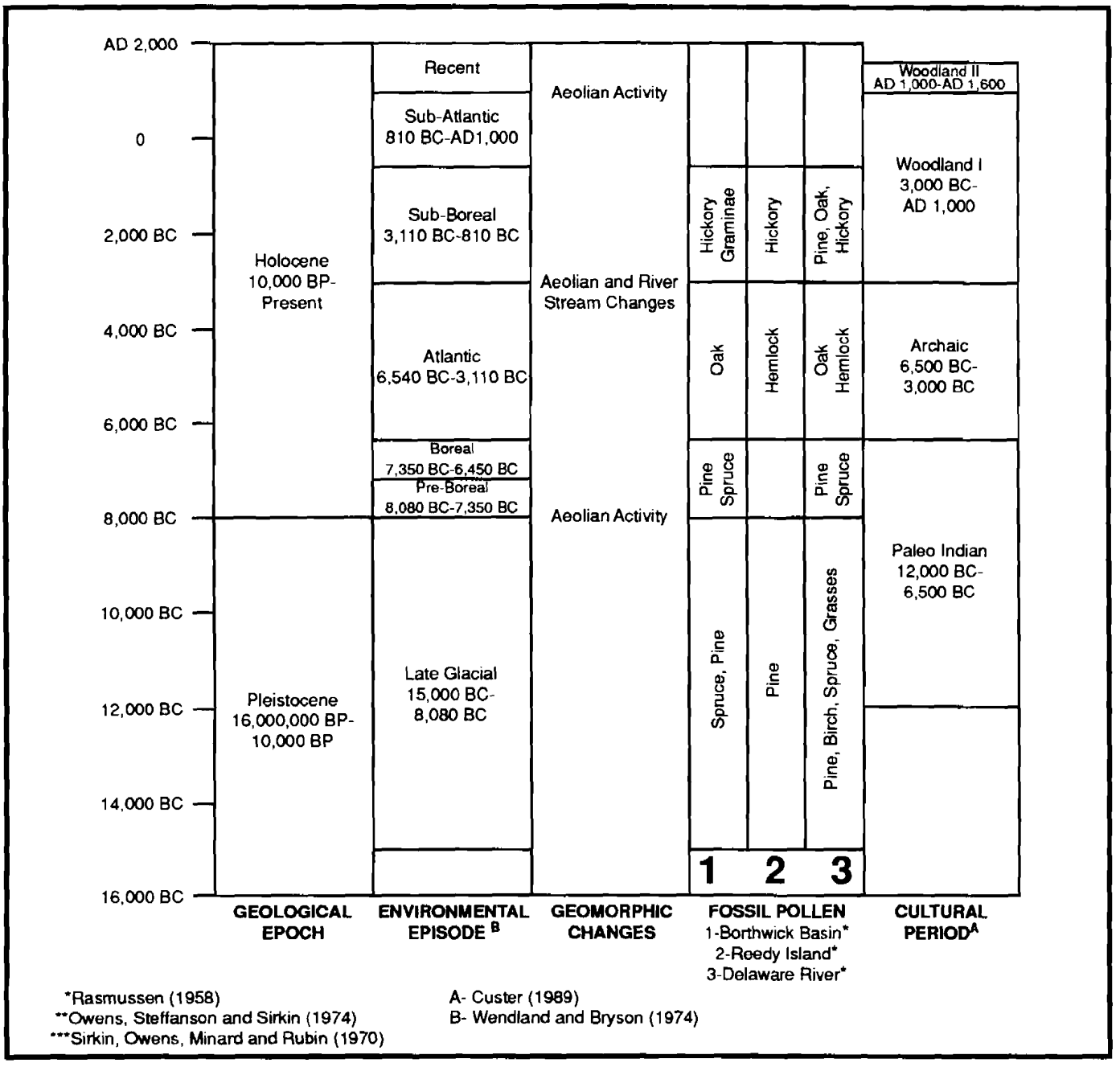
In order to better understand prehistoric lifeways in Delaware, it is necessary to study the dynamics of past physical environments of the Delmarva Peninsula. A wide range of environmental studies, including climatology, pedology, hydrology, and fossil pollen analysis have provided useful tools for reconstructing past environments and the following discussion is based on recent summaries (Custer 1989; Kellogg and Custer 1994). Models created from these studies can be applied to further understand prehistoric adaptations. The current geological period, the Quarternary Period, is divided into two epochs, the Pleistocene (16,000,000 B.P. - 10,000 B.P.) and the Holocene (10,000 B.P. - present) (Figure 4). Studies have shown that within these epochs are periods of climatic change which have had impact on the subsistence strategies of prehistoric groups. Based on their analysis of fossil pollen data, Wendland and Bryson (1974) have developed an "episodic model" to explain discrepancies in the global geologic-botanic record. This model suggests that discrepancies in the pollen data sequence may be a reflection of abrupt environmental disturbances that divide time periods of relatively stable climates. Five environmental episodes have been established in the time between 15,000 B.C. and A.D. 1600 (Figure 4).

Studies of regional landscape modification have also identified periods of change in the environment (Figure 4). Two geomorphic processes have been linked to climatic changes (Knox 1983; Curry 1978; Curry and Custer 1982; Custer 1989; Kellogg and Custer 1994). These processes are aeolian deposition/erosion of soils, and changes in river and stream systems. Deposition of aeolian, or windblown, soils indicates degrees of denudation of vegetation (Curry 1980; Curry and Custer 1982; Custer 1989). Three significant occurrences have been dated to the transitional period from the Pleistocene to the Holocene (Foss et al. 1978), the Middle Holocene (Curry 1980), and the Late Holocene (Custer and Watson 1985). Changes in river and stream systems, during the Holocene Epoch, have been noted in the Middle Atlantic region (Curry and Custer 1982), and especially in Central Delaware (Custer and Griffith 1984). Research on changes in waterway systems in other parts of North America and the Eastern Woodlands have been attributed to responses to storm and flood activities (Knox 1983). These activities have also been suggested as being responsible for changes in river and stream systems on the Delmarva Peninsula (Custer 1989). The various studies show that past environmental transitions coincide with one another and also with the cultural time periods of the Delmarva Peninsula (Figure 4). To fully understand the impact of these changes on prehistoric settlement patterns, these environmental changes must be regarded in a spatial and temporal context.

The Pleistocene is characterized by the onset of colder conditions with recurring episodes of continental glaciation. The last glaciation consisted of a large ice sheet, the Laurentide, which covered most of the northeastern portion of the continent. The retreat of this ice sheet was most influential on the climatic conditions of the past 14,000 years. By ca. 12,000 B.C. the Laurentide ice sheet had retreated to just north of the headwaters of the Delaware River (Ogden 1977). During this later portion of the Pleistocene, or Late Glacial Episode, the Delmarva Peninsula would have been subjected to extensive frontal activity caused by the mixture of the cold air associated with the ice sheet and warm air from the south (Carbone 1976). This climate would have resulted in cloudy, wet, and cold conditions on the Delmarva Peninsula.

FIGURE 4

Environmental Changes and Climatic Episodes



After ca. 8500 B.C. the melting of the Laurentide ice sheet shifted air mass activities and increased moisture content in the atmosphere. The increase in moisture combined with the cold air of the diminishing ice sheet resulted in precipitation levels higher than those of the present (Carbone 1976). Other parts of the Middle Atlantic are thought to have once resembled tundra-like settings (Carbone 1976; Bernabo and Webb 1977), while in areas further south, the late Pleistocene was characterized by a mosaic of vegetational settings (Whitehead 1965; Brown and Cleland 1968; Custer 1989). Pollen data dating to

this time from the Coastal Plain indicate that the Delmarva Peninsula probably contained grassland settings within a broader coniferous matrix (Figure 4). These grassland environments would have supported cold weather megafauna and moose. Grassland areas would have been located in the low relief flood plains of the Delaware and Susquehanna Rivers, which have since been inundated and buried by post-Pleistocene sea-level rise. High velocity winds generated by these open grasslands would have created aeolian depositions at the interface of the broad coniferous forest stands. As the ice sheet retreated further north, its effects on the climate of the Delmarva Peninsula lessened.

Transition between the Pleistocene and the Holocene began after 8000 B.C., with the Pre-Boreal and Boreal environmental episodes, when the ice sheet retreated north into Canada and temperatures increased due to solar warmth. This transition between the end of the Pleistocene and the beginning of the Holocene is characterized by marked changes in floral environmental settings with the major effect being a reduction of open grassland environments and a spread of boreal woodland settings. The pollen data from this time on the Delmarva Peninsula reflect a replacement of spruce with pine. The reduction of grassland and forest interface settings lowered the carrying capacity for browsing and grazing species. As a result, poorly drained swampy areas would have been focal points for animal populations including deer, elk, and moose.

By 6500 B.C., the beginnings of the Atlantic Episode, temperatures from solar radiation reached a maximum and the cold weather floral and faunal species migrated out of the Middle Atlantic region to areas further north. This early part of the Holocene is marked by a general warming trend and an increase in precipitation. Grasslands diminished and the coniferous woods were replaced by the expansion of dense mesic forests of hemlock, oak, and pine. Swamp areas were distributed among poorly drained areas such as the floodplains and bay/basin settings. These environments supported fauna species similar to species found today such as deer and turkey. The Atlantic Episode of the Holocene Epoch is characterized by the stabilization of a continental climate with distinct seasonal differences in air mass distribution patterns, temperature, and precipitation.

After the Atlantic Episode, the climates and environments of the Delmarva Peninsula are complex and have been subjected to many interpretations. The Atlantic Episode was followed by the Sub-Boreal Episode (3110 B.C. - 810 B.C.) which is characterized first by warm and dry conditions followed by increases in precipitation and cooler temperatures. The early part of the Sub-Boreal Episode has been called the "Mid-Postglacial Xerothermic," which seems to have had a significant impact on the distribution of plant and animal resources of the Delmarva Peninsula. The pollen data dating from this time shows a decline in oak and an increase in hickory species. These data suggest that the mesic forests of hemlock and oak were replaced by xeric forests of species such as hickory. In addition, grassland settings seem to have once again become wide spread on the Delmarva Peninsula. During the Sub-Boreal, estuarine resources change. Although sea level was still rising, the rate of change seemed to have been stable enough to support significant accumulations of estuarine resources.

By the Sub-Atlantic Episode, ca. 500 B.C., fluctuations in temperature and precipitation stabilized and conditions resembled those of the present. The variety of pollen data from the Delmarva Peninsula of this time indicate that environmental settings were able to support a wide range of mesophytic species. These environments also supported a variety of animal species. The dominant game animals of this episode were deer and turkey. After 500 B.C., the rate of sea level change stabilized and estuarine resources continued to accumulate.

Regional studies of past environments can also be applied to reconstruct the past environment of the Wrangle Hill Site area. The decline in sea-level rise has probably been most influential in shaping the current setting of this area. During the Late Glacial Episode, the site may have been either a dense forest of spruce and/or pine. By the onset of the Holocene (Pre-Boreal, Boreal episodes), the spruce pine mixtures would have been replaced by pine-spruce mixtures. The general warming replaced the coniferous forests with dense hardwood forests of oak, pine and hemlock.

Regional Prehistory

The following summary of regional prehistory has been abstracted from the work of Custer (1986, 1984, 1989). The prehistory of the Delaware Coastal Plain is divided into four periods: the Paleo-Indian Period (12,000 B.C. - 6500 B.C.), the Archaic Period (6500 B.C. - 3000 B.C.), the Woodland I Period (3000 B.C. - A.D. 1000), and the Woodland II Period (A.D. 1000 - A.D. 1650). A fifth time period, the Contact Period, from A.D. 1650 to A.D. 1750, marks the final phase of occupation by Native American groups in Delaware in anything resembling their Pre-European Contact form (Figure 5).

Paleo-Indian Period (ca. 12,000 B.C. - 6500 B.C.). The Paleo-Indian Period encompasses both the final retreat of Pleistocene glacial conditions from eastern North America and the subsequent establishment of more modern Holocene environments. The distinctive feature of the Paleo-Indian Period is an adaptation to climatic changes; from the cold climate of the end of the Pleistocene to the alternatively wet and dry climate marking the beginning of the Holocene. Paleo-Indians practiced a hunting and gathering subsistence in which animal food resources comprised a major portion of their diet. Hunted animals may have included now extinct megafauna and moose. A mosaic of deciduous, boreal, and grassland environments in central Delaware would have provided numerous productive habitats for such animals. Watering areas would have been particularly good hunting settings.

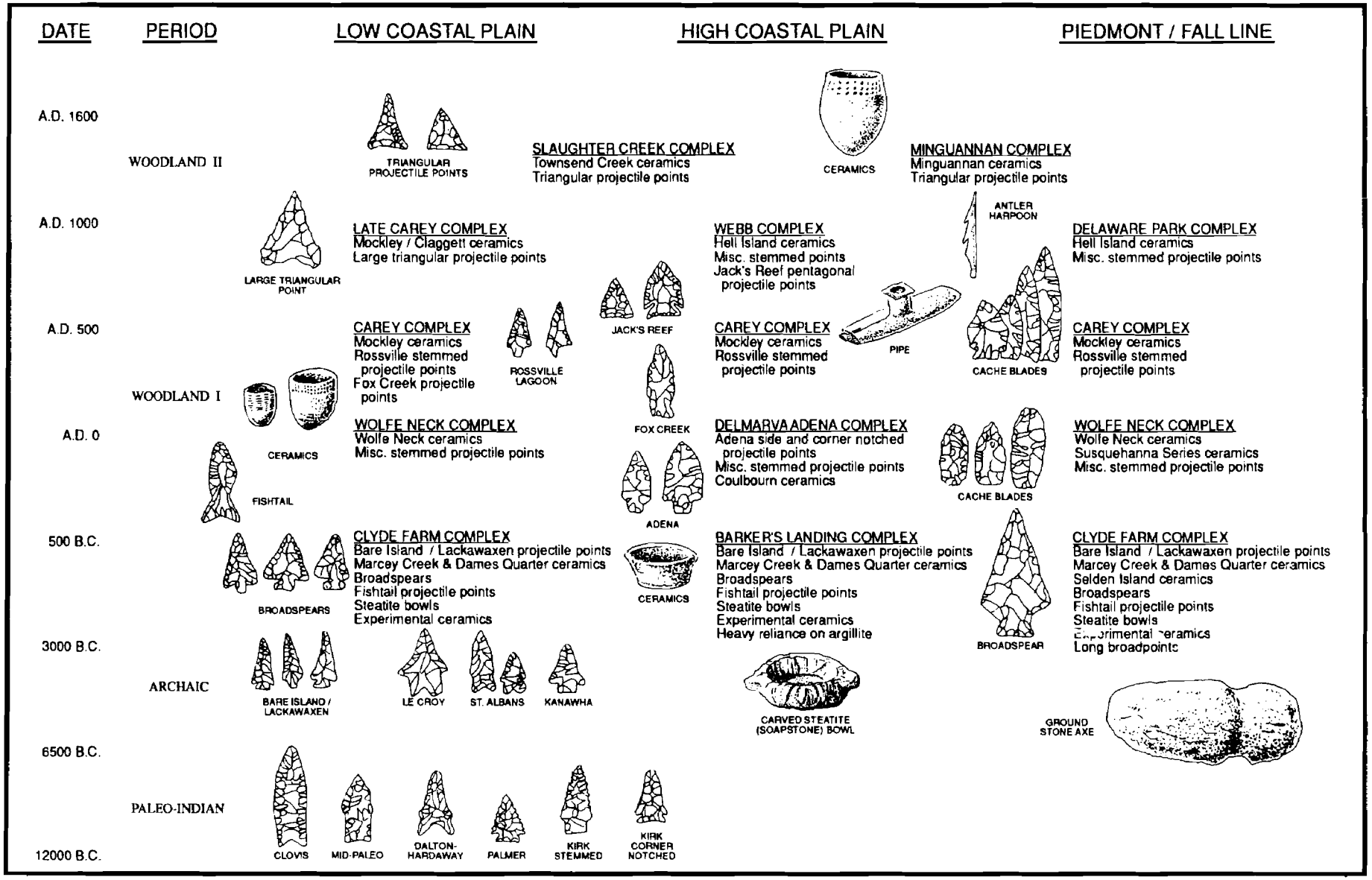
Tool kits of Paleo-Indian groups were oriented toward the procurement and processing of hunted animal resources. Preferences for high quality lithic materials are apparent in flaked stone tool kits. Careful resharpening and maintenance of tools was common. Mobile groups of single and multiple family bands are hypothesized to have focused on game attractive environments for settlement. Throughout the 5,500 years of this time period, the basic adaptive lifestyle remains consistent with some modifications being seen as Holocene environments appeared at the end of the Paleo-Indian Period.

Numerous Paleo-Indian finds are noted in Central Delaware. These finds are usually made on well-drained knolls adjacent to poorly drained areas. Unfortunately, all finds are also surface find spots and shed little light on Paleo-Indian lifeways on the Delmarva Peninsula. The Hughes Paleo-Indian Complex (sites 7K-E-10, 7K-E-24, and 7K-E-33), produced several varieties of fluted and notched points from sites which are well-drained areas adjacent to various swampy settings (Custer 1984:58). Bay/basin features are also hypothesized to have attracted Paleo-Indian groups; however, no clear association has been observed.

Archaic Period (6500 B.C. - 3000 B.C.). The Archaic Period is characterized by the complete emergence of the Holocene environment in central Delaware. Mesic forests of oak and hemlock predominated in the Holocene climate while grasslands diminished. Consequently, many of the grazing animals, hunted during Paleo-Indian times, became extinct while browsing species such as deer flourished.

FIGURE 5

Cultural Periods of Delaware Prehistory



The beginning of the Holocene in central Delaware is also associated with a rise in sea level. This rise resulted in a rise in the water table, creating numerous large interior swamps. Adaptations shifted from the hunting focus of the Paleo-Indian Period to a generalized foraging pattern in which plant food resources played a more prominent role. Swamp settings, such as Churchman's Marsh in northern Delaware, supported base camps, as indicated by archaeological excavations at the Clyde Farm Site. Numerous small procurement sites in favorable hunting and gathering locales are recorded in central and southern Delaware.

Differences between the adaptive subsistence patterns of the Archaic Period and the Paleo-Indian Period are also reflected in the tool kits. In addition to the introduction of plant processing tools such as grinding stones, mortars, and pestles, Archaic tool kits were more generalized than those of their Paleo-Indian precursors. A mobile lifestyle was still practiced, with a wide range of resources and environmental settings utilized on a seasonal basis. A shifting band level of organization, which saw the waxing and waning of group size in response to seasonal resource availability, is evident.

Woodland I Period (3000 B.C. - A.D. 1000). The Woodland I Period coincides with dramatic local climatic and environmental shifts. These shifts seem to be part of larger scale changes occurring throughout the Middle Atlantic region at this time. The emergence of pronounced warm and dry conditions caused the mesic forests to be replaced by xeric forests of oak and hickory and once again grasslands became common. Although some interior swamps disappeared, the overall effect of these changes was not a degradation, but rather an alteration of the environment. The continued rise in sea level, although at a reduced rate, created many large brackish marshes around the Delaware River and Bay Shore. These marshes were especially high in productivity.

These changes in environment and resource distributions brought about a radical shift in adaptations for prehistoric groups. Important areas for settlements included the major river floodplains and estuarine swamp/marsh areas. Large base camp sites have been identified at several of these types of environmental settings in central Delaware. Some of these large base camp sites include the Barker's Landing, Coverdale, Hell Island, and Robbins Farm sites. These sites seem to have been occupied by larger groups than those occupying Archaic base camp sites and may have been the loci of year-round habitations. Overall, the Woodland I Period tended toward a more sedentary lifestyle compared to the former periods.

Woodland I tool kits also reflected the practice of a more sedentary lifestyle. Chipped stone tool assemblages changed little from the preceding Archaic Period, although more broad-blade, knife-like processing tools became prevalent. Plant processing tools became more common. These types of tools indicate intensive harvesting of wild plant foods which may have approached the efficiency of agriculture by the end of the Woodland I Period. The addition of stone, and later ceramic, vessels is also seen. These containers enabled more efficiency in the cooking of certain foods and may have also functioned as storage containers for surplus plant foods. Storage pits and house features from the Woodland I Period have also been identified in Northern Delaware at sites such as Clyde Farm and Delaware Park.

Social organization also changed radically during this period. The onset of relatively sedentary lifestyles and intensified plant harvesting yielded occasional surpluses and may have instigated the development of incipient ranked societies. Indicators of this development include evidence of extensive trade and exchange of lithic materials to be used in tool manufacturing as well as for non-utilitarian artifacts, and caching of special artifact forms.

Woodland II Period (A.D. 1000 - A.D. 1650). In many areas of the Middle Atlantic, the Woodland II Period is characterized by the appearance of agricultural food production systems. However, this shift in subsistence strategy is not apparent in the Coastal Plain of Delaware (Custer and Cunningham 1986:24). Occupation of many Woodland I settlements, especially the large base camps, continued throughout the Woodland II Period, with few changes in basic lifestyles (Stewart, Hummer, and Custer 1986). Intensive plant utilization and hunting remained the basic subsistence activities up to European Contact. Similarly, no major changes are evident in social organization during this period in central Delaware.

Contact Period (A.D. 1650 - A.D. 1750). The arrival of the first substantial number of Europeans marks the beginning of the Contact Period. Due to the paucity of known archaeological sites clearly dating from this time, this period remains enigmatic for Delaware. Site 7NC-C-42 in northern New Castle County and the Dragon Run Site (7NC-G-104) are the only sites with Contact components yet investigated in Delaware (Custer and Watson 1985; Kellogg et al. 1994). These sites' small size, impoverished assemblage of European goods, and persistence of aboriginal lithic technologies contrast with the larger Contact sites of neighboring southeastern Pennsylvania and elsewhere. It seems clear that Native American groups of Delaware did not participate in much interaction with Europeans and were under the virtual domination of the Susquehannock Indians of southern Lancaster County, Pennsylvania. The Contact Period ended with the virtual extinction of Native American lifeways in the Middle Atlantic area with the exception of a few remnant groups.

Previous Research

The Wrangle Hill Site (7NC-G-105) was identified by the University of Delaware Center for Archaeological Research during a Phase I survey of the right-of-way for the proposed State Route 1 Corridor (Hodny, Bachman, and Custer 1989). Surface visibility was very limited due to post-harvest corn stubble left on the ground by no-till agriculture; therefore, a series of shovel test pits was excavated across the site area (Hodny, Bachman, and Custer 1989:59-62). Two argillite, one quartz, one chert, one jasper, and two quartzite flakes were recovered from the plow zone of three shovel test pits. In addition, one argillite flake was collected from the surface. The artifacts and location of the site suggested a procurement site according to settlement models established by Custer (1984) and Custer and DeSantis (1986).

Additional test excavations consisted of twenty-nine 1- x 1-meter units placed to define the site limits, locate features, and explore the sediments of the site (Figure 6). Twenty-three of the units contained artifacts in the first level excavated below the disturbed plow zone. Six of the units also had artifacts in the second level below the plow zone. Three units were expanded into 2- x 2-meter squares to expose features. Features 1, 2, and 3 were prehistoric pits. Feature 4 was a lens of light tan silty clay, approximately 10 - 15 centimeters thick, overlying the orange silty clay that formed the subsoil of the site (Kellogg et al. 1994:40-44).

Based on the artifact densities, the core of the site was defined as a diamond-shaped area of about 400 square meters (Figure 6). Features 1-3 fell within the core area, with Feature 4 covering the northern half of the core. Cultural material recovered from the site (Table 1) included 167 flakes of a variety of stone materials dominated by ironstone (55%), five bifaces, and six fragments of prehistoric

TABLE 1

Artifact Counts from Initial Testing

	RAW MATERIALS							
	Quartzite	Quartz	Chert	Jasper	Argillite	Ironstone	Other	TOTAL
Flakes	16 (1)	18 (2)	9	15	1	92	16 (1)	167 (4)
Utilized flakes	2	7 (1)	--	2 (1)	--	4	3 (1)	18 (3)
Flake tools	2	4	2	2 (1)	--	1	2	13 (1)
Woodland I points	--	--	--	1	--	1	--	2
Other bifaces	1	1	--	--	1	--	--	3
Miscellaneous stone tools	--	--	--	1	--	--	--	1
Shatter	--	1	--	--	--	--	--	1
Cores	2 (1)	--	--	--	--	--	--	2 (1)
TOTAL	23 (2)	31 (3)	11	21 (2)	2	98	21 (2)	207 (9)

(#) = with cortex

Prehistoric ceramics = 5 Nassawango
1 possible Coulbourn

Ground stone tools = 1 possibly fire-cracked
Fire-cracked rock (count/weight) = 18/3576.0 grams

ceramics (Kellogg et al. 1994:44). The prevalence of ironstone among the lithic raw materials is unusual for the region. The bifaces are not distinctive - two are tips only, but all probably date to the Woodland I time period. Five fragments of possible Nassawango ceramics and one possible Coulbourn sherd were recovered in Feature 1. Based on these data, the occupation of the site occurred during the Woodland I Period, perhaps with a Delmarva Adena Complex component. Because the site contained intact features and had the potential to yield important data on prehistoric lifeways in Delaware, further excavations were undertaken.

Research Design

Additional excavations at the Wrangle Hill Site were undertaken in order to better determine the potential significance of the archaeological material. Three general research goals guided the excavations. First, a large excavated sample of the plow zone was desired to insure an adequate assemblage of artifacts for lithic raw material, flake attribute, and ceramic type analysis. Collection of material from the plow zone is essential to allow comparisons with other sites in northern Delaware, since so many have been plowed. Second, a thorough investigation of the buried soil was needed to establish the relationship between site occupation and sequences of sediment deposition on the site. Third, excavation of the prehistoric cultural features below the plow zone was undertaken in order to provide information on settlement and subsistence from undisturbed contexts.

Other wide-ranging research issues were also addressed based on numerous studies (Custer 1986; Custer and DeSantis 1986; Custer and Bachman 1986; Custer, Bachman, and Grettler 1987) for example, studies of lithic material use on the Delmarva Peninsula tie the area into the larger Mid-Atlantic region because trade and exchange of raw material seems to have been significant at various times in the past, especially during the Barkers Landing, Delmarva Adena, and Webb Complex occupations of the Woodland I Period (Custer 1989:297). Extensive trade and exchange networks may have required

a more complex social structure. Therefore, studies of lithic raw material use are essential for establishing the social context of Woodland Period occupations at the site. On a more local scale, lithic materials reflect seasonal movements of people, or hunting and gathering rounds. Flake attribute analysis (Lowery and Custer 1990) can be used to study the organization of lithic technology with regard to these issues.

Only six small ceramic sherds were recovered from test excavations at the Wrangle Hill Site. The sherds contain some small pieces of burnt clay in the temper, as well as crushed quartz, grit, and sand. Because burnt clay temper is diagnostic of Delmarva Adena related ceramics (Custer 1987) a larger, more definitive sample of ceramics was needed to verify and characterize the Delmarva Adena occupation of the Wrangle Hill Site. Excavation of a large sample of the plow zone would also increase the likelihood of recovering other Adena-related items, such as pipe fragments and distinctive bifaces forms. Based on the site distribution shown by Custer (1989:252), the Wrangle Hill Site could possibly be the most northerly Delmarva Adena site in Delaware.

The presence of large, prehistoric pit features at the Wrangle Hill Site is unusual (Kellogg et al. 1994:43). The size and location of the Wrangle Hill Site suggests limited activities carried out during procurement forays from larger base camps (Custer 1989:189, Figure 38). However, the presence of deep pit features similar to those found at the Delaware Park Site (Thomas 1981) suggests more diverse activities and longer occupation, perhaps a micro-band campsite. Furthermore, like the surface below the silt lens on the site, the pit features hold undisturbed cultural deposits untouched by the plow. Pit features also offer better preservation for ceramic and organic remains than exposed surfaces; therefore, more diverse cultural data may be recovered from features. Organic remains can yield information on prehistoric diet and seasonality of site occupation that would help to refine settlement models. Therefore, excavation of the pit features can help to determine the duration and intensity of the site's occupation.

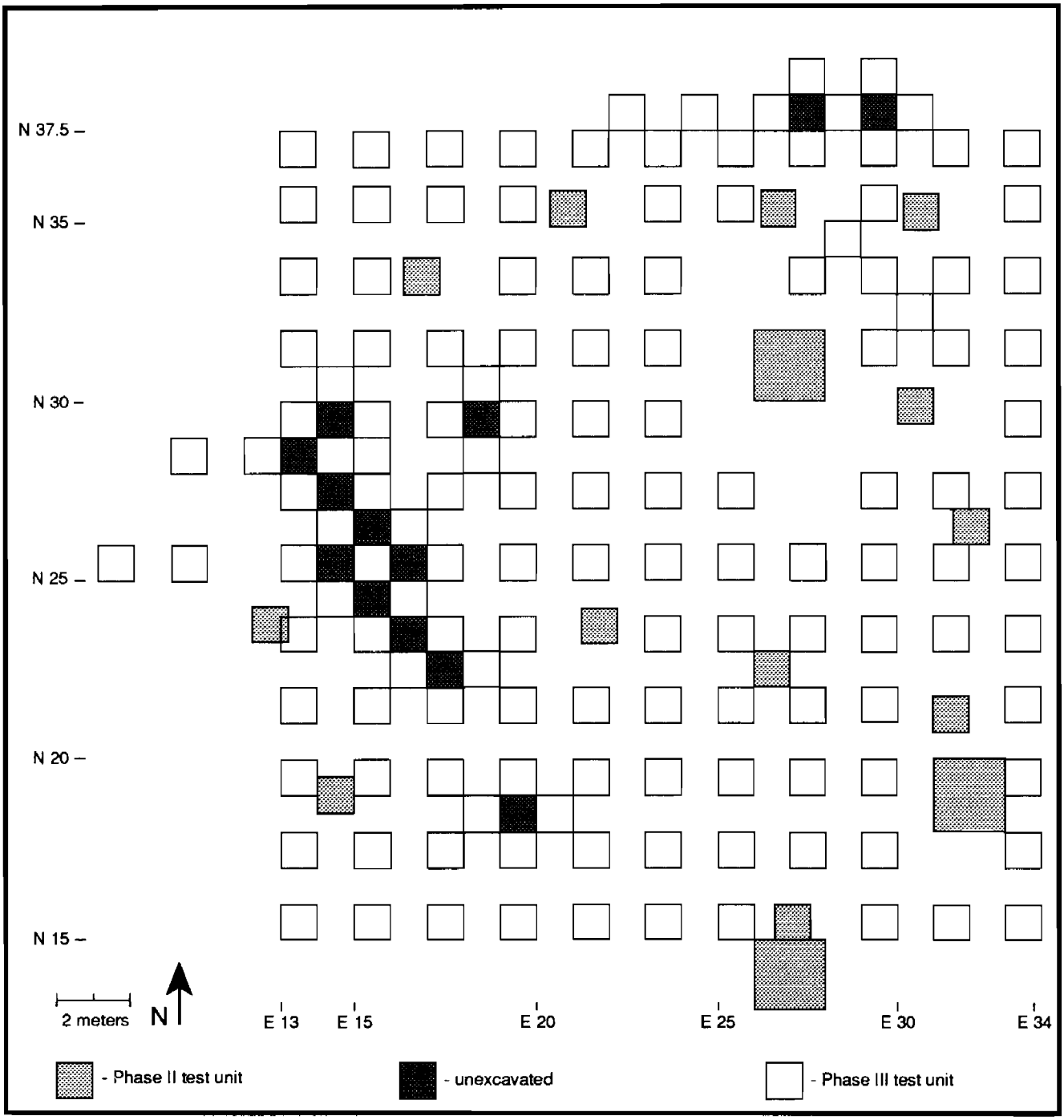
Research Methods

Final excavations at the Wrangle Hill Site included excavation of a 25 percent sample of the plow zone soils in the core area of the site (Figure 7, Plate 2). The sampling strategy was designed to document the density and distribution of prehistoric artifacts in the plow zone. The plow zone sampling also revealed feature locations and identified the limits of the buried soil. Within each excavation unit the plow zone was removed as a single stratigraphic layer. Sediments were sifted through 1/4-inch mesh screens and artifacts bagged for analysis (Plate 3).

The plow zone sample from the Wrangle Hill Site consisted of 156 1- x 1-meter square excavation units, 141 from the Phase III data recovery excavations and 15 from the Phase II test excavations.

After sampling was completed, the plow zone was mechanically stripped to expose features. Features appeared as darker, soil discolorations against the tan silt lens and red-orange, sub-plow zone soil. All features were mapped and excavated (Plate 4). Feature fill was removed according to internal stratification if present. Sediment samples were retained when artifacts were found within features as background control for blood residue analysis. Sediment samples for flotation were also taken from each feature.

FIGURE 7
Plow Zone Test Units



To further investigate the buried soil of the site, 40 of the plow zone squares were excavated into the soil as it was exposed after stripping the plow zone. Excavation within the silt lens was by five-centimeter levels. The first six squares were excavated in 50-centimeter square quadrants to establish tighter provenience for artifacts recovered; however, the artifact content of the buried soil was very low and the remaining squares were not divided into quadrants. Excavations extended at least one five-centimeter level into the red-orange soil underlying the silt lens.

PLATE 2

Plow Zone Test Units

All artifacts were washed and marked using the standard accession system developed by the staff of the Island Field Museum. A sample of lithic artifacts was sorted by raw material type and functional category and then analyzed for blood residues prior to being washed according to standards developed by Custer, Ilgenfritz and Doms (1988). All lithic artifacts were cataloged by raw material type and functional categories including projectile point/knives, bifaces, retouched flake tools, ground stone tools and debitage. Cortex on lithics was noted for study in cobble utilization and bifaces were sorted into rejects and discards for study of the tool manufacturing sequence according to the work of Callahan (1979). Several samples of debitage were characterized according to procedures outlined by Lowery and Custer (1990) and (Riley et al. 1994: Appendix II).

Flotation samples of feature fill were ranked according to a set of criteria designed to maximize the recovery of significant information. Samples given a low priority were archived. Higher priority samples were processed using a water driven flotation tank with heavy fractions being collected in window mesh sized screen and light fractions collected in a silk bag. After drying, the samples were inspected and further ranked. All artifacts and ecofacts were removed and cataloged from the most promising samples, and from samples from features of particular interest. The remaining samples were archived for future researchers.

PLATE 3

Screening Plow Zone Soils

PLATE 4

Excavating a Feature