III. ENVIRONMENTAL SETTING

A. OVERVIEW

The Drawyer Creek South Site is located within the Atlantic Coastal Plain physiographic province, a level and low-lying surface that lies between the submerged continental shelf and the rugged crystalline rock formations of the Piedmont province to the west. The eastern edge of the Piedmont is known as the fall line, where streams descend via rapids and waterfalls from rocky upland surfaces to the level expanse of the Coastal Plain. The Coastal Plain is composed principally of unconsolidated sands, clays, and gravels of marine and fluvial origin.

Drawyer Creek is tidal, and the boundary between fresh and salt water is just west of the Drawyer Creek South Site. There are large tidal marshes along Drawyer Creek. Drainage has undoubtedly changed with the development of agriculture and the resulting loss of wetland acreage; also, there is a difference between Drawyer Creek environs (fewer wetlands) and southern Delaware, where bay/basin ponds, and a broad range of wetlands exist.

The Drawyer Creek South Site is situated approximately one kilometer northeast of Odessa, Delaware, just upstream from the confluence of Drawyer Creek with the Appoquinimink River. This is considered part of the mid-drainage region of the Upper Coastal Plain in Delaware (Custer 1984:25). The site environs are composed of a heavily dissected interfluve drained by small intermittent tributaries of both Drawyer Creek and the Appoquinimink River. Most of the wetlands are associated with the margins of the larger drainages. South of Fieldsboro, however, the upland landscape is dominated by small wetland areas and bay/basin ponds.

The elevation on the Drawyer Creek South Site varies between 10 and 20 feet above sea level. The local geology underlying the site is comprised of Hornerstown Formation deposits, which are fine to medium fine sandy silts and sands of Paleocene age (Pickett and Spoljaric 1971). Further east, toward the Delaware shore, more recent sand and silt deposits of the Vincentown and Calvert formations are exposed at the surface.

One explanation for the origin of the Coastal Plain uplands such as those surrounding the Drawyer Creek South Site has been proposed by Knox (1983). The Coastal Plain uplands are believed to be the result of rapid downcutting by area streams during periods of extensive runoff. Prior to this, during the early Holocene, patterns of precipitation had resulted in the accumulation of stable floodplain deposits in many of the stream valleys in eastern North America. By 6,000 years ago, however, the climatic pattern shifted to one dominated by more intense storm activity and river channel cutting. At that time, downcutting in Coastal Plain stream valleys would have resulted in the isolation of the older floodplain deposits in settings of higher elevation. This pattern was again followed by a trend toward the accumulation of floodplain sediments.

Another means of sediment accumulation on Delaware's Coastal Plain was the intense aeolian or wind-blown deposition of fine sediments which appears to have been most prevalent during the period between 6,000 and 2,000 years ago, during the Xerothermic maximum (Carbone 1976; Curry 1980). Curry and Ebright (1990:7) have noted that sites buried by aeolian deposits may be

differentially buried across the site. That is, local aeolian processes may have buried some components more deeply, while others are either shallowly buried or mixed with earlier and later occupations. Archaeological sites buried by these processes, as already mentioned, include sites all around the Chesapeake Bay region as well as in northern Delaware. The same factors were responsible for the burial of sites under fine sediments in the Middle and Lower Delaware Valley such as at Abbott Farm, near Trenton, New Jersey. Extensive investigations at Abbott Farm (Stewart 1987) and at sites in Delaware (Ward and Bachman 1987) have provided substantial documentation on the burial of Coastal Plain sites by wind-blown sediments.

Along Drawyer Creek, soils of the Tidal Marsh association predominate (Matthews and Lavoie 1970). The primary soil association in the area surrounding the Drawyer Creek South Site is Mattapeake-Sassafras. Mattapeake-Sassafras soils are well-drained and coarse-textured sediments found in upland settings. Nearby, in the poorly drained regions south of Fieldsboro, Sassafras-Falsington soils predominate, interspersed with well-drained sandy ridges, or relict dunes remaining from earlier landscapes.

The project area is contained within the Chestnut Oak-Post Oak-Blackjack Oak forest association (Braun 1950; Brush et al. 1976). The flora of this forest group includes red maple, black gum, white oak, sassafras, greenbrier, American holly, and Virginia pine. The vegetation in the project area can be characterized as oak-chestnut forest, with upland areas represented by mixed deciduous forests. Shelford (1963) includes the project area within the temperate deciduous forest biome (or oak-deer-maple biome). The region would have provided aboriginal populations with rich and varied biotic resources in the form of nuts, seeds, berries, fish, large and small mammals, and birds. The project area was forested at the time of this study.

The modern climate in the region is humid continental, with very minor local variations due to differences in elevation, valley position, and proximity to the Atlantic Ocean. Precipitation averages about 45 inches per year. The average annual temperature is 54 degrees Fahrenheit, and the average number of days with temperatures below freezing is about 100.

This region of Delaware has very little relief, with the exception of some of the stream valleys which have downcut through the relatively soft underlying sediments. The Drawyer Creek and Appoquinimink stream channels contain a large number of floodplain swamps, which during prehistoric times would have provided attractive habitats for both large and small game, as well as waterfowl. In the vicinity of the Drawyer Creek South Site, relief from the water's edge to the height of land is just under 60 feet. Upland flats surrounding the Drawyer Creek area tend to be well dissected by small intermittent and first-order stream channels, creating a continuous sequence of spurs overlooking both high- and low-order stream settings as well as tidal wetlands.

B. REGIONAL LITHIC RESOURCES

Cobbles of chert, jasper, quartz, and quartzite, as well as other siliceous materials, are found in secondary deposits in the region and were most likely utilized extensively by the occupants of the Drawyer Creek South Site. Many of these lithic resources, particularly quartz, quartzite, and jasper originate in the metamorphic formations of the Piedmont physiographic province. Rhyolite, which is represented to a very minimal degree in the site assemblage, originated in the Blue Ridge

mountains. The use of rhyolite is very evident in assemblages from the Late Archaic period in the Coastal Plain and Piedmont physiographic provinces, when perhaps the first marked expressions of trade are found in the region.

Debitage composed of these raw materials dominates most sites in the eastern Piedmont and the Coastal Plain. Many of these materials originate in secondary deposits of cobbles, as evidenced by the predominance of cobble cortex on artifacts from many of the region's sites. Custer and Galasso (1980) provide a comprehensive inventory and description of many of these Coastal Plain lithic raw materials.

Primary sources of siliceous raw materials in Delaware are also found within what is called the Delaware chalcedony complex (Wilkins 1976), a conglomeration of cherts, jaspers, and chalcedonies of variable knapping quality. Most of these materials are probably jaspers of variable knapping quality (Custer 1989:56), such as the material called Iron Hill jasper, found in an aboriginal quarry context at Site 7NC-D-34.

Argillite, found in Lockatong Formation deposits in the Piedmont region of northern Mercer County, New Jersey (Didier 1975; Widmer 1965:21-22), is also common on sites in the region (Custer 1989), although very little argillite was recovered from the Drawyer Creek South Site. Argillite was widely used for the manufacture of stone tools at Abbott Farm as early as the Late Archaic period. Its popularity as a raw material declined during the Late Woodland period, when it was replaced by jasper, chert, and other siliceous raw materials. Secondary or cobble sources of argillite were also utilized extensively.

C. PALEOENVIRONMENT

An overview of Middle Atlantic region paleoenvironments provided in the work of Carbone (1976) gives the background data essential for modeling man-land relationships throughout the Holocene. The description presented below is only an outline of major events and shifts in the composition of environmental settings that may have influenced prehistoric settlement patterns and lifeways in the Atlantic Coastal Plain. Relevant pollen data from the Middle Atlantic region come principally from Buckle's Bog near Meadow Mountain in western Maryland (Maxwell and Davis 1972), and from Cranesville Swamp, near the West Virginia-Maryland boundary (Cox 1968). Although other pollen data are available from sources closer to Delaware, incomplete profiles and a lack of radiocarbon-dated contexts make these data less useful. One of the more complete pollen sequences relevant to northern Delaware is from Dismal Swamp in northern Virginia (Whitehead 1972).

The climate circa 12,000 years ago, when the first aboriginal peoples entered the region, was relatively cool and wet compared to the present. Late Glacial period environments included forests dominated by spruce and pine as well as a mixture of other arboreal species not found in any present-day settings. Pollen sequences derived from coring bay/basin features in central Delaware show a predominance of spruce, pine, and birch circa 9000 BC (Webb et al. 1994). The cool, wet climate would have provided suitable conditions for bogs, ponds, and other types of wetlands throughout the Coastal Plain. Relict bog sites in many areas of the Middle Atlantic have produced evidence (e.g., fluted points and Early Archaic projectile points) of early Holocene occupations. These types of environments were prevalent throughout the Coastal Plain.

The Appoquinimink system and nearby drainages such as Drawyer Creek were subjected to marked changes over the last 10,000 years, as were most fluvial systems along the Atlantic coast. In late Pleistocene times, when the Atlantic Coastal Plain was far more extensive than it is today, the Appoquinimink River and Drawyer Creek were downcutting through pre-Holocene sediments characterized by a patchwork of wetland and well-drained surface features. With the withdrawal of the glaciers from areas further north, and with it a significant rise in sea level, the Delaware and Appoquinimink rivers and Blackbird and Drawyer creeks slowly expanded into viable estuarine systems. These estuarine systems had more or less stabilized by 4000 BC. By 1000 BC, tidal waters extended as far as Silver Lake, which is the present tidal boundary in the Appoquinimink system (Bedell et al. 1997). These systems provided the basis for incipient Woodland I subsistence practices as the Delaware Coastal Plain and interior environments assumed a modern character.

In late Pleistocene and early Holocene times, the fauna inhabiting the area would have included megafauna such as mastodon, mammoth, sloth, moose, caribou, bison, and musk-ox (Carbone 1974:94). Remains of such species have been found in submerged contexts along the Atlantic continental shelf (Edwards and Merrill 1977). Similar faunal assemblages have also been recovered from montane regions of the Middle Atlantic, particularly from cave and salt lick sites such as New Paris No. 4 Sinkhole (Guilday et al. 1964) in Bedford County, Pennsylvania; Natural Chimneys (Guilday 1962) in Augusta County, Virginia; Clark's Cave (Guilday et al. 1977) in Bath County, Virginia; and Cumberland Bone Cave (Franz and Slifer 1971; Gidley 1918; Gidley and Gazen 1938), near Cumberland, Maryland.

By middle Holocene times, climatic warming trends resulted in an increase of deciduous elements in the forests, resulting in forests of mixed deciduous-coniferous composition. The most dramatic change in climate over the last 18,000 years occurred between 12,000 and 9000 BP. This change included a marked increase in average temperature in eastern North America (Webb et al. 1993). Pollen data from Cranberry Glades, West Virginia, show a pine-birch forest around 9500 BP, followed by a forest dominated by oak, hemlock, and birch (Carbone 1976; Darlington 1943). In some of the broader valleys there is evidence of an oak forest, with conifers not as well represented (Gardner 1987). In Delaware, after 4000 BC, pollen data show a significant rise in oak (*Quercus*) and buttonbush (*Cephalanthus*) (a wetland species), both predominant in modern vegetation assemblages. This is supported by more recent core sampling of localities within Delaware, such as Walter's Puddle, Longhauser Pond, and Nowakowski Pond (Webb et al. 1994).

These pollen studies also show a significant hiatus in sedimentation in each of the sampled basins from circa 12,000 BP to 6000 BP. This observation seems to indicate desiccation and deflation of earlier sediment packages (Webb et al. 1994:46). The relatively dry climate may also have affected distributions of human activity in the region. The implications of the data are that the dry period may have lasted anywhere from 100 to 5000 years (Kellogg and Custer 1994:97), although it is likely that a portion of the sediments laid down after 12,000 BP were deflated by aeolian activity during the subsequent dry climatic episode.

After 11,000 BP bay/basin features may have been sought after as viable sources of fresh water in a region that was broadly affected by the drying climatic trend. These bay/basin features may also have been attractive settings for a variety of game species, thereby increasing the importance of these settings as critical resource areas (see Kellogg and Custer 1994:98-99). The overall rarity of

archaeological sites in Delaware dating prior to 6500 BP may be at least partially explained by the dry climate (Kellogg and Custer 1994:98). When found, Archaic sites in the region tend to be located near sources of fresh surface water.

Following 8500 BP, a warm and moist climate supported the growth of deciduous forests. Subsequently, during what is termed the mid-postglacial Xerothermic (5000-3000 BP), a drier climate supported xeric deciduous forests. During this period, hickory, chestnut, and oak would have been the predominant forest species, thereby providing an increasing abundance of nut resources in the region upon which the regional small mammal population subsisted. It is during this time that upland resources of the Coastal Plain would have been heavily exploited by Woodland I groups. A more open character in some of the region's forests would also have been common during this Xerothermic interval, creating greater diversity in regional habitats and increasing the carrying capacity of the environment.

Many of the faunal species characteristic of the area in late Pleistocene and early Holocene times were no longer present, as the faunal assemblage by this time had assumed a more or less modern character. However, the area would have remained a productive environment for the hunting and trapping of both large and small game. After 6500 BP, settlement around bay/basin features was relatively common, but use of such settings diminished in Woodland II times. This may be explained by a much lessened need for fresh water as a result of the moist climatic conditions.

By about 3,500 years ago, an essentially modern climate and associated forest cover characterized the region. Any changes that have occurred from 3,500 years ago to the present day are interpreted as minor shifts in a modern pattern, rather than as major changes in the climatic regime such as those that occurred earlier (Carbone 1976). These minor shifts include a cool, dry period from about AD 250 to 650 and another period of climatic deterioration, termed the Little Ice Age (AD 1200 to 1250) (Baerreis et al. 1976). Although these climatic shifts were not catastrophic in their effect on peoples living in the Middle Atlantic Coastal Plain area, some settlement shifts may have occurred in response to changes in the distribution of associated plant and animal populations.

The site setting at the Drawyer Creek South Site would have provided the requirements necessary to sustain a variety of temperate fauna, such as deer, bear, and elk, as well as smaller game animals. Fish and shellfish would have been readily available in nearby Drawyer Creek and the Appoquinimink River. Faunal species lists from excavated sites in the region show that shellfish as well as deer and small mammals were important components of prehistoric subsistence, especially in Woodland times.

Note: Based on paleoenvironmental data obtained from a number of sites in the Middle Atlantic region, it can be determined that when northern Delaware was first settled some 12,000 years ago, the climate was cool and wet and the region's forests consisted predominantly of spruce, pine, and birch. Wetlands, including ponds and swamps, were very common in the uplands, and streams which are tidal channels today were freshwater rivers at that time. Periods dominated by dry climatic conditions followed, and settlements tended to cluster in areas containing reliable sources of fresh water, such as the bay/basin features. By around 7,000 years ago, the climate became

warmer, and deciduous forests gradually replaced the northern coniferous trees. During the final dry-climate period, between 5,000 and 3,000 years ago, modern forests dominated by hickory, chestnut, and oak were established.