Phase IA Archaeological Investigations
Trussum Pond Bridge and Mill Dam

Little Creek Hundred, Sussex County, Delaware

Agreement No. 1779 / Work Order No. 1

THIS REPORT CONTAINS CONFIDENTIAL INFORMATION
NOT FOR PUBLIC DISTRIBUTION

Prepared for:

DelDOT

Delaware Department of Transportation
800 Bay Road
Dover, Delaware 19901

Prepared by:

Louis Berger

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Washington, D.C. 20037-1164

Final Report
May 22, 2017

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Abstract

On behalf of the Delaware Department of Transportation (DelDOT), Louis Berger completed a Phase IA Archaeological Investigation of the Trussum Pond Bridge and Mill Dam in Little Creek Hundred, Sussex County, Delaware. The Trussum Pond dam is an artificial impoundment across the James Branch of Broad Creek, forming Trussum Pond to its south. Bridge No. 349, constructed in the early 1970s, carries Rd. 72 over the James Branch and the dam. The dam was damaged by a flood event in September 2016, and as a result the road has been closed where it crosses the dam since that time. Substantial repairs are needed that will involve ground-disturbing activity, including replacement of the spillway. These repairs will be coordinated by DelDOT and Delaware Department of Natural Resources and Environmental Control, and will require a permit from the U.S. Army Corps of Engineers.

The purpose of the Phase IA investigation was to determine the archaeological resource potential of the area of potential effect (APE) and to provide a context for assessing the importance or significance of any archaeological remains that are present. DelDOT has defined the APE for this project as the entire dam and small areas of the shore adjacent to and on either end of the dam, covering an area measuring approximately 550x150 feet (168x46 meters), or approximately 1.9 acres (0.8 hectare). The investigation included background research, conducted March 28-30, 2017, and a field inspection, conducted March 28, 2017.

Based on the background research and field inspection, Louis Berger determined that the majority of the APE is not sensitive for prehistoric archaeological resources. Exceptions include small areas near the east and west ends of the existing dam that contain upland soils favorable for prehistoric habitation. Louis Berger recommends either avoiding these areas, if possible, or conducting additional archaeological investigation prior to any ground-disturbing activities.

Background research determined that the existing mill dam and Trussum Pond are associated with historic gristmills and sawmills that date to the eighteenth century. For a time the mills were owned by Levin Thompson, a free African American. At the time of his death, Thompson owned nearly 600 acres of farm and timberland in Little Creek and Dagsboro Hundreds, placing him among the top 5 percent of taxable landowners in Sussex County. This is no small feat in a time when the African-American population in Delaware was marginalized politically, socially, and economically. Identifying mill remains once associated with this individual would certainly help tell this significant story in the history of African Americans in the Lower Peninsula.

The field inspection determined that portions of the APE have been significantly disturbed by construction of Bridge No. 349 in the 1970s, as well as recent flooding and expedient repair work. Sensitivity for intact historic archaeological resources in these previously disturbed areas is low; however, the precise location of the historic mills is unknown and undisturbed portions of the APE therefore have a moderate potential to contain intact historic archaeological remains. Louis Berger recommends monitoring ground-disturbing activities in undisturbed portions of the APE adjacent to the existing bridge by a qualified archaeologist to identify and record any historic archaeological remains uncovered during such activities.

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I. Introduction

A. Project Description

On behalf of the Delaware Department of Transportation (DelDOT), Louis Berger completed a Phase IA Archaeological Investigation of the Trussum Pond Bridge and Mill Dam in Little Creek Hundred, Sussex County, Delaware (Figures 1 and 2). The Trussum Pond dam is an artificial impoundment across the James Branch of Broad Creek, forming Trussum Pond to its south. Bridge No. 349, constructed in the early 1970s, carries Rd. 72 over the James Branch and the dam. The dam was damaged by a flood event in September 2016, and as a result the road has been closed where it crosses the dam since that time. Substantial repairs are needed that will involve ground-disturbing activity, including replacement of the spillway. These repairs will be coordinated by DelDOT and Delaware Department of Natural Resources and Environmental Control (DNREC), and will require a permit from the U.S. Army Corps of Engineers (USACE).

The purpose of the Phase IA investigation was to determine the archaeological resource potential of the area of potential effect (APE), or project area, and to provide a context for assessing the significance of any archaeological remains that are present. DelDOT has defined the APE for this project as the entire dam and small areas of the shore adjacent to and on either end (Figure 3). The APE covers approximately 550x150 feet (168x46 meters), or approximately 1.9 acres (0.8 hectare).

B. Scope of Services

Louis Berger assessed the archaeological potential of the project area through background research and a field inspection. Background research included reviewing site files and previous cultural resource reports related to the project vicinity at the State of Delaware-Division of Historical and Cultural Affairs and using their online Cultural and Historical Resource Identification System (CHRIS), reviewing soil survey data (United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS] 2017), and consulting historical maps, local and regional histories, deeds, and other property records for the project area. The field inspection was conducted March 28, 2017. Background research for the project was conducted March 28-30, 2017.

All cultural resource services were performed using the professional guidelines and standards set forth in the *Procedures for the Protection of Historic and Cultural Properties* (36 CFR 800) and the *Procedures for Determining Site Eligibility for the National Register of Historic Places* (36 CFR 60 and 63). This investigation also conformed to the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 *Federal Register* 44716) (United States Department of the Interior 1983). The cultural resource specialists who performed this work satisfy the Secretary of the Interior's Professional Qualifications standards as specified in 36 CFR 66.3(6)(2).

This report has been organized into six chapters. Chapter II describes the project area's environmental setting, and Chapter III discusses the its cultural context, briefly outlining the 11,000-year history of the region and summarizing previous archaeological investigations in the vicinity. Chapter IV presents the results of the field inspection and sensitivity assessment. Chapter V provides conclusions and recommendations, and Chapter VI lists the references cited.

Louis Berger Principal Archaeologist John Bedell, Ph.D., served as Project Manager. Louis Berger Archaeologist Wesley Willoughby, Ph.D., completed the background research and conducted the field inspection. This report was written by Dr. Willoughby and Louis Berger Senior Archaeologist Stuart Fiedel, Ph.D. Principal Draftsperson Jacqueline L. Horsford prepared the graphics. Principal Editor Anne Moiseev supervised the editing and production of the report.

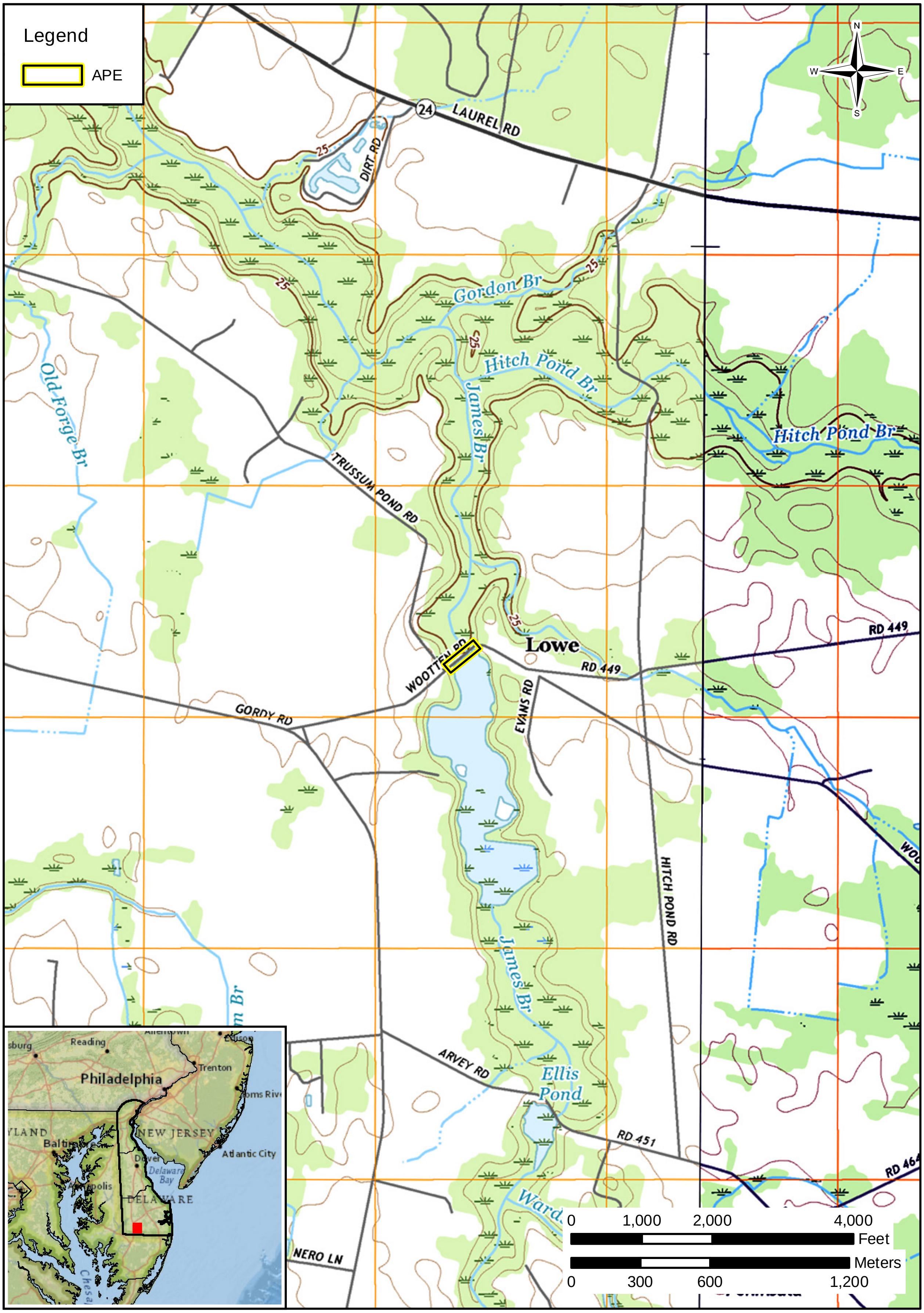

FIGURE 1: Location of Project Area (USGS Laurel 2016a, Trap Pond 2016b)

FIGURE 2: Overview of Bridge No. 349 from James Branch, Facing Southeast

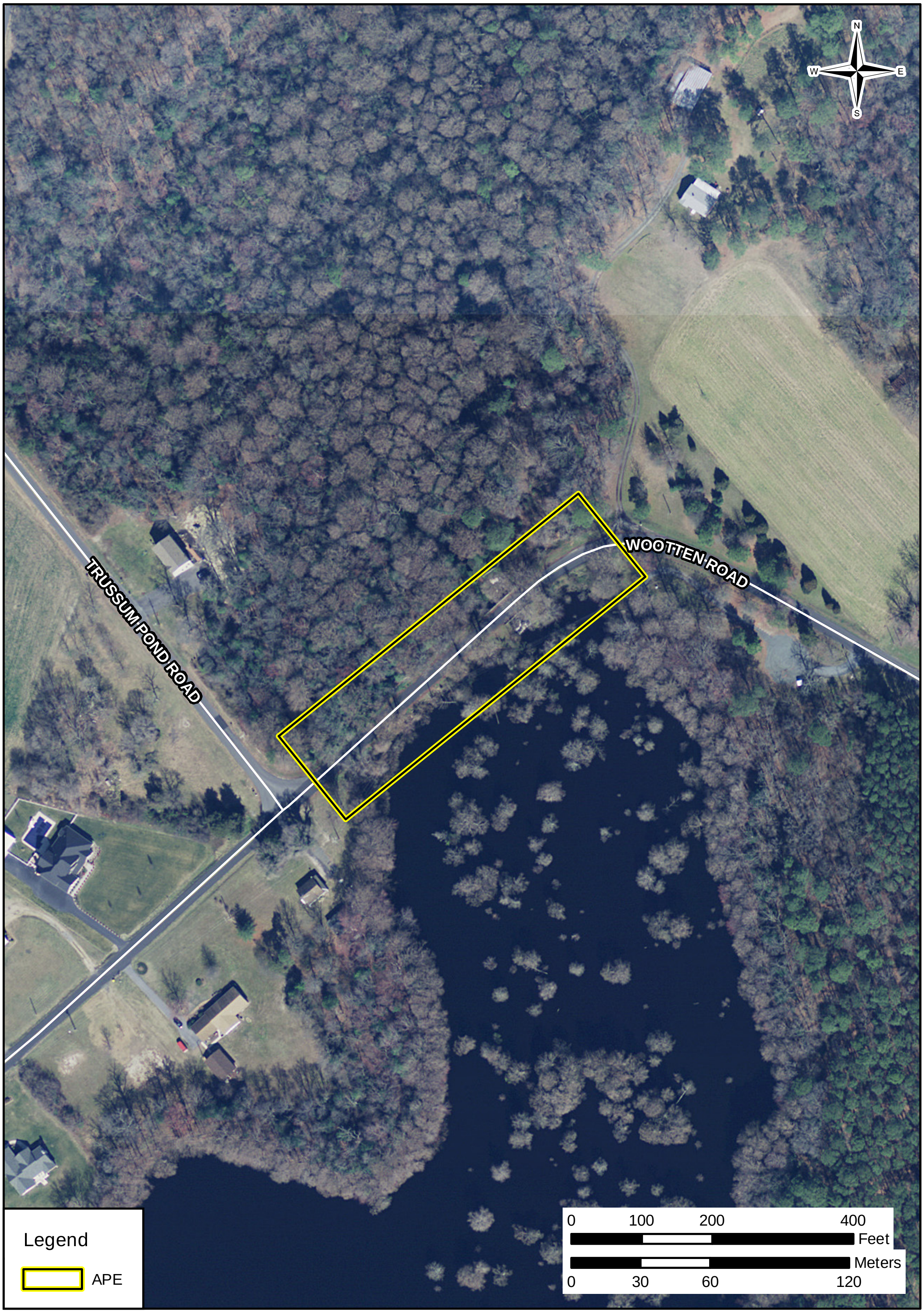

FIGURE 3: Aerial View of Project Area Showing APE (DEMAC 2012)

II. Environmental Setting

The project area is located along Rd. 72, just east of the intersection of Rd. 72 and Trussum Pond Road in Sussex County, Delaware (see Figure 1). DelDOT has defined the APE for the project as the entire dam and small areas of the adjacent shoreline (see Figure 3). Trussum Mill Pond is situated along the south side of the dam, with James Branch continuing north to feed into Broad Creek. James Branch is flanked on both sides by low-lying muck and cypress swamplands.

The project is located in the Atlantic Coastal Plain physiographic province and the Delaware Lower Peninsula/Cypress Swamp geographic zone. The Coastal Plain is underlain by the sands of the Columbia Formation and is relatively flat and featureless (De Cunzo and Garcia 1993:12). This area is characterized by extremely low topographic relief (less than 30 feet) and consists of sedimentary deposits covered by a thin veneer of young sand and gravel that was deposited in Delaware by Pleistocene glacial outwash (De Cunzo and Garcia 1993:12; Eiswert et al. 2014; Plank and Schenk 1998:17). The climate of the region is fairly moderate, as it lies in a transition zone between humid subtropical conditions to the south and humid continental conditions to the north. Delaware typically experiences four distinct seasons, although annual precipitation can vary significantly from year to year (Office of the Delaware State Climatologist 2017).

The project area is underlain by the Turtle Branch Geologic Formation. East of the Nanticoke River, this formation is characterized by clean, well-sorted, white to pale yellow fine sand grading down to interlaminated fine to coarse sand with opaque heavy mineral laminae, granules, and pebbles at its base. These Middle Pleistocene, Quaternary deposits are typically less than 10 feet thick in this portion of Sussex County (Ramsey and Tomlinson 2014).

As mentioned above, James Branch bisects the project area with Trussum Pond formed along the south side of the dam. James Branch continues north and west, eventually feeding into Broad Creek, just outside the town of Laurel, approximately 2.85 miles (4.59 kilometers) northwest of the project area. Broad Creek continues westward, eventually draining into the Nanticoke River, which eventually drains into the Chesapeake Bay on the Eastern Shore of Maryland, approximately 30 miles (48 kilometers) southwest of Trussum Pond.

Only two different soil types have been mapped in the project APE (USDA-NRCS 2017) (Figure 4; Table 1). The majority of the APE, particularly along the north side of the mill dam, consists of Puckum muck (Pk) with 0 to 1 percent slopes. This series is characterized as very deep, very poorly drained, decomposed organic deposits that typically accumulate in freshwater swamps on broad floodplains. Small portions of the APE near the east and west ends of the mill dam contain Evesboro loamy sand (EvD) with 5 to 15 percent slopes. These are very deep, excessively drained soils formed on flats, knolls, and ancient dunes in Coastal Plain uplands.

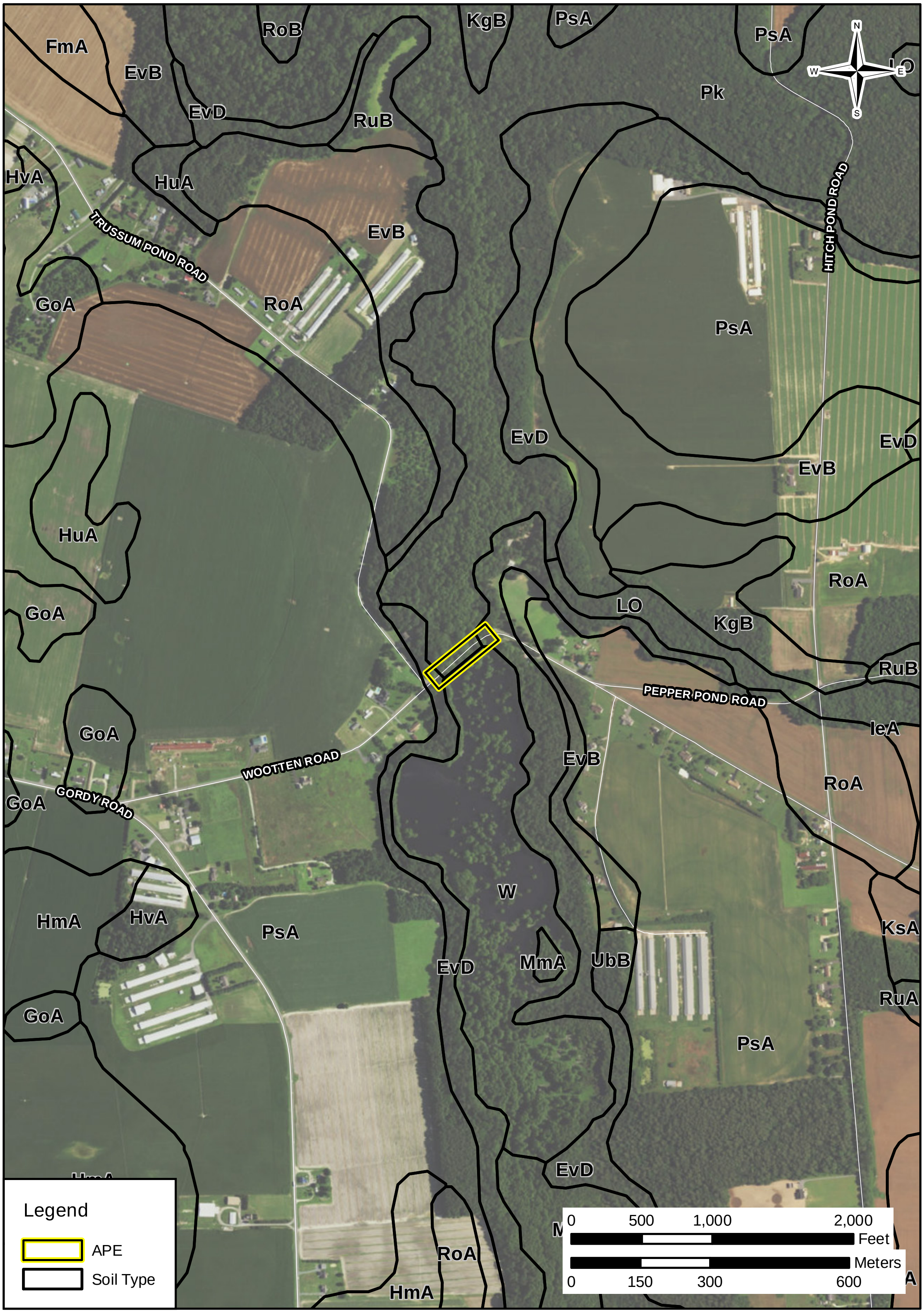

FIGURE 4: Soils Mapped in the Project Area (ESRI World Imagery 2015; USDA NRCS 2016)

TABLE 1

SOILS IN THE PROJECT AREA

NAME	SOIL HORIZON	DEPTH	COLOR	TEXTURE, INCLUSIONS	SLOPE %	DRAINAGE	LANDFORM
Puckum muck (Pk)	Oa1	0 – 4 in	VDk Brn	Muck	0 – 1	Very poorly	Swamps on broad floodplains
	Oa2	4 – 20 in	Dk Brn	Muck			
	Oa3	20 – 40 in	Dk Brn	Muck			
	Oa4	40 – 57 in	VDk Brn	Woody muck			
	Oa5	57 – 65 in	Dk Brn	Muck			
	Oa6	65 – 80 in	VDk Brn	Muck			
Evesboro loamy sand (EvD)	Oe	0 – 1 in	Blk	Mod. decomp. Plant mat.	0 – 40	Excessively drained	Coastal Plain uplands
	A1	1 – 2 in	VDk Gry Brn	Sa, Fi Roots			
	A2	2 – 4 in	Dk Gry Brn	Sa, Fi Roots			
	B/E	4 – 10 in	Dk Yw Brn/Lt Brn Gry	Sa, Fi Roots			
	BE1	10 – 36 in	Dk Yw Brn	Sa, Fi Roots			
	BE2	36 – 45 in	Yw Brn	Sa			
	BE3	45 – 62 in	Yw Brn	Sa			
	E and Bt1	62 – 76 in	Yw Brn/S Brn	Sa/Lo Sa			
	E and Bt2	76 – 96 in	Yw Brn/S Brn	Sa/Lo Sa			

KEY: *Shade:* Lt – Light, Dk – Dark, V – Very, Ple – Pale, S – Strong, Du -- Dusky. *Color:* Blk – Black, Brn – Brown, Gry – Gray, Grn – Green, Yw–-Yellowish, Ol – Olive, R – Red
Soils: Cl – Clay, Lo – Loam, Si – Silt, Sa – Sand, BdRk -- Bedrock.
Other: / – Mottled, Grl – Gravel, Fi – Fine, V – Very, M – Medium, Ex – Extremely, Fl – Flaggy, Ch – Channery, Co – Coarse, Fe - Iron
Source: USDA-NRCS 2017

III. Cultural Context

A. Prehistoric Background

1. Custer's Delaware Chronology

To better understand the temporal framework of the prehistoric occupations of this area, it is necessary to correlate the local sequence with broader regional patterns. All systems that divide a continuous archaeological record into temporal periods are, to some extent, arbitrary. In several sweeping syntheses of Delaware prehistory, Jay Custer (1984, 1989, 1994; Custer et al. 1996a,b) has formulated an idiosyncratic sequence of prehistoric cultural development in the state. He has extended this schema beyond Delaware's borders into eastern Pennsylvania (Custer 1996). The key assumptions that underpin Custer's chronology are as follows.

1) From the perspective of cultural ecology, human cultures are primarily adaptive structures, which respond appropriately to environmental change; therefore,

2) Episodes of major climatic/environmental change correspond closely to significant episodes of culture change (e.g., the Boreal/Atlantic transition provokes the Paleoindian to Archaic transition at 8500 rcbp; the Atlantic/Sub-Boreal transition precipitates the Archaic to Woodland I transition at 5000 rcbp).[1]

3) Maize-based horticulture never replaced foraging as the subsistence base in much of Delaware before European contact; therefore the temporal boundary defined elsewhere as dividing Archaic-stage hunter-gatherers from Woodland-stage farmers is inappropriate for Delaware.

4) Instead, increased sedentism, as manifest in creation of large base camps, is a more important distinction between earlier and later foragers. This development marks the beginning of Custer's Woodland I period.

5) The "Coe Axiom" (Brennan 1967; Coe 1964) is wrong: Projectile point styles are often not exclusive diagnostics of time periods or ethnic groups. For example, broadspears are tools of a specific function, added to local Late Archaic assemblages. They are contemporaneous with narrow stemmed points, part of the same cultural complex, and not markers of a new intrusive population.

Based on these assumptions, Custer has divided Delaware's prehistory into four major periods: Paleoindian, Archaic, Woodland I, and Woodland II.

a. Paleoindian (14,000 to 8500 rcbp)

This period, characterized by cultures with a mobile hunting adaptation, encompasses the terminal Pleistocene and the early Holocene. Elsewhere, the transition from lanceolate to side- and corner-notched projectile points at 10,000 rcbp (11,400 cal BP) is generally interpreted as the divide between Paleoindian and succeeding Early Archaic cultures. Custer observes, however, that in Delaware, settlement patterns,

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[1] Dates are presented variously in several formats: "rcbp" or "rcybp" refers to uncalibrated radiocarbon years before present ("present" by accepted convention is AD 1950); "cal BP" refers to calibrated or calendrical years before 1950 (generally earlier than radiocarbon ages, by as much as 2000 years at 11,000 BP [=13,000 cal BP]); "bc" and "ad" are uncalibrated dates before and after Year 1 (as used in many previous chronological schemes), and "cal AD" and "cal BC" denote calibrated calendar ages according to standard western usage.

reliance on cryptocrystalline lithic materials, and ancillary elements of the toolkit (e.g., endscrapers, gravers) display no significant changes until 8500 rcbp (9500 cal BP), when bifurcate points appear. Custer originally (1989:52) used this date of 8500 rcbp for the onset of the Holocene, but subsequently shifted to treating it as the boundary between early and mid-Holocene climate.

b. Archaic (8500 to 5000 rcbp)

In response to mid-Holocene warming, mesic forests dominated by oak and hemlock expanded across the mid-Atlantic region, replacing conifers. This vegetation change at 9500 cal BP was accompanied by the extinction of grazing fauna (Custer 1989:92). The human response was a change in weaponry to forms more appropriate for hunting smaller deciduous forest-adapted fauna—thus the appearance of bifurcate points. The regional water-table rises created swamps, where plant resources are increasingly utilized by people. The necessary processing technology for this new food source is grinding stones, which now appear in the archaeological record. Efficient, scheduled use of multiple resources within more confined band territories allowed greater sedentism, as manifest in the first appearance of base camps such as Clyde Farm (Site 7-NC-E-6).

c. Woodland I (5000 to 1000 rcbp)

A period of climatic oscillation between wet and dry conditions began at 5000 rcbp. Custer (1994:8) observes that his Woodland I period is "generally correlated" with the Sub-Boreal and Sub-Atlantic climatic episodes. During this period foragers established large base camps. The Delmarva Adena complex (2500 to 2000 rcbp) is a manifestation of far-flung exchange networks; elaborate mortuary ceremonies provided a focal point for the exchange of exotic goods. A similar mortuary/exchange system is manifest later at Island Field (Site 7-K-F-17) about AD 700 to 1000.

Custer (1994:4) emphasizes that Woodland I is a cultural period defined by similarities in adaptations and lifeways; it encompasses the three chronological periods recognized by archaeologists working in the region (Late Archaic, Early Woodland, and Middle Woodland). Custer's period is based on "similarities in cultural adaptations, not diagnostic lithic and ceramic artifact styles" (Custer 1989:143-4), as follows.

1) Development of estuarine and riverine adaptations stable and intensive enough to support large macroband base camps in the freshwater/saltwater interface zone and along floodplains of major drainages.

2) Population growth at single sites, or more intensive use of sites, producing sites much larger than earlier Archaic base camps.

3) Appearance of foraging and collecting adaptations (sensu Binford 1980) in less productive areas outside the estuarine and riverine settings.

4) Participation in long-distance exchange networks that moved both raw materials and finished artifacts.

5) Occasional participation in complex mortuary rituals that created cemeteries containing rich grave goods.

Previously, Custer (1984:144, 1989:297) more succinctly stated that, "The common characteristics of the Woodland I adaptations to the biosocial environments that existed between 3000 B.C. and A.D. 1000 in Delaware were the emergence of a focal adaptation and the appearance of a settlement system that was centered on large macroband base camps."

d. Woodland II (AD 1000 to AD 1650)

Woodland I mortuary/exchange systems collapsed about AD 1000. Although in many areas in the eastern woodlands, maize-based agriculture was adopted at this time, there is no evidence of significant dependence on crops in the Delaware Coastal Plain. Large base camps occupied during Woodland I continued to be used in Woodland II, and the basic foraging adaptation changed very little; however, emphasis apparently increased on plant foods and coastal resources (Custer et al. 1996a:19).

Despite some evidence of cultural continuity from Woodland I into Woodland II, Custer recognizes the possibility of major breaks in the following two domains.

1) Algonquian-speaking people may have intruded into the Middle Atlantic region around AD 200 to 800 (Custer 1989:310; Fiedel 1990).

2) In southern Delaware the period from AD 500 to 1000 is an archaeological blank. Custer fills this gap with a "hypothesized" Late Carey complex to account for perceived continuities from Woodland I into Woodland II cultures of the region, but admits (1984:135): "No known sites exist to be placed in this complex, and further field research will be needed to establish its validity" (see also Custer 1989:289).

2. Custer's Sequence vs. Alternative Chronological Schemes

Griffin (1952) established the period framework still used by archaeologists working in the eastern United States: Paleoindian, Archaic, Early Woodland, Middle Woodland, Mississippian (including Late Woodland). This accepted chronological scheme represents an uneasy blending of environmental, adaptive, and stylistic criteria of culture change, and an ambiguous mixture of temporal periods and stages of cultural evolution (Griffin 1952; Jennings 1974; Ritchie 1932, 1944, 1965; Willey and Phillips 1958). Further, it is clearly no coincidence that period boundaries tend to fall, perhaps too conveniently, at millennial disjunctions (e.g., 10,000 rcbp, 3000 rcbp, AD 0, AD 1000).

Ritchie (1965) presented the following clearly formulated and influential sequence of cultural stages for New York and adjacent regions.

I. Paleoindian Hunters (ca. 7000 BC)
II. The Archaic or Hunting, Fishing, Gathering Stage (ca. 3500 to 1300 BC)
III. The Transitional Stage—from Stone Pots to Early Ceramics (ca. 1300 to 1000 BC)
IV. The Woodland Stage—Development of Ceramics, Agriculture and Village Life (ca. 1000 BC to AD 1600).

The interface of Custer's Delaware scheme with the accepted regional sequence can be seen most clearly in his Pennsylvania synthesis (Custer 1996). Again, he lumps Paleoindian and Early Archaic into the 15,000 to 8500 rcbp period, "Life at the End of the Ice Age." The Middle Archaic is covered in a chapter on "The Lost Years?" 8500 to 5000 rcbp (Custer thinks this seeming hiatus is an illusion caused mainly by mis-dating of some stemmed point varieties). The Late Archaic (Woodland I), 5000 to 3000 rcbp, is discussed as "New Lifeways and New Environments." Early and Middle Woodland (3000 rcbp to AD 1000) are covered in "Cultural Development and Variation," and Late Woodland (AD 1000 to 1500) is "Village Life and Agriculture."

Custer (1996) distinguishes three parallel but coeval domains: cultural periods, chronological periods, and paleoenvironmental periods, as follows.

15,000 to 8500 rcbp
cultural period Hunter-Gatherer I
chronological period Paleo-Indian and Early Archaic
paleoenvironmental period Late Pleistocene and Early Holocene

8500 to 5000 rcbp
cultural period Hunter-Gatherer II
chronological period Middle Archaic
paleoenvironmental period Middle Holocene I

5000 to 3000 rcbp
cultural period Intensive Gathering-Formative, Part I
chronological period Late Archaic
paleoenvironmental period Middle Holocene II

3000 rcbp to AD 1000
cultural period Intensive Gathering-Formative, Part II
chronological period Early and Middle Woodland
paleoenvironmental period Late Holocene

AD 1000 to 1500
cultural period Village Life
chronological period Late Woodland
paleoenvironmental period Late Holocene

Table 2 presents the chronology of the Middle Atlantic region using the conventional period divisions and calibrated dates.

TABLE 2

PREHISTORIC CULTURAL SEQUENCE, MIDDLE ATLANTIC REGION

	APPROXIMATE DATES	
CULTURAL PERIOD	UNCALIBRATED*	CALIBRATED**
Paleoindian	11,000-10,000 rcbp, 9000-8000 BC	11,000-9600 cal BC
Early Archaic	10,000-8500 rcbp, 8000-6500 BC	9600-7600 cal BC
Middle Archaic	8500-5000 rcbp, 6500-3000 BC	7600-3800 cal BC
Late Archaic	5000-4000 rcbp, 3000-2000 BC	3800-2400 cal BC
Terminal Archaic	4000-3200 rcbp, 2000-1200 BC	2400-1400 cal BC
Early Woodland	3200-2500 rcbp, 1200-500 BC	1400-700 cal BC
Middle Woodland	2500-1100 rcbp, 500 BC-AD 900	700 cal BC-cal AD 1000
Late Woodland	1100-350 rcbp, AD 900-1600	cal AD 1000-1600
Contact	AD 1600-1700	cal AD 1600-1700

*Radiocarbon dates. **Calibrated (calendrical) dates, based on INTCAL13 program

3. *Paleoenvironments*

The climatic chronology to which Custer's scheme is keyed is that of Wendland and Bryson (1974) (Custer 1994:6). Carbone's (1976) thesis is an often cited (e.g., Custer 1994:6) application of that episodic chronology to the Middle Atlantic, and particularly to the Shenandoah region. Wendland and Bryson (1974) synthesized radiocarbon-dated abrupt pollen discontinuities throughout the Northern Hemisphere. They recognized discontinuities corresponding to the Boreal/Atlantic climatic transition at 8490 rcbp (9500 cal BP), the Atlantic/Sub-boreal at 5060 rcbp (5800 cal BP), and the Sub-boreal/Sub-Atlantic at 2760 rcbp (2850 cal BP). Additional transitions were evident at 10,030 rcbp (11,600 cal BP), 9300 rcbp (10,500 cal BP), 7740 rcbp (8500 cal BP), 6910 rcbp (7700 cal BP), 6050 rcbp (6900 cal BP), 4240 rcbp (4800 cal BP), 3570 rcbp (3900 cal BP), 1680 rcbp (1600 cal BP), and 850 rcbp (800 cal BP).

Four major developments in ancient climate research have occurred since the publication of the Wendland and Bryson chronology. First is the extension of tree ring-based radiocarbon calibration as far back as 12,500 cal BP (even in 1996, Custer could only calibrate dates back to 8000 cal BP). Second is the recovery of several ice cores from Greenland that offer decadal-scale detailed proxy records of temperature, snowfall, and wind patterns in the North Atlantic, extending from the present to 200,000 years ago (e.g., Steffensen et al. 2008). Pollen and chemical signatures in lake-bed sediments from Europe and America can now be tied to the dramatic climate-change events visible in the Greenland cores. Third, analyses of North Atlantic sediments have demonstrated a roughly 1,500-year recurrence of ice-rafted debris (IRD) events, which are interpreted as markers of sudden cold episodes accompanied by major reorganizations of atmospheric circulation (Bond et al. 2001). Fourth, a growing corpus of regional proxy records has been amassed (pollens, carbonates, midges, plant macrofossils), which shows both pan-continental episodes (e.g., Hypsithermal warming) but also local variability and out-of-phase changes of climate.

The salient episodes of climatic and environmental change in eastern North America during the Holocene now include the following.

The Laurentide ice sheet advanced during the Wisconsinan glacial period in the late Pleistocene to a maximal front stretching from Long Island through northern New Jersey and Pennsylvania. The ice started to retreat after 23,000 cal BP. Recession accelerated after the abrupt Bølling warming at 14,600 cal BP. This warm period was interrupted by the Younger Dryas cold episode (stadial), which began abruptly at 12,850 cal BP (11,000 rcbp). The Younger Dryas ended even more suddenly with a warming of about 5 degrees C in about 50 years at 11,650 cal BP (10,000 rcbp). This warming initiated the Holocene (or modern) epoch, which has entailed much smaller climate oscillations than the preceding Pleistocene (Mayewski et al. 2004).

The sharpest of the Holocene cold oscillations occurred early on: the Pre-Boreal Oscillation at about 11,300 cal BP, and the 8200 cal BP cold event (Alley et al. 1997). The latter has been attributed to the final massive draining of glacial Lake Agassiz into the North Atlantic, an event that would have disrupted thermohaline circulation. The flood event may also be related to accelerated wasting of the remnant Laurentide ice sheet and collapse of the Hudson Bay ice dome between 8400 and 7900 cal BP (Shuman et al. 2002). The effects of the 8200 cal BP event may have lasted for about 400 years. Ice sheet melting had negligible climatic effects after 6800 cal BP (Törnqvist and Hijma 2012); this date can be taken as the end of the early Holocene.

There was apparently a 200-year cooling event at 10,300 cal BP (9100 rcbp) (Bjorck et al. 2001). This event has been theoretically linked to reduced solar forcing, as inferred from a beryllium-10 flux peak (i.e., more intense cosmic radiation was affecting the atmosphere as insolation weakened).

The Laurentian ice shrank rapidly after 10,000 cal BP. A lowering of the ice mass may have caused significant changes around 9000 cal BP. Between 9000 and 8000 cal BP, summer monsoon rains intensified in the southeastern United States, causing a rise of lake levels and expansion of the range of moisture-tolerant southern pines. In the same period the mid-continent was arid; lake levels dropped and prairie expanded eastward. This was a period of maximum aridity in the Northeast. After the collapse of the

Hudson Bay ice dome (7900 cal BP), a decreased albedo effect, along with increasing influence of the Bermuda subtropical high, resulted in more moisture in the Northeast; lake levels rose and pines were replaced by beech and hemlock.

Variations in solar output seem to have caused the "Bond events," cooling episodes in the North Atlantic that occurred about every 1500 years throughout the Holocene, and probably also during the Pleistocene (Bond et al. 2001). The eight Holocene events are dated to about 11,100, 10,300, 9400, 8100, 5900, 4200, 2800, and 1400 cal BP. The modeled mechanism involves reduced solar irradiance, which triggered changes in stratospheric ozone that caused cooling of the atmosphere in high northern latitudes, a slight southward shift of the northern subtropical jet stream, and decreased Northern Hadley circulation. These atmospheric changes would then have led to increased North Atlantic drift ice, cooling of the ocean surface and atmosphere above Greenland, and reduced precipitation in low latitudes (Bond et al. 2001).

Viau et al. (2002) examined radiocarbon dates obtained for more than 700 pollen diagrams from across North America. These dates tend to cluster at significant discontinuities in the climate record. The major transitions identified by Viau et al. within the past 14,000 calendar years occur at 13,800, 12,900, 10,190, 8100, 6700, 4030, 2850, 1650, and 600 cal BP. Their analysis did not attach a direction (cooling or warming) to the vegetation changes observed at each transition, but it is clear that those changes were pan-continental. More recently, Gajewski, Viau, and Sawada (2007) have synthesized dates for North American and European pollen transitions, Bond events in the North Atlantic, and cold spikes in the Greenland ice cores, to identify trans-hemispheric "climate transitions" at 13,900, 12,800, 11,100, 10,300, 9000, 8100, 6800, 5900, 4200, 2800, 1600, 600, and 350 cal BP.

Apart from these hemispheric-scale climate events, several more localized developments (or local manifestations of the broader phenomena) would have significantly affected the human inhabitants of the Middle Atlantic region. Chesapeake Bay (originally the lower channel of the Susquehanna River in the late Pleistocene) rapidly changed from a freshwater to a brackish body between 8200 and 7400 cal BP, coincident with local sea level rise above 18 meters below the present level. This sudden saline flux was accompanied by the initial appearance of oysters in the bay (Bratton et al. 2003). These developments may have been a local result of the global eustatic sea-level rise (Meltwater Pulse 1d) (Liu and Milliman 2003) associated with the 8200 cal BP cold event; the sea level rose rapidly by about 2 to 3 meters (Törnqvist and Hijman 2012).

Based on periodic declines in the percentages of pine pollen in cores from the Chesapeake Bay, Willard et al. (2005) inferred the occurrence about every 1,400 years of cool, dry periods that each lasted 300 to 500 years. These seven pine minima are centered at 9500, 8100 (8300 to 000), 6000 to 5800, 4800 to 4100, 3500 to 2700, 1800, and 650 to 350 BP. They appear to correlate with Bond events (including the 8200 cal BP event and the Little Ice Age [AD 1300 to 1600]), and are taken to signify weakened solar activity, a change in the jet stream, and enhanced meridional circulation. An eighth pine minimum, designated as 4A, is recognized in the Chesapeake cores at 7000 cal BP, but there is no equivalent Bond event. These periodic pine declines are superimposed on a larger pattern: the amount of pine pollen doubled between ca. 5500 and 4800 cal BP, signaling the shift from deciduous to mixed deciduous-conifer forests in the Middle Atlantic region. This change was responsive to warming late-Holocene winters (warmer by 2 to 4 degrees C in January owing to increased winter sunlight), and to a slight increase in precipitation.

Relative pollen frequencies in these sediment cores have also provided data about nearby terrestrial environments (Willard et al. 1999). Early to mid-Holocene vegetation fringing the Chesapeake was diverse; oak was dominant, accompanied by abundant hickory, beech, pine, hemlock, sweetgum, and grasses. In the mid-Holocene beech and grasses declined around 6500 cal BP, followed in the mid- to late Holocene (between ca. 4000 and 2200 cal BP) by a doubling in frequency of pine, an increase in birch, and declines in oak, hemlock, and beech. Approximately synchronous pine increases have been observed in bogs and lakes in the Appalachians and Coastal Plain; they indicate increased precipitation in the late Holocene but punctuated by drought periods.

It is noteworthy that pollen cores have been obtained in northern Delaware (Custer 1996: figure 2) but none in the southern part of the state, so, apart from the cores in the bay sediments, there is no direct evidence of the sequence of terrestrial vegetation in this area.

4. Climate Change and Culture Change

A significant change in cultural adaptation may be signaled by the appearance (whether by invention, diffusion, or intrusive replacement) of an altogether new technology (e.g., boiling stones, manos and metates, pottery, bow and arrow). However, the meaning of more subtle changes in projectile point form in the eastern woodlands is less obvious. It is intriguing that most styles seem to have a duration of roughly 1,500 years. Not only does this roughly correspond to the length of North Atlantic climate events, but the moments of transition coincide so often as to raise the possibility of climatic causation (Table 3).

TABLE 3

CHANGES IN PROJECTILE POINT STYLES AND COEVAL CLIMATE CHANGE

STYLE CHANGE	DATE rcbp (cal BP)	CLIMATE (cal BP)
Fluted Point→notched point	10,000 (11,500)	YD to Holocene 11,500
Kirk→Bifurcate	8800 (10,000	10,300 cold
Bifurcate→Morrow Mt.	7300 (8000)?	8100 cold
Morrow Mt.→Brewerton	5700 (6700)	6700 (Atlantic 2)
Brewerton→Stemmed	4500 (5500)	5900 cold
Stemmed→Broadspear	3700 (4200)	4200 cold
Broadspear→EW stemmed	2700 (2800)	2800 cold
Adena intrusion	2500 (2800-2400)	2800 cold
EW stemmed→Selby Bay	1700	1650; end of dry period
Selby Bay→Jack's Reef	1200	1400 cold
Jack's Reef→triangles	900	1000 Medieval optimum

Fiedel (2014) proposes a causal chain that links abrupt climate changes, resource fluctuations, inter-male competition, and shifting societal boundaries as monitored by point styles. A crucial difference between this interpretation of the Middle Atlantic cultural sequence and Custer's is that Fiedel sees projectile points as both functional hunting and warfare weapon tips *and* emblematic artifacts indicative of male coalitions. Fiedel thus hypothesizes that successive expansions of distinctive styles are indicative of a series of mostly male migrations triggered by disruptive environmental changes. In contrast, Custer's assumption is that projectile points are entirely functional, and that they indicate only changing tasks within *in situ* populations. The consequences of these different perspectives are seen most clearly in interpretations of the ubiquitous appearance of broadspears at ca. 4200 cal BP (e.g., Custer 1991; Custer and Mellin 1986). In Custer's view broadspears were a useful new tool type that diffused rapidly through *in situ* local populations that continued using narrow stemmed points for many tasks (specifically, in the Barker's Landing II and Clyde Farm II complexes) (e.g., Custer 1994: figure 19). These groups would have been unusually amenable to borrowing new equipment because they were presented with new potential resources caused by environmental change. This model emphasizes changes in the marine environment, particularly the assumed stabilization of estuaries as the rate of sea level rise slowed. Sturgeon and other large anadromous fish began to migrate regularly up the eastern rivers ca. 6000 cal BP; the broadspears, in this view, were not projectiles at all but specialized knives devised to process these fish. Why it should have taken 2,000 years to develop the broadspears, and why they fell out of use ca. 3000 cal BP while sturgeon migrations continued to the present, are obvious questions that this interpretation does not address.

5. Synthesis of the Regional Culture Sequence

a. Paleoindian (11,000 to 9600 cal BC)

The Delmarva region figures prominently in ongoing debates over the timing and process of first human occupation of North America because of several finds of bipointed and small lanceolate bifaces and blade cores along the eroding eastern shores of the Chesapeake (Lowery, personal communication 2017; Lothrop et al. 2016; Stanford and Bradley 2012). At face value, based on stratigraphic position and radiocarbon and optically stimulated luminescence (OSL) dates, the artifacts found at Miles Point and Parsons Island would appear to be older than ca. 20,000 cal BP. However, supposed connections to the Solutrean culture of France and Spain (dated ca. 26,000 to 22,000 cal BP) are unconvincing, and the long temporal gap separating this material from Clovis (ca. 13,000 cal BP) is unexplained. All of the reported artifact forms can be matched in known Paleoindian assemblages.

The first securely attested occupants of the Middle Atlantic region were Paleoindian hunters, descendants of Northeast Asians who crossed Beringia about 14,500 cal BP. They entered the region around 13,000 cal BP (11,000 rcbp) (Fiedel 1999). The Paleoindians arrived at a time of abrupt climate changes at the end of the Wisconsin glacial, as spruce-dominated boreal vegetation was replaced by northward expansion of deciduous trees, and animals either migrated to new ranges or were driven to extinction. The diagnostic Paleoindian artifact is the basally fluted, lanceolate Clovis point; typically associated tools include scrapers and gravers for working hides and bones. These tools were often made of preferred high-quality stones such as jasper, chalcedony, and chert.

In the high Plains of the western United States, Clovis points have been found at kill sites alongside the skeletons of mammoths, but east of Missouri there is no unequivocal evidence of mammoth or mastodont hunting by eastern Paleoindians, even though radiocarbon dates show that mastodonts and other Pleistocene megafauna persisted in the East at least as late as 12,800 cal BP. Bone is usually very poorly preserved on eastern Paleoindian sites; the few odd bits of identifiable calcined bone that have been recovered indicate hunting of caribou or other cervids by the more northern bands; deer may have been a staple in the diet of more southern groups. Finds at the Shawnee-Minisink Site in the Upper Delaware valley, now precisely dated to 10,935±15 rcbp (Waters and Stafford 2007) show that the Paleoindian diet also included fish as well as berries and fruits (Dent 1985, 1991, 1999; Gingerich 2011, 2013).

It is noteworthy that the Pleistocene megafauna (mammoth, mastodon, ground sloths, etc.) collapsed not at the onset of the Holocene (11,600 cal BP), but more than 1,000 years earlier, at the onset of the Younger Dryas. Their extinction occurred only a few centuries after the arrival of Paleoindians, a temporal coincidence that strongly suggests human predation as a major causal factor (Fiedel 2009). In the absence of an adequate, well-preserved faunal record, we cannot be sure what late Paleoindians in the Middle Atlantic region were eating between 10,800 and 10,000 rcbp (12,700 to 11,500 cal BP), after the megafauna went extinct. Was their main prey woodland caribou, or deer? In the mid-South late Paleoindians of the Dalton complex relied on deer and waterfowl.

Stylistic variations in fluted points suggest gradual change and regional differentiation over time during the Younger Dryas, from an original ubiquitous Clovis or Early Paleoindian type, through the Mid-Paleoindian Barnes, Cumberland, Quad, and Debert types, to the Late Paleoindian Dalton and Hardaway types (Gardner 1974, 1989). The small number of Dalton points found north of the Carolinas may indicate a population collapse in the mid- to late Younger Dryas (Gardner 1989:39).

Quite apart from his equivocal pre-Clovis finds, Lowery has reported a remarkable concentration of Clovis points and other lithic artifacts along the eastern shore of the Chesapeake in Maryland and Virginia (Lothrop et al. 2016; Lowery 1989). These points are typically small, and they were made from locally procured jasper pebbles. Fluted points are concentrated in two areas of Delaware; between Newark and Elkton, and in the poorly drained mid-peninsular Drainage Divide (Custer 1984). The Newark/Elkton area is close to outcrops of high-quality toolstone. Isolated point finds and sites in the drainage divide are located near swamps and bogs that may have been frequented by megafauna and other game animals in the Terminal Pleistocene and Early Holocene. Fluted points and many Early Archaic notched points have been found at the Hughes Site complex (Sites 7K-E-10, 7K-E-24, and 7K-E-33) in central Kent County. Hughes's surface collections include Dalton-Hardaway points; points of this type also were found at the Crane Point Site in Talbot County, Maryland (Lowery 2017, personal communication).

A possible fluted point base, made of crystal quartz, was found at the Two Guys Site (7S-F-68). An unfluted lanceolate made of jasper may be a late Paleoindian artifact (LeeDecker et al. 1996). This site is located in Redden, about 20 miles (32 kilometers) north of Trussum Pond.

b. Early Archaic (9600 to 7600 cal BC)

The Pleistocene/Holocene transition was marked by a rapid warming at 10,000 rcbp (11,650 cal BP), the end of the Younger Dryas cold episode. During the ensuing early Holocene, cold-adapted conifers such as spruce were replaced by trees adapted to a temperate climate, such as oaks, which expanded northward from refugia in the Southeast. Mast-eating fauna, such as deer and turkeys, migrated north along with the temperate forest.

As the climate warmed, the regional human population apparently rebounded rapidly. Throughout the Middle Atlantic region Early Archaic (11,500 to 10,000 cal BP) sites, which frequently occur on large river terraces or upland surfaces, are more numerous than Paleoindian sites. A marked stylistic change is evident in the projectile points of the early Archaic; they begin to be notched near the base, either in the sides or the corners, instead of basally thinned. The meaning of this change in hafting technique is unclear. Because the spearthrower or atlatl was probably already used by Paleoindians, the new point styles cannot indicate its introduction, as was formerly speculated (Gardner 1974).

Side-notching seems to be slightly earlier than corner-notching; radiocarbon dates of ca. 10,200 to 10,000 rcbp are associated with side-notched forms in Alabama and Florida. At the St. Albans Site in West Virginia, a Kessell Side-Notched point came from one of the deepest levels (36), near a hearth dated to 9850±500 rcbp (Broyles 1966, 1971). Side-notched Taylor, Warren, and Big Sandy points may be comparably early, but few radiocarbon dates for these types are available. In any case these points seem to be rare in Virginia and northward. Corner-notched Palmer points, which are much more common in Virginia, seem to be of about the same age as Kessell points (ca. 11,500 to 11,000 cal BP); in fact two points ascribed to the Charleston type, which might as easily have been typed as Palmer/Kirk, were found in Zone 36 at St. Albans, near the Kessell point (Broyles 1971). A fragment of the basal corner of an ostensibly similar point was recovered from the deeply stratified Tuscarora Creek Site (18FR798) on the mid-Potomac, in loose association with a radiocarbon date of 9290±40 rcbp (Fiedel et al. 2005). At St. Albans, Kirk Corner-notched points in Zone 20 were associated with a radiocarbon date of 8930±160 rcbp; in Zone 18, still dominated by Kirk points, a date of 8850±320 rcbp was obtained. The shift from Kirk to bifurcate forms occurs in Zones 14-16, which contained a few intermediate-looking MacCorkle Stemmed points (Broyles 1971). Bifurcate-based, side-notched St. Albans points dominate Zones 12 through 10, dated to ca. 8800 rcbp (by two radiocarbon dates with very large standard errors).

In central Pennsylvania a stratified Early Archaic component was excavated at the West Water Street Site (Custer et al. 1996a). Kirk Corner-notched points were associated with a radiocarbon date of 9430±310 rcbp. Early Archaic sites frequently occur on large river terraces, as Paleoindian sites do, but Early Archaic sites are more numerous than Paleoindian sites; however, population density remained low. A comparison with the recent Native hunting peoples living in the similar environment of present-day northeastern Canada suggests that the territory of a single band of perhaps 150 to 250 people might have stretched from the Chesapeake Bay to the Blue Ridge, covering as much as half the state of Virginia (Custer 1990).

The presumed shift to smaller game, and perhaps initial use of nuts from the new deciduous trees, may have encouraged formation of smaller and less mobile social units. With increasing human population, fixed band territories may have been established. This should be reflected in more frequent use of local lithic resources. In fact there is rather ambiguous evidence of major differences between Paleoindian and Early Archaic lithic preferences. True, rhyolite, quartz and quartzite become more frequent in Early Archaic assemblages (Custer 1996:128), but high-quality cryptocrystalline stone continued in use. In Delmarva Early Archaic points are actually more often made on exotic lithics than Paleoindian points, which were mainly chipped from local jasper pebbles (Lowery, personal communication 2017). The Brook Run jasper quarry, in Culpeper, Virginia, was in use at about 9900 rcbp (Voigt 2002).

Many Early Archaic points are present in the Hughes Site complex in Kent County. To the west Lowery has found Early Archaic sites and isolates along the Chesapeake shoreline, e.g., at Crane Point in Talbot County (Lowery and Custer 1990). North of the project area, Palmer/Kirk and Decatur points were found at the Two Guys Site (LeeDecker et al. 1996). At Cactus Hill in southeastern Virginia, Decatur points were dated to ca. 9100 rcbp (McAvoy and McAvoy 1997).

c. Middle Archaic (7600 to 3800 cal BC)

The Middle Archaic period roughly corresponds to the Hypsithermal, a climatic episode marked at the continental scale by rising temperatures, decreasing precipitation (but perhaps not in the Southeast [Goman and Leigh 2004]), and the development of more seasonally variable climate. The warmest temperatures of the entire Holocene actually occurred at the beginning of the period, around 9500 cal BP (7500 cal BC). Around the Chesapeake, the forests were dominated by oak trees, accompanied by abundant hickory, beech, pine, hemlock, sweetgum, and grasses (Willard et al. 1999, 2005; Yuan 1995). Deer became the dominant large mammal. The growing human population changed its subsistence-settlement patterns. Sites are larger and more numerous, and a more diverse toolkit implies a broader range of subsistence activities than in the Early Archaic.

Diagnostic Middle Archaic projectile points include, from the earlier portion of the period, bifurcate-base point types (LeCroy, St. Albans, Kanawha), Kirk Stemmed, Kirk Serrated, and Stanly points, and from the later portion (after 6200 cal BC), Morrow Mountain, Brewerton, Guilford, Otter Creek, Halifax, and Lobate points. Non-diagnostic triangular points have also been recovered from Middle Archaic contexts. The ostensibly quite sharp stylistic break between bifurcates and Morrow Mountain/Stark points might provoke some hesitation about lumping these types together in a single Middle Archaic period, but one can view bifurcate–Kanawha–Stanly/Neville–Morrow Mountain/Stark as an evolutionary sequence.

Until recently, the bifurcate points dated ca. 8500 rcbp were classified as Early Archaic; however, the recent tendency (since the early 1990s) is to regard them as the first manifestation of the Middle Archaic (although some authors still classify bifurcates as Early Archaic, e.g., Kimball 1996).

In Pennsylvania site frequency increases sharply (by 135 percent) from the Early to the Middle Archaic (as demarcated by bifurcate-base points) (Adovasio and Carr 2009), and this appears to be the case throughout the region. During the Middle Archaic period sites began to appear in locations that had been previously ignored, such as upland swamps and interior ridgetops (Gardner 1987); however, base camps were still located primarily in the floodplains of major drainages. The appearance of new tool types specifically designed for wood-working, seed-grinding, and nut-cracking (e.g., axes and adzes, mauls, grinding slabs, and nutting stones) and the location of sites in previously unused locations indicate an increasing reliance on plants for food and construction materials. During the Middle Archaic procurement of high-quality lithic material was no longer an important component of the settlement pattern, as most artifacts were manufactured from locally available stone. As one example of this trend, the jasper source at Flint Run on the Shenandoah was abandoned after the Early Archaic (Gardner 1974). On the other hand bifurcate point-makers conducted the first systematic quarrying of South Mountain rhyolite (Stewart 1987). The emphasis on more local materials may reflect increasing circumscription of band territories as a growing population filled in available environments and their movements became restricted. A noteworthy technological change is the shift from carefully made and curated unifacial scrapers to the expedient tools found in Middle Archaic and later assemblages (Adovasio and Carr 2009; Gardner 1989).

At St. Albans side-notched and bifurcate-based St. Albans points came from Zones 12 and 11, which were both radiocarbon-dated to roughly 8800 rcbp. Comparable dates of 8800 to 8650 rcbp for this type were obtained from the Rose Island Site (40MR44) in Tennessee (Chapman 1975). Bifurcate-based LeCroy points were found in Zones 8 and 6 at St. Albans; the latter zone was dated to 8250±100 rcbp (Broyles 1971). Six similar radiocarbon dates ranging between 8500 and 8000 rcbp were associated with bifurcate points at the Main Site (15BC35) in Kentucky (Maslowski et al. 1995), and consistent dates in the same approximate range have been obtained from Illinois and Tennessee (Inashima 2008). A bifurcate component at the Mansfield Bridge Site (36TI116) in Tioga County, Pennsylvania, yielded dates of 8780±50 and 8540±50 rcbp (Wall et al. 2003:15). At the State Road Ripple Site (36CL52) in Clarion County, Pennsylvania, a bifurcate component was associated with several radiocarbon dates: 6915±100, 7045±195, and 7425±200 rcbp (Cowin 1991:47). These dates seem too recent to be entirely credible. Kanawha points, with bifurcate bases that are relatively constricted in comparison with LeCroy, predominate in Zones 4 and 2 at St. Albans. A radiocarbon date obtained for Zone 4 is 8160±100 rcbp (Broyles 1971).

To clear up an unfortunate confusion in the archaeological literature, it should be noted here that the Kirk Stemmed and Kirk Serrated types are not closely related or temporally equivalent to the earlier Kirk Corner-notched point type. These stemmed and serrated forms may be functional knives associated with bifurcate-base projectiles; in any case they are dated to between ca. 8700 and 7000 rcbp (Inashima 2008).

Above Zone 2 at St. Albans there is a discontinuity, evidently both in riverine deposition and in human occupation. The later part of the Middle Archaic cultural sequence is missing; Zone 1 contained Late and Terminal Archaic artifacts. We must look to other sites for the remainder of the Middle Archaic sequence.

The Stanly Stemmed point type of the North Carolina Piedmont, as described by Coe (1964), is nearly identical to Broyles's Kanawha type, except for the raw material used (chert in West Virginia, rhyolite in North Carolina). Associated radiocarbon dates for the Stanly type (and its northern equivalent, the Neville point) suggest an age of ca. 7800 to 7400 rcbp (Inashima 2008). At the Hansford Site (46KA104) in Kanawha County, West Virginia, a Stanly Stemmed component was associated with a radiocarbon date of 7695±155 rcbp (Wilkins 1985). A date of 7560±70 rcbp was obtained for a Stanly component at the Glasgow Site (46KA229) (Niquette et al. 1991). A date of ca. 7400 rcbp was associated with Neville/Stanly and LeCroy points at the West Water Street Site in Pennsylvania (Custer et al. 1996a:33). The Neville component at the Memorial Park Site in Clinton County, Pennsylvania, was dated to ca. 6830 rcbp (Hart 1995).

In the Southeast there appears to be a sharp stylistic break between the Stanly and Morrow Mountain point types; the latter features small convergent basal stems. Coe (1964:122) stated that, in the North Carolina Piedmont, Morrow Mountain represented an intrusive "cultural unit" that "appeared without any background in the area." Credible radiocarbon dates for Morrow Mountain range from 7500 to 6400 rcbp

(Inashima 2008). In the Northeast the equivalent types are Stanly-like Neville points, and Morrow Mountain-like Stark points. In Massachusetts, Neville points and Stark forms seem to be contemporaneous elements of a single assemblage at Annasnappet Pond, dating from ca. 7900 to 6400 rcbp (8800 to 7300 cal BP) (Cross 1999). Cross suggests that they may have been functional variants within the same toolkit, the Neville points used as dart tips and the Stark points as tips of thrusting spears.

In the Northeast large side-notched Otter Creek points represent a clear stylistic break from the preceding Stark type, and they are the hallmark of a new Laurentian tradition that is later expressed by Brewerton point types, which last until about 4500 cal BP. Otter Creek-like points have been found on the Potomac and at the Higgins Site on Maryland's Western Shore (Ebright 1992). The earliest credible dates for Otter Creek points are about 6200 rcbp (7100 cal BP) (Funk 1993; Inashima 2008; Wall et al. 2003). At the Mansfield Bridge Site (36TI116) in Tioga County, Pennsylvania, small Brewerton points characterized a "Proto-Laurentian" occupation zone that was dated to 6400 to 6000 rcbp (Wall et al. 2003).

It is therefore reasonable to regard the appearance of Otter Creek points at 7000 cal BP as marking the division between Middle and Late Archaic in the Northeast. Indeed, this is where Funk (1993) placed the Middle/Late Archaic boundary in the Upper Susquehanna region. In West Virginia Wilkins (1978:33) observed, with respect to Brewerton notched points, that "the appearance of this new horizon of point types marks a sharp break with the preceding Stanly, Guilford, and Morrow Mountain types." At the Hansford Site (46KA104), located 30 miles upstream from St. Albans, side-notched points were associated with radiocarbon dates of 5550±80 and 5680±170 rcbp (Wilkins 1978, 1985).

In the Chesapeake region the exact date of the Middle Archaic–Late Archaic transition remains rather vague, with some authors placing it at 6000 rcbp, some at 5000 rcbp. Some diagnostic point types (e.g., Brewerton, Otter Creek) are alternately regarded as Middle or Late Archaic markers. The Late Archaic is often viewed as a time of explosive population growth, as indicated by diagnostic point frequencies, numbers of sites, and numbers of dates; however, this apparent growth spurt actually occurs well after the supposed initiation of the period. In fact Gardner and his students regarded the very abundant broadspears of the Chesapeake region, dated after 5000 rcbp, as the earliest Late Archaic diagnostics.

Middle Archaic diagnostic points—bifurcate, Kirk Stemmed, probable Morrow Mountain, and one Otter Creek—were found at the Two Guys Site (LeeDecker et al. 1996). A radiocarbon date of 7560±340 rcbp on charcoal from the lower soils at the site would be appropriate for a Kirk Stemmed occupation.

d. Late Archaic (3800 to 2400 cal BC)

At about the same time that the various Brewerton notched points appeared in the Northeast, narrow stemmed points also began to be made. Although various scholars have tried to associate these distinctive forms with geographic/environmental divisions (e.g., coastal vs. interior or mast forest vs. lake forest), their distributions do not seem to be so cleanly separated.

Custer's chronology relies heavily on the stratigraphic sequence reported by Barry Kent (1970, 1996) from the Piney Island Site in the Lower Susquehanna valley of southeastern Pennsylvania. From the lowest levels Kent recovered four varieties of stemmed points (called types B, D, E, and I). Type B, with a convergent stem, is also known as Poplar Island. Types E and D are also known Duncan's Island, Piney Island, and Bare Island points. Type I, also known as Pequea, resembles the Lycoming County series of central Pennsylvania that Fogelman (1988) regards as a Laurentian variant. Custer (1994:35) dates the lower Piney Island component to 3700 to 500 BC (the latter must be a typo for 2500 BC). Calibrated, this range (5700 to 4500 rcbp) would be 6500 to 5200 cal BP. This component is dominated by Type E points, along with some Type I and fewer Type D points. Type B is not present in this component but becomes the second most abundant type, after Type D, in the upper component (4000 to 3200 rcbp).

In eastern Virginia one of the most common point types is Halifax, dating from the late Middle to early Late Archaic. This stemmed type, usually made of quartz, was originally defined in the North Carolina Piedmont (Coe 1964). Halifax points are not recognized as such in Delaware; they perhaps grade into the roughly contemporary Pequea or stemmed Type I. The greatest numbers of Halifax points in Virginia have been reported in the western Piedmont, where sites are found along streams and rivers of every size and are usually associated with soils favored by nut-bearing trees (Holland 1978; Mouer 1991). At those sites Halifax points seem to be associated with crude scrapers and chipped stone axes made from large quartz cobbles.

Halifax points are usually found in near-surface contexts on eroded upland sites. However, recent excavations at the Chopawamsic Creek Site at MCB Quantico, on the lower Potomac, provided an opportunity to study a Halifax occupation in a roughly stratified context (Bedell et al. 2014). Apart from the typical quartz points, the finds from the Halifax levels at Chopawamsic Creek include pit features, large amounts of fire-cracked rock, and several small formal scrapers. Five radiocarbon dates were obtained, all between 5800 and 5600 cal BP (3800 and 3600 cal BC). Large "platform hearths" made of cobbles have been attributed to the smoking of fish caught in annual runs of herring or eels, so the finds at Chopawamsic Creek suggest that reliance on this annual bounty began in Late Archaic times.

Wood charcoal shows that when Halifax people lived along Chopawamsic Creek, the local forest was dominated by oaks and hickories, and the Halifax residents certainly collected hickory nuts. In fact the origin and spread of the Halifax adaptation may be related to the appearance of oak-hickory and oak-chestnut forests in Virginia and Maryland. Before 6000 cal BP, this region was dominated by oak-pine-hemlock forests that were noticeably less productive from the point of view of human hunter-gatherers. Hemlock (*Tsuga canadensis*) populations collapsed abruptly throughout the Middle Atlantic and Northeast between ca. 5800 and 5200 cal BP. This seems to have been the result of two severe droughts (Bennett and Fuller 2002; Haas and McAndrews 2000; Yuan 1995). After the hemlocks died off and pines also declined, oaks increased and hickories first became prevalent. In the mountains chestnuts multiplied. The effects of the drier climate and the changed forests on humans may have been profound. Historic Indians made great use of forest nuts, and their favorite game animals (deer and turkeys) also relied on nut mast to sustain them through the winter.

The appearance of the Halifax culture around the same time as the development of oak-hickory and oak-chestnut forests may not be a coincidence. Their culture may have been based on exploiting the new riches of a changing environment. Indeed, the expansion of the oak-hickory forest may have been partly caused by human activity. Data from Dan's Bog near Washington, D.C., and other sites show an increase in burning in this period (Yuan 1995). The burning might have been caused solely by the drier climate, but humans may have played a role (as previously suggested in a controversial essay by Stevens [1991]). Human-set fires can get out of control in dry, windy conditions and spread to the surrounding forest, so the simple presence of more people usually leads to more fires. Historic-period Indians also set large fires intentionally when they were driving deer in large communal hunts. Fires favor oak and hickory trees over evergreens, so more frequent fires helped maintain the oak-hickory forest. Some native groups may have set fires as a way of intentionally changing their environments. From Halifax times onward, Indians and the oak-hickory forest may have been symbiotic.

The radiocarbon dates for the Halifax culture mainly fall within the 4000 to 3000 cal BC period. What came after the Halifax tradition in the Middle Atlantic region is obscure. Stemmed points resembling the Lamoka points of New York were found at the Puncheon Run Site (7K-C-51) on the St. Jones River in Delaware, associated with radiocarbon dates of 4250±90 to 3820±70 rcbp (3085 to 2035 cal BC) (LeeDecker et al. 2004). At the Slade Site in southeastern Virginia, Lamoka-like points were found in a stratum just above the Halifax levels; no radiocarbon dates were obtained but the excavators estimated the date of this horizon as 3000 to 2500 cal BC (Egloff and McAvoy 1990:74).

e. Terminal Archaic (2400 to 1400 cal BC)

Around 2400 cal BC the cultures of the Chesapeake region changed dramatically. The narrow-bladed points of the Late Archaic were replaced by broad-bladed projectile points, initiating the Terminal Archaic or Transitional period (2400 to 1400 cal BC). The broad-bladed points include Savannah River, Susquehanna, and Perkiomen types. Over several centuries the Susquehanna broadspears were transformed into narrower points: Dry Brook and Orient Fishtail (ca. 1400 to 800 cal BC). These large broad-bladed stemmed points are typically made of quartzite (in the Coastal Plain) or rhyolite (in the Piedmont and mountains). It is not certain if they were used as projectile points or as specialized knives for fish-processing or some other task (McLearen 1991). Although broadspear points are sometimes found in ritual mortuary contexts, they were apparently utilitarian objects, as shown by occasional breakage and edge attrition (Custer 1991).

The widespread appearance of broadspear points probably marks a rapid intrusive expansion northward by a population originating in the Coastal Plain of Georgia and the Carolinas (Kinsey 1972; Mouer 1990). It is probably not a coincidence that the spread of this new tool type is contemporaneous with a centuries-long “megadrought” in North America and elsewhere (Booth et al. 2005). This abrupt climate change may have destabilized local cultures and thus facilitated expansion of the broadspear-makers. The broadspear expansion also coincides with the intrusion of the coastal-based Stallings Island culture into the mid-Savannah River valley. This pottery-making group displaced the resident Mill Branch phase, which is presumably ancestral to the more northern broadspear-producing cultures (Sassaman 2006a). Continued northward expansion of the broadspear-makers beyond Virginia is indicated by the appearance of Lehigh/Koens-Crispin points in Pennsylvania and New Jersey, and Snook Kill points in New York (Kinsey 1972). Around 3500 rcbp (1900 cal BC) the Perkiomen and Susquehanna point types were probably developed in Pennsylvania from northern Savannah River variants and were spread back, by diffusion or migration, into parts of northern Virginia, such as the Potomac Valley. As already noted, Custer has viewed the broadspears in Delaware as functional items added to the toolkit of the indigenous Late Archaic population.

Apart from broadspears, Transitional assemblages include two other significant new artifact types: grooved groundstone axes, which replace earlier chipped stone forms; and carved soapstone (steatite) bowls. Soapstone was quarried in the Piedmont of Virginia, Maryland, and Pennsylvania (Holland et al. 1981). W.H. Holmes (1897) recorded a number of soapstone quarries in Washington, D.C., and nearby locales. Vessels were carved at the quarries and transported in finished form, probably by canoe. Soapstone pots were clearly used for cooking, but it is not yet known what foods (fish, meat, seeds, tubers, or nuts) they were used to process, or why such containers suddenly became necessary or desirable. Although there was a long history of use of heated soapstone chunks for boiling in the Savannah River Valley, the creation of bowls of this material seems to be an innovation that arose after the initial expansion phase. Radiocarbon dates on external soot residues on stone bowls cluster between 3700 and 2800 rcbp, coeval with the Susquehanna Broadspear complex (Sassaman 2006b).

Regional subsistence-settlement patterns also changed dramatically after 2400 cal BC. The diffuse, widely dispersed settlements of the Halifax and related peoples were replaced by a smaller number of base camps, almost all of which are adjacent to rivers or other major bodies of water. These sites can be quite large, particularly in the Coastal Plain. The number of small sites in the uplands greatly decreased (Bedell et al. 2014; Mouer 1991). The pattern of sites suggests that people were spending much of the year in these riverside base camps and moving much less often, and also that they often moved about by canoe. Throughout most of Maryland and Virginia’s Coastal Plain, archaeologists have found broad-bladed points associated with shell heaps (middens) dating to around 2000 cal BC (Dent 1995; Potter 1982). Intensive oyster collection appears to have begun around that time.

The large sites of the Savannah River culture are the most impressive seen up to that time in the region. The radiocarbon dates for these sites cluster in the period between 2400 and 2000 cal BC. Fewer radiocarbon dates from sites in the Chesapeake Coastal Plain fall into the period from 2000 to 1400 cal BC. In the mountains and the Piedmont, the latter period was the heyday of the Susquehanna Broadspear culture, which seems to have been an offshoot of the Savannah River culture, adapted to upland conditions. However, Susquehanna Broadspears are relatively uncommon in the Coastal Plain, where Savannah River broadspears seems to have been replaced with points that are similar but narrower, often called Holmes points, and also fishtailed points like the Orient Fishtail type of New York. Few radiocarbon-dated samples have been associated with either of these types in the Chesapeake region. In fact there are no secure dates for broadspear components in Delaware. At the Pig Point Site in Maryland, the dominant type in the latter part of the Terminal Archaic seems to have been Piscataway points, which are usually found elsewhere in Early Woodland contexts (Luckenbach et al. 2010).

f. Early Woodland (1400 to 700 cal BC)

The distinctive attribute of Woodland cultures is their manufacture of pottery. Fiber-tempered pottery was already being made during the Late Archaic in the Southeast, on the Georgia coast by 3300 cal BC and on the Savannah River at 3100 cal BC (Sassaman 2006a). In the Middle Atlantic region, however, ceramic technology appears only much later, after 1450 cal BC, where its appearance denotes the start of the Early Woodland period (Gardner and McNett 1971).

The earliest Middle Atlantic ceramic vessels, known as Marcey Creek ware, imitated the form of flat-bottomed soapstone pots, including lug handles, and were tempered with bits of soapstone (Egloff and Potter 1982). The Marcey Creek type site (44AR0002), where these early ceramics were first recognized, was located in Arlington County, Virginia (Manson 1948). Various experimental wares with diverse temper particles appear to be contemporaneous with Marcey Creek ware (Mouer 1991). One of these early variants is Bushnell ware, first identified on the lower Potomac in King George County, Virginia (Waselkov 1982). In Delaware the early flat-bottomed variants are known as Dames Quarter ware. Selden Island ware is at least partially coeval with Marcey Creek. Selden Island vessels, although steatite-tempered like Marcey Creek ware, were conoidal, cordmarked, and constructed by coiling rather than by modeling from slabs.

On the lower Potomac and the Shenandoah, Accokeek pottery was being made by ca. 2900 cal BP. This is a thin-walled, cordmarked ware with quartz particles and sand added to the clay as temper; vessels were conical or round-bottomed (Egloff and Potter 1982). In Delaware the temporal equivalent of Accokeek ware is called Wolfe Neck ware. Tempered with crushed rock, it includes both cordmarked and netmarked varieties. Radiocarbon dates ranging from 2735±35 to 2190±100 have been associated with Wolfe Neck ware. The type site for this pottery is the Wolfe Neck Site (7S-D-10) (Artusy 1976; Griffith and Artusy 1977).

The population of the Chesapeake region became more sedentary during the Early Woodland, inhabiting sites for longer periods of the year. Larger sites are commonly located on tidal creeks that feed into the Potomac and other rivers or the bay, with smaller resource-extraction sites in a wide variety of environmental settings. Diets probably focused on fish, shellfish, and nuts, but deer, turkey, and plant seeds were also important parts of the native diet (Mouer 1991).

Point types associated with Early Woodland pottery include Orient, Calvert, Rossville/Piscataway, and teardrop or ovoid points (Dent 1995). Teardrop and Rossville-like points were found at the Two Guys Site (LeeDecker et al. 1996); two radiocarbon-dated features here had appropriate Early or early Middle Woodland ages (2640±110 and 2460±130).

g. Middle Woodland (700 cal BC to cal AD 1000)

In Midwestern archaeology the division between Early and Middle Woodland was originally conceived to denote the temporal divide at ca. 2200 rcbp between Adena (Early) and Hopewell (Middle) (Griffin 1952, 1967). In the East, where Adena exists only as a brief intrusive episode or not at all, and Hopewell influence is minimal, different criteria had to be employed to create an analogous disjuncture. In various areas archaeologists have fastened on localized ceramic style changes as the transition marker. This has inevitably created temporal disconformities between regions. In the Chesapeake region the shift from cordmarking (Accokeek) to netmarking (Popes Creek) demarcates the Middle Woodland onset at ca. 2500 rcbp. In Delaware the equivalent division is between Wolfe Neck and Coulbourne wares. This creates a basic inter-regional problem because intrusive Delmarva Adena becomes Middle Woodland in this area, while in the Adena heartland in the Ohio Valley, it has long been classified as Early Woodland. In the Northeast the transition is from Vinette I cordmarked ware to the more elaborately decorated (dentate, rocker-stamped) Point Peninsula pottery types. However, there has been an evident tension between the desire to put the temporal boundary at AD 0 and the recognition that there is a data gap of several centuries prior to appearance of the later ceramics ca. AD 200 to 300 (Fiedel 2001). In eastern Pennsylvania Custer (1996) places the Early/Middle transition either at AD 200 (1996:224) or AD 0 (1996:253), based on ceramic style changes (from Vinette I to Vinette II-like ware on the Lower Delaware, and from netmarked to dentate shell-tempered ware [Abbott Zoned] on the Middle and Upper Delaware).

Based primarily on ceramic chronology, two phases of the Middle Woodland period have been recognized in the lower Potomac region. The earlier is characterized by Popes Creek and related ceramics (700 cal BC to cal AD 300) and the later by Mockley ware (cal AD 300 to 1000) (Stewart 1992). Popes Creek is a thick-bodied ware with sand temper that is usually net-impressed. Mockley ware is shell-tempered and has a variety of surface treatments. Albemarle ware was contemporaneous with Popes Creek but has crushed-rock temper. The Popes Creek ceramic type takes its name from the shell midden site of that name, which was located on the Potomac River bank in the Coastal Plain of Maryland (Egloff and Potter 1982). In Delaware the beginning of Mockley ware production is placed somewhat earlier around AD 1 (Custer 1994: table 10). The preceding pottery types of the period from 400 cal BC to AD 1 are Wilgus, Coulbourn, and Nassawango. All were conoidal and coiled, in cordmarked and netmarked varieties. Coulbourn pots were tempered with clay (grog); Nassawango vessels were tempered with crushed rock and clay, and Wilgus pottery was tempered with crushed shell and clay. The use of grog or clay temper seems to be an intrusive trait in the local sequence, possibly linked to the Delmarva Adena complex.

Diagnostic Middle Woodland point types of the circum-Chesapeake region include Fox Creek-Selby Bay lanceolate, stemmed, and side-notched points, which are often associated with Mockley pottery. These points are often made of exotic lithic materials, especially Maryland and Pennsylvania rhyolite. Potts, Nomini, and Jack’s Reef corner-notched and pentagonal points are found in later Middle Woodland components. Rossville/Piscataway and Calvert points, which appeared during the Early Woodland period, may have carried over to the Middle Woodland and have been found on sites with Popes Creek ware (Waselkov 1982). At the Pig Point Site on Maryland’s Western Shore, the most common points in the Middle Woodland levels were rather poorly made side-notched forms that resemble cruder examples of earlier types (Luckenbach et al. 2010).

During the earlier part of the Middle Woodland period, there may have been a severe population decline, as sites of this period are comparatively rare (Fiedel 2001). Later, after cal AD 1, populations began to increase. Bands became more sedentary and participated in regional exchange networks. There is some continuity in site locations between the Early and Middle Woodland periods, implying that earlier subsistence-settlement systems persisted. Middle Woodland groups in the lower Potomac River basin appear to have been mobile, exploiting diverse and dispersed resources but focusing on riverine environments. The fall line and eastern Piedmont may have been utilized seasonally as part of the settlement round of groups based in the Coastal Plain (Johnson 2001; Stewart 1992).

In the Ohio Valley the Adena complex (regarded by archaeologists in that area as Early Woodland) flourished between circa 600 and 100 cal BC. The construction of burial mounds, characteristic of this complex, did not spread to the peoples of the Atlantic coast. Nevertheless, sustained cultural contact with the Adena complex is demonstrated by massive caches of typical Adena artifacts (lobate-stemmed points, tubular pipes made of Ohio fireclay, shale and slate gorgets, etc.) found in cremation burials on the Delmarva Peninsula and on Maryland's Western Shore. Rich Adena burials were found at the Frederica Site (7K-F-2) on the Murderkill River (dated to 1615±45 rcbp) and the St. Jones Site (7K-D-1) on the St. Jones River (dated to 2330±80 rcbp) (Thomas 1976). Radiocarbon dates as late as cal AD 300 and distinctive artifact types indicate that Delmarva Adena was partially contemporaneous with the Hopewell culture that followed Adena in the Ohio Valley (Lowery 2017; Luckenbach 2013).

A later, post-Hopewellian exchange network (dated ca. cal AD 500 to 900) is evident in mortuary contexts in Virginia, Maryland, Delaware (the Island Field Site), and the District of Columbia. Fiedel (2013) suggests that this network may be linked to the expansion of speakers of Eastern Algonquian languages. A cremation burial dated to about cal AD 750 was discovered some years ago beside the Whitehurst Freeway in Washington, D.C.; it contained a comb made of moose or elk antler, fossil shark teeth, and a polished stone gorget (Knepper et al. 2006). Similar artifacts were associated with late Middle Woodland burials at the Hand Site (44SN0022) in Southampton County, Virginia, and are thought to relate to a cultural horizon known as the Kipp Island Phase in New York State (Ritchie 1969; Ritchie and Funk 1973) and the Intrusive Mound Complex in Ohio (Seeman 1992). Jack's Reef points, frequently made of jasper, and other Kipp Island diagnostic artifacts (e.g., platform pipes, barbed bone harpoons, worked sharks' teeth) are concentrated in the upper Nanticoke drainage, from the Riverton Site (18WC5) to the Island Field Cemetery Site (7K-F-17) (Lowery 2013). In northern Delaware grit and sand-tempered Hell Island ware is associated with the Jack's Reef points. In southern Delaware the coeval pottery is Claggett ware, which is a shell-tempered, relatively thin-walled late variant of Mockley ware (Custer 1989).

Four features at the Two Guys Site yielded radiocarbon ages appropriate for both the early and late Middle Woodland: 1960±70, 1260±70, 1140±60, and 1020±70 rcbp (LeeDecker et al. 1996: figure 11). However, diagnostic artifacts of this period were not recovered.

h. Late Woodland (AD 1000 to 1607)

In the Midwest the Late Woodland is the period after Hopewell decline. In many areas Late Woodland cultures were superseded by, or continued alongside, Mississippian mound-building cultures after AD 1000. In the East it is generally accepted that the Middle to Late transition is demarcated by the widespread adoption of maize horticulture around AD 1000. This subsistence change was accompanied by a major change in settlement pattern, as large, permanently occupied villages appeared, sometimes protected by palisades. At about the same time or slightly earlier (ca. AD 800), notched projectile points were replaced everywhere by triangular points, which signal the introduction of the bow and arrow. This may also be an indicator (along with the palisades) of intensified warfare. Ceramic styles also changed significantly, with the appearance of collared vessels and incised decorations. Although most of these ancillary cultural developments are evident in the Late Woodland archaeological record of the Middle Atlantic and Northeastern Coastal Plain areas (e.g., the Slaughter Creek Complex in Delmarva), the evidence of agriculture is generally very scarce (Custer 1989:329). It has even been suggested that native peoples along the East Coast only began intensively cultivating maize in response to European contact in the seventeenth century. However, the archaeological record stands in sharp contradiction to European explorers' descriptions of extensive cornfields. One might speculate that preservation is an issue, but Custer (1989:329) notes that items smaller than corn cobs were recovered from old excavations, so if corn was present, it should have been reported. Custer observes marked continuities from Woodland I to Woodland II settlement patterns, but the major change is disruption of Woodland I trade networks and the cessation of elaborate mortuary rituals. During the Late Woodland period ranked societies emerged, which developed into the complex tribes and chiefdoms encountered by the Europeans in the late sixteenth and early seventeenth centuries (Potter 1993).

Prior to AD 1200 or even 1300, settlements were not stockaded (fortified), suggesting that there were minimal inter- and intra-group hostilities. At around AD 1200 to 1300, throughout the Middle Atlantic region population density increased, nucleated settlements and stockaded villages were established, and there is evidence of population movement and displacement (Stewart 1993).

Diagnostic artifacts of the Late Woodland period include Levanna and Madison triangular projectile points. These were certainly used as arrow tips; the bow seems to have replaced the spearthrower around AD 800.

The Late Woodland pottery of southern Delaware continued to be made with shell temper. However, this ware, called Townsend, now had fabric-impressed exteriors that were often decorated with incised lines in geometric patterns. Virtually identical, coeval (AD 1000 to 1600) pottery in the Potomac basin is known as Rappahannock ware.

i. Contact Period: The Nanticoke

During Captain John Smith's exploration of the shores of the Chesapeake Bay in 1608, he sailed up the Nanticoke River from June 8 to 11 (Smith 1986). The principal native village, where the paramount chief lived, was Kuskarawaok. It may have been located near modern Vienna, or farther upstream near Laurel, roughly where the Broad Creek reservation was later established (Sullivan et al. 2013: figure 9). Smith also mentioned four other villages: Nautaquack (or Nantaquack), Nause, Soraphanigh, and Arsek. He estimated that the Kuskarawaok (called Nanticoke after ca. 1640) numbered some 200 warriors. Smith ventured upstream beyond Kuskarawaok (his farthest exploration is marked by a cross on his map), but he may not have seen all of the communities on the uppermost reaches of the river. In 1697 the Nanticoke were reported to live in 10 towns (Archives of Maryland Online 25:256).

After initial contact the Nanticoke chiefdom traded with the English, Dutch, and Swedish colonists. In the late 1650s English settlers began to encroach on Nanticoke lands, leading to violent encounters. In May 1668 the Nanticoke "emperor" Unnacokasimmon signed the first of several peace treaties with the Proprietor of the Province of Maryland (Archives of Maryland Online 5:29).

In 1698 Maryland created the large Chicone reservation on Chicacoan Creek (Busby 2010:121); across the river, to the south, there was a contemporaneous community called Puckamee (Rountree and Davidson 1997:126). By 1705 many of the Nanticoke had moved upriver from Chicone to Broad Creek (perhaps the former location of the chiefdom center). The Maryland legislature formally recognized this area as the Broad Creek Reservation in 1711. The reservation, in present-day Laurel, continued to exist until 1768 (Rountree and Davidson 1997:126). At that time this area was part of Somerset County, Maryland; it would be ceded to Sussex County, Delaware, in 1769.

In June 1742 the Nanticoke, Choptank, Indian River Indians, and Pocomoke met at a place called Winnasoccum. This may have been the same location called Wimbesoccom Creek and Neck in eighteenth-century documents, and Sockum Creek on later maps. This equation suggests that it was about 6 miles east of Broad Creek Town, in the area between today's Pepper Pond and Trinity United Methodist Church (Slavens n.d.). Scharf (1888) stated that Wimbesoccom Neck was situated on the south side of the easternmost branch of Broad Creek, nearly surrounded by the Bull and Melson mill ponds. This location is consonant with identification of Wimbesoccom Creek as Gray's Branch.

The tribes assembled at Winnasoccum plotted with a Shawnee delegation to stage an uprising against the English colonists. However, the Maryland authorities were warned by local residents that something odd was happening, which led to arrests and interrogations of many Indians who had attended the meeting. The upshot for the Nanticoke was that they were compelled to agree to a very restrictive treaty. They could no longer elect an emperor, and they were forbidden to own guns unless licensed by the governor.

In 1744, perhaps impelled by these harsh restrictions, the Nanticoke began to abandon their homes at Broad Creek Town. Simon Alsechqueck and other Nanticoke leaders were permitted to leave the reservation with their followers. They moved to Pennsylvania, where the Iroquois allowed them to settle near Wyoming on the Susquehanna River and on Haldeman Island, at the confluence of the Juniata River and the Susquehanna. There they joined the Piscataway/Conoy tribe. The Nanticoke were admitted as non-voting members of the Iroquois League, under the aegis of the Cayuga, in 1753. By 1754 Broad Creek Town was probably completely abandoned. Both the Broad Creek and Chicacoan reservations were sold in 1768, but not all the former inhabitants received payments. A group of Nanticoke who had ended up in Ontario, Canada, claimed compensation for the Chicacoan reservation in 1852, but the Maryland Assembly refused to pay (Weslager 1983).

At the time of European contact, the natives of the Atlantic shore of southeastern Delaware were known as the Assateagues. They were called the Indian River Indians by 1705, when their chief Robin signed a peace treaty in Annapolis on behalf of "Queen Wyransconmickonous." Nanticoke and Choptank representatives also signed the treaty. Robin complained to Governor Seymour that his people, long resident in Somerset County, had lately been "disturbed & Expulsed from their several Settlements in Towns viz^ts^ first from Buckingham in this County to Assawamem & from thence to the Indian River and from thence to the head of the said River where we now are settled in a Town but are Continually Threaten'd to be Driven from thence likewise" (Archives of Maryland Online 26:445). He requested that their town and 1,000 acres of adjacent land be reserved for the tribe's use. The original village must have been near present-day Berlin in Maryland; that area was known as the Buckingham Hundred. A site in that vicinity has been identified as an Assateague village, but no Contact-period artifacts have been reported.

The reservation established in 1705, known as Askeksy, was located southwest of Millsboro, between Irons Branch and Route 24. Irons Branch was known as Indian Town Branch or Indian Branch during the 18th century; it defined the southern boundary of the tract. Indian Town Road and part of Hickory Hill Road, running parallel to the stream, approximately define the same boundary today (Slavens n.d.). The Indian River reservation was only about 14 miles east of the Nanticoke reservation at Broad Creek Town.

By 1742, much of the Indian River reservation had been sold to local English settlers; what remained was sold to William Burton in 1743. After that date there are no written records of the Indian River Indians. Some of them may have joined in the Nanticoke diaspora in 1744. Others may have stayed in the area, becoming part of a poorly documented mixed-race community along with surviving local Nanticokes. This community is first documented in the 1840s on the north shore of the Indian River.

The Indian River group organized as the Nanticoke Indian Association and they were recognized as a tribe by the state in 1881. The association's headquarters are in Millsboro. In 1922 they were chartered as a non-profit organization. They organized annual powwows, held until the mid-1930s, during the Great Depression. The tribe revived the annual powwow in 1977.

Some Nanticokes may also have remained behind in the vicinity of the old Nause village mapped by Smith near the mouth of the river. In 1792, at the request of Thomas Jefferson, William Vans Murray collected some vocabulary from an old woman named Mrs. Mulberry at the Nanticoke village of Locust Neck Town, located on Goose Creek near the Choptank River in Dorchester County, Maryland (Brinton 1893; Speck 1927). Murray noted that the four cedar bark-covered wigwams at Locust Neck were occupied by only nine people, the rest having gone to live among the Iroquois. Today, the Nause-Waiwash Band, numbering some 300 people, claims an ancestral connection with the Nanticoke of Nause and the people of Waiwash, a village on the Choptank.

B. Historical Overview

1. Early Exploration and Settlement (ca. 1580s to 1770)

Some of the earliest European explorers to visit present-day Delaware likely included the Spanish and Portuguese prior to the 1580s (Eiswert et al. 2014:11). The Dutch eventually laid claim to the region following Henry Hudson's brief exploration of the Delaware Bay in 1609 before continuing up to the Hudson River in present-day New York. In 1631 the Dutch established the short-lived settlement of Zwaanendael at Cape Henlopen, present-day Lewes, about 35 miles northeast of the current project area. By the time a second detachment of settlers arrived in December 1632, the settlement had been destroyed by a group of native inhabitants. Other early settlements in the Delaware region included the Swedish settlement of Fort Christina (present-day Wilmington) in 1638, and the Dutch settlement at Fort Casimir (present-day New Castle). By 1656 the Dutch were able to expel the Swedes and consolidate their claims over the region. These claims were lost to the British in 1664 (Child et al. 2008:48).

Meanwhile, English settlers from Maryland (established 1634) and Virginia (established 1607) were also claiming portions of the Delmarva Peninsula. Relatively early on, settlers from Jamestown had moved across the Chesapeake and established plantations on the lower Eastern Shore at Accomack, Virginia (Child et al. 2008:48; Truitt and LesCallette 1977:62-63). When Lord Baltimore established Maryland in 1634, he laid claim to all lands north of the Virginia line between the Chesapeake Bay and Atlantic Ocean. By 1665 nearly 80,000 acres of Maryland's Eastern Shore had been patented. In 1666 Somerset County was established; it included much of the land that would later become Sussex County, Delaware. Dorchester County was established in 1669, including much of present-day Caroline County (Maryland) and portions of Delaware (Child et al. 2008:48-49)

Maryland's claim to the land that became Delaware was short-lived. William Penn received a charter from King Charles II in 1681 for land west of the Delaware River, which was named Pennsylvania. The following year, in 1682, Penn received a second grant for the Delaware territory, which he organized into the "three lower counties" of New Castle, Kent, and Sussex (formerly part of Somerset County, Maryland) (Child et al. 2008; Eiswert et al. 2014; Klein and Hoogenboom 1986). These counties were further organized into a system of hundreds, which consisted of large land tracts roughly equivalent to townships elsewhere (Eiswert 2014:12; Siders et al. 1991:6). Ten years after their organization, owing to cultural and political differences among the largely non-Quaker population, the lower counties petitioned Penn for separate jurisdiction from the Quaker authorities in Philadelphia and were placed under separate authority (Bevan 1929; Child et al. 2008:49).

Despite the Pennsylvania charter and grants, Maryland attempted to maintain influence and control of the southwestern portions of Delaware, leaving the settlement claims and territorial borders of western Sussex County uncertain until the borders were finally settled by the Mason and Dixon survey of the 1770s (Child et al. 2008; De Cunzo and Garcia 1993; Quinn and Herman 1986). The overall landscape of the Lower Peninsula/Cyprus Swamp Zone of Sussex County remained largely unaltered through most of the seventeenth and eighteenth centuries. Permanent settlement of the region, particularly in the western portions of the county, remained sparse, largely because of the political uncertainty (Quinn and Herman 1986:3). During the seventeenth century the few settlers in the interior portions of Sussex County were primarily trappers and foresters (Ames et al. 1989:46; Child et al. 2008:49; Pendleton 2000:3). Agriculture, particularly tobacco, sustained much of Delmarva's economy during this early period (Child et al. 2008:49).

By 1700 only approximately 1,000 individuals resided in Sussex County (Eiswert et al. 2014:12), although this figure might not take into account those living in the disputed western territories. Lewes was the commercial center of the county during the period, with settlements concentrated along the coastal bays and other accessible waterways.

2. Agriculture, Forestry, and Early Industry (ca. 1770 to 1830)

Delaware's western boundary was finally settled in 1775, effectively ending the dispute with Maryland (Quinn and Herman 1986). As a result Sussex County became the largest in Delaware, covering roughly 940 square miles. Five new hundreds were created as a result of the border resolution. Baltimore, Little Creek, Dagsborough, Nanticoke, and Broad Creek joined the "Old" Sussex County hundreds of Lewes and Rehoboth, Indian River, Northwest Fork, Broadkill, and Cedar Creek (De Cunzo and Garcia 1993:21; Hancock 1976:25). This newfound stability resulted in significant changes in southwestern Sussex County as settlements, transportation networks, and other land-use patterns developed in ways consistent with regional cultural and geographical patterns (Quinn and Herman 1986:3).

The economy of the Lower Peninsula/Cyprus Zone characteristic of Little Creek Hundred centered on forestry and the timber industry during the latter eighteenth century. Timber was cut and buried cypress mined from the swamps for the production of planks, shingles, barrel staves, naval stores, and more. Products were shipped to major markets in Philadelphia, Wilmington, and New York (Quinn and Herman 1986:3). Settlement patterns shifted and farming gradually moved into the western interior as forests were cut and arable land exposed (De Cunzo and Garcia 1993:22; Quinn and Herman 1986). A series of "Ditch Acts" passed between 1779 and 1812 aided in the reclamation of swampy ground for agriculture, which significantly altered the ecological and cultural landscape (De Cunzo and Garcia 1993:22). The soils in this region made the land marginal for agricultural production, and corn was soon favored over tobacco as the chief agricultural product of the zone. Farmsteads in Sussex County during this period averaged less than 200 acres but were largely structured according to the southern plantation system De Cunzo and Garcia 1993:22; (Quinn and Herman 1986:3). However, tax assessments for Little Creek and Broad Creek Hundreds in 1803-1804 indicate that a somewhat more egalitarian pattern of land-holding emerged in this portion of the county. In Little Creek Hundred, for example, only 48 percent of the taxable inhabitants owned over 60 acres of land, indicating a broader base of land ownership than found in neighboring hundreds (Quinn and Herman 1986:4).

As the region developed during the late eighteenth and early nineteenth centuries, both the transportation networks and settlement patterns became tethered to the network of gristmills and sawmills that sprung up along the drainages to facilitate the processing of timber and grain (De Cunzo and Garcia 1993:23). The mill dams provided ready-made causeways across streams and creeks, and provided focal points for the surrounding population and communities. Taverns, shops, stores, and other services often sprang up to accompany the mill complexes. A number of these early mill seats and crossings expanded into larger towns, such as Laurel (est. 1802), Millsboro (est. 1792), Baltimore Mills (now Omar), and Dagsboro (circa 1780) (De Cunzo and Garcia 1993:23). In 1791 the county seat was moved to Georgetown, spurring transportation improvements toward the interior of the zone. By 1796 roads ran from Georgetown to Laurel, Milton, and Broadkill (De Cunzo and Garcia 1993:23; Delaware Road Papers 1792, 1796). Other industries besides mills developed in the region: by 1814 Sussex County housed five iron forges and 20 distilleries (De Cunzo and Garcia 1993:22-23).

Changes in settlement patterns and industry in Sussex County during the eighteenth and early nineteenth centuries also resulted in changing demographics. By 1790 Sussex County had 20,488 residents, which increased to 24,057 by 1820 (Eiswert et al. 2014:14). This accounted for roughly 30 percent of the state's population. Northwest Fork, Nanticoke, and Broadkill hundreds were the most populous in the county, accounting for roughly 40 percent of Sussex County's residents (De Cunzo and Garcia 1993:21). Between

1800 and 1820, between 2,164 and 2,851 individuals resided in Little Creek Hundred (Quinn and Herman 1986:5). The majority of residents were of European descent. In 1800 African Americans accounted for approximately 22 percent of the population in the zone. At that time roughly half of this African American population was enslaved; however, this rapidly shifted so that by 1830 more than 80 percent were free. This is indicative of the increasingly reduced profitability of an enslaved workforce in this zone prior to emancipation (De Cunzo and Garcia 1993:21; Quinn and Herman 1986:5). Throughout this period free African-American labor would play an increasingly significant role in Delaware farm production (De Cunzo and Garcia 1993:21).

3. Growth and Agricultural Diversification (ca. 1830 to 1880)

The progression of the nineteenth century brought significant changes to the cultural landscape of the Lower Peninsula, largely attributed to rapid population growth, improved transportation routes, and developments in agricultural production (De Cunzo and Garcia 1993:23; Quinn and Herman 1986:5). Corn remained the principal crop, although farmers increasingly produced market crops for the growing urban centers of Philadelphia, Wilmington, and Baltimore. The development of the railroad and its extension into Sussex County between 1856 and 1878 was particularly significant, providing more direct access to these urban markets. This allowed Sussex County farmers to bring more perishable produce to market, such as peaches, blackberries, and strawberries (De Cunzo and Garcia 1993:24). Gristmills and sawmills remained the primary industry through most of the nineteenth century. Of the 141 manufacturers reported in Sussex County in 1860, 37 gristmills and 56 lumber mills are listed, along with 15 blacksmiths, six shipyards, and a handful of boot/shoe manufacturers, leather works, wagon and carriage shops, and others (De Cunzo and Garcia 1993:27).

Delaware’s population increased steadily throughout the nineteenth century at a rate of between 5 and 10 percent per decade. By the outbreak of the Civil War, the state’s population had reached 112,216. Approximately 26 percent lived in Sussex County (De Cunzo and Garcia 1993:24). The population of Little Creek Hundred reflected these statewide trends, increasing from 2,973 in 1840 to 3,770 in 1870 (Quinn and Herman 1986:7). Slavery decreased in the Lower Peninsula throughout the nineteenth century; prior to emancipation, Sussex County housed over half of the state’s enslaved population. Most of these slaves worked as domestic servants or field hands on small farms. The majority of free African Americans owned little land and worked as wage laborers or skilled artisans. The Civil War brought emancipation to all of Delaware’s slaves, but in reality they rarely saw much improvement in their social or economic positions (De Cunzo and Garcia 1993:24).

4. Modernization (ca. 1880 to 1940)

During the late nineteenth and early twentieth centuries, significant changes took place in the Lower Peninsula as lumber industries declined as a result of deforestation. Trade and manufacturing occupations rose in prominence in much of the state; even so, agriculture and related businesses continued as the primary economic driver in the region (De Cunzo and Garcia 1993:30; Quinn and Herman 1986:8). The advent of the automobile and improved overland highways and other routes sparked growth in the cultivation of more perishable, seasonal crops, such as peppers, melons, tomatoes, peaches, and berries. Canneries also sprang up to process some of these crops locally (Quinn and Herman 1986:8). Sussex County also developed a significant poultry industry during this period. By 1944 Sussex County farmers were raising roughly 60 million broiler chickens annually, although most of this industry was concentrated in the southeastern portion of the county (De Cunzo and Garcia 1993:31). Deforestation continued to bring new land under cultivation, but as a result the lumber industry declined substantially by the early twentieth century (Quinn and Herman 1986:8).

Although new lands were being brought under cultivation, farm size and the total acreage in farmland declined. This signals a period of farm abandonment and reorganization that coincided with suburbanization of the northern counties. By 1920 the majority of Sussex County farms were 100 acres or less. Tenant farming increased, and around the turn of the twentieth century, more than 50 percent of farmers were tenants or sharecroppers (De Cunzo and Garcia 1993:31).

During this period most of the towns in the Lower Peninsula/Cypress Zone reached their present size and general appearance. Towns expanded rapidly as new commercial buildings and manufacturing facilities were constructed. Despite this, places such as Little Creek Hundred remained overwhelmingly rural and agricultural in character. Changes in the landscape that occurred during the early twentieth century are still recognizable today, including "large fields mechanically cultivated, natural forestation restricted to preserves or along watercourses and fields, and an intricate network of paved roads collapsing the distances between back country and town centers with great efficiency" (Quinn and Herman 1986:8). Significant growth in Sussex County has continued throughout the twentieth century. Between 1940 and 2000, Sussex County increased from 52,502 residents to over 156,000 (Eiswert et al. 2014:26). Much of this growth has concentrated along the coast, where significant residential and commercial development has expanded to support the thriving beach vacation economy.

C. Cartographic Review of the Project Area

Available historical maps show little development in the project vicinity through much of the early nineteenth century (e.g., Lewis 1804). The earliest map showing development in the vicinity of the project APE is the Beers map of 1868 (Figure 5). This map depicts Trussum Pond along the south side of present-day Wootten Road (Rd. 72). On the north side of Wootten Road, buildings flank both sides of James Branch. The building west of James Branch is labeled "G.M. Wootten," with the building on the east bank of the creek indicated as a sawmill. Early United States Geological Survey (USGS) topo maps show several changes. A map dated 1915 continues to show the mill pond along the south side of the road, though it is labeled "Moores Pond" at that time (Figure 6). However, the buildings flanking both sides of James Branch are no longer evident. Trussum Pond Road now appears with a structure indicated near the northwest corner of the intersection of Trussum Pond and Wootten roads. Other houses are depicted along Wootten Road farther to the east, well outside the APE. By 1955 two additional buildings are depicted near the west end of the dam, both north and south of Wootten Road, but no structures are shown within the APE (Figure 7).

D. Property History

The property associated with the mill dam and Trussum Pond dates back to at least the late eighteenth century. In 1776 James Tresham received proprietary warrants for three parcels of land in Sussex County totaling 298 acres (Shanklands Warrants and Surveys [SWS] No. 1:219, 250, 251). One of these warrants was for a 12-acre parcel called "Tresham's Chance," located on a branch of Broad Creek, referred to then as "Cypress Branch" in the corresponding survey (SWS 1:219). From the survey description it appears to enclose a parcel of land situated primarily on the north side of "James Treshams Millpond," suggesting that the dam and mill had already been constructed prior to the 1776 warrant. It is quite possible that James Tresham had formerly patented and registered the land with one of the Maryland counties that claimed jurisdiction in the area prior to 1775. This is supported by one of Tresham's other warrants that indicates a resurvey of one of his parcels, totaling 196 acres, that had previously been deeded in "the County of Worcester in the Province of Maryland but now of Sussex County upon Delaware…" (SWS 1:251). Nevertheless, it would seem that the mill pond, and presumably a sawmill and/or gristmill, had been in operation by 1776.

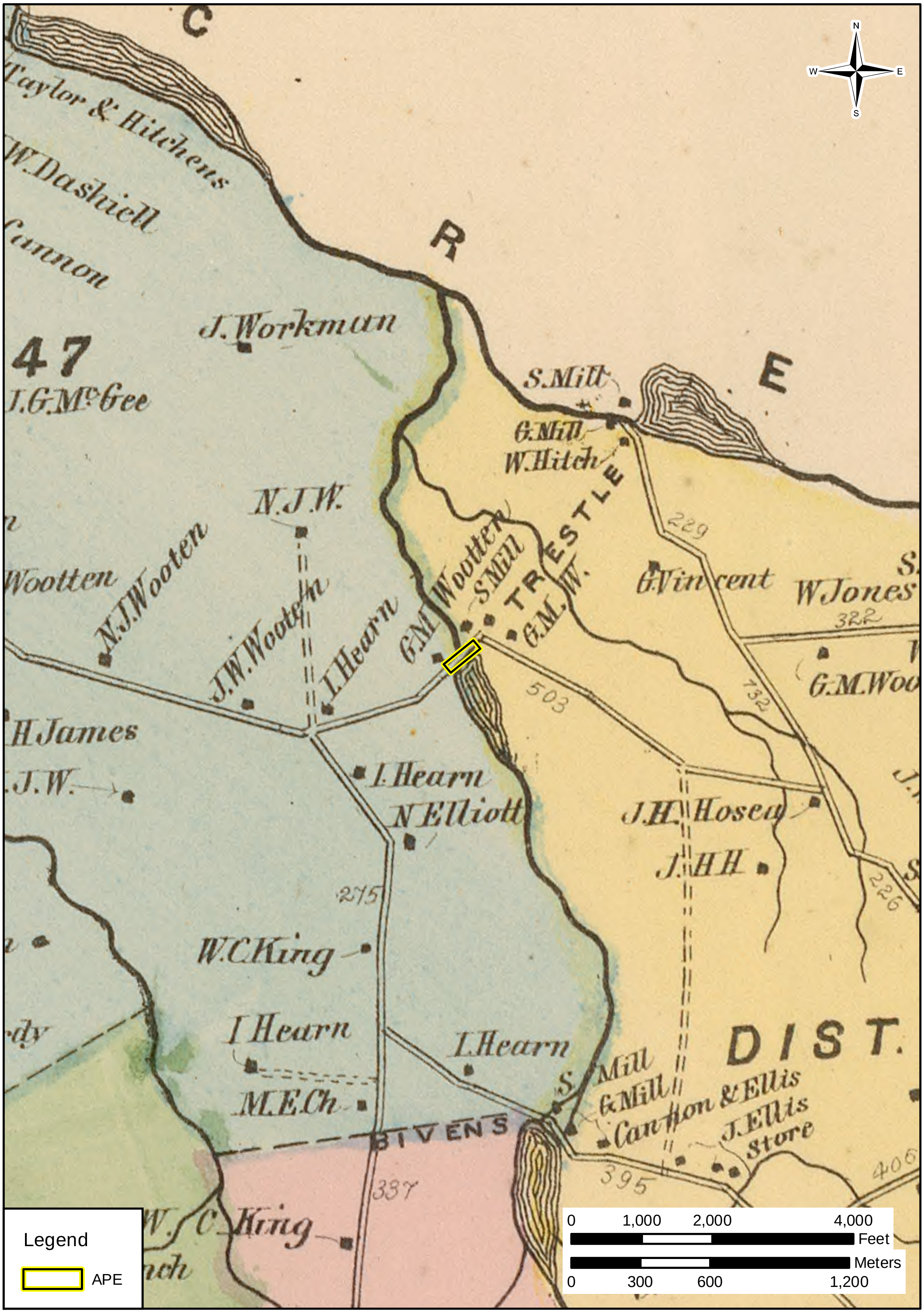

FIGURE 5: Project Area in 1868 (Beers 1868)

FIGURE 6: Project Area in 1915 (USGS Seaford 1915, Millsboro 1917)

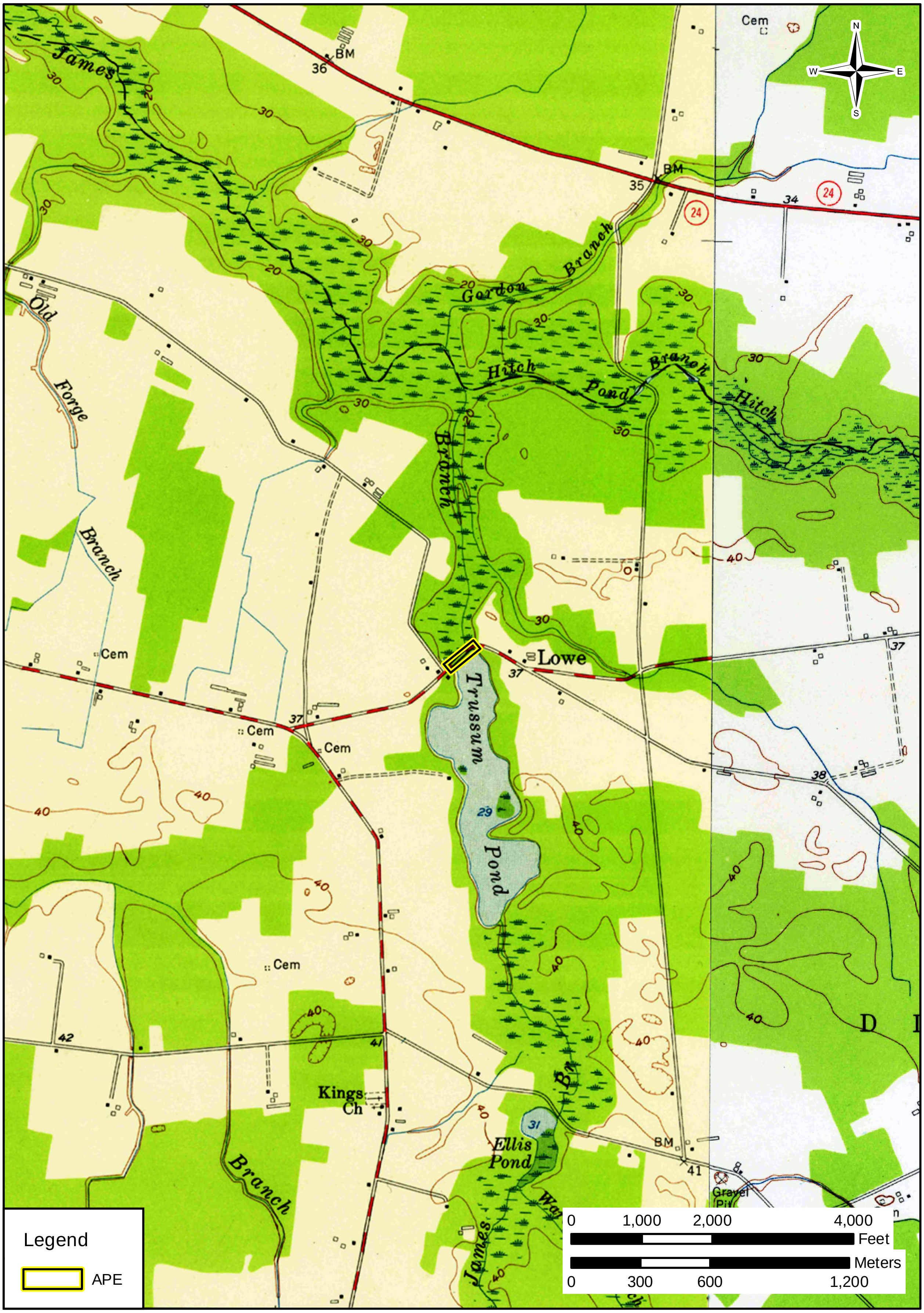

FIGURE 7: Project Area in 1955 (USGS Laurel 1955a, Trap Pond 1955b)

By the early nineteenth century it appears that interests in the mill property had been split among multiple stakeholders, but the property was soon reconsolidated as a free African American named Levin Thompson began acquiring these various holdings. Born sometime around 1750, Levin Thompson begins appearing on the tax rolls in Little Creek Hundred in the 1790s. In 1796 Thompson was assessed for 100 acres in Little Creek Hundred, with 40 of them cultivated. Over his lifetime Thompson acquired substantial tracts of land and was listed as the head of two households in 1810 (Heinegg var.). His holdings eventually included 428 acres of farmland in Little Creek Hundred and 135 acres of cypress timberland in Dagsboro Hundred, placing him amongst the top 5 percent of assessed property owners in Sussex County at the time of his death in 1816 (Dalleo 1997).

Between 1808 and 1814, Levin Thompson's land acquisitions included Tresham's Mill and surrounding properties. In July 1808 Thompson, "free black man of the county and state…," purchased two parcels from Alexander White for $35, including one south of Broad Creek and on "the south side of the Mill that formerly belonged to John Houston deceased…" (Sussex County Public Records Deed Book [DB] 27:318). The following year (1809) Thompson purchased "one undivided eighth part of the Saw Mill Stock and Plank Yard situate in Little Creek Hundred County and State aforesaid commonly Called and Known by the name of Treshams Mill…" from Wootten Lloyd (Sussex County DB 28:251-252). Later that fall Levin purchased for $25 from Catherine Lewes "… being Mills including a twelve acre Lot formerly belonging to James Tresham on one of the head waters of Broad Creek called and known by the name of Treshams Mills containing by estimation twelve acres of land be the same more or less Together with all impoundments, water courses profits [sic] and appurtenances whatsoever to the said premises…" (Sussex County DB 28: 425).

Thompson had purchased the bulk of the property associated with Treshams Mills at this point, but there were still stakeholders in the property. In March 1814 Thompson purchased two shares in the mills. One from Peter G(?) Wootten for $250 included "…one fourth part of saw and grist Mill and one fourth part of Mill Lott and one fourth part of pond privileges called and known by the name of Treshams Mills…" (Sussex County DB 31:210). That same month he also purchased Manaen Bull's "right and title to a tract called Treshams Chance (Commonly called Treshams Mill) situate in Little Creek hundred…" for $150, although this transaction was apparently not completed until Thompson's daughter Betsy payed an outstanding balance of $117.50 in 1817, following Levin Thompson's death (Sussex County DB 33:54). In July 1814 Levin Thompson purchased Peter Wootten's remaining equity in the mills for another $155, consolidating the majority of the property's equity under one owner (Sussex County DB 31:366).

This would prove to be short-lived, however. Levin Thompson died in 1816 and his holdings were divided among his heirs, detailed in a will and probate certified in July 1816 (Sussex County Public Records Will Book [WB] 7:75-77). The following year Thompson's heirs offloaded their claims in the mills. Clement Thompson sold his share to William Wootten (Sussex County DB 33:126), and Littleton Thompson sold his share to his brother-in-law, Charles Green (Sussex County DB 33:182). Over the next couple of decades, the mills would pass through multiple stakeholders before being purchased by the Wootten family.

Beginning in the 1830s, George M. Wootten began acquiring substantial land holdings in Little Creek Hundred (e.g., Sussex County DB 43:126; 48:382; 54:394; 56:526; 62:179; 63:417). One of these was for a parcel purchased in 1832 "known by the name of 'Treshams Purchase'…" (Sussex County DB 43:126). It would appear that the mill lot would stay within the Wootten family for the next 150 or so years. George appears to have retained ownership until his death. The Beers (1868) map depicts the sawmill near other structures labeled as G.M. Wootten or simply G.M.W. (see Figure 5). George died in 1888 and the property went to his sons Isaac and Jacob, detailed in a will certified in 1885 (Sussex County WB 15:396). Jacob retained the property well into the twentieth century, until it passed by will to Harold E. Wootten, Sr.

In 1909 Jacob was served with a notice that a petition will be presented to the Court of General Sessions proposing a new road to be constructed near the south end of "Tresham's Mill Dam" to run between "the 'Mill Lot' and the lands of the heirs of George M. Wootten…" (Delaware Road Papers 1909). This road was approved April 5, 1909, as detailed in the General Sessions *Order, plot and Report of the Commissioners Appointed to lay out a new public road in Little Creek Hundred* (Delaware Court of Sessions 1909:GSB 1905, p. 219). The description appears to correspond to present-day Trussum Pond Road. Construction plans for improvements to Rd. 72 on file with DelDOT dated to the 1930s also continue to indicate J. (Jacob) F. Wootten as the owner of the mill/dam property. The road over the dam may have been paved at that time, if not earlier, and a new 27-foot span bridge is indicated in the plans.

Following Jacob's death, the property transferred to Harold E. Wootten, Sr. He died in 1962 without a will, and the property transferred to his heirs. Harold's heirs sold most of the mill property to the current owners, Eschal and Effie Mariner, in 1975 (Sussex County DB 761:154-156). Also in the 1970s the bridge/culvert over the existing spillway were replaced with its current configuration (Bridge No. 349), according to design plans provided by DelDOT. This included a substantial concrete slab bridge with concrete walls and footings, supported by timber piles, as well as shoring up and splicing the weir to the bridge using timber framing, steel sheet piles, and additional rip-rap.

Overall it is clear from the documentary history that the mills and their associated pond and property have a long history, going back at least to the late eighteenth century. James Tresham received a proprietary warrant for the property in 1776, which references the mill pond in the survey. Unfortunately no mention of any mills was made at the time, but it reasonable to assume that mills were associated with the pond and in operation by that time, or at least planned. Prior to 1775, Maryland had been asserting jurisdictional authority over the area, so it is quite possible James Tresham had earlier patents on the property registered in a Maryland courthouse, most likely Somerset or Worcester County. At the time of the 1776 warrant survey, the stream is referred to as Cypress Branch, but over time both the stream and pond would become linked with the name of the original owner; *Trussum* is most likely a vernacular variation of the name *Tresham*. Later documents would refer to the stream as Tresham Branch, or by its current name of James Branch.

At the time of their construction, the mills were part of a larger network that sprang up along the water courses in the Lower Peninsula to serve both farmers and the thriving timber industry. As De Cunzo and Garcia (1993) note, a number of these small industrial nodes that punctuated the rural landscape would later develop into modest commercial and/or urban centers. This does not appear to have been the case for Treshams Mills, however, which retained its rural setting throughout its history. Never more than a handful of residences appear in the project vicinity on historical maps, and the area remains rural today.

Perhaps one of the most interesting and significant stories about Treshams Mills is their brief period of ownership and association with a free African American, Levin Thompson, in the early part of the nineteenth century. As noted before, African Americans made up only 20 percent or so of the population in the Lower Peninsula at that time, and roughly half of them were enslaved. Even though a significant number were free, African Americans tended to be marginalized politically, socially, and economically. Nonetheless, by the time of his death in 1816 Levin had amassed almost 600 acres of land holdings. This placed him in the top 5 percent of landowners in the county, and he was even in the business of loaning money to his white colleagues. He also apparently provided housing for up to 30 other free African Americans (Dalleo 1997). He was primarily a farmer but supplemented his income with his mill operations. His probate inventory lists various stacks of lumber planking "in the Mill Pond" and "at the Mill" worth more than $90.00, no doubt supplied in part by his 135 acres of cypress timberlands to the east in Dagsboro Hundred (Sussex County WB 7:75-77). It is clear that, by the time of his death, Levin Thompson had become a man of considerable means with substantial social and economic capital.

The mills apparently stayed in operation through most of the nineteenth century, although the gristmill was apparently abandoned before mid-century. Scharf (1888:1321) notes that at that time the sawmill was operated by Selby M. Lowe, but the gristmill had been abandoned about 40 years prior. It is uncertain from the documents currently available how long the sawmill continued in operation. The Road Papers from 1909 still reference the "Mill Lot," which implies that it still may have been in use. It may not have stayed operational for much longer, however, given the significant decline in the timber and lumber industry by the early twentieth century, as noted by Quinn and Herman (1986). The USGS (1915) topo map of the area shows no structures in the vicinity of the APE, indicating that the mill was likely abandoned by that time (see Figure 6). A close reading of the various tax assessments may provide additional insight. The precise location of the mills on the property is also uncertain. Documentary research failed to produce detailed descriptions of the mills or any detailed maps of the property depicting the mills' precise location. Regardless, the only remaining evidence of the mills left visible aboveground in the project area are the earthen dam and associated mill pond.

E. Previous Cultural Resource Management Projects and Known Sites

1. Previous Cultural Resource Management Studies in Vicinity of Project Area

Louis Berger's background research included examination of the Delaware Division of Historical and Cultural Affairs (DHCA) site files and survey reports using the CHRIS and survey reports database systems. A considerable number of archaeological investigations have been conducted in Sussex County. Major regional studies include a heritage study of the James Branch watershed (Wise 1987) followed by an archaeological investigation of the same area (Wise and Clark 1990); however, Louis Berger located only two reports from previous cultural resource studies completed within 1 mile (1.6 kilometers) of the APE.

The earliest study conducted in the project vicinity was an architectural evaluation carried out by the University of Delaware's Center for Historic Architecture and Engineering in 1986 to identify and evaluate National Register-eligible properties in Little Creek and Broad Creek hundreds (Quinn and Herman 1986). This study reviewed cultural resource files for 294 listed properties in Broad Creek Hundred and 315 in Little Creek Hundred. They grouped and assigned these resources among three different priority categories, ranging from eligible (Priority I), to ineligible but worthy of additional study (Priority II), to ineligible (Priority III). They then conducted additional background research and fieldwork to evaluate the significant properties with reference to a number of thematic issues they drew from relevant historic contexts. Of the 609 sites reviewed in that study, a total of 80, or 13.1 percent, were determined eligible for National Register listing. Nine of the sites examined in the study occur within 1 mile (1.6 kilometers) of the current APE, consisting of three eligible and six non-eligible properties.

The second cultural resource study conducted in the project vicinity was a Phase I Archaeological Survey conducted by A.D. Marble & Company in 2003 for a waste storage structure and composter. The project was conducted on behalf of the USDA-NRCS in preparation for the installation of waste control measures on a chicken farm. Two shovel tests were excavated. One test located outside the current APE recovered four prehistoric artifacts (three ceramic, one flake) from within previously identified Site 7S-H-060, but no artifacts were recovered within the APE. No additional investigation was recommended.

One other cultural resource study worth mentioning is a study and excavation of the Reynolds Mill Site (7S-C-99), located in Broadkill Hundred, by Skelly and Loy, Inc. (Grundy et al. 2009). This project consisted of a partial mitigation of mill remains uncovered in association with the replacement of Bridge No. 918 on State Route 30. Although not conducted in the immediate project vicinity, Skelly and Loy created a GIS database of Sussex County mill sites as part of an alternative mitigation effort, accessible on DelDOT's website. This consisted of mapping the locations of historic mills throughout the county using historical maps and other sources, primarily the Beers (1868) Atlas and the Scharf (1888) *History of Delaware*. The site of Treshams Mills was included in this survey and database, assigned numbers S-LC-39 (Grist Mill) and S-LC-25 (Saw Mill).

2. Previously Recorded Cultural Resources in Vicinity of Project Area

As of 1994, a total of 713 prehistoric sites had been identified in Sussex County. These are categorized temporally as follows: 9 Paleoindian, 13 Archaic, 205 Woodland I, 119 Woodland II, 183 Unknown, 84 Ceramic (Custer 1994: table 34).

The project area is located near the intersection of four rectangular blocks that are part of a system, established arbitrarily, for recording the state's archaeological sites. These blocks are E to the northwest, F to the northeast, J to the southeast, and H to the southwest. As of 1994, the total numbers of sites identified in each block were: E, 150; F, 77; J, 37; and H, 115 (Custer 1994: figure 82). Of these sites, those that can be assigned to Custer's Woodland I period (5000 to 1000 rcbp) number as follows: 55 in E, 33 in F, 8 in J, and 43 in H. Notably, the 55 Woodland I sites in Block E represent the greatest concentration of sites of that age in the state (13 percent of the total).

As of 1994, no Archaic (pre-5000 rcbp) sites had been identified within these blocks. In contrast, small clusters of Woodland I, Woodland II (AD 1000 to 1600), and temporally unassignable sites were mapped in the James Branch drainage (Custer 1994: figures 85-88). This was doubtless the result of Wise and Clark's surveys of this area.

Despite a considerable number of previously identified sites in Sussex County, a review of site files located only four sites within 1 mile (1.6 kilometer) of the project APE (Table 4). Three of the sites are located north of the current project area in the vicinity of James Branch. All of these appear to represent Woodland associations. Site 7S-H-014 was apparently located by a single pit dug in 1963 that recovered shell-tempered, fabric-impressed sherds from a pot measuring 12 to 15 inches in diameter, along with an undisclosed number of jasper flakes. Site 7S-H-019 appears to be represented by a private collection that includes undisclosed numbers of projectile points and ceramics, but few other details are provided. Site 7S-H-060, however, was reported in 1987 by University of Delaware Center for Archaeological Research (UDCAR) following a pedestrian survey. The survey recovered a large number of flakes and ceramics, as well as stemmed, notched, and broadpoint style projectile points. Wolfe Neck, Coulbourne, and Mockley are among the ceramic types listed on the inventory form. They classified the site as an Early Woodland macrobase.

The fourth site, 7S-H-065, is located south of the current APE, just east of Trussum Pond. Also reported by UDCAR in 1987, the file indicates that the site was partially destroyed in the 1950s and 1960s, although portions may remain undisturbed in the adjacent woodlands. A lost private collection said to have contained over 50 bifaces is indicated on the form, but few other details are provided.

TABLE 4

KNOWN ARCHAEOLOGICAL SITES WITHIN 1 MILE (1.6 KILOMETERS) OF THE PROJECT AREA

SITE No.	LOCATION	PERIOD(S)	RESULTS
7S-H-014	East bank of James Branch	Prehistoric/Woodland	Shell-tempered ceramic, jasper flakes.
7S-H-019	West of James Branch	Prehistoric/Woodland	Ceramics and projectile points.
7S-H-060	West of James Branch	Prehistoric/Woodland	Flakes and ceramics, stemmed and notched points.
7S-H-065	East of Trussum Pond	Prehistoric/Unknown	Destroyed. Lost collection reported to have over 50 bifaces.

CHRIS indicates that 10 historic properties have been recorded within 1 mile (1.6 kilometers) of the project APE (Table 5). The majority of these properties constitute dwellings or agricultural complexes. One resource, S-12605, consists of a historic cemetery located along the south side of Gordy Road. Three of these properties were determined eligible for National Register listing during the Quinn and Herman (1986) survey. Two of the eligible properties are nineteenth-century dwellings associated with agricultural complexes (S-06666 and S-06669). The third (S-06664) is an early twentieth-century potato house that has since been listed in the National Register as part of a multi-property registration. Potato houses were part of an early twentieth-century historical trend largely unique to Sussex County, when sweet potato cultivation dominated the region (Quinn 1987).

TABLE 5

OTHER HISTORIC PROPERTIES WITHIN 1 MILE (1.6 KILOMETERS) OF THE PROJECT AREA

No.	LOCATION	RESOURCE TYPE	DETERMINATION
S-06678	East Side of Gordy Rd.	Dwelling complex	NA
S-06666	Rd. 449 and Rd. 72	Agricultural complex	Eligible
S-06671	East Side Rd 463	Agricultural complex	NA
S-06664	South of Wooten Rd.	Agricultural complex - Potato house	Listed
S-06668	Wooten and Trussum Pond roads	Dwelling	Non-eligible
S-06669	North Side of Wooten Road	Agricultural complex	Eligible
S-06679	Gordy and Wooten Roads	Dwelling complex	Non-eligible
S-06665	Rd. 72 and Rd. 449	Dwelling complex	Non-eligible
S-12605	South of Rd. 72	Cemetery	NA

IV. Archaeological Sensitivity Assessment

A. Field Inspection and Current Conditions

Louis Berger conducted the field inspection March 28, 2017, by walking over all portions of the project area to assess current conditions and identify areas of sensitivity. The field inspection also assessed and/or recorded evidence of recent disturbance in areas of sensitivity and looked for traces of structural remains, particularly in areas where historical roads, map-documented structures, or other features might be located.

Overall the existing mill dam appears to maintain relatively good integrity (Figure 8); however, portions of the dam and road near the existing bridge show signs of recent disturbance where expedient repairs have been made. Patches of fresh asphalt have been laid along the south side of the road, supported by fresh sand and gravel fills (Figures 9 and 10). Portions of the wood and steel cribbing for the weir and spillway structure along the south side of the bridge also display evidence of displacement and recent repair. The structure appears to have been shored up with stone rip-rap and fill (Figures 11-13).

With the exception of the east and west ends of the APE near the outside edges of the dam, the remaining portions of the project area adjacent to the dam consist of existing wetlands and cypress swamp. Investigators observed no traces or evidence of any structural remains that may have been associated with historic mills associated with the dam in the APE.

B. Determination of Archaeological Potential

1. Sensitivity for Prehistoric Archaeological Resources

The majority of the APE is not sensitive for prehistoric archaeological resources, based primarily on soils and environmental conditions. A significant portion of the APE has been substantially modified in historic times by the construction of the existing mill dam and roadway. The majority of the APE outside the existing dam is also overlain by Puckum muck soils and covered by swamp land, which was not conducive to prehistoric settlement (see Figure 4). However, very small areas on either side of the dam located on higher ground are overlain by Evesboro soils characteristic of Coastal Plain uplands. These soils, located adjacent to a reliable water source, would have been favorable for prehistoric habitation. Undisturbed areas in these portions of the APE are considered sensitive for prehistoric archaeological resources. This is supported by the previously identified sites recorded near or adjacent to James Branch in nearby locations.

2. Sensitivity for Historical Archaeological Resources

Louis Berger determined sensitivity for the presence of historical archaeological resources in the project APE based primarily on documentary and other background research, including deeds, historical maps of the project area, local/regional histories, and similar archaeological resources investigated in the region. This background research was combined with the results of the field inspection.

Overall documentary evidence indicates that the mill dam and mill pond existed as early as 1776 and were associated with the gristmills and sawmills of James Tresham. For a brief period in the nineteenth century, they were associated with Levin Thompson, a relatively wealthy free African American. Apparently the gristmill was abandoned sometime around the 1840s (Scharf 1888); however, the sawmill continued in operation at least until the latter part of the nineteenth century and possibly into the early twentieth century. The Beers (1868) map depicts a structure labeled as “Saw Mill” on the north side of the dam near the east

FIGURE 8: Overview of APE from West End of Dam, Facing Northeast

FIGURE 9: Recent Asphalt Patchwork on Rd. 72, Facing Northeast

FIGURE 10: View of Weir and Spillway, Recent Fill and Asphalt Patchwork in Background, Facing Northeast

FIGURE 11: Damaged Cribbing and Recent Fill along Spillway, View Northeast

FIGURE 12: View of East Side of Spillway from Bridge, Facing Southeast

FIGURE 13: View of West Side of Spillway from Bridge, Facing Southeast

bank of James Branch (see Figure 5). Rd. 72 is also depicted at that time crossing the mill dam. The precise location of the mills is currently unknown, and it is uncertain if the gristmills and sawmills were separate structures or integrated into a single, multipurpose building. It was apparently not uncommon to integrate gristmills and sawmills together into a single structure (Auman et al. 2005). Cubbage Mills is another example in Sussex County that eventually had both mills integrated into a single mill building (Resnick and Frye 2005). This would seem to be most economical as it would only require a single wheel or turbine to power both operations.

The precise location of the mills relative to the mill dam and watercourse is also uncertain. Some mills in the region were constructed directly adjacent to, and partially integrated with, their associated mill dam, such as seen at Betts Mill Pond (Morin et al. 2004), Cubbage Mills (Resnick and Frye 2005), and Reynolds Mill (Grundy et al. 2009). Archaeological remains associated with all of these mills were discovered in conjunction with various bridge repair efforts. The particular configuration and location relative to the mill dam is likely tied, at least partially, to the water source and the amount of available head fall. Cubbage Mills, for example, had only a 3-foot headfall. When it was initially constructed, it had a relatively short penstock carrying water to an undershot wheel. Analysis conducted by Auman et al. (2005) for the Diamond Pond sawmill, also identified in Sussex County, suggested that overshot wheels were better suited to higher head falls, of perhaps 10 feet or more. The Diamond Pond sawmill was identified during the Milton Bypass project north of Bridge 3-806, and no intact archaeological remains were identified during monitoring of the bridge replacement efforts. However, coffer dams were placed upstream and downstream from the bridge while the replacement work was done, which exposed timber framing from the mill downstream from the dam. This provided the archaeologists an opportunity to investigate the mill's remains. Their analysis found the Diamond Pond sawmill had a head fall of approximately 13 feet and suggested that a penstock carried water from the dam downstream to the mill and powered an overshot wheel. Based on topographical analysis of Sussex County mill dams, Auman et al. (2005:5-62) determined that the Tresham Mill had a head fall of approximately 10 feet. Given its similar headfall to Diamond Pond, it is possible the Tresham Mill followed a similar configuration, with the mill structure located downstream from the dam.

Perhaps the best available documentary evidence of the location thus far is the Beers (1868) map. This map depicts the mill set back a ways from the road and mill dam, as well as from the east bank of James Branch. Some of the other mills on the map are depicted directly against their corresponding watercourse, adjacent to their associated dams, or even straddling their associated watercourses. The scale and accuracy of this map are somewhat questionable, but it would appear there was some deliberate attempt to accurately portray the location of structures relative to other natural and cultural features in the landscape. This provides additional evidence that the Tresham Mill structure was located slightly downstream from as opposed to directly adjacent to the mill dam. This can only be confirmed with additional investigation.

The field inspection determined that the existing mill dam that currently supports portions of Rd. 72 retains good overall integrity; however, portions where the exiting bridge and spillway are located were substantially disturbed when the concrete slab box-culvert bridge was installed in the 1970s. Evidence of additional disturbance from the September 2016 flooding and subsequent expedient repair work was also visible. Given the extent of disturbance from the bridge installation and recent flooding, the probability of intact archaeological remains associated with the historic mills that once stood on the property is low in this particular portion of the APE. Bridge construction and subsequent flooding/repair work most likely destroyed any evidence of the sluice gate and possible penstock framing that may have been associated with the original spillway. However, portions of the APE adjacent to the existing bridge have a moderate probability of containing historic archaeological resources. Since the precise locations of the mills are unknown, the potential for associated remains along the north side of the existing dam, near the east bank of James Branch, cannot be ruled out.

3. Summary

Based on the soil conditions and environmental characteristics, it is Louis Berger's opinion that the majority of the APE is not sensitive for prehistoric archaeological resources. The majority of the APE adjacent to the existing mill dam consist of wetlands and cypress swamp. Small portions of the APE along the east and west ends of the dam that consist of higher ground with upland soils that would have been favorable for prehistoric habitation and remain undisturbed are considered sensitive for prehistoric archaeological resources.

The combined field inspection and documentary research suggest that portions of the APE have a low to moderate sensitivity for historical archaeological resources associated with the eighteenth- to nineteenth-century mills that were once associated with the existing mill dam. The dam maintains overall good integrity; however, a substantial portion of it was disturbed in the 1970s by the placement of a concrete slab culvert. Additional disturbance was caused by flooding in September 2016 that washed out portions of the dam and roadway in the vicinity of the bridge. These disturbed portions of the APE have a low probability for containing intact archaeological remains associated with the former mills.

Undisturbed portions of the dam and APE have a moderate probability to contain preserved archaeological remains associated with the historic mills. Although it is likely the mills were located downstream from the dam, no documents detailing their precise location relative to the dam have thus far been identified, and the possibility of preserved framing or foundations located in the vicinity of the dam cannot be ruled out.

V. Conclusions and Recommendations

On behalf of the Delaware Department of Transportation (DelDOT), Louis Berger completed a Phase IA Archaeological Investigation of the Trussum Pond Bridge and Mill Dam in Little Creek Hundred, Sussex County, Delaware (see Figure 1). The Trussum Pond dam is an artificial impoundment across the James Branch of Broad Creek, forming Trussum Pond to its south. Bridge No. 349, constructed in the early 1970s, carries Rd. 72 over the James Branch and the dam. The dam was damaged by a flood event in September 2016, and as a result the road has been closed where it crosses the dam since that time. Substantial repairs are needed that will involve ground-disturbing activity, including replacement of the spillway. These repairs will be coordinated by DelDOT and DNREC, and will require a permit from the USACE.

The purpose of the Phase IA investigation was to determine the archaeological resource potential of the APE, or project area, and to provide a context for assessing the importance or significance of any remains that are present. DelDOT has defined the APE for this project consisting of the entire dam and small areas of the shore adjacent to and on either end of the dam (see Figure 3). The APE covers an area measuring approximately 550x150 feet (168x46 meters), or approximately 1.9 acres (0.8 hectare).

Based on the background research and field inspection, Louis Berger determined that the majority of the APE is not sensitive for prehistoric archaeological resources. Exceptions include small areas near the east and west ends of the existing dam containing upland soils favorable for prehistoric habitation. Louis Berger recommends either avoiding these areas, if possible, or conducting additional archaeological investigation prior to any ground disturbing activities.

Background research determined the existing mill dam and Trussum Pond are associated with historic gristmills and sawmills that date to the eighteenth century. For a time the mills were owned by Levin Thompson, a free African American. At the time of his death, Thompson owned nearly 600 acres of farm and timberland in Little Creek and Dagsboro Hundreds, placing him among the top 5 percent of taxable landowners in Sussex County. This is no small feat in a time when the African-American population in Delaware was marginalized politically, socially, and economically. Identifying mill remains once associated with this individual would certainly help tell this significant story in the history of African Americans in the Lower Peninsula.

The field inspection determined that portions of the APE have been significantly disturbed by construction of Bridge No. 349 in the 1970s, as well as recent flooding and expedient repair work. Sensitivity for intact historic archaeological resources in these previously disturbed areas is low; however, the precise location of the historic mills is unknown. Undisturbed portions of the APE therefore have a moderate potential to contain intact historic archaeological remains. Louis Berger recommends monitoring ground-disturbing activities in undisturbed portions of the APE adjacent to the existing bridge by a qualified archaeologist to identify and record any historic archaeological remains uncovered during such activities.

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