2011

Postglacial Sandy Hill: A Regional Manifestation of the Gulf of Maine Archaic Tradition

Benjamin Russell
University of Mississippi

POSTGLACIAL SANDY HILL: A REGIONAL MANIFESTATION OF THE GULF OF MAINE ARCHAIC TRADITION

A Thesis

Presented for the

Master of Arts

Degree

The University of Mississippi

Benjamin B. Russell

Summer 2011

ABSTRACT

Over twenty years of archaeological excavations at Sandy Hill, in Mashantucket, CT, have provided an incredibly rich assemblage of artifacts. Yet some of the most basic questions about Sandy Hill's Early Archaic inhabitants remain unanswered. This thesis will synthesize the results of major excavations at Sandy Hill by analyzing site morphology, lithics, and hard tissue macrobotanical remains from several radiocarbon dated contexts. Macrobotanical artifacts recovered from Sandy Hill indicate a preference for hazelnut as well as wetland roots and tubers. The lithic assemblage is related to the Gulf of Maine Archaic Tradition and the predominance of quartz flakes technology and the uniform size and shape of these flakes suggest systematic production for a specific purpose, perhaps grater boards. Sandy Hill is a regional manifestation of the Gulf of Maine Archaic Tradition where people exploited dependable wetland resources in a time of ecological stress.

DEDICATION

This research was made possible by the Mashantucket Pequot Museum and Research Center. I would like to thank the Director of Research, Dr. Kevin McBride for the opportunity and funding to perform my research there. Roberta Charpentier provided considerable help and guidance at the museum. Timothy Ives offered encouraging words and was especially helpful in understanding the overlapping traditions in Early Archaic New England. Kimberly Casper showed incredible patience with me as she imparted a wealth of archaeobotanical knowledge in a very short time. Brian Jones, Zack Decker, and Dr. Dan Forrest were very helpful in explaining their excavation methods. I am very grateful to friends and family, including the Shannon and Parker families, who allowed me use of couches and spare beds.

My committee members at the University of Mississippi, Drs. Jay K. Johnson, Matthew Murray, and Janet Ford provided great support and detailed comments during the process of writing this thesis. I am very grateful for all of their help.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

TABLE PAGE

CHAPTER I

INTRODUCTION

This thesis results from an analysis of a collection from Sandy Hill (Fig 1.1), a prehistoric site in Connecticut. An existing relationship with the Director of Research at the Mashantucket Pequot Museum and Research Center facilitated an analysis of charred macrobotanical artifacts and a chipped stone assemblage. Using the data provided by this analysis, I hope to make some general statements regarding Sandy Hill in the Early Archaic. I intend to characterize the unremarkable chipped stone assemblage as having some specific purpose, namely, as graterboard flakes.

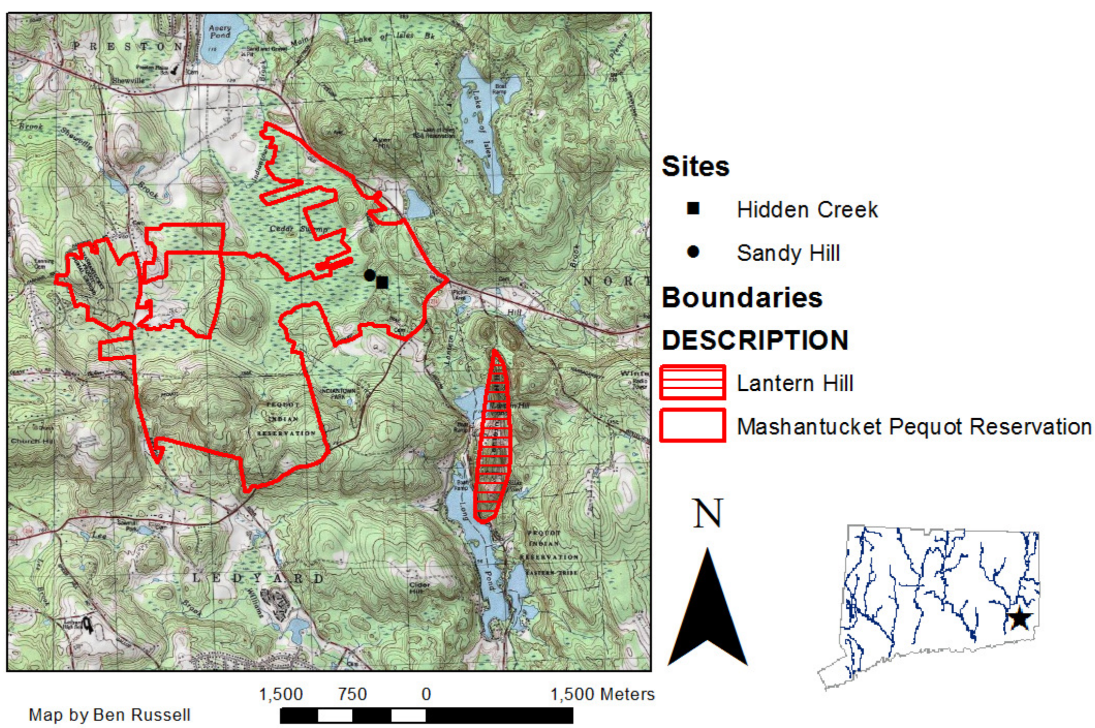


Figure 1.1, Location of Sandy Hill on the Mashantucket Pequot Reservation.

Following the introduction and site description, the foundation of my theoretical framework and regional expressions of cultural traditions will be presented in the form of a literature review. Chapter Three will characterize the actual collection that I analyzed and the particular methods that I chose to do so. Chapter Four will discuss my results and how they relate to the original research problems laid out below. Chapter Five will review my research problems, goals, methods, and results before tying my research into the larger themes of the literature review. Any recommendations for future work or contribution this thesis has made to these larger themes will be discussed.

The soils and stratigraphy at Sandy Hill are very complex and choosing a suitable amount of material for analysis involved tough decisions. Ultimately I decided to choose those soil contexts that yielded strong radiocarbon dates. All the chosen contexts contained both chipped stone artifacts and macrobotanical specimens, making it easy to conduct the research in tandem. Difficulties with botanical analysis include not being an expert. Kimberly Casper was a PhD candidate who conducted her own botanical research at the MPMRC at the time of my analysis and contributed greatly in verifying my results.

Difficulties in lithic analysis include knowing where to start. My original goal in both the botanical and lithic analysis was to identify change over time. The radiocarbon dates that span over 800 years at Sandy Hill tend to "bunch up" towards the beginning and end of occupation, not offering a truly spread-out timeline. For this reason, some contexts were combined after analysis in ways that made the results more meaningful. Quartz, the predominant raw material at Sandy Hill, is unsuitable for analyzing fine detail in lithic technology. The types found at Sandy Hill are wholly unremarkable and do not offer many degree of interesting analysis. Any ambitious ideas I had fell back to deciding whether or not an artifact was a flake or not and taking a standardized set of metrics from those that were flakes. The benefit of this analysis was a dataset that allowed a straightforward comparison to other sites of the Gulf of Maine Archaic Tradition and to other graterboard assemblages.

Sandy Hill (Connecticut Site #72-97) is a unique site for several reasons. First, it is a large, semi-permanent site occupied for nearly 800 years, which conflicts with the previously held notion of highly mobile people in a barren landscape. This conflict raises interesting questions about the assumptions regarding Early Archaic peoples. Second, the lithic technology shows a narrow range of variation suggesting some sort of specific function. Third, it relates to the Atlantic Slope Tradition (Dincauze 1971:198) in some way that is not clear. I propose that the lithic assemblage at Sandy Hill represents some form of Robinson's (1992) Gulf of Maine Archaic (GOMA) Tradition, and furthermore that it represents a contemporary, yet distinct, tradition to the Bifurcate Culture as delineated by Dincauze.

Fitting (1968) was one of the first to draw attention to the relative paucity of Early Archaic sites in the Northeast. He claims that the carrying capacity of the Northeast was much lower than it was for Archaic sites in Tennessee and the Great Lakes region. The boreal environments that have been reconstructed for this era supported a sparse population that does not leave many clues for archaeologists (Fitting 1968:443). He characterizes Northeastern Archaic populations as marginal until the Terminal Middle and Late Archaic periods. Primary impressions of the Early Archaic in the Northeast were that there were two periods of population density. The first is tied to the first PaleoIndian pioneers from the west. The second period of population density is from those moving from non-productive boreal forests towards the relatively productive broadleaf forests. Fitting rightly acknowledges a higher diversity of diet for those near glacial lakes, marine coasts, and wetland resources, but claims that his proposed cultural hiatus is not an archaeological oversight (Fitting 1968:443). Sandy Hill's unorthodox nature raises interesting questions about the assumptions regarding Early Archaic peoples.

While several preliminary reports have included previous excavations at Sandy Hill (Jones 1999, Forrest 1999, Jones and Forrest 2003), mine will be the first to synthesize the numerous excavations. This thesis will also incorporate the myriad unpublished manuscripts and M.A. theses to be written on topics such as micromorphology and starch grain analysis of Sandy Hill assemblages. The lithics have been identified by experts familiar with the GOMA Tradition as being morphologically similar. However, there has not yet been a systematic analysis, and they will be compared to other GOMA assemblages in the Gulf of Maine region. Also, this site is the earliest Archaic site on the Mashantucket Pequot Reservation and shares an obvious connection with the swamp, which continues to be a source of spiritual significance to the tribe which currently occupies the area.

Sandy Hill

Sandy Hill (CT 72-97) is located on the southeastern edge of the Great Cedar Swamp basin. Currently the site lies between the Mashantucket Pequot Museum and Research Center (MPMRC) and the Foxwoods Casino on the Mashantucket Pequot Reservation. First recorded as an archaeological site in 1986 by a survey crew, the site was intensively sampled in 1996 when crews were preparing for the construction of a cooling tower and parking garage. When commercial development threatened the site's integrity, the tribe recommended the site be tested and salvaged. Carbonized hazelnut shells were sampled and sent in for a radiocarbon date. All of the carbon samples taken at Sandy Hill were collected and sent to Beta Analytic, Inc. for conventional and accelerated mass spectrometry dating. By 1997, archaeologists knew they were dealing with the earliest site on the reservation. Later that year, following testing of an area adjacent to the proposed parking garage footprint, a nearby slope was mechanically stripped. Removal of the overburden revealed a series of black anthrosol features that were deposited upslope over time (see Figure 1.2).

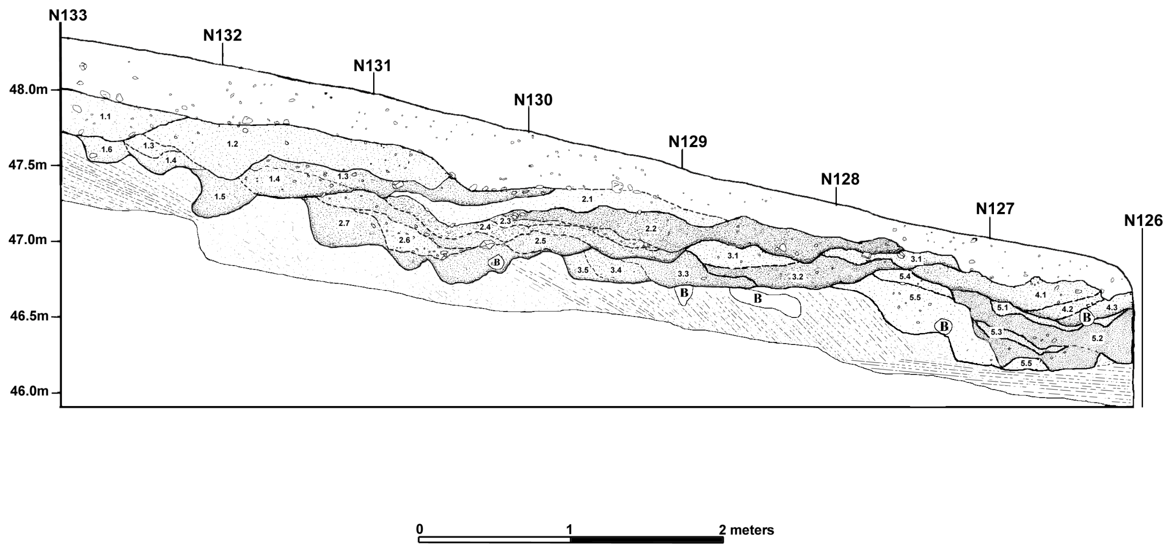


Figure 1.2, East wall profile of typical Sandy Hill living floor. “B” denotes animal burrows, from MPMRC

University of Connecticut geologist Robert Thorson was called in to examine the rich cultural features revealed during the machine stripping of the site. His comments describe the features in detail (Forrest 1999:85).

> Each feature was formed when a large cut was excavated into the fine-grained glacio-deltaic sands. Each was filled with a series of anthrosols, consisting of glacial sands and large quantities of micro-divided charcoal, charred nuts, and other floral remains. The anthrosols are either capped by talus or colluvium from the flanking embankments or are truncated by the excavation of subsequent features. In North-South section; the features demonstrate a clear stratigraphic relationship, such that the oldest features are located at the base of the slope.

The features, with their high artifact density, are interpreted as house floors. The nature of the most clear and concise features indicated a residence for prolonged period of human activity. Postmold patterns indicated semi-subterranean, southwest-facing structures, presumably covered in perishable material, with indoor hearths, and remnants of activity that could have taken place outside. The structure and aspect of the house floors are interpreted as a sign that the residences were occupied during the cold, winter months. These features offer a unique opportunity to study change over time as each floor was excavated separately with distinct artifact provenience. Soil samples were taken from each feature. Some were separated by soil floatation; others were screened through 1/8” hardware cloth. The results revealed thousands of botanical specimens, including phytoliths, starch grains, and charred hard tissue macrobotanical artifacts.

The same isolated house floors that offer temporal control of the botanical specimens also offer the opportunity for a diachronic analysis of the lithic assemblage. The assemblage is comprised mostly of quartz microdebitage and flakes but also includes cores, tools, and a hammerstone. The assemblage conforms to the typical Gulf of Maine Archaic Tradition as described by Robinson (1992). It is characterized by a predominance of quartz material and a core/flake/uniface technology. There is a notable absence of projectile points and systematically made bifaces.

In 2000, further excavations recovered a large stain with hearth and post mold features that are interpreted as a large “semi-subterranean pithouse” (Jones and Forest 2003:81). The lowest 10 centimeters that were excavated in this level represent a discrete cultural moment, that is, one of the few soil contexts that are not disturbed by repeated occupation. This area was excavated as a block and is referred to hereafter as the “Pithouse” (Fig. 1.3).

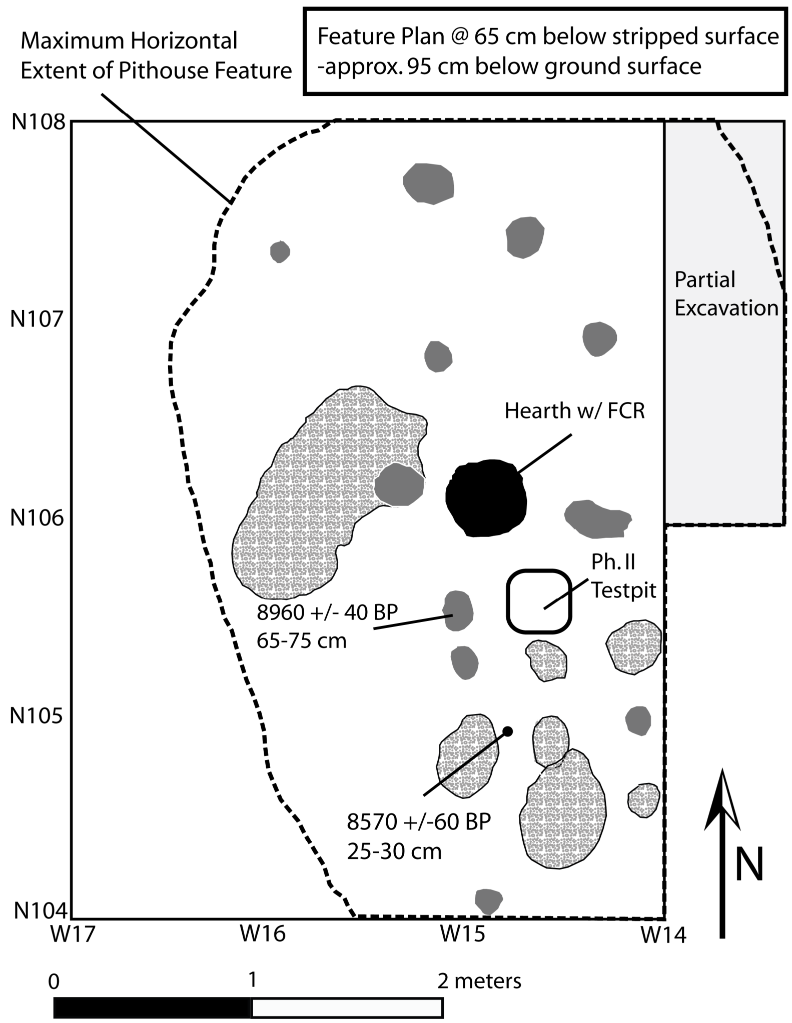


Figure 1.3, Pithouse excavation from 2000, MPMRC.

Another series of excavations (N132-141 E0-3) from 2006 focused on an incredibly complex stratigraphic sequence located northeast of the Pithouse. This sequence is characterized by deposition, disturbance, and redeposition of soil over one hundred to two hundred years in the Early Archaic. Several soils from this sequence yielded artifacts and strong radiocarbon dates. Museum staff designated these soils as 4A, 4V, 9A, and 10A. Another radiocarbon dated soil from N114 W11 was chosen because it had a high sample number and helped round out the samples of the Early Archaic.

The complex stratigraphy noted in Table 1.1, along with soil from N114 W11 represents an overlapping, roughly one hundred year sequence. To avoid confusion, these soils will be referred to in analysis as the "Hillside Soils". Few Paleo-Indian artifacts have been discovered at Sandy Hill including two Holcomb-like projectile points and a handful of scraping tools made from high-quality chert. These artifacts were found in disturbed contexts and, due to their extremely low frequency on the site, will not be discussed at length. They likely belong to an older Paleo-Indian occupation that was disturbed by Early Archaic activity.

	Soils	**4A**	**9A**	**10A**	**N114W11**	**N104-108, W14-17**
RC Dates (Calibrated)		**8610+/-60**	**8710+/-60**	**8600+/-40**	**8630+/-50**	**8960+/-40**

Table 1.1, Calibrated radiocarbon dates recovered from Sandy Hill.

Features at Sandy Hill

The stratigraphy of Sandy Hill is very complex. In 2000, Brian Jones supervised excavation of one block, N104-108, W14-17. The bottom 10 cm was separated from the disturbed soils above and considered a discrete level free from disturbance. In order to maintain accurate soil descriptions during the excavation, Jones started an east-west excavation baulk at 30 centimeters below surface. It measured 50cm x 300cm in area until the rest of the block reached a termination depth. The baulk was then excavated and screened. The block was opened to its ultimate extent to completely expose the remains of a living floor. This was a unique floor as it was not disturbed by repeated episodes of occupation. Jones took some charred botanical samples (Beta 162920) from a post mold at the bottom of the cultural deposit for AMS dating. It came back with a date of 8960 +/-40 BP.

The floor contained a central hearth with fire-cracked rock, several post molds surrounding the area and a general living floor characterized by compacted black anthrosols. Unfortunately the hearth area could not be sampled for RC dating because part of the excavation baulk had collapsed on it, ruining the provenience. This living floor and all the artifacts recovered within it are interpreted as a discrete cultural moment. I believe the lithics and botanical specimens recovered within it are useful in reconstructing the behavior of its occupants.

In the summer of 2006, a large portion of Sandy Hill was selected for Phase III recovery due to the impending construction of the West Access Road (Fig 1.4).

Figure 1.4, Summer 2006 excavations in preparation for West Access Road.

Over the course of several months, over 130 different soils were identified in approximately eighteen cubic meters of excavation. Zack Decker supervised the block plan excavation of N141-132, E1-3. He identified nine discrete features, including the upward migrating living floors and several stone hoe caches (Fig 1.5).

Figure 1.5, Stone hoe from Sandy Hill, MPMRC.

Each soil was excavated in 10cm levels recorded in Meters Above Sea Level. Each soil was screened separately due to the anticipated complexity of the site. Decker notes that the features from this block roughly conform to those previously found at Sandy Hill. The most visible characteristics during excavation are the shape and nature of the features and the frequency and type of artifacts recovered.

Faunal Remains at Sandy Hill

Analysis of the faunal assemblage at sites on the Mashantucket Pequot Indian Reservation was conducted by Brown and Bowen (2000). Their analysis does not include faunal remains from the 2006 excavations. Of a sample taken, the collection from Sandy Hill had 10 bones analyzed and they were reported as “Mostly unidentified vertebrate, two unidentified mammal fragments, all calcined" (Brown and Bowen 2000:23).

Randy Nokes from the MPMRC has also done some preliminary analysis on the faunal collection from Sandy Hill. By measuring the cortical thickness of a femur shaft fragment, he was able to determine that the cervid taxa represented by this 9000 B.P. specimen was likely elk. Other than this, it seems that all the faunal remains are heavily calcined and are unsuitable for analysis or identification. The lack of projectile points at Sandy Hill conditionally supports the conclusion that hunting animals was not important as other subsistence methods, but it is also possible that snares or traps were used and are not visible in the archaeological record.

CHAPTER II

LITERATURE REVIEW

Early Holocene Environment

The last glacial maximum occurred in southern New England ca. 18,000 BP, with the southern extent of the Laurentide Glacier covering Connecticut in an ice sheet as much as a mile in thickness (McWeeney 1999:5). Cores recovered from basins and ponds in Southern New England show that organic preservation began about 12,500 BP. The environmental reconstruction of Southern New England and the immediate Sandy Hill area comes principally from Lucinda McWeeney's analysis of ice cores in Greenland and the pollen and sediment cores from Pequot Cedar Swamp. Lily seeds indicate an open pond environment beginning 10,050 BP and ending just after the Pithouse soils were deposited, 8,890 BP.

McWeeney's analysis was important because the previous palynological reports focused on too few genera and did so at chronological intervals of 2,000 to 3,000 years. For archaeobotanists looking to characterize change over time, this resolution of the data is too coarse. McWeeney used sets of core data from multiple places and combined them with plant macro fossils, and archaeobotanical remains. The crucial difference moves paleoenvironmental analysis from the simple presence or absence of genera, to the implicit use and cultivation by human beings. In these cases, the resolution of change over time can sometimes be brought to a single human generation.

The dates established for Sandy Hill's cultural features, as well as its Gulf of Maine

Archaic Tradition lithic assemblage, place it in the Early Holocene. This period of environmental change coincides with the Early Archaic. While periodic adjustments to the environmental record push the exact date of cultural phases around, my basic assumption is that the Early Archaic coincides with the Early Holocene, which begins ca. 10,000 BP. Yet, as the terms come from different fields of study, I will use them to discuss either environmental or cultural data as it is appropriate.

In spite of radiocarbon dating, absolute chronology is not perfect. The interpretation of carbon remains in the archaeological record must be scrutinized. The many sources of carbon in the archaeological record include not just culturally produced features such as cooking hearths, but naturally occurring formations as well. Discriminating between these possible phenomena is important because Sandy Hill has a number of burn features and RC dates associated with them. As Bonnichsen and Will (1999) discuss, these may be the result of forest fires, alluvial transport, or tree throws. The criteria the authors propose indicate that features created by human activity are symmetry in plan and profile, surrounded on all sides by backfill, and contain an oxidation zone in the soil under the charcoal layer. Their criteria help archaeologists in the field discriminate between natural and cultural burn features. It is acceptable to dismiss some carbon samples as unsuitable, but it is unacceptable to interpret features as cultural when they do not, in fact, reflect human activity.

Dincauze (2000) addresses the role that humans play in the environment, both as agents of change and reactors to change. She treats humans in transitional environments primarily as adaptive agents and this is reflected in most of her structural models, although she does allow for feedback systems that adjust adaptive strategies towards equilibrium as the environment stabilizes. At a regional scale however, humans make changes to the environment. She discusses human housing and purposeful construction as unique in the biosphere and concludes that the effect that humans have on other species is typically drastic. “This Human Mode of Adaptation (HMA) has become in this century a major source of environmental perturbation, whose world-wide effects are now undeniable. Archaeology shows that, at lesser scales, the effects of the HMA are very ancient – as old, at least, as the genus, *Homo*” (Dincauze 2000:64). Sandy Hill was intensively occupied and the effects of this occupation show in the botanical assemblage. Plants that thrive in disturbed areas were thriving at Sandy Hill.

When discussing human reaction to short term changes, she says that, “Events of short duration, low frequency, and high amplitude, whether periodic or not, are likely to constitute crises and to stimulate innovative behavior” (Dincauze 2000:69). The climactic changes that were occurring, such as general warming, cooling, and the dynamic environment of postglacial New England, were quick, infrequent, and drastic. The changes forced inhabitants of New England to develop a response. One response was the occupation at Sandy Hill, where people were exploiting more dependable wetland resources and lithic material at nearby Lantern Hill. Sandy Hill’s inhabitants were also modifying the environment, most notably by digging house floors into the hillside near the lake front, but in all probability by acting as a selective force on floral species around them.

The most comprehensive understanding of the Early Archaic environment comes from the combination of pollen core data, charred plant remains in archaeological contexts, and oxygen isotope analysis done on ice cores. According to McWeeney (1999:7-9) the combination of these data indicate that following the glacial maximum in New England ca. 12,500 BP, the water table fluctuated over the next few thousand years. McWeeney’s analysis is important because it allows us to say, with certainty, that Great Cedar Swamp during the Early Archaic was hydrographically dynamic and constantly physically changing. Biological change in these dynamic environments is well noted (McWeeney 1999:8).

Yansa's "Park Oasis" hypothesis demonstrates how pollen cores and chronostratigraphic correlation of lake sediments have been used to reconstruct and reassess Paleo-Indian and Early Archaic subsistence strategies. Data from North Dakota suggests that while the area has been mostly arid, the postglacial flooding saturated the land with glacial meltwater. By 10,000 B.P., the water table lowered, and scattered oases formed in deciduous parkland. This environment supported Early Archaic peoples and their prey by providing scattered centers of safety in periods of even extreme drought. Yansa (2007:130) says:

> Without a doubt, droughts were common during the early and mid-Holocene on the northern plains and adjacent regions, since they have been reconstructed not just from paleolacustrine data, but also from archaeological contexts. Fluctuations between severe aridity and moist intervals between ca. 9000 and ca. 5000 C14 yr B.P. would have impacted available resources, including potable water, during the late Paleoindian and Early Archaic periods. While some became dry, others became "oases" that provided drinkable water and forage for game animals.

Great Cedar Swamp is located in Mashantucket, CT on the Mashantucket Pequot Indian Reservation. It is a glacially carved basin that receives fresh water from nine streams and the Indian Town Brook. The plant population varies according to aspect, soil, and water conditions. The swamp is populated primarily by red maple and white pine trees, and contains a considerable amount of high bush blue berry, sweet pepper bush, winterberry, elderberry, rhododendron, and mountain laurel (McWeeney 1999:37-38). Marsh ferns are prevalent and club-moss carpets the ground. Along the streams, a modern survey finds false hellbore, skunk cabbage, and water cress. Surrounding the basin, well within a foraging population's reach, is a mixed deciduous forest. The forest contains red oak, white oak, dogwood, red maple, hickory, hop chornbeam, black cherry, gray birch, eastern red cedar, and butternut trees (McWeeney 1999:38).

The Early Archaic

In general, the Archaic Period in North America signifies the end of the hunter-gatherer culture of the Paleo-Indian period. The use of local materials, horticultural practices, and the appearance of crude ceramics begin towards the end of the Archaic period. All these factors signal a shift away from the highly-mobile ways of people in their post-glacial environment. This is also the beginning of real regional particularism in North America. Paleo-Indian points show little variation and tend to be made of extensively traded material. In effect, there was less cultural distinction in the Paleo-Indian era across North America. The different expressions of projectile points, the introduction of ceramics, and the access to more dependable resources began the more varied expression of culture, and this is why the Archaic period in North America is interesting and important.

In the past, expressions of the period 10,500B BP to 7,500 BP in Southern New England were centered on the appearance of large side-notched projectile points made of local material. Comparison of these highly visible artifacts to large Paleo-Indian points in postglacial era, it seemed populations had begun become smaller or have less impact on the environment. Environmental data, at first, seemed to support the idea that large broad-leaf forests contained little ground level resources for humans and their hunted game. Nichols (1987) began to challenge the idea of scarce resources and scant populations in Southern New England during the Early Archaic. The following materials outline how we think about Southern New England during this time and how it relates to the larger picture of The Early Archaic in North America.

Goodyear (1999:432) refers to the need to identify more sites that fall within the transitional period between the Pleistocene and Holocene periods. While Paleo-Indian sites are easy to distinguish due to the appearance of large, basally thinned, lanceolate bifaces, these artifacts are typically recovered in disturbed contexts or on the surfaces of much younger sites. Interestingly, Paleo-Indian and Early Archaic associated projectile points have a general widespread appearance across the continent. Dragoo (2006:06) published a short but fairly comprehensive guide on the identification of these points, with emphasis on those that appear during the transitional period, which he starts at about 10,500 BP The best circumstances for developing further knowledge of this cultural transition, according to Goodyear (1999), would be deeply stratified and well excavated sites with high levels of integrity. I believe that the excavations of Sandy Hill fall in this category and my thesis will contribute to the currently limited body of knowledge.

Walthall and Koldehoff (1998) have discussed the PaleoIndian-Archaic transition in the Central Mississippi Valley. The transition appears most visibly in the archaeological record as the ‘Cult of the Longblade’. They argue that the Cult of the Longblade is evidence of a mechanism for social cohesion in which these large points of high-quality material were found over wide areas and signified social relations between the givers and takers. These social relations were networks formed as an adaptation to the environmental change happening at the end of the Pleistocene and beginning of the Holocene. They mention that other large points that match this pattern are found all over North America and merit further study as markers of networking (1998:269). A similar argument for exchange and sharing was made for the Midsouth region dating to the Middle Archaic (Johnson and Brookes 1989). The lithic tradition of Sandy Hill does not feature these large distinctive projectile points, instead it makes use of lesser-quality, locally available quartz. It also contains a few pieces of ground slate and a large groundstone axe. It seems unlikely that anyone would trade quartz, which is present in much of New England, but the ground stone items are similar to those found hundreds of miles to the north in the Gulf of Maine. It is possible that a cultural link exists between these two people, or that they are the same people.

Mikell and Saunders' (2007:193) suggest the first Archaic occupation in Florida was ca. 7270-7150 BP with continuous Archaic occupation from 5000 to 3500 BP. It was at this time that "Populations living along the sandy Pleistocene terrace overlooking the current Mitchell River floodplain began to exploit newly forming estuaries as early as 7200 years ago, and they continued to do so with varying intensity for a period of some 3500 years while the nearby marsh estuaries were apparently productive". These environments were not only resource bases but possibly centers of ritual activity. Wentz and Gifford (2007) discuss the role that sinkholes may have played as mortuary ponds in these coastal environments. Little Salt Springs is a large sinkhole on Florida's northwest coast. SCUBA divers had reported human remains on floor of the sinkhole and archaeological investigations recovered human remains dating to the Middle Archaic. Far from being an accidental internment, Wentz and Gifford (2007:334) argue that these mortuary ponds were locations of water internment. I propose that water interment was practiced at Sandy Hill during the Early Archaic which could explain the absence of the Morrill Hill burial complex, a marker of the Maritime Tradition and several sites in the Gulf of Maine region.

The spiritual significance of water for human populations both past and present is notable. Indeed, much of human activity is centered on water. Not only for practical reasons such as sustenance and transportation but also for spiritual and psychological placation. Our current population densities around coastlines of large bodies of water are merely a continuation of the earliest North Americans' desire to be near water. Not only was the southeastern region of North America home to ritual activity in the Archaic period, but "Some of the earliest intentionally constructed monuments in the New World are found in the Southeast" (Thompson 2007:104). According to Thompson, shell rings are remainders of occupational patterns, and the repeated long-term occupation of these sites is what forms distinctive shapes and patterns. This is to say that ceremonial patterns reflect patterns of use and activity. This information is pertinent because Sandy Hill is in direct proximity to wetlands, which could have served not only as a resource base, but as possible places of ritual and psychological significance during the same period at the aforementioned sites.

A Cultural Hiatus

Fitting (1968) was one of the first to draw attention to the relative paucity of Early Archaic sites in the Northeast. He claims that the carrying capacity of the Northeast was much lower than it was for Archaic sites in Tennessee and the Great Lakes region. The boreal environments that have been reconstructed for this era supported a sparse population that does not leave many clues for archaeologists (Fitting 1968:443). He characterizes Northeastern Archaic populations as marginal until the Terminal Middle and Late Archaic periods. Primary impressions of the Early Archaic in the Northeast were that there were two periods of population density. The first is tied to the first PaleoIndian pioneers from the west. The second period of population density is from those moving from non-productive boreal forests towards the relatively productive broadleaf forests. Fitting rightly acknowledges a higher diversity of diet for those near glacial lakes, marine coasts, and wetland resources, but claims that his proposed cultural hiatus is not an archaeological oversight (Fitting 1968:443).

For some time, Fitting's 'Boreal Forest' model was essentially unchallenged. He describes the postglacial landscape of the Northeast as being either a broadleaf forest of limited productivity or a boreal forest of virtually no productivity. He cites Ritchie's characterization of the Northeastern Early Archaic as being sparse in terms of cultural materials compared to the preceding and following periods (Fitting 1968:442). Until the 1990s, it was understood that in the Northeast, "…either the overall carrying capacity was limited or not all this potential was exploited. Human populations were small, belatedly arrived, or both" (Gramley and Funk 1990:5). The previously mentioned scholars correlate environmental reconstruction with the presence and absence of fluted and bifurcate projectile points, and do not find issue with considering artifacts in disturbed contexts such as plowed fields, tree throws, or animal burrows. While they are in error regarding the ubiquity of diagnostic artifacts, they had less data than we have now. The Ritchie-Fitting Model was one of the first hypotheses of the Early Archaic in the Northeast. It was largely based on environmental data, and as the data will show, we now reject their hypothesis. Dincauze was the first to propose another culture history for the region, with Robinson (Figure 2.1) elucidating particular differences in the Gulf of Maine region during the Early Archaic.

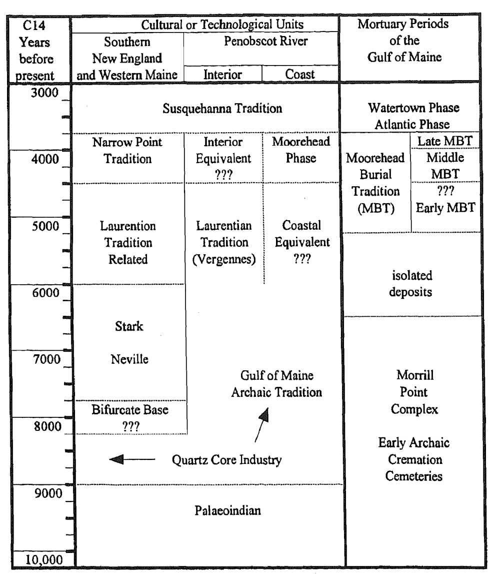


Figure 2.1, Culture history chart for Early Archaic New England, (Robinson 2003:16).

Atlantic Slope Tradition

Dincauze (1971, 1976) described a widespread cultural tradition along the Atlantic Coast from North Carolina to New Hampshire. The Atlantic Slope Tradition (AST) is marked by Hardaway, Kirk, and Palmer points during the period of Sandy Hill's occupation. Northeastern examples of these points are thought to date from 9600 BP to 8500 BP (Funk 1996:13), though their occurrence is exceedingly rare and securely dated examples are scarce (Forrest 1999:81). The only known concentration of specimens in Southern New England is from a cluster of sites in the Robbins Swamp Basin in Northwestern Connecticut (Nicholas 1998:272-273).

The AST, as seen in Connecticut, seems to represent the most northern incursion of the Piedmont Tradition, which is typically associated with the Carolinas. After the Piedmont Tradition expanded across the Carolinas area and northward into the area that is modern day New York and New Jersey, it gained some presence in southern New England by 10,000 BP according to Forrest (1999:81), as seen in a higher number of bifurcate points. The AST in Southern New England is marked by low population density and high mobility. The subsistence strategy reflects a diffuse base of resources that tended to keep people on the move and in low numbers.

The AST toolkit is marked by personal items that were heavily curated by the users and typically made of local quartz and quartzite, with little evidence for "regional exchange of exotic cherts" (Snow 1980:172). Examples of this strategy include Dill Farm in East Haddam, CT where bifurcates were made of local quartz and quartzite, but high mobility is suggested by the low frequency of Boston Basin cherts and Hudson Valley Rhyolites (Pfeiffer 1986:30).

Glacial Lake Wetland Mosaic

Quite opposite to Fitting's 'Boreal Forest Model', Nicholas finally suggests that the environment in the postglacial New England region was a stable mosaic pattern that was used advantageously by its inhabitants. The predictability of these environments supported a higher carrying capacity, especially around glacial lakes. In the Middle Archaic, when the glacial lake areas dried up and became more like the surrounding deciduous forest, land-use patterns changed with them. The resulting technological and social changes mark the end of the Early Archaic. Nicholas' Glacial Lake Wetland Model is reflected in the later paleoenvironmental models (Dincauze 2000; Forrest 1999; Jones and Forrest 2003; Jones 1997, 1998, 1999; McBride 1992).

Understanding the wetland environment of the Northeast during this time is especially important. It has been argued that wetlands provide both stability and resources for population growth by being predictable sources of food (Nicholas 1998:720). Great Cedar Swamp was a glacial lake. Some local kettle-lakes were formed by massive ice-boulders, left behind by the retreating glacial mass, but the swamp was formed by glacial action whose meanderings formed an inlet and outlet into the greater Connecticut Valley. The swamp regulates drainage, provides some expansion room for floods, and is still the source of some water for the Mashantucket Pequot Reservation. As a component of the larger Connecticut River Valley, Great Cedar Swamp does rise and fall with the regional water table, but in times of drought and flood it acts as a buffer to retain some water in times of need and prevent dynamic flooding systems, such as washouts, from tearing the entire landscape apart.

The swamp did not just provide protection from natural disasters. It also was a place of physical and psychological comfort. McBride (1992) mentions that in contact times, the Pequots used the swamp as refuge to escape conscription into the Colonial militias. Wetlands play a mitigating role in much of the regional settlement systems. Nicholas (1998:725) notes the tendency for glacial lakes in the Northeast to be surrounded by long term occupation sites during the transitional phase. The Robbins site in Northwestern Connecticut had a population whose growth mirrored the reconstructed water level (Nicholas 1998:725).

Gulf of Maine Archaic Tradition

Robinson (1993) directly addresses Fitting's assessment of New England Early Archaic and says that the apparent pattern seen in New England 10,000 to 8,000 RC years B.P. is not one of marginality. He argues for a cultural core in the Gulf of Maine, which he aptly calls the Gulf of Maine Archaic Tradition (GOMA) (Robinson 1992). GOMA is distinguishable from other cultural traditions in this time because of its general lack of diagnostic artifacts, such as architecture, projectile points, ceramics, etc. It is exactly this lack of diagnostic, highly visible artifacts that led previous archaeologists to consider the entire region as marginal. Robinson claims this assumption is false. Early Archaic food strategies might simply have a low impact on the archaeological record. He was not the first to raise this point. Nicholas (1987) was the first to say that by focusing on previously unconsidered reliable sources of food such as wetlands and more open bodies of water, can we see a more productive background.

Not counting the marine environment, Maine is 10% open water. Robinson identifies several sites in the Gulf of Maine region that follow the pattern of low visibility lithic debitage but high population densities around wetland resources and open lakes carved by glacial activity. The lithic assemblage is characterized by utilized flakes and cores, groundstone technologies, and a notable absence of projectile points. His examination of slate rods and full channeled gouges raises some remarkable questions that have not yet been answered. The gouges do not serve any immediately recognizable purpose, yet they are not rare and the distribution is fairly even in the immediate Gulf of Maine cultural core. So it is clear that there is much we do not know and may never know from the archaeological record.

Robinson constantly references Dincauze and Mulholland (1977) for their correlation of the distribution of projectile points with 20% oak isopolls. Their hypothesis was an extrapolation of Fittings (1968) oak pollen isopoll in which the Northeast was quickly enveloped by an encroaching arboreal forest. They applied it by correlating the proposed population density from the Neville site (Dincauze 1976) in New Hampshire to the 20% oak pollen isopoll. Robinson immediately recognizes the double standard of dismissing Fitting's argument but using his reasoning to support Dincauze and Mulholland's hypothesis. He does suggest though that the recognition of Neville site as a productive and successful site of human occupation is a landmark in refiguring the Early Archaic in the northeast. Robinson (1993) presents four working hypothesis for the GOMA: 1) Old sampling models are obsolete. There is no reason to believe that the Archaic Gulf of Maine region was not densely populated relative to the rest of the continent. 2) The technological assemblage of these people is not well understood and larger samples must be collected in order to realize this understanding. 3) The Gulf of Maine region has a unique mortuary practice that is characterized by red ochre and ground stone artifacts. 4) It is now reasonable to assume that population density did not fluctuate dramatically between the very Early Archaic and the Late Archaic.

Robinson (1992) had already characterized the lithic reduction strategy of the Gulf of Maine Archaic Tradition. Quartz core technology occurs in the region both in the Early/Middle Archaic and also the Woodland Period. The Archaic period assemblages differ from their Woodland counterparts in a few ways. The Woodland flakes are generally smaller and thinner.

These cores tend to be bipolar and, as they approach exhaustion, form narrow blade cores with greater incidence of bipolar reduction. He suggests that the uniface quartz core industry may represent a widespread microflake industry. Any who endeavor to support this argument should make sure that the sample size of their lithic assemblage is large enough to provide strong negative evidence of well-thinned bifaces production. Furthermore, any bifaces that do occur should not conform to well-documented types, but rather should exist as random variants and part of a non-systematic production.

Robinson's qualm's regarding the scarcity and inadequacy of the data in relation to the claims that were being made were first raised by Nicholas (1987). Briefly summarized, his argument is that our conclusions are severely hampered by: 1) The words we use, 2) the questions we ask, and 3) the archaeological record itself. Our vocabularies, which include higher-level applications such as models and systems, are structured around words such as 'first', 'small', 'band', and 'simple'. These words and models reinscribed those environmentally-poor and marginal landscape theories that hampered research development for too long. Regarding the archaeological record, we need to understand that the Archaic period especially is subject to the environmental destruction that defines it in relation the Holocene epoch.

> The degree of landscape modification, which is quantifiable through surficial geological mapping of landform remnants, should be used as the initial consideration of early site potential or scarcity, since this can be verified empirically, rather than population hiatus hypotheses or population limiting hypotheses for the early Holocene that remain to be tested in many areas (Nicholas 1987:103).

The other issue regarding the Early Archaic archaeological record is more directly related to archaeological methods. When Early Archaic sites have low visibility, there is not enough aggregate data to identify sites beyond easily recognized diagnostics. In these days when

Cultural Resource Management firms are conducting more and more of the archaeological surveys, a bifurcate point is easily identifiable for any shovelbum. But industries and traditions such as the GOMA are not. Without easy recognition by archaeologists, artifacts are not recovered, thus reducing the likelihood that future sites will be recognized. In this way, our archaeological sampling strategies have failed to develop new thoughts on Early Archaic archaeology. As a result, Nicholas (1987:104) argues "..well-intentioned and well-planned field studies may produce land-use patterns, for example, that can be viewed more as 'artifacts' of the present cultural system than of the past".

Dan Forrest (1999) has used Archaic site data in the New England region to help place Connecticut's Archaic period in the greater picture. He focuses on Sandy Hill and Dill Farm, Archaic sites in Connecticut. Dill Farm was a site originally excavated by John Pfeiffer between 1982 and 1985. It has been previously characterized by the 'Atlantic Slope Tradition', a tradition with distinctive bifurcate projectile points, unifacial choppers, and unifacial flake scrapers. This description grew out of the Ritchie-Fittings boreal forest model that postulated only several small invasions of hunters into the game-scarce northeast. For this reason, the Atlantic Slope Tradition was seen as a smaller, more mobile population. But Forrest questions the logic of this argument. It may be that Sandy Hill is simply a core area and sites like Dill Farm, not 40 miles to the west, is a periphery. If this were true, Sandy Hill acting as a base camp could have supplied what most recognize to be the core of early human diet, vegetative food. Outer peripheries or possibly short-term hunting camps such as Dill Farm could represent the occasional foray into the country to take advantage of game.

CHAPTER III

MATERIALS AND METHODS

The two major classes of artifacts considered in this thesis, macrobotanical specimens and lithic artifacts, require substantially different analytical procedures. In both cases, I was initially attempting to characterize the general makeup of each assemblage. Characterizing the botanical analysis included identifying dominant species or plant types and suggesting reasons for their presence.

Characterizing the lithic assemblage meant identifying different types of artifacts and raw materials. I also wanted to attribute it to an existing cultural tradition if possible. A diachronic approach was the initial framework for both the botanical and lithic analysis, so the different radiocarbon-dated contexts were analyzed separately.

The methods presented below will demonstrate how I sought to fulfill the objectives within the limits of my abilities. In the end, it seemed there was little evidence of change over time, but the collected data reaffirmed assumptions about the botanical assemblage and was helpful answering question about the quartz flakes at Sandy Hill and their possible use as graterboard flakes.

Macrobotanical Remains

The questions I sought to answer regarding the macrobotanical remains were "What is the general makeup of the archaeobotanical assemblage found at Sandy Hill?" And "What patterns, if any, exist?" In 2000 and 2006 archaeological crews at Sandy Hill collected botanical remains through both soil flotation and dry screening. At the time of this research over 26,000 botanical artifacts had been catalogued from Sandy Hill. Thousands more are being processed at the time of this writing.

I performed a preliminary sort of hard tissue macrobotanical specimens. The final analysis of the artifacts was performed by Kimberly Casper, a PhD candidate who conducted her own botanical research at the MPMRC at the time of my analysis and contributed greatly in verifying my results. Having Ms. Casper verify the accuracy of my data is a strength that boosts the legitimacy of my results. My initial sort of materials indicated that a greater amount of macrobotanical specimens were identifiable to the genus level. Her skillful eye and knowledge made the variety of identifiable material to a more conservative estimate.

The amount of botanical specimens and lithic material from both the 2000 and 2006 excavations was overwhelming. In order to make the analysis more manageable, I focused on the soils that had been associated with good radiocarbon dates. In an attempt to synthesize the findings of my analysis, I will identify the types of botanical remains recovered, their uses as food, tools, and fuel, and the implications for Sandy Hill's inhabitants. I will attempt to compare my findings with contemporary sites and assemblages.

My goal during the laboratory analysis was to perform a preliminary sort of the recovered macrobotanical remains. Kim Casper determined whether any species were identifiable to the genus or species level. Identification of family was sometimes possible, but of little use in the archaeobotanical interpretation. Identification of wood to the genus or species level was done when possible, but due to the heavily fragmented nature of the remains, this was seldom possible. Plant Material became a catch-all term for items that clearly did not fit the other categories. Extremely small fragments of nutmeat, parenchyma, and other storage and transport tissues often fell into this category. Burned plant resin is another example of something that would be placed in this group. These pieces are usually non diagnostic and unfortunately yield little information.

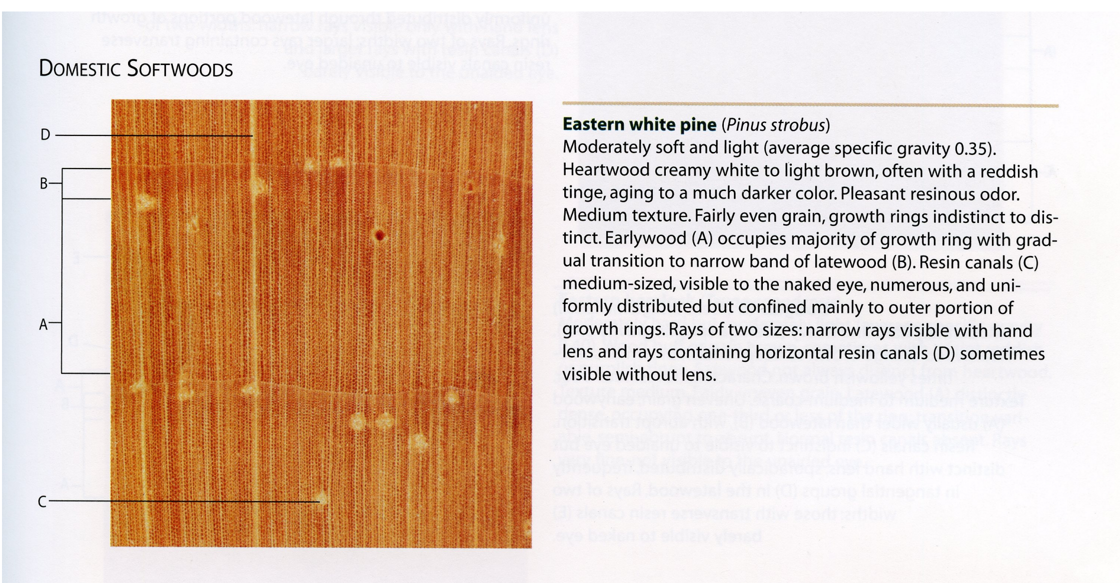
Methods and Protocols

Botanical specimens were recovered from the Pithouse excavation by 1/8th inch hardware cloth on site. A total of 90.25 liters of soil from the Hillside contexts were sampled. A portion, 23.5 of those liters, was floated in the laboratory while the remaining samples were screened by a dry 1/8th inch hardware cloth in the laboratory. Many botanical specimens were found in ¼ and 1/8th inch hardware cloth on site. The botanical specimens I analyzed for this thesis are an uncertain mix of these methods.

By the time I chose specific soils for botanical analysis, they had been floated or screened and catalogued in plastic bags, and stored in archive boxes for three to eight years. Trays of bagged botanical artifacts were made available to me and I isolated them from the entire Sandy Hill botanical collection. At the time this isolation occurred, the entire Sandy Hill charred botanical collection consisted of over 13,000 items. I personally processed 5,974 charred botanical specimens.

Hard tissue macrobotanical artifacts, notably wood, seeds and nuts, are heavily fragmented by both taphonomic processes and archaeological excavations. Using a 10-40X binocular microscope, I sorted the artifacts into the following groups: Wood, Nutmeat, Nutshell, Fungus, Seed, and Plant Material. Plant Material consists of Parenchymous tissue and unidentifiable yet clearly charred organic material. Some of the wood is further divisible into hardwood and softwood. Softwood is clearly identified by the presence of resin canals and less clearly by specific ring patterns. Hoadly's (2000) text was used for the preliminary sort of the wood based on ring patterns, but comparative collections from the MPMRC and UMass Amherst were used for any genus or species identification.

Charred wood was recovered from every single feature and matrix. It was the most ubiquitous and readily visible type of specimen. The vascular tissue (Figs. 3.1, 3.2) that makes up the majority of tree structures can be seen with a simple hand lens, and patterns in rings, rays, and pores are visible with a 10X magnification. Pores in particular are helpful in the use of a dichotomous key to identify woods. Ring-porous woods such as ash, chestnut, elm, hickory and oak are distinguished on the basis of pores in the earlywood, which forms in the spring time. Under magnification, this will appear as pores gathered around the ring towards the pith. The pores in diffuse porous species of hardwood, such as birch, maple, poplar, and willow are more evenly distributed between the earlywood and latewood. Resin canals are vertical vessels within certain softwood species, such as spruce, larch, pine, and fir.


DOMESTIC SOFTWOODS

D

B

A

C

Eastern white pine (*Pinus strobus*)
Moderately soft and light (average specific gravity 0.35). Heartwood creamy white to light brown, often with a reddish tinge, aging to a much darker color. Pleasant resinous odor. Medium texture. Fairly even grain, growth rings indistinct to distinct. Earlywood (A) occupies majority of growth ring with gradual transition to narrow band of latewood (B). Resin canals (C) medium-sized, visible to the naked eye, numerous, and uniformly distributed but confined mainly to outer portion of growth rings. Rays of two sizes: narrow rays visible with hand lens and rays containing horizontal resin canals (D) sometimes visible without lens.

Figure 3.1, White Pine, a species thought to grow in the Swamp Basin at the time, was not recovered. Image and text from Hoadley (2000:63).

Figure 3.2, Several fragments of Quercus spp. were recovered. They were not identifiable to the species level. Image and text from Hoadley (2000:59)**.**

While I did look for both types, as well as monocot stems (plants like grasses, maize, or sedge) the only type visible in the record was hardwood. There are many specimens which were clearly wood, but without enough area in cross section to identify a pattern of pores, were listed as indeterminate. It is entirely possible and highly likely that at least some of these represented softwood species, but this cannot be proven positively. Based on pollen cores, many species bearing resin canals such as spruce, larch, and fir were replaced by pine, birch, beech and oaks, during the early Holocene (McWeeney 1999:8).

Comparing the patterns to known samples helps in identifying hardwoods and softwoods. The Mashantucket Pequot Museum did not already have a comparative collection for charred wood, so one was created. It contained species that are typically found on sites in the reservation. The specimens were helpful, yet the size and preservation of the archaeological samples remained the biggest obstacle to any quality identification.

Lithic Artifacts

At the time of this research, over 136,000 lithic artifacts have been inventoried from Sandy Hill with thousands more being recovered and processed. Early characterizations of the lithic collection at Sandy Hill focused on relative simplicity of the reduction strategy and uniformity of material.

There were three goals to the lithic research. One is to see if flake production at Sandy Hill is systematic. Regular flakes with predictable dimensions would support the conclusion that these were being systematically produced to perform a specific function. I suspect this function involves the use of quartz graterboards or other compound tools.

The second goal in this lithic analysis is to look for morphological change over time. From a cursory view, the only static feature of Early Archaic Sandy Hill is the presence of this flake assemblage. The environmental record indicates an unpredictable climate during this postglacial time and it would be interesting to see if the archaeological record reflects this as well. Sandy Hill, because of its well-stratified and long term occupation, offers a good opportunity to look at change over time. If no change is detected, it would indicate that there was a specific behavior occurring at Sandy Hill that was not modified during the period of occupation. If change is visible, then a dynamic material culture offers another layer of complexity to the Early Archaic in Southern New England.

While previous publications on the lithic assemblage at Sandy Hill have all discussed the affinity of Sandy Hill's lithic assemblage to that of Robinson's (1992) Gulf of Maine Archaic Tradition, a final goal of this thesis is to clarify this similarity with some quantitative measure. The Eddy Site (Bunker 1992) will be used as a comparison as it is the only known GOMA site for which lithic data are available.

Table 3.1, Lithic categories used by MPMRC staff during cataloging of Sandy Hill artifacts.

Lithic Type Category	Attributes
Biface Reduction Flake	Flake with extensive lip, early stage reduction or rejuvenation
Biface Retouch Flake	Flake with bifaces platform remnant, usually small
Biface Thinning Flake	Long, thin flake with bifaces platform remnant
Blade	Flake twice as long as wide
Chunk	Angular debris larger than 5cm
Core	Raw material source of flakes, usually angular
Core Fragment	Part of a core
End Scraper Retouch Flake	Thick unifacial retouch flake with edge damage
Flake	Formed by percussion, exhibits platform, bulb, and flake scars
Large Angular Debris	Angular debris between 3 and 5 cm
Large Flake	Flake greater than 5cm long
Microdebitage	Undifferentiated flakes and fragments smaller than 1 cm
Microflake	Catch all for complete flake smaller than 1 cm
Primary Reduction Flake	Flake with cortex evident
Resharpening Flake	Bifacial flake with damage evident on proximal end
Shatter	Angular debris smaller than 1 cm
Small Angular Debris	Angular debris between 1 and 3 cm
Tablet	Flat piece with perpendicular edges, greater than 5cm
Unidentified Debitage	Unrecognized form
Unifacial Retouch Flake	Thick unifacial retouch flake with edge damage

Methods and Protocols

Six discrete soil contexts were chosen because of their solid radiocarbon dates and manageability. The assemblages have large sample sizes and little effort has been made so far to systematically analyze a large portion of flakes from Sandy Hill. When recovered by museum staff in 2000 and 2006, lithic artifacts were separated by unit, level, soil, material, and category. These categories are highly subjective and while effort was made to follow a standardized set of types (Table 3.3), the process was completed over a long span of time by numerous individuals, who also worked on other sites and assemblages from other periods. I looked at every single lithic artifact that was loaned to me and determined if it was a flake or not. The recovery strategy at Sandy Hill since 2000 had been to collect every piece of stone larger than coarse sand. The reason for this strategy is that if the glaciodeltaic deposit of sand was the uniform subsoil, then the presence of anything else indicates cultural activity. Some artifacts were large cobbles, possibly manuports. They could easily have been employed as simple weights, anvils, or nutting stones, though a primary analysis of use wear is not indicative of the latter.

As mentioned previously, the inhabitants of Sandy Hill chose to select the locally available material for a specific purpose. A USGS Bedrock Map shows Lantern Hill as the nearby source of “Silicified rock, mylonite and sheared rock with abundant quartz veins” (Rodgers 1985). The area underlying the swamp and its perimeter is the Tatnic Hill formation, a gray to dark-gray medium grained gneiss or schist. Quartz is notoriously poor for its workability. It does not fracture in desirable patterns, and is particularly hard. This hardness is exactly why it was selected by Sandy Hill’s inhabitants.

When determining what constituted a flake, I wanted to include the presence of a bulb of percussion, ripples, a striking platform and a tapering towards the distal end. Because of the poor suitability of this coarse grained quartz for identification of these characteristics, I ultimately made my decision based on the presence of a striking platform, and a tapered and sharp end. Most flakes were thin in cross section, but short and wide in plan view.

A high frequency of lithic artifacts from Sandy Hill is categorized as “other”. These artifacts are chipping debris. They are simply byproducts of making flakes and tools. They were not counted for most of the analysis in this thesis. If an artifact was determined to be a flake, length, width, thickness, and edge angle were measured. The presence or absence of thermal alteration and cortex was noted and every artifact was weighed. For bags containing more than 10 pieces of non flake debitage, I sampled 10 pieces for thermal alteration and cortex presence. Several bags contained more than a hundred pieces of very small debitage, (<5mm) they were weighed all together to provide an average weight for future analysis. The non flake debitage was not counted as part of my analysis, except for aggregate totals. Most of the descriptive statistics below use data from the flake category.

At first glance, the lithic assemblage does not appear to have much differentiation. The structure and near uniform color and clarity of the quartz material do not allow obvious recognition of gross differences in lithic tool morphology. However, by systematically giving each artifact particular attention, one begins to see patterns in the categories of Sandy Hill's lithic assemblage. By accepting that quartz obscures fine lithic details and reducing the definition of flake to include the presence of a striking platform, a general bulb shape, and a shape that tapers from a proximal to distal end, it is possible to more realistically include more flakes in an assemblage that would otherwise be reclassified almost entirely as non-flakes.

Other artifact types such as hammerstones, FCR, or cores require far less expertise to identify. The main distinction being made in this analysis is whether certain items are potential flake tools or debitage, that is to say, whether they are purposefully created or simply a byproduct from the creation of another item.

CHAPTER IV

RESULTS

The macrobotanical analysis provided little evidence of change over time. The data reaffirmed previously held assumptions regarding activity at Sandy Hill. The high proportion of wood and nutshell reflects burning fuel and consumption of hazelnut. While this organic material was helpful in providing radiocarbon samples, it provided little new information in terms of activities at Sandy Hill. Starch grains and phytoliths identified as part of other individuals' research provides more nuanced insight, and will be discussed below.

The lithic analysis provided little of change over time but did reaffirm the affinity of lithic technology at Sandy Hill to the assemblage at another GOMA site. The comparisons are carried out in this chapter. The possibility of the quartz flakes from Sandy Hill belonging to a graterboard assemblage is evaluated below. This indicates the possible 'specific purpose' for which flakes are being systematically produced at Sandy Hill.

Botanical Results

Table 4.1 shows the breakdown of identifiable macrobotanical artifacts by category. The category that composed most of the collection was wood. The high percentage of wood, more pronounced in the Hillside soils, probably reflects its use as fuel. All of the recovered remains were from Archaic soils and thus, if not carbonized, would have decayed. Since wood is the most readily consumed fire fuel, this explains its high visibility in both the Hillside (81%) and Pithouse soils (53%).

Table 4.1. Identifiable Macrobotanical Artifacts (grams).

	HILLSIDE	PITHOUSE	TOTAL
RC Dates	Ca. 8637+/-52	8960+/-40	
Macrobotanical Types	N=2810	N=3150	N=5974
Fungus	.01	0	.01
Seeds	.01	.01	.02
Wood (Total)	22.41	35.03	57.44
Hardwood	0	1.09	1.09
Softwood	0	0	0
Plant Material	1.43	26.14	27.57
Parenchyma	2.00	0	.2
Nutmeat	0	0	0
Nutshell (Total)	2.32	2.34	4.66
Corylus Nutshell	1.31	2.04	3.35
Other Nutshell	.13	.06	.19
Total	27.82	66.71	94.53

Figure 4.1 depicts proportions of the macrobotanical assemblage according to the three main categories. The proportion of macrobotanical specimens from the Pithouse is represented by the solid line and that of the Hillside by the dashed line. Just as wood makes up a larger percentage of the botanical specimens recovered from Hillside soils, plant material makes up more of those recovered from Pithouse soils. The difference between the two soil contexts is probably the result of different activities taking place in the two locations, or the mixture of

different soils that make up the Hillside soils. Nutshell is very visible in both soil contexts and nearly all of it was *Corlyus* sp. Unfortunately, very few seeds were recovered.

Wood

In New England during the Early Holocene, one expects to find oak and pine, along with larch, birch, hemlock, and heath (Jones and Forrest 2003:77). My analysis has found oak, both diffuse and ring porous species and one unidentifiable hardwood species. The presence of resin canals which secrete resin in vertical tubes within certain softwoods was not observed anywhere in the collection. This is notable as pine, in particular, would have been a dominant species at the time. While there is undoubtedly some softwood among the vast number of unidentifiable remains, the features chosen for analysis are mostly domestic contexts and probably reflect the selection of hardwood for fuels.

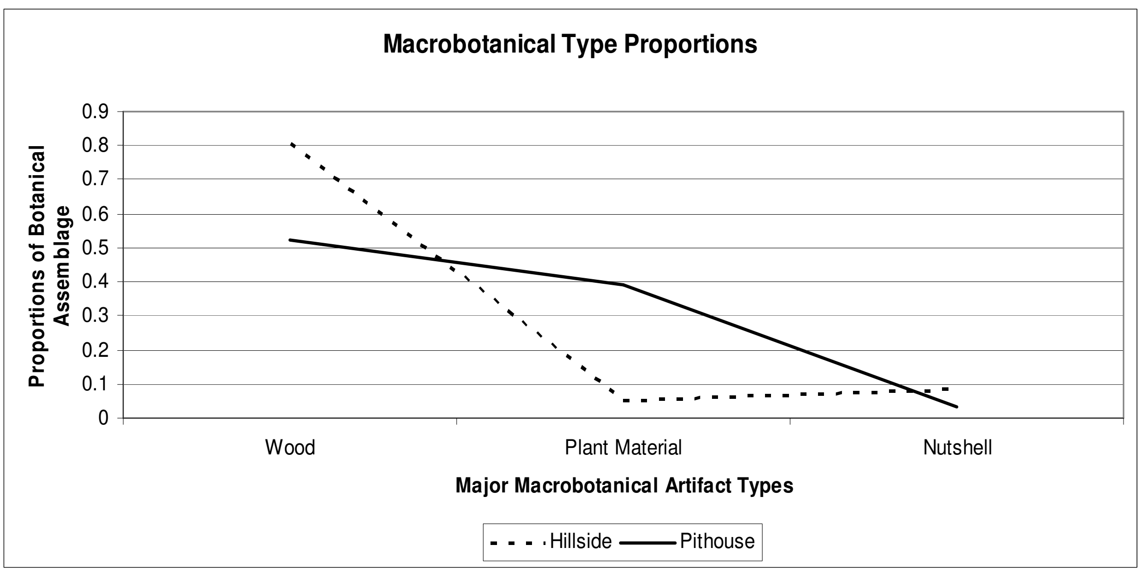


Figure 4.1, Macrobotanical specimen proportions from Sandy Hill.

Nutshell and Nutmeat

Quercus

Acorns, long considered a valuable mast resource in the Archaic period (Anderson

2005:255), were identified only in the Pithouse feature excavated by Brian Jones in 2000. The bottom stratum of this feature is dated to 8960 +/ 40 BP (Beta 162920), which would indicate that acorns are being exploited during some of the earliest occupation of Sandy Hill. Acorns were likely exploited to some extent during all the periods of occupation. However, the bottom ten centimeters of the Pithouse is a relatively undisturbed stratum. The Hillside deposits may have contained acorns at one point but during the continuous disturbance to the Hillside, they were moved to less distinguishable soils, or fragmented to a degree that precludes identification.

Corylus

Hazelnut was recovered from all soil contexts with the exception of one. This indicates not only that people were exploiting this resource but that it was available throughout the possible 440 year occupation that this assemblage represents. Nutshell, the majority being Corylus, is only 5% of the total assemblage, but in two of the Hillside soils, it makes up 32% and 45% respectively.

Ethnographic evidence from California (Anderson 2005) indicates that simple forest management techniques can help increase acorn yields. These include managing oak stands with fire and competing with animals by knocking acorns out of trees before they fall to the ground. There is no evidence of large scale burning at Sandy Hill during the Early Archaic, but soil cores indicating forest fires during the warmer, drier, hypsithermal period, about 5,500 BP - 3,000 BP, have always been interpreted as a time of low productivity for the region (Thorson and Webb 1991). It is possible that fires were an attempt to rejuvenate what was becoming an open-forested, more arid landscape.

The high visibility of *Corylus* throughout the site has been noted since the beginning of excavations at Sandy Hill (Forest 1999). The conditions in the early Holocene were appropriate for *Corylus* to grow abundantly. While other mast trees often produce their fruit high up and humans must compete with arboreal mammals, *Corylus sp.* grows in a bush that produces its fruit low enough to the ground for humans to pick. Hazelnuts are highly nutritious, easily gatherable, storable, and generally have a pleasant flavor. Procuring the meat of hazelnut is time consuming and labor intensive. If gathered in large quantities, which the data suggests, they would likely have been boiled, soaked, or roasted. The presence of stone hearths and thermally altered rock, possibly used in the preparation of hazelnuts, is discussed later.

Seeds

One charred fragment of *Acalypha rhomboidea* was found in the context of a stone hoe cache. This plant has been developed as a cultivar in modern times, but is widely regarded as an invasive weed. Commonly named Three-sided Mercury, it grows in disturbed areas, which supports the suggestion that repeated human occupation helped form the biosphere of Sandy Hill (Jones and Forrest 2003:84). More Three-sided Mercury seeds would certainly be helpful in supporting the conclusion that Sandy Hill was a site disturbed by human occupation, but the preservation, as always, is a problem that affects all of Sandy Hill's botanical artifacts. The stone hoe cache was found in soil 4A, which begins 48.2MASL and continues in no more than one square meter in area to 48.7 MASL. In several levels, soil 4A is adjacent to other soils but I support the museum staff's conclusion that the botanical remains in the cache are attributable to a date of 8610 +/-40 BP.

One whole *Cornus spp*. seed was recovered from a mottled non-feature soil outside of the floor area of the Pithouse feature. The *Cornus* or Dogwood species is a conspicuously flowering and fruiting tree that produces seeds from spring to fall. It is not a particularly useful fuel wood, nor is it palatable for human consumption. It's presence in the mottled soil, therefore, leads me to believe this is a result of bioturbation. One unidentified seed was found in another mottled soil within the Pithouse floor.

Plant Material

Starch Grains

The dirt from several tools, including scrapers and hoes, is currently being analyzed by the MPMRC staff for phytolith and starch grain analysis (McBride, personal communication). Early results indicate that starch grains from the food storage tissues in roots and tubers are present on flakes found at Sandy Hill. The presence of these species is discussed below, but the association with the flakes carries implications for human subsistence at Sandy Hill. The inhabitants were specifically using the flakes to process the wetland plants that formed part of the prehistoric diet. Flakes derived from the site are simple uniface technology and follow a common morphological pattern. As developed in detail below, they were likely inset in planks to be used as graterboards, as suggested by ethnographic and archaeological evidence.

Wetland Plants

Preliminary analysis of phytolith remains by David Perry (1998, 2000) shows a predominant use of root, tubers, and other plants that grow in wetland environments. The following phytoliths found at Sandy Hill (Table 3.2) grow in wetland and aquatic surroundings.

Perry’s analysis indicates that at least 11 species of wetland plants, summarized above, were present in the archaeological matrix. These species all have some immediate use as food, medicine, and even poison. They do require cooking in order to eat them and some processing to make them easily digestible and palatable. Without ceramic artifacts in this Archaic assemblage, it is unknown if they were cooked in anything other than charcoal or possibly stone wares.

Table 4.2, Wetland Plant Remains identified by Dave Perry et al, (n.d.).

Species	Common Name	Number of Specimens	Possible Uses
Sparaganium spp.	Bur-reed	4	Food, Medicine
Typha spp.	Cattail	25	Food, Matting
Alisma plantago-aquatica	Water Plantain	3	Food
Saggitaria sp.	Arrowhead	2	Food, Medicine
Cyperus esculentus	Yellow Nutsedge	14	Food
Scirpus L.	Bullrush	10	Food, Matting, Basketry
Calla L.	Wild Calla	2	Medicine, Poison
Medeola L.	Indian Cucumber	2	Food, Medicine
Polyganatum Mill.	Solomon's Seal	2	Food, Medicine
Iris L.	Blue Flag	2	Medicine, Cordage
Nymphae L.	White Water-Lily	4	Food, Medicine

The presence of these species indicates that Sandy Hill people were selecting and using these plants, particularly cattail, nutsedge, and bullrush. Their presence in the wetland area indicates that the inhabitants of Sandy Hill were not gathering these items and using them elsewhere, but using them in close proximity to their source. Cattail is a grass-like plant with starchy roots. This in combination with the fat and protein of hazelnuts forms the foundation of a simple diet for a small population. Cattail is available in spring and summer, and the roots are easily storable for later use. This is a characteristic of a more sedentary culture, not a highly mobile one, as was thought to exist at the time.

Softstem bulrush is a perennial plant that grows up to ten feet tall. Native Americans wove the stems into mats (Guard 1995). It is reported that the roots, when boiled, produce sweet syrup (Steyermark 1963:292). Bur-reed is an herbaceous marsh plant with root stocks. It produces flowers and has many documented pharmacological uses. There are nine species native to North America but Yeung (1985:445) describes the use of *Sparganium stoliniferum* for the treatment of chest pains and abdominal pain. Steyermark (1963:292) notes the use of *Sparganium spp.* roots as food by the Klamath of the Northwest coast. Specifically, they are harvested in the late fall. Their use in the treatment of chills is further described by Moerman (1998:89).

Lithic Results

The lithic categories below were taken from Victoria Bunker's analysis of the Eddy Site (1992). By assigning the lithic artifacts from Sandy Hill to the same categories (Tables, 4.3, 4.4), it was easy to compare them. Essentially, assemblages at both sites were primarily quartz and composed of flakes and edge tools.

Table 4.3, Sandy Hill deposits compared to Eddy Site (Bunker 1992:143).

Soil	Flakes	Nonflakes	Hammer-stones	Cores	Edge Tools	FCR	Other	Total Count
Pithouse	98	1253	0	12	3	31	1207	1351
Hillside	193	754	1	6	5	1	741	947
Total	291	2007	1	18	8	32	1948	2298
Eddy Site	2100	61	6	14	34	?	7	2161

Table 4.4, Lithic artifact distribution by weight (grams).

Soil	Flakes	Nonflakes	Hammer stones	Cores	Edge Tools	FCR	Other	Total Weight
Pithouse	162.17	2050.22	0	329.65	141.13	356.18	1223.26	2212.39
Hillside	489.67	2487.66	?	333.87	176.94	46.89	1899.13	2977.33
Total	651.84	4537.88	0	663.52	318.07	403.07	3122.39	5189.72

The byproducts of flake production: cores, hammerstones, and thermally altered material were also found in close association.

Graterboards

Since the discovery of an unusual yet uniform lithic assemblage at Sandy Hill, archaeologists at the MPMRC have attempted to find reason either for the absence of projectile points or for the utility of flakes. Concerning the latter, the most discussed use for such an assemblage at Great Cedar Swamp is as a graterboard. What follows is a discussion of available graterboard research in order to determine how a grater-board assemblage is likely to appear in the archaeological record.

Ethnographic accounts of manioc graterboards show the versatility of compound tools and the utility of what is usually considered undesirable material (Mason 1886, Knight 1877). Roth (1917:277) details the selection of construction materials for manioc graterboards in Guiana. It was important to have quartz, granite, or gneiss for the flakes as their hardness and roughness ideally suited their purpose. One man would select a tree and cut from it a block for the graterboard. The block was cut down to dimensions of 2 feet long, 15 inches wide, and about an inch thick. One of the men would draw a diagram of intersecting lines to indicate where the flakes would go. The flakes were set into the patterned board, and the peeled manioc was ground by rubbing it against the inside of the bowl-shape. A paste derived from bird lime and vegetable glue was used to set the flakes in place. The paste did not work perfectly as Roth notes that the boards were soaked in water prior to use in order to swell the wood and hold onto the stone chips more securely. Roth's descriptive account also details the preferred dimensions of the flakes used in the graterboards. He describes the flaking process "Flakes come off, as a rule, about 1 to ½ inches in width and one sixteenth of an inch in thickness; and in various shapes—circular, semicircular, semi-lunar, lanceolate, and foliate, the latter frequently with a 'shoulder.' Great care is taken to get uniformity in thickness, but width and length do not matter" (Roth 1917:279).

The flakes are then set into the predetermined spots by placing one's (presumably long) fingernail on the business end of the flake and tapping it with a knife. Following the grating, the pulp is put into a basket-style press and squeezed to remove moisture. The moisture is sometimes collected to be included in drinks, but the main product, the dry mass, is eaten either as is or after being ground into flour and baked as bread.

Debert and Sheriff (2007) discuss a unique tool form found in abundance in the isthmus of Rivas, Nicaragua. The *raspadita* is essentially a small flake, hypothesized to be graterboard flakes for manioc processing. Data from the Debert and Sherriff (2007:1892) is presented in Table 4.5.

Table 4.5 – Dimensions of Raspaditas, from Debert & Sheriff (2007:1889)

Measurement	**Range (cm)**	**Average(cm)**	**Standard Deviation**
Length	2.60-0.75	1.50	0.37
Width	1.80-0.40	0.89	0.24
Thickness	1.00-0.20	0.48	0.15
Length of Tip	0.98-0.37	0.54	0.09

Flakes recovered from Sandy Hill can be compared to flakes recovered from the Three Dog site in Bahamas. The most efficient way to produce graterboard flakes is to use bipolar percussion (Berman et al. 1999:422), a strategy that results in faint to unobservable flake characteristics, such as bulbs of percussion. Sussman (1985:108) also discusses the poor suitability of quartz for microwear studies, noting that the high reflectivity of the surface requires both incident light and Scanning Electron Microscopes for a quality review. An SEM was not available to me during my analysis, nor do I have the requisite skills to perform a detailed usewear analysis of Sandy Hill flakes. A forthcoming report on starch grains from Sandy Hill flakes should shed some light on their uses (McBride and Hart, personal communication). Even without microscopic analysis, macrowear analysis of the cores from Sandy Hill shows crushing on both ends of the cores, suggesting bipolar reduction (Fig 4.2). Sandy Hill flakes are generally longer and wider than those at the Three Dog site (Fig. 4.3). Length to width ratio and presence of bipolar crushing are some of the few discernable patterns at Sandy Hill.

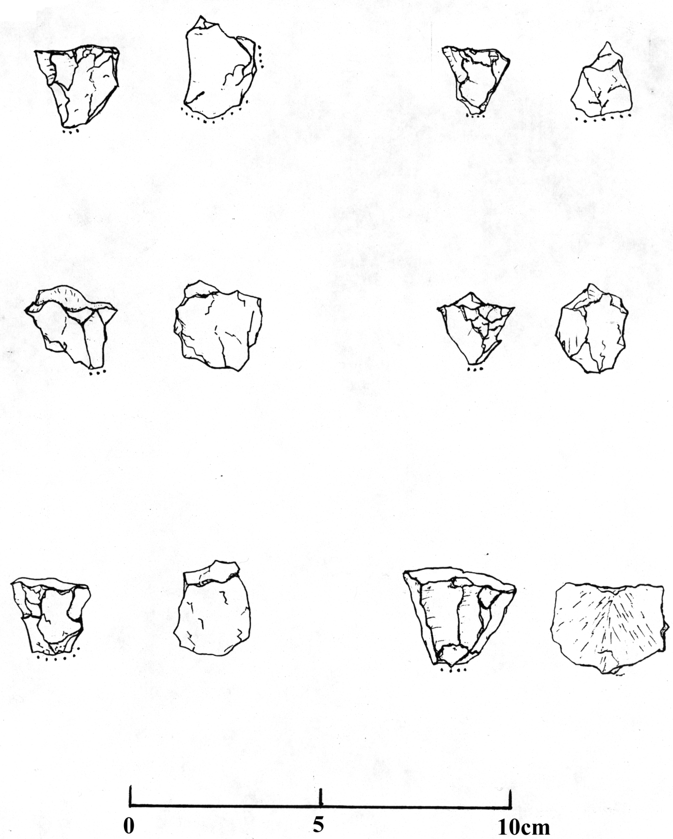


Figure 4.2, Microcores recovered from Sandy Hill, dots indicate crushing.

Evidence of bipolar flake production at Sandy Hill is significant because it could represent a systematic means of producing a set of graterboard flakes. The systematic method produces a set of flakes with similar morphological characteristics.

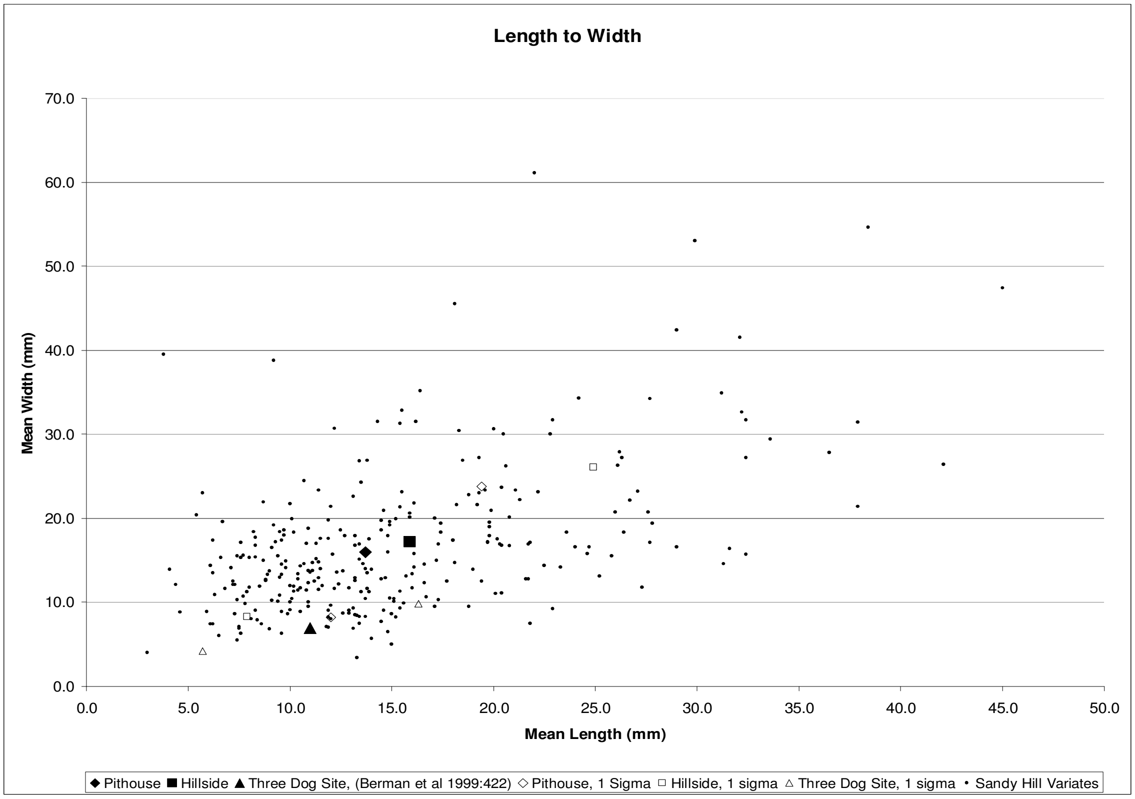


Figure 4.3, Flakes from Sandy Hill compared to those from Three Dog Site.

As seen in Table 4.6, the coefficients of variation for length are generally near one another, with the Pithouse soils being the least variable. The Three Dog site is the least variable, however, in terms of both width and thickness. Comparison between the three soil contexts indicates that their respective flakes are different, but not so different that they couldn't have been used for similar purposes.

Table 4.6, Coefficients of variation from Sandy Hill and Three Dog Site

	Pithouse Soils	Std. Dev.	Hillside Soils	Std. Dev.	Three Dog Site	Std. Dev.
N	98		193		58	
Edge Angle	35.29	12.0	34.21	13.0	n/a	
length	41.60	5.7	50.31	8.0	48.58	5.3
width	49.00	7.8	51.74	8.9	40.27	2.8
thickness	57.75	2.3	125.98	3.2	46.11	1.6

Hart's discovery of starch grains on quartz flakes (McBride, personal communication) and the abundance of wetland resources indicate likely use of these tools to process roots and tubers. Cattail, bulrush, nutsedge, and arrowhead can be processed much like manioc. Thus the absence of traditional bifacial projectile points does not indicate poor subsistence practices. Rather, it suggests a broader foraging strategy reliant on a number of resources.

Davis (1975) notes that in an experiment with obsidian flakes made in to a graterboard the irregular size and shape of the flakes made it only possible for unidirectional manioc processing. If the flakes at Sandy Hill were made in a consistent way and had a modal form, they could provide for the efficient processing of wetland roots and tubers. There are clear flakes and some evidence of bipolar reduction. If the idea of a tradition that exploits wetland roots and tubers or a compound tool industry is to be entertained, then the data must support a uniformly, well-produced lithic product that indicates a specific purpose.

Fire cracked rock was abundant in hearth features throughout the site, and in the large burn feature in Pithouse block. Fishel and Mandel (2003:3) discuss fire cracked rock, or thermally altered rock at the Allen Fan site within the Archaic period of Central Iowa. Furthermore, there is mention of a nut-processing assemblage including anvil stones and some hazelnuts recovered in the Allen Fan botanical assemblage. A large rock hearth at Sandy Hill (Figure 4.4) found during the 2009 excavations suggests that the large amount of hazelnut harvested was prepared by roasting.

If this is the case, nut roasting represents another way that the early archaic inhabitants of Sandy Hill were exploiting the local resources. As a stable resource base in an environmentally dynamic time, hazelnuts deserve a closer look in future archaeological analysis of Early Archaic sites.

Figure 4.4. Rock Hearth Excavated in 2009.

Comparison with other Gulf of Maine Archaic Sites

The Eddy Site is located in the Merrimack River Watershed near Manchester, New Hampshire. Victoria Bunker (1992) provides an overview of the traditions represented there. The analysis of the Gulf of Maine Archaic tradition discusses metrics and material identifications collected from cores, flakes, hammerstones, and edge tools.

Figure 4.5 demonstrates differences between the Eddy Site and Sandy Hill. Given the difference in the size of the sample, Kolmogorov-Smirnov tests (Table 4.7, 4.8) were carried out comparing data I collected to that collected by Bunker (1992:143). There is a statistically significant difference in flake length between samples from the Eddy Site and from Sandy Hill." While the difference in the size of the flakes seems apparent when viewing Figure 4.5, the difference in the sample sizes makes it important to run such a test.

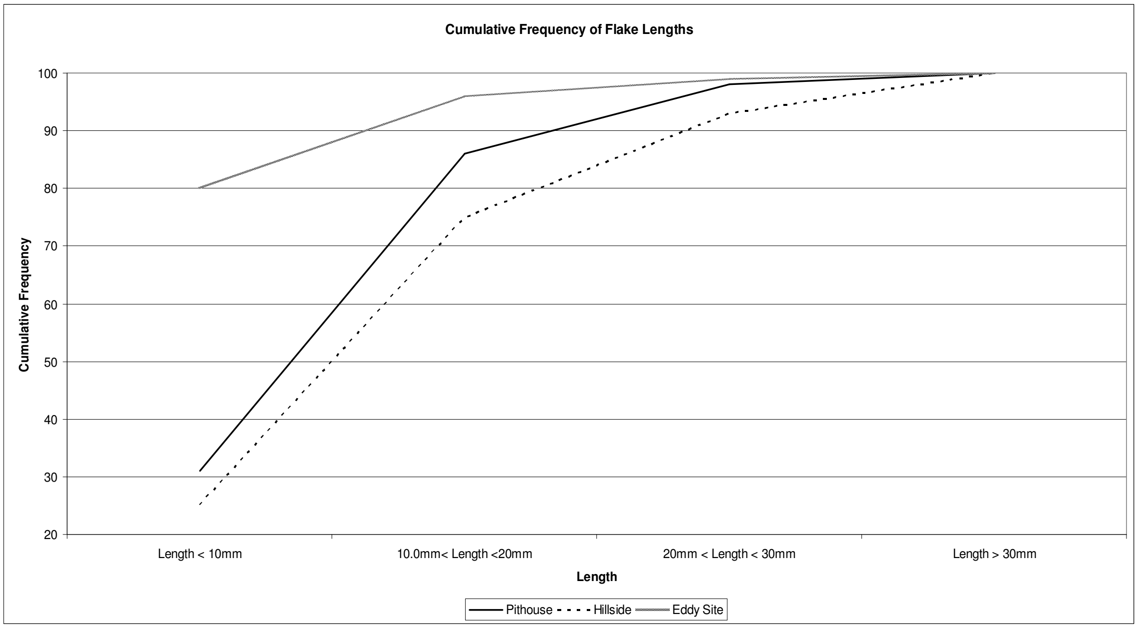


Figure 4.5, Cumulative frequency of flake lengths from Sandy Hill and Eddy Site.

Table 4.7, Kolmogorov Smirnov test of Eddy Site and Pithouse.

Length of Flake (cm)	Eddy Site		Pithouse		
	Raw	Cumulative, %	Raw	Cumulative, %	Difference
0.10 - 1.00	*1680*	0.80	30	0.31	0.49
1.10 – 2.00	*336*	0.96	54	0.86	0.10
2.10 – 3.00	*63*	99.00	12	0.98	0.01
3.10 – 4.00	*21*	1.00	2	1.00	0.00

D=1.36 * √ ((2100+98)/(2100(98))) = .1405

Table 4.8 Kolmogorov Smirnov test of Eddy Site and the Hillside.

Length of Flake (cm)	Eddy Site		Hillside		
	Raw	Cumulative, %	Raw	Cumulative, %	Difference
0.10 - 1.00	*1680*	0.80	48	0.25	.55
1.10 – 2.00	*336*	0.96	96	0.75	0.21
2.10 – 3.00	*63*	99.00	35	0.93	0.06
3.10 – 4.00	*21*	1.00	14	1.00	0.00

D=1.36 * √ ((2100+193)/(2100(193))) = .1022

When using a Kolmogorov-Smirnov test to compare the Eddy Site to both the Pithouse and Hillside contexts, the observed value of D exceeds the critical value, D. This experiment shows a significant difference between the two sites in terms of flake lengths. The Pithouse and Hillside flakes are significantly smaller than those from the Eddy Site. This may be the result of a difference in raw materials or reflect differences in intended end product.

Figure 4.6 suggests that, excepting fire cracked rock, the assemblages are similar. Flakes are common and edge tools are rare. This supports the conclusion that the Eddy Site and Pithouse lithic assemblages are similar. The Hillside assemblage is even more like the Eddy Site in that fire cracked rock is rare there.

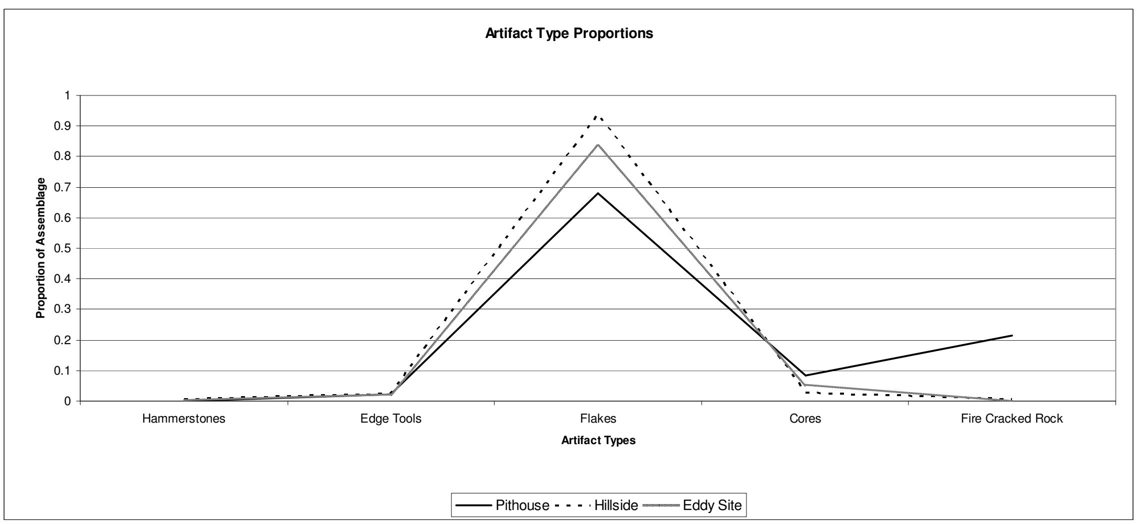


Figure 4.6, Proportions of artifact types from Sandy Hill and Eddy Site.

There are substantial raw material differences between the Eddy Site assemblage and those from Sandy Hill (Figure 4.6). Comparing the differences in raw material by site is comparing nominal data by nominal data. A Chi-square test is an appropriate way to discover a significant level of difference. Table 4.9, demonstrates that the difference between expected and observed data is significant. With four degrees of freedom, α = 9.48 at .05 level of significance. The Chi-square value is 161.33, far exceeding the critical value. The Chi-square test demonstrates there is a statistically significant difference between the types of lithic material at the two sites. There is then, the suggestion that the differences in flake size between these two sites may be the result of differences in raw material.

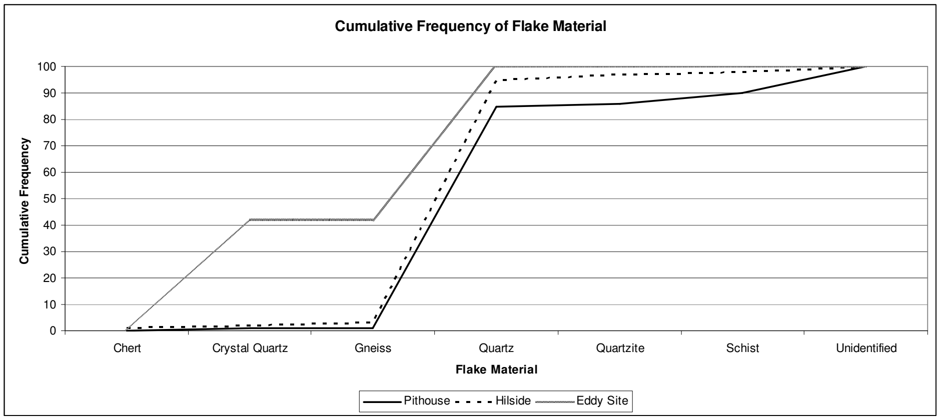


Figure 4.7, Cumulative frequencies of flake materials from Sandy Hill and Eddy Site.

Table 4.9, Chi-square test comparing Eddy Site and Sandy Hill raw material counts.

Material	**Eddy Site**	**Hillside**	**Pithouse**	**Total**
Crystal Quartz, Observed	882	1	1	884
Expected	776.41	71.36	36.23	
x^2	14.36	69.37	34.26	
Quartz, Observed	1218	180	82	1480
Expected	1299.87	119.46	60.66	
x^2	5.16	30.67	7.51	
Other, Observed	0	12	15	27
Expected	1299.87	119.46	60.66	
x^2				
Total Observed	2100	193	98	2391
Total x^2	**20**	**100.04**	**41.77**	**161.33**

The significant difference in flake length between the Eddy Site and Sandy Hill can be explained by significant difference in raw material. Aside from slightly inferior lithic material, the flake assemblages both resemble GOMA toolkits as described by Robinson (1992). It is likely they shared a similar purpose, possibly as graterboard flakes.

CHAPTER V

SUMMARY AND CONCLUSIONS

The Early Archaic in Southern New England was originally thought to have a sparse population that lived a highly mobile lifestyle (Fitting 1968). The discovery of semi-permanent living floors at Sandy Hill challenged that view (Forrest 1999). The lack of diagnostic artifacts in the Early Archaic contexts of the site left seemingly scant connections to other cultural traditions during the same period of time. A combination of nuanced environmental and behavior models (Nicholas 1998) , artifact analysis, and ethnographic evidence (Mason 1886; Knight 1877; Roth 1917) offered an explanation for Sandy Hill as an outlier of the Early Archaic cultural traditions in the Gulf of Maine region (Robinson 1992).

As a result of the unique assemblage at Sandy Hill and the questions regarding behavior there during the Early Archaic period, two analytical objectives guided the research in this thesis. One is to characterize the lithic and botanical assemblage in a way that is helpful. For the lithic assemblage this included assessing it's similarity to the GOMA tradition. The characterization of the botanical assemblage was not as exciting but includes the presence of starch grains on quartz flakes and a collection rich in hazelnut shell. The other is to assign some specific purpose for the uniform size and shape of the quartz flakes. The presence of starch grains on quartz flakes and ethnographic evidence of graterboard manufacture led to comparisons of flakes from Sandy Hill and other graterboard assemblages.

The preference for quartz, the unifacial technology, predominance of flakes in the assemblage, and the radiocarbon dates at Sandy Hill clearly indicate that it fits comfortably in the GOMA. However, the groundstone artifacts that characterize the GOMA are absent. Likewise, mortuary data are missing at Sandy Hill. Until they are discovered and documented, Sandy Hill must be considered a regional manifestation because it is not exactly like its counterparts to the north. Both regions share a quartz core industry. They show a strong preference for quartz and notable lack of formal bifaces. They differ in that Sandy Hill does not display the early development of a ground stone industry. There is a distinct, Morrill Point burial tradition evident at the sites to the north. This tradition is characterized by graves lined with red ochre. Even without skeletons, such a grave would be evident by loads of red ochre in the ground. As of yet, no Early Archaic burials have been found either at Sandy Hill or anywhere on the Mashantucket Pequot reservation.

The Eddy Site, in particular, has minor differences with Sandy Hill. The flakes from the Eddy Site seem to be smaller on average, and there is more chert being utilized. More metric data from debitage and edge tools from other Gulf of Maine Archaic sites would be helpful in forming a more solid link between the Archaic inhabitants of Sandy Hill and their counterparts in the Maine region.

Initially, it seemed that several millennia of observable data in the archaeological record would yield some change throughout time at Sandy Hill. However, it seems that Sandy Hill, from our perspective, appears as a mostly static resource base during a generally dynamic climatic period. This fits with Nicholas' Glacial Lake Wetland Mosaic Model (Nicholas 1998) and the idea of Great Cedar Swamp being an environmental buffer to natural disaster and water shortages.

Graterboards in ethnographic (Knight 1877; Mason 1886; Roth 1917) and archaeological assemblages (Berman et al 1999; Debert and Sherriff 2007) in give us some clues as to what a graterboard assemblage should look like. The uniform flake size in the assemblage at Sandy Hill resembles those graterboard assemblages. As these graterboards are used to process roots and tubers, common wetland resources, it seems that activity at Sandy Hill in the Early Archaic has manifested in the archaeological record as a focus on swamp resources. This focus is also expressed in the lithic assemblage by a scarcity of formal tools. Since this is one of the primary characteristics of GOMA, the use of graterboards as an adaptation to a swampy landscape might be a fundamental feature of GOMA.

More analysis of known and future GOMA sites will be needed to tell if this adaptation to wetland resources is a common aspect of this tradition. If more sites that conform to the GOMA also have analogous graterboard collections, this could change the way we think about prehistoric populations and their impact on the environment. Rather than simply being passive inhabitants of the landscape, it would seem that Early Archaic populations could have had a role as selective agents in stable resource base, glacial lake wetlands. Important elements of future research on Sandy Hill should include more results of the starch grain analysis and a Geographic Information System that will model the living floors in three dimensions.

BIBLIOGRAPHY

Anderson, M. Kat
2005 *Tending the Wild: Native American Knowledge of California's Natural Resources*. University of California Press, Berkeley, California.

Berman, Mary Jane, April K. Sievert and Thomas R. Whyte
1999 Form and Function of Bipolar Lithic Artifacts from the Three Dog Site, San Salvador, Bahama. *Latin American Antiquity* 10(4):415-432.

Bonnichsen, Robson and Richard F. Will
1999 Radiocarbon Chronology of Northeastern Paleoamerican Sites: Discriminating Natural and Human Burn Features. In *Ice Age People of North America: Environments, Origins, and Adaptations*, edited by Robson Bonnichsen and Karen L. Turnmire, pp. 395-415. Oregon State University Press, Center for the Study of the First Americans, Corvallis, Oregon.

Bunker, Victoria
1992 *Stratified Components of the Gulf of Maine Archaic Tradition at the Eddy Site, Amoskeag Falls.* Early Holocene Occupation in Northern New England, Occasional Publications in Maine Archaeology 9:135-148.

Brown, Gregory J. and Joanne Bowen
2000 Draft Copy of Zooarchaeological Analysis of Bones from the Mashantucket Pequot Indian Reservation, Submitted to Mashantucket Pequot Museum and Research Center.

Davis, Dave D.
1975 Patterns of Early Formative Subsistence in Southern Mesoamerica, 1500-1100 B.C. *Man*, New Series 10(1):41-59.

Debert, Jolene and Barbara L. Sherriff
2007 Raspadita: A New Lithic Tool from the Isthmus of Rivas, Nicaragua. *Journal of Archaeological Science* 34:1889-1901.

Dincauze, Dena F.
1971 An Archaic Sequence for Southern New England. *American Antiquity* 36(2):194-198.

1976 *The Neville Site: 8,000 Years at Amoskeag*. Peabody Museum Monographs 4. Harvard University, Cambridge.

2000 *Environmental Archaeology: Principles and Practice.* Cambridge University Press, Amherst.

Dincauze, Dena F. and Mitchell T. Mulholland
1977 Early and Middle Archaic Site Distributions and Habitats in Southern New England. In *Amerinds and their Paleoenvironments*, edited by Walter S. Newman and Bert Salwen, Annals of the New York Academy of the Sciences 288:439-456.

Dragoo, Don W.
2006 The Paleo-Indian Early-Archaic Transition. *The Chesopiean* 44(4):6-21.

Fishel, Richard L. and Rolfe D. Mandel
2003 The Archaic Occupations of the Allen Fan Site (13HA385) in the Iowa Valley of Central Iowa. *Plains Anthropologist* 48(185):1-74.

Fitting, James E.
1968 Environmental Potential for the Postglacial Readaptation in Eastern North America. *American Antiquity* 33(4):441-445.

Forrest, Daniel T.
1999 Beyond Presence and Absence: Establishing Diversity in Connecticut's Early Holocene Archaeological Record. *Bulletin of the Archaeological Society of Connecticut* 62:79-98.

Funk, Robert E.
1996 Holocene or Hollow Scene? The Search for the Earliest Archaic Cultures in New York State. *The Review of Archaeology* 17:11-24.

Goodyear, Albert C.
1999 *The Early Holocene Occupation of the Southeastern United States: A Geoarchaeological Summary.* In Ice Age People of North America: Environments, Origins, and Adaptations, edited by Robson Bonnichsen and Karen L. Turnmire, pp. 432-481. Oregon State University Press, Center for the Study of the First Americans, Corvallis, Oregon.

Gramley, Richard M. and Robert E. Funk
1990 What is Known and not Known about the Human Occupation of the Northeastern United States Until 10,000 BP. *Archaeology of Eastern North America* 18:5-32.

Guard, J.B.
1995 *Wetland Plants of Oregon and Washington.* Lone Pine Publishing, Redmond, Washington.

Hoadly, R. Bruce
2000 *Understanding Wood: A Craftsman's Guide to Wood Technology..* Taunton Press, Connecticut.

Johnson, Jay K. and Samuel O. Brookes
1989 Benton Points, Turkey Tails, and Cache Blades: Middle Archaic Exchange in the Midsouth. *Southeastern Archaeology* 8(2):134-145.

Jones, Brian D.
1997 The Late Paleoindian Hidden Creek site in Southeastern Connecticut. *Archaeology of Eastern North America* 25:45-80.

1998 Human Adaptation to the Changing Northeastern Environment at the End of the Pleistocene: Implications for the Archaeological Record. Doctoral Dissertation, University of Connecticut.

1999 The Middle Archaic Period in Connecticut: The View from Mashantucket. *The Bulletin of the Archaeological Society of Connecticut* 62:101-123.

Jones, Brian D. and Daniel T. Forrest
2003 Life in a Postglacial Landscape: Settlement – Subsistence Change During the Pleistocene-Holocene Transition in Southern New England. In *Geoarchaeology of Landscapes in the Glaciated Northeast*, edited by David L. Cremeens and John P. Hart, pp 75-89. New York State Museum Bulletin 497, State Education Deaprtment, Albany, New York.

Kidder, Tristram R.
2006 Climate Chance and the Archaic to Woodland Transition (3200-2500 Cal B.P.) in the Mississippi River Basin. *America Antiquity* 71(2):195-231.

Knight, Edward J.
1877 Crude and Curious Inventions at the Centennial Exhibition, VII, *The Atlantic Monthly,* 40(205):548-561.

Mason, O.T.
1886 Archeological Enigmas. *Science* 8(201):528-529.

McBride, Kevin
1992 Prehistoric and Historic Patterns of Wetland Use in Eastern Connecticut. *Man in the Northeast* 43:10-24.

McWeeney, Lucinda
1999 A Review of Late Pleistocene and Holocene Climate Changes in Southern New England. *Bulletin of the Archaeological Society of Connecticut* 62:3-18.

Mikell, Gregory A. and Rebecca Saunders
2007 Terminal Middle to Late Archaic Settlement in Coastal Northwest Florida: Early Estuarine Exploitation on the Northern Gulf Coast. *Southeastern Archaeology* 26(2):169-195.

Moerman, D.E.
1998 *Native American Ethnobotany*. Timber Press, Portland, Oregon.

Nicholas, G.P.
1987 Rethinking the Early Archaic. *Archaeology of Eastern North America*, 15:99-124.

1998 Wetlands and Hunter-Gatherers: A Global Perspective. *Current Anthropology* 39(5):720-731.

Perry, David W.
1998 Interim Report on the Analyses of Vegetative Plant Remains from Sites 72-97, 72-91, 72-66. Unpublished report on file at the Mashantucket Pequot Museum and research Center.

2000 Vegetative Plant Remains from the site 72-163. Unpublished report on file at the Mashantucket Museum and Research Center.

Perry, David, Daniel Forrest, and Kevin McBride
n.d. Vegetative Plant Remains from the Early Archaic of Connecticut: Preliminary Results of Research at Sandy Hill, Manuscript in Author's Possession.

Perry, Linda
2004 Starch Analyses Reveal the Relationship between Tool Type and Function: an Example from the Orinoco Valley of Venezuela. *Journal of Archaeological Science* 31:1069-1087.

Pfeffer, John
1986 Dill Farm Locus 1: Early and Middle Components in Southern New England. *Bulletin of the Archaeological Society of Connecticut* 49:19-35.

Petersen, James B., Brian S. Robinson, Daniel F. Belknap, James Stark and Lawrence K. Kaplan
1994 An Archaic and Woodland Period Fish Weir Complex in Central Maine. *Archaeology of Eastern North America* 22:197-222.

Rinck, Brandy Anna
2007 The Micromorphology of Archaic and Woodland Pits from the Sandy Hill Site, CT, Master's Thesis, Boston University, Graduate School of Arts and Sciences.

Robinson, Brian S.
1992 Early and Middle Archaic Period occupation in the Gulf of Maine Region: Mortuary and technological patterning. In *Early Holocene Occupation in Northern New England*, edited by B.S. Robinson, J.B.Petersen, and A.K. Robinson, pp 63-116. Occasional Publications in Maine Archaeology No. 9. Maine Archaeological Society and the Maine Historic Preservation Commission, Augusta.

1993 Perceptions of Marginality: The case of the Early Holocene in Northern New England. *Northeast Anthropology* 46:61-75.

Rodgers, John
1985 Bedrock geological map of Connecticut: Connecticut Geological and Natural History Survey, Connecticut Natural Resources Atlas Series, scale 1:125000.

Roth, Walter Edmund
1917 *An Introductory Study of the Arts, Crafts, and Customs of the Guiana Indians*. Thirty-Eighth Annual Report of the Bureau of American Ethnology, Government Printing Office, Washington.

Snow, Dean
1980 *The Archaeology of New England*. Academic Press, New York.

Steyermark, J.A.
1963 *Flora of Missouri.* The Iowa State University Press, Ames Iowa.

Sussman, Carole
1985 Microwear on Quartz: Fact or Fiction? *World Archaeology* 17(1):101-111.

Thompson, Victor D.
2007 Articulating Activity Areas and Formation Processes at the Sapelo Island Shell Ring Complex. *Southeastern Archaeology* 26(1):91-107.

Thorson, Robert M. and Robert S. Webb
1991 Postglacial History of a Cedar Swamp in Southeastern Connecticut. *Journal of Paleolimnology* (6):17-35.

Walthall, John A. and Brad Koldehoff
1998 Hunter-Gatherer Interaction and Alliance Formation: Dalton and the Cult of the Long Blade. *Plains Anthropologist* 43(165): 257-273.

Wentz, Rachel K. and John A Gifford
2007 Florida's Deep Past: The Bioarchaeology of Little Salt Springs (8SO18) and It's Place Among Mortuary Ponds of the Archaic. *Southeastern Archaeology* 26(2): 330-336.

Yansa, Catherine H.
2007 Lake Records of Norther Plains Paleoindian and Early Archaic Environments: The "Park Oasis" Hypothesis. *Plains Anthropologist* 53(201):109-144.

Yeung, H.C.
1985 *Handbook of Chinese Herbs and Formulas*. Vol. 1, Institute of Chinese Medicine, Los Angeles, California.

VITA

Benjamin Burks Russell was born in St. Louis, Missouri. After graduating high school in Stamford, Connecticut, he earned a Bachelor of Arts degree in Anthropology from the University of Connecticut in 2007. He earned a Master of Arts degree in Anthropology, with a focus in Archaeology, from the University of Mississippi in 2011. Ben currently lives in Washington, DC and works for TRC Solutions. He hopes to get a dog and a sailboat one day.