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Editor

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Cover: Neville-like projectile points (from Jones, Figure 5)

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EDITOR'S CORNER

This year is the 65th anniversary of the inception of the Archaeological Society of Connecticut. In honor of the occasion, the ASC Board of Directors authorized this special volume of the Bulletin characterizing the present state of knowledge on archaeological cultures in the state. A similar volume (47) was published in honor of the ASC's 50th anniversary in 1984. The publication was a great success. It has long been sold out, but the editorial staff still receives requests for copies.

As a courtesy, the authors who had participated in the 50th anniversary synopsis were invited to submit new or revised articles taking into account the many archaeological discoveries in the past 15 years since the publication of Volume 47. All but two of the original authors eagerly responded to the call: Roger Moeller for the Paleo-Indian period; Harold Juli for the Early and Middle Woodland period; Kenneth Feder for the Late Woodland period; and Robert Gradie and David Poirier for the Historic Period. Because of the increased amounts of data on the Early and Middle Archaic periods, separate articles appeared justified. Daniel Forrest and Brian Jones were invited to author the latter, as both their respective doctoral dissertations concern the early prehistory of what is presently the state of Connecticut. Daniel Cassedy was invited to submit a paper on the Late Archaic and Terminal Archaic periods based on archaeological information retrieved during construction of the Iroquois Gas pipeline through western Connecticut, a region for which there is little published research.

Additionally, because of the recent growth of a body of information on paleo-botany, Lucinda McWeeney was asked to submit a paper on prehistoric environmental changes in Connecticut to set the stage for the ensuing chronological cultural reconstructions. Stuart Reeve and Katherine Forgacs's paper, which enumerates and synthesizes the several hundred local, largely unpublished, radiocarbon dates that had been generated from state archaeological sites in the past 15 years, provides a general backdrop for Connecticut prehistory and a takeoff point for the subsequent discussions of specific cultural periods by the remainder of the authors.

Reeve and Forgacs' article replaces my 1984 chronological synthesis of the various cultural stages and periods as we knew them at that time. It and the other articles in the volume were mainly oriented toward culture history and settlement archaeology, due to the kinds and amounts of archaeological data that were then available. The unearthing of greater and more diverse cultural information has allowed our present authors to expand those original cultural bounds. Most deal with cultures in regional perspective. Several, like Cassedy, Feder, and Juli, address theoretical and classificatory problems. Others such as Moeller, Gradie, and Poirier, critique recent archaeological endeavors, illuminating future research topics. In sum, this special volume on Connecticut archaeology is packed with empirical information and suffused with theoretical questioning. It provides a firm background in the region's prehistory for students and lay persons and a wealth of data for professionals for supporting, generating, and/or testing archaeological hypotheses on a myriad of subjects. I thank each author for his/her contribution to this outstanding work.

Lucianne Lavin
December, 1999

A REVIEW OF LATE PLEISTOCENE AND HOLOCENE CLIMATE CHANGES IN SOUTHERN NEW ENGLAND

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ABSTRACT

Environmental reconstruction draws from numerous databases to interpret the prehistoric setting for people who lived in the past. Archaeologists typically draw from pollen interpretations to provide broad descriptions of the landscape vegetation history. However, in the last decade more analytical techniques have been added to the archaeologists' repertoire for recovering evidence of past environments. Charred plant remains from archaeological sites along with anaerobically preserved plant macrofossils recovered from swamp sediments, buried peat deposits, and cut-off meander channels provide a wealth of environmental data to supplement the pollen.

Environmental reconstruction draws from numerous databases to interpret the prehistoric setting for people who lived in the past. Archaeologists typically draw from pollen interpretations to provide broad descriptions of the landscape vegetation history (e.g., Delcourt and Delcourt 1984, 1987a, 1987b; Gaudreau 1988; Jacobson *et al.* 1987; Watts 1979, 1983; Webb *et al.* 1987; Whitehead 1973, 1981). However, in the last decade more analytical techniques have been added to the archaeologists' repertoire for recovering evidence of past environments. Charred plant remains from archaeological sites along with anaerobically preserved plant macrofossils recovered from swamp sediments, buried peat deposits, and cut-off meander channels provide a wealth of environmental data to supplement the pollen. However, pollen found in lake or swamp sediments represents regional terrestrial and local aquatic plants, but rarely contains pollen from plants pollinated other than by the wind. Pollen preservation and representation varies with the size of the catchment basin (lake, pond, swamp, forest-hollow, moss polsters), continuity of anaerobic conditions, water chemistry, and other climatic conditions (Jacobson and Bradshaw 1981; Birks 1997).

Obtaining precise enough dates from pollen and plant remains to allow detailed environmental reconstructions of value to archaeologists has been difficult for a number of reasons. First, cores obtained for sedimentary analysis were usually dated in relation to sedimentary events rather than for botanical interest. Second, until the advent of accelerator mass spectrometer dating (AMS), it was necessary to submit large samples to radiocarbon laboratories, and critical samples often lacked sufficient carbon to be accurately dated. Sometimes, as a result, the submitted samples bracketed a thousand years and while this helped with understanding geological processes it was not adequate for archaeology. Sending the material to be dated without prior identification of the included plant remains also resulted in dating organisms that did not breathe terrestrial carbon leading to older dates (MacDonald 1987; Miller and Thompson 1979). For all of these reasons, the dating of plant remains has lagged behind the dating of archaeological sites. Fortunately, with the use of AMS dating, these problems can now largely be overcome.

As archaeologists, we need precisely dated vegetation profiles that can be refined to narrow time frames. A decade would be nice, a generation would be acceptable, but for now a ±50-60 years is about as close as we can achieve using AMS. Pollen studies and regional overviews are more typically reported in increments of 1000 to 3000 years or more. In many instances pollen interpretations melded the Holocene environment (geologically, the last 10,000 years) into one large unit from the preboreal stage to the advent of Europeans whose presence was indicated by the rise in *Ambrosia* pollen 400 years ago. Recent vegetation studies have therefore incorporated plant macrofossil identification along with pollen identification and interpretation. The analyzed sediments come from closely spaced samples to recover terrestrial plant remains for AMS radiocarbon dating (Kneller and Peteet 1993; McWeeney 1994). Unlike pollen, macrofossils provide irrefutable evidence for the vegetation in a past locality (Miller and Thompson 1979; McWeeney 1991). This is critical when interpreting archaeological sites. From this newly established and expanding vegetation record we can formulate hypotheses and develop new testing methods to expand our knowledge of the prehistoric landscape. An accurate environmental description will provide a significant backdrop for examining social, technological and economic patterns.

The following discussion provides a general description of the post-glacial environment in southern New England based on the best available, current information. Radiocarbon dates are uncalibrated and will be referred to as BP (uncalibrated and before present) using 1950 AD as the baseline date. Plant taxonomy follows Fernald (1950); common names are used in the text and Latin names can be found in Table 1.

TABLE 1: LATIN NAMES FOR PLANTS REFERRED TO IN TEXT

Abies balsamea	Balsam fir
Acer sp.	Maple
Alnus	Alder
Ambrosia sp.	Ragweed
Betula sp.	Birch
Betula populifolia	Gray birch
Brasenia schreberi	Water shield
Carpinus virginiana	Hornbeam
Carya sp.	Hickory
Castanea dentata	American chestnut
Chamaecyparis thyoides	Atlantic white cedar
Chameadaphne calyculatta	Leatherleaf
Chara	Stonewort
Chenopodium sp.	Goosefoot
Cornus sp.	Dogwood
Cladium mariscoides	Twig rush
Corylus sp.	Hazel
Cyperaceae	Sedge family
Decodon verticilatta	Water willow
Dryas integrifolia	Driads
Eupatorium maculatum	Joe Pye weed
Fagus grandifolia	American beech
Fraxinus sp.	Ash
Gaylussacia baccata	Huckleberry
Gramineae	Grass family
Ilex opaca	Holly
Juglans cinerea	Butternut
Juglans nigra	Black walnut
Juncus spp.	Rush
Larix laricina	Larch
Myrica sp.	Bayberry
Myrica gale	Sweet gale
Nuphar sp.	Pond lily
Najas flexilis	Naiads
Nymphaea odorata	Water lily
Nyssa sylvatica	Sour gum, tupelo
Ostrya virginiana	Hop hornbeam

TABLE 1: LATIN NAMES FOR PLANTS REFERRED TO IN TEXT (continued)

Oxydendrum arboreum	Sourwood
Pinus banksiana	Jack pine
Pinus resinosa	Red pine
Pinus strobus	White pine
Picea glauca	White spruce
Picea mariana	Black spruce
Portulaca sp.	Purslane
Prunus serotina	Wild cherry
Quercus alba	White oak
Quercus macrocarpa	Over-cup oak
Quercus rubra	Red oak
Rhododendron sp.	Rhododendron
Rubus sp.	Brambles, raspberry/blackberry
Salix sp.	Willow
Salix herbacea	Dwarf willow
Sambucus sp.	Elderberry
Sassafras albidum	Sassafras
Scheuchzeria palustris var. *americana*	Arrow grass
Tsuga canadensis	Hemlock
Typha sp.	Cattail
Ulmus sp.	Elm
Vaccinium sp.	Bilberry/blueberry
Viola sp.	Violets

GLACIAL MAXIMUM: 21,000 - 14,000 YRS BP

Current nomenclature refers to end of the Last Ice Age as the Last Termination based on recent correlation with the Greenland ice-core records (GRIP and GISP2) (Bjorck *et al.* 1998). According to Bjorck *et al.* (1998), the ice core annular layers provide "continuous, high-resolution, proxy climatic record that spans the entire period from the Last Glacial Maximum through Termination 1 of the marine isotope sequence to the Pleistocene-Holocene boundary." This continuous environmental data which reflect global patterns of climate change form a stronger base level for comparisons than terrestrial stratigraphic records for the North Atlantic region. Critical oxygen isotope values document fluctuating temperatures in the last 22,000 years (See Table 2). Ice covered southern New England, with estimates suggesting a thickness of over a mile high at the peak of the last glacier, ca. 18,000 ^{14}C BP. The adjacent vegetation zone included arctic/alpine tundra plants which probably ranged more than 100 km south of the ice (Clark and Ciolkosz 1988; Martin 1958; Watts 1983). Tundra conditions are evident based on pollen and plant macrofossils found in the basal swamp cores in Pennsylvania 60 km south of the ice at the time of maximum glaciation (Watts 1979) and in New Jersey (Peteet *et al.* 1994). The growing range for boreal conifers such as spruce and fir was pushed far to the south (Watts 1980; Whitehead 1973) and deciduous trees were only sparsely represented in the pollen record (Jackson and Givens 1994).

As the glacial lobes melted and retreated northward after 18,000 yrs BP., the landscape changed rapidly. While organic preservation in southern New England basin cores often begins around 12,500 BP, some sites farther south document earlier changes. Brown's Pond, located in the Ridge and Valley Province of Virginia at 620 m elevation contained organic remains dating to 17,300±180 BP (Kneller and Peteet 1993). Big Run Bog in West Virginia contained organics dating to 16,910±340 BP (Larabee 1986). Pine, with spruce and fir and a few warmer climate plants dominated the vegetation at Brown's Pond, even as the ice was retreating in New England (Kneller and Peteet 1993). The higher elevation of Big Run

TABLE 2: INTIMATE TERMINOLOGY AND CLIMATE STAGES AT THE END OF THE ICE AGE

'INTIMATE' Nomenclature	Climate	Prior Name	Radiocarbon years (yrs BP)	Ice Core Years (k=1000)
GI-1		Bolling/Allerod		14.7 - 12.65 k GRIP yrs BP
GI-1a	Warmer			
GI-1b	Colder			
GI-1c	Warmer			
GI-1d	Colder			
GI-1e	Warmer			
GI-2				21.2 - 21.8 k GRIP yrs BP* 23.6 - 23.0 k GISP yrs BP*
GS-1	Cold	Younger Dryas	11,000 to 10,000	12.65 - 11.5 k GRIP yrs BP
GS-2	Cold			
GS-2a	Colder			16.9 - 14.7 k
GS-2b	Less cold			19.5 - 16.9 k
GS-2c	Colder			19.5 - 21.2 k

* Greenland ice core record by the U. S. team.

The author's participation in the INTIMATE group (INTegration of ice-core, MArine, and TErrestrial records), a program of the INQUA (International Quaternary Union) Paleoclimate Commission leads to the inclusion of this new terminology.

Bog, at 980 m produced tundra vegetation. The identification of white pine charcoal dating to 15,050 BP from the Nottoway River Cactus Hill site in the Coastal Plain of southeastern Virginia (McWeeney 1997a) indicates warming temperatures at lower latitudes and lower elevations (McWeeney 1994). Based on the overlapping temperature ranges for oak, ash, maple trees, and white pine, the presence of white pine suggests Plain most likely indicates the local presence of temperate trees colonizing the region (McWeeney 1994, 1997a).

Ice had withdrawn from southeastern Connecticut before 15,200 yrs BP, allowing arctic/alpine type vegetation such as billberry (dwarf ericaceous shrub), dwarf birch, driads, and willow to cover the landscape (McWeeney 1994). Pollen and macrofossil evidence indicates that periglacial (near the ice) conditions persisted in the deglaciated parts of New England until ca. 12,500 BP (Davis 1969; Kellogg 1991; McWeeney 1994; Peteet *et al.* 1993). Fluctuating cool and moist conditions have been described for the lower latitudes of the Middle Atlantic (Kellogg and Custer 1995).

POST-GLACIAL: 14,000 - 10,000 YRS BP.

Some of the first indications of the warming appear at Brown's Pond, Virginia, when fir becomes abundant along with substantial amounts of alder pollen around 14,000 (GI-1) (Kneller and Peteet 1993; also see Taylor *et al.* 1993) for temporally refined fluctuations registered in the Greenland ice cores-GISP2). The pollen from floating aquatic plants such as pond lily tells us there was an open pond, while the fir trees are an indication of moist land around the pond. The presence of oak and birch pollen this early strongly suggests an increasing deciduous influence with ameliorating temperatures. During the 12th millennium before present, fir and spruce decrease to below 10% at Brown's Pond while oak and hornbeam increase. With the addition of hemlock pollen we see the advent of the conifer/northern hardwood forest. Spruce pollen continued to be present in some pollen cores from the Middle Atlantic region, and south into Georgia, until 11,000 yrs BP, but the pollen most likely was derived from higher elevations and traveled long distances by wind rather than growing at the lower elevations (Gaudreau 1988; Watts 1983). Alternatively, black spruce may have persisted around wetlands or bogs under a relatively warm climate, and at higher elevations until more temperate tree species replaced them.

In general, boreal and temperate vegetation migrated northward rapidly as the ice retreated (Davis *et al.* 1980; Davis and Jacobson 1985; Delcourt and Delcourt 1987a, 1987b; Gaudreau 1988; McWeeney 1994; Webb *et al.* 1987). Spruce trees were growing on Fisher's Island, off the coast of Connecticut, by 12,400 yrs BP, and based on AMS dates, had moved into Connecticut by 12,000 ^{14}C yrs BP (McWeeney 1994, 1997b). Based on the macrofossils, white pine, fir, and larch arrived in Connecticut at the same time as spruce trees, a time that corresponds to the Allerod warm interval of northern Europe. White pine is an indicator of warmer environments; its northern range is close to that of red oak, black ash, and hornbeam (McWeeney 1994). The evidence of pollen from temperate deciduous trees, white pine needles, and seeds from temperate aquatic plants strongly implies that a mixed conifer/hardwood forest co-existed in southern New England, the adjacent Hudson Highlands, as well as northern New Jersey 12,000 ^{14}C yrs BP (Maenza-Gmelch 1997; McWeeney 1994, 1998; Peteet *et al.* 1994).

The extended peak in warm temperature during GI-1e (See Figure 2 of Bjorck *et al.* 1998:289) created the conditions for deglaciation in the White Mountains approximately 12,500 ^{14}C yrs BP (Ridge *et al.* 1999). The ice withdrew northward across the St. Lawrence sometime around 11,000 ^{14}C yrs BP (Ridge *et al.* 1999). Botanical evidence from New England indicates that warmer and wetter conditions prevailed between approximately 12,000 and 11,000 ^{14}C yrs BP (Peteet *et al.* 1993; McWeeney 1994). Estimates for mean July temperature (Peteet *et al.* 1990; Peteet *et al.* 1994; Bjorck *et al.* 1998), of 16 degrees C (60 degrees F) or higher, suggested by specific plant requirements (McWeeney 1994:85), indicate very different climatic conditions than previously imagined.

Pollen reports for northern New England indicate that spruce arrived insouthern Maine between 13,000 and 12,000 ^{14}C yrs BP (Davis and Jacobson 1985), and spread to northern New Hampshire by 11,000 ^{14}C yrs BP (Davis *et al.* 1980:245; Spear *et al.* 1994). Pine colonized in Maine by 12,000 ^{14}C yrs BP. Red or Jack pine may have been the first species to arrive, with white pine delayed until ca. 10,000 ^{14}C yrs BP. With percentages between 5 and 23% for oak pollen recorded from southern Maine, Davis and Jacobson (1985) agree that the trees were present by 11,400 yrs BP. The boreal/sub-boreal conifer trees moved far into Canada by 10,000 yrs BP (Mayle *et al.* 1993; Webb *et al.* 1987).

Cold temperatures returned around 11,200 yrs B P, warmed briefly, and then dropped for nearly 1000 years (Taylor *et al.* 1993; GS-1 of Bjorck *et al.* 1998). This long term shift in climate (in human terms, though not geologically), known as the Younger Dryas event or oscillation now appears to be of global impact, while originally it was seen as a North Atlantic phenomena (Peteet *et al.* 1994). Widespread evidence for the Younger Dryas is now recognized as far south as the Chesapeake Bay region of the U.S. coast (Grace Brush, personal communication 1995), and globally. Glacial lobes reactivated in Nova Scotia (Stea and Mott 1989) and evidence suggests the same may be true in northern Maine (Dorian 1997). Estimates based on plant remains and oxygen isotope records suggest a temperature decrease of 3 to 4 degrees C (2 degrees F) with a mean July temperature of 13 - 14 degrees C (58 degrees F) (Peteet *et al.* 1994). The increase in spruce, white birch, and alder pollen, along with a decrease in oak pollen, makeup indicator species for the Younger Dryas event in southern New England. (Peteet *et al.* 1990, 1993). A gap in sediment preservation at both Pequot Cedar Swamp and the headwaters of Bull Brook suggests that a drier climate led to lower water levels at both sites during the Younger Dryas. Grassy marshes formed in some former open wetland basins (McWeeney 1994, 1995). The overall climate was colder and appears to have been drier, with pulses of higher temperatures (Taylor *et al.* 1993; Bjorck *et al.* 1998).

A Connecticut archaeological site provided the documentation for the end of the Younger Dryas. Oak charcoal AMS dated to 10,215+90 yrs BP, either *Quercus alba* or *Q. macrocarpa* (McWeeney 1994, 1998), and a bulk date of 10,190+350 yrs BP from a feature containing oak charcoal, both from the Templeton site (Moeller 1980, 1984) in Washington, Connecticut, suggests that temperatures were ameliorating. The additional date of 10,290±460 yrs BP from a cultural feature containing oak in Maine (Robinson and Petersen 1992:27) reinforces 10,200 yrs BP as the termination of a millennium of cold in southern New England.

EARLY HOLOCENE: 10,000 - 8,000 YRS BP

Environmental stability remained elusive during the early Holocene. The GISP2 cores and oxygen isotope analyses show that climatic fluctuations continued during the 10th millennium B.P (Yu and Eicher 1998). Indications of these fluctuations were recorded when water levels rose early in the Holocene, only to fall in the second half of the millennium. The GISP2 ice core record shows several fluctuations between warm and colder in the first few hundred years. The oxygen isotopes and carbon isotope analyses from southern Ontario support this pattern with a minor decline in temperature recorded for 9,600 yrs BP (see Yu and Eicher 1998 Fig.3). While the fluctuations continue throughout the Holocene, temperatures (correlated with changes in oxygen isotopes) do not dip as low as between 10,000 and 9600 yrs BP (Yu and Eicher 1998).

At Pequot Cedar Swamp water lily seeds indicate an open pond dated to 10,050 and 8,890 yrs BP (McWeeney 1994). However, the dates for the pond also bracket a drying episode recorded in the oxidized sediments during that millennium. Arrow-grass seeds, typically found in bogs and peat (Fernald 1950:83), dated to 9,900±70 (AA-10919) and 9,310±110 yrs BP from a small wetland in central Connecticut suggest a higher water level (Godwin 1975) during the early Holocene (McWeeney, unpublished data). At Bull Brook, water shield, naiads and twig-rush seeds, along with stonewort (algae) strengthen the rising water level hypothesis for the beginning of the Holocene. Based on the pollen record, spruce, larch, and fir were replaced by white pine, birch, beech, and oaks in the Northeast (Gaudreau 1988; Peteet *et al.* 1994). Plant macrofossils from cores and archaeological sites show that white pine, yellow and gray birch, and oak increased dramatically, and were quickly accompanied by a suite of temperate deciduous trees (McWeeney 1994; Maenza-Gmelch 1997).

Based on the peak in solar insolation, July temperatures may have been 8% greater than today, but winters were colder; therefore, seasonal extremes need to be considered for the early Holocene and especially at 9,000 yrs BP (Kutzbach 1987:426). Breaks in sedimentation and oxidation provide some of the clues that wetlands shrank and water levels dropped throughout the New England area (Davis 1983; Jacobson *et al.* 1987; McWeeney 1994; Newby nd; Webb *et al.* 1993). Lower water levels have also been inferred from sedimentary hiatuses, sediment accumulation rates (Newby nd), plus diatoms and sponge spicule identification from Pequot Cedar Swamp in southern New England (McWeeney 1997b). Oxidized, cemented, orange sediments, just below the water lily seeds AMS dated to 8,890 yrs BP at Pequot Cedar Swamp, suggest a period of extreme drying and possibly fire (McWeeney 1994). Similar sediments are reported for Bull Brook (McWeeney 1994). From a cranberry bog in Massachusetts, Newby (nd) found evidence of drying just above sediments dating to 9,160±110. Transposing the dates to 1 sigma standard deviation, the drying period appears to occur sometime between 9,270 to 8,830 yrs BP In coastal Maine, Kellogg (1991) identified algal cysts suggesting shallow, stagnant water during the APine period at Ross Pond. The abundant pine pollen may reflect colonization of the newly exposed, dried out shorelines by the white pine trees. In the White Mountains, white pine and hemlock grew beyond their modern tree line suggesting higher temperatures and a decrease in precipitation at 9,000 yrs BP (Davis *et al.* 1980:176). While modern investigations frequently revise older research, these dates support Deevey and Flint's (1957) time for initiation of the Hypsithermal period at 9,000 yrs BP. Bryson *et al.* (1970) also suggested that several significant environmental changes occurred around 9,140 yrs BP.

After 8,900 BP plants such as alder, sweet gale, elderberry, leatherleaf, rhododendron and brambles indicate shrub swamp conditions at Pequot Swamp (McWeeney 1994:72-73). Gray birch and white pine trees provide a backdrop of pioneering species colonizing open spaces. On the deeper, east side of the basin sedges, cattails, and twig-rush depict the initiation of marsh conditions. Abundant (>300) miniscule fragments of charred stem material appeared in this unit. The shrub swamp transition also occurred at Bull Brook, Massachusetts, with scant evidence preserved from willow and leatherleaf, as well as gray birch (McWeeney 1994:135-136), an indicator of sterile, dry or wet soil (Fernald 1950:534).

The archaeological charcoal assemblages may not reflect the entire floral assemblage because of human selection and preservation issues. However the charred remains provide an opportunity to see some of what was locally available during the millennium. Oak, aspen, and white pine trees provided some of the fuelwood at the Templeton site in Washington, Connecticut (McWeeney 1994). White oak and white pine were abundant, as well, in the charcoal remains from an Early Archaic context at the Dill Farm site in southeastern Connecticut (L. McWeeney, personal research); walnut and hazelnut shells were also identified (Pfeiffer 1986:31). Red and white oak, ash, maple, hornbeam and white pine were identified from the Early Archaic Johnsen 3 site in upstate New York (Funk 1993; McWeeney 1994). Based on the pollen, white pine has long been acknowledged as a component of the early Holocene forests; however, the charcoal from archaeological sites provides a more diverse picture of the deciduous trees also growing in southern New England at that time.

MIDDLE HOLOCENE 8,000-5,000 YRS BP

The remarkable record of climate change found in the Greenland ice-core layers (GRIP) continues for the middle Holocene. Dahl-Jensen (*et al.* 1998) suggests an increase in temperature ca. 2.5 degrees Centigrade/Fahrenheit between 8,000 and 5,000 yrs BP. However, as in previous eras, the pattern was not static. According to Deevey and Flint (1957), glaciers re-advanced in some parts of the globe around 7,000 BP, with cooling again between 5,600 and 5,500 yrs BP. However, Grove (1988) writes because of warming the spruce forest extended past the modern boreal forest/tundra zone around 6,200 yrs BP, and the advanced tree line remained further north until around 4,800 yrs BP. Occasional shifts to cold were interlaced with the warmer temperatures (Grove 1988); higher summer temperatures returned between 5,300 and 5,200 yrs BP and again at 4,800 yrs BP. The GISP2 interpretations place the sharp decline in temperature ca. 7,100 yrs BP. However, within a few decades the warming increased around 7,000 BP and continued until another major cooling event appeared ca. 6,500 BP. The carbon isotope and oxygen isotope analyses show an earlier drop in temperature, ca. 7,500 yrs BP which correlates more closely with the sediment changes at Pequot Cedar Swamp.

The pollen record provides additional evidence for fluctuating environments, with a predominant image of warming during the middle Holocene. An increase in the amount of ragweed led Margaret Davis (1969:419) to interpret a decline in forest trees in the northeast around 8,000 years ago. She described a corollary to the onset of the prairie period reported for the mid-western states (Davis 1969). The pollen spectra from Pequot Swamp recorded a decline in numerous deciduous trees (North American Pollen database). The increase in the ragweed pollen in Connecticut and an increase in oak in Vermont implied a drier climate around 7,900 yrs BP (Davis *et al.* 1980). Winkler found a decline in the pollen deposition rates (PDR) on Cape Cod between 8,200 and 5,000 yrs BP. The presence of hemlock needles 250 m. above their modern elevation in the White Mountains provides further evidence for climate change at 7,000 yrs BP (Davis *et al.* 1980:247). However, Miller (1973) reported that several mesic pollen indicators remained in western New York, although oak and hickory decreased (Miller 1973). This may record a very local condition since the Prairie period clearly expanded eastward at this time in the Midwest (Cushing 1965; McAndrews 1967). For New England, the pollen spectra show a decrease in pollen deposition rates, decline in pollen from forest trees, extension of tree ranges, and an increase in herbaceous plants.

Sediments and plant macrofossils document a drying period for the middle Holocene. A broadly distributed pattern shows an increase in charred organics in swamp cores from New England (McWeeney 1994, 1996; Sneddon 1987; Winkler 1985), and as far away as Nova Scotia (Green 1982). All of the cores recovered from Pequot Cedar Swamp contained a charred peat stratum 8 to 15 cm thick. The dates spanned from 7440±120 and 5,740±70 yrs BP (McWeeney 1994). Lightning strikes on desiccated vegetation or human accidents may have caused the widespread fires. However, with the widely distributed geographic pattern, climate appears to be the predominant cause. Following the fires, air circulation patterns apparently lofted the exposed soil up along the ridges outside of the basin. This unusual layer of aeolian sediment buried Early Archaic archaeological sites not only at Pequot Cedar Swamp, but also at Dill Farm (Pfeiffer 1986), and Bolton Springs (Thorson and McBride 1988), as well. Dincauze (1976: 121) described burial of the Neville component by aeolian sediments which continued to accumulate during the Stark occupation at the Neville site beginning before 7,000 and ending before 6,000 yrs BP. The charred layers at Pequot Cedar Swamp and other New England sites hint at several episodic dry periods during the middle Holocene.

Environmental data recovered from archaeological sites document what was available for human use during the middle Holocene. Regionally, mast trees such as oak, hickory, and chestnut played a significant role in the temperate forests during this interval. Oak had been a part of the New England forests from at least 12,000 yrs BP, with a hiatus during the Younger Dryas (Maenza-Gmelch 1996, 1997; McWeeney 1994; Peteet *et al.* 1994). Watts (1979:463) concluded that the drier climate from before 8,000 yrs BP to about 5,500 yrs BP favored oak tree species. This statement is reinforced by the archaeological assemblages. White pine and oak dominated the fuelwood selection at the Templeton site. Hickory became part of the oak and pine assemblage for the Middle Archaic period at Dill Farm (Pfeiffer 1986:29). Based on charcoal from Dutchess Quarry Cave 8, hickory grew in southern New York State by 8,340+65 yrs BP (AMS AA-10916) (McWeeney 1994). Oak, hornbeam, elm, alder, sour gum, and white pine were found in association with the hickory. The AMS dates on charcoal and charred hickory nutshell (6,910±80 yrs BP Beta-44418) from the 2 Baker site (L. McWeeney, personal research) documents the presence of hickory trees in southern New England region (McWeeney 1994) thousands of years earlier than estimates based on the pollen (Davis 1969, 1983). Holly, if it is *Ilex opaca* identified from the 2 Baker site, suggests a northern range extension for that tree during the middle Holocene, and provides another indication of warming.

To date, I have not identified chestnut charcoal from any Connecticut sites older than 2,000 yrs BP. This lack of evidence concurs with Davis' (1969) pollen interpretation for a delayed migration of chestnut into New England. The Middle Archaic context for chestnut from the Bolton Spring site in Connecticut (Dincauze 1989; Thorson and McBride 1988) has been corrected to 500 yrs BP based on an accelerator date (L. McWeeney, personal research). The above mentioned archaeological examples clearly demonstrate contribution of identifying the charcoal for environmental reconstruction purposes. Detailed sediment analyses and AMS dates bracketing changes at every archaeological site would also make an enormous contribution to correlating dry episodes, wind activated intervals, and periods of erosion with settlement patterns.

LATE HOLOCENE: 5,000 to 400 yrs BP

While many researchers imply that we reached modern forest conditions in the late Holocene, the climate continues to fluctuate. Not only did temperature and moisture regimes change, but also natural disasters such as fires, storms, volcanic eruptions (Zielinski *et al.* 1994), changes in atmospheric circulation patterns (Yu *et al.* 1997), and floods (Brackenridge *et al.* 1988) altered the landscape, along with human impact. Deevey and Flint (1957; also see Grove 1988) reported several "Little Ice Ages" during this interval: at 4,330 yrs BP; 3290, 2,550, 1550, and 650 yrs BP. Based on the GRIP ice core data, Dahl-Jensen (*et al.* 1998:270) suggests a 0.5 degree cooling around 2,000 years ago in Greenland. Continuing up core, "The Little Climatic Warming period" occurred around 1000 AD, when temperatures increased by 1 degree Centigrade. What many historians call the "Little Ice Age" dates to 1500 and 1850 AD, based on the ice core data from Greenland (Dahl-Jensen *et al.* 1998:270). The rise in spruce pollen in New Hampshire around 2,000 years ago also suggests cooler temperatures (Davis *et al.* 1980:241). In fact, Davis (1969:421) suggests that pollen assemblages representative of the modern environment have been in existence only for the past 2,000 years.

Plant macrofossils preserved in the Pequot Cedar Swamp cores (McWeeney 1994) provide evidence for the appearance of numerous additional deciduous and conifer trees during the late Holocene. Macrofossils found in the sediments close to the margin of the basin contained sedges, rushes, cattails, composites such as Joe Pye weed, violets and brambles (blackberry/raspberry). Charcoal from local fires preserved oak, beech, elm, maple, and hickory to provide a picture of the terrestrial environment during the last 5,000 years. Atlantic white cedar began growing in the swamp during the late Holocene when water level fluctuations became less extreme (McWeeney 1998).

The plant remains from archaeological sites provide critical information for reconstructing the diversity of local prehistoric environments. The 1940s excavation at the Boylston Street Fishweir (Bailey and Barghoorn 1942) documents native plant selection and use of their environment. Based on the recovered stakes and wattle, 17 different taxa were used to construct the weir, portions of which date to 4,000 yrs BP (Newby and Webb 1997). Red oak, beech, sassafras, and alder dominated the assemblage, with occasional use of sycamore, aspen, white oak, dogwood, bayberry, larch, and hemlock. The identification of larch and aspen presents a quandary, since modern aspen and larch are found in colder climates (or the larch may grow around bogs). Do these species represent Deevey and Flint's "Little Ice Age" circa 4,330 yrs BP? Selection of the saplings appears to have been based on availability, not that a specific tree type was favored for stakes.

Oak and pine continue as the dominant fuelwood choices into the Terminal Archaic period (3,800 to 3,000 yrs BP) based on the charcoal identified from the Millbury site in Rhode Island (McWeeney 1992a). Largy (1993) identified charred seeds from the Millbury botanical assemblage that dramatically expand our knowledge of plants growing near the site: ragweed, goosefoot, grasses, purslane, blueberry, huckleberry, brambles, and hickory nuts. Yet, the Terminal Archaic archaeological assemblage does not provide evidence of climatic cooling that was noted around 3,290 yrs BP by Deevey and Flint (1957).

Significant evidence for a rarely recorded return to cold temperatures comes from clay deposits discovered along the Quinnipiac River, north of New Haven. Preserved leaves, fruits, and twigs from several trees, shrubs and herbaceous taxa, hickory, butternut, white pine, hemlock and fir needles, dated to 2680±30 yrs BP (Pierce and Tiffney 1986:229). The presence of fir needles provides a strong indicator of cool, moist conditions in Connecticut at that time, possibly refining the date for Deevey and Flint's (1957) "Little Ice Age" around 2550 yrs BP.

The "Little Climatic Warming period" noted in the Greenland Ice cores ca. 1000 AD (Dahl-Jensen *et al.* 1998) is represented archaeologically in the southern New England region. Charcoal from two trees with a more southerly range has been identified from archaeological features from New Jersey, coastal New York and Connecticut. Sourwood normally grows in Florida and Louisiana and in the Piedmont Zone as far north as Pennsylvania (Fernald 1950:1125). However, the charcoal has been identified from the Sturgeon Pond site in New Jersey, the Sebonac site in New York, and a coastal site in Greenwich, Connecticut (L. McWeeney, reports to CRM contractors e.g., the Manakaway site for the Bruce Museum, Sturgeon Pond for Lewis Berger Associates, and charcoal from Coastal New York sites for Ceci). Ceci (1988:25) infers that the presence of sourwood is due to native people bringing the wood to the site as an artifact or for medicinal purposes. Alternatively, it can be suggested that the presence of sourwood at three regional sites indicate it was growing there, and represents a northern range extension made possible during the global climatic warming period. Black walnut, the second taxa found north of its normal range at the Morgan site, in Rocky Hill (Lavin 1988), came from a cultural feature with several deciduous woods such as sycamore and hickory (McWeeney 1992b). Rivers are frequently conduits for range extensions, and the presence of black walnut AMS dated to AD 1065±45 (AA-10917) along the Connecticut River suggests warming conditions allowed the expansion northward, overlapping the range for our native butternut (Little 1977). A short distance north, up river, at the Burnham Shepard site (Bendremer 1993), similar wood charcoal was identified, including elm, hickory, hornbeam, ash, tupelo, cherry, and butternut. No black walnut was identified. Up until that time, the pollen record (North American Pollen Data Base nd) shows only sporadic presence of black walnut during the middle Holocene. The modern range for black walnut in New England continues to find this taxa restricted to the coastal areas as far north as southern Massachusetts (Little 1971). These black walnut specimens may be related to intentional planting during the Little Climatic Warming period. The new climatic conditions allowed their survival in the north; then human cultivation encouraged their continued growth.

Significantly, the advent of maize horticulture along the floodplain of the Connecticut River, as evidenced from remains found at the Morgan site and Burnham Shepard did not eradicate the typical floodplain taxa as was found in Tennessee. In that case, (Cridlebaugh 1984) noted that a shift to upland taxa became necessary following intense levels of clearing the floodplain for maize agriculture. It may have been that maize agriculture was successful along the floodplain due to the warming climate and a decrease in spring and fall flooding that threaten crops today. Stratigraphic analyses and sedimentation records remain to be explored to determine if this was the case in southern New England.

CONCLUSION

Archaeological studies require refined temporal and spatial scales for environmental reconstruction. Combining climate proxy data from the Greenland ice cores, oxygen isotope studies, pollen and plant macrofossils, as well as the sediments from lakes, ponds and swamps can make increasingly reliable interpretations. The botanical assemblages from cultural features at archaeological sites help refine the local environmental picture, and complement the other available data.

Evidence for several global climate changes has been recorded in Connecticut and elsewhere in southern New England, based on lake level changes, sediment anomalies, shifts in pollen accumulation rates, and range extensions for various plant macrofossils. However, we need more details on the sediments from archaeological sites as well as more AMS dating of individual plant remains to further refine the picture of the past.

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CONNECTICUT RADIOCARBON DATES: A STUDY OF PREHISTORIC CULTURAL CHRONOLOGIES AND POPULATION TRENDS

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ABSTRACT

Over the past fifty years radiocarbon dating has become the most frequently utilized method for developing absolute chronologies for prehistoric sites and artifacts, as well as for addressing questions of prehistoric culture change. The Connecticut sample includes 414 dates. Connecticut dates are compared to radiocarbon chronologies from five other Northeastern states (New Hampshire, Massachusetts, Pennsylvania, Maryland and West Virginia) and southern Ontario. Connecticut and other New England states have bi-modal distributions of radiocarbon dates after 5000 BP. Dates increase during the Late Archaic period between 4800 BP and 3600 BP, and again during the Late Woodland after 1200 BP. Late Woodland radiocarbon dates are not as common in New England, and especially northern New England (New Hampshire), as in the Middle Atlantic region. Maize may not have been as significant to prehistoric subsistence in New England as in the Middle Atlantic region, and Late Woodland population increases were apparently less pronounced in New England.

INTRODUCTION

The radiocarbon dating method was discovered in 1947, and was immediately embraced by archaeologists (Marlowe 1999). In 1969, Douglas Jordan, the first Connecticut State Archaeologist, compiled available radiocarbon dates from New England. These included only forty-five dates from archaeological sites and five geological dates. Only three dates were from Connecticut archaeological sites. The first Connecticut dates were two samples submitted by Suggs (1958) from the Manakaway site in Greenwich. David Thompson (1969) submitted the third Connecticut archaeological date from the Binette site, Naugatuck.

In the three decades following Jordan's early survey, radiocarbon dating became the most frequently utilized method for developing absolute chronologies for prehistoric sites and associated artifacts. Table 1 assembles 414 published and unpublished radiocarbon dates from Connecticut archaeological sites. These dates derive from cultural resource management surveys, doctoral studies, museum research files, academic institutions, and investigations by professional and avocational archaeologists. This list is intended as a research tool for cross-referencing radiocarbon samples, archaeological sites, artifact assemblages, and archaeological reports. However, this paper poses the hypothesis that radiocarbon dates also reflect broader prehistoric cultural processes.

Radiocarbon dating is commonly employed by archaeologists to evaluate prehistoric culture changes among material artifacts such as projectile points, ceramic types, burial practices, and subsistence patterns (particularly the origins of agriculture). At a more general level, radiocarbon dates from Connecticut and other regions might also be valid samples for the total numbers of archaeological sites, and therefore might reflect general changes of prehistoric settlement patterns and/or human populations over time. For example, all prehistoric peoples built hearths for warmth and cooking. More dated hearths might reflect more people during specific prehistoric periods. Larger human populations might also have started more frequent forest fires, either accidentally or from subsistence-related activities (especially intentional burning

TABLE 1: CONNECTICUT RADIOCARBON DATES

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
12880	540	GX-9362	150	1	Washington	WU	Titus Field 82	Trench 1	C		Possible geologic sample	IAIS file
11960	330	GX-10872			North Canaan	NH	Twing	RS84-C1	O		Possible geologic sample	IAIS file
10640	160	Beta-11880	12	8	Bolton	EU	Bolton Spring	S9W5	C	MA	Neville-Stark	McBride and Soulsby 1989
10250	70	Beta-126817	72	163	Ledyard	EC	Hidden Creek		N		Nuts	MPMRC file
10215	90	AA-7160	6LF	21	Washington	WU	Templeton	N12W1.5	C		Oak	McWeeney 1994
10190	300	W-3931	6LF	21	Washington	WU	Templeton	9N4.5W	C	PI		Moeller 1980
9500	75	AA-7158	6LF	21	Washington	WU	Templeton	N31.5W1.5	C		Oak	McWeeney 1994
9390	70	AA-7157	6LF	21	Washington	WU	Templeton	N31.5W1.5	C		Oak or Hickory	McWeeney 1994
9340	60	Beta-122013	72	97	Ledyard	EC	Sandy Hill	Str. 12	C			MPMRC file
9160	50	Beta-121846	72	163	Ledyard	EC	Hidden Creek	N8W2	C			MPMRC file
9020	60	Beta-122014	72	97	Ledyard	EC	Sandy Hill	N10E2	N			MPMRC file
8920	100	Beta-102564	72	97	Ledyard	EC	Sandy Hill	Fea. 21A	C			PAST file
8710	60	Beta-113498	72	97	Ledyard	EC	Sandy Hill	S21W59	C			MPMRC file
8680	60	Beta-126816	72	97	Ledyard	EC	Sandy Hill	Fea.41	C	MA	Neville, nuts	MPMRC file
8660	60	Beta-126812	72	97	Ledyard	EC	Sandy Hill	Fea.22	C		Quartz Core Industry	MPMRC file
8560	270	GX-11414	41	51	East Haddam	EU	Dill Farm 1	Fea. E	C	EA	Bifurcate Base	Pfeiffer 1986
8490	60	Beta-113499	72	97	Ledyard	EC	Sandy Hill					MPMRC file
8330	120	Beta-13176	12	8	Bolton	EU	Bolton Spring	Fea.4	B	MA	Neville-Stark	McBride and Soulsby 1989
8050	90	Beta-7049	41	51	East Haddam	EU	Dill Farm 1					McBride 1984
7800	80	Beta-57274	72	163	Ledyard	EC	Hidden Creek	Sample 1	C			Jones 1997
7790	100	Beta-13177	12	8	Bolton	EU	Bolton Spring	Fea.1	C	MA	Neville-Stark	McBride and Soulsby 1989
7720	260	GX-11415	41	51	East Haddam	EU	Dill Farm 1	Fea. M		MA	Neville, Bifurcate Base	Pfeiffer 1986
7630	120	Beta-60979	72	163	Ledyard	EC	Hidden Creek	Sample 2	C			Jones 1997
7305	280	GX-11416	41	51	East Haddam	EU	Dill Farm 1	Fea.5e	C	MA	Neville	Pfeiffer 1986
7200	110	Beta-121840	72	97	Ledyard	EC	Sandy Hill	N2E2	C			MPMRC file
6580	55	AA-8229			Westport	WC	Two Baker		C		Hickory nuts	McWeeney 1994
6102	100	UGa-6582	97	50	Newtown	WU	Swamp, 272A-1-1	Fea. 3	C			Kingsley 1992
5960	250	QC-940			West Hartford	CV	Bugbee-Hathaway			MA	Merrimack	McBride 1984
5045	230	GX-9359	21	31	Canaan	NH	Schrenk I	N37E25	C			IAIS file
5020	95	GX-22744			Westport	WC	Watts	Fea.2	C			Wiegand p.c., 1998
5010	80	Beta-74357	11	2	Bloomfield	CV	Indian Hill	Fea.59	C	MA	Neville	Banks p.c., 1998
5000	150	Beta-10347	22	4	Canterbury	EU	R12					PAST file
4920	250	QC-1081	4	2	Avon	CV	Alsop Meadow		C	TA	Fishtail	Feder 1981a
4890	100	Beta-15587	12	4	Bolton	EU	England			LA	Brewerton	McBride and Soulsby 1989
4880	110	Beta-25206	130	36	Southbury	WU		S1E2	C			PAST file

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
4870	80	Beta-50852	11	2	Bloomfield	CV	Indian Hill	Fea.23	C			PAST file
4835	50	AA-8228	61.F	21	Washington	WU	Templeton	N12W1.5	C		Maple	McWeeney 1994
4775	120	SI-5304	105	23	Old Lyme	EC	Bliss-Howard			LA	Cremation Burial	Pfeiffer 1984
4765	180	SI-5306	105	23	Old Lyme	EC	Bliss-Howard			LA	Cremation Burial	Pfeiffer 1984
4730	280	Beta-6723	41	60	East Haddam	EU	Basham Lake		C	LA	Brewerton	Pfeiffer 1984
4675	100	SI-5303	105	23	Old Lyme	EC	Bliss-Howard			LA	Cremation Burial	Pfeiffer 1984
4610	80	Beta-94955			Granby	CV	Firetown Meadow	T5P6	C	LA	Narrow-stem	Feder and Banks 1996
4550	100	Beta-17983	119	3	Rocky Hill	CV		Fea. 3	C	LA	Narrow-stem	McBride and Soulsby 1989
4540	165	GX-16724	8	8	Bethany	WU	Antronelli	Fea. 4	C			Thompson p.c. 1998
4535	95	SI-5305	105	23	Old Lyme	EC	Bliss-Howard		C	LA	Cremation Burial	Pfeiffer 1984
4520	80	Beta-20148	32	59	Coventry	EU	Coventry Sewer	Fea. 3	C	LA	Brewerton	McBride 1988
4500	110	Beta-52982	97	27	Newtown	WU	270A-4-1	Fea. 19	C			Millis et al. 1995
4490	80	Beta-15589	32	59	Coventry	EU	Coventry Sewer	Fea. 1	C	LA	Brewerton	McBride 1988
4470	100	GX-10852			Old Lyme	EC	Arbucci	Fea. A	C	LA	Triangular	Pfieffer and Stuckenrath 1989
4465	240	GX-2489	150	7	Washington	WU	Kirby Brook	Fea. 1	C	LA	Narrow-stem	Swigart 1974
4460	70	Beta-17557	32	59	Coventry	EU	Coventry Sewer	Fea. 7	C	LA	Narrow-stem	McBride 1988
4460	70	Beta-116902	96	22	New Milford	NH	Larson	Fea. B	C			Walwer and Walwer 1998
4440	70	Beta-80185	97	71	Newtown	WU	Newtown Sewer	Fea. 22	C	LA	Otter Creek, Lamoka	Jones et al. 1997
4410	100	GX-10848	105	23	Old Lyme	EC	Bliss-Howard		C			Pfeiffer 1992
4355	185	GX-2696	150	7	Washington	WU	Kirby Brook		C	LA	Narrow-stem	Swigart 1974
4340	120	Y-1664	6NH	48	Naugatuck	WU	Binette A	EU0W3S	C	LA	Vosberg	Thompson 1969
4295	90	SI-5312	105	1	Old Lyme	EC	Broedeur Point		C			Pfeiffer 1984
4290	70	Beta-53939	97	27	Newtown	WU	270A-4-1	Fea. 8	C			Millis et al. 1995
4280	120	Beta-5792	83	8	Middletown	CV	Hubbard Brook			LA	Narrow-stem	McBride 1984
4280	120	SI-4846	105	23	Old Lyme	EC	Bliss-Howard	TP12	C	LA	Cremation Burial, Triangular	Pfeiffer and Stuckenrath 1989
4275	255	GX-3386	105	8	Old Lyme	EC	Ames Rockshelter	Fea. 1	C	LA	Notched	Pfeiffer 1992
4240	80	SI-5308	105	42	Old Lyme	EC	Chadwick	Str. D	C	LA	Narrow-stem	Pfeiffer 1984
4220	250	QC-952			Avon	CV	Avon Old Farms Br.		C	LA	Notched	Feder 1981a
4220	90	Beta-21230	32	59	Coventry	EU	Coventry Sewer	Fea. 2	C	LA	Narrow-stem, Triangular	McBride 1988
4200	90	Beta-5790	41	8	East Haddam	EU	Ashland Lake		C	LA	Brewerton	McBride 1984
4200	90	Beta-78563	97	71	Newtown	WU	Newtown Sewer	Fea. 2	C			Jones et al. 1997
4200	80	Beta-92845	97	71	Newtown	WU	Newtown Sewer	Fea. 26	C			Jones et al. 1997
4185	240	GX-2836	150	5	Washington	WU	Fern	Fea. 1	C	LA	Squibnocket Triangle	Swigart 1974
4180	95	QC-1157	41	50	East Haddam	EU	Salmon Cove		C	LA	Brewerton	McBride 1984
4175	90	UGa-6579	97	50	Newtown	WU	Swamp, 272A-1-1	Fea. 2	C			Kingsley 1992

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
4170	80	Beta-44513	88	22	Monroe	WU	280-12-1	Fea. 1	C			Cassedy et al. 1991
4160	70	Beta-121844	72	54	Ledyard	EC	Button	Fea.5	C			MPMRC file
4105	55	AA-7156	6LF	21	Washington	WU	Templeton	N31.5W1.5	C		Oak or Hickory	McWeeney 1994
4075	90	GX-14805	161	14	Wilton	WU	Comstock Brook 4	Fea. 2	C			Wiegand 1989
4060	205	GX-3213	6LF	21	Washington	WU	Templeton		C	LA	Squibnocket Triangle	Swigart 1974
4060	60	Beta-102565	72	97	Ledyard	EC	Sandy Hill	Fea. 4	C			PAST file
4050	60	Beta-92847	97	71	Newtown	WU	Newtown Sewer	Fea. 27	C	LA	Narrow-stem	Jones et al. 1997
4040	210	GX-22745			Westport	WC	Watts	Fea.4	C			Wiegand p.c. 1998
4040	60	Beta-80186	97	71	Newtown	WU	Newtown Sewer	Fea. 12	P			Jones et al. 1997
4030	90	I-7187	6HT	15	Farmington	CV	Lewis-Walpole	Fea. 69	C			Starbuck 1991
4020	220	Beta-11930	12	5	Bolton	EU	Staven's III	Fea.2	C	LA	Narrow-stem	McBride and Soulsby 1989
4020	180	Beta-52058	164	20	Windsor	CV	Area II	Fea. 1	C			Lizee 1994b
4020	80	Beta-24224	132	11	South Windsor	CV	Kasheta	Fea. 8	C	LA	Narrow-stem	Bendremer 1993
4010	90	Beta-66823	164	24	Windsor	CV	Frontage Road		C			McBride 1992
4010	80	Beta-66824	164	24	Windsor	CV	Frontage Road	Fea.10	C			McBride 1992
3995	100	QC-976	54	53	Glastonbury	CV	Long Knoll		C	LA	Narrow-stem	McBride and Dewar 1981
3995	90	GX-22743			Westport	WC	Watts	Fea.3	C			Wiegand p.c. 1998
3990	70	Beta-17556	32	59	Coventry	EU	Coventry Sewer	Fea. 5	C	LA	Narrow-stem	McBride 1988
3990	60	Beta-9072	61	8	Haddam	EU	Archaic Midden		C			McBride 1984
3980	90	Beta-34006	97	19	Newtown	WU	Hoosgow III	FCR Conc.	C	LA	Normanskill	Raber and Wiegand 1990
3980	70	AA-2125	84	18	Milford	WC	Robillard	Fea. 10	C			Thompson p.c. 1998
3975	125	GX-16725	8	8	Bethany	WU	Antonelli	Fea. 1	C			Thompson p.c. 1998
3970	100	Beta-17453	5	17	Barkhamsted	NH	Super Tree		C	LA	Narrow-stem	Feder 1986
3960	90	I-7188	6HT	15	Farmington	CV	Lewis-Walpole	Fea. 6	C			Starbuck 1991
3950	60	Beta-8739	19	6	Brooklyn	EU	Cat/Gluck	Fea. 5	C	LA	Squibnocket	McBride and Soulsby 1989
3945	150	QC-708	164	3	Windsor	CV	Loomis I		C			Feder 1981b 1982
3905	140	GX-3639	101	21	North Haven	CV	Pratt	Fea. 2	C	LA	Narrow-stem	McBride and Dewer 1981
3890	80	Beta-17558	32	59	Coventry	EU	Coventry Sewer	Fea. 8	C	TA	Genessee, Narrow-stem	McBride 1988
3880	60	Beta-20153	12	2	Bolton	EU	Bolton Notch	Fea 7	C			McBride and Soulsby 1989
3850	60	Beta-78564	97	71	Newtown	WU	Newtown Sewer	Fea. 4	C			Jones et al. 1997
3840	70	Beta-16120	72	55A	Ledyard	EC	Museum A	Fea. 1	C	TA	Broadspear	PAST file
3810	70	Beta-126814	72	97	Ledyard	EC	Sandy Hill	Fea. 5	C			MPMRC file
3800	120	Y-2582	149	1	Warren	NH	Hopkins	EU1		LA	Sylvan Lake	Thompson 1973
3800	90	Beta-50838	84	55	Milford	WC	294A-AF-2-1	Fea. 9	C			Millis et al. 1995
3800	60	Beta-20152	12	5	Bolton	EU	Stavens III	Fea.17	C	LA	Narrow-stem	McBride and Soulsby 1989

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
3790	60	Beta-92846	97	71	Newtown	WU	Newtown Sewer	Fea. 32	C			Jones et al. 1997
3770	70	Beta-121845	72	54	Ledyard	EC	Button	Fea.6	C			MPMRC file
3740	80	Beta-20150	12	17	Bolton	EU	Last	Fea. 3	C	TA	Broadspear, Narrow-stem	Pagoulatos 1986, McBride and Soulsby 1989
3740	60	Beta-54143	97	27	Newtown	WU	270A-4-1	Fea. 17	C			Millis et al. 1995
3740	40	Beta-122015	72	97	Ledyard	EC	Sandy Hill					MPMRC file
3730	70	Beta-121847	72	209	Ledyard	EC	Museum Parking Lot	Fea.3	C			MPMRC file
3710	40	Beta-122015	72	97	Ledyard	EC	Sandy Hill	Str. 6.5	C			MPMRC file
3690	80	QC-305	132	44	South Windsor	CV	Woodchuck Knoll	Fea. 58	C	LA	Narrow-stem	McBride 1978
3680	80	Beta-54142	97	27	Newtown	WU	270A-4-1	Fea. 10A	C			Millis et al. 1995
3665	180	GX-2592	6LF	70	New Milford	NH	Lover's Leap 2		C	TA	Snook Kill, Vinette I Ceramics	Swigart 1974; Hoffman 1998
3660	150	GX-2878	150	5	Washington	WU	Fenn	Fea. 2	C	TA	Snook Kill	Swigart 1974
3645	200	GX-11570	100	32	North Canaan	NH	Carlson 1	S16W0	C			IAIS file
3620	170	Beta-52052	164	20	Windsor	CV	Area II	Fea. 4	C			Lizee 1994b
3620	80	Beta-15584	32	47	Coventry	EU	Rufus Brook	Fea.12	C	TA	Broadspears	Pagoulatos 1986
3610	90	GX-16723	6LF	100	Woodbury	WU	Rye Hill	Fea. 1	C	LA	Atlantic blades, Cremation Burial	Thompson 1989
3610	70	Beta-122012	72	97	Ledyard	EC	Sandy Hill	Fea.29	C			MPMRC file
3610	70	Beta-7808	105	34	Old Lyme	EC	Lieutenant River	Fea. 1	C	TA	Broadspear	McBride 1984
3570	230	Beta-6446			West Hartford	CV	Bugbee-Hathaway		C			McBride 1984
3570	60	Beta-8737	132	44	South Windsor	CV	Woodchuck Knoll	Fea. 24	C			McBride 1978
3550	90	Beta-13406	54	23	Glastonbury	CV	Carrier	Fea. 1-4	C	TA	Cremation Burial, Steatite, Copper	Pagoulatos 1986; Hoffman 1998
3550	60	Beta-9073	12	15	Bolton	EU	Tiger Lee III	Fea. 1	C			PAST file
3550	60	Beta-9037	14	1	Branford	EC	Waldo-Hennessey	S4E6	C	EW	Vinette 1 Ceramics	McBride 1984; Lizee 1994a
3550	60	Beta-36067	72	55A	Ledyard	EC	Museum A	Fea. C+D	C			PAST file
3535	140	GX-5564	105	41	Old Lyme	EC	Griffin		BC	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3530	180	Beta-52577	84	55	Milford	WC	294A-AF-2-1	Fea. 3	C	TA	Orient, Steatite, Vinette I Ceramics	Millis et al. 1995; Hoffman 1998
3530	90	Beta-20151	12	5	Bolton	EU	Stavens III	Fea. 15	C	LA	Narrow-stem, Ceramics	McBride and Soulsby 1989; Lizee 1994a
3520	50	Beta-90369	72	163	Ledyard	EC	Hidden Creek	N10E2	C			Jones 1997
3515	85	QC-350	132	44	South Windsor	CV	Woodchuck Knoll	Fea. 58	C			McBride 1978
3510	140	QC-301	132	44	South Windsor	CV	Woodchuck Knoll	Fea. 58	C			McBride 1978
3500	130	Beta-52607	126	28	Shelton	WU	284A-AF-2-1	Fea. 35	C	EW	Vinette I Ceramics	Millis et al. 1995; Hoffman 1998
3495	150	GX-5565	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3480	70	Beta-90368	72	163	Ledyard	EC	Hidden Creek	N7W27	C	TA	Broadspear	Jones 1997
3470	140	Beta-52050	88	8	Naugatuck	WU	Hop Brook	Fea. 2	C			PAST file
3470	60	Beta-3950	61	25	Haddam	EU	Candlewood Hill	Fea. 1	C	LA	Narrow-stem	McBride 1984
3450	210	GX-3130	6NH	48	Naugatuck	WU	Binette A	EU15W3S	C	LA	Squibnocket Triangle	Swigart 1974

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
3390	60	Beta-74947	72	163	Ledyard	EC	Hidden Creek		C			Jones 1997
3380	130	Beta-15582	32	50	Coventry	EC	Moriarity	Fea. 1	C	TA	Snook Kill	Pagoulatos 1986; McBride and Soulsby 1989
3335	90	GX-10850	164	4	Windsor	CV	Schwartz	Fea. 8	C	TA	Broadspear	Pfeiffer 1992
3320	70	Beta-52167	84	55	Milford	WC	294A-AF-2-1	Fea. 19	C	EW	Vinette I Ceramics	Millis et al. 1995; Hoffman 1998
3250	60	SI-4842	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3230	80	Beta-52169	84	55	Milford	WC	294A-AF-2-1	Fea. 30	C	EW	Vinette I Ceramics	Millis et al. 1995; Hoffman 1998
3220	110	QC-360	132	44	South Windsor	CV	Woodchuck Knoll	Fea. 58	C			McBride 1978
3200	80	Beta-24225	132	11	South Windsor	CV	Kasheta	Fea. 5	C		Maize	McBride and Soulsby 1989; Bendremer 1993
3180	220	GX-2909	150	5	Washington	WU	Fenn	Fea. 2	C	TA	Orient	Swigart 1974
3160	620	GX-4186	96	13	New Milford	NH	Flynn		C			Swigart 1974
3140	60	SI-4845	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3130	90	Beta-8738	19	6	Brooklyn	EU	Cat/Gluck	Fea. 2	C	TA	Snook Kill	McBride 1984, McBride and Soulsby 1989
3130	90	Beta-7051	163	3	Windham	EU	Beaver Brook	EUN0E9	C	LA	Narrow-stem	McBride 1984, McBride and Soulsby 1989
3105	60	SI-4843	105	41	Old Lyme	EC	Griffin		N	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3100	175	GX-2880	6LF	70	New Milford	NH	Lover's Leap 2	Str. IV	C	TA	Orient	Swigart 1974
3080	140	GX-5051	6LF	114	Cromwell	CV	Squash Cave	Fea. 21	C			IAIS file
3065	175	GX-2593	6LF	70	New Milford	NH	Lover's Leap 2	EUN34	C	TA	Orient	Swigart 1974
3055	20	SI-5313			Wallingford	CV	Toelle Road	Fea. 1	C	TA	Cremation Burial	Ziac and Pfeiffer 1989
3045	135	GX-3638	96	17	New Milford	NH	Gene's Motel	Fea. 4	C	TA	Steatite; Vinette I Ceramics	Swigart 1974; Hoffman 1998
3025	140	QC-580/1/2	132	11	South Windsor	CV	Butternut Knoll	Fea. 1	C	TA	Susquehanna, Orient	McBride 1978
3010	110	Beta-37776	5	27	Barkhamsted	NH	Wood Lily		C	LA	Narrow-stem	Feder 1986
3005	70	SI-4841	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
3005	60	SI-4840	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer abd Stuckenrath 1989
3002	89	UGa-6580	97	50	Newtown	WU	Swamp, 272A-1-1	Fea. 1	C			Kingsley 1992
2985	70	SI-4844	105	41	Old Lyme	EC	Griffin		C	TA	Cremation Burial	Pfeiffer and Stuckenrath 1989
2970	85	SI-5309	105	1	Old Lyme	EC	Broedeur Point	Str. C	C	EW	Wayland, Vinette 1 Ceramics	Pfeiffer 1984; Lizee 1994a
2960	70	Beta-37093	5	27	Barkhamsted	NH	Wood Lily	Fea. 4	C	LA	Narrow-stem	Feder 1986
2910	60	Beta-5317	75	30	Lyme	EC	Cedar Lake	Fea. 1	C	LA	Narrow-stem	McBride 1984
2860	60	Beta-102566	72	97	Ledyard	EC	Sandy Hill	Fea. 18	C			PAST file
2800	140	GX-2581	6NH	48	Naugatuck	WU	Binette B			LA	Narrow-stem	Swigart 1974
2800	69	Beta-113414	46	44	Easton	WU	TBV Block M	EU5-2-4	C			Walwer and Gimigliano 1998
2765	65	AA-7159	6LF	21	Washington	WU	Templeton	N12W1.5	C		Oak	McWeeney 1994
2740	185	GX-10874	100	101	North Canaan	NH	Foley Field	EU127	C			IAIS file
2740	100	Beta-5314	75	7	Lyme	EC	Hamburg Cove	Fea. 1	C	TA	Broad Blade	McBride 1984
2740	90	Beta-13404	54	25	Glastonbury	CV	Timothy Stevens	Fea. 11	C	TA	Steatite, Snook Kill, Vinette 1 Ceramics	Pagoulatos 1986; Lizee 1994a

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
2700	60	Beta-7810	105	33	Old Lyme	EC	Lieutenant River	Fea. 1	C	TA	Orient, Wayland, Steatite, Vinette 1 Cer.	McBride 1984; Lizee 1994a; Hoffman 1998
2650	90	Beta-10557	12	2	Bolton	EU	Bolton Notch	Fea. 1	C	EMW	Narrow-stem. Vinette 1, Dentate Cer.	McBride and Soulsby 1989; Lizee 1994a
2645	90	GX-15111	161	6	Wilton	WU	Allen's Meadows	Fea.1	C			Wiegand p.c. 1998
2635	155	GX-5050	6LF	115	Cromwell	CV	Motel	Sample M	C			IAIS file
2585	185	GX-9361	96	13	New Milford	NH	Flynn	Trench 1B	C			IAIS file
2570	100	Beta-29064	14	28	Branford	EC		Fea.34				PAST file
2550	170	Gx-10047	59	63	Groton	EC	Hidden Valley Shelter		C			Barron 1988
2540	50	Beta-122395			East Lyme	EC	Camp Rowland		C			Lavin et al. 1998
2535	170	GX-3368	93	21	New Haven	CV	Burwell-Karako		C	LA	Narrow-stem	Swigart 1974
2530	430	Beta-7812	41	51	East Haddam	EU	Dill Farm 1	Fea. 1	C			PAST file
2515	55	AA-2127	84	18	Milford	WC	Robillard	Midden	S	TA	Steatite, Vinette I Ceramics	Thompson p.c.; Hoffman 1998
2470	40	Beta-121849	72	94	Ledyard	EC	Gravel Knoll	Fea.2	N	LA	Brewerton, Otter Creek	MPMRC file
2460	60	Beta-16117	54	25	Glastonbury	CV	Timothy Stevens	Fea. 1	C	TA	Steatite, Snook Kill, Susquahanna	Pagoulatos 1986
2420	140	GX-5096	158	2	Westport	WC	Indian River	Fea. 9	C	EW	Vinette 1 Ceramics	Wiegand 1987; Lizee 1994a
2420	70	Beta-126813	72	97	Ledyard	EC	Sandy Hill	Fea.25	C			MPMRC file
2400	235	GX-9363	150	1	Washington	WU	Titus Field 82	Trench II	C		Possible geologic sample	IAIS file
2380	210	Beta-7048	22	2	Canterbury	EU	Pete's Drive	Fea. 1	C	LA	Narrow-stem	McBride and Soulsby 1989
2350	125	GX-3647	68	6	Kent	NH	South Kent Rockshelter			LA	Narrow-stem	Swigart 1974
2310	70	Beta-103254	72	97	Ledyard	EC	Sandy Hill	Fea. 27				MPMRC file
2310	60	Beta-74519	58	10	Westport	WC	Wakeman Farm	Fea.11	C			Lavin and Mozzi 1994
2300	270	Alpha-3007	32	59	Coventry	EU						PAST file
2290	70	QC-217	63	3	Hampton	EU	Spruce Swamp	Fea. 1	C			Warner p.c.
2280	100	Beta-60978	112	8	Pomfret	EU		Fea. 2	C			PAST file
2270	50	Beta-90367	72	163	Ledyard	EC	Hidden Creek	N8W2	C			PAST file
2235	150	GX-10851	105	45	Old Lyme	EC	Great Island	Fea. 1		EMW	Vinette I, Vinnette II Ceramics	McBride 1984; Hoffman 1998
2235	140	GX-2488	6LF	70	New Milford	NH	Lover's Leap 2			EW	Meadowood	Swigart 1974
2150	60	Beta-44514	126	41	Shelton	WU	282-8-4	Fea. 3	C			Cassedy et al. 1991
2130	80	Beta-53940	97	27	Newtown	WU	270A-4-1	Fea. 18E	C		Nuts	Millis et al. 1995
2085	135	GX-7298	158	2	Westport	WC	Indian River	Fea. 8	C	EW	Vinette I Ceramics	Wiegand 1987; Lizee 1994a
2060	90	Beta-8741	19	6	Brooklyn	EU	Cat/Gluck	Fea. 3	C			McBride and Soulsby 1989
2060	90	Beta-52166	84	55	Milford	WC	294A-AF-2-1	Fea. 6	C			Millis et al. 1995
2030	55	GX-20544			Greenwich	WC	Cobb Is. (Lot 4A)	Fea.2	C			Wiegand p.c. 1998
2015	135	GX-10331	158	2	Westport	WC	Indian River	Fea.7	C	MW	Linear Dentate Ceramcis	Wiegand pc 1998; Lizee 1994a
1940	95	QC-707	164	2	Windsor	CV	Loomis II		C	MW	Windsor Brushed Ceramics	Feder 1981b; Lizee 1994a
1930	70	Beta-80913	75	60	Lyme	EC	Cooper	Fea.9	C			Tryon and Pilpotts 1997

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
1930	70	Beta-52919	84	56	Milford	WC	294A-25-2	Fea. 7	C			Millis et al. 1995
1920	80	Beta-50839	84	56	Milford	WC	294A-25-2	Fea. 3A	N	EMW	Steatite, Vinette, Matinecock Stamp Cer.	Millis et al. 1995; Hoffman 1998
1915	150	QC-1162	75	4	Lyme	EC	Selden Point	Fea. A	C	MW	Linear Dentate Ceramics	McBride 1984; Lizee 1994a
1910	100	Beta-13409	41	18	East Haddam	EU	Parkos			TA	Broadspear	Pagoulatos 1986
1840	70	Beta-16118	6MD	40	East Haddam	EU		Fea. 1		MW	Ceramics	PAST file
1835	105	QC-1063	41	22	East Haddam	EU	Roaring Brook			MW	Rocker Dentate Cereramics	McBride 1984; Lizee 1994a
1830	140	GX-8349	103	15	Norwalk	WC	Tuthill	Fea. 3		MW	Dentate Stamped Ceramics	Wiegand 1987
1815	125	GX-8721	103	15	Norwalk	WC	Tuthill	Fea. 2		MW	Vinette, Dentate Stamped Ceramics	Wiegand p.c. 1998
1765	250	QC-1065	75	1	Lyme	EC	Selden Island	Fea. 11	C			PAST file
1760	70	Beta-50840	84	56	Milford	WC	294A-25-2	Fea.3B	C	MW	Vinette, Matinecock Stamp. Ceramics	Millis et al. 1995
1710	80	Beta-34004	97	17	Newtown	WU	Hoosgow I	Fea.3	C			Raber and Wiegand 1990
1700	70	Beta-121848	72	209	Ledyard	EC	Museum Parking Lot	Fea.5A	C			MPMRC file
1690	70	Beta 52980	97	27	Newtown	WU	270A-4-1	Fea.18C	C	MW	North Beach Net Ceramics	Millis et al. 1995
1630	170	Beta-6722	22	12	Canterbury	EU	Pearl Harbor			MW	Linear Dentate Ceramics	McBride 1984; Lizee 1994a
1630	80	Beta-94953			Granby	CV	Glazier		C	MW	Blade cache, cf Fox Creek	Feder n.d.
1600	80	Beta-5795	54	23	Glastonbury	CV	Carrier				Cremation Burial	McBride 1984
1590	100	QC-836			Avon	CV	Fisher Meadows I		C			Feder 1981a
1590	60	Beta-94954			Granby	CV	Glazier		C	MW	Blade cache, cf Fox Creek	Feder n.d.
1555	80	QC-571	6HT	123	South Windsor	CV	Burnham-Shepard	S20W40	C	MW	Linear Dentate Ceramics	McBride 1984; Lizee 1994a
1550	50	Beta-7816	22	7	Canterbury	EU		S5E15	C			McBride and Soulsby 1989
1540	125	GX-7884	103	15	Norwalk	WC	Tuthill	N13E1	S	MW	Rocker Dentate Ceramics	Wiegand 1987
1525	165	GX-9360			Canaan	NH	Lakebed #1	Profile I	C		Possible geologic sample	IAIS file
1510	170	Beta-52056	88	8	Naugatuck	WU	Hop Brook		C			PAST file
1490	100	Beta-5318	75	60	Lyme	EC	Cooper	Fea.1		MW	Linear Dentate Ceramics	McBride 1984; Lizee 1994a
1470	200	GX-3214	6LF	115	New Milford	NH				MW	Fox Creek	Swigart 1974
1450	80	Beta-52168	84	55	Milford	WC	294A-AF-2-1	Fea.22	C			Millis et al. 1995
1450	80	GX-16655			East Haddam	EU	M.R.	Stor. Pit			Nuts	Parkos 1991
1440	80	Beta-40851	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.36	C			Bendremer 1993
1320	180	GX-10871	100	32	North Canaan	NH	Carlson I	U014	C			IAIS file
1320	70	Beta-7809	105	30	Old Lyme	EC	Lieutenant River			MW	Windsor Brushed Ceramics	McBride 1984; Lizee 1994a
1310	85	GX-21036			Greenwich	WC	Cobb Island (Lot 7)	Fea.31	C	MW	Net-marked Ceramics	Wiegand p.c. 1998
1310	60	Beta-12941	5	9	Barkhamsted	NH	Beaver Brook		C			Feder 1986
1280	250	Beta-2545			New London	EC	Mamacoke Cove			MW	Ceramics	Juli 1992
1280	105	GX-4573	57	9	Greenwich	WC	Mead's Point I	Fea. 2		MW	Cord-marked Ceramics	Wiegand 1987
1240	185	QC-1160	41	51	East Haddam	EU	Dill Farm 1		C			PAST file

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
1190	115	I-5618	86	1	Montville	EU	Shantock Cove			MW	Windsor Brushed, Cordmarked Ceramics	Salwen and Ottesen 1972; Lizee 1994a
1180	125	GX-4132	135	4	Stamford	WC	Finch's Corners	Fea.2	C			Wiegand p.c. 1998
1175	120	GX-21037			Greenwich	WC	Cobb Island (Lot 7)	Fea.36	C	LW	Dog Burial	Wiegand p.c. 1998
1170	80	Beta-34005	97	17	Newtown	WU	Hoosgow I	Fea.5	C			Raber and Wiegand 1990
1150	115	GX-3637	135	6	Stamford	WC	Rockrimmon Rockshelter	Fea.9	C			Wiegand 1980
1140	90	Beta-17984	119	3	Rocky Hill	CV		Fea.2				PAST file
1130	60	Beta-121841	72	54	Ledyard	EC	Button	Fea.1	C			MPMRC file
1125	130	GX-4023	135	4	Stamford	WC	Finch's Corners	Fea.2	C			Wiegand p.c. 1998
1110	95	I-5615	86	1	Montville	EU	Shantock Cove			MW	Windsor Brushed, Cordmarked Ceramics	Salwen and Ottesen 1972; Lizee 1994a
1110	70	Beta-36068	14	28	Branford	EC		Fea.19.C	C			PAST file
1100	180	Beta-8742	152	11	Waterford	EC	Mago Point			MW	Windsor Brushed, Cordmarked Ceramics	McBride 1984; Lizee 1994a
1060	125	GX-5545	158	2	Westport	WC	Indian River	Fea.5	C	LW	Levanna	Wiegand p.c. 1998
1060	80		96	83	New Milford	NH	260A-2-1	Fea. 1	C			Cassedy 1998
1060	70	Beta-5312	75	1	Lyme	EC	Selden Island			MW	Sebonac Ceramics, Maize	McBride 1984; Bendremer 1993
1040	110	Beta-8740	152	11	Waterford	EC	Mago Point			LW	Shantock Cove Ceramics	McBride 1984
1040	80	Beta-24223	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.1	C			Bendremer 1993
1040	50	Beta-39189	5	19	Barkhamsted	NH	Kiln		C	MW	Stemmed	Feder 1986
1035	150	I-5616	86	1	Montville	EU	Shantock Cove			MW	Ceramics	Salwen and Ottesen 1972
1020	40	Beta-126815	72	97	Ledyard	EC	Sandy Hill	Fea. 16	C			MPMRC file
1010	50	Beta-3946	75	1	Lyme	EC	Selden Island			MW	Windsor Cord, Sebonac, Selden Is. Cer.	McBride 1984; Lizee 1994a
1000	90	Beta-11269	12	2	Bolton	EU	Bolton Notch	Fea. 2		LW	Levanna	McBride and Soulsby 1989
990	120	GX-8722	103	15	Norwalk	WC	Tuthill	N13E9	S	MW	Cord-wrapped, Puntate Ceramics	Wiegand 1987
970	50	Beta-80914	75	60	Lyme	EC	Cooper	Fea. 13	C	LW	Ceramics	Tryon and Pilpotts 1997
965	105	GX-21262			Greenwich	WC	Cobb Island (Lot 7)	Fea.7	C			Wiegand p.c. 1998
950	90	Beta-101930			Granby	CV	Firetown North		C	LW	Triangular	Feder in press
945	160	GX-14802	161	12	Wilton	WU	Comstock Brook 2	Fea.1	C			Wiegand 1989
940	60	Beta-121843	72	54	Ledyard	EC	Button	Fea.3	C			MPMRC file
910	190	Beta-7818	22	7	Canterbury	EU						McBride and Soulsby 1989
910	90	Alpha-3006	32	47	Coventry	EU	Rufus Brook	Fea.5		LW	Ceramics	McBride and Soulsby 1989
895	120	GX-7297	158	2	Westport	WC	Indian River	Fea.3	C			Wiegand p.c. 1998
890	70	Beta-70368	45	21	East Lyme	EC	Niantic Sewer	Fea. 4	C	LW	Ceramics	PAST file; Lizee 1994a
890	20	Alpha-496	75	60	Lyme	EC	Cooper			LW	Windsor Cord. Dentate Stamp. Ceramics	McBride 1984; Lizee 1994a
885	45	AA-10917	6HT	120	Rocky Hill	CV	Morgan		Maize	LW	Maize	McWeeney 1994
880	120	Beta-10553	12	1	Bolton	EU	P.R. Howard	Fea.4	C	LW	Hollister Stamped Ceramics	McBride and Soulsby 1989; Lizee 1994a
880	20	Alpha-497	75	60	Lyme	EC	Cooper			LW	Windsor Cordmarked Ceramics	McBride 1984; Lizee 1994a

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
865	30	GX-14040			Westport	WC	Taylor-by-the-Sea	Fea.1	C			Wiegand p.c. 1998
860	80	GX-21035			Greenwich	WC	Cobb Island (Lot 7)	Fea.22	C			Wiegand p.c. 1998
845	125	I-5617	86	1	Montville	EU	Shantock Cove			LW	Schantock Cove Incised Ceramics	Salwen and Ottesen 1972; Lizee 1994a
845	80	GX-10873			North Canaan	NH	Town Farm	RS84U007	C			IAIS file
840	80	Beta-21234	152	11	Waterford	EC	Mago Point	Fea. 4		LW	Maize	Bendremer 1993
835	120	GX-5095	103	7	Norwalk	WC	Highland	Fea. 2	S	LW	Dentate Stamp Ceramics, Maize	Wiegand 1987; Bendremer 1993
830	90	Beta-11929	152	11	Waterford	EC	Mago Point	Fea. 5		LW	Shantock Incised, Dentate Ceramics	Lizee 1994a
830	70	Beta-12939	52	11	Farmington	CV	Meadow Road		C			Feder 1986
790	80	Beta-49945	84	56	Milford	WC	294A-25-2	Fea.17	C			Millis et al. 1995
780	125	GX-5052	6LF	70	New Milford	NH	Lover's Leap	Fea. 16	C			IAIS file
780	100	Beta-15993	105	7	Old Lyme	EC	Griswold Point	Exposure 2	C	LW	Sebonac Ceramics	Juli and Lavin 1996
780	90	Beta-23662	6HT	120	Rocky Hill	CV	Morgan	S13E0		LW	Burial, Levanna	Lavin 1988
780	70	Beta-36650	6HT	120	Rocky Hill	CV	Morgan			LW	Maize	Bendremer 1993
760	120	GX-14041			Westport	WC	Taylor-by-the-Sea	Fea.2	C	LW	Shell-tempered Ceramics	Wiegand p.c. 1998
745			103	5	Norwalk	WC	Spruce Swamp	Midden	C	LW	Sebonac Ceramics	Wiegand 1987
742	130	L-339A	57	6	Greenwich	WC	Manakaway		C	LW	East River-Untyped Ceramics	Suggs 1958; Wiegand 1987
740	60	Beta-12942	5	9	Barkhamsted	NH	Beaver Brook		C	LW	Triangular	Feder 1986
735	90	QC-1067			Simsbury	CV	King Philip's Brook		C	LW	Triangular	Feder 1981a
730	115	GX-5544	103	7	Norwalk	WC	Highland	Fea. 1	S	LW	Van Cortlandt Ceramics, Maize	Wiegand 1987; Bendremer 1993
730	80	GX-21034			Greenwich	WC	Cobb Island (Lot 7)	Fea.15	C	LW	Dog Burial	Wiegand p.c. 1998
730	70	Beta-12940			Avon	CV	Bridge		C	LW	Ceramics	Feder 1986
710	50	Beta-53920	84	56	Milford	WC	294A-25-2	Fea.9	C	MW	Maize, North Beach Net Ceramics	Millis et al. 1995
690	70	Beta-70367	45	21	East Lyme	EC	Niantic Sewer	Fea. 1	C	LW	Sebonac Stamped Ceramics	PAST file; Lizee 1994a
690	60	Beta-84973	84	55	Milford	WC	294A-AF-2-1	Fea.10B	Maize	LW	Maize	Cassedy 1998
690	60	Beta-11043			New London	EC	Mamacoke Cove					Juli 1992
690	40	Beta-52918	84	56	Milford	WC	294A-25-2	Fea.1	C	LW	Brushed Interior Ceramics	Millis et al. 1995
680	105	Beta-15731	1	1	Andover	EU	Bear Swamp Knoll	Sample 14				PAST file
680	50	Beta-13464	5	11	Barkhamsted	NH	Yellow Trail		C	LW	Triangular	Feder 1986
675	75	Alpha-3008	54	24	Glastonbury	CV				LW	Ceramics	Pagoulatos 1986
670	60	Beta-13407	41	18	East Haddam	EU	Parkos	Fea. A				PAST file
660	40	Beta-121850	72	94	Ledyard	EC	Gravel Knoll	Fea.11	N	LA	Brewerton, Otter Creek	MPMRC file
640	90	Beta-13408	41	18	East Haddam	EU	Parkos	Fea. B				PAST file
635	80	GX-21033			Greenwich	WC	Cobb Island (Lot 7)	Fea.13	C			Wiegand p.c. 1998
630	150	GX-3211	6NH	109	Southbury	WU				LW	Levanna	Swigart 1974
630	80	GX-21039			Greenwich	WC	Cobb Island (Lot 4)	Fea.3	C	LW	Ceramics	Wiegand p.c. 1998

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
630	70	Beta-40849	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.24	C	LW	Beans	Bendremer 1993
630	70	Beta-20147	6HT	120	Rocky Hill	CV	Morgan	Fea. 8		LW	Levanna, Ceramics	Lavin 1988
630	60	Beta-10555	12	3	Bolton	EU	Staven's II	S1W0	C	LW	Levanna, Windsor Plain Ceramics	McBride and Soulsby 1989; Lizee 1994a
620	105	GX-4572	57	9	Greenwich	WC	Mead's Point I	S20W1	S	LW	East River-Untyped Ceramics	Wiegand 1987
620	70	Beta-27676	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.17	Maize	LW	Maize	Bendremer 1993
610	100	I-339B	57	6	Greenwich	WC	Manakaway	Midden	S	EW	Vinette I Ceramics	Suggs 1958; Wiegand 1987
610	70	Beta-13465	5	11	Barkhamsted	NH	Yellow Trail		C	LW	Triangular	Feder 1986
600	80	Beta-40848	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.17	C	LW	Beans	Bendremer 1993
600	60	Beta-111189	47	11	East Windsor	CV	Fox Run 2	Fea.1	C	LW	Maize, Ceramics	Raber 1997
590	70	Beta-20146	6HT	120	Rocky Hill	CV	Morgan	Fea. 37		LW	Levanna, Ceramics	Lavin 1988
580	240	GX-13071	59	63	Groton	EC	North Gungywamp	Hearth	C			Barron 1988
570	190	GX-3212	6NH	109	Southbury	WU				LW	Levanna	Swigart 1974
565	115	GX-21038			Greenwich	WC	Cobb Island (Lot 7)	Fea.37	C			Wiegand p.c. 1998
565	45	AA-10922	12	8	Bolton	EU	Bolton Spring		C		Chestnut	McWeeney 1994
550	70	Beta-50789	84	56	Milford	WC	294A-25-2	Fea.8	C	MW	Maize, Vinette, North Beach Ceramics	Millis et al. 1995
550	60	Beta-29619	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.6	Bean	LW	Beans	Bendremer 1993
540	110	GX-2990	6NH	109	Southbury	WU				LW	Levanna	Swigart 1974
530	100	Beta-52057	164	19	Windsor	CV	I 91-A1-F	S22E3	C			Lizee 1994a
530	90	Beta-10554	12	1	Bolton	EU	P.R. Howard	Fea.2	C	C	Hollister Stamped Ceramics	McBride and Soulsby 1989; Lizee 1994a
510	110	Beta-13976	105	7	Old Lyme	EC	Griswold Point	Area A	C	LW	Sebonac Ceramics	Juli and Lavin 1996
500	70	Beta-24222	132	14	South Windsor	CV	Butternut Knoll	Fea. 1				Bendremer 1993
495	175	GX-15986	59	63	Groton	EC	Tanbark Mill		C			Whittall and Barron 1991
470	80	Beta-5791	22	10	Canterbury	EU	1480' Site	S55W15	C	LW	Windsor Plain Ceramics	McBride and Soulsby 1989; Lizee 1994a
470	70	Beta-74805	72	88	Ledyard	EC	Museum Site	N9E1	C			PAST file
460	110	QC-940	6HT	116	South Windsor	CV	Myette	Fea. 1		LW	Sebonac Stamped Ceramics, Maize	McBride 1984; Bendremer 1993
460	100	QC-974A	6HT	116	South Windsor	CV	Myette	Fea. 1		LW	Sebonic Stamped Ceramics, Maize	Bendremer 1993; McBride p.c.
455	115	GX-21032			Greenwich	WC	Cobb Island (Lot 7)	Fea.2	C	LW	Levanna, Ceramics, Dog Burial	Wiegand p.c. 1998
450	60	Beta-13405	54	25	Glastonbury	CV	Timothy Stevens	Fea. 1				PAST file
445	90	QC-974B	6HT	116	South Windsor	CV	Myette	Fea. 1		LW	Sebonac Stamped Ceramics, Maize	McBride 1984; Bendremer 1993
440	80	Beta-50788	84	55	Milford	WC	294A-AF-2-1	Fea.10A	C	LW	Maize	Millis et al. 1995
440	80	Beta-52059	164	20	Windsor	CV	I 91-A2-E	S13E1	C			Lizee 1994a
440	50	Beta-49943	84	55	Milford	WC	294A-AF-2-1	Fea.31c	C	LW	Ceramics	Millis et al. 1995
430	155	GX-9357	21	32	Canaan	NH	Nicholas I	S0E73				IAIS file
430	130	Beta-7047	19	8	Brooklyn	EU	R.G.					McBride and Soulsby 1989
430	100	Beta-15586	12	15	Bolton	EU	Tiger Lee III			LW	Levanna, Niantic Ceramics	McBride and Soulsby 1989; Lizee 1994a

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
430	70	Beta-50787	84	55	Milford	WC	294A-AF-2-1	Fea.10B	C	LW	Maize	Millis et al. 1995
430	60	Beta-3943	75	6	Lyme	EC	Coudert Ledge			C	Hollister Stamped Ceramics	McBride 1984; Lizee 1994a
420	80	Beta-40850	6HT	123	South Windsor	CV	Burnham-Shepard	Fea.3		LW	Maize	Bendremer 1993
415	105	GX-14804	161	12	Wilton	WU	Comstock Brook 2	Fea.3	C			Wiegand 1989
410	120	Beta-15545	12	7	Bolton	EU	Bolton Notch Rock.			LW	Ceramics	McBride and Soulsby 1989
410	120	Beta-14578	12	7	Bolton	EU	Bolton Notch Rock.		C	LW	Levanna, Hollister Stamped Ceramics	McBride and Soulsby 1989; Lizee 1994a
410	120	Beta-10556	12	7	Bolton	EU	Bolton Notch Rock.	S1E2	C			PAST file
410	60	Beta-3944	61	45	Haddam	EU	Fielding Rock.			LW	Ceramics	McBride 1984
395	180	GX-14803	161	12	Wilton	WU	Comstock Brook 2	Fea.2	C			Wiegand 1989
390	100	Beta-7817	32	47	Coventry	EU	Rufus Brook	Fea.1	C	LW	Untyped Smoothed Ceramics	McBride and Soulsby 1989; Lizee 1994a
370	50	Beta-75600	75	7	Lyme	EC	Hamburg Cove	Fea. 2	C			PAST file
360	60	Beta-49946	84	56	Milford	WC	294A-25-2	Fea.11	C	MLW	Vinette, Matinecock Ceramics	Millis et al. 1995
330	80	Beta-15585	32	47	Coventry	EU	Rufus Brook	Fea.8	C			McBride and Soulsby 1989
330	70	Beta-3580			New London	EC	Arboretum	Burial	B	C	Burial	Juli and Kelley 1991
320	110	Beta-10558	54	24	Glastonbury	CV						PAST file
310	70	Beta-3947	61	37	Haddam	EU	Beaver Brook					McBride 1984
310	60	Beta-84972	84	56	Milford	WC	294A-25-2	Fea.6A	Maize	LW	Maize	Cassedy 1998
290	90	Beta-15590	32	47	Coventry	EU	Rufus Brook	Fea.9C				McBride and Soulsby 1989
280	80	Beta-15581	32	51	Coventry	EU	Moriarity II	Fea.1	C			McBride and Soulsby 1989
275	140	GX-3845	135	6	Stamford	WC	Rockrimmon Rockshelter	Fea.5	C			Wiegand 1980
275	95	QC-1066	169	5	Woodstock	EU	Stafford Brook					McBride et al. 1979
270	110	Beta-7814	163	2	Windham	EU				C	Incised, Hachney Pond Ceramics	McBride and Soulsby 1989; Lizee 1994a
270	70	Beta-70369	45	21	East Lyme	EC	Niantic Sewer	Fea. 4				PAST file
270	60	Beta-6721	22	12	Canterbury	EU	Pearl Harbor			C	Shantock-like Ceramics	McBride and Soulsby 1989; Lizee 1994a
270	60	Beta-64416	72	163	Ledyard	EC	Hidden Creek	Sample 3				PAST file
270	60	Beta-7811	105	3	Old Lyme	EC	Bennett Rockshelter					McBride 1984
260	110	Beta-5794	105	9	Old Lyme	EC	Kaiser I			C	European Ceramics	McBride 1984
260	80	Beta-50853	164	7	Windsor	CV	Oliver Ellsworth	N21W6		C	Niantic Ceramics	PAST file; Lizee 1994a
260	60	Beta-49942	84	55	Milford	WC	294A-AF-2-1	Fea.31c	C	LW	Ceramics	Millis et al. 1995
260	40	Beta-3945	61	48	Haddam	EU	Nick's Niche			C	Niantic Stamped Ceramics	McBride 1984; Lizee 1994a
256	90	GX-3722	6LF	126	Washington	WU	Woodruff Rockshelter	S50W5	B			Swigart 1987
255		GX-2090	150	7	Washington	WU	Kirby Brook					Swigart 1974
250	90	QC-1062	12	4	Bolton	EU	England	Fea. BW				PAST file
250	60	Beta-5315	75	21	Lyme	EC	Costa's Cove			C	Stamped Ceramics	McBride 1984; Lizee 1994a
245	145	GX-9358	21	32	Canaan	NH	Nicholas I	S0E73				IAIS file

TABLE 1: CONNECTICUT RADIOCARBON DATES (Continued)

RCYBP	SD	Lab.	Town	Site	Town Name	Reg	Site Name	Location	Mat.	Per.	Associated Artifacts	Reference
230	60	Beta-49944	84	56	Milford	WC	A294A-25-2	Fea.5	C	C	Maize, Ceramics	Millis et al. 1995
230	40	Beta-3949	18	5	Brookfield	WU						PAST file
220	50	Beta-52921	126	28	Shelton	WU	284-AF2-1	Fea.10	C	MW	Middle Woodland Ceramics	Millis et al. 1995
210	60	Beta-122016	72	49	Ledyard	EC	Pequot Cemetery	Fea.22	C			MPMRC file
200	80	Beta-7050	105	24	Old Lyme	EC	Natcon					PAST file
200		GX-2835	6LF	70	New Milford	NH	Lover's Leap 2			LW	Levanna	Swigart 1974
180	40	Beta-3948	61	49	Haddam	EU	Hackney Pond			C	Guida Incised, Hackney Ceramics	McBride 1984; Lizee 1994a
170	50	AA-7155	6LF	21	Washington	WU	Templeton	N31.5W1.5	C		Hickory	McWeeney 1994
160	60	Beta-5316	75	29	Lyme	EC	Cedar Lake Rockshelter					PAST file
160	50	Beta-122018	72	88	Ledyard	EC	Museum Site	Fea. 19L5	C			MPMRC file
150	100	Beta-16114	152	11	Waterford	EC	Mago Point	Locus 2				PAST file
150	90	Beta-11928	152	11	Waterford	EC	Mago Point	Fea. 4				PAST file
150	50	Beta-122017	72	88	Ledyard	EC	Museum Site	Fea.23L1	C			MPMRC file
150	1	Beta-116310	72	31	Ledyard	EC						MPMRC file
140	90	Beta-15579	32	51	Coventry	EU	Moriarity II	Fea.9				McBride and Soulsby 1989
140	90	Beta-17884	45	7	East Lyme	EC	Tubbs Shell Heap		Maize	LW	Maize	PAST file; Bendremer 1993
130	80	Beta-15580	32	51	Coventry	EU	Moriarity II					McBride and Soulsby 1989
130	75	GX-1147	59	63	Groton	EC	North Gungywamp	N2F2	C			Barron 1988
100	1	Beta-116310	72	31	Ledyard	EC	Rockshelter					MPMRC file
94	350	UGa-6581	97	40	Newtown	WU	Church, 273-2-4	Fea. 8	C			Robertson and Blomberg 1992
70	10	QC-620	6HT	29	Glastonbury	CV						PAST file
0		Beta-15588	1	5	Andover	EU	Faulds					PAST file
0		Beta-7815	19	9	Brooklyn	EU		N94W4	C			PAST file
0		Beta-7819	32	47	Coventry	EU		Fea.9	C			PAST file
0		QC-1158	41	50	East Haddam	EU	Salmon Cove	N127W3	C			PAST file
0		QC-1159	41	50	East Haddam	EU	Salmon Cove	N128W3	C			PAST file
0		Beta-17887	45	7	East Lyme	EC	Tubbs Shell Heap		P	LW	Maize	PAST file
0		Beta-7813	105	1	Old Lyme	EC	Broedeur Point					PAST file
0		GX-3510	135	6	Stamford	WC	Rockrimmon Rockshelter	Fea.2	C		Wading River	Wiegand 1980

related to agriculture). Perhaps questionable radiocarbon dates from archaeological sites also provide chronological information for human activities in an environment over time. Charcoal might reflect periods of site occupations even if not directly associated with artifacts that archaeologists wish to date.

Direct analogies of radiocarbon samples to general populations of archaeological sites and/or human groups might be overly simplistic. Cultural factors probably influenced archaeological site formation, kinds of features constructed and preserved, and associated radiometric dates. For example, throughout the Paleo-Indian and Archaic periods it is assumed that Native Americans hunted and gathered naturally occurring animal, plant and fish resources. Human populations were mobile in order to exploit highly productive seasonal resources, such as changes in animal ranges, fish spawning runs, and the differential ripening schedules of greens, roots, fruits, seeds and nut resources. Many archaeological sites in Connecticut were reoccupied over thousands of years, suggesting favorable environmental conditions at particular locations. Woodland period agriculture involved production of new food resources that might have led to lower seasonal mobility. Agriculture is also often associated with human population increases (e.g., Boserup 1956). Sedentary agricultural lifestyles might have led to new types of deep storage features that were conducive to preservation of charcoal and other organic remains (e.g., Moeller 1991; Bendremer *et al.* 1991). Greater numbers of features might have been associated with agricultural subsistence patterns such as food storage facilities, postholes from permanent structures, middens resulting from annual or prolonged seasonal occupations, and perhaps palisades or other fortifications. Therefore, adoption of agricultural subsistence strategies might be indicated by increasing numbers of radiocarbon dated features than during pre-agricultural times.

Many environmental factors also effect carbon preservation. Because charcoal and other organic matter physically decay over time, fewer and smaller carbon samples are usually available from Paleo-Indian and Archaic period sites than from more recent Woodland period sites. Geological processes have destroyed archaeological sites throughout the Holocene period of human occupations. Sea levels have risen and have inundated coastal sites. Rivers and streams have eroded valleys and terraces. Geomorphic processes have probably destroyed a greater number of older archaeological sites, and associated charcoal samples, than recent sites.

Carbon physics and chemistry also influence radiocarbon dates as valid chronological indicators of human occupations at archaeological sites. Bristlecone pine calibrations (Suess 1980; Stuiver *et al.* 1993) revealed that atmospheric C14 production and organic uptake have varied over time. Recent data from Greenland ice cores and uranium-thorium dates from corals and from other sources have extended the calibration range to include the Paleo-Indian period (e.g., Fiedel 1999). By Paleo-Indian times, the magnitude of error for radiocarbon dates is more than 2,000 years earlier than actual calendric dates. Radiocarbon dates are usually reported as BP dates (radiocarbon years before present, 1950) and are converted to calendric dates (BC or AD) following calibration. Shells, bone and short-lived plant materials have often provided inaccurate radiometric dates. Accelerator mass spectrometry (AMS) dating techniques have greatly relieved problems of small carbon samples and differences among dated materials. C13 isotope corrections can also be applied to plant samples with a C4 pathways, including maize and other cultigens.

Radiometric dates also reflect the research designs of individual archaeologists who selectively excavate sites, submit samples, and publish results from radiometric dating to support specific research questions. Sets of radiocarbon dates might reflect biases among researchers rather than unbiased samples of archaeological sites or features.

Many of these factors were considered when assembling radiocarbon data from Connecticut. Interpretations of the Connecticut radiometric chronology were aided by comparisons with other radiocarbon sequences from Northeastern North America.

CONNECTICUT RADIOCARBON DATES

Connecticut includes an area of 4,965 square miles, divided into 169 incorporated towns, boroughs and cities within eight counties. The counties are Fairfield, Litchfield, New Haven, Hartford, Middlesex, New London, Tolland and Windham. The state is also divided into six physiographic regions; the Northwest Highlands, Western Uplands, Western Coastal Slope, Central Valley, Eastern Coastal Slope, and Eastern Uplands (Figure 1). Until about 1980, archaeological sites were recorded by Smithsonian inventory numbers identifying the state number (e.g., Connecticut 6), county initial (e.g., Litchfield LF), and site series number (e.g., 6LF1). Since approximately 1980, the Connecticut Historical Commission and the Office of the State Archaeologist have inventoried archaeological sites by an alphabetical town number and site series number (e.g., 158-1 signifies the first archaeological site recorded in the town of Westport).

The Connecticut radiometric database derives from combined efforts of numerous archaeologists and research institutions. The Connecticut database presently includes 414 radiocarbon dates from 188 archaeological sites (Table 1). Radiocarbon dates are listed from older to more recent dates. Information was collected from published sources, unpublished archaeological survey reports on file with the Connecticut Historical Commission, Ph.D. dissertations, unpublished dates from museum files including the Institute for American Indian Studies (IAIS) and the Mashantucket Pequot Museum and Research Center (MPMRC), college and university faculty, cultural resource consulting firms (e.g., the Public Archaeology Survey Team, Inc., PAST), and from avocational archaeologists associated with the Archaeological Society of Connecticut and other organizations.

Table 1 reports uncalibrated radiocarbon dates in years before present (BP is before 1950) and (+) one standard deviation. C13-C12 corrections were selected for this list when this information was available. Laboratory numbers are reported on Table 1. Connecticut site inventory numbers have been compiled for named sites from computerized site files of the Connecticut Historical Commission. Radiocarbon dates are also presented for twenty-two sites that either have not yet received site numbers or for which site forms have not yet been filed with the Connecticut Historical Commission. Towns and physiographic regions associated with archaeological sites have also been reported on Table 1.

Archaeological information presented on Table 1 includes site names, features or site proveniences of dated samples, and the material submitted for dating (e.g., charcoal, wood, bone, nuts, maize, shell, etc.), when this information has been reported. Projectile point types, ceramic types, cultigens, and other important cultural materials associated with radiocarbon dates are included on Table 1. Typological information for artifacts often varies between archaeological reports. The expected prehistoric cultural periods of artifacts are also listed. Published and unpublished references for radiocarbon dates are presented below.

Table 2 summarizes the radiocarbon database from Connecticut towns and physiographic regions. Table 2 describes the numbers of archaeological sites with radiocarbon dates, the numbers of individual dates from towns, and the range of dates from towns. The total chronological range of Connecticut radiocarbon dates extends from 12,880 BP to 0 BP (modern). Only 34 percent of Connecticut towns (57 towns) have dated prehistoric archaeological sites. Most towns have few dates that only encompass segments of the prehistoric chronological sequence. Ledyard has the most dates (41 dates) largely resulting from cultural resource surveys sponsored by the Mashantucket Pequot Tribal Nation.

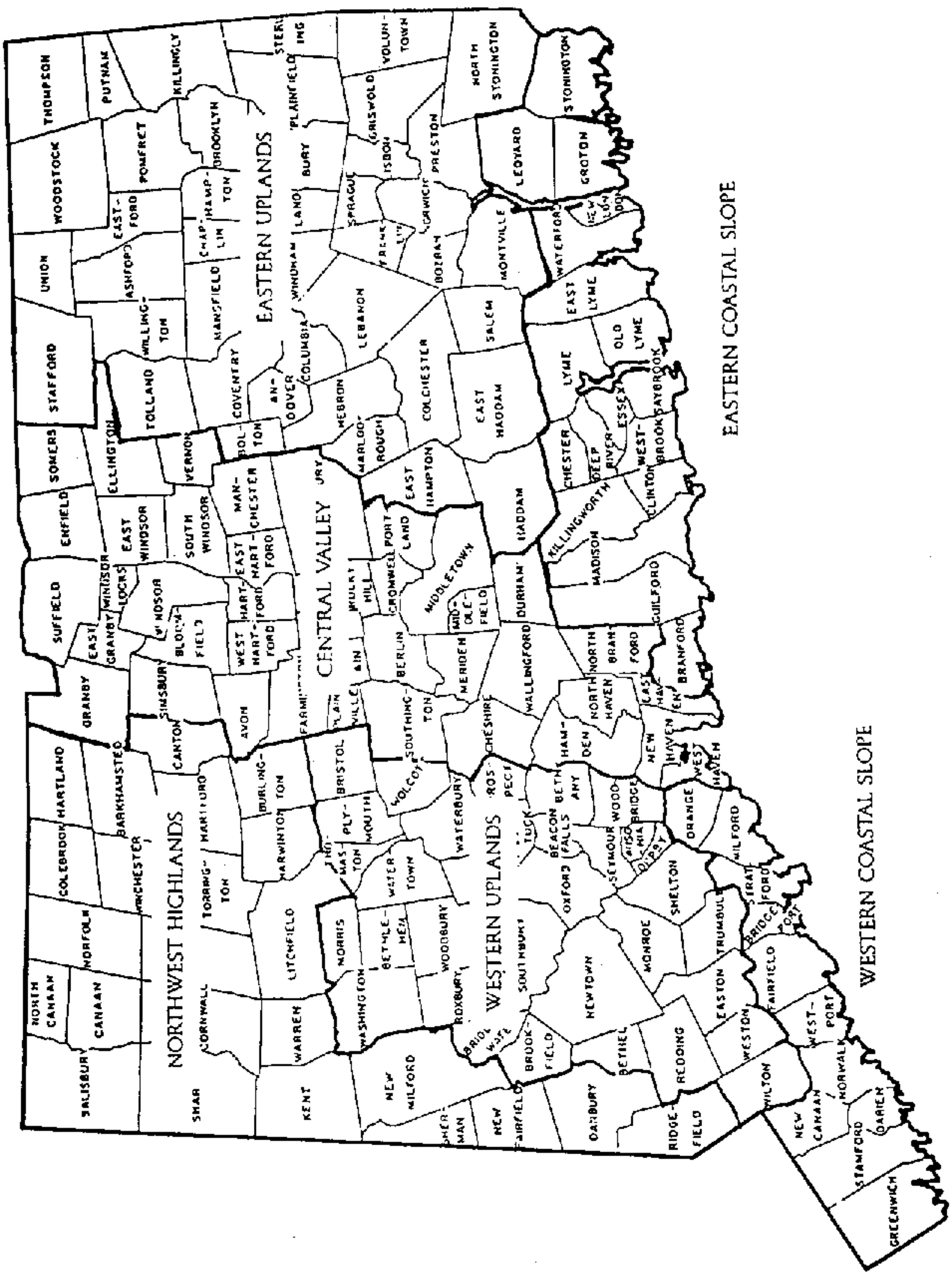

Figure 1. Connecticut towns and regions.

Table 2. Summary of Radiocarbon Dates in Regions and Towns of Connecticut.

Town Number	Town Name	Sites (n)	Dates (n)	Date Ranges (BP) Recent	Date Ranges (BP) Early
Northwest Highlands					
5	Barkhamsted	5	8	610	3970
21	Canaan	3	4	245	1525
68	Kent	1	1	1950	2350
96	New Milford	6	12	200	4460
100	North Canaan	4	5	845	11960
149	Warren	1	1	3800	3800
	Total	**20**	**31**	**200**	**11960**
Western Uplands					
8	Bethany	1	2	3975	4540
18	Brookfield	1	1	270	270
46	Easton	1	1	2800	2800
85-	Monroe	1	1	4170	4170
88	Naugatuck	2	5	1510	4340
97	Newtown	6	20	94	6102
126	Shelton	3	3	220	3500
130	Southbury	2	4	540	4880
150	Washington	5	18	170	12880
161	Wilton	3	5	395	4075
168	Woodbury	1	1	3610	3610
	Total	**26**	**61**	**94**	**12880**
Western Coastal Slope					
57	Greenwich	5	14	455	2030
84	Milford	4	23	0	3980
103	Norwalk	3	7	730	1830
135	Stamford	2	5	0	1180
158	Westport	5	12	760	6580
	Total	**19**	**61**	**0**	**6580**
Central Valley					
4	Avon	4	4	730	4920
11	Bloomfield	1	2	4870	5010
33	Cromwell	2	2	2635	3080
47	East Windsor	1	1	600	600
52	Farmington	2	3	830	4030
54	Glastonbury	4	9	70	3995
56	Granby	3	4	950	4610
83	Middletown	1	1	4280	4280
93	New Haven	1	1	2535	2535
101	North Haven	1	1	3905	3905
119	Rocky Hill	2	7	590	4550
128	Simsbury	1	1	735	735
132	South Windsor	5	20	420	4020
148	Wallingford	1	1	3055	3055
155	West Hartford	1	2	3570	5970
164	Windsor	7	10	260	4020
	Total	**37**	**69**	**0**	**5970**
Eastern Uplands					
1	Andover	2	2	0	680
12	Bolton	9	21	250	10640
19	Brooklyn	3	5	0	
22	Canterbury	3	7	270	5000
32	Coventry	5	17	0	4520
41	East Haddam	8	17	0	8560
61	Haddam	6	6	180	3990
63	Hampton	1	1	2290	2290
86	Montville	1	4	845	1190
119	Pomfret	1	1	2280	2280
163	Windham	2	2	270	3130
169	Woodstock	1	1	275	275
	Total	**42**	**84**	**0**	**10700**
Eastern Coastal Slope					
14	Branford	2	3	1110	3550
45	East Lyme	3	6	0	2540
59	Groton	3	4	130	2550
72	Ledyard	11	42	100	10260
75	Lyme	7	15	250	2910
95	New London	2	3	330	1280
105	Old Lyme	14	29	0	4775
152	Waterford	1	6	150	1100
	Total	**43**	**108**	**0**	**10260**

REVIEW OF RADIOCARBON DATES WITHIN VARIOUS REGIONS OF CONNECTICUT GENERALLY CHRONICLES THE RECENT HISTORY OF ARCHAEOLOGICAL RESEARCH IN CONNECTICUT

Northwest Highlands

The northwestern corner of Connecticut includes metamorphic geological sections of the Taconic Mountains, the southern part of the Berkshire Mountains, and the Hudson Highlands that extend as far south as Ridgefield along the western edge of the state (Figure 1). The Northwest Highlands encompass an area of 973.7 square miles and 23 towns (O'Brien 1985:274-281). The highest point in Connecticut is 2380 feet elevation on Mount Frissel at the northwest corner of the state. The average elevation for all towns in the Northwest Highlands is 694 feet above sea level (O'Brien 1985). The Housatonic River flows south from Massachusetts through the Northwest Highlands. Mountains and rolling plateaus drain into the narrow valleys, including the Shepaug River tributary to the Housatonic River, and the Farmington River that drains into the Connecticut River.

An aggressive program of archaeological excavations and radiocarbon dating began in western Connecticut during 1968 by the Shepaug Valley Archaeological Society (Swigart 1974). By 1974, the society had amassed a collection of more than 300,000 artifacts and had organized the American Indian Archaeological Institute, now the Institute for American Indian Studies (IAIS), in Washington, Connecticut. Swigart (1974) reported 10 radiocarbon dates from the Northwest Highlands and 11 dates from towns in the adjacent Western Uplands. The Institute has continued to support archaeological research projects. IAIS research files also include 11 unpublished radiocarbon dates from the Northwest Highlands, 2 dates from the Western Uplands, and 2 dates from the Central Valley. More recently, Kenneth Feder of Central Connecticut State University has submitted 8 radiocarbon dates from the Northwest Highlands during the Farmington River Valley Archeological Survey (Feder 1981a, 1981b, 1986, 1996).

The present sample of radiocarbon dates from the Northwest Highlands includes 32 dates from 20 archaeological sites among six towns (Table 2). This is the smallest sample of radiocarbon dates from any region of Connecticut. The oldest date in the Northwest Highlands is 11,960 BP from the Twing site, North Canaan (unpublished IAIS file). This date derived from an organic sample and might be of geological rather than human origin.

Western Uplands

The Western Uplands is a region of rolling hills and valleys. The Housatonic River flows southwest toward Long Island Sound, and is joined by the Naugatuck River at Derby. The uplands are also headwaters to several smaller rivers that flow south into Long Island Sound including the Norwalk, Saugatuck, Mill and Pequonnock Rivers. The Western Uplands includes 782.7 square miles and 33 towns. The average elevation of towns in the Western Uplands is 459 feet above sea level (O'Brien 1985:274-281).

The Western Uplands presently have a sample of 61 radiocarbon dates from 26 sites among 11 towns. The Institute for American Indian Studies sponsored excavations at Connecticut's first Paleo-Indian site, the Templeton site, in Washington (Moeller 1980). The first radiocarbon date from the Templeton site was 10,190±300 BP, consistent with the assumed ages for Paleo-Indian artifacts in Northeastern North America (Moeller 1980). Recently, Lucinda McWeeney (1994) procured seven AMS dates from the Templeton site that ranged from 10,215 to 170 BP. McWeeney's three earliest carbon samples (between 10,215 to 9300 BP) probably relate to Paleo-Indian occupations at the Templeton site. All of these Paleo-Indian charcoal samples were identified as oak or hickory wood, suggesting early Holocene expansion of temperate hardwoods into the uplands of Connecticut by Paleo-Indian times (McWeeney 1994). An unpublished date of 12,880±540 BP was procured from a trench profile at the Titus Field 82 site, Washington, which might be of geological origin rather than an archaeological sample.

Numerous archaeological sites were identified between 1989 and 1991 during Phase I to Phase III excavations along the Iroquois Gas Transmission System corridor (Cassedy *et al.* 1991; Kingsley 1992;

Robertson and Blomberg 1992; Millis *et al.* 1995; Cassedy 1998). A total of 36 radiocarbon dates were procured from sites along the Connecticut sections of the transmission corridor, including 14 dates from seven Western Upland sites, 21 dates from three sites in the Western Coastal Slope region, and one date from the Northwest Highlands.

Other cultural resource management surveys have also contributed substantial numbers of radiocarbon dates from the Western Uplands. Seven dates are available from the Newtown Sewer site in Newtown (Jones *et al.* 1997), three dates from surveys at the Community Correctional Center in Newtown (Raber and Wiegand 1990), and one date from Trout Brook Valley, Easton (Walwer and Gimigliano 1998). David Thompson (1969, 1989, personal communication, 1998) has maintained a tradition of Archaeological Society of Connecticut field research in the Western Uplands, reporting six dates from the region.

Western Coastal Slope

Long Island Sound provides rich environments of marine fisheries, abundant coastal shellfish, and estuary habitats with diverse plant and fish nursery communities. Sea levels have risen throughout the Holocene period of human occupations. The shoreline of Long Island Sound was approximately 40 m below modern sea levels at approximately 12,400 BP, 25 m lower between approximately 8300 and 9000 BP, 5 m lower at 4000 BP, and approximately 2 m lower at 2000 BP (Gayes and Bokuniewicz 1991:52). Rising seas have destroyed older archaeological sites along former coastlines, and have eroded headlands and inundated river valleys that may have been important locations for human occupations.

The Western Coastal Slope includes 285 square miles within 11 towns (Figure 1). A total of 60 radiocarbon dates has been reported from 19 archaeological sites within five towns (Table 2). The earliest date from the Western Coastal Slope is only 6580 BP from the Two Baker site, Westport (McWeeney 1994). The radiometric chronology from the Western Coastal Slope has largely resulted from excavations conducted by Ernest Wiegand, Norwalk Community Technical College. Wiegand has accumulated 34 published and unpublished radiocarbon dates from nine sites in the region (Wiegand 1987, 1989, and personal communication). In addition, excavations conducted along the Iroquois Gas Transmission System included 21 radiocarbon dates from three sites in Milford (Millis *et al.* 1995; Cassedy 1998).

Central Valley

The Central Valley formed from faulting and subsidence along its eastern border and sedimentary filling of the valley floor (Bell 1988:158). Metacomet Ridge rises along the middle of the Central Valley as a result of volcanic intrusions into sedimentary brownstone formations. The Connecticut River flows south through the Central Valley, but turns southeast and flows through the Eastern Uplands to Long Island Sound. During the Late Pleistocene, Glacial Lake Hitchcock formed in the upper part of the Connecticut Valley and eventually broke its dam at Rocky Hill and drained before 12,000 BP (Gayes and Bokuniewicz 1991:49). Following glaciation, the falls of the Connecticut River at Windsor Locks was a significant ecological barrier to spawning fish moving up the Connecticut River. The Central Valley encompasses an area of 1,029.9 square miles, and includes 41 towns. Towns of the Central Valley average 149 feet elevation (O'Brien 1985:274-281).

The prehistoric chronology of the Central Valley contains 66 dates from 36 archaeological sites in sixteen towns (Table 2). Radiocarbon dates are available from 5970 BP at the Bugbee-Hathaway site, West Hartford. Kevin McBride initiated intensive radiocarbon dating for his doctoral research within the Connecticut River valley. McBride's doctoral dissertation and preparatory publications reported 15 radiocarbon dates from the Central Valley, 13 dates from the Eastern Uplands, and 19 dates from the Eastern Coastal Slope regions (McBride 1978, 1984; McBride and Dewar 1981). Following his degree, McBride joined the faculty of the University of Connecticut at Storrs, and incorporated the Public Archaeology Survey Team, Inc. (PAST). Unpublished radiocarbon dates from PAST files and the University of Connecticut include 4 dates from the Western Uplands, 6 dates from the Central Valley, 17 dates from the Eastern Uplands, and 22 dates from the Eastern Coastal Slope.

Several other doctoral dissertations from the University of Connecticut contributed significant new information concerning prehistory of the Central Valley and the Connecticut River. In 1986, Peter Pagoulatos completed a study of Terminal Archaic settlements, reporting nine new radiocarbon dates within the Connecticut River valley. In 1993, Jeffrey Bendremer (1993) completed a dissertation about Late Woodland agriculture, focusing on the Burnham-Shepard site, South Windsor, and reporting 11 radiocarbon dates from the Central Valley. In 1994, Jonathan Lizee (1994a) reanalyzed prehistoric ceramics associated with the Windsor Ceramic Tradition from dated archaeological sites both within and outside the Connecticut River drainage (also see Lavin 1987, 1998). These studies greatly expanded information about the timespans of particular artifact types and subsistence resources within Connecticut.

Many other archaeological projects have been conducted in the Central Valley. Yale University conducted excavations at the Lewis–Walpole site, Farmington, between 1967 and 1977, and Starbuck (1991) published 2 radiocarbon dates. Feder (1981a, 1981b, 1986, in press, n.d.) has contributed 11 radiocarbon dates in the Central Valley during the Farmington River Valley Archeological Survey. Members of the Archaeological Society of Connecticut conducted excavations at the Morgan site in Rocky Hill (Lavin 1988), Squash Cave and Motel sites in Cromwell, and the Burwell-Karako site in New Haven (Swigart 1974).

Eastern Coastal Slope

The Connecticut River enters Long Island Sound at the towns of Old Saybrook and Old Lyme along the Eastern Coastal Slope. The Thames River drains the Eastern Uplands and enters Long Island Sound at New London. The region was greatly affected by Pleistocene glaciation, and many modern landforms were formed from moraines and deltatic deposits (Lewis and Stone 1991). Similar to the Western Coastal Slope, rising sea levels have inundated early Holocene shorelines and associated archaeological sites. The Eastern Coastal Slope encompasses 502 square miles and contains 18 towns (O'Brien 1985).

The Eastern Coastal Slope contains 108 radiocarbon dates from 44 archaeological sites within eight towns. The earliest radiocarbon date is 10,260 BP, recently obtained from the Hidden Creek site, Ledyard (MPMRC file). John Pfeiffer reported 22 dates from the region in publications leading toward his 1992 doctoral dissertation at the State University of New York at Albany about Late Archaic and Terminal Archaic cultures of the lowest Connecticut River valley (Pfeiffer 1984, 1992; Pfeiffer and Stuckenrath 1989). As mentioned above, Kevin McBride accumulated 43 dates from the Eastern Coastal Slope region while in positions with the University of Connecticut and PAST. McBride has also joined the staff of the Mashantucket Pequot Museum and Research Center (MPMRC) to supervise cultural resource surveys and develop museum programs on Mashantucket Pequot Tribal Nation lands. MPMRC project files include 29 unpublished dates from seven sites. These include seven Early and Middle Archaic dates between 7200 and 9240 BP from the Sandy Hill site, and dates of 9160 and 10,260 BP from the Hidden Creek site (MPMRC file; Jones 1997).

Many other archaeological surveys have been conducted along the Eastern Coastal Slope. Harold Juli contributed five dates from Connecticut College field school projects (Juli 1992; Juli and Kelley 1991; Juli and Lavin 1996) in New London and Old Lyme. Amateur archaeologists have investigated possible Medieval Celtic settlements at Gungywamp, Groton, and have received radiocarbon dates of 2550, 580, 495 and 170 BP preceding, contemporaneous with, and following the supposed Medieval period of early European colonization (Barron 1988, Whittall and Barron 1991).

Eastern Uplands

The Eastern Uplands encompasses an area of 1,436 square miles within 41 towns (Figure 1). The region is primarily composed of rolling metamorphic formations that form headwaters to the Salmon and Moodus Rivers draining to the Connecticut River, the Yantic and Shetucket Rivers that form the Thames River at Norwich, the Quinebaug River that joins the Shetucket River above Norwich, and the Pawcatuck River that is the boundary with Rhode Island (Bell 1988:42-48). The average elevation of towns in the Eastern Uplands is 379 feet above sea level (O'Brien 1985:274-281).

A total of 85 radiocarbon dates is available from 46 archaeological sites in 11 towns of the Eastern Uplands (Table 2). Salwen and Ottesen (1972) published an important series of dates for Middle and Late Woodland Windsor Tradition ceramics from Shantock Cove along the Thames River in Montville. The Early and Middle Archaic periods were first described in Connecticut from excavations at Dill Farm, East Haddam, including four dates between 7305 and 8560 BP (McBride 1984; Pfeiffer 1986). PAST conducted the largest archaeological survey in the Eastern Uplands along the Route 6 and I-84 highway corridor (McBride and Soulsby 1989). A total of 34 new radiocarbon dates was reported from this project, including dates for Neville-Stark projectile points from the Bolton Spring site ranging between 7790 BP and 10,700 BP.

CONNECTICUT REGIONAL SUMMARY

Connecticut radiocarbon dates contain a great deal of information about prehistoric use of particular regions. Regions of Connecticut differ in the number of radiocarbon dates and sites investigated by archaeologists (Table 2). The Eastern Coastal Slope contains twice the number of dated sites and more than three times as many radiocarbon dates as the Northwest Highlands. Varying sample sizes of radiocarbon dates might influence assessments of regional cultural chronologies.

Differing histories of archaeological research within various regions might have introduced biases into the radiocarbon database. For example, Pagoulatos (1986) and Pfeiffer (1992) submitted many dates for doctoral studies from the Terminal and Late Archaic sites along the Connecticut River (Central Valley, Eastern Uplands and Eastern Coastal Slope). Lizee (1994a) and Lavin (1987, 1998) focused on Woodland sites that contained ceramics. Bendremer (1993; also George 1997) focused on Late Woodland agricultural sites. Many CRM highway surveys have been conducted along level river terraces that may not have existed during the Early Holocene. Do selective research designs inflate numbers of radiocarbon dates from particular periods?

Table 3 summarizes temporal distributions of radiocarbon dates from different physiographic regions in Connecticut. Dates have been combined into standardized 200-year intervals based upon uncalibrated mean laboratory dates. The primary assumption of this study is that radiocarbon dates represent relatively unbiased samples. While archaeologists may differentially select artifacts or feature types for dating, we believe that archaeologists are incapable of predicting specific ages of radiocarbon samples. Archaeologists often reject radiocarbon dates that do not meet preconceived chronological parameters for artifact use or site occupations. Rejected dates are also included in this database. Rejected dates may provide previously unsuspected evidence for cultural chronologies.

Figure 2 presents frequency curves (numbers of dates per 200-year intervals) for total Connecticut radiocarbon dates and chronologies for six physiographic regions. Several patterns are notable. Radiocarbon dates are rare in Connecticut before 5000 BP, and are nearly lacking (only 3 dates) between 5200 BP and 7000 BP. Numbers of radiocarbon dates increase to a Late Archaic mode between 4200 BP and 3600 BP. A second mode is expressed during the Late Woodland between 1000 BP and 200 BP.

If archaeological research designs have biased the radiocarbon database, then separate regions should have differing radiocarbon chronologies based on research activities of individual archaeologists. The Central Valley, Eastern Coastal Slope and Eastern Uplands have very similar bi-modal distributions. These modes do not appear to result from sampling biases since similar modes are also present in the Western Uplands between 4400 BP and 3600 BP, and in the Western Coastal Plain between 1200 BP and 400 BP. These modes are not expressed in the Northwest Highlands possibly because of the small number of dates from this region, but perhaps also because of different cultural-ecological processes in mountainous habitats. Sea level rise, and consequent destruction of early archaeological sites, may have been more severe along the Western Coastal Slope than along the Eastern Coastal Slope. Late Archaic dates are less common in the west than the east. No amount of sampling bias can account for the consistent lack of radiocarbon dates between 5200 BP and 7000 BP across all physiographic regions of Connecticut.

TABLE 3: RADIOCARBON DATES FROM REGIONS WITHIN CONNECTICUT

RCYBP	Northwest Highlands	Western Uplands	Western Coastal	Central Valley	Eastern Coastal	Eastern Uplands	Total
0	0	1	1	1	2	5	10
200	2	5	3	1	17	9	37
400	1	2	6	7	4	11	31
600	2	3	8	10	5	6	34
800	3	0	11	6	6	2	28
1000	2	1	3	2	6	4	18
1200	0	1	5	1	4	3	14
1400	3	0	2	1	2	1	9
1600	1	2	1	5	0	2	11
1800	0	1	3	0	2	2	8
2000	0	0	6	1	2	2	11
2200	1	2	0	0	2	2	7
2400	1	1	2	1	3	2	10
2600	1	1	1	2	3	2	10
2800	1	3	0	1	3	0	8
3000	4	1	0	3	5	0	13
3200	2	1	1	2	3	2	11
3400	0	2	1	1	3	2	9
3600	2	4	1	7	6	3	23
3800	1	3	1	0	6	4	15
4000	1	6	3	9	1	4	24
4200	0	7	0	2	5	3	17
4400	1	4	0	0	2	2	9
4600	0	2	0	2	2	1	7
4800	0	2	0	1	2	2	7
5000	1	0	1	2	0	1	5
5200	0	0	0	0	0	0	0
5400	0	0	0	0	0	0	0
5600	0	0	0	0	0	0	0
5800	0	0	0	0	0	0	0
6000	0	0	0	1	0	0	1
6200	0	1	0	0	0	0	1
6400	0	0	0	0	0	0	0
6600	0	0	1	0	0	0	1
6800	0	0	0	0	0	0	0
7000	0	0	0	0	0	0	0
7200	0	0	0	0	1	0	1
7400	0	0	0	0	0	1	1
7600	0	0	0	0	1	0	1
7800	0	0	0	0	1	2	3
8000	0	0	0	0	0	1	1
8200	0	0	0	0	0	0	0
8400	0	0	0	0	1	1	2
8600	0	0	0	0	2	1	3
8800	0	0	0	0	1	0	1
9000	0	0	0	0	2	0	2
9200	0	0	0	0	1	0	1
9400	0	1	0	0	1	0	2
9600	0	1	0	0	0	0	1
9800	0	0	0	0	0	0	0
10,000	0	0	0	0	0	0	0
>10,000	1	3	0	0	1	1	6
Total	**31**	**61**	**61**	**69**	**108**	**84**	**414**

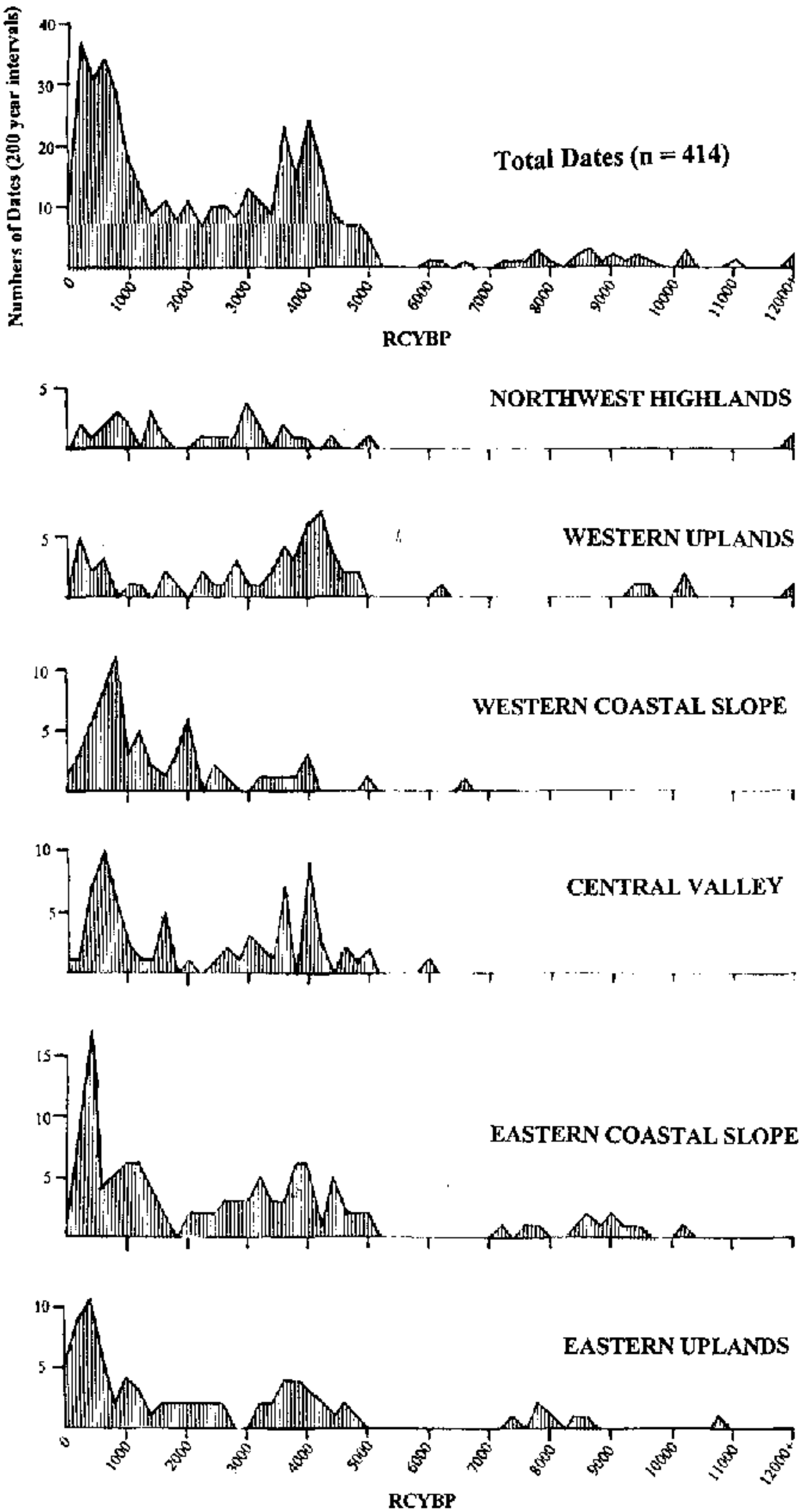

Figure 2. Connecticut radiocarbon dates (dates per 200-year interval) in geographic region.

Several minor modes within regional samples are curious, and at present are unexplained (see Figure 2). A northwest to southeast regional gradient of dates seems to be expressed by high number of dates in the Northwest Highlands at 3000 BP, a minor peak in the Western Uplands at 2800 BP, on the Western Coastal Slope at 2000 BP, in the Central Valley at 1600 BP, in the Eastern Uplands between 1200 and 1000 BP, and on the Eastern Coastal Slope between 1000 and 800 BP. A subsequent west to east gradient of dates are evident from regional modes along the Western Coastal Slope at 800 BP, in the Central Valley at 600 BP, along the Eastern Uplands between 400 and 200 BP, and along the Eastern Coastal Slope at 200 BP. Geographic patterning of these radiocarbon date modes is beyond its likelihood of archaeological sampling bias, and probably reflects undetermined cultural processes in Connecticut. One tempting hypothesis is that regional modes reflect shifting population centers, perhaps associated with ethnic migrations (e.g., Fiedel 1990; Lavin 1998). However, this question is beyond the scope of this paper.

Connecticut radiocarbon dates should contribute to general understanding of prehistoric cultural changes. The Connecticut radiocarbon chronology can be appreciated from comparisons with other studies of prehistoric chronology and culture change in Northeastern North America.

NORTHEASTERN RADIOCARBON CHRONOLOGIES

Douglas Jordan's (1969) early survey of radiocarbon dating in New England included many dates from William Ritchie, State Archaeologist of New York. Ritchie's (1965) prehistoric cultural chronology for New York was developed from relatively large numbers of radiocarbon dates during the early decades of radiocarbon dating in archaeology. The New York chronology has provided structure for New England archaeology until the present time (e.g., Snow 1980; Lavin 1984). Ritchie's cultural sequence included a then poorly dated Paleo-Indian Stage (ca. 10,000 BP), a period with no evidence for prehistoric occupations (10,000 - 6500 BP), an Archaic Stage (6500 - 3300 BP), a Transitional Stage (3300 - 3000 BP), and a Woodland Stage (3000 - 300 BP). Each cultural stage was associated with artifacts and other material traits that presumably conferred progressive adaptive advantages, and possibly effected prehistoric human populations over time.

The Archaic Stage was first named by Ritchie (1932), based upon excavations at Lamoka Lake and other sites, to signify pre-ceramic cultures subsisting by hunting, gathering wild plants and fishing. Ritchie (1965) initially defined two projectile point traditions within the Archaic Stage. The Laurentian Tradition included notched projectile points (Otter Creek, Brewerton, Vosburg and Normanskill, and later Sylvan Lake side-notched points). The Susquehanna Tradition included broadspear projectile points (Susquehanna, Snook Kill, Wayland, Lehigh, Perkiomen, and Orient-Fishtail point types). Based upon radiocarbon from the Sylvan Lake site, Ritchie and Robert Funk (1973:39-49) later expanded the Late Archaic (6000 - 3500 BP) to include a Narrow Point Tradition (including Squibnocket, Beekman, Poplar Island, Bare Island, probably Lamoka stemmed, and other small stemmed points).

Initial lack of radiocarbon dated sites between 10,000 BP and 6000 BP led Ritchie and Funk (1973:38; after Fitting 1968) to speculate whether an Early Archaic Sub-Stage was a period of population abandonment in the Northeast, associated with low resource productivity of early post-glacial boreal conifer forests. Pollen and macro-botanical studies have subsequently demonstrated that mixed hardwood forests had expanded into the region at much earlier times (e.g., Davis 1969; Gaudreau 1988; McWeeney 1994). The Early Archaic (10,000 - 8000 BP) was established from radiocarbon dates at Staten Island sites that contained Kirk, Palmer, and bifurcate-base points analogous to point types in the Southeastern United States (Ritchie and Funk 1973:38). The Middle Archaic (8000 - 6000 BP) in New England was established from excavations at the Neville site in New Hampshire and dating of Neville, Stark, and Merrimack projectile points (Dincauze 1971, 1976). The Maritime Archaic was recognized by nineteenth-century archaeologists from elaborate red-ochre cemeteries and complex marine hunting tool technologies in Maine and the Canadian Maritime provinces. The Maritime Archaic has been dated after 7000 BP (McGhee and Tuck 1975). The Maritime Archaic has not been identified in Connecticut.

The Transitional Stage (or Terminal Archaic) was associated with an expanded material inventory toward the eventual manufacture of pottery (Ritchie 1965). Transitional Stage artifacts included steatite vessels, early Vinette I pottery, and Susquehanna, Frost Island and Orient projectile points. Burial ceremonialism was also a recognized as trait of the Transitional Stage in New England (Dincauze 1968). Radiocarbon dates demonstrated broad chronological overlaps among Archaic projectile point traditions and other artifacts in New England (Hoffman 1985).

The Woodland Stage was defined during 1941 at the Woodland Conference in Chicago and at the 1941 Conference on Man in Northeastern North America at Andover, Massachusetts (Johnson 1946; Brose 1973). Ritchie (1965; Ritchie and Funk 1973) divided the Woodland into Early, Middle and Late Stages in New York, based on influences from Adena, Hopewell, and Fort Ancient-Mississippian cultures, respectively, of the Mississippi-Ohio River drainage. In New York, the Early Woodland Adena Tradition included Vinette 1 pottery, copper ornaments, burial ceremonialism (Middlesex Phase), and Adena, Meadowood, Rossville, Lagoon, and Wading River projectile points between approximately 3000 to 2300 BP (Ritchie and Funk 1973:96-98). The Middle Woodland was marked by Vinette 2 and Point Peninsula ceramics in northern New York, and Windsor Tradition ceramics on Long Island. Middle Woodland projectile points included Fox Creek, Greene, Jack's Reef and Levanna point types between 2300 to 1000 BP. The Late Woodland showed increasing influences from maize agriculture and regional diversification of ceramic types in New York after 1000 BP (Ritchie and Funk 1973:165-178). Late Woodland projectile points included Levanna and Madison triangular types. Most Late Woodland ceramics from Connecticut were associated with the Windsor Tradition that included the Middle Woodland North Beach and Clearview Phases and the Late Woodland Sebonac, Niantic, and Shantock Phases (Rouse 1947; Smith 1947; Ritchie and Funk 1973). Late Woodland East River Tradition ceramics were isolated to the lower Hudson River and western Connecticut (Smith 1950; Suggs 1958; Ritchie and Funk 1973).

Many radiocarbon samples have been submitted by archaeologists during the decades following the publications of Ritchie's (1965) New York prehistoric chronology, and Jordan's (1969) early survey of New England radiocarbon dates. As radiocarbon databases grew, lists of dates were published from many New England and Middle Atlantic States. Studies include Hoffman's (1988) list of 291 dates from Massachusetts, Gengras' (1996) list of 165 dates from New Hampshire, Herbstritt's (1988) 382 dates from Pennsylvania, Trader's (1994) list of 223 dates from West Virginia, and Boyce and Frye's (1986) 168 dates from Maryland. A list of 218 dates is available from southern Ontario covering the Middle and Late Woodland periods (Smith 1997). In addition, Hoffman (1998) has recently published a list of 104 dates for steatite and early ceramics from New England. Most of these studies reported uncalibrated radiocarbon dates (radiocarbon years before present or BP). Date sequences are therefore uncalibrated in following discussions and in Table 1.

As noted above, radiocarbon dates are valuable for studying changes of prehistoric material culture. Samples of radiocarbon dates might also represent general populations of archaeological sites, datable archaeological features, and/or possibly human populations if one assumed that radiocarbon samples are unbiased and random. Assumptions of randomness might be invalid, but this question should be examined through a review of available data.

Table 4 summarizes the numbers of uncorrected radiocarbon dates within 200-year intervals from individual states. Simple frequency distribution curves (number of dates per 200-year interval) have been compiled for each state and regional radiocarbon study. Individual state studies reported varying information about associated archaeological artifacts, the kinds of materials dated, and/or geographic information about archaeological sites containing radiocarbon dates. Therefore, it is not possible to compare prehistoric cultural chronologies in quite the same ways between all areas of Northeastern North America from the published studies of radiocarbon chronologies. Differences in approaches between different studies are often illustrative of varying research designs and problems of radiocarbon dating, in general.

TABLE 4: RADIOCARBON DATES FROM SELECTED AREAS IN NORTHEASTERN NORTH AMERICA

RCYBP	Maryland	West Virginia	Pennsylvania	Southern Ontario	New Hampshire	Massachusetts	Connecticut	Archaic - Woodland
0	3	0	0	0	1	0	10	0
200	4	4	8	0	5	10	37	0
400	13	16	21	0	6	12	31	0
600	16	13	49	17	7	12	34	0
800	14	25	48	65	8	25	28	0
1000	14	16	41	36	9	25	18	0
1200	12	25	24	29	6	9	14	0
1400	6	13	15	16	6	7	9	0
1600	4	15	9	13	3	11	11	0
1800	9	9	11	16	0	11	8	2
2000	6	6	5	7	3	4	11	13
2200	8	15	12	5	3	9	7	15
2400	11	13	12	8	4	10	10	13
2600	4	1	7	3	4	6	10	14
2800	6	1	7	0	0	3	8	11
3000	4	2	9	0	3	3	13	12
3200	7	3	11	0	4	8	11	5
3400	4	4	7	0	12	16	9	2
3600	4	1	11	0	4	10	23	9
3800	2	1	12	0	7	10	15	3
4000	0	4	8	0	3	18	24	2
4200	5	3	6	0	3	14	17	1
4400	3	2	3	0	6	13	9	1
4600	2	0	2	0	7	3	7	1
4800	0	0	0	0	4	8	7	0
5000	1	0	2	0	2	2	5	0
5200	3	0	2	0	3	8	0	0
5400	0	2	2	0	1	1	0	0
5600	2	1	2	0	1	1	0	0
5800	1	2	0	0	0	1	0	0
6000	0	2	1	0	2	0	1	0
6200	0	0	2	0	0	0	1	0
6400	0	1	3	0	0	3	0	0
6600	0	0	3	0	2	1	1	0

TABLE 4: RADIOCARBON DATES FROM SELECTED AREAS IN NORTHEASTERN NORTH AMERICA (Continued)

RCYBP	Maryland	West Virginia	Pennsylvania	Southern Ontario	New Hampshire	Massachusetts	Connecticut	Archaic - Woodland
6800	0	2	4	0	0	0	0	0
7000	0	0	1	0	1	3	0	0
7200	0	1	1	0	1	1	1	0
7400	0	0	1	0	3	0	1	0
7600	0	1	1	0	2	2	1	0
7800	0	3	0	0	3	1	3	0
8000	0	0	0	0	3	3	1	0
8200	0	1	1	0	3	0	0	0
8400	0	3	0	0	1	0	2	0
8600	0	3	0	0	3	3	3	0
8800	0	1	0	0	0	1	1	0
9000	0	5	1	0	1	1	2	0
9200	0	0	1	0	1	2	1	0
9400	0	1	2	0	1	0	2	0
9600	0	0	0	0	2	0	1	0
9800	0	0	0	0	2	0	0	0
10,000	0	1	0	0	0	0	0	0
>10,000	0	0	14	0	8	0	6	0
Total	**168**	**222**	**382**	**215**	**164**	**291**	**414**	**104**

Figure 3 illustrates frequencies of radiocarbon dates from Maryland (Boyce and Frye 1986). The Maryland sample was relatively small with only 168 dates. The earliest date at the time of the study was 5685 BP. Rising sea levels flooded many Chesapeake Bay archaeological sites, perhaps accounting for few Archaic dates in the Maryland sample. The number of dates in Maryland increased from the Late Archaic to the Early Woodland. There was an Early Woodland peak at approximately 2400 BP related to several excavated Chesapeake Bay Adena cemeteries. A large increase of dates occurred after 1200 BP, marking the beginning of the Late Woodland. Subsequent archaeological studies have demonstrated that maize appeared at many sites along the western shore of Chesapeake Bay at approximately 1100 BP (Reeve 1992).

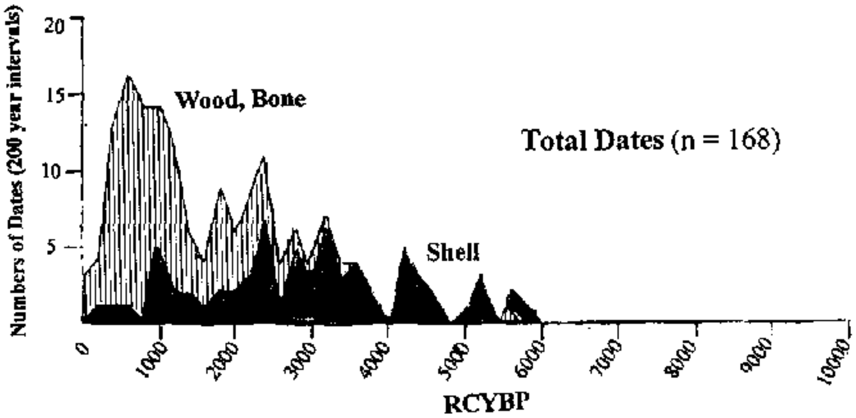

Figure 3. Maryland Dates (after Boyce and Frye 1986).

The Maryland sample reflects one problem of radiocarbon chronologies. During the 1970s, the federal government and Maryland Coastal Zone Administration sponsored Chesapeake Bay coastal archaeological surveys (e.g., Wilke and Thompson 1977). Oyster shells from many prehistoric shell middens were directly dated. Figure 3 suggests differences between shell and wood charcoal dates. Shell dates were consistently older than wood charcoal dates, possibly biasing chronological patterns with numerous spurious dates in this small sample. Non-shell samples magnify the increase of radiocarbon dates during the Late Woodland period (Figure 3).

Figure 4 is a West Virginia sample of 223 dates (Trader 1994). The Early Archaic is particularly well dated in West Virginia from excavations at the St. Albans site. Bifurcate Base points ranged between 9300 and 7700 BP. There was also a well-dated Early Woodland Adena component in West Virginia between 2600 and 2200 BP. The subsequent increase in dates at approximately 1600 BP might reflect Middle Woodland Hopewell and early Late Woodland Fort Ancient agricultural complexes. Shifts to maize agriculture occurred earlier in the Ohio River valley than in the Chesapeake Bay area and New England.

Figure 5 presents a large sample of 382 dates from Pennsylvania (Herbstritt 1988). Herbstritt reported cultural periods rather than specific artifact types associated with radiocarbon dates. There were many Pennsylvania Paleo-Indian dates between 10,000 and 20,000 BP from sites such as Meadowcroft Rockshelter, Shawnee-Minisink, and State Road Ripple. Herbstritt's cultural periods approached normal (uni-modal) distributions for date frequencies. The Paleo-Indian period ended by approximately 9800 BP. The Early Archaic might have extended to 7800 BP. The Middle Archaic in Pennsylvania ended at 4800 BP. The Late-Terminal Archaic ended abruptly at 3200 BP. Early Woodland to Late Woodland periods tended to overlap in time. The overall Pennsylvania pattern suggested punctuated increases and then stability for the numbers of dates over time from the Paleo-Indian through Middle Archaic periods and again during the Late-Terminal Archaic through Middle Woodland periods. A dramatic increase of Late

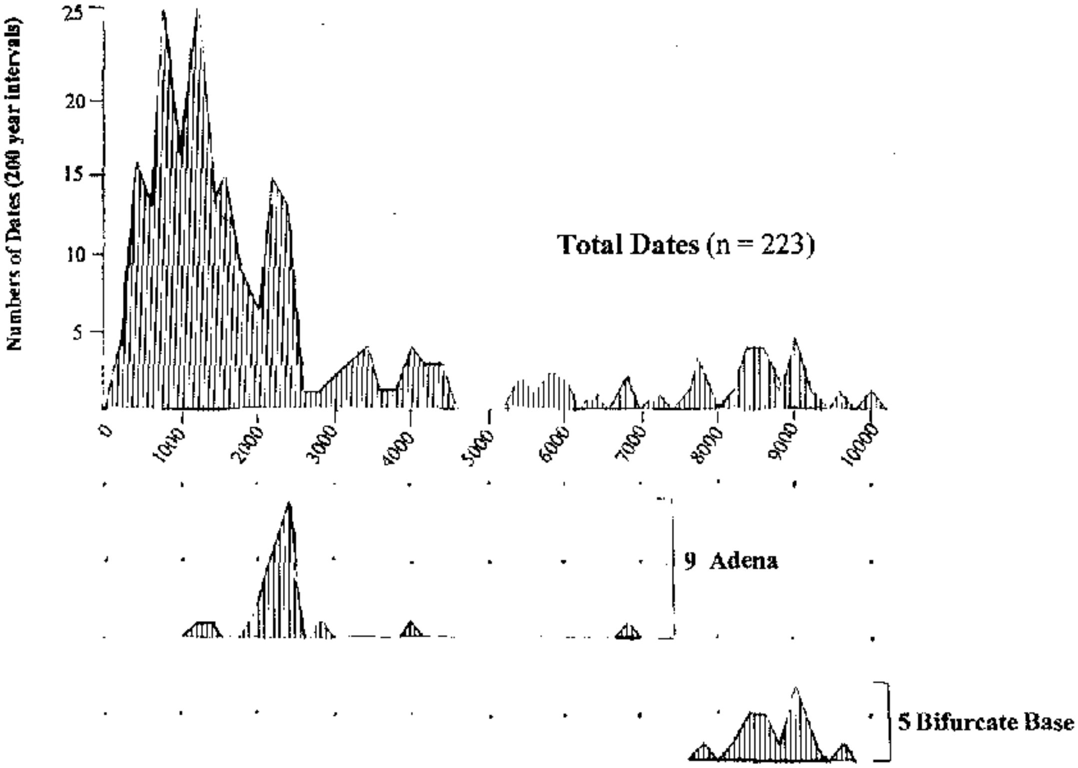

Figure 4. West Virginia dates (after Trader 1994) and selected point types.

Woodland dates was evident after 1200 BP. Similar to date sequences to the south of Pennsylvania, the dramatic increase of Late Woodland dates might reflect the adoption of maize agriculture, marking both sedentary villages and population increases.

Recently, Smith (1997) focused attention on the Middle to Late Woodland transition to maize agriculture in southern Ontario. Southern Ontario cultural phases were examined from 218 radiocarbon dates between 2619 and 510 BP (Figure 6). A recent AMS date defined maize at the Grand Banks site dating to 1570 BP during the Middle Woodland Princess Point Phase. This is currently the earliest verified date for maize (macro-botanical rather than pollen evidence) in Eastern North America outside of the Mississippi-Ohio River drainage (e.g., Riley *et al.* 1990). The period between 1600 BP and 1200 BP was apparently a time of cultural diversity in southern Ontario (Figure 6). Smith (1997:57) suggests that early maize (1570 BP) might have been traded into the southern Ontario, or was part of a mixed hunting-gathering-fishing-horticultural subsistence economy. Relatively low frequencies of Middle Woodland dated sites indicate population stability among southern Ontario hunter-gatherers until after 1200 BP, when a large increase of radiocarbon dates indicated expansion of agricultural villages among Early Ontario Iroquoians. The dramatic increase of Early Ontario Iroquoian dates after 1200 BP was consistent with the chronology for agriculture from the Middle Atlantic region to the south.

A comparative list of radiocarbon dates from northern New England has recently been published for New Hampshire (Gengras 1996). The New Hampshire sample included 164 dates from 38 sites (Figure 7). This study did not report associated artifacts or cultigens, but instead listed dated sites by river systems. The total New Hampshire sample demonstrated relative continuity of radiocarbon dates from the Paleo-Indian period at the Whipple site through the Middle Archaic periods. A large Late Archaic increase in the number of dates was evident in New Hampshire between 4800 and 3200 BP, and was most pronounced at 3400 BP along the Merrimack River. A smaller Late Woodland mode occurred at 1000 BP.

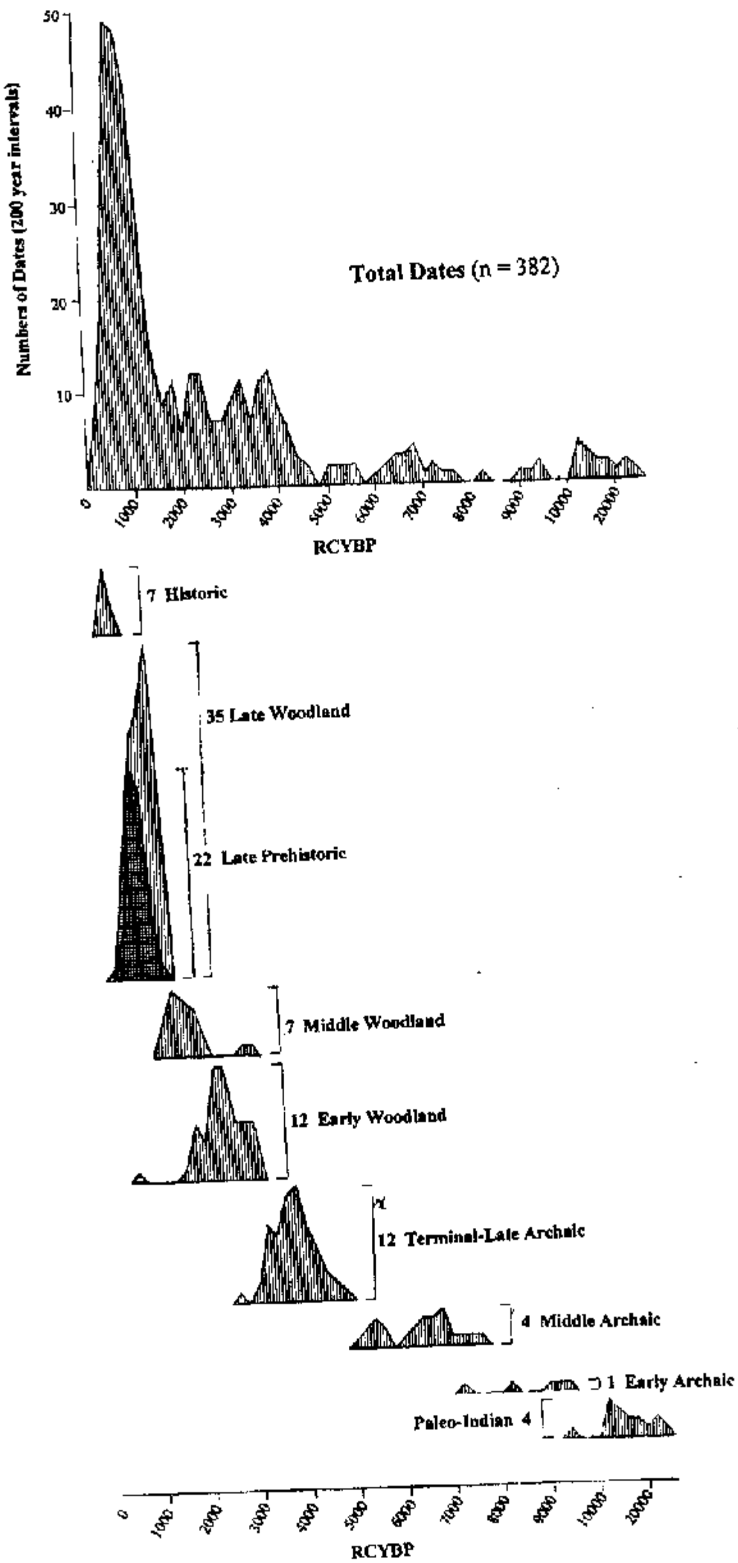

Figure 5. Pennsylvania dates (after Herbstritt 1988) and cultural periods.

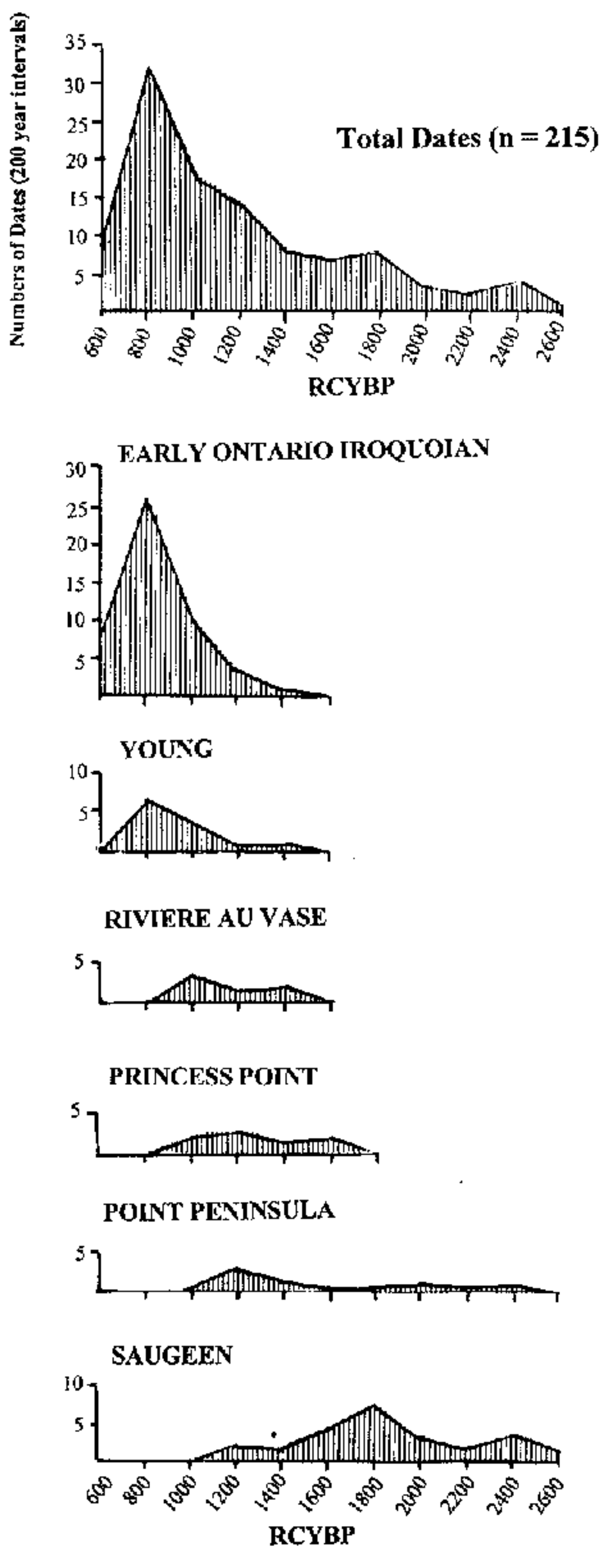

Figure 6. Southern Ontario dates (after Smith 1997) and cultural phases.

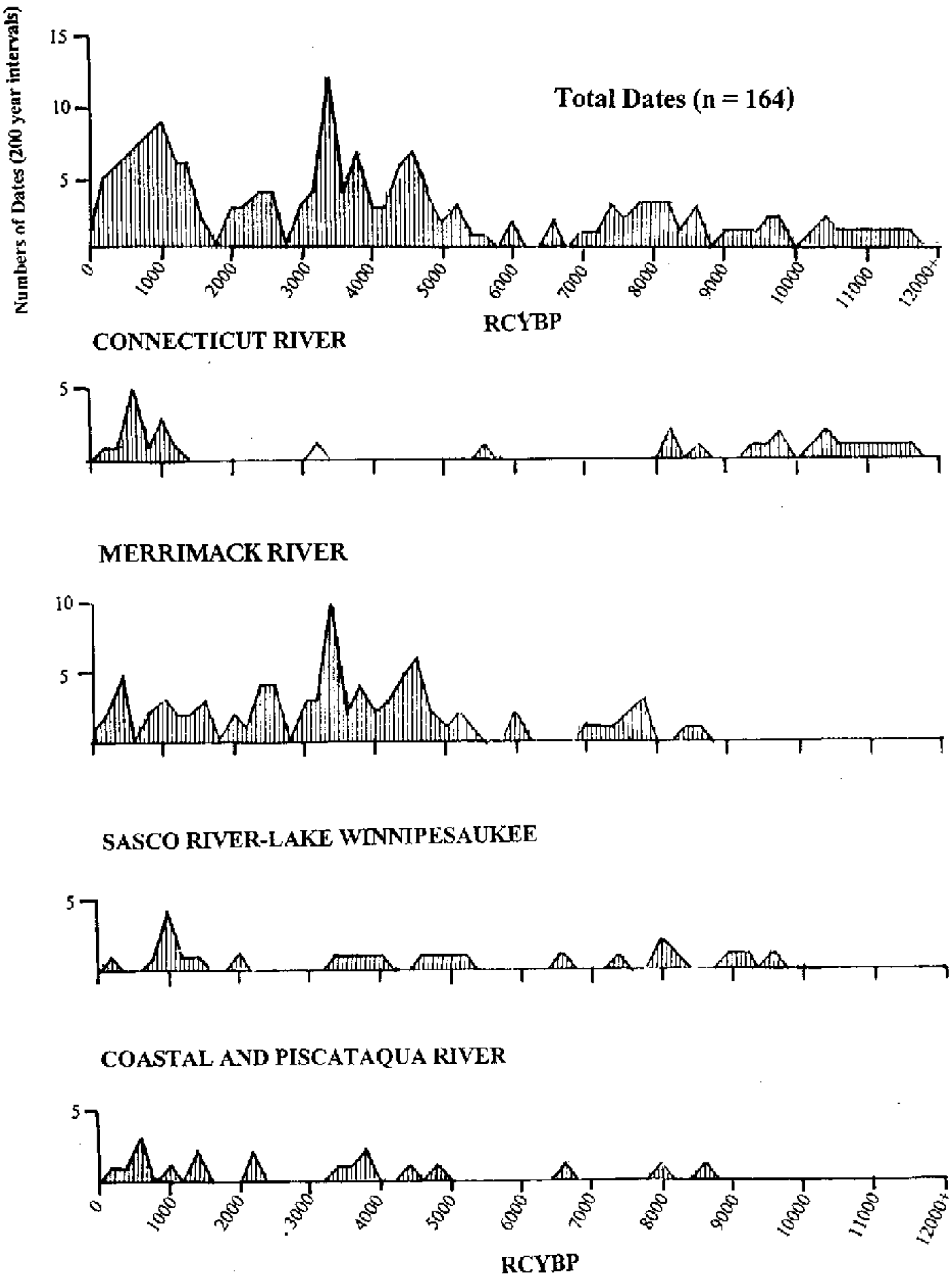

Figure 7. New Hampshire dates (after Gengras 1996) and geographic regions.

Agricultural production might account for the Late Woodland mode. In Vermont, maize has been dated to 850 BP, and later, at the Skitchewaug site along the upper Connecticut River (Heckenberger *et al.* 1992). Late Woodland dates were more common along the Connecticut River than within other New Hampshire river systems (Figure 7). Agriculture was probably not as important to Late Woodland people in the colder, mountainous areas of New Hampshire as farther south or at lower elevations of the Connecticut River valley. However, small sample sizes from most New Hampshire rivers affect interpretations of regional variability within the radiocarbon chronology.

Figure 8 summarizes Hoffman's (1988) sequence of 291 dates from Massachusetts. Massachusetts dates maintained a bi-modal distribution similar to the New Hampshire sample. There were relatively few dates from the Paleo-Indian through the Middle Archaic periods in Massachusetts. Dated sites became more common at 5200 BP, and reached a peak at approximately 4000 BP. Dates were less common during the Early and Middle Woodland between 3200 and 1200 BP than during the Late and Terminal Archaic. Numbers of dates increased during the Late Woodland after 1000 BP. The Late Woodland peak in Massachusetts was greater than in New Hampshire, but is not as extreme as in the Middle Atlantic region. Agriculture might not have been as important among New England populations as among Late Woodland people to the south and west.

Hoffman's (1988) study provided contexts for associated projectile point types in Massachusetts (Figure 8). Typological problems might be indicated by the broad time ranges among many projectile point types. (Note that Hoffman often reported several artifact types within a five-meter distance from a radiocarbon sample.) For example, dates for Middle Archaic Neville and Stark points ranged between 9200 and 2200 BP. Similarly, Squibnocket triangular and stemmed points included two periods of popularity, during the Late Archaic and again during the Middle to Late Woodland. Squibnocket points might have been a generalized biface form rather than a chronologically diagnostic projectile point type. The Massachusetts chronology suggested that during the Late Archaic, Laurentian Tradition notched points preceded and later coexisted with Narrow Point (e.g., Narrow Stemmed and Squibnocket) and Susquehanna Tradition points. Many of the Late Archaic projectile point types persisted through the Early Woodland, although with substantially fewer associated radiocarbon dates. The persistence of projectile point types in Massachusetts raises questions about the validity or importance of the long-held cultural-chronological division between Archaic and Woodland Stages in New England (Hoffman 1985).

The boundary between the Archaic and Woodland Stages has been one of the major chronological divisions within Northeastern archaeology for at least the past 50 years. The division was based on the presumed presence or absence of ceramics, marking a major material change and possible adaptive changes within prehistoric societies. Steatite vessels were among the principal attributes defined by Ritchie (1965) for the Transitional Archaic Stage. Steatite vessels were believed to have preceded pottery in Northeastern North America. This model was reinforced by steatite-tempered pottery from Chesapeake Bay, often having vessel forms similar to steatite bowls (e.g., Mason 1948). By the Early Woodland, ceramics, burial ceremonialism and complex social organization were associated with the Adena Tradition in the Ohio River drainage, Chesapeake Bay, New York, and northern New England (Middlesex Phase). Relationships are problematic between introduction of pottery and development of complex social organization, especially in areas beyond the areas of Adena influence. Adaptive advantages of ceramics and/or burial ceremonialism are questions that require long term archaeological studies, although the chronology for Archaic to Woodland material changes has been addressed (Hoffman 1998).

Hoffman (1998) has recently compiled 104 dates from New England and adjacent areas for earliest ceramics (Vinette I, Vinette II and Point Peninsula ceramics), steatite and native copper artifacts. Figure 9 presents frequency curves for dates associated with these artifacts between approximately 4600 and 1800 BP. Figure 9 also compares dates from northern New England (Vermont, New Hampshire, Maine and New Brunswick) and southern New England (Massachusetts, Rhode Island, Connecticut and New York). Hoffman (1998) described the earliest date for Vinette I pottery at 4535 BP, while the earliest available date for steatite was 3655 BP in New England. Vinette I pottery was rare in New England until after 3800 BP. At this time, dates associated with Vinette I pottery increased in southern New England. Northern

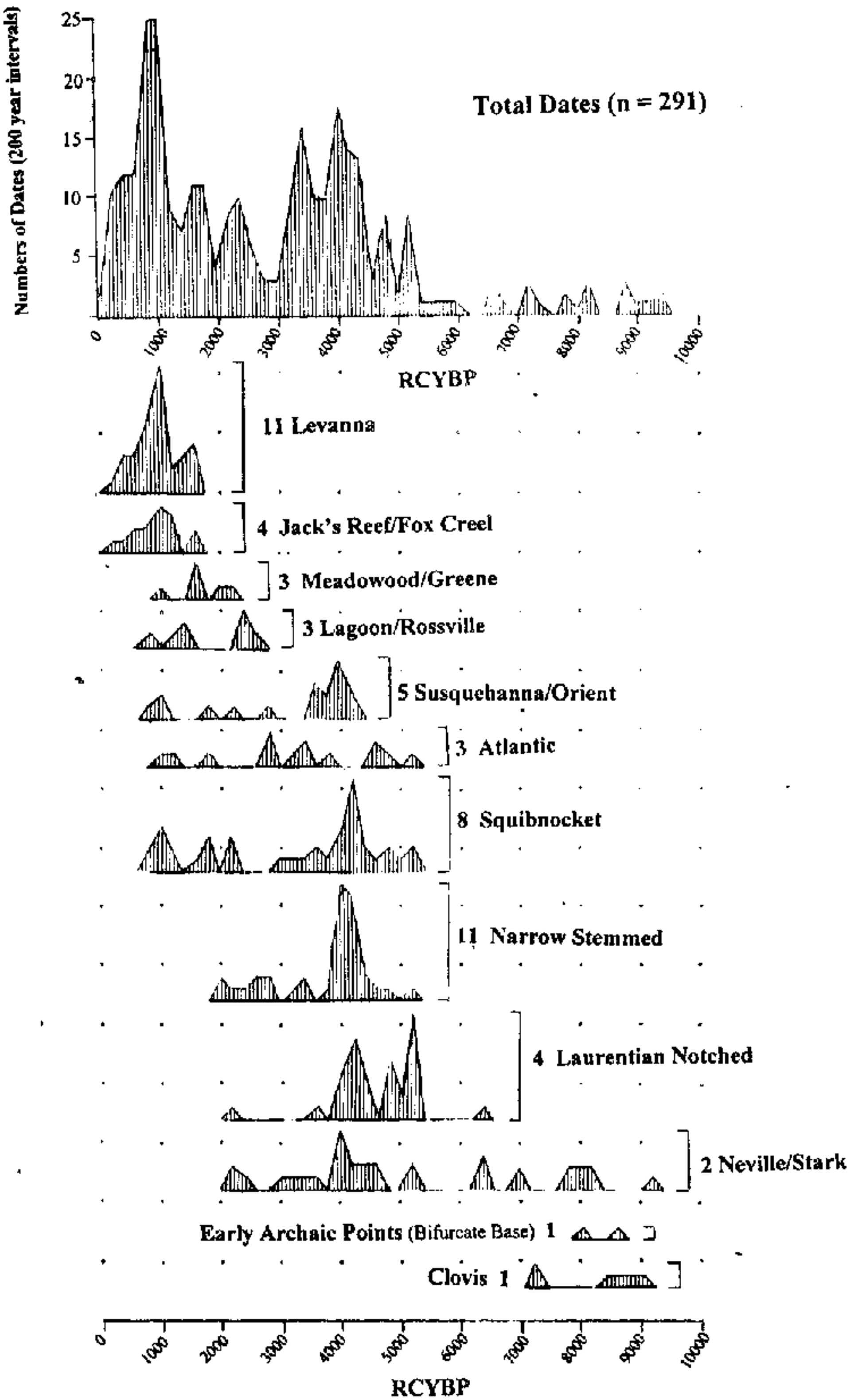

Figure 8. Massachusetts dates (after Hoffman 1988) and selected point types.

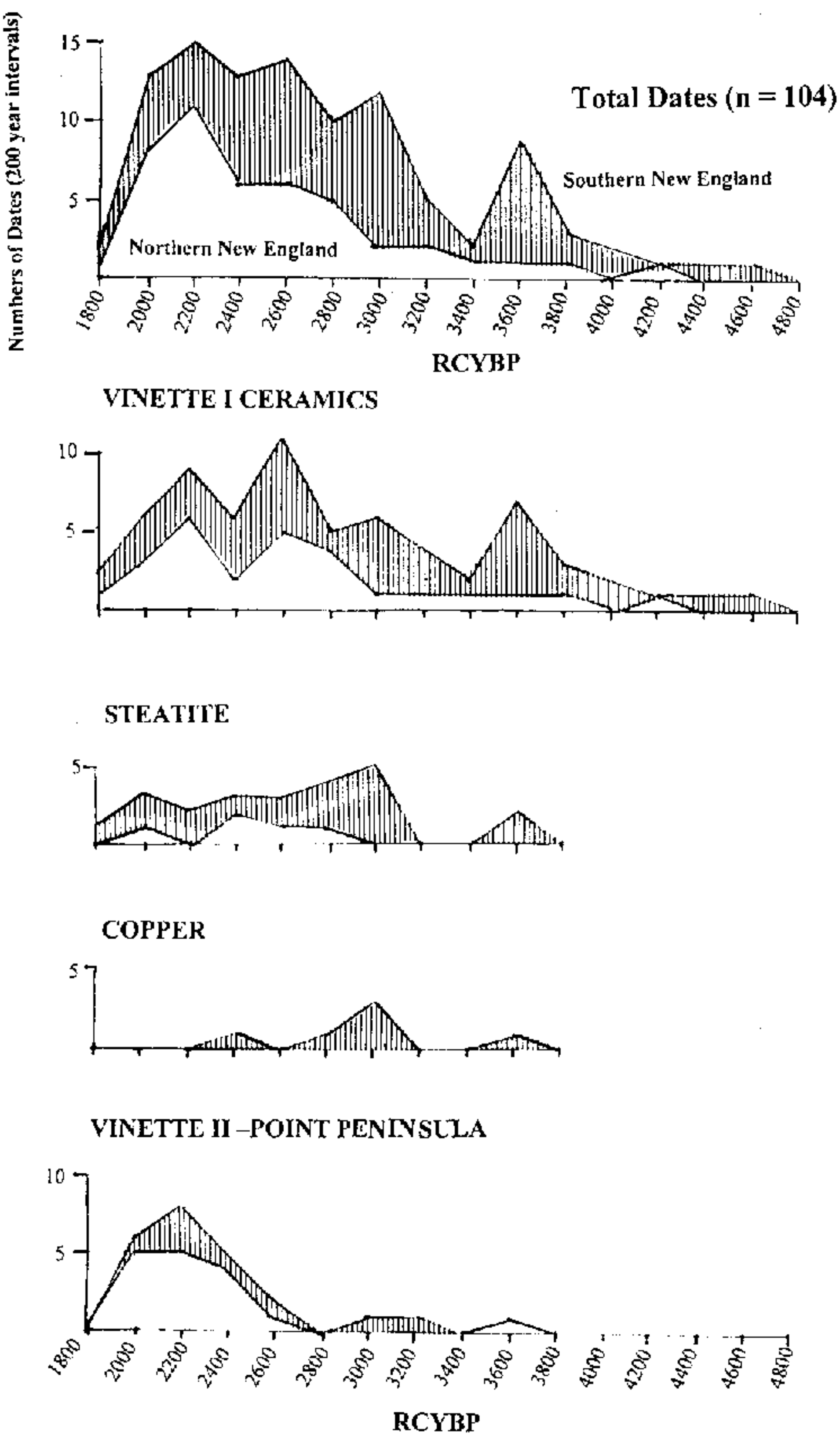

Figure 9. Archaic-Woodland Transition (after Hoffman 1998) and major artifacts.

New England dates for Vinette I pottery were uncommon until 2800 BP. Dates for steatite bowls and copper grave goods were far more common in southern New England after 3000 BP than in northern New England. Steatite bowls and copper have been found in several cremation burials in Connecticut (McBride 1984; Pfeiffer 1984). Vinette II and Point Peninsula ceramics were diagnostic artifacts for the Middle Woodland in New England. Vinette II and Point Peninsula ceramics may be present by 3600 BP, but became common in northern New England by 2400 BP. In summary, Hoffman's (1998) study completely obscures the former division between the Archaic and Woodland cultural stages by extending the history of ceramics much farther into the Late Archaic than formerly accepted, and by positing the earlier appearance of ceramics than steatite vessels in New England.

Figure 10 presents temporal trends among major projectile point types, ceramics, steatite, cremation burials, and cultigens in Connecticut from this study (see Table 1). Definitively dated Paleo-Indian sites, Early Archaic Bifurcate Base points, and Middle Archaic Neville-Stark-Merrimack points are extremely rare in Connecticut. Sites such as Lewis-Walpole contained Paleo-Indian to Middle Archaic artifacts, but features had little datable charcoal (Starbuck 1991). Only 13 sites (31 radiocarbon dates) in Connecticut have been dated before 5000 BP (Table 1). The last date for Neville points is 5010 BP at Indian Knoll, Bloomfield (Banks personal communication, May 22, 1998). This terminal Middle Archaic date in Connecticut is consistent with the Pennsylvania (Herbstritt 1988) and Massachusetts (Hoffman 1988) chronologies and appears to correspond with the end of the hot-dry Atlantic Climatic Phase (Hypsithermal) as defined in Connecticut (McWeeney 1994).

The Late Archaic in Connecticut is marked first by the appearance of Laurentian Tradition Brewerton points at 4890 BP at the England site, Bolton (McBride and Soulsby 1989), and 4730 BP at Bashan Lake, East Haddam (Pfeiffer 1984). Narrow-stem points first appear by 4610 BP at Firetown Meadow, Granby (Feder and Banks 1996), and 4550 BP at the Pod site, Brooklyn (McBride and Soulsby 1989). The Susquehanna Tradition may be indicated by a "Fishtail" point dated to 4920±250 BP at Alsop Meadow, Avon (Feder 1981a), although this seems to be too early. Broadspears are more commonly dated after 3980 BP at the Coventry Sewer site, Coventry (McBride 1988), and 3880 BP at the Museum A site, Ledyard (PAST file). Similar to Ritchie's (1965) chronology and data from Massachusetts (Hoffman 1988), Late Archaic sites in Connecticut suggest sequential modes of dates for Laurentian points at 4200 BP, Narrow Points at 4000 BP, and Susquehanna Tradition/Broadspear points at 3600 BP. These Late Archaic projectile point traditions overlap in time (Figure 10). Cremation burials were associated with different Late Archaic traditions in Connecticut. Cremation burials are first dated by four features between 4775 BP and 4535 BP at the Bliss-Howard site, Old Lyme (Pfeiffer 1984).

Many of the radiocarbon dates referred to by Hoffman (1998) in his study of steatite and early pottery in New England derived from Connecticut archaeological sites. Figure 10 illustrates that accepted temporal ranges for steatite (3550-1920 BP), Early Woodland pottery (3665-1815 BP), and Broadspear points (3890-1910 BP) are nearly synonymous in Connecticut (see Table 1). Adena-Middlesex sites have not been dated in Connecticut, obscuring the division between the Early Woodland and Terminal-Late Archaic in Connecticut. Accepted dates for the end of the Late Archaic Narrow Point Tradition are 2350 BP from the South Kent Rockshelter, Kent (Swigart 1974), and 2380 BP from the Pete's Drive site, Canterbury (McBride and Soulsby 1989). This is a shorter time span than reported for Small-stemmed and Squibnocket points in Massachusetts (Hoffman 1988). Final dates for Terminal Archaic cremation burials in Connecticut include dates of 2985 BP and 3005 BP from the Griffin site, Old Lyme (Pfeiffer and Stuckenrath 1989), and 3055 BP from the Toelle Road site, Wallingford (Ziac and Pfeiffer 1989). Cremation burials thus end before Narrow Point and Susquehanna Traditions in Connecticut.

Transitions to the Middle Woodland and Late Woodland in Connecticut are somewhat obscured by overlapping ceramic styles of the Windsor Ceramic Tradition (Lizee 1994a; Lavin 1987, 1998). Middle Woodland Fox Creek and Meadowood projectile points rarely have been dated, but appear to range between 2235 BP and 1470 BP in Connecticut (Swigart 1974). Jack's Reef points have not yet been dated in Connecticut. The Late Woodland is marked by nearly simultaneous appearances of Levanna triangular points and cultigens. Levanna triangular points appear at 1000 BP at Bolton Notch (McBride and Soulsby

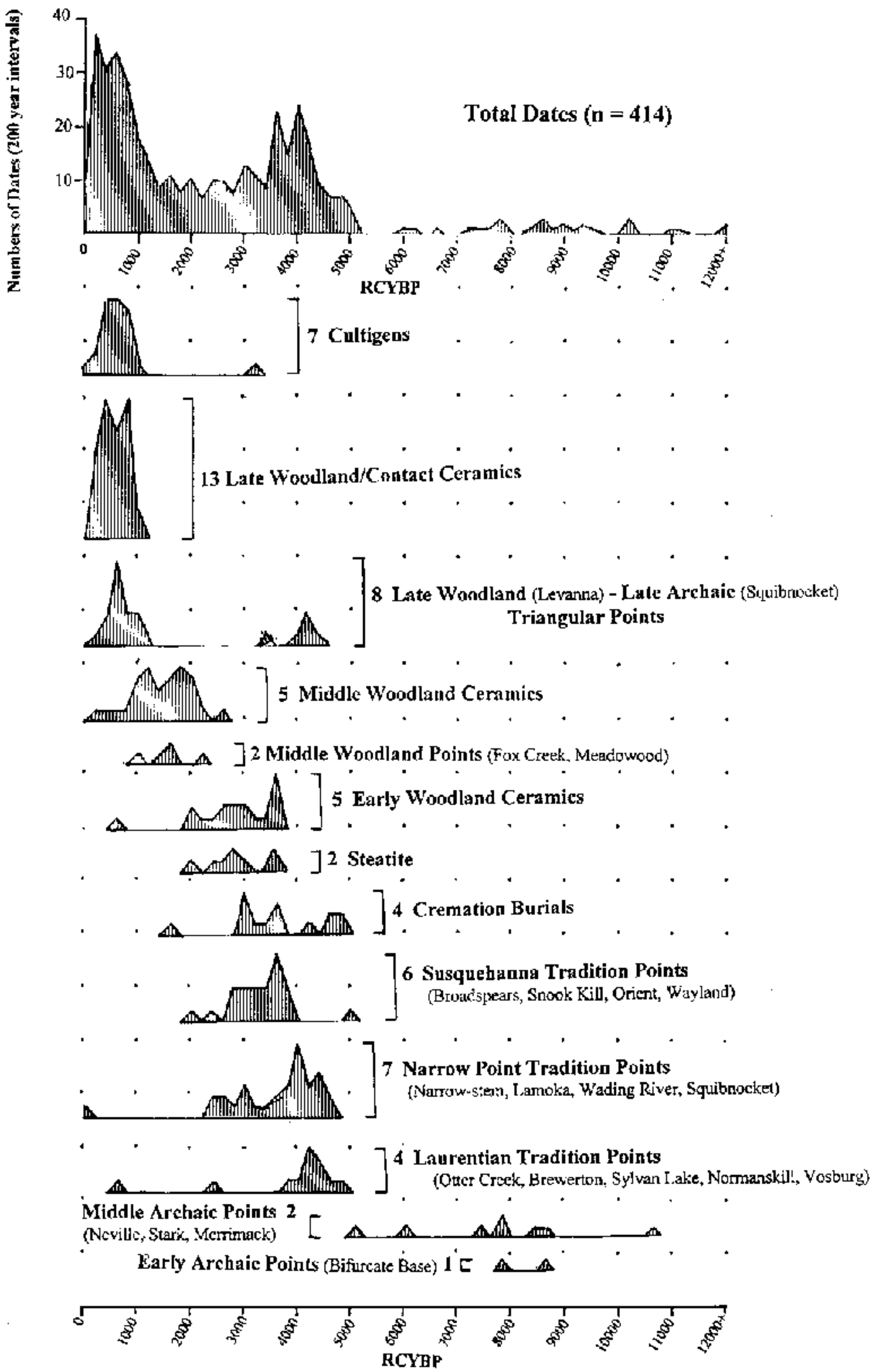

Figure 10. Connecticut dates and major artifacts.

1989) and 950 BP at Firetown Notch (Feder, in press). The first accepted dates for maize agriculture are 1060 BP at Selden Island and 840 BP at Mago Point (Bendremer 1993). Modes for dated maize and Levanna points both occur at approximately 600 BP. The appearance of maize in Connecticut is therefore only approximately 100 years later than at Chesapeake Bay, but 200 - 400 years later than in Southern Ontario, Pennsylvania and West Virginia.

DISCUSSION

The significance of the Connecticut radiocarbon sequence is apparent from comparisons to other radiocarbon sequences from the Northeast region. Figures 11 and 12 standardize frequency curves as percentages of dates per 200 years for New England states and Middle Atlantic states, respectively. Radiocarbon dates are relatively rare throughout the entire Northeast until approximately 5000 BP, suggesting relatively small Native American population levels from Paleo-Indian through Middle Archaic times. The New England pattern of radiocarbon dates differs from the Middle Atlantic region after 5000 BP.

The New England pattern includes bi-modal distributions of radiocarbon dates after 5000 BP (Table 11). Connecticut, Massachusetts and New Hampshire patterns are nearly identical, with low percentages of dates before 5400 BP, dramatic increases of dates during the Late and Terminal Archaic periods between 4600 and 3600 BP, reduced percentages of dates during the Early and Middle Woodland periods between 3400 and 1400 BP, and Late Woodland increases of dates between 1200 and 200 BP.

The Middle Atlantic pattern (Figure 12) is very different from that of New England. The Middle Atlantic pattern exhibits gradual increases of dates through the entire Archaic period. Early Woodland Adena increases are recognizable between 2500 and 2100 BP, but are accompanied by a brief decreases of dates between 2200 and 1800 BP. Late Woodland dates are far more common in the Middle Atlantic than in New England, probably indicating earlier shifts toward maize agriculture between 1800 and 1200 BP, and greater population growth and settlement nucleation than in New England.

Clearly, Late and Terminal Archaic population increases in Connecticut and elsewhere in New England provide a significant research topic. If Late Woodland populations were responding to increased agricultural productivity, then the Late Archaic mode for radiocarbon dates (and possibly related population increases) might also be related to subsistence changes.

McWeeney (1994) proposed that the Atlantic Climatic Phase, between 8500 and 5000 BP, was a time of extreme dryness in New England and elsewhere in the Eastern North America. Many wetlands maintained lower water levels. Charred plant remains in swamp cores suggested greater fire frequency in wetlands during this period. The subsequent Sub-Boreal Climatic Phase, 5000 to 2000 BP was cooler and wetter in New England. These climatic changes probably led to a recharging water tables and wetlands, as well as greater fluvial river-stream flow.

One explanation for Late Archaic population increases might be a florescence of Atlantic fisheries, particularly the exploitation of prodigious spring spawning runs of sturgeon, Atlantic salmon, shads, and other anadromous fish. Large archaeological sites along rivers and streams should indicate fishing, especially at falls and rapids where large numbers of fish might have been caught with weirs or nets. The Western Uplands and Central Valley show the greatest increases of Late Archaic dates, which might reflect extensions of fish spawning ranges into new upstream habitats after the dry Atlantic Climatic Phase. Conversely, the Northeast Highlands are mostly beyond the ranges of anadromous fish, and only small increases of Late Archaic radiocarbon dates have been noted in this region (Figure 2).

Nicholas (1991) emphasized the immense productivity of wetland habitats in Connecticut. Wetland root crops have the potential to support large hunter-gatherer populations (Reeve and Siegel 1996). Root crops such as arrowheads (Alismataceae), arrow arums (Araceae), lilies (Liliaceae), and groundnuts (Apiaceae) are nearly invisible in the archeobotanical record. Ethnographically, *tuckahoe*, or bread roots, were important to subsistence among Eastern Algonquians, and many modern place names preserve this cultural ecological heritage. Archaeologically, root processing may be indicated by large fire-cracked rock

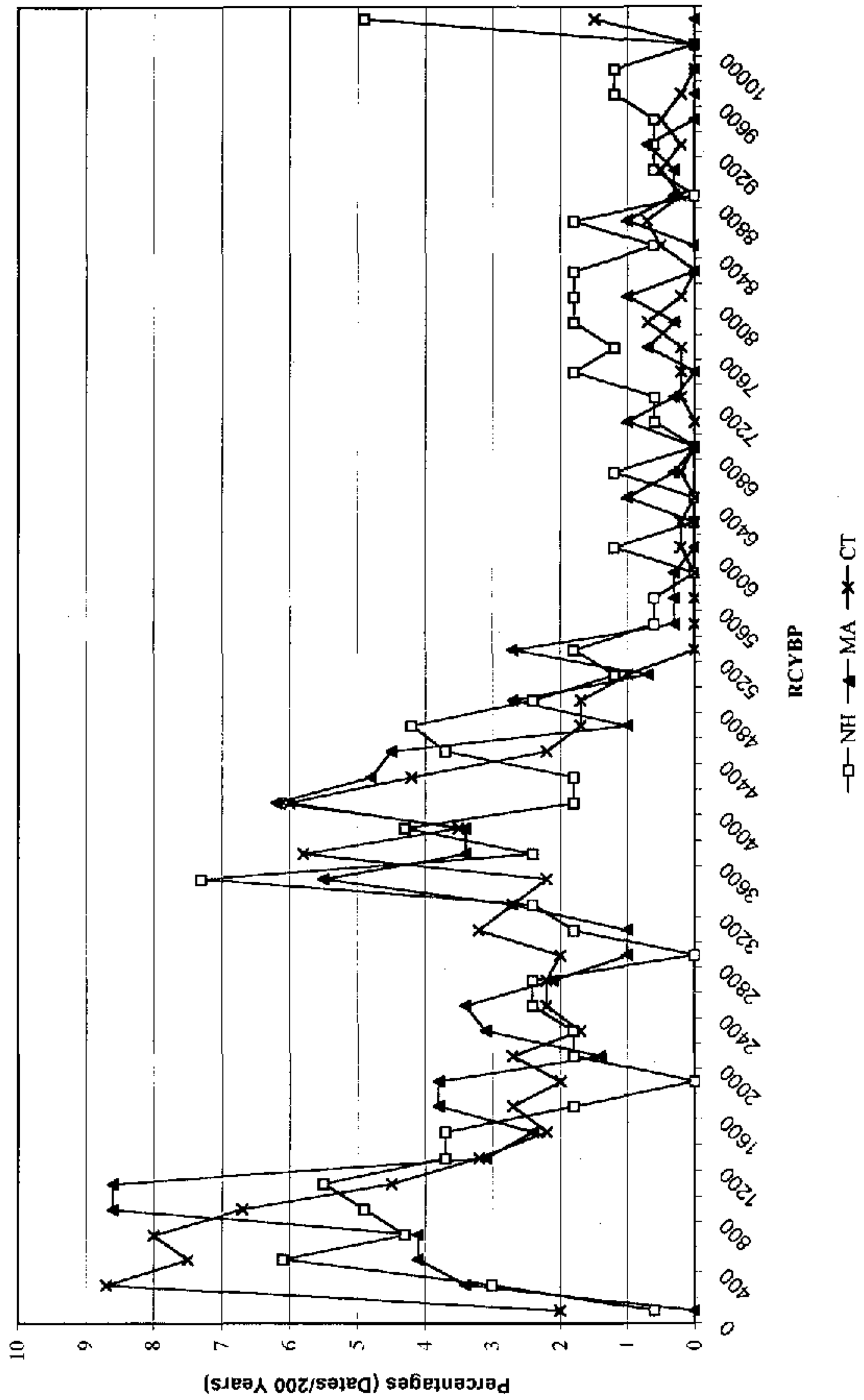

Figure 11. New England dates (percent per 200-year interval).

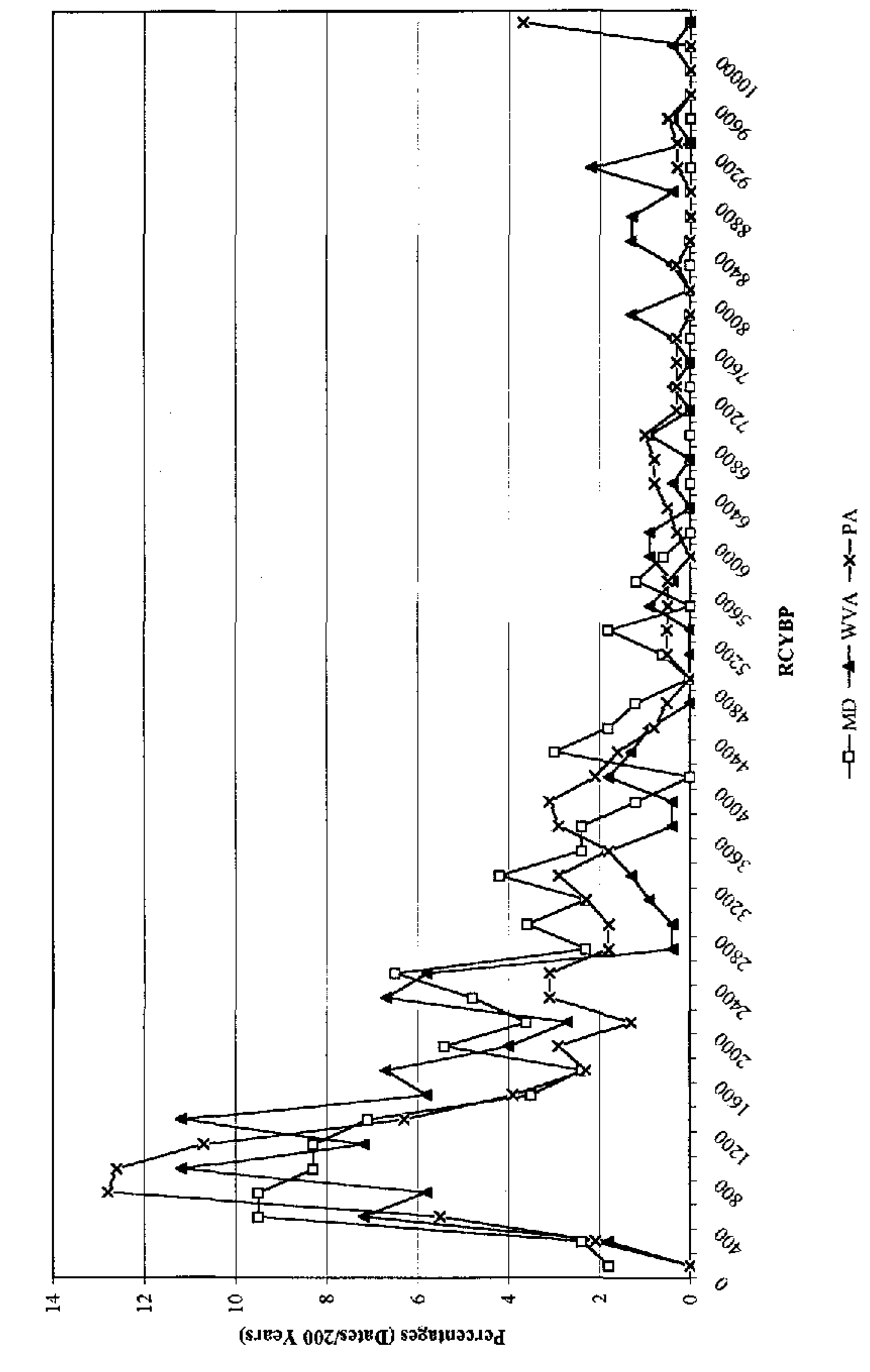

Figure 12. Middle Atlantic dates (percent per 200-year interval).

features, or earthovens. Earthoven cooking could prepare large root crop harvests, and the technology was critical for detoxifying many species of root crops. Feature soils could contain evidence of rootcrops, or more likely, vegetation layered to protect and steam the food. For example, Captain John Smith gave a detailed description of earthoven cooking during the early seventeenth century, probably for the preparation of *Peltandra virginica* or *Sagittaria* spp. roots:

> The chiefe root they have for food is called Tockawhoghe. It groweth like a flagge in the Marishes. In one day a Salvage will gather sufficient for a weeke. These roots are much of the greatness and taste of Potatoes. They use to cover a great many of them with Oke leaves and Ferne, and then cover all with earth in the manner of a Colepit; over it, on each side, they continue a great fire for 24 hours before they dare eat it. Raw it is no better then poyson, and being roasted, except it be tender and heat abated, or sliced and dryed in the Sunne, mixed with sorrell and meale or such like, it will prickle and torment the throat extremely, and yet in sommer they use this ordinarilly for bread (Smith 1907:55).

Earth oven technology has been documented at least since the Late Archaic in Connecticut, such as at the Lewis-Walpole site (Starbuck 1991:79). In the Middle Atlantic region, McLearen (1991:110-112) observed that fire-cracked rock features were the most common type of archaeological feature from the Late Archaic through the Middle Woodland. Increases of Late Archaic radiocarbon dates might reflect the introduction of a new technology, as well as exploitation of new resources or habitats. A quantitative study of fire-cracked rock feature types might provide new insights into subsistence and demographic patterns in Connecticut.

Radiocarbon dates in New England decrease at approximately 3000 BP and remained below Late Archaic frequencies until approximately 1000 BP. No substantial environmental changes have been described during the Early and Middle Woodland periods that might account for this fluctuation among radiocarbon dates. Although ceramic technology appeared during the Late or Terminal Archaic periods, ceramics became common at archaeological sites during the Early Woodland and Middle Woodland in New England.

As noted above, the adaptive advantages of ceramic technologies are not obvious but might have involved social rather than demographic advantages (smaller rather than larger populations). In fact, Levi-Strauss (1981:623) concluded his monumental study of North American and Amazonian mythology with the observation that ceramics and earthoven cooking technologies conjoined entirely different cosmological paradigms. Adoption of Woodland ceramics might represent a significant ideological change that extended to use of new resources (e.g., seed crops rather than root crops) and new environments. George and Dewar (1996) have proposed the possible use of small seed plants such as *Chenopodium*, mimicking the Eastern Agricultural Complex of the Ohio Valley and Midwest. If these hypotheses are correct, then seed grinding technologies should be increasingly common at Early and Middle Woodland ceramic sites.

One of the major conclusions of this study is that radiocarbon dates, and probably also human populations, increased during the Late Woodland with the adoption of maize agriculture. However, Late Woodland radiocarbon dates are not as common in New England, and especially northern New England (New Hampshire), as in the Middle Atlantic region. Maize might not have been as significant to prehistoric subsistence in New England as in the Middle Atlantic region. Apparently, Late Woodland population increases were less pronounced in New England than in regions to the south.

Obviously, a great deal of additional research and radiometric dating must be conducted before these and other hypotheses deriving from the Connecticut radiocarbon chronology can be verified.

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A VIEW OF PALEO-INDIAN STUDIES IN CONNECTICUT

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ABSTRACT

Paleo-Indian artifacts continue to be found in Connecticut. While the quantity of artifacts dating to this period has increased in the past twenty years, the diversity has not. Statements about Paleo-Indian culture history, lifeways, and cultural processes are the same now as they were two decades ago. Have archaeologists learned all there is to know about Paleo-Indians, or are they still laboring under fallacious stereotypes and self-fullfilling prophesies?

INTRODUCTION

This article consists of two parts. The first is an update on the Paleo-Indian components at the Templeton site (6LF21). The second begins where the excavation, analysis, and interpretation of Paleo-Indian sites in Connecticut specifically and the Northeast in general ends.

I have been watching the archaeology of Eastern Paleo-Indian mature during the past 30 years from when Debert (MacDonald 1968) and Bull Brook (Jordan 1960) were the best and the brightest hopes for understanding man's entrance into the Northeast. The proliferation of new sites, more abundant and reliable dates, and vastly improved technology for excavation and analysis should have honed our interpretations of Paleo-Indian lifeways and cultural processes to a point only dimly imagined by the first researchers (Moeller 1984a).

Although my future excavation days are numbered in single digits, and I do not expect to have the opportunity to delve deeply into any Paleo-Indian analyses, I have a few comments on what I believe are fruitful and fruitless theoretical avenues. Lithic sourcing, environmental reconstruction, and artifact analysis have one thing in common: context. The only place to begin the interpretation of Paleo-Indian settlement systems is with guaranteed Paleo-Indian artifacts, ecofacts, and features. Starting with mixed contexts, multi-component surface collections, deflated features, tree-throw pits, and non-diagnostic artifacts will produce useless results which merely re-enforce the false stereotypes (Moeller 1983).

The most pervasive stereotypes in Paleo-Indian studies begin with lithics and the environment.

Stereotype 1: Paleo-Indians used only the best cryptocrystalline lithics regardless of the distance they had to travel to obtain them.

Stereotype 2: The people were living in a peri-glacial tundra, or at best, taiga environment. All researchers should consider very carefully any pronouncements or assumptions in these realms which preclude the use of non-cryptocrystalline lithics and the occupation of habitable oases.

TEMPLETON SITE IN 1977

The Paleo-Indian component at the Templeton site on the Shepaug River in Washington, Connecticut, was first excavated in 1977. After several years of careful artifact analysis and research, the monograph, *6LF21: A Paleo-Indian Site in Western Connecticut*, was published in 1980. Two years later I returned to the site to answer some questions raised by the earlier work, by the few people who understood the implications of environmental archaeology, and by some strange feelings every time I attempted to explain what had happened there.

I had never expected to find a Paleo-Indian component during the first season of excavation. A field school and teaching situation with only a few experienced staff are not the best circumstances for confronting something absolutely unique. The few fluted points previously known from the state were stray finds in surface collections or lacked definitive, subsurface, *in situ* associations. I decided to institute very rigid controls on data recovery and cataloging rather than to delay the excavation until a better plan could be developed.

In the first season we uncovered a deeply buried, undisturbed, single-occupation, activity area of about 43 square meters. A wide variety of artifacts for woodworking, bone working, hide working, tool manufacturing, food processing, and hunting were found. These artifacts included a fluted point, drill, gravers, graving spurs, knives, scrapers, utilized flakes, medial thinning ("channel") flakes, retouched flakes, miniature points, bifacial thinning flakes, cores, spokeshave, hammerstones, bifacial rejects, and debitage of chert, jasper, quartz, and quartzite. Ecofacts included calcined bone and wood charcoal from red oak and either juniper or white cedar. A carbon-14 date of 10,190 B.P.±300 years (8240 B.C.) (W-3931) was obtained from a probable post mold (Moeller 1980).

The stratigraphic layer containing the Paleo-Indian component was clearly distinguishable from the Woodland and Archaic period layers above it. The upper layers were a far looser, larger-grained sand. The denser, clay-coated sand was darker and retained moisture more readily. A thin lens of culturally sterile sand separated the Archaic component from the Paleo-Indian component. We found no instances of artifact migration into or out of the sealed Paleo-Indian component.

The first cultural indication of the Paleo-Indian layer was chert debitage. The chipping debris spanned the complete debitage spectrum from water-polished cortical chunks to fine shatter. Debitage increased in frequency by each arbitrary level, reached a maximum, and then decreased in nearly every excavation unit. Fitting pieces of medial thinning flakes and the fluted point were found horizontally close, but vertically separated. Tool manufacture, use, and discard were occurring in the same location. From this evidence I concluded that this was a minimally disturbed, single occupation site. The artifacts were originally deposited over a very short period of time on the surface of the soil lens and were gradually migrating vertically downward. The bottom layer of the site was covered with very large cobbles.

The horizontal boundaries of the component could not be identified. On the river side of the site was a small corner with no cobbles and no chert debitage. Opposite this on the inland side the lens was thinning sharply and was expected to merge with the Archaic and Woodland components. But we still had the ends parallel to the river where the debitage counts were still very high.

Flotation was employed minimally and arbitrarily to search for something associated with the debitage (Moeller 1982). The bits of calcined bone were very tiny, and the charcoal did not look good enough for identification. Complete columns would have been better than grab samples taken arbitrarily.

The cobble zone is part of an alluvial fan of high-energy stream-transported, water-sorted, glacially derived materials. The stream adjacent to the site had once flowed (more than 10,000 years ago) where we were excavating. Its course changed to its present location less than 50 years ago. Early maps and our test pits suggest it has been in many locations across the field. We sidestepped the question of how it was being forced to various locations and focused on the impact of this on the human occupation of the site. We concluded that the site was preserved because the tip of the cobble fan deflected the primary erosive force of the river to the far bank. The site on the near bank was protected once it had been formed. But this part of the explanation for its preservation does not explain its formation.

The logical source of the chert was upriver. Subsequent surface collections two miles north of the site included chert debitage. No outcrops were ever found, but my research interest was piqued.

This excavation exposed a major activity area densely populated by chert debitage and expended tools. Paleo-Indians are credited throughout the Northeast with only using high quality, exotic lithics, so we did not expect to break new ground here. We had found what we expected to and expected to continue to find the same in future work.

Paleo-Indians were not living on the glacial margin, in a peri-glacial park land, or on a tundra. The scant pieces of wood charcoal from red oak and juniper or white cedar suggested a richer environment. The potential for deciduous econiches or a mosaic environment with very diverse resources in close proximity at 10,000 years ago in New England was denied completely by other researchers in 1977.

RETURN TO THE TEMPLETON SITE IN 1982

The return to 6LF21 in 1982 (Moeller 1984b) with a paid crew of experienced people for 10 weeks began well, but everything rapidly fell apart. We found the grid north edge of the old excavation block and laid out the excavation units. The flotation process went very smoothly, but where was the chert debitage and calcined bone from the deep levels? Where was all the quartz shatter coming from? Where were the large pieces and amounts of chert debitage? Why? What? Where? Something had changed radically for unknown reasons. If the cobbles had not appeared exactly where they should have, I would have thought I was in the wrong field.

Toward the end of the excavation, things finally began to make sense. The first season's block encountered a very large, atypically dense, lithic reduction activity area, and we fortuitously excavated almost the entire thing without realizing we had hit the boundaries of it. Because it was the result of a short term, single occupation, it was not scattered and diffuse, but highly concentrated. Rather than gradually ending, it ended abruptly. The continuation of the excavation block five years later yielded another set of activity areas which was not as dense, not consisting entirely of chert, and possibly not contemporaneous with the first. No overlap of any kind was ever recognized. No fitting artifacts were found between the separately excavated blocks even though the blocks came within 2 cm of overlapping.

We could have been investigating activity areas of a second group of knappers who could see the first or who never even knew that others had or would occupy this section of the floodplain. This was still Paleo-Indian and in the same type of soil matrix, but how close in time is unknown. On the positive side, we knew that the distribution of objects at a Paleo-Indian site should not be expected to be continuous or even uniform.

Constant volume (10 liters) flotation samples from the same half quadrant of each level and each square starting from the base of the topsoil, through the Woodland and Archaic components, through the sterile zone and the Paleo-Indian levels, and into the cobble zone were collected to better study the association of artifacts, debitage, and ecofacts. The 800 flotation samples provided proof of something suspected for a long time. Paleo-Indians used locally available lithics even if they were of quality as poor as the vein quartz found in these levels. Archaeologists working on disturbed Paleo-Indian or multi-component sites could easily dismiss poor quality lithics as being post-Paleo-Indian. At Templeton one can see the consistent distribution of quartz in flotation columns and in activity areas securely within the sealed zone. This poor material is not only Paleo, but they are using expedient quartz flakes and unfinished formal tools. The flotation columns revealed small concentrations of tiny edge-damaged quartz flakes and worn, utilized quartz flakes lacking any retouching. The quartz reduction areas horizontally overlapped the chert ones, but the utilization was taking place elsewhere. The same is true for the chert implements in the second excavation block. Expended tools are not associated with the primary reduction debitage.

The lithic sources are decidedly local, but are not limited to a lustrous black chert. Quartzite, quartz, and jasper chunks and water worn cobbles were found on the cobble fan and in the surrounding sandy matrix. Jeff Kalin, an experimental archaeologist who lives less than 10 miles from the site, has a huge jasper boulder on his property. North of the site in western Massachusetts, David Parrat reported a jasper quarry, which was actually many boulders. There is no reason to think that every piece of jasper has come from the Pennsylvania quarries. Jasper occurs in Vermont and could easily have been glacially transported into the Housatonic River and other drainages. There is also no reason to think that archaeologists know all the lithic sources. Indians could easily have completely exploited small outcrops or scavanged the larger cobbles. These people needed stone tools to survive regardless of the source or quality of the stone.

As we defined the primary excavation block, we began a long trench parallel to the river to physically connect the Paleo-Indian component to a small, Early Archaic component discovered during test pitting about 20 meters downriver. At the ends of the continuum we had a 10,000-year-old deposit at roughly the same depth as a 7000-year-old one. There had to be a geological explanation, a disconformity to explain what had happened. Discovering the disconformity not only destroyed our previous model for explaining what attracted the people to this spot in the first place, but it led me to an exceedingly complex, long-term study of environmental adaptation, site preservation, and archaeological dynamics.

The disconformity appeared as the cobble layer ended. The cobbles were not ubiquitous and continuous across the field. We had found an edge. The sandy lens at the edge extended at least 50 cm below the level where the cobble layer should have been encountered. The lens was coarser and lighter-colored than was typical of the Paleo-Indian component sediments. Cobbles were found in the trench as we moved farther downriver from the Paleo-Indian component, but the sediments changed. Cobbles are cobbles regardless of where they were found, but the associated sediments were not the same.

The perfect association of the Paleo-Indian component with the cobble layer and a certain type of sediment was realized very early in the first season. The basic assumption was that the people were attracted to the cobbles because this was on open area on the river. Had the river not been subject to annual flooding and extensive overbank sedimentation, the Paleo-Indian component would never have been buried and preserved. The deep burial maintained its integrity and precluded admixture with subsequent occupations. Since the cobble fan appeared in so many test pits and the stream believed responsible for its creation could be documented in many areas across the field, we thought that we had the ideal explanation. In actuality we had a piece of the puzzle, but it took 17 years for the significance of the other pieces to be realized.

The first model was so wrong in so many ways. The people never could have realized that they were camping on cobbles, since the cobbles were already buried by sand. The sand had to have been in place because the Paleo-Indian artifacts are seen in the uppermost layers. Since the sand covering is almost a meter deep in some place, the improved drainage over the cobble layer would have been too slight to have been perceived.

If they could not have realized that they were camping directly over the cobbles and there was no obvious benefit to them from the presence of the cobbles, then they could well have camped elsewhere. The same camp could have extended beyond the cobble layer, and there is no reason to think that it did not. If it did extend, then why were no Paleo-Indian artifacts ever found in the sand zone not underlain by cobbles, but immediately adjacent to where the sand zone which was underlain by cobbles? As we moved far downriver from the Paleo-Indian component, why were the cobbles covered by a different sediment having Early Archaic artifacts? The picture looked wrong.

In 1984 a major new model evolved. I had been watching the river for the previous seven years and had noticed that gravel bars suddenly appeared, gradually evolved, and then disappeared. The massive amount of material carried into the river by high energy streams created alluvial fans at their mouths. Because of the very large cobbles, the river was forced to the far bank. As side cutting occurred on the far bank, the new stream dynamics brought changes in the depositional and erosional patterns on the near bank. The gravel bars are in part the previous bed of the river, in part new deposition, and in part remnants from soil erosion. The spring flooding brings ice blocks that bulldoze the gravel and cobbles from the fans and subsequent depositions.

The dynamic nature of the gravel bars was not realized immediately. The appearance of new ones over the years did not explain the disappearance of the old ones. They were too massive to be eroded and redeposited during anything but the 100 or 1000 year floods. What was happening to the old ones when new ones were being formed? Dynamic is the key word here and recurs throughout the environmental model developed.

During the excavation in 1977, we frequently went to the river during lunch breaks. A mucky, back channel separated the site from the nearly bare, gravelly bank of the river. We watched as the river cut the far bank and deposited a little fine-grained sediment onto the gravel. Within two years a thin mantle of grass covered the gravel, and the back channel nearly drained. Within five years sturdy shrubs and briars covered the gravel, and the back channel was dry and vegetated. By 1993 trees were well established, and the gravel is no longer obvious. A series of other gravel bars have appeared downstream. The gravel bars are protecting the near bank from erosion and are forcing the river to cut the far bank.

Once the gravel bar had a sandy covering on it, the humans could have camped there. The reason that we found an abrupt end to the Paleo-Indian component is that the cobble layer was not there to protect it. Even though the river is very obviously cutting the far bank, it is still eroding the near bank when it can. Small floods will raise the water level, increase the speed of flow, and erosion will occur as the water level drops. Larger floods will do more damage because of increased turbulence and speed. Side cutting will be minimal against the cobbles. But if there are no cobbles, the side cutting will erode the sand very quickly. That is why the sediment disconformity was a different color and texture. This is sand that was deposited later. A previous flood had scoured the periphery of the cobble layer removing the adjacent sandy layer. The flooding was not severe enough to inundate the occupation zone, but it didn't need to. Subsequent flooding and overbank sedimentation filled the scoured areas.

Downstream the Early Archaic component is underlain immediately by a cobble layer because the previous sediments had been eroded. This sediment was deposited after the Paleo-Indian occupation. It is very likely that the Paleo-Indian occupation once extended beyond the cobble zone, but it was lost to erosion. Upriver, the Paleo-Indian deposits were above the highest flood, but downriver, the sediments (and any artifacts they may have contained) were not above flood stage. These were swept away. Others were deposited as the floor for subsequent Early Archaic occupations.

THEORETICAL CONSIDERATIONS AND STEREOTYPES

The preceding research was discussed at meetings of the Archaeological Society of Connecticut, Society for Pennsylvania Archaeology, Middle Atlantic Archaeological Conference, Vermont Archaeological Society, New York State Archaeological Association, and Eastern States Archaeological Federation and in a number of publications (Moeller 1980, 1982, 1984a, 1984b, 1989). Since then, most of the citations to this research have focussed solely upon the radiocarbon date. Although this was the earliest dated human occupation site in New England at one time, I could never understand why the significance of this site was never appreciated in the archaeological community. The research questions raised should have been applicable to any Paleo-Indian study.

Archaeology, as a historical social science, is supposed to be cumulative and progressive. Students learn what has happened and how research is done before starting on their own. Part of the learning process is to study and evaluate procedures and methodologies. Not all observations are equally valid, but must be considered in light of the research goals and methods employed. Researchers have an obligation to report their techniques and findings, and students have a reciprocal responsibility to study these. Precise replication of techniques and theories should be avoided because the cabinets will fill objects at the expense of the advance of science.

I offered an opportunity to future researchers pursuing Paleo-Indian studies to learn from my experience. Flotation, microtopographic mapping (piece plotting), and highly detailed debitage analyses (Moeller 1980:95-97) are three areas not completely exploited in the 1977 excavation and analysis. I have seen these undertaken only in a perfunctory fashion, if at all, in subsequent excavations. I am disappointed because these would have been useful in resolving some questions I had. I cannot expect other researchers with other goals to make the same choices I did. However, all researchers must appreciate and understand the greater realm of lithic analysis and sourcing.

OTHER RECENTLY EXCAVATED PALEO-INDIAN SITES IN CONNECTICUT

The Hidden Creek (aka Power Plant) site (Jones 1997) in Ledyard, Connecticut, appears to represent a short-term camp of perhaps a week's duration. A number of hunting implements were retooled and freshly manufactured, while spent expedient tools were discarded at the site. Formal tools including ones of chert (allegedly from the Hudson Valley) and quartz and quartzite (probably derived very locally) were used for rough chopping and scraping tasks as well. A ^{14}C date on a hazelnut shell fragment identified by Lucinda McWeeney returned a date of 10260±170 uncalibrated years BP (Beta-126817) (Jones, personal communication, June, 1999).

The Liebman site is a multicomponent Paleo-Indian campsite in Lebanon, Connecticut, which was situated on a small sandy knoll overlooking a meandering stream. The site was found by John Pfeiffer (personal communication, July, 1999) during a drawdown of Williams Pond. The artifact inventory included a fluted point base, 17 steep angled unifacial scrapers, 12 utilized flakes, and hundreds of chert flakes. The chert is similar to Normanskill from the Hudson Valley.

LITHIC SELECTION AND SOURCES

William Gardner (1983:50-51, 57), Jay Custer (Custer, *et al.* 1983), and I (1989) have walked all over the lithics/quarry/cobble issues:

1. Distance from the lithic source can be estimated by amount of debitage (more debitage means they were closer to the source).
2. Cyclical camp movements show a decreasing amount of debitage as distance from source increases.
3. Imported bifaces do not match the debitage from local sources.
4. Multi-purpose tools ("Paleo Swiss Army knives") are more likely to be made when raw material is in short supply.

The debateable areas are the actual sources of the lithics found at specific sites. The only <u>known</u> sources for the raw materials used for the fluted points and other tools found in Western Connecticut are the flint quarries of the Hudson Valley located about a eighty miles away. Archaeologists have been arguing that it is quite logical to expect these people to have obtained their lithics there. They could have been near a quarry, stocked up on 20 kg of prime flakes and bifaces, and then roamed their way to Western Connecticut. If they compulsively stocked up on fine lithics whenever they encountered a prime source, then we need not assume that they were regularly exploiting a territory of more than a 50 miles in radius. We need not assume that they had previously visited Washington, Connecticut, and knew it was devoid of knappable stones. We also need not assume that they were at 6LF21, discovered it had no knappable stone, and then sent one of their apprentice knappers (we call them "students" now) back to Flint Mine Hill where they last saw good stones and failed to replenish their stash.

Given all the things we need not assume, then why bother to assume that 6LF21 was devoid of fine lithics, that the people compulsively required the best or they would not knap at all, and that the people actually ranged over a territory of hundreds of square miles? According to LaPorta (1994) -- who can find previously unrecognized quarries faster than a trained pig can find truffles -- chert outcrops need not be prominent landmarks on the current landscape. He has been identifying quarries throughout northern New Jersey and adjacent regions for years. William Gardner disproved the assumption that the jasper from the Thunderbird site in Virginia was Pennsylvania jasper. He located a local source across the Shenandoah River from the site that was not known to the broader archaeological community.

When I was excavating 6LF21, the prevailing assumption was that the source for the chert had to be in the Hudson Valley at one of the well-known quarries. I walked 10 meters from the site to the bank of the Shepaug River and found cobbles of high quality, physically similar chert. A quick note to a geologist (Dr. Eau Zen, geologist, United States Geological Survey, personal communication, September 1, 1977) identified the likely original source of the cobbles as the Stockbridge Marble Formation less than two miles away. While no quarries are known to archaeologists, outcrops with 80 cm high beds of chert are visible in this formation near the Massachusetts border with Connecticut. No intensive search has been made for quarries or exposed beds along this formation within Connecticut because it is variously under-water, buried in bogs, or covered with sediment. Glaciation before 10,000 years ago could easily have cut into these beds, broken up chunks, and introduced them into streams where cobbles were eventually produced and transported by the Shepaug River to 6LF21.

Far distant sources for lithics found at Paleo-Indian sites are certainly possible. Finished points and rough bifaces can easily be carried a great distance from the place where they were manufactured at a quarry or on a cobble fan. Even if the only source known to archaeologists for a particular lithic is quite distant, one should not assume that all sources are known to archaeologists. I will go one step farther and proclaim that archaeologists do not know of any sources that do not have obvious, extensive debitage fans until a geologist goes looking for them. Even then it takes a geologist with a background in archaeology to realize the significance of chert to archaeologists.

Physical examination as a basis for lithic sourcing is not conclusive. If we add LaPorta (1994) to the equation, then small, local quarries or cobble beds with lithics having traits similar to those of well-known, distant sources are possible. Why should the possible sources be limited to the ones known to archaeologists? Why should have the people depended on a distant source for the tools that ensured their survival?

Paleo-Indians used non-cryptocrystalline lithics. The only way that any one can make that statement is to have found these lithics in a buried, sealed context with diagnostic Paleo-Indian artifacts. This was the case in the second year of excavation at the Templeton site. Not only was poor quality vein quartz being reduced in small, tightly defined activity areas, but the flakes were being used without retouching. Edge damage flakes were recovered by flotation away from the reduction areas.

Until buried, sealed contexts become the only basis for statements on Paleo-Indian artifact and settlement patterning, the stereotype of "only the best lithics being carefully retouched are good enough for these people" will remain. If one assumes that only the best was good enough for them, then archaeologists removing Paleo-Indian artifacts from collections at mixed, multi-component sites will only study a portion of the true picture and come to inaccurate conclusions.

PALEOENVIRONMENTAL STUDIES

My favorite Paleo-Indian stereotype concerns the environment: These people had to have been hunters, because the big game animals were the only food for them to exploit efficiently. They were living in a peri-glacial, tundra, or, at best, taiga environment with no other visible food. Fluted points must be present at a site or it cannot be a Paleo-Indian site because these people had to hunt to survive.

Lou Brennan summarized this best as the hide-clad triad -- man, woman, child -- wading through knee-deep snow with a single sparse shrub in the far distance. The caption should read "Do we eat it or burn it?" He might have been quite serious or just overstating what might have been the case in some areas. We should not believe this stereotype, unless it can be proved by wood charcoal (or other scientific) analyses. The environment where the people are actually camping should be the one that archaeologists reconstruct.

I had the good fortune to become involved with the recovery of a partial mastodon from a Western Massachusetts bog during the late summer of 1982 (Moeller 1984c). The recovered material includes mastodon bone slabs, ivory chunks, and teeth fragments associated with seeds of *Najas flexilis* and white spruce cones. Bone gelatin dated to 11,440±655 years BP (GX-9024-G). The white spruce cones dated to 11,630±470 years BP (GX-9529). *Najas flexilis* is an aquatic plant found in shallow, fresh water in climates no more extreme than are currently found in New England today. The plant is no longer found in this region. Although no evidence was found for a human role in the demise of the mastodon, the point is made that the environment was not a tundra or a taiga 1500 years before the occupation of the Templeton site.

Identifications of wood charcoal and plant macrofossils at many Paleo-Indian and early Holocene sites in the 1980s and 1990s by McWeeney (1994) among others show that the environment was not as hostile and barren as pollen studies at bogs had suggested. A mosaic environment with deciduous econiches made human habitation possible and expanded the potential variety of available foods far beyond big game. Archaeologists had failed to recognize that the pollen cores from bogs were providing a picture of the general evergreen environment, while the people were living elsewhere. When wood charcoal identifications revealed the deciduous elements, archaeologists then failed to appreciate why people were living where they were and not in the swamps: the deciduous areas offered a greater food diversity and opportunity for survival. They might exploit bogs for part of their seasonal round or diet, but they will maximize their locations.

Gradually the identification of wood charcoal, seeds, and macroscopic plant parts has broadened the archaeologist's perception of prehistoric environments. Predators and prey likely to be in these environments can be assumed from modern geographical associations. While we may not be able to state definitively that humans used these resources, we can demonstrate that they were available. The complementary concepts of the mosaic environment, deciduous econiches, and edge-effect need to be considered to balance this picture.

For many years my greatest disappointment from my Paleo-Indian excavations was that I was unable to persuade people outside of the botanical realm of the significance of the paleoenvironmental data from this and related sites. Red oak and either juniper or white cedar charcoal from a 10,000 year-old site was absolutely amazing. Had this been the only find, the excavation would have been worth the time and expense. At the time, the stereotypic picture of Paleo-Indian life was a highly nomadic family band struggling for survival with a glacier on the horizon. Tundra and taiga vegetation does not include red oak. The pollen profile from bogs suggests an evergreen environment, but the people are not living in the bogs. They are living within a deciduous econiche of a mosaic environment. This one observation provided the primary focus for my research for the next 20 years.

Identifying prehistoric environments has always been pivotal in determining site locations. People have always selected camp sites in close proximity to their required resources. Archaeologists attempt to perceive these same patterns to locate those prehistoric sites. Unfortunately, early surveys were directed towards where sites had been found in the past. Archaeologists kept finding sites in the same locales (e.g., floodplains of major rivers and banks of large lakes) until sites were found accidently elsewhere (e.g., adjacent to small streams).

If closer, previously unrecognized, lithic sources can be found for Paleo-Indian sites, then one less reason exists to assume that they were really regularly exploiting a catchment with a radius of 50 (or more) miles. If the underlying reason for holding onto the huge catchment is that the environment was too harsh or food was too sparse to support a group in a smaller territory, I would ask to look at the direct evidence for this particular reconstruction.

According to Caldwell (1958), "primary forest efficiency" began during the Archaic when people finally learned how to exploit a wide diversity of natural resources, to develop an effective seasonal round, and to achieve the technical skills necessary for manufacturing specialized tools. Now this should be considered a very naive view based upon a scant database of Paleo-Indian sites, artifacts, ecofacts, technology, and ecology hobbled by a self-limiting definition.

By defining Paleo-Indians as big game hunters and by limiting diagnostic artifacts to hunting implements (e.g., fluted points), archaeologists would have been doomed to never recognize Paleo-Indian fishing or gathering camps if it were not for flotation at buried, undisturbed sites having these ecofacts associated with fluted points. Once this breakthrough was achieved at the Shawnee-Minisink site (Kauffman and Dent 1982) on the Delaware River in Pennsylvania, the door to environmental possibilism was opened.

Paleo-Indian sites are found in all 49 continental states and across Canada, but no given region can boast large numbers or closely spaced camps. They camped in an area to exploit a particular resource and then moved to the next seasonally available resource. Paleo-Indians had to have had "primary forest efficiency" from their first entry into the New World. They could not wait until the Archaic to figure out how to live off the land's resources, but why were they moving into the Northeast as soon as the glaciers retreated? Given a relatively low population density and an established presence in unglaciated areas, what was the rush?

Paleo-Indians were probably used to taking advantage of plant foods in naturally occurring, deciduous oases in the evergreen-dominated forests, but these would have been relatively small and widely scattered. Even as they observed the food diversity present in natural openings in the forests, they could not have known that they could create these openings themselves. They left a camp when they had exploited what they could. At first the edge-effect would have been minimal because of the limited availability of plant species for fortuitous adventing in the gradually ameliorating de-glaciated regions.

Edge-effect occurs when the closed forest is cleared naturally or culturally for living space, firewood, and construction materials. The newly created forest edges are where the greatest possible diversity of new plants will advent. Increase the diversity of plants, and the diversity of animals increases. Increase the diversity of prey, and the predators increase. Increase the food supply, and the number of people increases. More people, more land clearing, more edge-effect, greater concentrations of food, less movement for food procuring, and longer periods of sedentism lead to more people in each band.

Human-caused openings are necessary for sufficient edge-effect to support human populations, but the forest edge plants, animals, and prey do not come the next day. The first time the humans made these openings in the course of their daily lives, they did not know to expect a positive benefit. Unless they returned to the same place later in their seasonal rounds, they would not know what had happened and may not have known that they had caused it. Once the plants established a stand then they could spread, but the humans had to assist in this process. Once learned, this lesson was repeated time and time again.

They were living at one with nature in the sense that virtually everything they ate or made was one step from the actual raw material. They could not have been living in a trackless wilderness or a virgin forest. They had to cut trees to clear for their camps, for building materials, and for camp fires. Clearing paths through the trees and underbrush would have facilitated travel as well as hunting. The destruction of the virgin forest began with the earliest human presence and was the primary factor in Indian survival.

Game stalking by individual hunters is very inefficient. This might be acceptable for sport, but not for survival. Just because these people colonized the region does not mean they were ignorant, stupid, or naive. They came from scores of generations of hunters. Communal drives, blinds on a game trail, herd following or stampeding, snares, deadfalls, and other mass killing or unattended trapping methods are better bets for survival. A fluted point as a thrusting weapon, a projecting weapon, or merely a hafted knife to slit a trapped animal's throat are all possible simultaneously. And this only looks at the hunted animal food which is a less secure source than collected slow game or gathered plants. The latter two will not require fluted points, but if identified in good association with fluted points will aid the environmental picture for temporal placement.

DIVIDING THE PALEO-INDIAN PERIOD

The last point I will address is dividing the Paleo-Indian period into three temporal segments. One cannot presume absolute temporal placement with an absence of pure, buried, single component, dated contexts. Nor can one develop a relative chronology without many, pure, buried, single components having a variety of diagnostic artifacts in different ratios. The basis of seriation is that stylistic change occurs through time with the new gradually replacing the old.

Relative chronology based on flutes getting longer or shorter, bases becoming more or less concave, or grinding appearing or disappearing is the old Upper Paleolithic cave art conundrum: realistic to abstract, or is it from abstract to realistic, or did it start one way, go the other way, and then come back again to the first? The cultural processes underlying stylistic change are so incredibly complex that they can only be understood by the Madison Avenue advertising executives dictating next year's in styles, colors, and catch phrases.

I do not see a large number of pristine Paleo-Indian contexts to make reliable statements on Early, Middle, and Late Paleo-Indian period subdivisions on a macro-regional scale. I see a far more productive venue being detailed analyses of individual sites. Once many verifiable, single component, short-term occupations with a diversity of Paleo-Indian artifacts have been identified, then one can use wood charcoal identification to start to build an ecological picture of their surroundings. Add a few animals, consider the likely prey/predators and the people are seen within an econiche. Compare the econiches within the framework of a mosaic environment and look at geographic models of climatic change, forest succession, and human predation before assuming which style of fluted point came first.

I cannot accept the giant leap of faith that presumes a common stylistic succession of fluted points over a huge region. I do not see the contextual basis from demonstrably single component sites. What is even more puzzling to me is why this should be a research question or even a problem. Fluted point styles vary through time, through space, by function, by lithics, and for personal taste. You cannot study one variable without controlling for all the remaining ones. I see a need for so much more work on just resolving the basic contexts.

CONCLUSIONS

The conclusions and models derived from the excavations at the Templeton site should have a profound impact on how people perceive Paleo-Indian in the Northeast. They should provide a basis for approaching other Paleo-Indian site excavations and analyses. The implications of Indians intentionally destroying their environment to obtain basic necessities for life should sound the death knell for the Noble Savage concept and should make white people feel less guilty about being the ones who invented environmental degradation.

The colonizing effect of plants and trees coupled with the suites of predators and their prey will proceed in the absence of man, but if you really wanted to alter the environment add humans. Burning, land clearing, and roaming hunters and gatherers destroyed the virgin forest which evolved as the glaciers retreated. Regardless of popular myths of the urbanized mind, all humans have exploited their environment to the limit of their technology.

Paleo-Indian studies have a long history of stereotypes. While some of these stereotypes are useful to the beginning student who needs to differentiate Paleo-Indian from Archaic and Woodland period cultures, they should not be believed, repeated, and set in stone by the serious researcher. Nobody can <u>always</u> do what <u>must</u> be done. There are always exceptions to every rule. To understand a single site one must always be aware of possible variations from the accepted cultural norms. Most of what we know is actually a first approximation. We need to learn more before we know anything.

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BEYOND PRESENCE AND ABSENCE: ESTABLISHING DIVERSITY IN CONNECTICUT'S EARLY HOLOCENE ARCHAEOLOGICAL RECORD

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ABSTRACT

The last fifteen years have witnessed a dramatic shift in archaeological perspectives on the earliest Archaic cultures of the Northeast. The long-held view that the region experienced only sporadic human occupation during the early post-glacial period has come under increased scrutiny. Both in Connecticut itself, and the Northeast in general, there is mounting evidence for a diversity of human adaptations in the Early Archaic. Contrary to the prevailing "scarcity" model, much of the new data suggest stable and substantial human economies may have characterized this time period. While these adaptations can be tentatively framed as two distinct populations, further research must explore the relationship between the Atlantic Slope and Gulf of Maine Archaic traditions.

INTRODUCTION

Fifteen years ago, Roger Moeller (1984:47) noted that much less was known about the Early Archaic than the Paleo-Indian in Connecticut. This is a particularly dramatic statement, given that the sum-total of fully characterized Paleo-Indian sites in the state at the time was one. Although Early Archaic sites are still poorly represented in Connecticut, research within the state and in other parts of the Northeast has significantly expanded our knowledge of this period. Interest in the Early Archaic remains strong, partly due to the elusiveness of archaeological evidence and partly due to the dramatic changes taking place during its temporal span. The period between 10,000 and 8,000 BP encompasses the final transition from glacially mediated climates to less seasonally severe conditions. The tenth and ninth millennia BP also witnessed the transition from the oft-romanticized Paleo-Indian lifeways to the more familiar, and somehow mundane, economies of the Holocene. The nature of both of these transitions is the subject of much debate among archaeologists working in the Northeast. Recent excavations suggest that archaeological sites within Connecticut will play an important role in characterizing the environmental transition from Terminal Pleistocene to Early Holocene climates and the human adaptation to these changes.

This paper will review the few excavated sites within the state and place them within the wider context of early regional prehistory. While this paper is intended to summarize the Early Archaic period in Connecticut, I will be drawing comparisons to many sites outside the state's boundaries. Human adaptation to tenth millenium BP environmental conditions in the region is poorly understood. This is the result of a dearth of radiometrically dated archaeological sites and continued skepticism over the extension of extra-regional typologies to the Northeast (e.g., Snow 1980; Moeller 1984). More information is available for the second half of the Early Archaic period, on which this paper will necessarily concentrate. I will focus on two sites, Dill Farm excavated by John Pfeiffer between 1982 and 1985 (Pfeiffer 1986), and my own work at the Sandy Hill site on the Mashantucket Pequot Indian Reservation (Forrest 1999). Comparison of the artifact and feature assemblages from these two sites suggests strong technological, economic, and cultural ties between people living in this area during the ninth millennia BP and groups to both the Southeast and Northeast.

Dill Farm clearly represents an early manifestation of what has been termed the Atlantic Slope Macro-tradition (Dincauze 1976). Characterized by distinctive bifurcate-based projectile points and simple unifacial flake scrapers, such sites are now well-documented, if still rare, in the Northeast (e.g., Taylor 1976; Funk and Ritchie 1971; Funk and Wellman 1984; Simon 1991; Johnson 1993; Ferguson 1995).

The Sandy Hill assemblage is quite different in a number of important ways. Formal bifaces are lacking, while steep-edged scrapers and small cores are abundant. The absence of projectile points is particularly striking given the large assemblage (see below) and extensive testing of early Holocene deposits at the site. Unlike Dill Farm, over 95% of the lithic assemblage is quartz, a locally abundant if somewhat intractable material. Overall, the chipped-stone assemblage at Sandy Hill is broadly similar to a number of recently excavated sites grouped under the Gulf of Maine Archaic by Brian Robinson (1992). Documenting this technological tradition in southern New England raises difficult questions for archaeologists studying the Early Holocene period in the Northeast. Available radiocarbon dates suggest the Atlantic Slope and Gulf of Maine Archaic Traditions are broadly contemporaneous in southern New England and adjacent areas. The specific cultural relationships between the people living at Dill Farm and Sandy Hill are unknown, as are the relationships between either tradition and the poorly understood Late Paleo-Indian foragers of the Northeast.

Finally, I will review the evidence for Early Archaic subsistence systems. New laboratory techniques employed in the analysis of Sandy Hill enable the documentation of many plant species previously identified as potentially important food-stuffs. Such approaches are critical in the evaluation of prehistoric economies and provide a necessary balance to the persistent hunting-bias plaguing early Holocene research. While it has long been argued that plant foods were important if not critical elements in Early Archaic subsistence systems, a lack of substantial archaeological remains and direct evidence of plant exploitation has limited the widespread acceptance of this position (cf. Funk 1996:15). I will argue that Sandy Hill provides a wealth of data supporting the Early Holocene wetland-foraging models proposed by Nicholas (1987, 1988).

THE ATLANTIC SLOPE TRADITION

The apparent lack of early Holocene archaeological sites in the northeastern Woodlands led two prominent archaeologists to speculate that environmental conditions were particularly harsh during this period. Both William Ritchie (1965, 1979) and James Fitting (1968) argued that lack of mast resources limited large animal biomass in the early Holocene, leading to a decline in local human population. As Ritchie put it, "early in the post-glacial period, Paleo-Indian hunters may have left the Northeast for parts unknown, or they may simply have dwindled in number from an already scanty maximum to a few remnant bands" (1969:16 cited in Snow 1980:157). This idea quickly became established as the conventional wisdom among regional archaeologists despite the objections of many researchers (e.g., Dincauze and Mulholland 1977; Dumont 1981; Nicholas 1987; Robinson and Petersen 1993). Even the most vocal critics of Ritchie and Fitting frequently resorted to similar lines of argument when assessing the Early Archaic period.

> The northward spread of deciduous trees, especially as represented by the 20% oak isopoll, appears to have been a significant determinant of habitat attractiveness for human populations who were dependant on Early and Middle Archaic kinds of technology. In southern New England, at least, settlement appears to follow, rather than precede, the northward progression of the 20% oak isopoll. The limited analogies we can draw indicate that the 20% isopoll represents good habitat for the white-tailed deer (Dincauze and Mulholland 1977:447).

The "Ritchie-Fitting hypothesis" offered a simple and coherent explanation for the puzzling gap between Paleo-Indian and Late Archaic archaeological manifestations in the Northeast (cf. Funk and Wellman 1984:87-89).

By the early 1970s a complete absence of a northeastern Early Archaic similar to the well-documented sequence in the Southeast (cf. Broyles 1971; Coe 1964) was untenable (Ritchie and Funk 1971). Dincauze's landmark publication of *The Neville Site: 8,000 years at Amoskeag* in 1976 firmly established a technological continuity between Middle Holocene people in the Northeast and their better known counterparts in the Southeast. *The Neville Site* is now recognized as a watershed in New England archaeology, rapidly spurring the documentation of numerous Middle Archaic sites throughout the region (cf. Robinson 1996:2-3). *The Neville Site* also re-invigorated the search for earlier manifestations of the Piedmont or Atlantic Slope traditions in the Northeast, encouraging both the publication of recently excavated materials and the search for previously unknown sites. In this context, Dill Farm can be viewed as one of a relatively small but important group of sites identified shortly after Dincauze published her analysis. Others include the Harrisena site, located south of Lake George (Snow 1977, 1980), the Russ-Johnsen Complex in the Upper Susquehanna Valley (Funk and Wellman 1984), and the Double P site in Plymouth County, Massachusetts (Thorbahn 1982).

Atlantic Slope Tradition sites share a common bifacial chipped-stone technology. Points associated with the earliest unambiguous manifestation of this tradition in the Northeast include Hardaway, Palmer, and Kirk corner-notched forms initially defined in the Carolinas (Coe 1964). Northeastern examples may be contemporaneous with their southern namesakes, placing them between 9600 and 8500 BP (Funk 1996: 13). Securely dated examples are scarce, however, and many researchers have expressed reservations about equating these isolated tools with the well-defined types to the south (Snow 1980:163-166; Moeller 1984). Dated, or not, Hardaway, Kirk, and Palmer points are exceedingly rare in New England and adjacent areas. A handful have been recovered from the Richmond Hill and Johnsen No. 3 sites in New York (Funk 1996), and several sites in the Robbins Swamp Basin in northwestern Connecticut (Nicholas 1988: 272-273). Slightly younger Piedmont Tradition sites are more common and more easily characterized. Sites dating between 8600 and 7800 BP typically contain relatively numerous expedient stone tools, including a wide variety of scrapers and other unifaces, "choppers" and small numbers of bifurcate-based points (e.g., Funk and Wellman 1984; Pfeiffer 1986; Simon 1991; Ferguson 1995). These latter artifacts are the most broadly recognized diagnostic artifacts of the Early Archaic period in the Northeast. Large numbers of bifurcate points have been recovered along the Taunton River and Titticut basins in Eastern Massachusetts, possibly representing focal points within the regional settlement pattern (Taylor 1976; Johnson 1993). Relatively large numbers of Atlantic Slope Tradition diagnostics have also been reported from Robbins Swamp, in the northwest corner of the state, leading Nicholas to suggest that the locality represents a core area during the Early Archaic (Nicholas 1988, Fig. 1). Isolated specimens and small collections of bifurcates have been identified from a much wider area, and the points are an uncommon if not unfamiliar element in many large assemblages from southern New England.

The initial introduction of early notched and bifurcate-based points appears to mark a lengthy period of gradual technological change. Viewed as a whole, both the formal and informal stone tools manufactured between 9,000 and 7,000 BP demonstrate a cohesiveness that can not be extended to either the preceding or following periods. This can be most readily observed in the morphological overlap between later examples of the bifurcate-based series (e.g., Kanawha) and the deeply indented bases of early Stanley and Neville point forms. Non-projectile elements of Atlantic Slope lithic technologies also share clear affinities, including the continued use of heavy cutting tools, choppers, and steeply retouched scrapers (see Jones, this volume; Dincauze 1976; Ferguson 1995). I suspect that future research will only enhance our appreciation of the similarities between local Early and Middle Archaic cultures. The possible connections between the people of the Atlantic Slope Tradition and the preceding inhabitants of the area are more obscure. The lack of an easily grasped *trajectory* of change uniting Late Paleoindian lanceolate points and knives with the notched, beveled, and bifurcated forms of the earliest Archaic has engendered the notion that the Atlantic Slope Tradition has no local antecedent. It should be clear that a more expansive comparison between terminal Paleoindian and Early Archaic subsistence and economy must be pursued before such suggestions are accepted. As Brian Robinson (1996) has recently reminded us, less emphasis ought to be laid on projectile points and greater attention given to more broadly conceived comparisons.

DILL FARM

The Dill Farm site remains one of the most important sites of the Atlantic Slope Tradition in the Northeast. The site is located in south-central Connecticut in the Town of East Haddam (Figure 1). Early Archaic artifacts including several bifurcate-based projectile points were recovered from an area overlooking a wetland basin drained by the Pine Brook (Pfeiffer 1986:20-23). Excavations between 1982 and

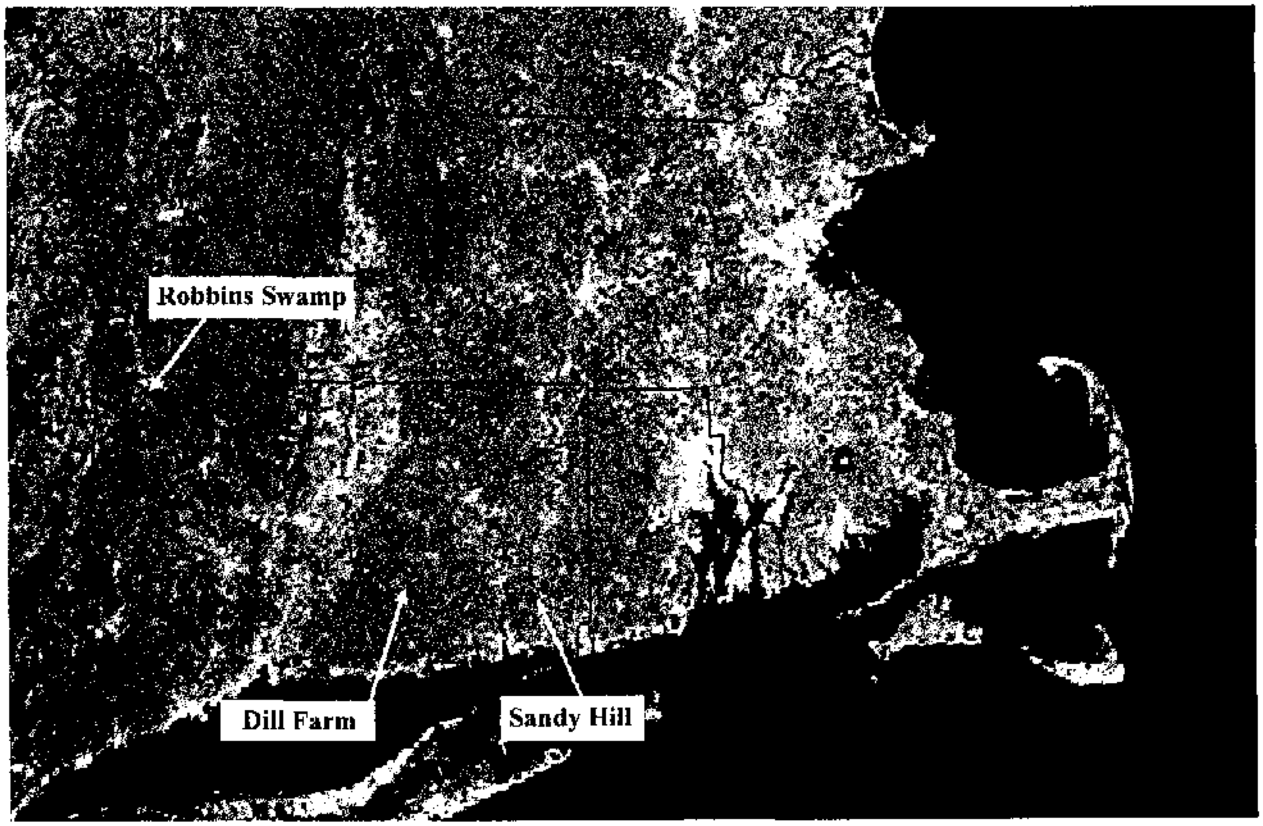


Figure 1. Location of Early Archaic components discussed in text.

1985 under the direction of John Pfeiffer revealed a small assemblage of early Holocene tools and features. These materials were recovered from 35 - 40 cm below the modern surface and separated from younger materials by a thin sterile layer (Pfeiffer 1986:28). A total of four features were identified during the excavations of the Early Archaic component, including a cache of forty crystal quartz quarry blocks (Pfeiffer 1986:28). A charcoal sample from Feature F, a basin-shaped hearth containing hazel and walnut fragments returned a date of 8560±270 BP (Pfeiffer 1986:31). Debitage includes secondary retouch flakes of chert, crystal chert, and fine-grained quartzite or chalcedony. The five bifurcate points recovered during controlled excavation were manufactured from a variety of materials including rhyolite, chert, and quartzite. Although I know of no formal attempts to source the cherts and rhyolites in the Dill Farm assemblage, the materials may represent lithic acquisition networks extending west to the well-known chert quarries of the Hudson Valley and northeast to Boston Basin volcanic deposits. The lack of early stage reduction debris indicates that the exotic lithics were transported to the site as preforms or finished tools. Pfeiffer suggests the lack of a developed "living floor" and a lithic assemblage dominated by secondary retouch flakes of exotic materials in Dill Farm's Early Archaic assemblage reflect short-term site occupancy during the early Holocene (Pfeiffer 1986:31). This contrasts with the Middle Archaic component at the site, which suggests both a longer period of site occupation and a greater diversity of subsistence activities.

Overall, the data from the Dill Farm excavations indicate a small group of mobile foragers camped along the margins of a shallow lake and surrounding wetlands sometime between the late summer and fall. The presence of a raw material cache indicates these people intended to return to the site, an intention which was presumably thwarted. The pattern of short site occupancy and clear indications of the occupants' intent to return to the location is repeated at the Double P site in Titticut Basin (Simon 1991).

SANDY HILL AND THE GULF OF MAINE ARCHAIC

Shortly, following the publication of *The Neville Site,* a collection of papers documenting the newly identified Early and Middle Archaic periods in New England was published (Starbuck and Bolian 1980). Among the papers was Charles Bolian's "The Early and Middle Archaic of the Lakes Region, New Hampshire". Bolian's analysis of the Weir's Beach site, at the southern end of Lake Winnipesaki included a description of a number of deeply buried steep-edged scrapers manufactured from quartz (Bolian 1980: 125). Bolian suggested that these tools might date from Early Archaic period, even though the assemblage lacked more typologically salient forms, i.e., projectile points. Bolian was not the first to argue that tools other than bifacially knapped projectile points might be diagnostic of early sites in the Northeast. Earlier suggestions that "crude" and expedient stone tools, including "choppers" and scrapers might have been more characteristic of the Early Archaic in the Northeast had been widely ignored (e.g., Byers 1959). However, Bolian's suggestion was soon borne out in a series of excavations undertaken in mid-1980's.

The Sharrow site of Milo, Maine was excavated under the direction of James Petersen between 1985 and 1989 (Petersen 1991:17-26). Sharrow and the nearby Brigham site (Petersen and Putnam 1992) are located on opposite banks of the Sebec River at its confluence with the Piscataquis (Petersen 1991: 3). Both contain deeply stratified alluvial deposits and rich archaeological potential. The well-dated early Holocene assemblage at Sharrow contains an abundance of groundstone tools and numerous scrapers and "core-scrapers" analogous to those described by Bolian at Ellsworth Falls. Formal bifaces are noticeably absent from these deposits.

The Gulf of Maine Archaic currently has an exclusively northern New England distribution; however, recent excavations in Connecticut have identified very similar assemblages. Sandy Hill (72-97) is a large multi-component site located along the southeastern edge of the Cedar Swamp basin within the Mashantucket Pequot Indian Reservation in southeastern Connecticut (Figure 1). This former glacial lake basin is approximately 15 km inland from Long Island Sound in the coastal uplands region. Sandy Hill is the largest, both in terms of area and assemblage size, of over 100 sites currently identified within the Cedar Swamp Basin. The site, as currently defined, occupies an area of approximately 2 hectares between the Foxwoods Casino and the Cedar Swamp wetlands. Sandy Hill was first identified in September 1986 by a survey crew from the Public Archaeology Survey Team. Subsequent testing of the site area was undertaken in May 1989, and March 1990. These early surveys revealed moderate to high prehistoric and historic artifact densities across a wide area. Intensive excavation of a small portion of the site threatened by the construction of a water pipeline in September 1991 yielded a small quartz assemblage and an unusual fragment of groundstone. Field supervisor Jon Lizee was the first to recognize the similarity of these materials with the then recently published descriptions of the Brigham and Sharrow sites in Milo, Maine. However, no cultural features were identified in association with the quartz, and Lizee's hunch remained unconfirmed.

Archaeological investigation of Sandy Hill was reopened in the fall of 1996 in response to the planned construction of cooling towers and a large parking garage associated with the expansion of hotel facilities at Foxwoods. Standard 50 cm square shovel test pits were excavated on a five meter grid across the site area threatened by construction (Figure 2). All sediment from the site was screened using eighth-

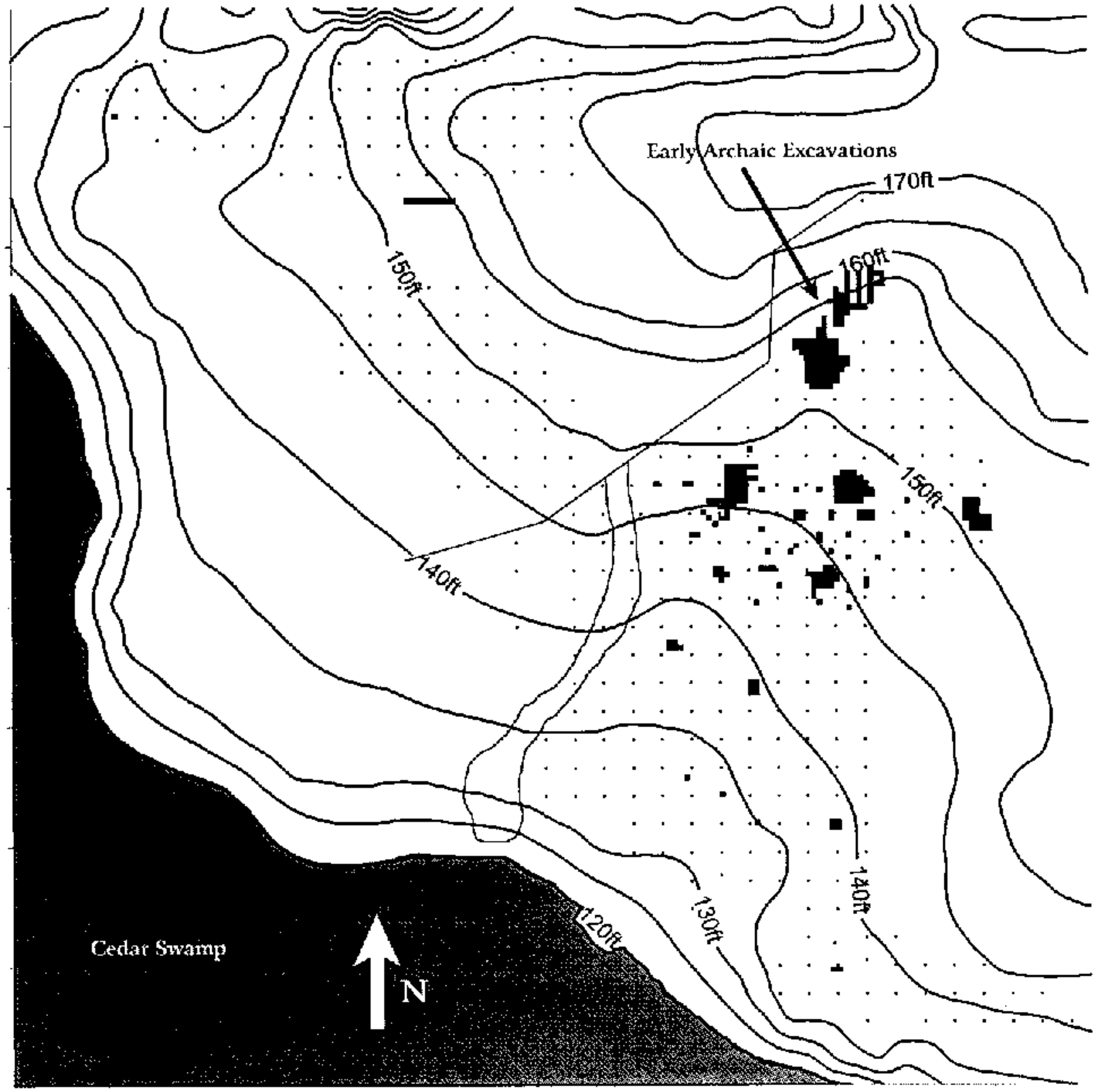


Figure 2. Contour map with Phase II and III excavation units at Sandy Hill.

inch hardware cloth. Three hundred sixty-seven test pits were completed between September and December 1996. These test pits yielded a sample of just over 8,000 lithic artifacts including debitage. Peak densities over 500 quartz flakes per test pit occurred across the base of 20 - 30 percent slope along the central and northern portions of the site.

Data recovery excavations began in January 1997. Excavation continued in the summers of 1997 and 1998 with a joint crew from the Mashantucket Pequot Museum and Research Center, The University of Connecticut archaeology field school, and the Public Archaeology Survey Team. Three hundred fifteen meters have been fully excavated to date. This does not include and additional 184 meters that were excavated subsequent to machine stripping of topsoil within the parking garage project limits. Although the inventory of the entire site assemblage is incomplete, field inventories indicate the entire assemblage will likely exceed 100,000 artifacts. One hundred and seven cultural features have been identified, not including the complex Early Holocene deposits discussed below. This large assemblage includes at least eight broadly defined temporal components spanning the Late Paleo-Indian to Historic periods. For the purposes of the present discussion, I will restrict my comments to the Early Archaic components and the smaller Middle Archaic and Late Paleo-Indian assemblages.

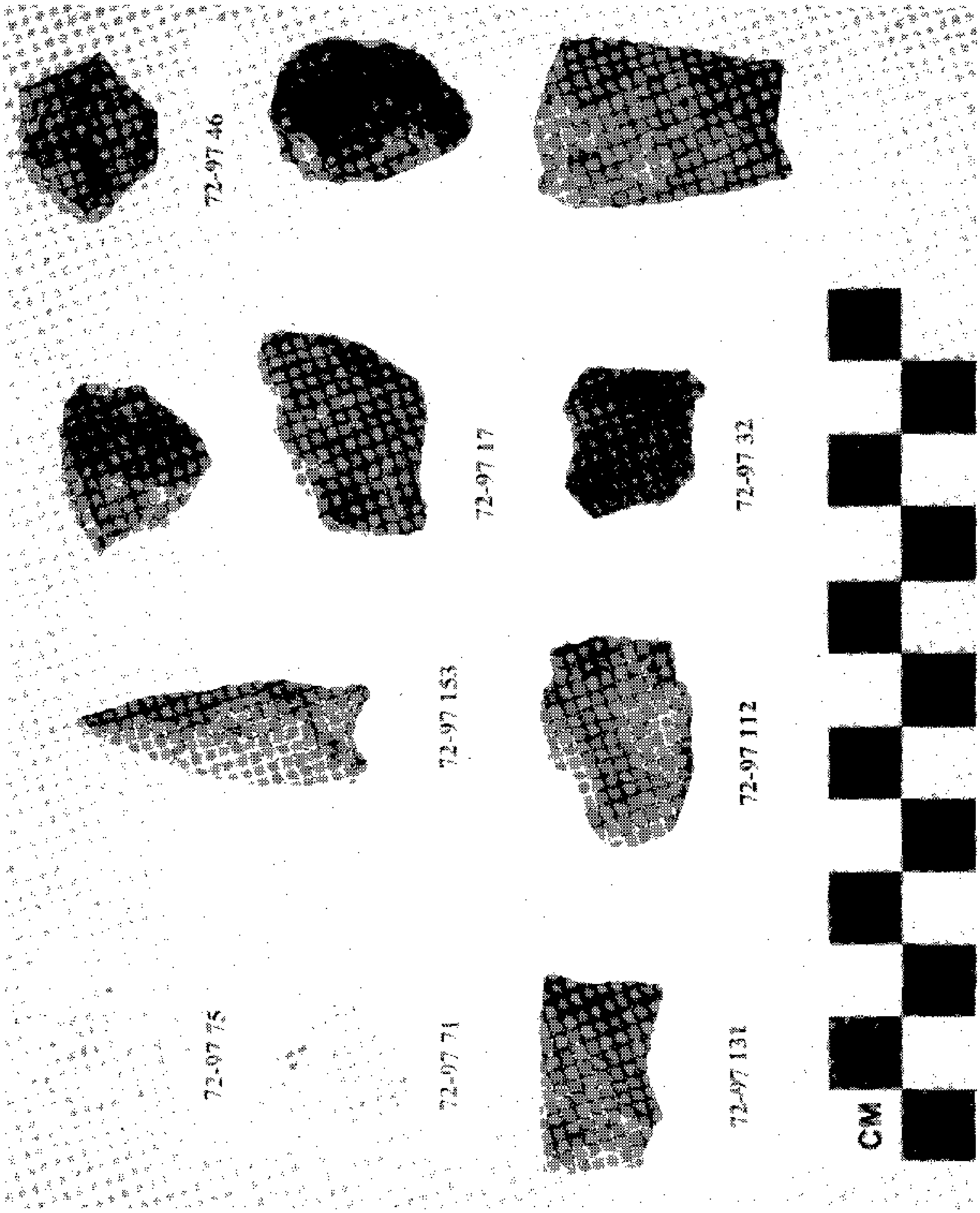
The Middle Archaic component at the site conforms to a general pattern well-documented elsewhere on the reservation (Jones, this volume). Neville and Neville-like points are the single most commonly identified bifaces in the assemblage. Over two dozen of these points have been recovered from the recent excavations, yet no cultural features at the site can be attributed to the Middle Archaic. Over 75% of the Neville points are broken, with a significant over representation of base versus blade fragments. Early field observations suggest that a higher proportion of the base fragments were manufactured of exotic rhyolites, while a majority of the points broken during production were made on locally available quartzite. The replacement of exhausted tool-kits made from materials acquired at some distance from the site is further supported by the relative rarity of rhyolite debitage. The only complete rhyolite tool recovered during the excavation was a drill apparently reworked from a projectile point. No later Middle Archaic artifacts have been recovered, with the possible exception of a single Stark point. This matches a much broader pattern documented in the area. Across the reservation, and within Connecticut in general, there appears to be a pronounced gap in the archaeological record between 7,000 and 5,000 BP.

A small scattering of Late Paleo-Indian artifacts including two Holcombe-like projectile points and a handful of scrapers manufactured from high quality exotic cherts represent the earliest identified components at the site (Figure 3). Very little debitage recovered during the excavation resembles the materials used in the manufacture of the Paleo-Indian tools. All these artifacts have been recovered from disturbed contexts, and the exact nature of the component is undetermined. The temporal relationship between these materials and the Hidden Creek site, a small Late Paleo-Indian camp excavated by Brian Jones (1997), is also currently undetermined. Hidden Creek is located less than 100 m south of Sandy Hill.

In contrast to the remains of Middle Archaic and Paleo-Indian occupations at Sandy Hill, the Early Archaic assemblage is rich in primary debitage and cultural features. Jon Lizee's suggestion of a Gulf of Maine Archaic-like component at Sandy Hill received dramatic support on the first day of machine assisted topsoil stripping in February 1997. An eight-meter wide cut along the base of a sandy embankment exposed thick black sandy deposits containing a very high density of quartz debitage, numerous steeply retouched quartz unifaces and hundreds of charred hazelnut fragments. A sample of hazelnut shell fragments was submitted for conventional radiocarbon dating almost immediately. The date of 8920±100 was received.

Initial inspection of the machine cut revealed what appeared to be two very large shallow basin-form features with flat bottoms. The features overlapped near the center of the exposed cut and were each approximately 6 m wide in the slightly oblique section. Subsequent excavation has revealed a far more complicated stratigraphic situation. The deposits were exposed in a series of meter-wide trenches (Figure 4). At least five individual features were identified in the first section examined by Dr. Robert Thorson of the Department of Geology at the University of Connecticut, Dr. Brian Jones of the Mashantucket Pequot Museum and Research center, and myself. The following description is largely derived from our conversations at the site and a more formal report prepared by Thorson (n.d.).

Each feature was formed when a large cut was excavated into the fine-grained glacio-deltaic sands (Figure 5). These large, basin-shaped excavations measure approximately 4 by 6 m. As the floor of each feature was level, maximum depth below surface always occurred at the up-slope end. 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. These anthrosols are either capped by talus or colluvium from the flanking embankments or are truncated by the excavation of subsequent features. The entire sequence is topped by a wedge of mid- to Late Holocene colluvium, showing minimal soil development. In North - South section, the features demonstrate a clear stratigraphic relationship, such that the oldest features are located at the base of the slope.



... Late ... artifacts from Sandy Hill.

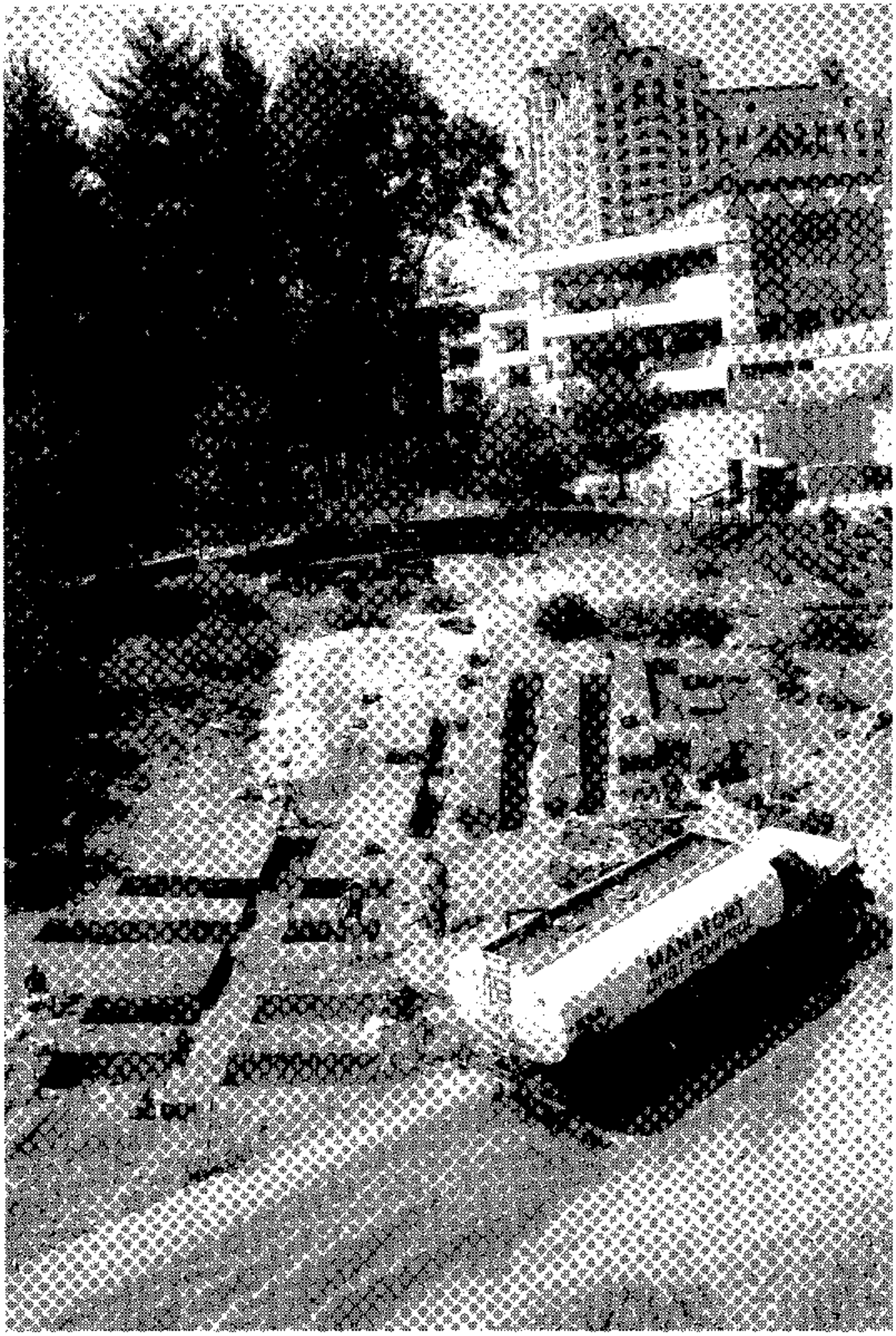


Figure 4. View North from the top of Parking Garage: Note Foxwoods Casino and Hotel in background.

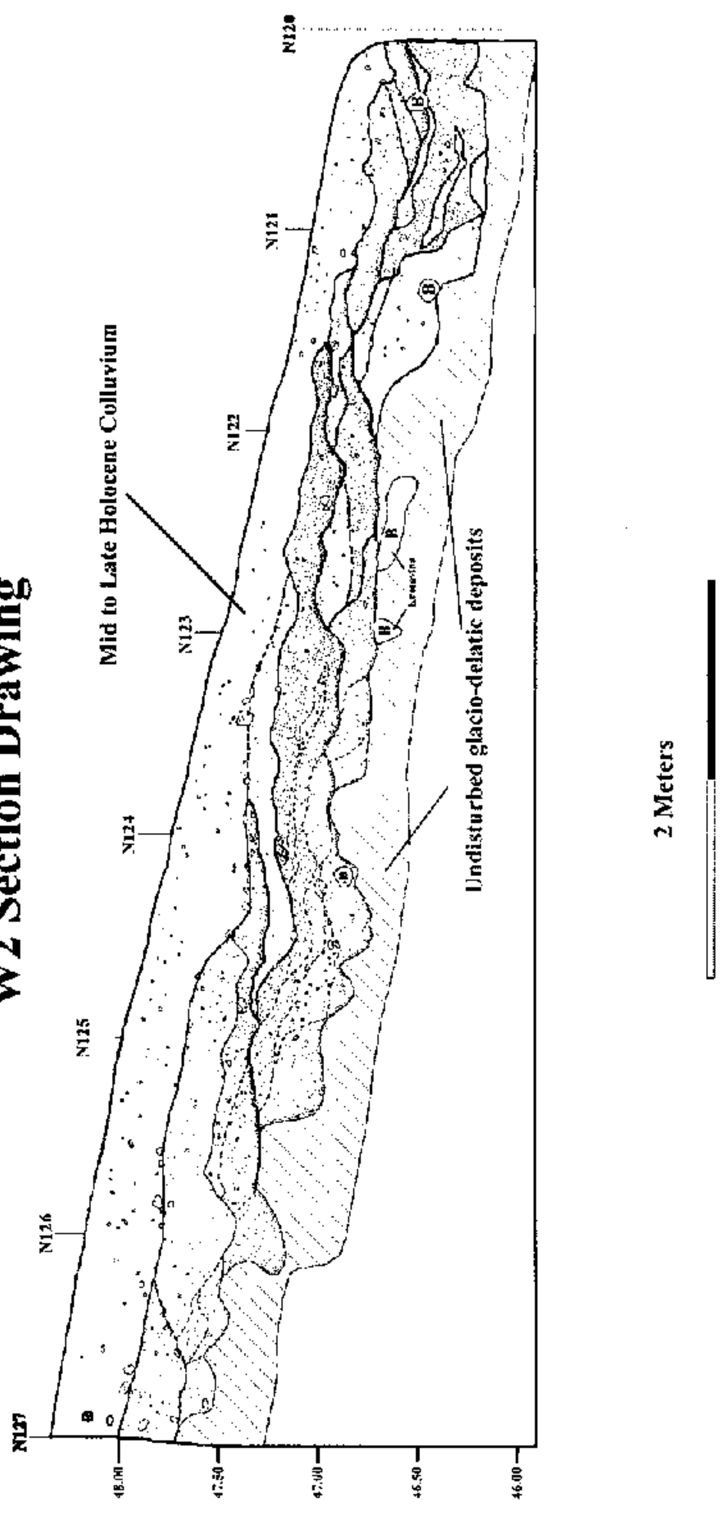


Figure 5. Vertical scale in meters above mean sea level.

I am currently interpreting these features as the remains of semi-subterranean pit-houses. Both the substantial efforts required in the excavation of each feature and the density of refuse found within, suggest these shelters were occupied for relatively long periods of time. Several of the features contain two or more distinct anthrosols separated by redeposited glacial sands, indicating possible reuse of the shelter after a period of abandonment. Most pit-house features do not show this pattern, though this may be attributed to pervasive turbation of the anthrosols by the treading of the human occupants or the action of burrowing insects and worms. It is notable that the features demonstrating successive cultural strata are all located near the base of the slope where the influx of fine-grained sediment is expected to be the greatest. This is the context most conducive to the preservation and separation of micro-strata. Geo-micro-morphological study of several soil columns from the pit-house features is underway and a more detailed review of the geological context of the early Holocene archaeological deposits will be forthcoming.

A series of radiocarbon dates places the pit-house features between 9,300 and 8,500 BP (Figure 6).

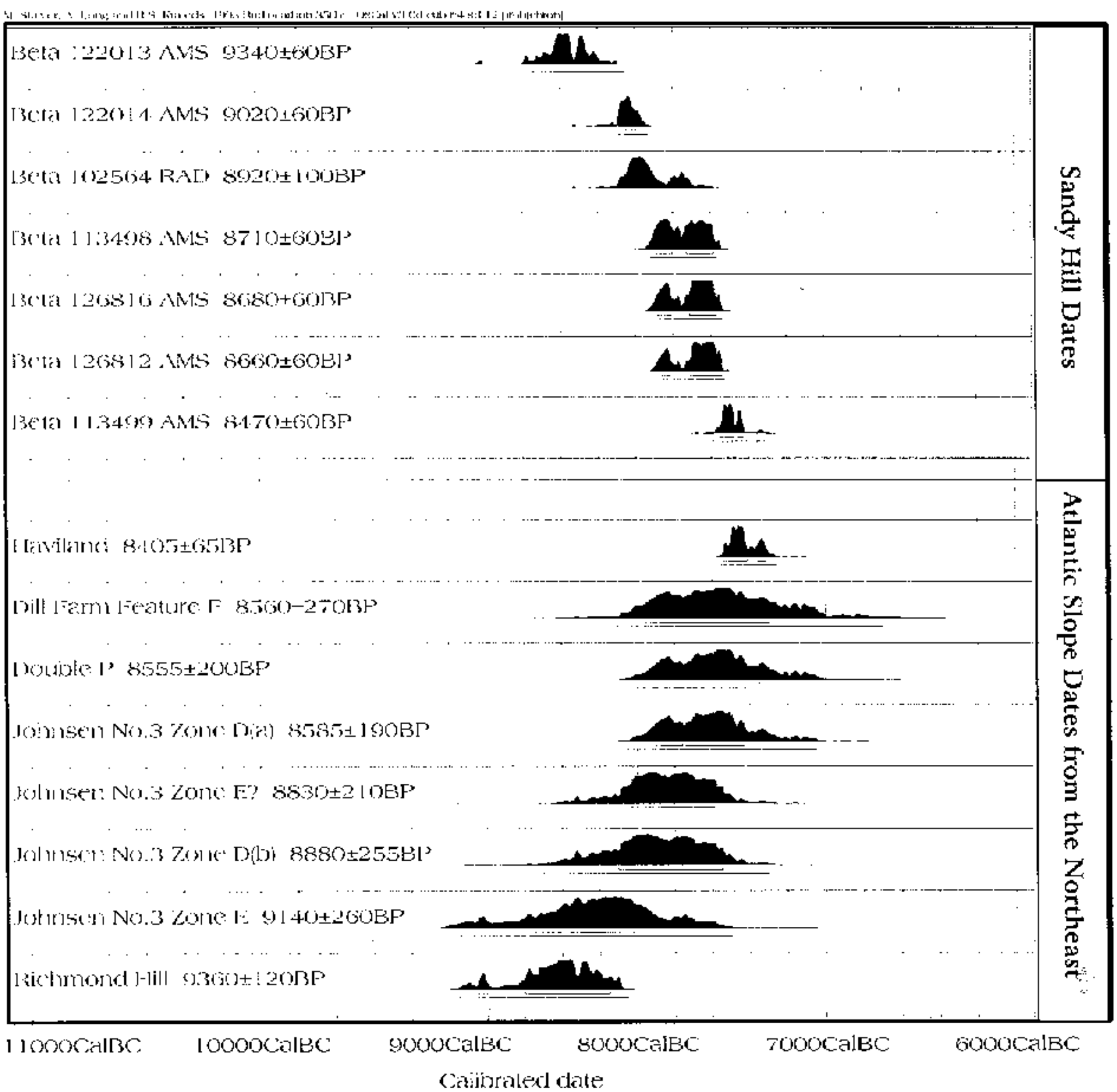


Figure 6. Age estimates for Sandy Hill and Atlantic Slope Tradition sites in the Northeast. (All dates are uncorrected for fractionation).

The earliest date from the sequence, 9340±60 BP (Beta-122013) is from an AMS sample of an unidentified wood fragment. This date appears out of sequence with a stratigraphically subordinate stratum dated to 9020±60 (Beta-122014). It is possible that this sample was heartwood from a large tree and overestimates the age of the feature by one or two centuries (all other Sandy Hill samples listed below were nutshell or cattail fragments). Alternatively, this may represent material from an earlier occupation that has become integrated with the matrix of a younger feature. It is quite clear from the stratigraphic sections examined in the field that later pit-house excavations truncated almost all of the earliest features in the sequence. As a consequence, some feature sediments and artifacts are likely to have been incorporated into younger features. Another AMS date of 3740±40 on a charred hazelnut fragment from an anthrosol bracketed in the middle of the stratigraphic sequence is clearly too young. It is likely the result of an unrecognized burrow, but is nonetheless troubling. Further dating of material from this stratum will hopefully clarify the situation in the near future.

Sandy Hill Lithics

The lithic technology employed by the early Holocene inhabitants of the Cedar Swamp Basin is distinctive in several respects. The most notable is the lack of formal bifaces. A single concave-based projectile point made from quartzite is the only tool of its kind recovered from a pit-house context (Figure 3 top row, second from the right). Bifacial reduction flakes are also exceedingly rare among the debitage. Only twelve have been identified among the approximately 20,000 Early Archaic artifacts catalogued to date. Steeply retouched quartz scrapers are abundant (Figure 7).

The numerous quartz cores recovered from Sandy Hill range from simple expedient forms produced on thick flakes and large angular debris to small conical forms. The majority of the former type appears to have been reduced using freehand percussion. Most were discarded after a small number of flakes were detached from fortuitous platforms. Such cores invariably retain significant mass and could easily have been utilized further if the knapper had desired. The latter core types by contrast share a common form and reduction trajectory (Figure 8). These forms have large, flat to slightly concave platforms located either along natural cleavage planes within the raw material or produced by the removal of a sizable flake. A moderate number of cores have platforms prepared by the removal of a series of smaller flakes from the margins of the core (Figure 8, middle right). Regardless of how the platforms were produced, the cores were utilized in a consistent manner. Flakes were systematically detached along the steep margins of the piece. Flakes were typically detached from the entire circumference of the core, although obstacles such as step fractures and inclusions frequently precluded the use of the entire platform edge. Edge angles on the majority of these artifacts fall between 60 and 70 degrees, though several exhausted examples approach 90 degrees. Many of the cores have readily observable crushing damage on their tapered ends. This and the small overall size of the cores indicate that they were reduced using a bipolar technique.

Given the intractability of the quartz used, the cores show an impressive uniformity of shape and reduction pattern. The diminutive size of the flakes produced from the cores would largely preclude their use as simple hand-held tools and likely rule out their use as tool blanks. So what were they doing with all these little, sharp flakes? The systematic production of such small flakes at Sandy Hill supports Brian Robinson's argument that a microlithic industry may have been developed in the Northeast during the Early Archaic (Robinson 1992:97). As Robinson has suggested, the lack of formal bifacial knives and projectile points in Gulf of Maine Archaic sites may be explained by the use of composite tools. Small flakes detached from the abundant bipolar cores may have been used as insets for bone, antler, or wood handles and hafts. This, in turn, may reflect an innovative means of utilizing readily available low-quality stone as an alternative to "expensive" raw material more suitable for the manufacture of bifacial knives and points. The numbers of these tools recovered within the pit-houses suggests they represented an important element of the overall lithic economy, whatever their specific function. Peak densities of bipolar cores approach 25 per m^3 of feature sediment.

Other stone tools recovered from the pit-houses include several dozen large bifacial "choppers" (Figure 9). These tools were manufactured on large pieces of schist, sandstone, and gneiss and are similar

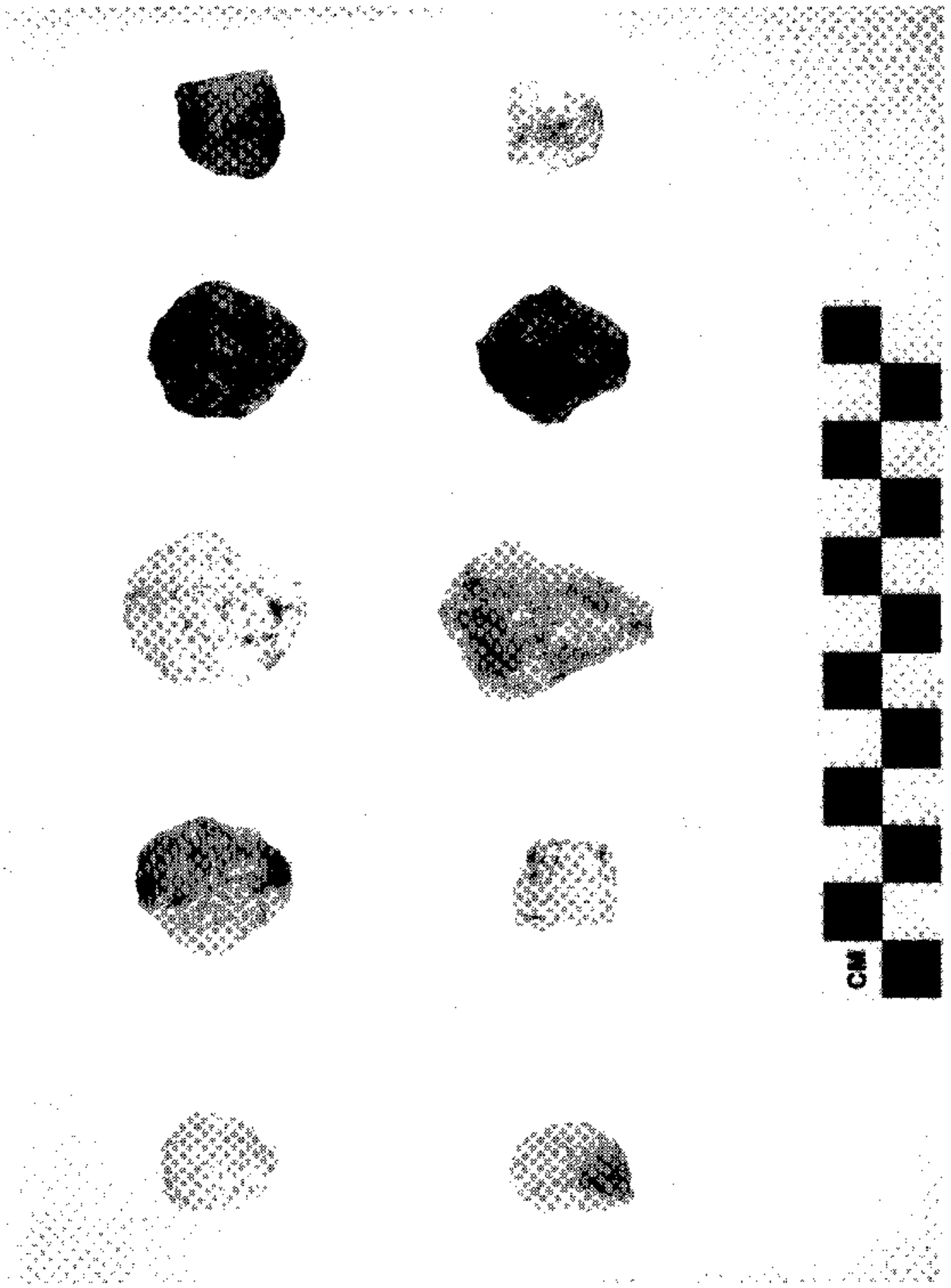


Figure 7. Steeply retouched quartz scrapers.

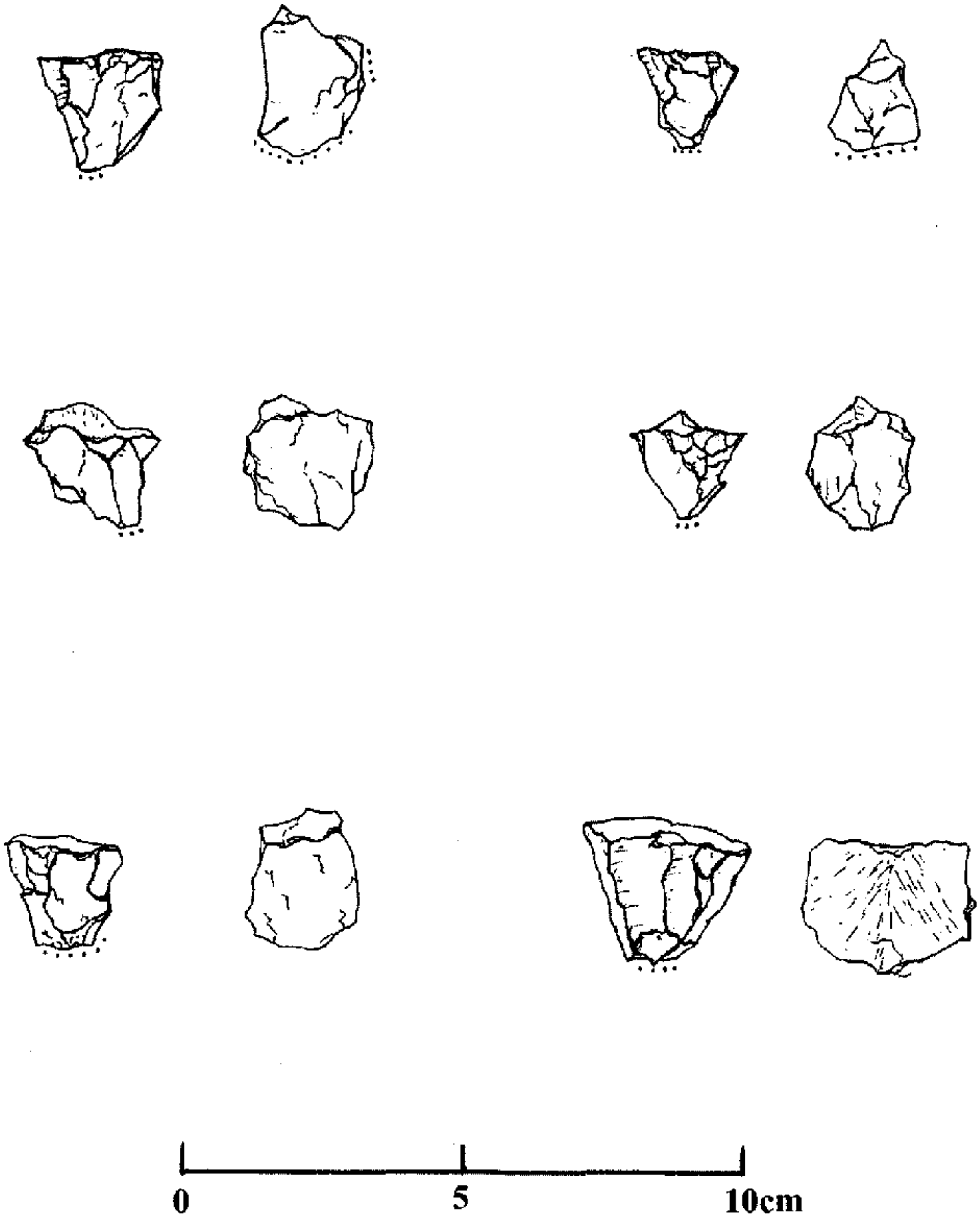


Figure 8. Quartz micro-cores from Sandy Hill.

Figure 9. Large choppers from Early Archaic deposits.

to tools recovered from the Brigham/Sharrow (Petersen and Putnam 1992), and Haviland sites (Ferguson 1995). Hematite and graphite fragments were also found in modest numbers within the pit-house features. Many of the fragments are faceted and incised, presumably from their use in the production of pigment. Unlike Gulf of Maine Archaic sites in northern New England, Sandy Hill contains few examples of Early Archaic groundstone. One heavily battered gouge bit and a large fully grooved gneiss adze are the only recognizable groundstone tools from the pit-houses. The adze may be from a younger component, as it was recovered at the interface between the late Holocene colluvium and shallow feature deposits.

Plant Use at Sandy Hill

While many of the subsistence models for Early Archaic foragers in the Northeast focus heavily on faunal resources (e.g., Fitting 1968; Ritchie 1965; Dincauze and Mulholland 1977), there is a growing awareness of the importance of plant foods to temperate hunter-gatherer economies (Mellars 1976; Nicholas 1998). An essential stumbling block to constructing realistic models of plant use in the remote past has been the lack of identifiable remains other than nuts and seed. While the very substantial numbers of hazelnuts recovered during the excavations at Sandy Hill indicate that mast resources were an important element in the overall economy, it is now apparent that other plants may have contributed greatly to the inhabitants' diet. Potentially important foodstuffs such as roots and tubers rarely survive in forms amenable to identification using conventional ethnobotanical methods. The use of scanning electron microscopy is now offering a means of circumventing this problem (Hather 1991; Perry 1999). This method allows the inclusion of very small charred remains that lack features traditionally utilized in the identification of macro-botanical remains. More importantly, the approach enables the identification of vegetative tissues including stems, roots, and tubers.

Four flotation samples from the Sandy Hill pit-house features were submitted to Dr. David Perry in the fall of 1997 and winter of 1998. A preliminary examination of the floral remains suggested an excellent chance for the preservation of vegetative tissues (Figure 10). Subsequent analysis has confirmed the presence of a wide variety of wetland species in the feature matrix. Table 1 summarizes the results of Dr. Perry's work (Perry *et al.* n.d.).

TABLE 1: IDENTIFICATION OF WETLAND PLANTS FROM THE SANDY HILL SITE

Species	Common Name	Number of Specimens	Possible Uses
Sparganium 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
Polygonatum Mill.	Solomon's Seal	2	Food, Medicine
Iris L.	Blue Flag	2	Medicine, Cordage
Nymphaea L.	White Water-Lily	4	Food, Medicine

The presence of aquatic, emergent, and terrestrial species suggests that the inhabitants of Sandy Hill were utilizing plants from a number of different microhabitats in the vicinity. Notably, both cattail and yellow nutsedge are highly productive "weedy" volunteer plants that thrive in disturbed environments. The number and specific nature of the pit-house features at Sandy Hill indicate a highly redundant series of long-term occupations at the site. Such an intimate association of people with a specific landform

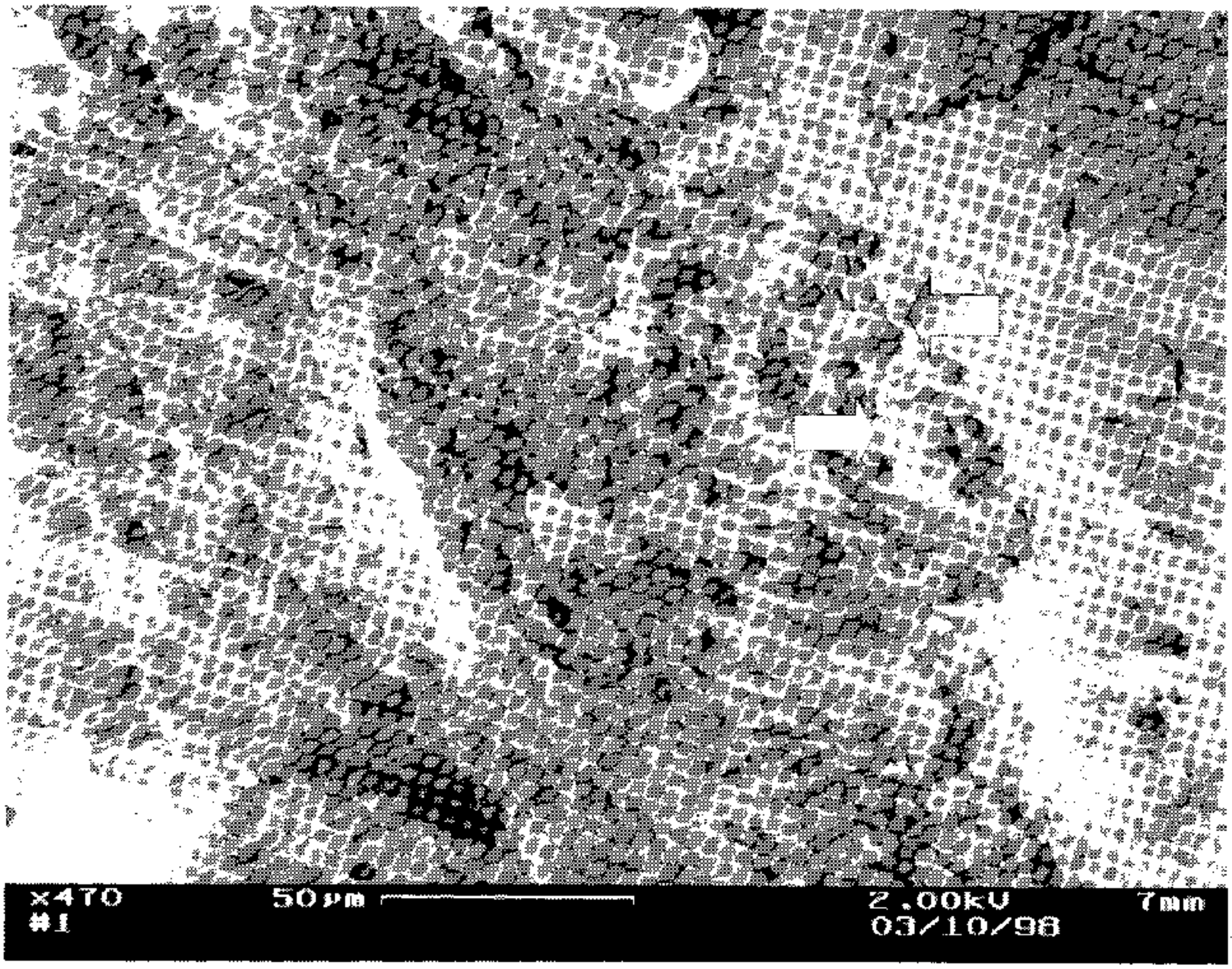


Figure 10. Scanning electron micrograph of a Sandy Hill botanical specimen.

undoubtedly produced substantial changes in the immediate environment. Certain plant (and animal) species may well have benefited from such changes and further enhanced the attractiveness of the area for habitation. Nutsedge may have flourished in forest openings created or enlarged by people, while cattail might have benefited from the increasing human traffic in and around the swamp. Aside from their food value, many of the plants listed above may well have provided raw material for baskets, cordage, and even structural elements of the habitations (i.e., bullrush and cattail).

In summary, Sandy Hill contains evidence of repeated, long-term occupations spanning at least five hundred years. Botanical remains recovered from Early Archaic features indicate the site was occupied minimally during the summer and fall seasons. Indirect evidence hints at winter season habitation as well. The use of semi-subterranean shelters suggests a need for greater insulation and protection from temperature extremes. The need must have been significant to warrant the increased energy expended on such shelters when compared with the more familiar "wigwam" structures. Clearly, humans were persistent members of the larger biotic community of Cedar Swamp Basin during the Early Holocene. The accumulated debris at Sandy Hill was not left behind by a highly mobile population simply "passing through". This locality was *home* to unknown numbers and stands in stark contrast to other reported Early Archaic sites in Connecticut.

DISCUSSION

When Roger Moeller was summarizing Connecticut's Early Archaic archaeological record in 1984, there was not enough information available to justify a separate chapter in the *ASC Bulletin*. Fifteen years later significantly more data are available. Discoveries within the state and in the wider Northeast region have now conclusively demonstrated a widespread Early Archaic presence. In fact we are now confronted with two seemingly distinct and contemporaneous Early Archaic technological traditions, and plausibly human populations, within southern New England. Are these truly discrete cultures? A superficial comparison of Atlantic Slope and Gulf of Maine sites would certainly suggest that they are. Dill Farm and other sites of the more familiar Atlantic Slope Tradition have generally been interpreted as evidence of highly transient foraging groups. As discussed above, Dill Farm fits nicely with conventional models of Early Archaic settlement and subsistence patterns. It's one of a handful of sites with small artifact assemblages and few cultural features, supporting the hypothesis that limited resources held population in check and encouraged high levels of mobility. Robert Funk (1978, 1979, 1984, 1997) has been one of the more vocal proponents of this perspective. As he summarized:

> The general paucity of remains could reflect a number of factors, such as the relatively small size of occupying groups, relatively infrequent visits by such groups, or a fairly short duration of visits. Thus the evidence indicates that the often-noted paucity of Early Archaic traces relative to those of later occupations reflects prehistoric reality, whatever the ultimate explanation may be (1979:35).

This plainly does not describe the type of settlement pattern evidenced at Sandy Hill. Coupled with the differences in lithic technology and economy such a contrast implies profound differences in the lifeways pursued by both groups.

Yet there are problems with such a comparison. Dill Farm and Sandy Hill are certainly different types of sites. The former is probably a logistical camp, preserving debris generated over the course of a few short days. While the latter would minimally qualify as a "base camp", though a Woodland village might be a better model for the duration and intensity of human activity onsite. Unfortunately, the published records from other Early Archaic base camps in the state lack important details that might enable meaningful comparisons. George Nicholas' work at Robbins Swamp apparently did provide enough information for him to turn Funk's model on its head:

> If glacial lake basin mosaics represented a highly productive, long-term, and reliable resource base on the early postglacial landscape of the Northeast, then it may be useful to examine the archaeological record of this period within a context of *affluent* gatherer-hunters, such as found on the Northwest Coast. Not only would this land use tend to focus on such places on the landscape during periods of maximum basin uniqueness, but resource availability would also facilitate certain types and levels of social and economic structures normally not associated with small, mobile, and egalitarian groups (Nicholas 1988:288). [Emphasis in original].

Sandy Hill provides support for this view of the Early Holocene, yet it remains difficult to assess the comparability of the data used to generate the model itself. Likewise, there is a lack of short-term camps associated with the Gulf of Maine Tradition in Connecticut that might be likened to Dill Farm. This is partially explained by a lack of familiarity with the newly described tradition itself. It also may reflect the difficulty of identifying such sites in a typical survey. The lack of formal bifaces and a reliance on quartz means that Gulf of Maine components might easily be missed on multicomponent sites, further contributing to the notion of a sparse Early Archaic record in the state (cf. Robinson 1996). As illustration of this very problem, I offer the following: despite fifteen years of intensive survey within the Cedar

Swamp Basin where Sandy Hill is located, there is not a single candidate for a support camp associated with the site. Until comparable sites are located, the relationship between the two traditions in this region must remain an open question.

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THE MIDDLE ARCHAIC PERIOD IN CONNECTICUT: THE VIEW FROM MASHANTUCKET

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ABSTRACT

This paper briefly examines the state-wide record of Middle Archaic sites in Connecticut as represented in the records of the Office of the State Archaeologist. This summary is followed by a more detailed look at Middle Archaic sites recently excavated on the Mashantucket Pequot Reservation in southeastern Connecticut. Three sites are examined in terms of assemblage content and artifact distribution. Middle Archaic sites at Mashantucket appear to represent short-term hunting and butchering-oriented camps. While they may represent family-sized residential camps, it is plausible that most of the Middle Archaic sites at Mashantucket functioned as logistical support camps for larger residential base camps located elsewhere. The general lack of archaeological data for the period between 7,000 and 5,000 BP is noted. Possible causes of the apparent hiatus are discussed, as are ways of locating sites dating to this period.

INTRODUCTION

Fifteen years have passed since the publication of the *Bulletin of the Archaeological Society of Connecticut*'s landmark 1984 summary of Connecticut prehistory. Since that time a volume of information has been added to the records in the Offices of the State Archaeologist and Connecticut Historical Commission. Numerous site reports have been published in regional journals and archived in the Connecticut Historic Preservation Collection at the new Dodd Research Center at the University of Connecticut. More and more information is available through the internet, and the state site records were recently digitized and formatted for research use within a Geographic Information System. Despite these advances, many gaps remain in our knowledge of Connecticut's prehistory. In fact, the most important research questions raised in the 1984 bulletin concerning demographic, subsistence, and settlement organization and change over time are far from answered. This fact underscores the importance of a renewed assessment of Connecticut prehistory and a reevaluation of our research goals.

This paper focuses on the Middle Archaic period, defined here as encompassing the eighth and seventh millennia BP (8,000 - 6,000 radiocarbon years ago or 7,000 - 4,900 calibrated calendar years BC). The state's best known and documented sites remain Dill Farm in East Haddam, excavated between 1982 and 1985 (Pfeiffer 1986), and the Lewis-Walpole site in Farmington, excavated between 1967 and 1975 (Starbuck 1980). The Middle Archaic period is marked by a mid-Holocene climate shift to dry, warm conditions which appear to have affected regional foraging lifeways (Nicholas 1998). In Connecticut and throughout most of the Atlantic coastal region this period is associated with an increase in the number of sites, the seasonal use of fishing locations, a stone tool industry focused on regionally available lithic materials, assemblages dominated by projectile points and expedient flake tools, and an elaboration of ground stone forms which included semi-lunar atlatl weights, ulus, full-grooved axes, and grooved pebble net sinkers. The increased number of sites and focus on regional lithics suggest a marked increase in human population density at this time.

While the first half of the Middle Archaic period is relatively well documented in the state, I will argue that the latter half is poorly understood. In fact, little information concerning the state's prehistoric hunter-gatherers exists until after 5,000 years ago. I will briefly review the distribution of Middle Archaic sites across the state as documented in the site files of the Connecticut Historic Commission. Thereafter, I will focus on the local expression of the Middle Archaic period where it is most familiar to me - on the Mashantucket Pequot Reservation in southeastern Connecticut. I will summarize the Mashantucket finds and make suggestions concerning their implications for the Middle Archaic period across the state. I will conclude by summarizing what I consider the most important unanswered research questions concerning this period and how we might begin to answer them.

THE STATE RECORD

Eighty-six sites with Middle Archaic components are listed in the files of the Connecticut Historical Commission (CHC) and Office of Connecticut State Archaeology. Individual site locations are plotted in Figure 1 and their distribution by county is presented in Table 1. Sites are clearly clustered in certain

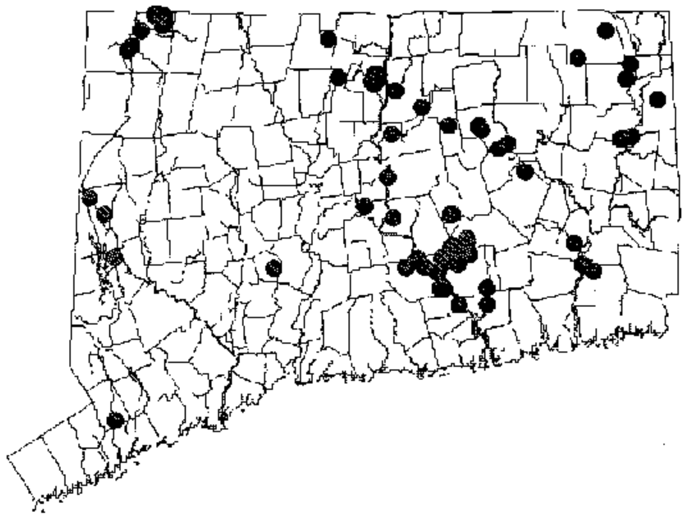

Figure 1. Distribution of sites with Middle Archaic components on file at the Office of Connecticut State Archaeology. Note the heavy concentration of sites in the lower Connecticut River Valley. Point locations based on GIS data compiled by William Keegan for the Connecticut Historical Commission.

TABLE 1: CHC SITES WITH MIDDLE ARCHAIC COMPONENTS

Region	County	CHC Middle Archaic Sites	CHC County Sites on File	Sites per 100 Square Kilometers
Western	Fairfield	2	3.0% of 664	0.11
Connecticut	New Haven	1	0.2% of 439	0.05
	Litchfield	15	1.9% of 773	0.55
Central	Middlesex	21	4.9% of 426	1.89
Connecticut	Hartford	14	3.3% of 427	0.65
Eastern	New London	11	1.1% of 1009	0.55
Connecticut	Tolland	7	2.1% of 325	0.58
	Windham	15	3.0% of 500	0.99
Total		86	4563	avg. = 0.67

regions. Much of this clustering is likely an artifact of research or project focus. Examples of this are the ten sites in Litchfield county reported by Nicholas recovered during the Robbins Swamp Survey project (Nicholas 1988) and the concentration of sites in the lower Connecticut River Valley recovered during

McBride's intensive survey of that area in the early 1980s (McBride 1984a). The current Connecticut site listing does not yet include an additional sixteen sites from the Mashantucket Pequot Reservation excavated by the Public Archaeology Survey Team and the Pequot Museum and Research Center, some of which are described below. These sites have only recently been re-evaluated and existing site forms are in need of updating. It is likely that the Connecticut Historic Commission record is an incomplete representation of the actual number of excavated sites dating to this period. I urge readers to keep these files updated as sites are re-excavated and further analyzed. Now that the record system has been digitized and incorporated into a Geographic Information System it has become a much more valuable research tool.

The state-wide data indicate that Middle Archaic sites are relatively common, although the nature of the data available does not allow clear conclusions to be drawn concerning the explanation of site distribution patterns. I suspect that much of the clustering of Middle Archaic sites exhibited in the CHC site distribution map can be explained by patterns of modern archaeological activity, rather than by prehistoric site selection criteria. This does not rule out, however, that despite obvious sample bias, real information may lurk within the existing data. Table 1 suggests that Middlesex County is not only the richest in Middle Archaic sites, but it is evident that Middle Archaic sites are better represented as a percentage of all sites in the county and that they are more dense per unit area than in any other county. It appears that a real Middle Archaic settlement focus may have existed in this part of the state. The core of the site cluster appears to be the confluence of the Salmon and Connecticut rivers, perhaps indicating the importance of seasonal fishing camps at this time.

MIDDLE ARCHAIC STUDIES AT MASHANTUCKET

Environmental Background

The Mashantucket Pequot Reservation is located in southeastern Connecticut roughly between the cities of Norwich and Groton (Figure 2). At its heart lies the Great Cedar Swamp - a 500-acre forested bog fed primarily by rainwater. The modern vegetation surrounding the swamp is comprised of a mixed hardwood forest dominated by oak, hemlock and pines. The wooded swamp itself consists primarily of red maple, white pine, hemlock, and white cedar with abundant shrub growth (Thorson and Webb 1991: 19).

Environmental and geological studies have focused on the Cedar Swamp wetland basin since the mid-1980s. Detailed palynological and plant macrofossil studies, as well as sediment analyses, have documented environmental and climate change at Cedar Swamp over the last 15,000 years (Thorson and Webb 1991:28). Between ca. 10,000 and 8,000 BP, the Cedar Swamp basin contained a complex mosaic environment. The terrestrial flora consisted of pine and oak, with lesser quantities of larch, birch, hemlock and heath. The swamp basin was likely thickly overgrown with shrubs and water tolerant trees at its southern end, providing good cover and browse for large and small game animals. The center of the swamp was marshy and offered a broad range of wetland resources, including cattail. The northern edge of the swamp held deeper open water indicated by water lily macrofossils.

Sometime shortly after 8,000 BP conditions in the Cedar Swamp basin changed markedly. Between 7,500 and ca. 5,000 radiocarbon years ago geological cores show a level of decomposed peat and charcoal associated with the onset of dry-warm Hypsithermal conditions and a lowered water table (Thorson and Webb 1991). Similar indicators of mid-Holocene lowered regional water tables are in evidence elsewhere in the Northeast as a whole (e.g., Webb *et al.* 1993, Shaw and van de Plassche 1991). It is probable that these local events are a reflection of global climatic aridity documented for this period in the Greenland Ice core record (Alley *et al.* 1997; Blunier *et al.* 1995; O'Brien *et al.* 1995; Stager and Mayewski 1997). A lowered water table would have transformed the complex mosaic wetland into a brushy meadow. This simplification of the basin's dominant landform is presumed to have resulted in a lowered diversity and abundance of resources useful to humans at this time. Only after about 5,000 years ago did local and regional water tables rise, and the Cedar Swamp basin regain its wetland character.

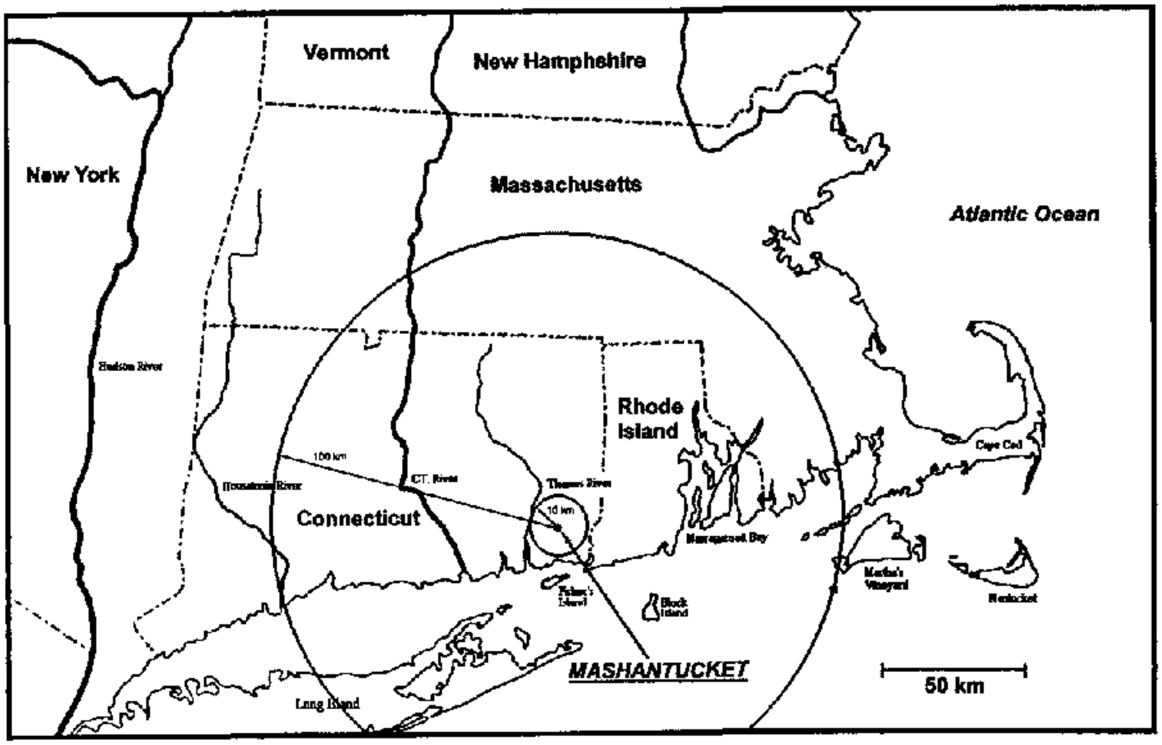

Figure 2. Location of the Mashantucket Pequot Reservation in southeastern Connecticut.

The Middle Archaic at Mashantucket

While Mashantucket was occupied on occasion during the Late Paleoindian and Early Archaic periods (Jones 1997, 1999; Forrest 1999), the number of sites currently identified dramatically increases about 8,000 radiocarbon years ago. Sixteen Middle Archaic sites are located around the periphery of the wetland, most commonly on dry, elevated sandy terraces (Figure 3). These sites have produced over 130 Middle Archaic projectile points to date. The majority of the points are Neville, Neville Variant and Neville-like types. Stark points are less common (11% of the total), while Merrimack-like points are represented by very few examples. Thus, most of the Middle Archaic activity at Mashantucket appears to have occurred during the earliest phase of this period, likely between ca. 8,000 and 7,000 BP. Middle Archaic points outnumber those of any other time period at Mashantucket, suggesting that the hunted food resources of Cedar Swamp were particularly rich at this time.

Middle Archaic sites on the Reservation tend to be expansive, extending across tens of meters, and contain numerous but dispersed artifacts. Multiple tool and debitage concentrations are often present, suggesting episodic reoccupation of the same landform. In addition to points, assemblages typically include flake knives, bifaces, utilized flakes, steep-bitted scrapers, choppers, point blanks, and rare drills (after Dincauze 1976). Ground stone tools with clear Middle Archaic associations are lacking. Site size and assemblage content suggest short-term, but repeated, occupations. Quartzite was the favored raw material for all tools, and makes up 81% of the diagnostic assemblage. This material resembles relatively local Plainfield formation varieties. Rhyolite (probably from eastern Massachusetts) and a white quartzite (of unknown origin) make up an additional 10% of the rock types used. The remaining 9% of materials are a heterogeneous mixture of unidentified materials, only four percent of which are likely exotic. Middle Archaic period diagnostics from Massachusetts are also predominantly manufactured from locally available materials. Exotic materials represented only about 5% of a sample of 452 artifacts from the Merrimack River and North Shore drainages (Johnson 1993:50). Quartz, though uncommonly used for the manufacture of diagnostic artifact types, is well represented at most sites in the form of expedient tools and debitage.

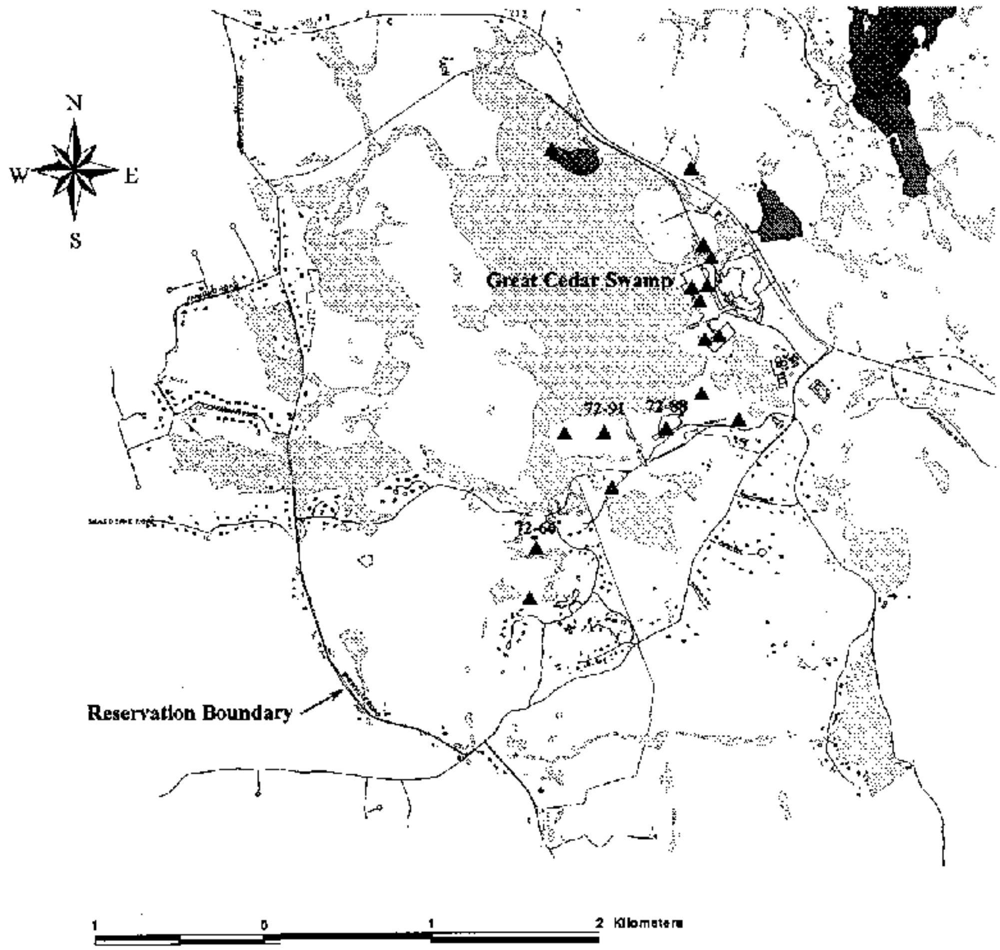

Figure 3. Middle Archaic site locations at Mashantucket. The concentration of sites along the southeastern margin of the Great Cedar Swamp is primarily a reflection of research focus in this area.

The Radiocarbon Record

Despite the relative abundance of sites and the density of tools recovered, not a single clearly Middle Archaic feature has been noted during excavations. Three Middle Archaic dates exist from among the 39 radiocarbon assays of Mashantucket charcoal samples. Two of these were from non-feature charcoal at the Hidden Creek site and are interpreted as evidence of middle Holocene forest fires (7630±120 Beta-60979, 7800±80 Beta-57274). No Middle Archaic period artifacts were found at the site itself. Another date (7200±110 Beta-121840) represents a bulk sample assay on a concentration of burned hazelnut shells and wood charcoal. The concentration of carbonized materials extended through 20 cm of sediments and was found in general proximity to a scatter of chert debitage and informal flake tools. The sample may represent a mixture of early Holocene carbonized nutshell fragments and later intrusive charcoal. The burned material was recovered approximately 20 m downslope of the heavy Early Archaic activity well dated at the Sandy Hill site between ca. 9,100 and 8,500 years ago (Forrest 1999). The possibility that the chert concentration is of Middle Archaic age is also hindered by the fact that no diagnostic chert tools are associated with Middle Archaic sites on the Reservation. In sum, Middle Archaic settlements left a relatively light footprint on the landscape and have defied dating at Mashantucket, despite their relative abundance.

Site Summaries

I have selected three of the most completely excavated Middle Archaic sites to discuss in this section. While some of the less intensively excavated sites may differ from these in size, artifact content, and artifact density, I believe these three generally typify Middle Archaic occupations elsewhere around Cedar Swamp. The locations of sites 72-66, 72-88 and 72-91 are presented in Figure 3. All three sites are multicomponent in terms of multiple prehistoric occupations as well as historic period site use. In each case, the focus of excavations was on historic period remains. Nevertheless, an abundance of Middle Archaic period artifacts was recovered in relatively discrete clusters at each site, and these artifacts outnumbered those of any other prehistoric period.

All three sites contained a similar variety of tool forms. These are directly comparable to those defined by Dincauze in 1976 from the Neville type-site. Most of the tool types described by Dincauze are present. Notable exceptions include the full-grooved axe, atlatl weights, and notched and grooved pebbles. The assemblages from each site differ primarily in the frequencies of tool types represented, although some uncommon tools such as drills and polyhedral nuclei are absent from certain sites. This suggests that overall these sites were used in a similar manner with the exception of certain apparently uncommon tasks. Table 2 summarizes tools and their frequencies from each site. Exemplary Neville and Neville Variant

TABLE 2: MIDDLE ARCHAIC TOOL CLASSES AT MASHANTUCKET

Site/ Tool Class	72-66		72-88		72-91	
	N	%	N	%	N	%
Neville/Neville-like	11	24.5	12	27	26	43
Stark	1	2	3	7	1	1.5
Preform	2	4.5	4	9	2	3
Point Fragment	4	9	7	16	6	10
Biface	14	31	2	4.5	4	6.5
Flake Knife	8	18	7	16	7	11.5
Utilized Flake	5	7	4	9	9	15
Steep-Bitted Scraper	1	2	3	7	1	1.5
Polyhedral Nucleus	0	0	2	4.5	1	1.5
Chopper	1	2	0	0	1	1.5
Drill	0	0	0	0	3	5
Total	45	100	44	100	61	100

points are illustrated in Figure 4, while Neville-like forms and related points are illustrated in Figure 5. Figure 6 shows a sample of projectile point preforms and bifaces. Figure 7 includes large flake-knives, while Figure 8 shows smaller flake-knives, steep-bitted scrapers, and utilized flakes.

The three sites are comparable in size, ranging between 168 and 200 square meters. Artifact density at all sites is quite low, but varies somewhat. The distribution of tools and debitage at sites 72-66 and 72-88 suggests two occupation episodes, or minimally two distinct activity areas. These sites have similar artifact densities, between about 0.22 and 0.24 tools per square meter. Artifacts are less obviously clustered at site 72-91 and the artifact density is somewhat higher, close to 0.36 tools per square meter. This suggests that heavier Middle Archaic reoccupation of 72-91 has blurred once discrete artifact patterning. Overall, however, tool distribution in all cases is non-random, with distinct concentrations of artifacts

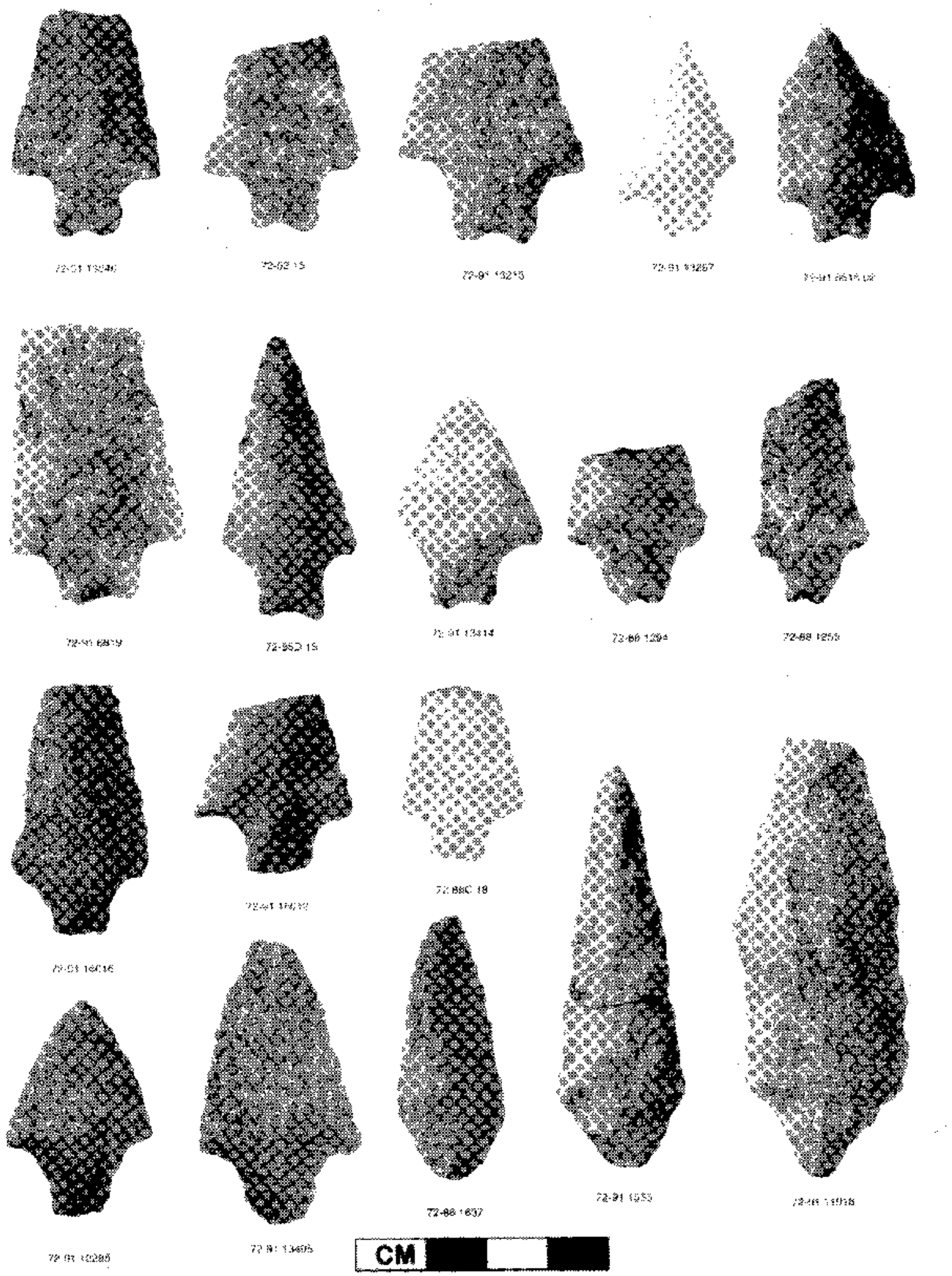

Figure 4. 72-91 13546 and 72-52 15: Kanawha-like points from Mashantucket; 72-91 13213 – 7288 1255: representative Neville stemmed points with concave bases; 72-91 16016 – 72-91 12285: representative Neville stemmed points with square bases; 72-91 13495: Neville Variant; 72-88 1637 – 72-91 11918: Stark stemmed-like points.

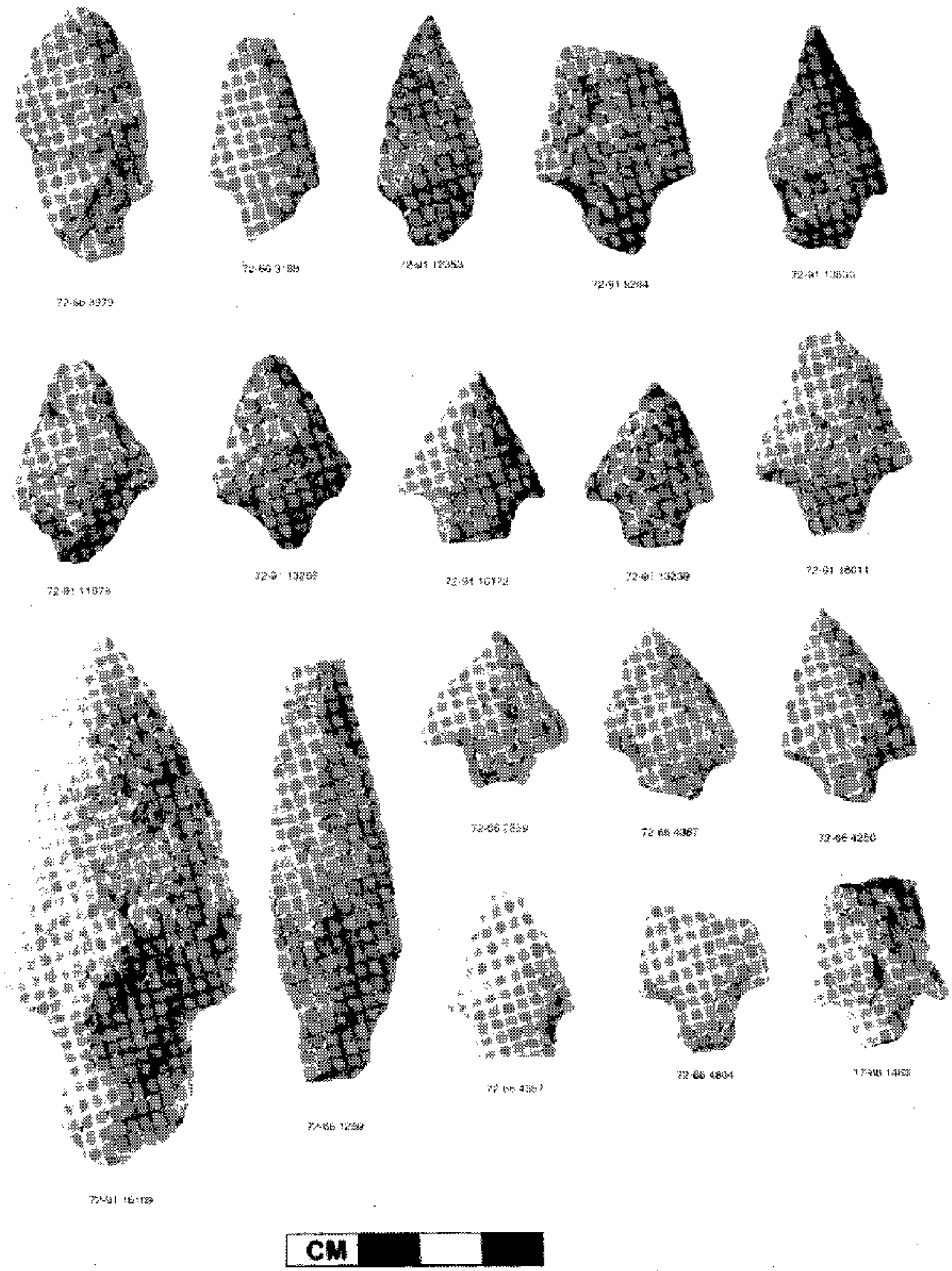

Figure 5. Representative Neville-like projectile points from Mashantucket. Note basal thinning flake removals from 72-91 16172, 72-91 16011, 72-66 4250 and 72-66 4357. 72-91 11079 and 72-91 13266 are small Morrow Mountain I-like points. 72-91 is a large quartz stemmed knife or spear point of possible Middle Archaic affiliation. 72-66 is a red-brown felsite Merrimack stemmed-like point. Errata: please note that label at bottom right should read 72-88 1463.

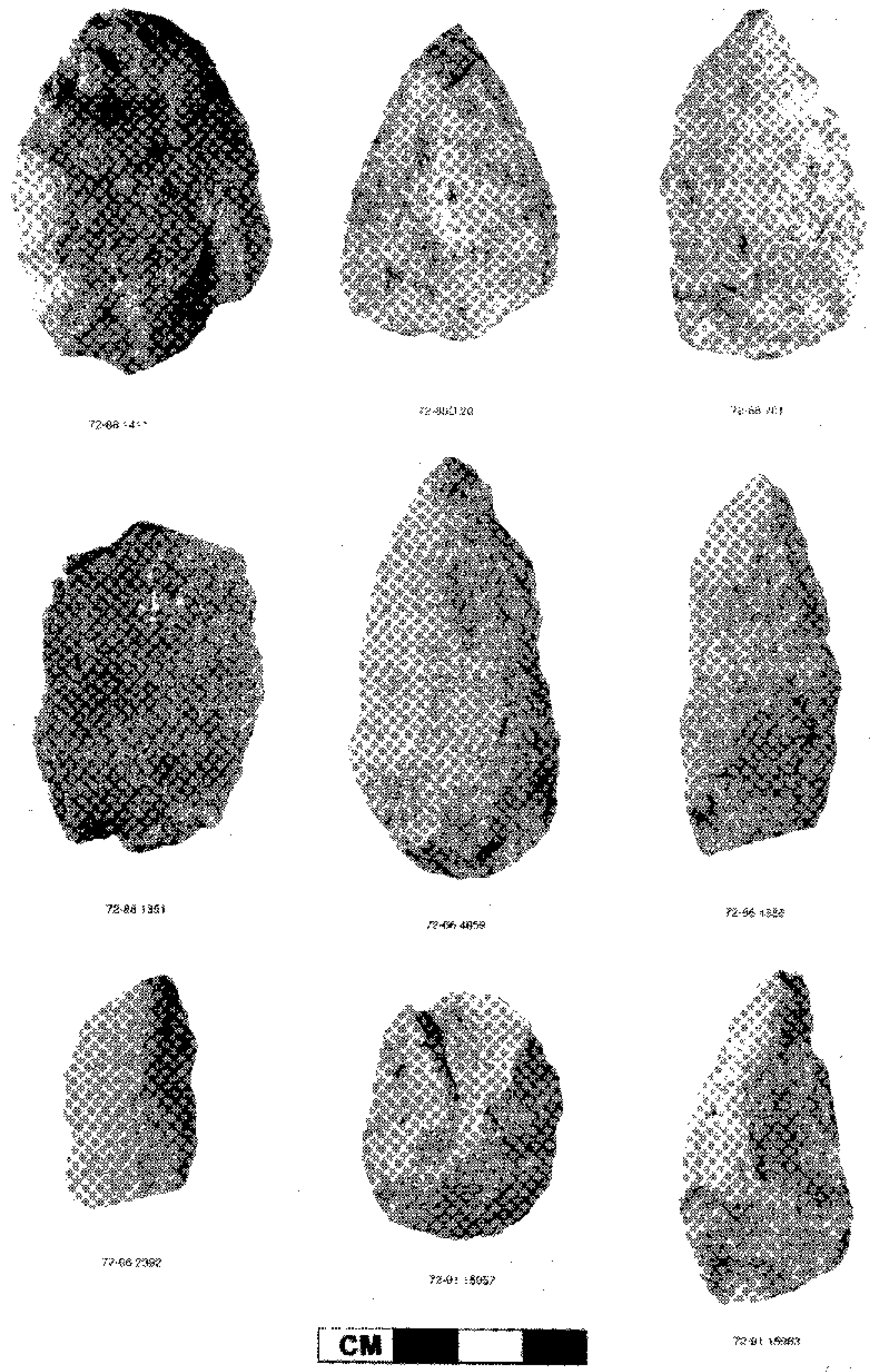

Figure 6. Representative Middle Archaic projectile point preforms and bifaces. All are manufactured from quartzite. 72-88D 20 and 72-88 701 were recovered outside of the main excavation block.

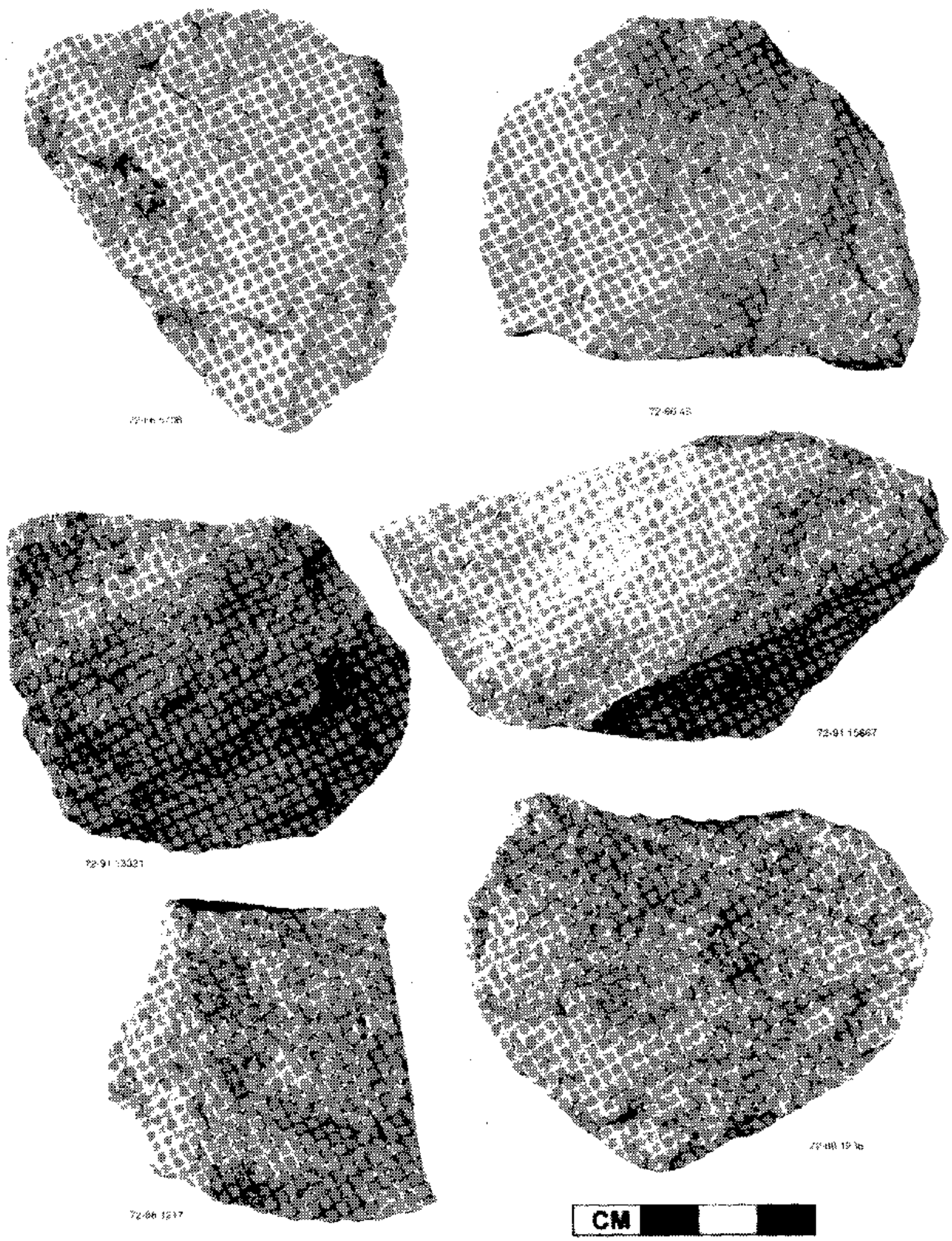

Figure 7. Representative large Middle Archaic flake knives or choppers. All are manufactured from quartzite. These tools are interpreted as heavy-duty butchering implements.

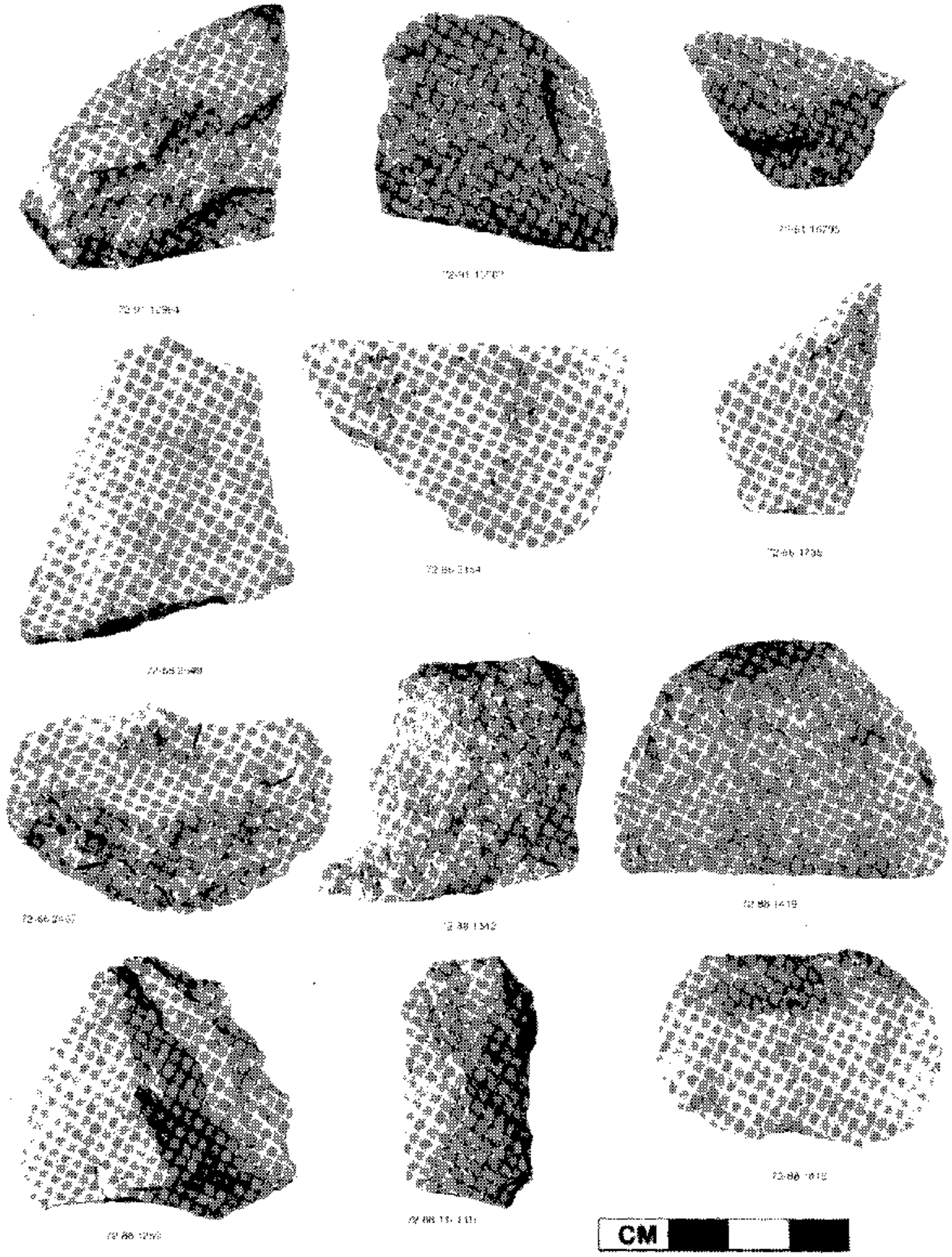

Figure 8. 72-91 1264, 72-91 13567, 72-66 2549, 72-66 3154, 72-66 4735, and 72-88 1161.01 are representative small Middle Archaic flake knives. 72-88 1269 is a denticulate flake knife. 72-91 15795 and 72-88 1342 are a utilized flake tools. 72-66 2407 is a semi-lunar biface knife. 72-88 1419 and 72-88 1616 are steep-bitted scrapers. All are manufactured from a variety of quartzites with the exception of 72-66 4735 (gneiss) and 72-88 1616 (quartz).

apparent. Tool concentrations are generally associated with areas of higher debitage density, although at sites 72-88 and 72-91 some tools were located in peripheral areas of very low waste-flake production. Sites 72-88 and 72-91 are large sites with evidence of additional Middle Archaic loci beyond the block excavations discussed here.

Individual Site Descriptions

Each site deserves a brief synopsis of setting, artifact content and artifact distribution. Site 72-66 is located about 0.5 km south of Cedar Swamp on a small stony knoll tucked below a steep hill rising to the south (Figure 3). A small perennial spring-fed wetland lies between the knoll and hill, draining west and then north into Cedar Swamp. The Middle Archaic component of this site was excavated in 1996 in conjunction with the examination of a late 18th Century farmstead. Diagnostic tools indicate repeated temporary use of this overall unremarkable location from the Early Archaic period through the Historic. Except for the abundance of late 18th Century artifacts, those of the Middle Archaic period are most common.

Tools and debitage form two distinct clusters (Figure 9). The northeastern cluster is indicated by the presence of reddish-brown felsite and quartzite debitage, which share a common distribution. Sixteen tools are associated with this area, most of which are believed to be contemporaries. This suggests that a Merrimack-like red-brown felsite stemmed point (Figure 5:72-66 1259) may be part of the same assemblage as a number of small quartzite Neville-like points. If this is the case, this Neville-like form may represent a seventh millennium variety. Small Neville-like points (Figure 5:72-66 3979, 4250, 4357, 4387, 4804) were also recovered in the southwestern cluster where they appear spatially associated with four untyped concave-based quartzite bifaces; two are crude in manufacture while two are more delicate (Figure 10:72-66 673, 4088, 4099, 4031). Remarkably similar crude concave-based bifaces are reported in association with Morrow Mountain I strata at the Cactus Hill site in Virginia (McAvoy and McAvoy 1997:50). Again, the evidence is suggestive of a seventh rather than eighth millenium date for these artifacts. Site 72-66 contained a much greater proportion of biface fragments than the other sites as well as a quartzite chipped-stone semi-lunar flake-knife (Figure 8:72-66 2407). Overall, debitage counts were very low, suggesting that tool repair and manufacture were not central activities at this site.

Site 72-88 was excavated in preparation for the construction of the Pequot Museum and Research Center in 1995. The site sits upon a broad sandy terrace overlooking Cedar Swamp which lies less than 100 m north (Figure 3). A small perennial stream flows into the swamp about 50 m to the west. The main block shown in Figure 11 was excavated primarily to examine two dozen deep historic period pit features of unknown function. In the course of excavation a large number of Middle Archaic tools were recovered as well. The original creation of the pit features sometime between 1600 and 1800 AD probably affected the distribution of tools and debitage at this site. Nevertheless, a degree of patterning remains apparent in the distribution of artifacts.

Quartz and quartzite debitage dominate the north-central portion of the excavation block, indicating relatively intensive tool production in this area. Four flake knives and three Neville Variant points were found near this knapping area. A secondary cluster of tools dominated by Neville points, with little associated debitage, is located 5 m south. A short distance to the west lies a third loose cluster of Middle Archaic artifacts containing intermittent low-density debitage nodes. While the artifacts recovered from this block could represent the remains of a single occupation, the distinct artifact clusters and variety of Middle Archaic projectile point styles (including Neville, Neville Variant and Stark) suggest repeated occupations of the same land surface during the eighth millennium BP. Except for a single probable Early Archaic Parallel Stem point (Figure 10:72-88 1310) and the base of an untyped lanceolate biface, no other diagnostic projectile points were found in this block. A relatively high proportion of point preforms occurs at this site, though only one is associated with the knapping area (Figure 6:72-88 1411, 20, 701, 1351).

Site 72-91 is located in a comparable topographic position to site 72-88 and lies less than a quarter kilometer west of it (Figure 3). Soils at this site are much rockier, however. The north-central excavation block examined here was excavated during a University of Connecticut field school session in the summer

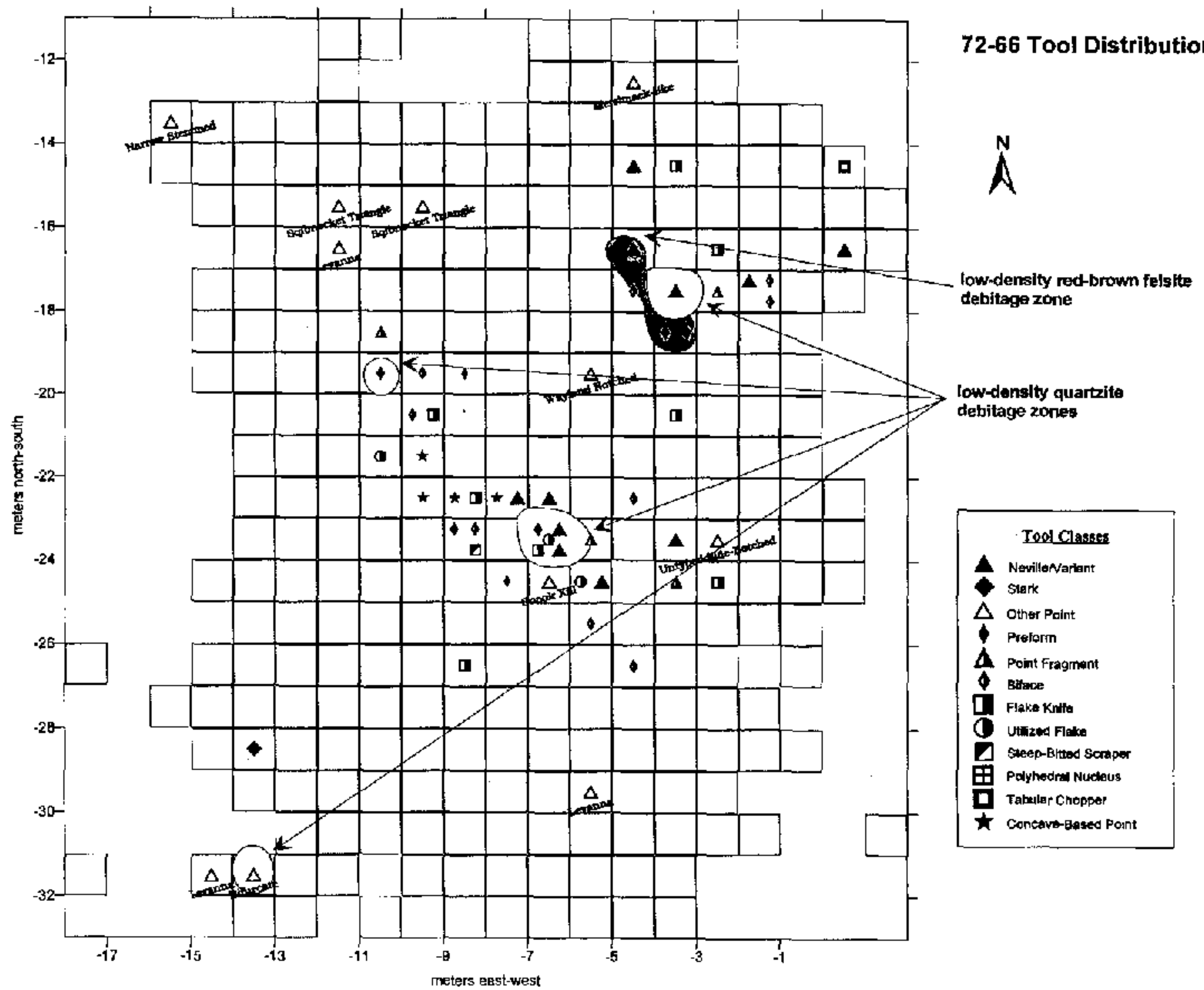

Figure 9. Stone tool distribution at site 72-66. Non-Middle Archaic diagnostic tools are labeled. Tool distribution indicates northeastern and southwestern artifact concentrations which may correspond with separate occupation episodes.

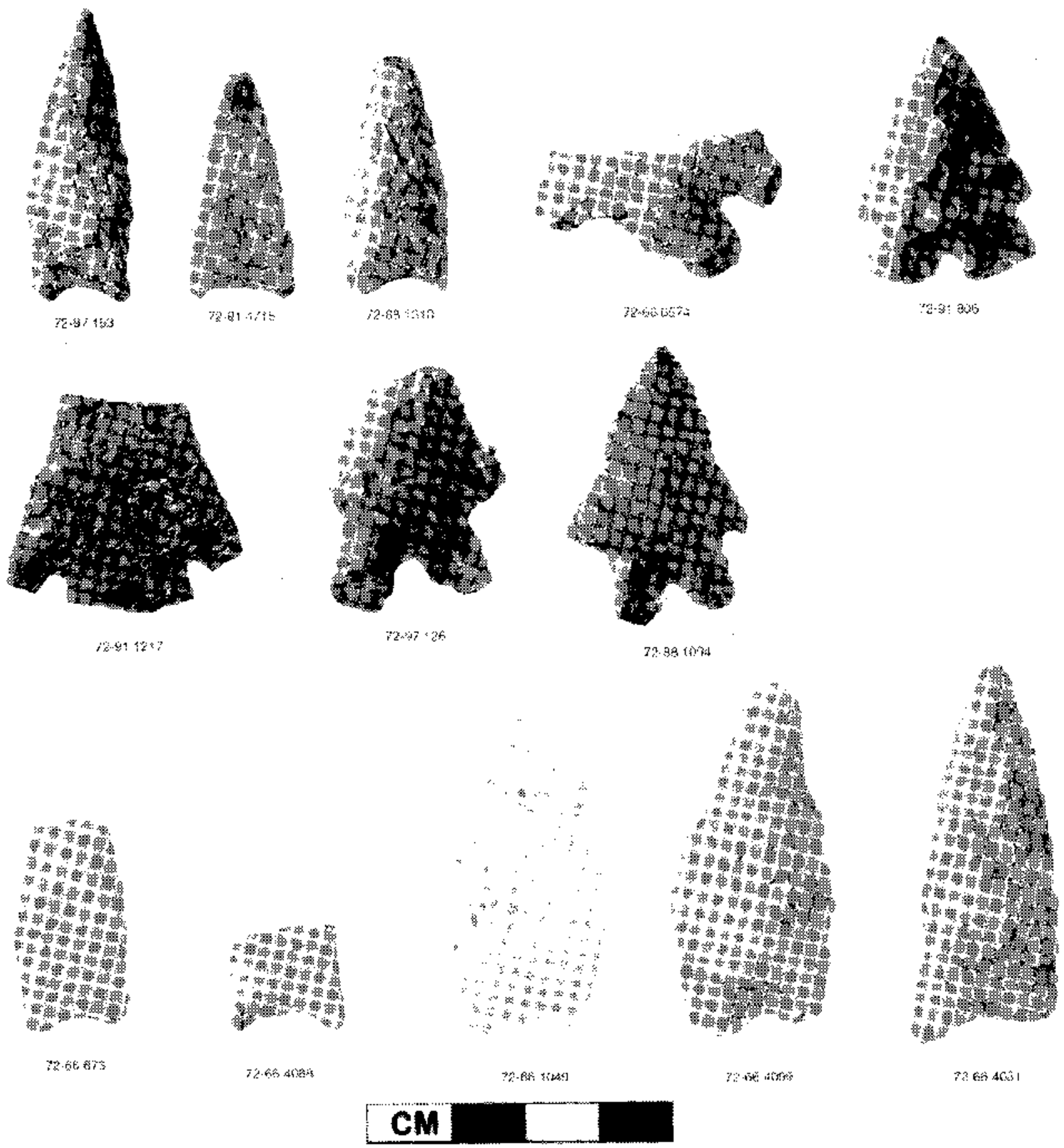

Figure 10. Representative Early Archaic projectile points and untyped concave-based bifaces from Mashantucket. Early Archaic Parallel Stem points: 72-97 153 (gneiss), 72-91 4715 and 72-88 1310 (both quartzite). Bifurcate points: 72-66 6574 (rhyolite), 72-91 806 (chert), 72-91 1217 (rhyolite), 72-97 126 (chert), 72-88 1094 (chert). Concave-based bifaces from site 72-66, numbers 673, 4088, 1049, 4099, and 4031. All are manufactured from quartzite with the exception of 1049 which is quartz. This biface was found outside of the main excavation block.

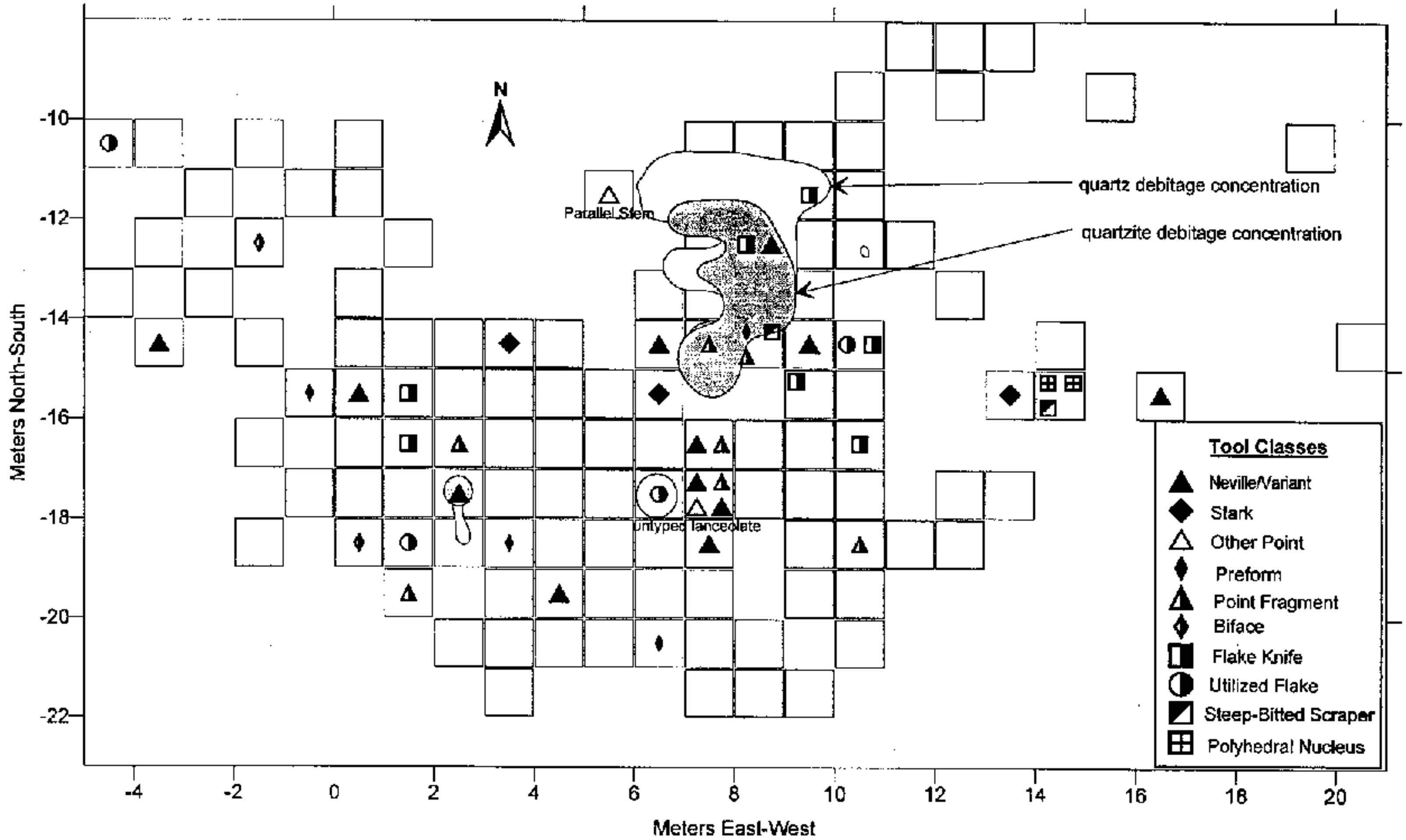

Figure 11. Stone tool distribution at the main excavation block at site 72-88, location of the existing Mashantucket Pequot Museum and Research Center. Two non-Middle Archaic projectile point types are labeled. A heavy quartz and quartzite knapping area is indicated in the north-central section of the block.

of 1995. Excavation at this site has focused on the late seventeenth century Pequot fort located in 1992. Because of the importance of very small artifacts such as trade beads, 1/8-inch mesh screens have been used in excavations. This has resulted in the recovery of smaller elements of the lithic debitage assemblage and thus higher recovery rates. Despite this, flake densities in knapping zones at site 72-91 were somewhat lower than those of 72-88.

While concentrations of debitage and tools occur at this site, they are less clear than at the other two sites (Figure 12). Debitage concentrations, tool distributions and projectile point typology strongly suggest that a minimum of four occupations occurred upon this land surface during the eighth and seventh millennia. Nine Neville and Neville-like points were found in association with a quartz and quartzite knapping area in the northeast corner of the block. The flakes and points were found with two flake knives, a utilized flake and a number of biface fragments. A very large, thick untyped quartz stemmed point was also found within 2 m of the center of this artifact concentration (Figure 5:72-91 16109). This very robust point or knife is probably part of the Neville assemblage. A large number of Middle Archaic projectile points are scattered in the center of the excavation block amidst three knapping areas. Quartz debitage was particularly dense in one of these. Point types include Neville, Neville Variant, Neville-like forms and two small Morrow Mountain I-like points. Individual examples of a flake knife, utilized flake, preform and chopper were found in this general area as well. A chert side-notched point most similar to the Early Archaic Fort Nottoway type was also found in this location, though its association with the other artifacts is unclear. Artifacts from this part of the site appear to represent the remains of repeated very short-term occupations. Debitage distribution suggests that excavations in the southeast corner of the block partially exposed a third Middle Archaic activity area which included Neville, Neville-like, and Stark points as well as three utilized flakes and a possible drill tip. A short distance separates distinct quartz and quartzite knapping areas. The western portion of the block contains a very loose grouping of artifacts with no debitage associations. Tools include four Neville points, two simple shaft drills, and two utilized flakes. The proportion of Middle Archaic projectile points at this site is nearly twice that of the other two indicating focused hunting tool repair (Table 2).

Summary of Finds

The nature of the Middle Archaic sites at Mashantucket suggests repeated short-term use of the resources provided by Cedar Swamp. Food resources are undocumented to date, but presumably included wetland plant foods, such as cattail, and hazelnuts which are well documented for the preceding Early Archaic period at Sandy Hill (Forrest 1999). Such plant foods may have been supplemented by game acquired through small mammal hunting or trapping and reptile gathering (see e.g., Spiess 1992). The pine-oak-shrub forests surrounding Cedar Swamp provided an ideal habitat for white-tailed deer as well. The importance of white-tailed deer during the Middle Archaic period is well documented in the Southeast (e.g., Styles and Klippel 1996:118). Dincauze and Mulholland (1977) believe this animal was an important component of the diet in the Northeast at this time as well. The abundance of projectile points and fragments suggests that hunting was one of the primary activities associated with these sites.

The dispersed pattern of artifacts and lack of any features or structural remains could indicate limited warm-weather activity. The sites suggest that Mashantucket was used regularly between 8,000 and 6,000 years ago on a short-term seasonal basis by relatively small groups of hunter-gatherers. The tool assemblages suggest that site activity was focused on hunting and butchering. While they may represent family-sized residential camps, it is plausible that most of the Middle Archaic sites at Mashantucket functioned as logistical support camps for larger residential base camps located elsewhere. The Mashantucket sites therefore likely represent a very limited aspect of a more complex settlement and subsistence system with a focus in eastern Connecticut. Nevertheless, the presence of occasional non-local rhyolites in the lithic assemblage suggests that Middle Archaic groups maintained connections with eastern Massachusetts, and perhaps even foraged seasonally in the Boston Basin area. I assume that the people who visited Mashantucket used coastal, lacustrine and riverine resources at other times of the year when these areas

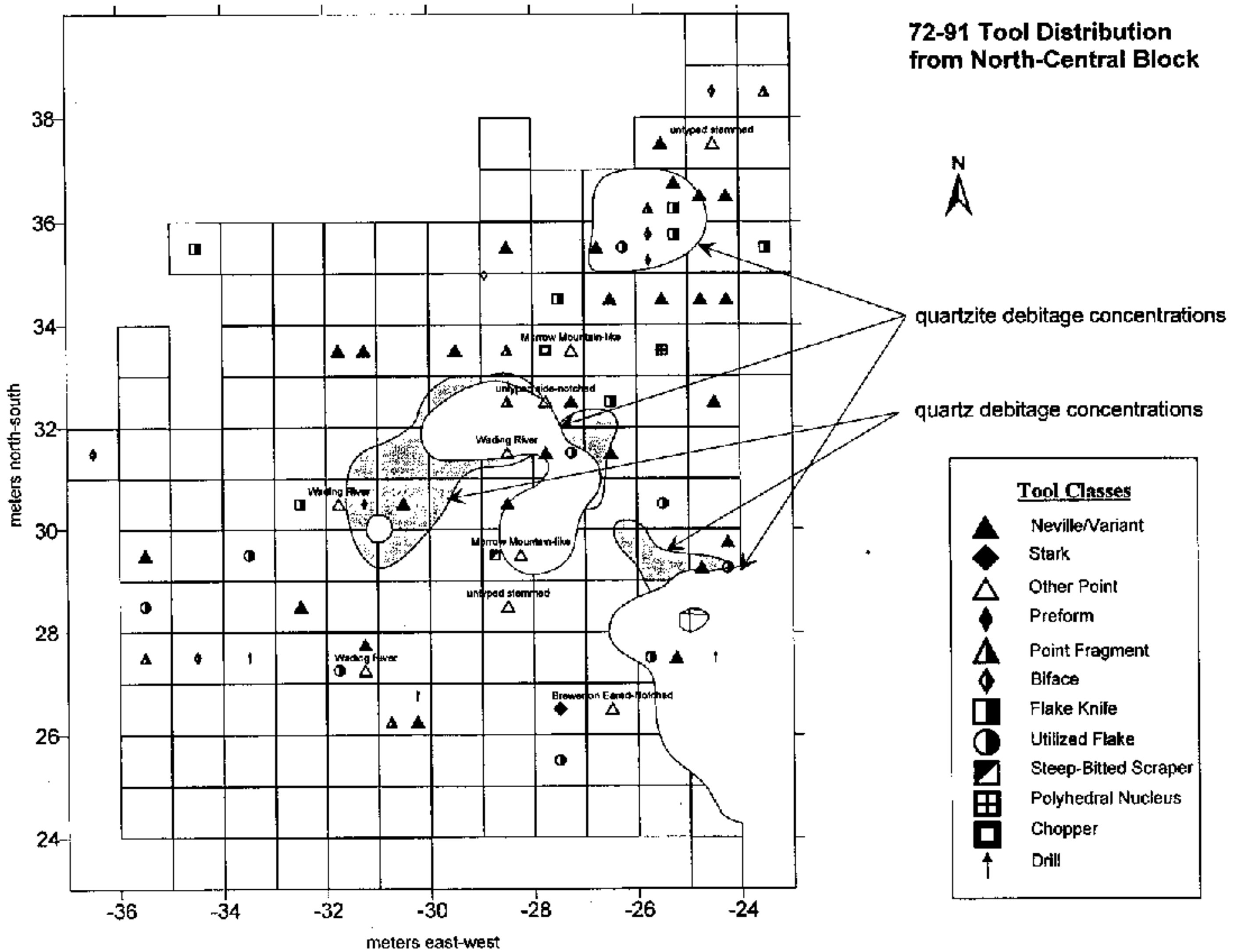

Figure 12. Stone tool distribution at the north-central excavation block at site 72-91 (the Pequot Fort). Non-Middle Archaic tools and two Morrow mountain-like points are labeled. Discrete knapping areas and tool distribution suggest multiple Middle Archaic occupations at this location. Middle Archaic projectile points were notably abundant at this site.

provided abundant and predictable resources. The density of sites located around the Great Cedar Swamp is probably typical of similar settings across the state.

Middle Archaic Projectile Point Variation at Mashantucket

The brief description of these three sites suggests that a high degree of variability is found among Middle Archaic projectile point styles at Mashantucket. The projectile point typology of this period is moderately well understood in the region, but remains rather poorly fixed chronologically. Neville stemmed points, as defined by Dincauze (1976), have been securely dated to the first half of the eighth millennium BP in southern New England (Dincauze 1976; Pfeiffer 1986; Bunker 1992; Maymon and Bolian 1992; Thorson and McBride 1988). Regional dates correspond well to the accepted date range of the Neville/Stanley type across the eastern seaboard (e.g., Egloff and McAvoy 1990; Anderson 1991). The rounded-based Neville Variant point, also described by Dincauze at the Neville type-site, is often found in association with Neville points, but it is unclear if the two types are contemporaries or simply close typological relatives separated by a short span of time. Stark stemmed projectile points are believed to date to about 7,000 BP, but confirmation of this remains elusive.

More poorly understood is the host of Neville-like points such as those recovered from sites at Mashantucket. Many of these are quite small with square stems thinned by the removal of a single flake taken from the base (e.g., Figure 5:72-91 16172, 16011; 72-66 4250). Others have oblique stem bases, some with evident striking platform remnants (e.g., Figure 5:72-66 3188; 72-91 12353, 9264). Some have distinctly barbed shoulders (e.g., Figure 4:72-91 13297). While these points may all be contemporaries of the Neville type, some are also similar to the Mid-Atlantic coastal Morrow Mountain square-based points of the seventh millennium BP. Mid-Atlantic stylistic affiliations are demonstrated by the presence of Morrow Mountain I-like points at site 72-91 (Figure 5:72-91 11079, 13266). These points are well dated in the Southeast to between 7,200 and 6,500 BP (Egloff and McAvoy 1990:73) and I assume they date to the early seventh millennium in the Northeast as well.

Merrimack points and analogs are relatively well dated to about 6,000 BP and mark the transition to the Late Archaic period in southern New England (Dincauze 1976; McBride 1984b). Merrimack-like points and a quartz cobble assemblage were dated at the Hathaway-Bugbee site in West Hartford to 5960±250 BP (McBride 1984a). Other, less well-defined stemmed point styles exemplified by the stemmed felsite point from 72-66 (Figure 5:72-66 1259) may be related to the Merrimack type, but their chronological placement is not secure. Associations at Mashantucket suggest that such points may have been in use at the same time as the small Neville-like forms, possibly during the seventh millennium BP. The untyped rather crudely manufactured concave-based bifaces recovered from site 72-66 may also date to this period (Figure 10:72-66 1049, 4099, and 4031).

The excavation of small, scattered camps such as those surrounding Cedar Swamp has the potential to yield important typological information resulting from very brief episodic occupations. This potential has been stymied by the fact that most of the sites examined appear to represent palimpsests of material resulting from multiple occupations - despite their relatively small size. The general chronology of the period is also hampered by a severe lack of sites with well-dated associated features. It seems that at Mashantucket, Middle Archaic visitors had no reason to produce the type of deep charcoal-rich features commonly associated with the Late Archaic period. The lack of evident features supports the interpretation that the Mashantucket sites were of very short duration.

DISCUSSION

The stylistic roots of the Middle Archaic lithic tradition in southern New England lie within the late Early Archaic bifurcate phase. While the cultural transmission of new ideas and technologies to indigenous populations of New England is feasible, I nevertheless believe that an actual movement of bifurcate point makers to the region occurred. These people appear to have arrived from the Mid-Atlantic coastal region during the last half of the ninth millennium BP. This is probably more evident at Mashantucket than elsewhere in the state at this time. It appears that the pit-house dwellers of the extensive Early Archaic Sandy Hill site (72-97) left Mashantucket shortly after 8,500 BP (Forrest 1999). These people shared a unifacial tool and groundstone technological tradition with other Early Archaic peoples of New England known as the Gulf of Maine Archaic (Robinson 1992). While bifaces of any kind are extremely uncommon within this tradition, it appears that Parallel Stem points (Fowler 1969) are associated with this period at Mashantucket (Figure 10:72-97 153). Such points have been found at sites 72-88 and 72-91 as well (Figure 10:72-88 1310; 72-91 4715). These hunter-gatherers may have had deep regional roots tied to Late Paleoindian peoples who had adapted to the changing environmental conditions of New England's early Holocene (Jones 1998). They were as adept at the harvest of local plant foods as in the manufacture of tools from readily available stone materials such as quartz and gneiss. This tradition appears to have shifted north and east of the Kennebec River in Maine with the appearance of bifurcate and Neville point makers (Spiess *et al.* 1983, Robinson 1992), but survived in central Maine to as late as 6,000 BP (e.g., Sanger 1996).

Eight bifurcate points have been recovered from the terraces surrounding Cedar Swamp (e.g., Figure 10:72-66 6574; 72-91 806, 1217; 72-88 1094; 72-97 126). All are stray finds without clear associations with tools or tool-making debris. This suggests very limited, hunting-oriented activity at Mashantucket at this time. The points are manufactured from chert and rhyolite in equal numbers. None of their makers made use of the local stone materials used both before and after their arrival. No doubt, within a generation or two, people of the Early Archaic bifurcate tradition became more familiar with regional resources. This is certainly the case in eastern Massachusetts where the majority of such points are manufactured from the locally available rhyolites (Johnson 1993). The Taunton River Valley may even have been a core area of settlement at this time (Taylor 1976; Dincauze and Mulholland 1977).

The Kanawha-stemmed point represents the typological intermediary between bifurcate points of the late Early Archaic and Neville stemmed points of the early Middle Archaic. A few points similar in style have been found at Mashantucket, where they are manufactured from the local quartzites so typical of the Middle Archaic period (Figure 4:72-91 13546, 72-52 15). It appears that by about 8,000 BP the new population had familiarized itself with local lithic materials and had become focused on the resources of eastern Connecticut. After 7,800 BP, makers of Neville and Neville-Variant points were visiting Mashantucket regularly for short periods of time to harvest the rich local resources of the Cedar Swamp basin. The abundance of projectile points and projectile point manufacturing debris indicate that hunting remained one of the focused activities at Mashantucket at this time. If white-tailed deer was the major target of such hunting, it is reasonable to suggest that Middle Archaic foragers began periodically burning the forests to promote vegetative regrowth and attract game to the area at this time.

After about 7500 BP the climatic shift to dry-warm Hypsithermal conditions resulted in the desiccation of Cedar Swamp. The archaeological record thereafter becomes less clear. The presence of rare Stark, Morrow Mountain I, and Merrimack-like points suggests that occasional harvesting forays to the basin continued to occur throughout the seventh millennium BP, though in very reduced numbers. Currently, Mashantucket appears nearly devoid of a regular human presence during the second half of the Middle Archaic. If, however, certain of the small, square-based Neville-like points can be shown, as is suspected, to date to this period this picture will change.

The difficulty in establishing clear typological correlations among points of the seventh millennium (and probably into the sixth) could be a result of the development of regional stylistic traditions. Such parochialism may be tied to continued adaptation to local resources and concomitant shrinkage of social and economic ranges. It remains unclear how the middle Holocene dry-warm period, which presumably reduced certain aspects of the resource base, might have provoked this effect. Were populations perhaps drawn more permanently to the major river bottoms where environments were less affected by lower water tables? These settings were certainly becoming more attractive at this time. As the rate of sea-level rise slowed during the middle Holocene, developing alluvial terraces began to produce more complex microhabitats with ox-bow ponds and marshes in the lower reaches of the major river valleys. This conjecture emphasizes the burgeoning importance of riverine settings and is similar to the "ecological leveling hypothesis" presented by Nicholas in 1988 and reiterated in a recent review (Nicholas 1998). The model suggests a habitation shift away from large interior wetlands with the onset of Hypsithermal conditions after about 7,500 BP.

The apparent middle Holocene hiatus does not end with the beginning of the Late Archaic in Connecticut. In fact, the archaeological record does not become apparent again until a few centuries after 5,000 BP. It is unlikely that the region was uninhabited at this time. However, sites dating to the period between 6,000 and 5,000 BP are quite rare. Again, this may in part be a typological issue: regional point styles from this period may simply be too poorly understood. If the population were comparable to that of earlier or later times, however, one would expect a more complete record. Examination of local projectile point collections indicates that Otter Creek points occur, albeit in very low numbers. In fact, these points are so uncommon in southeastern Connecticut that they could represent the traces of subsistence forays into the region by non-local groups.

To resolve some of the questions raised here Connecticut archaeologists must initiate excavations within the deeply stratified alluvial floodplains of the lower Thames, Connecticut and Housatonic River valleys. These settings will provide the necessary stratigraphic separation of components to resolve some of the settlement-subsistence and typological questions raised here. They may also provide a better context for finding longer-term residential sites where datable features will be more common than they have been in the uplands. Such sites should also contain a broader range of tool types than the small, short-term camps at Mashantucket. I suggest that the first places to look for such sites are the paleo-falls and rapids along these rivers. With the current drowning of the Connecticut River Valley, the present first rapids exist well upriver at Windsor Locks. During the Middle Archaic period, while sea-level was between 20 and 10 m lower than today (Gayes and Bokuniewicz 1991), similar rapids or falls would have been located much farther seaward. The state-level Middle Archaic site distribution presented above, as coarse-grained as it is, suggests that the area around Haddam and East Haddam is particularly rich in Middle Archaic sites. The river terraces of these towns are my first candidates for the location of rich, deeply buried Middle Archaic sites.

CONCLUSIONS

The state-level data and in particular the record from Mashantucket indicate that the Middle Archaic period of Connecticut is relatively rich in sites. However, our overall understanding of it remains quite incomplete. The middle Holocene was a period of dynamic climate change that must have directly affected the subsistence systems of local hunter-gatherer populations. The data from Mashantucket indicate that large interior wetlands such as Cedar Swamp were seasonally important to subsistence pursuits during the Neville phase, between about 8,000 and 7,000 BP. Settlement models proposed here and elsewhere suggest that subsistence activities became more intensively focused on the valley floor settings of the major river drainages with the onset of the Hypsithermal after about 7,500 radiocarbon years ago. The subsequent deep burial of the largest seasonal base camps by increased alluviation during the middle Holocene may in part be responsible for the apparent lack of sites between 7,000 and 5,000 BP.

The variety of Middle Archaic projectile point forms recovered from just three sites at Mashantucket suggests that some may have been in use well into the seventh millennium BP. This implies that the lack of clear typological control for this period may also be responsible for the apparent hiatus. I have suggested that the best way to resolve both subsistence and typological issues is to excavate deeply stratified sites along the lower reaches of any of the state's major river valleys. State-level site distribution data suggests that one of the best places to start would be the floodplains of Haddam and East Haddam in the lower Connecticut River Valley.

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THE ARCHAIC FLORESCENCE: THE LATE AND TERMINAL ARCHAIC PERIODS OF CONNECTICUT AS SEEN FROM THE IROQUOIS PIPELINE

DANIEL F. CASSEDY

ABSTRACT

This article presents an overview of the Late and Terminal Archaic periods of Connecticut prehistory that was derived from the Iroquois Pipeline research of the early 1990s. In 1990 and 1991, the Iroquois Gas Transmission System (IGTS) sponsored extensive archaeological research along the route of a new pipeline corridor from the St. Lawrence River to Long Island. In Connecticut, this corridor traversed the Housatonic River drainage through New Milford, Brookfield, Newtown, Shelton, and Milford. This multi-year project identified 540 archaeological sites (182 in Connecticut) and collected Phase II evaluation data from 192 of these. Forty of the sites (14 in Connecticut) had detailed data recovery excavations conducted as part of an impact mitigation program.

INTRODUCTION

As Co-Principal Investigator of the project for Garrow & Associates, Inc. (now TRC Garrow), I had the rare opportunity to analyze a large data set from this regional transect across the Mohawk, Hudson, and Housatonic river valleys. The overview presented here was adapted from a Technical Synthesis of the entire project (Cassedy 1996) sponsored by IGTS. The Technical Synthesis was based to a great extent on my dissertation submitted to the State University of New York at Binghamton (Cassedy 1992).

CHRONOLOGY AND MODELS OF THE LATE ARCHAIC

Prior to the 1960s, Late Archaic sites were virtually the only Archaic period sites recognized in the Northeast. William Ritchie's work at sites like Lamoka Lake in New York had produced his seminal definition of an "Archaic" stage of culture in North American prehistory (Ritchie 1932), but no earlier complexes were known.

Throughout the Northeast, archaeologists now recognize the Late Archaic period as one in which the numbers and types of sites increase dramatically—what Snow (1980:187) describes as the Late Archaic "florescence". Unlike the earlier time periods, interpreters of Late Archaic assemblages have to contend with a sometimes confusing and complex array of data. Based on his work in New York, Ritchie recognized two major Late Archaic trajectories, the Lamoka and the Laurentian, which overlap in both time and space. Both trajectories are also represented in Connecticut, but there is a lack of agreement concerning their relationship.

Following Tuck's (1978) definition of the Lamoka/Sylvan/Squibnocket complexes of central and southern New York and New England as the "Mast Forest Archaic", Snow (1980:226) proposed that we designate the Laurentian complex and related assemblages in northern New England and the St. Lawrence drainage as the "Lake Forest Archaic". As Snow described them, these two complexes coexisted at times during which each was more common within a particular geographic region. This scheme supposes that there was a "marginal belt of tension between the two coeval zones that persisted throughout the Late Archaic" (Snow 1980:227). In this scheme, Lake Forest Archaic sites were thought to be most common north of the Mast Forest Archaic manifestations. More recent research has documented that Laurentian expressions are also relatively commons in the lower Hudson Valley and in Connecticut (Pfeiffer 1984, 1990, 1992; Funk 1988:28).

The Lake Forest (Laurentian) Archaic

The Laurentian was originally defined by Ritchie as an extensive cultural continuum spread throughout northeastern North America:

> . . . with its major area of development and diffusion within southeastern Ontario, southern Quebec, northern New England, and northern New York. Its most diagnostic traits, occurring in considerable morphological variety, comprise the gouge; adze; plummet; ground slate points and knives, including the semi-lunar form of ulu, which occurs also in chipped stone, simple forms of the bannerstone, a variety of chipped-stone projectile points, mainly broad-bladed and side-notched forms; and the barbed bone point [1969:79]. . . .

Although Ritchie believed that Lamoka was the oldest Late Archaic tradition, more recent research has documented that Laurentian manifestations appeared as early as the last centuries of the sixth millennium BP. Initially, the Laurentian in New York was subdivided into three phases — Vergennes, Brewerton, and Vosburg—based on projectile point morphology and, to some degree, chronology. These phases extend from about 5,500 to 4,300 BP. (Funk 1988:36). Subsequently, the discovery of Otter Creek and Brewerton Side Notched projectile points dating to the fifth and early sixth millennia BP. led Funk to posit a "Proto-Laurentian" assemblage composed of "broad side notched points with ground bases and notches generally resembling Otter Creek and Brewerton side notched points" (Funk 1988:29), along with "biface knives, a variety of unifacial end and side scrapers, and common forms of 'rough stone' tools such as hammerstones and pitted stones" (Funk 1991:9). Absent from this assemblage are the groundstone tools found in true Laurentian assemblages. Funk has labeled this Proto-Laurentian manifestation the South Hill phase, which he places between approximately 6,200 and 5,500 BP, based on five radiocarbon dates from four sites Funk (1991).

Funk and others (Tuck 1977:37) suggest that the Proto-Laurentian assemblages are "closely allied with Middle Archaic complexes of the Southeast and Midwest, chiefly identified by Raddatz, Modoc Side Notched, Big Sandy, and other large, notched points similar to the Otter Creek type" (Funk 1991:9). They suggest that groups of people actually moved into the Northeast, bringing their familiar tool types with them, or alternatively, that a successful adaptation involving the use of these types of tools gradually spread from a homeland in the Midwest or Southeast into the Northeast during the earliest part of the Late Archaic period.

Although Snow (1980) suggests that the Lake Forest Archaic sites are primarily a northern New England manifestation, and only appear in sparse numbers in western Connecticut between 5,500 and 4,500 BP., Pfeiffer (1984, 1990, 1992) has compiled evidence that the Lake Forest Archaic in Connecticut is a widespread tradition firmly dated to the period between 5,000 and 4,200 BP. Pfeiffer (1984:85) notes that "the Late Archaic period also witnessed an increase in the importance of gathering activities, the employment of storage, and an expanded duration of settlement".

McBride (1984a) has designated those elements of the Lake Forest (Laurentian) tradition that occur in southern New England (notably Brewerton and Vosburg projectile point styles) as the Golet phase, which he considers to be a regional variant. Brewerton and Vosburg points are widespread in the artifact assemblages for western Connecticut (Swigart 1974:10; Lavin and Russell 1985) and are well represented throughout the state of Connecticut (Pfeiffer 1984:74). Just recently, Lavin *et al.* (1999) have documented a substantial residential site in New Milford that has extensive evidence of hearth features and post mold patterns. The site produced both Lake Forest (Otter Creek) and Mast Forest (Narrow Point) diagnostics, and three of the hearths have been radiocarbon dated at an average of about 4,375 BP. Unfortunately, the radiocarbon dates cannot be assigned to specific diagnostic types.

McBride suggests that populations associated with the Lake Forest tradition in Connecticut likely consisted of small mobile bands exploiting a broad range of ecozones and resources (McBride 1984a:249, 252; McBride and Dewar 1981:48). He describes Brewerton sites in eastern Connecticut as being evenly distributed between riverine and non-riverine areas, with a dispersed settlement pattern and limited evidence of seasonal aggregations. If aggregations did occur, he feels it is likely that either the groups were small, or did not remain for long periods of time (McBride 1984a:252).

Pfeiffer (1984:76-77), however, contends that the Lake Forest inhabitants may have been sedentary and perhaps territorialistic. This assertion is based on evidence that he collected from a Lake Forest component at the Bliss site in Old Lyme, Connecticut where structural outlines, compact living floors, and elaborate mortuary ceremonialism were associated with an artifact assemblage containing many of the traits included on Ritchie's (1980) attribute list for the Laurentian tradition.

Pfeiffer (1984:77) suggests that subsistence during the Lake Forest Archaic was based on a specialized or focal adaptive strategy, consisting primarily of year-round hunting, with fishing and plant gathering occasionally contributing to the diet. This adaptive strategy is more likely to be selected by populations interested in high quantities of resources, and generally will not occur unless the primary resource, such as that available in a deer-turkey biome, is highly dependable (Snow 1980:15, 151).

The Mast Forest Archaic (Narrow Point Tradition)

Ritchie's "Lamoka People" (1980:43) occupations date to as early as 4,500 BP in New York and to as late as ca. 3,700 BP. Although Ritchie originally asserted that the Lamoka phase began before the Laurentian, more current evidence supports Funk's (1976, 1993) assessment that early Laurentian components predate the appearance of narrow point traditions, particularly in eastern New York.

What Ritchie first defined as the Lamoka culture in the Finger Lakes region has been shown to be associated with a horizon of small narrow stemmed projectile points that extends across southern New England, and includes such types as the Sylvan and Wading River points from the Hudson Valley and southeastern New York, and the Squibnocket complex from southern New England. Although some researchers have proposed that the Lake Forest tradition coexisted with the Narrow Point tradition (Ritchie 1969; Dincauze 1968, 1974, 1975; Snow 1980), others (McBride 1984a: 247-248) consider the Lake Forest (Golet phase) as temporally distinct from the Mast Forest (Tinkham phase).

Mast Forest Archaic sites are numerous and occur in a "wide variety of local settings" (Snow 1980: 230). The settlement system likely consisted of "central based wandering" by highly territorial groups (Dincauze 1974:48, 1975:25; Snow 1980; McBride 1984a, 1984b:65). Population aggregations occurred along major drainages and interior wetlands, with movement between habitation sites prescribed by seasonal availability of resources (Dincauze 1974:48, 1975:25; McBride 1984a, 1984b:65; Snow 1980).

Mast Forest site distributions for the lower Connecticut River valley suggest an increase in frequency and size for sites utilized as base camps, seasonal camps, and special purpose camps during the Late Archaic period (McBride and Dewar 1981:48). Swigart (1977:70) has noticed a similar proliferation of sites in the upper Housatonic drainage. With populations aggregating near riverine areas or large interior wetlands, the base and seasonal camps were augmented by temporary and task-specific campsites associated with a wide range of exploitation of a variety of micro-environments, especially the upland/highland areas which were intensively used by small mobile groups (McBride 1984a:262; McBride and Dewar 1981:48; Swigart 1977:70).

The subsistence base of the Mast Forest tradition probably consisted of a generalized, or diffuse adaptation (Dincauze 1974, 1975; McBride 1984a). Although a major source of food for the Mast Forest Archaic was white-tailed deer, this was supplemented by a broad range of vegetal foods, particularly nuts, and a broad range of finfish and shellfish resources. Evidence of technological innovations such as weirs and nets first appear in the Late Archaic.

Coffin (1947) identified several such structures along the lower Housatonic River. Although he was unable to date these weirs, the construction techniques he describes are consistent with those dated to the Late Archaic period (cf. Pfeiffer 1983; Dincauze 1973:37; Johnston and Cassavoy 1978). In addition to the weirs in western Connecticut, Pfeiffer (1983) has excavated a weir structure associated with a Brewerton component on Bashan Lake in eastern Connecticut. Several other similar structures in the Northeast and Canada have also been dated to the Late Archaic period. The Boyleston Street weir in Boston yielded radiocarbon ages extending from 4,450 - 4,860 BP, and has been attributed by Dincauze (1973:37) to the Squibnocket complex of the Narrow Point tradition. A system of weirs has also been identified at Atherley Narrows in Ontario, at least two of which can be assigned to the Late Archaic period based on four radiocarbon ages extending from 4,375 - 4,560 BP. (Johnston and Cassavoy 1978).

Narrow points are commonly assigned to the Late Archaic period; however, Lavin, McBride, and others have suggested that the Narrow Point technological tradition may have even continued into Contact and historic periods (McBride 1984a:105; Lavin 1984:Figure 2). Specifically, evidence from the Connecticut River drainage of Connecticut indicates that the narrow-stemmed points traditionally associated with the Late Archaic continue to be found well into the Woodland period.

Swigart (1974) has dated points of this type in the Housatonic drainage to 2,700 - 2,500 BP.; Lavin and Salwen (1983:40) report similar data from their excavations at the Fastener Site in Shelton, and Pfeiffer (1990) and McBride (1984a) have dated Narrow Points in the lower Connecticut well into the Terminal Archaic and Early Woodland. As Funk (1984:134) points out, this contrasts with the well-established sequence from New York, where the narrow-stemmed traditions clearly do not extend beyond the end of the Late Archaic. Raber and Wiegand's recent excavations at the Hoosgow III site in Newtown produced a narrow-point (Wading River) occupation associated with a Late Archaic radiocarbon date of 3980±90 BP. They conclude that "the persistence of the narrow-point types beyond the Late Archaic has yet to be conclusively demonstrated in southwestern Connecticut" (Raber & Wiegand 1990:11).

CHRONOLOGY AND MODELS OF TERMINAL ARCHAIC

The end of the Archaic has sometimes been called the "Transitional" in reference to its presumed transitional status between the Archaic and Woodland periods. Since research continues to indicate that there is actually a great deal of cultural and biological continuity between the Archaic and the Woodland periods, Snow (1980:235) has suggested that the label "Terminal Archaic" is more appropriate.

The hallmark of the early part of the Terminal Archaic is the Susquehanna tradition of broad stemmed projectile points and their associated assemblages. These points include a number of regional varieties, including the Genesee, Perkiomen, Snook Kill, and Susquehanna Broad types in New York. This Susquehanna tradition of broad stemmed projectile points is analogous to Coe's (1964) Savannah River type from the southeastern United States. Characteristics of the Susquehanna Tradition include a marked preference for a riverine adaptation and a predilection for the fine-grained lithic resources of the Piedmont province including rhyolite, felsite, argillite, and slate (Dincauze 1975:27; Turnbaugh 1975:54).

The latter portion of the Terminal Archaic period is marked by the appearance of narrow tapered Orient Fishtail projectile points. Named for the type locations at Orient Point on eastern Long Island, Orient Fishtail points tend to be found on Long Island, in the Hudson Valley, and in southern New England (Ritchie 1971).

Another hallmark of the Terminal Archaic is the appearance of steatite (soapstone) cooking vessels towards the end of the Susquehanna tradition (which continued throughout the Orient tradition). These large steatite vessels suggest that "the people who made, traded, and used [them] had reached a point in the evolution of their settlement and subsistence systems where the use of heavy cooking vessels was advantageous" (Snow 1980:240). This implies that these people lived in more sedentary settlements, utilizing foodstuffs that required long processing with heat.

Pfeiffer (1984, 1992) has labeled the Susquehanna tradition in Connecticut as the "River Plain Tradition", which is derived from its apparent settlement pattern focus along the floodplains of the major river systems. Radiocarbon dates for the River Plain tradition place it between 3,600 BP and 2,700 BP in Connecticut. Pfeiffer (1990) describes it as "the direct descendant" of the Late Archaic Lake Forest adaptation of southern New England. Despite a gap in associated radiocarbon dates of a few centuries, he sees continuity in burial practices, lithic source preferences, and the economic base. Pfeiffer (1992) also points out that the Narrow Point/Mast Forest adaptation was then coexistent with the River Plain for at least a millennium.

McBride (1984a) does not recognize a chronological distinction between the various Terminal Archaic projectile points in the lower Connecticut River valley, but instead lumps them all in the Salmon Cove phase as the only phase of the Terminal Archaic period present within this region.

During the Terminal Archaic period in Connecticut there was a major shift in settlement from interior wetlands to large river drainages (Lavin 1988:105; McBride 1984a; Pagoulatos 1988, 1990). Seasonal and base camps tend to be located on terraces of major stream drainages, with temporary or task-specific camps located in floodplains and uplands (McBride 1984a:282; McBride and Dewar 1981:47, 49). It has been suggested that the Susquehanna and related broadspear traditions are the result of a specialized adaptation towards the exploitation of migratory fish (Kraft 1972; Turnbaugh 1975). Based on intensive exploitation of riverine resources and collection of wild plants, the Susquehanna broadspear culture appears to have practiced a more focal adaptation than the Narrow Point tradition (McBride 1984a:278-279).

It is generally accepted that the Susquehanna Tradition represents a complete cultural tradition; however, Pagoulatos (1983:57) has theorized that "broad blade point types may only reflect a minor technological innovation adopted by local Late Archaic cultures possessing Narrow-Stemmed point types in the lower Connecticut River Valley". He further suggests that "the distribution of broad bladed point types along rivers may imply a specialized function, possibly associated with fishing, while Narrow-Stemmed point types found at a distance from rivers may suggest hunting or related activities" (Pagoulatos 1983:57). According to his theory, both projectile point forms should exist on sites during certain times of the year.

As noted above, the narrow-stemmed point traditions also appear to continue from the Late Archaic period into the Terminal Archaic in Connecticut (McBride 1984b). This is supported by both stratigraphic data and radiocarbon dating from multiple sites. The nature of the relationship between the River Plain/ Salmon Cove manifestations and the narrow-stemmed traditions in the Archaic of southern New England has been the subject of controversy for some time, and is still being debated (Lavin 1984; Pfeiffer 1990).

EVIDENCE FOR LATE AND TERMINAL ARCHAIC OCCUPATIONS ALONG THE IROQUOIS PIPELINE

Site Components

Late and Terminal Archaic components are the most common of all periods within the pipeline data set. Twenty-nine of the 40 data recovery sites in New York and Connecticut produced Late Archaic components and 27 produced Terminal Archaic components. Late and Terminal Archaic occupations were not only widespread, they were relatively intensive. The major components from these periods were spread widely along the pipeline. The following section summarizes information gained from components in Connecticut examined at the Phase III data recovery level of investigation.

In the Housatonic drainage, a small Late Archaic period component was found at site 249-1-1, which is located only 200 m east of the New York border in the Town of Sherman, Connecticut. The diagnostic point collection is dominated by Late Archaic Mast Forest point types, including two Lamoka, two Wading River, and one Squibnocket Stemmed (Barse 1992a). The excavators also identified a small triangular point as a Beekman Triangle, which would be associated with a slightly earlier Laurentian (Lake Forest) Late Archaic component. The two triangular late stage bifaces may also be related to the Beekman point. No ceramics were recovered from any of the excavations to indicate a Woodland component.

Another upland site in Litchfield County (251-4-1) produced typical Late and Terminal Archaic components (Barse 1992b). These include two Beekman Triangle points of the Laurentian tradition, but the major component at Site 251-4-1 can be assigned to the Narrow Stemmed tradition. Four Lamoka and four Wading River points were recovered, and a minor Terminal Archaic presence is indicated by two quartz Orient Fishtail points. Three sherds of Vinette I pottery could possibly belong to the Orient component.

Some of the most intensive Archaic occupations in the project area were recovered from locations adjacent to large wetlands along Cavanaugh Brook in the Town of Newtown, west of the Housatonic River. At site 270A-2-1 (Kingsley 1992a), the earliest Late Archaic point types includes three quartz Burwell points and three chert Brewerton Side-Notched points. A subsequent Mast Forest component includes three Squibnocket Triangles, two Squibnocket Stemmed points, and four quartz Wading River points. The smaller Terminal Archaic presence is documented by one Susquehanna point, three Orient Fishtails, and five steatite fragments (all apparently from the same bowl).

Nearby site 270A-4-1 appears to have functioned as a major base camp during several periods of prehistory, as witnessed by the recovery of thousands of artifacts and multiple cultural features (Cassedy 1996:118). A Lake Forest tradition occupation is indicated by 10 Brewerton Side Notched and Brewerton Eared points and two radiocarbon dates (4500±110 BP from Feature 19; 4290±70 BP from Feature 8).

A second Late Archaic period occupation at 270A-4-1 is represented by at least some of the narrow points recovered. The Narrow Point tradition is represented by 104 projectile points representing at least six related styles. Of these points, 39 are Wading River, 18 are classified as Lamoka, 16 are Sylvan Lake Side Notched, 10 are Bare Island, six are Squibnocket Stemmed, and two are Poplar Island. An additional 13 points have been assigned to the Narrow Point tradition but lack clear attributes of formal typologies. At this site, a radiocarbon date of 3,680±80 BP associated with a narrow point in Feature 10A falls near the end of the Late Archaic period and the beginning of the Terminal Archaic period, as does a date of 3740±60 BP from Feature 17. Site 270A-4-1 also included substantial Woodland components, and evidence from some of the features and activity areas suggests that some of the Narrow Points may also be associated with Woodland components. The Terminal Archaic period is represented by seven projectile points (five Orient Fishtails and two Snook Kill points) and one steatite vessel fragment.

The extensive and intensive Late Archaic Mast Forest (Narrow Point) occupations at Site 270A-4-1 correlate with the currently accepted settlement pattern of base camps and seasonal camps located around large interior wetlands of major drainages (McBride 1984a, 1984b; McBride and Dewar 1981; Swigart 1974).

Moving farther south and east along the pipeline, another upland, wetland-associated site was documented in the Town of Newtown. At Site 272A-1-1, the earliest Late Archaic component yielded six Brewerton points and five quartz Burwell points (Kingsley 1992b). A subsequent Narrow Point occupation is documented by seven Squibnocket Stemmed points and 10 Wading River points. Although the contexts were mixed, an associated assemblage of various lithic tools and flaking debris document a fairly intensive occupation at this location.

The final major Late and Terminal Archaic components were found at site 294A-AF2-1 on the floodplain of the Housatonic River in the City of Milford (Cassedy 1996:121). The beginning of the Late Archaic period is represented by three Brewerton Side Notched points. The Narrow Point tradition is represented by 26 projectile points of six styles. Twelve points are classified as Lamoka, five are Bare Island, four are Normanskill, two are Wading River, two are Poplar Island, and one is a Rossville.

The Terminal Archaic period at 294A-AF2-1 is represented by 30 points of four different styles and by twelve steatite vessel fragments. The points included three Snook Kill, two Susquehanna/ Wayland Notched, one Mansion Inn, and 24 Orient Fishtail types. In addition to the diagnostic artifacts, five features were radiocarbon dated to the Terminal Archaic period, and a sixth was assigned to this period based on the presence of a steatite sherd. Some of the prehistoric ceramic sherds from this site also appear to be derived from the Terminal Archaic occupation.

For some time, researchers in the Northeast have known that ceramics begin to appear in low frequencies prior to the Early Woodland period. Funk (1976:264) identified at least two sites in the Hudson Valley that produced Orient Fishtail points in association with Vinette I pottery. These two components produced two radiocarbon dates in the 2,600 to 3,000 B.P range. In the upper Housatonic drainage, Swigart (1973:46) reports Vinette I ceramics from the same cultural level as Snook Kill points at the Kirby Brook site, and Thompson (1973:16) describes Vinette I sherds in the same level as Snook Kill points at the Hopkins site. McBride (1984a:125) also notes that a radiocarbon date of 2,700 BP was associated with Vinette I ceramics, Orient Fishtail and Wayland Notched points, and a steatite bowl at the Lieutenant River Rockshelter in the lower Connecticut River valley.

Data from Iroquois Project site 294A-AF2-1 support these observations. Out of six Terminal Archaic features, three contained undecorated ceramic sherds that could not be assigned to known Woodland types. Two of the three were radiocarbon dated at 3230±80 BP and 3320±70 BP and the third was placed in the Terminal Archaic by the presence of a steatite fragment. Unfortunately, other than the associations with Vinette I pottery which is more common from Early Woodland components—the regional data set is not yet large enough to allow definition of distinctive Terminal Archaic ceramic types. For this reason, as a general rule, Vinette I pottery from the project was assigned to the Early Woodland period unless other chronological data were available to modify that assignment.

The Late Archaic period occupations at site 294A-AF2-1 probably represent temporary camps, with the episodes limited to activities such as hunting, fishing, or other forms of resource procurement. By the Terminal Archaic period, the site appears to have been used as a seasonal camp or semi-permanent base camp occupied at least during the fall months. The Terminal Archaic component at 294A-AF2-1 is consistent with models presented for Salmon Cove/River Plain settlements located in the Connecticut River valley. According to these models (Pagoulatos 1988:74, 84), residential camps like this yield a high intrasite, low intersite variability, and are usually in riverine zones.

Projectile Point Sample

Additional regional trends can be examined via analysis of the entire collection of diagnostic artifacts recovered from all three phases of investigation during the pipeline project. Table 1 summarizes the Iroquois Pipeline project diagnostic projectile point sample from the Hudson and Housatonic drainages. This table includes all 616 projectile points that could be assigned to an established type. It does not include fragments or artifacts that were identified only by generic labels such as "untyped side notched".

TABLE 1: SUMMARY OF DIAGNOSTIC PROJECTILE POINTS BY PERIOD AND DRAINAGE

	Hudson	Housatonic	Total	Hudson%	Housatonic%
Early and Middle Archaic	12	8	20	4%	2%
Lake Forest	25	38	63	9%	11%
Mast Forest	73	210	283	26%	62%
Subtotal All Late Archaic	98	248	346	35%	73%
Susquehanna Tradition	62	14	76	22%	4%
Orient Phase	22	32	54	8%	9%
Subtotal All Terminal Archaic	84	46	130	30%	14%
Early Woodland	11	6	17	4%	2%
Middle Woodland	6	3	9	2%	1%
Middle/Late Woodland	62	24	86	22%	7%
Late Woodland	4	4	8	1%	1%
Subtotal All Woodland	83	37	120	30%	11%
Grand Total	277	339	616	100%	100%

The information in Table 1 can also be compared with trends from data sets previously published by Funk (1976) and Swigart (1974) (Figure 1). Funk's (1976:199) inventory of 7,947 projectile points covered the entire Hudson Valley and is taken from his Table 29. Swigart's (1974: Figure 3A) tabulation of 2,986 points came from collections in the upper Housatonic region above Newtown. In both cases, I reassigned some point types to match the categories established for the Iroquois Pipeline project data set (such as including Snook Kill points with the Terminal Archaic Susquehanna tradition).

Late and Terminal Archaic projectile points were very abundant in the pipeline data set, and together they account for 65% of the entire collection. As discussed elsewhere, this number may be slightly inflated considering the likelihood that some of the Narrow Points in the Housatonic drainage were actually associated with some of the Woodland occupations.

<u>Lake Forest</u>. Projectile points from the Lake Forest tradition are the earliest types found in notable frequencies. Although few of the early Late Archaic Otter Creek side-notched points were recovered, Brewerton and Vosburg points were widely distributed across both drainages. Lake Forest tradition points were slightly more common in the Housatonic sample than in the Hudson sample (11% versus 9%). In contrast, almost 20% of Funk's Hudson Valley inventory consisted of Lake Forest Archaic types, while Swigart reported only 5% in the upper Housatonic.

<u>Mast Forest</u>. The most striking feature of Table 1 is the very high proportions of narrow stemmed and side-notched points of the Mast Forest tradition. In the combined sample of 616 points, 46% can be assigned to the Mast Forest category, which combines all of the Narrow Point types such as Lamoka, Sylvan, Squibnocket, and Wading River, as well as Normanskill. They dominate the collection from the Housatonic drainage, where they constitute 62% of the sample, but are less common in the Hudson drainage sample. The percentages in Funk's and Swigart's inventories parallel the Iroquois project trends. Although Funk's research (1984:134) continues to indicate that Narrow Points date to the Late Archaic period in New York, the abundance of Narrow Points in the Housatonic drainage can best be explained by their temporal persistence beyond the Late Archaic period into the Terminal Archaic and Woodland periods in this region, as has been previously been suggested for other regions in Connecticut.

Although most Connecticut researchers agree with this general scenario, there is not a consensus on the chronological boundaries of the Late and Terminal Archaic periods and traditions. For example, in the 1984 issue of the *Bulletin of the Archaeological Society of Connecticut* summarizing Connecticut's prehistory, three slightly different chronologies were offered. A combination of the three chronologies and an update from Pfeiffer (1990, 1992) results in the following sequence for Connecticut. The Lake Forest Archaic occupations began in the fifth millennium and lasted until about 4,200 BP, and the Narrow Point tradition began somewhere between 4,500 BP and 4,200 BP and overlapped with the Lake Forest Archaic for several centuries. The Narrow Point Tradition continued on into the Terminal Archaic (and beyond), and overlapped with the Susquehanna Tradition (ca. 3,600 - 2,700 BP) for most of the fourth millennium.

Iroquois project data recovery sites in Connecticut produced a variety of data relevant to the chronology of Narrow Points. Unfortunately, most of the associations are suggestive rather than definitive since the sites were not stratified. Data from Site 270A-4-1 indicate that, at this site, Narrow Points were most common in the Late and Terminal Archaic periods. Narrow Points cluster in an aceramic locus dated to 4,290 BP, and a quartz workshop with Wading River, Sylvan Lake Side Notched, and Bare Island projectile points was near a feature dated at 3,740 BP In addition, Feature 10a produced a Narrow Point in association with a radiocarbon date of 3,680 BP.

Despite these indications of Late Archaic and Terminal Archaic use of Narrow Points, data from site 270A-4-1 are insufficient to clarify the regional evidence that these points continued to be used in the Woodland period as well. For example, a ceramic and radiocarbon-dated early Middle Woodland locus in Block C also contained eight Narrow Points, but due to vertical mixing, the degree of association could not be clarified.

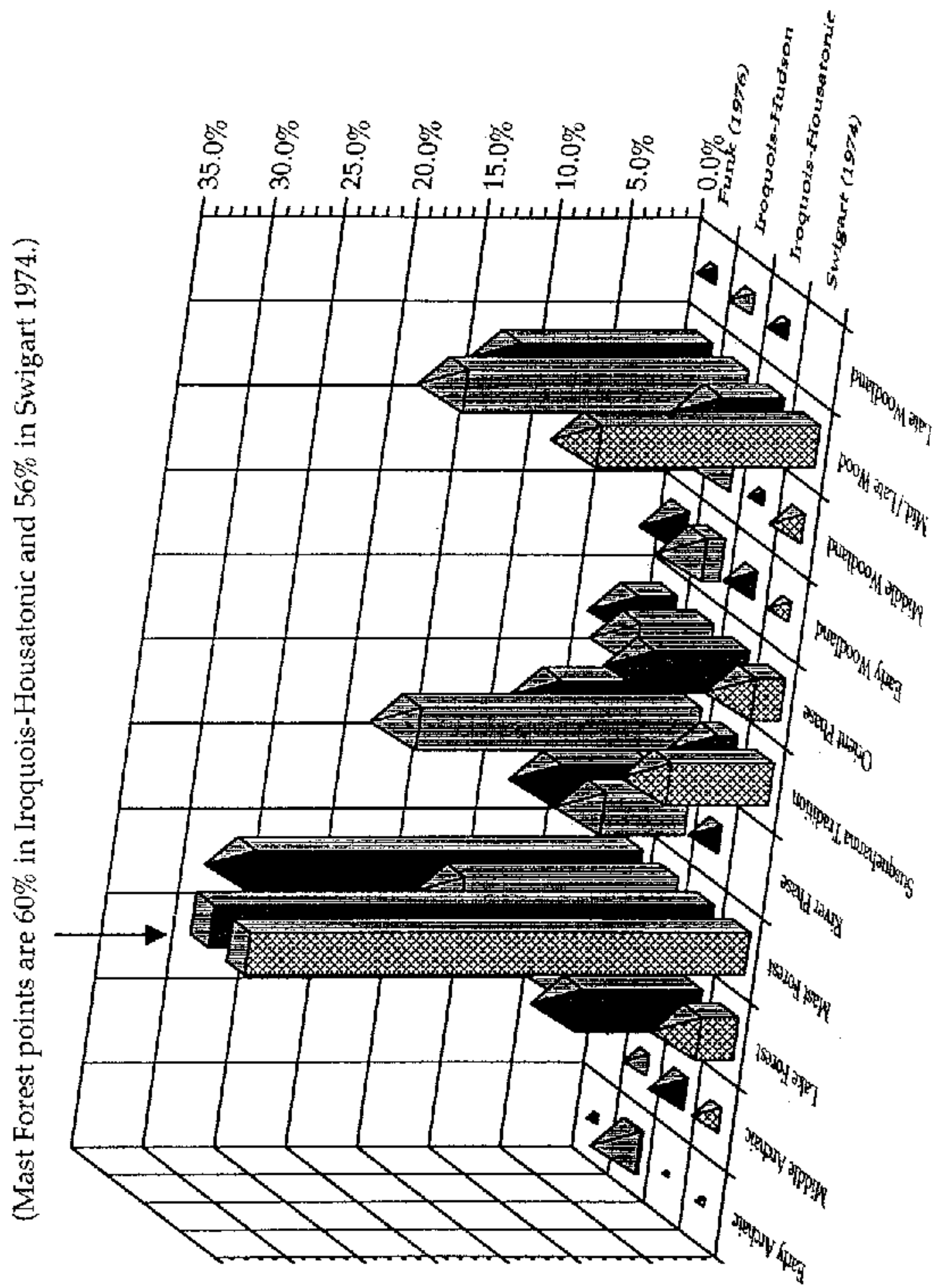

Figure 1. Comparison of Iroquois Project Projectile Point Collection with Funk's (1976) and Swigart's (1974) data sets.

No radiocarbon associations were obtained for Narrow Points from Site 294A-AF2-1, but three rock cluster features produced Narrow Point associations with Woodland period ceramics and charred maize. Other data from this site indicate intensive Terminal Archaic and Woodland occupations, and no Late Archaic dates were obtained. Finally, Locus 1 at Site 294A-17-1 produced two ceramic sherds and a Bare Island point, but the stratigraphic integrity was not high.

Terminal Archaic. The Susquehanna tradition is strongly represented in the Hudson drainage and accounts for 22% of that drainage's point collection (n=62) in our pipeline data set. In addition to Susquehanna Broad points, the Genesee, Perkiomen, and Snook Kill types are tabulated with this tradition. Snook Kill points are most common of the four types, followed by Susquehanna Broad points. In contrast, Susquehanna tradition points account for only 4% of the Housatonic collection from the pipeline, and eight of the 14 specimens from that drainage came from the lower Housatonic River floodplain sites in the City of Milford.

Current chronologies for the region place the Orient phase at the close of the Terminal Archaic period, and the Orient Fishtail points diagnostic of this phase were recovered in roughly equal proportions from the Hudson and the Housatonic drainages. In both drainages, the Orient Fishtail points are concentrated near the largest rivers—along South Bay Creek near the main channel of the Hudson River and on the floodplain of the lower Housatonic in Milford.

THE LATE AND TERMINAL ARCHAIC IN THE NORTHEAST IN LIGHT OF THE IROQUOIS PIPELINE DATA SET

In the Hudson drainage, the Late and Terminal Archaic periods are well-represented in the Iroquois Pipeline projectile point collections but poorly represented by cultural features or radiocarbon dates. This is not the case for the Housatonic drainage, which produced 10 radiocarbon-dated features from four different sites that can be assigned to this span of time. In addition, the Housatonic drainage produced a larger number of single component sites that can be placed in the Late Archaic.

"Laurentian" or Lake Forest Archaic points were relatively common and present throughout the project, but few discrete Vosburg or Brewerton components could be delineated at any of the sites. Except at one site, no cultural features could be assigned to this tradition, so subsistence data and independent chronological data were lacking. The notable exception to this trend was a major Proto-Laurentian component excavated at the Mohawk River crossing in upstate New York.

In the pipeline collections, Brewerton and Vosburg points are made exclusively of Hudson Valley cherts in the Hudson drainage, and the common use of the Hudson Valley cherts also extends the length of the pipeline through the Housatonic drainage. Forty five percent of our Brewerton and Vosburg points in the Housatonic drainage are made of Hudson Valley chert.

In general, Laurentian-related Lake Forest Archaic components from across the Northeast display a preference for moderate to high quality lithic materials. Evidence of exchange in materials such as native copper and seashells is seen for the first time in this tradition. Extensive movement of distant non-local lithics is not evident, but people of the Lake Forest Archaic tradition appear to have made an effort to obtain good quality materials.

The Mast Forest tradition of narrow stemmed projectile points was more common in the pipeline data set than the Lake Forest Archaic. Narrow points were found almost everywhere, but particularly in the Housatonic drainage. Two features from this time period were also excavated at site 270A-4-1 on Cavanaugh Brook and dated at 4290 ±70 and 4500±110 BP. These features contained substantial evidence of nut collecting.

In contrast to the Lake Forest Archaic, components from the Mast Forest tradition convey an impression of relatively insular regional relationships. Over a decade ago, Snow (1980:230) concluded that the narrow-stemmed point traditions of central and southern New England show "a rather parochial use of raw materials, [with] communities often using only those materials immediately available within local stream drainages".

The Iroquois project data set has done nothing to dispel that notion. In the lower Housatonic drainage, project Mast Forest components contained very little chert or any other high quality materials. More chert was used in the upper Housatonic relative to the lower portion of the drainage, but still far less than at any other period in prehistory. This is also the only phase in which Hudson drainage sites show any appreciable use of quartz.

Evidence for Terminal Archaic occupations was the most widespread of all time periods in the Hudson drainage portion of the pipeline. Numerous Terminal Archaic points were spread across the entire drainage, but no cultural features could be conclusively assigned to this period. The most intensive Susquehanna Tradition and Orient Phase occupations were near the Hudson River and the Roeliff Jansen Kill. Terminal Archaic projectile point frequencies were lower in the Housatonic drainage portion of the project, but feature frequencies were much higher. Again, the Terminal Archaic occupations tended to concentrate near the Housatonic River or near major wetlands.

In the Terminal Archaic, between approximately 4,000 and 3,000 BP, there is evidence that both drainages established links with a wider area. In this period, New York cherts are again more common in the Housatonic drainage, and rhyolite is observed in both the Hudson and Housatonic drainages (albeit in low frequencies).

The Late and Terminal Archaic components identified at the Iroquois project sites fit comfortably within existing subsistence/settlement patterns identified for the region. Mast Forest Tradition site distributions in southern New England suggest an increase in frequency and size for sites utilized as base camps, seasonal camps, and special purpose camps during the Late Archaic period (McBride and Dewar 1981:48). Populations were exploiting a variety of micro-environments, especially in the upland areas, with populations aggregating near large interior wetlands (McBride 1984a:262; McBride and Dewar 1981:48; Swigart 1977:70).

Site 270A-4-1 appears to contain a substantial Narrow Point Tradition base camp occupation that covers the last 500 years of the Late Archaic period and the first 500 years of the Terminal Archaic. The two Late Archaic dated features from Site 270A-4-1 both produced relatively abundant evidence of acorn and hickory nut exploitation, but other plant or faunal remains were not preserved. The Terminal Archaic feature produced acorn, hickory, and hazelnut. Identifiable bone remains were not preserved, but the large wetland environment would have produced abundant terrestrial and aquatic faunal resources.

The largest Susquehanna Tradition component from the Housatonic drainage is at site 294A-AF2-1, which appears to represent a substantial, semi-permanent occupation reflective of the regional riverine focus described above. This component produced a high frequency of Orient Fishtail points, steatite vessels, ceramics, and hearth features. The combined data suggest that the bulk of this component dates to the later portion of the Susquehanna Tradition.

During the Terminal Archaic period in the region, there was a major shift in base camp settlement from interior wetlands to large river drainages (Lavin 1988:105; McBride 1984a; Pagoulatos 1988, 1990). Some researchers have attributed this settlement shift to a northward population movement by cultural groups from the Susquehanna drainage of Pennsylvania; asserting that the Susquehanna groups were adapted to a specialized environmental domain of riverine and estuarine locales (Dincauze 1974, 1975; Ritchie 1980; Turnbaugh 1975:54).

Other factors that may have been responsible for this shift in settlement pattern correlate to a change in regional environmental conditions that occurred during this period. Significant climatic shifts caused changes in biotic environments, including the distribution of plants, animals, and other resources, and may ultimately have influenced changes in the settlement and subsistence patterns of resident populations (Custer 1984:35). Considering that the latter part of the thermal maximum, or warm, dry period corresponds to the Terminal Archaic period, Lavin (1988:106, 114) has suggested that a possible reason for the peak in floodplain settlements during the Terminal Archaic period could be related to shrinking of interior wetlands. The shift in settlements from inland wetlands to riverine zones coincides with an inferred economic shift from a diffuse adaptation in the interior to a focal adaptation in the floodplain locales. Population groups adapted to a riverine focus maintained a strong reliance on aquatic resources. These patterns appear to apply more to Susquehanna Tradition occupations than to coeval Narrow Point Tradition manifestations.

SUMMARY

The Iroquois pipeline provided a comprehensive and systematic sample across the landscape of the lower Housatonic River valley, which allowed us to paint a clearer picture of the prehistoric cultural patterns of southwestern Connecticut in relationship to better-studied portions of the rest of the state. In addition, the continuous nature of the project corridor through the Hudson Valley into Connecticut also allowed us to closely examine the regional variations in artifact types and raw material usage.

The collected evidence from the pipeline project best supports Pfeiffer's (1990, 1992) reconstruction of the complex cultural relationships visible for the Late and Terminal Archaic periods in Connecticut. In brief, it appears that the Lake Forest Archaic had a substantial and widespread presence throughout much of the state, and the cultural adaptations of this tradition show strong links to the River Plain/ Susquehanna manifestations of the Terminal Archaic. The Mast Forest tradition began in the Late Archaic about 4,500 BP and represents a locally focused adaptation that persisted through the Terminal Archaic period and into Early Woodland times. The Mast Forest occupations coexisted with River Plain/Susquehanna tradition occupations, and the two different traditions focused on very different environmental niches. The River Plain tradition appears to be a complete cultural assemblage, rather than a technological graft, and despite participation in broader patterns found up and down the east coast of North America, the evidence for in-migration at this time is not compelling.

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CURRENT PERSPECTIVES ON EARLY AND MIDDLE WOODLAND ARCHAEOLOGY IN CONNECTICUT

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ABSTRACT

In 1984 Kevin McBride and I reviewed the Early and Middle Woodland periods in Connecticut, focusing on the 1980s research program of the University of Connecticut's Public Archaeology Survey Team (PAST), which highlighted discoveries in the lower Connecticut River Valley (Juli and McBride 1984). In this review and update on new discoveries and theoretical advances during the subsequent fifteen years, I will take a broader approach, first reviewing the evolution of Early and Middle Woodland conceptual models, then considering new discoveries and selected issues including chronology, survey, technology, and the advent of horticulture.

CONCEPTUAL MODELS

The concept of the Woodland stage was developed in the early 1940s following the First Woodland Conference at the University of Chicago in 1941 (Ritchie 1980:179). This stage, following the Archaic, included the various regional manifestations of societies using ceramics and engaging in horticulture in Eastern North America. Subsequently, a synthesis developed by Willey and Phillips (1958) used the term Woodland as a synonym for the Eastern Formative, a culture-historical developmental stage and period, following the Archaic and preceding the more advanced varieties of Classic stage cultural fluorescence developing in Mesoamerica. As it evolved, in Eastern North America, the Woodland concept embodied three subdivisions: Early, Middle, and Late Woodland (Willey and Phillips 1958:118). In this review I consider only the first two as they are manifest in Connecticut's prehistoric record.

W. Ritchie's View of the Early and Middle Woodland

As has been clear for some time, William Ritchie's pioneering research in New York State prehistory profoundly influenced the development of stage/period definitions and our understanding of the associated diagnostic artifacts in Connecticut. Ritchie defined the Early Woodland as the period with the earliest evidence for the use of ceramics (Vinette I ware) and by artifact innovations including tubular smoking pipes, distinctive types of gorgets, boatstones, barstone amulets, and the earliest use of copper, in the form of beads (Ritchie 1980:179). The Middle Woodland saw the introduction of various styles of stamped and impressed ceramic decorative forms, the use of elbow and platform pipes, as well as the suggestion that horticulture may have had a minor economic role towards the end of Middle Woodland times (Ritchie 1980:180).

In Ritchie's work, the classic Early Woodland culture in New York State is Meadowood. It represents a Late Archaic-like inland lacustrine foraging adaptation with Early Woodland artifacts, showing some attributes of sedentary site location in Ritchie's view, due to the presence of significant cremation burials. The diagnostic artifact was the side-notched, pressure-flaked Meadowood point. Based on site size, Ritchie felt that these people lived in limited population groupings such as small bands of 30 - 50 individuals. The cremations and flexed burials indicated elaborate patterns of mortuary ceremonialism with connections to the Adena/Hopewell complex to the West.

In most of New York State, Late Early Woodland times saw the emergence of a culture Ritchie called Middlesex, which was eventually understood as an Eastern manifestation of Adena people and customs (Ritchie and Dragoo 1960). Typical Adena traits such as burial mounds were not present in New

York or eastward towards New England in Early Woodland times ca. 1000 BC - 1 AD, even though all Middlesex sites are burial components (Ritchie 1980:204).

The Middle Woodland in New York was defined by the Point Peninsula culture (Ritchie 1980). Technologically, Point Peninsula included the artifact innovations seen in Meadowood, with the addition of various forms of notched and triangular projectile points, cache blades, combs, antler flaking tools, barbed bone and antler points, new forms of rectangular gorgets, pressure flake knives and mica. In ceramic decorative motifs, Point Peninsula wares include scallop-shell, dentate and rocker stamped styles (Ritchie 1980:205). Ceramics were well-made and consisted of at least two forms of cooking pots in 2 and 4 quart sizes. In New York, Middle Woodland components were dated approximately 1 AD - 1000 AD. Point Peninsula subsistence was a foraging economy with a reliance on fishing, as seen in abundant remains of fish bones and scales on all sites. Early Middle Woodland cultures in New York State were strongly influenced by Hopewellian society, with evidence of occasional burial mounds in the western part of the state.

The Middle and Late Middle Woodland cultures completing this period in New York are largely defined by the Kipp Island phase (Ritchie 1980). Artifacts continue the previous types with the introduction of polished stone pendants and various forms of shell beads. Most Kipp Island burials are not cremations, but in the flesh in the flexed or sitting position, with grave goods including red ochre, but excluding pottery. Economically, Kipp Island exhibits a robust hunting, fishing, and gathering pattern with some evidence of maize horticulture.

Finally, in Late Middle Woodland times Ritchie (1980), defined the Hunter's Home phase as a transition between Kipp Island and the Late Woodland Owasco-Iroquoian continuum. Hunters' Home material culture is essentially the same as Kipp Island, with some variations in items of personal adornment and ceramic decorations. Burial ceremonialsm and associated material culture decreases in importance and prevalence as the Late Woodland unfolds.

A New England Model

Following Ritchie's seminal work on New York, Dean Snow published a New England-based synthesis in 1980 (Snow 1980). In this work Snow argued that New England prehistory developed within the environmental context of river drainage systems. In Connecticut, these drainages were the Housatonic, Connecticut and Thames river systems (Snow 1980:3). He also proposed definitions for the units he termed prehistoric periods, such as Paleo-Indian, Archaic, etc. defining these units temporally, as opposed to using a traditional and concurrent stage concept. Each period was supported by relevant radiocarbon chronologies. One somewhat radical change in his terminology was the substitution of an "Early Horticultural period" designation for the traditional and widely used Early and Middle Woodland periods. While maintaining approximately the same beginning and ending dates used to define these periods by others (ca 1000 BC - 1000 AD), Snow generated controversy among regional specialists. Some archaeologists felt that the new label was incorrect, since Early and Middle Woodland economies lacked firm evidence of horticulture, and were essentially Archaic in form, with an overlay of ceramic use in some regions (Sanger 1982:174). Another criticism was leveled at his synthesis of Southern New England prehistory, when Snow did not adhere to his river drainage model, but seemed to more or less describe all developments in the region as though they represented a similar Early Horticultural period system (Perlman 1982).

Snow viewed the early centuries of his Early Horticultural period in Connecticut as dominated by the North Beach cultural system, a clear descendant of Orient culture. The sites were small coastal seasonal shellfish camps. He believes that through this period cultigens may have been gradually adopted in the subsistence economy (Snow 1980:279). In an earlier synthesis of coastal New York archaeology (Smith 1950), Smith focused on North Beach mortuary customs, which favored secondary disarticulated bundle burial, rather than the dominant Adena-Hopewell pattern seen to the west. One Adena-like burial has been suggested for Connecticut at East Windsor Hill (Cooke and Jordan 1972).

Following North Beach is the Clearview phase, which, like North Beach, is seen as part of Connecticut's Windsor tradition. Snow dates Clearview to the early centuries AD and argues that it is still poorly understood, since Smith originally defined it almost entirely on the basis of ceramic types exhibiting grit and shell temper. In Snow's view, this era and the subsequent centuries up to 1000 AD, are poorly understood along Connecticut's river drainages. Snow describes Braun's (1974) study of shellfish resource availability and water temperatures, noting that some species may have been less available in Early Horticultural times (e.g., bay scallops, oysters, quahogs), while others may have been more abundant (soft clams). In general, Snow sees the Early Horticultural period in our region as similar to its manifestations in the Hudson drainage. The sites include several seasonal settlement types, within a social organization structured around nuclear and extended families (Snow 1980).

Connecticut Models: I

In 1984 Lucianne Lavin produced a synthesis of Connecticut's prehistory for the 50th Anniversary Volume of the Archaeological Society of Connecticut (Lavin 1984). In this article she described her view of the Early Woodland period (1000 BC - AD 1) and the Middle Woodland period (AD 1 - 1000). Lavin did not adopt Snow's revised terminology for these two periods. She suggested, like previous authors, that the Early Woodland way of life was similar to that of the Archaic with the addition of innovations such as ceramics, the celt, bow and arrow, and smoking pipes, while arguing that the distinctions in the literature among periods, traditions and stages were largely based on ceramic sequences beginning with Vinette (I) cordmarked pottery. At the Indian River site in Westport, Ernest Weigand had a series of dates to support the ceramic associations (personal communication to Lavin 1984). Lavin (1984:17) also felt that the Early Woodland was characterized by stylistic continuity in projectile points from the Late Archaic, with the presence of various forms such as Lamoka-like points, Squibnocket and Wading River. She reported on a series of sites with these artifacts, as well as the presence of an associated quartz cobble reduction technique.

Connecticut data also suggested that subsistence patterns were Archaic-like during the Early Woodland, with a variety of seasonal subsistence variations in hunted and gathered resources. Regular seasonal movements throughout various local habitats were indicated by the data. Other Early Woodland point types are also found in Connecticut, such as Meadowood, Fulton Turkey Tail, Adena, and Rossville forms. Boatstones were also present at two sites, as was the Adena-like East Windsor Hill burial mentioned earlier.

For the next stage, Middle Woodland, Lavin saw strong similarities with the Late Archaic and Early Woodland. New ceramic forms appeared such as cord-wrapped stick and dentate stamped sherds. New Middle Woodland point types are also present including Green, Fox Creek Stemmed, Fox Creek Lanceolate, Jack's Reef Corner-notched, and Jack's Reef Pentagonal (Lavin 1984:19). Other ceramic decorative forms of the Windsor tradition are evident including brushing, fabric marking, and stamped motifs. Smoking pipes are present in Connecticut's Middle Woodland, but Lavin did not see clear associations or chronology for these artifacts. In 1984 there was no evidence of horticulture in Connecticut during Middle Woodland times. Settlement patterns based on a foraging economy at seasonal and temporary camps was indicated during the Middle Woodland (Juli and McBride 1984; McBride 1984).

Connecticut Models: II

In 1984 Kevin McBride completed a doctoral dissertation at the University of Connecticut based on extensive lower Connecticut River Valley surveys and analysis encompassing this region's prehistory (McBride 1984). In the same year, Juli and McBride published a summary of that research focusing on the Early and Middle Woodland periods in the 50th Anniversary Volume of the Archaeological Society of Connecticut (Juli and McBride 1984). McBride's discoveries clearly provided new insights into the prehistory of these two periods, not only for the lower Connecticut River zone, but for the state as a whole. This work defined a culture-historical sequence in the region, ca 1000 BC - 1000 AD.

McBride termed the lower Connecticut River Valley's Early Woodland period the Brodeur Point Phase after the Brodeur Point site, because at several sites he found a consistent *in situ* association of Brodeur Point cultural materials stratigraphically positioned between Terminal Archaic Broadspear artifacts and Middle Woodland components ca. AD 1. He described the technology as including narrow-stemmed points and Vinette I ceramics made with local quartz. McBride saw the narrow-stemmed forms as "a strong argument for continuity of indigenous groups from Late Archaic to Early Woodland times, and a possible counter explanation to earlier arguments linking the Early Woodland period to an era of population decline" (Juli and McBride 1984:90; Dincauze 1974; Braun 1974). The Public Archaeology Survey Team found evidence that Early Woodland assemblages were probably often misidentified as Late Archaic, due to the identification of narrow-stemmed point types as Late Archaic rather than Early Woodland. Thus, it was probably incorrectly assumed that low Early Woodland site densities meant that these people had suffered a population decline, when compared to the large number of preceding Archaic sites.

In the following Middle Woodland, McBride identified differences in lithics, ceramics, and settlement patterns. In this region the Middle Woodland is divided into Roaring Brook and Selden Creek phases. The Roaring Brook Phase is defined by Windsor ceramics of the Clearview Phase with rocker or dentate stamping. Twenty sites showing ceramic variations are defined for this phase, where lithics exhibit an increase in non-local materials (5 - 10%) and continue to increase through time.

In the Selden Creek Phase (750 - 1500 AD) non-local materials increase to 54% of the lithic assemblage. Sebonac-like ceramics predominate in this phase, (e.g., Windsor Brushed, Windsor Cord Marked, Sebonac Stamped), while dentate stamping is not present. Pots with constricted necks and globular bodies appear in Middle Woodland assemblages, while a new type, Shantok Cove Incised from the Thames River (Salwen and Ottesen 1972), is similar to Selden Creek forms.

In settlement pattern studies this research documented a high percentage of seasonal camps along the river, its terraces and adjacent upland zones during the Early Woodland, followed by a shift to sedentary villages along the river during the Middle Woodland period. Evidence suggests that larger sedentary settlements may have been associated with, and benefited from, the development of tidal marshes ca. 450 AD (McBride 1984; Lavin 1988). People may have begun to aggregate in year-round villages in this period, due to the presence of enriched tidal marsh ecotones along the lower Connecticut River Valley, with a concomitant decrease in the number of interior seasonal sites. In 1984 there was no evidence of sustained horticulture in Connecticut, even during Late Middle Woodland times ca. 1000 AD.

Connecticut Models: III

A final model is provided by a recent synthesizing discussion of Early and Middle Woodland patterns in Southwestern Connecticut by Lavin and Mozzi (1996). This study, completed as a regional review for the Connecticut Historical Commission, includes a culture-historical summary of the Early and Middle Woodland and provides an example of the current 1990s interpretation of these periods. This review has relevance for understanding these periods in Connecticut as a whole.

Lavin and Mozzi argue that the patterns described in earlier studies have maintained their validity through the 1990s. They note that the material culture break between the Archaic and Woodland is not distinctive, while Woodland economy continues the essential elements of Late Archaic seasonal foraging patterns. Of course, ceramic technology is the distinctive Woodland material innovation along with other changes, such as the advent of smoking pipes, the bow and arrow, and a full-range of the lithic chipped and groundstone forms.

The material continuity does not mean that there was no change. Rather, the cultural process operating at this time wrought slow, gradual changes that were additive in nature. In other words, the distinction between the Archaic and Woodland groups, and between those of each Woodland period, is in the cumulative technological innovations that were added and retained during each successive Woodland period. These new inventions included pottery for cooking, pipes for smoking, the bow and arrow for hunting and warfare, and horticulture. The interregional exchange of raw materials and goods, or trade, expanded and flourished during much of the Woodland stage, introducing the indigenous Indian societies to new technologies and, perhaps, exotic ideologies (Lavin and Mozzi, 1996:22)

Having reviewed relevant older and current models, in the next section I will discuss developments and findings in Connecticut's Early and Middle Woodland archaeology since 1984.

CHRONOLOGY

Since 1984, a comprehensive study of radiocarbon chronology in Connecticut, has been produced by Stuart Reeve (Reeve 1997). For this study, Reeve compiled dates from 319 archaeological sites in Connecticut (Figure 1), processed during the last fifty years. Along with compiling Connecticut dates, Reeve also compared these data to dates from New England and Middle Atlantic sites to discern patterns in chronology and associated issues, such as population growth, decline and culture change. Figure 1 is a summary of Reeve's data showing selected assemblage dates in 200 year intervals. The Early and Middle Woodland dates are derived from seven sites with datable ceramics (two Early Woodland and five Middle Woodland). In addition to these data, other components and sites of the Connecticut Early and Middle Woodland have been dated since 1984. In all, nine Early Woodland dates and eleven Middle Woodland dates have appeared since 1984. These dates indicate a continuing relationship between artifacts previously defined as diagnostic for these two periods, and the radiocarbon year ranges for each period: Early Woodland ca. 3000 BP (1000 BC - 2000 BP (O AD) and Middle Woodland ca. 2000 BP (1 AD) - 950 BP (1000 AD). Inspection of Figure 1 also indicates that the selected assemblages show relatively few Early and Middle Woodland dated components, sites, or assemblages compared to other periods. This finding may confirm previous ideas that Early Woodland site densities may not have been reported accurately, since they may have traditionally been confused with Late and Terminal Archaic sites. The data, including Middle Woodland dates, do not indicate major population growth during these periods.

SURVEY

It is probably correct to say that the period of large, state-sponsored, regional-based, archaeological surveys in Connecticut occurred before 1984. During this period, sustained survey programs were carried out by the University of Connecticut (PAST) in Central and Eastern Connecticut, Central Connecticut State University in the Farmington River Valley, and the American Indian Archaeological Institute (AIAI), in the Shepaug Valley and other Western Connecticut regions. Other surveys by individuals and institutions added to our site inventory, such as the earliest work by the Connecticut Archaeological Survey (CAS).

Since 1984 the emphasis has largely shifted from regional-based programs, to smaller, single and multiple site surveys and Indian Reservation investigations. However, from 1989 - 1993, a large archaeological survey program in Western Connecticut was carried out as part of the Iroquois Gas Company's pipeline project (Cassedy 1998). In this extensive study, archaeological data were collected along a 345 mile right-of-way in New York and Connecticut. In Connecticut, the path roughly correlates with the lower Housatonic River drainage system.

Interestingly, in Cassedy's and his co-workers' analyses, the general patterns of Early and Middle Woodland technology, chronology and settlement defined previously for the state as a whole were confirmed for the lower Housatonic region (Cassedy 1998:204-206). For example, radiocarbon age ranges for datable components which had diagnostic artifacts, confirmed earlier chronological relationships. Early Woodland patterns of site density suggesting small populations, followed by Middle Woodland population growth, were also seen in this region. In addition, the patterns of Middle Woodland settlement pattern changes discovered by McBride (1984) for Central Connecticut are mirrored in the Iroquois Pipeline survey findings. Increases in site densities in coastal and riverine habitats during the Middle Woodland, correspond to decreases in upland occupations as seen in the Housatonic flood plain and its upland regions

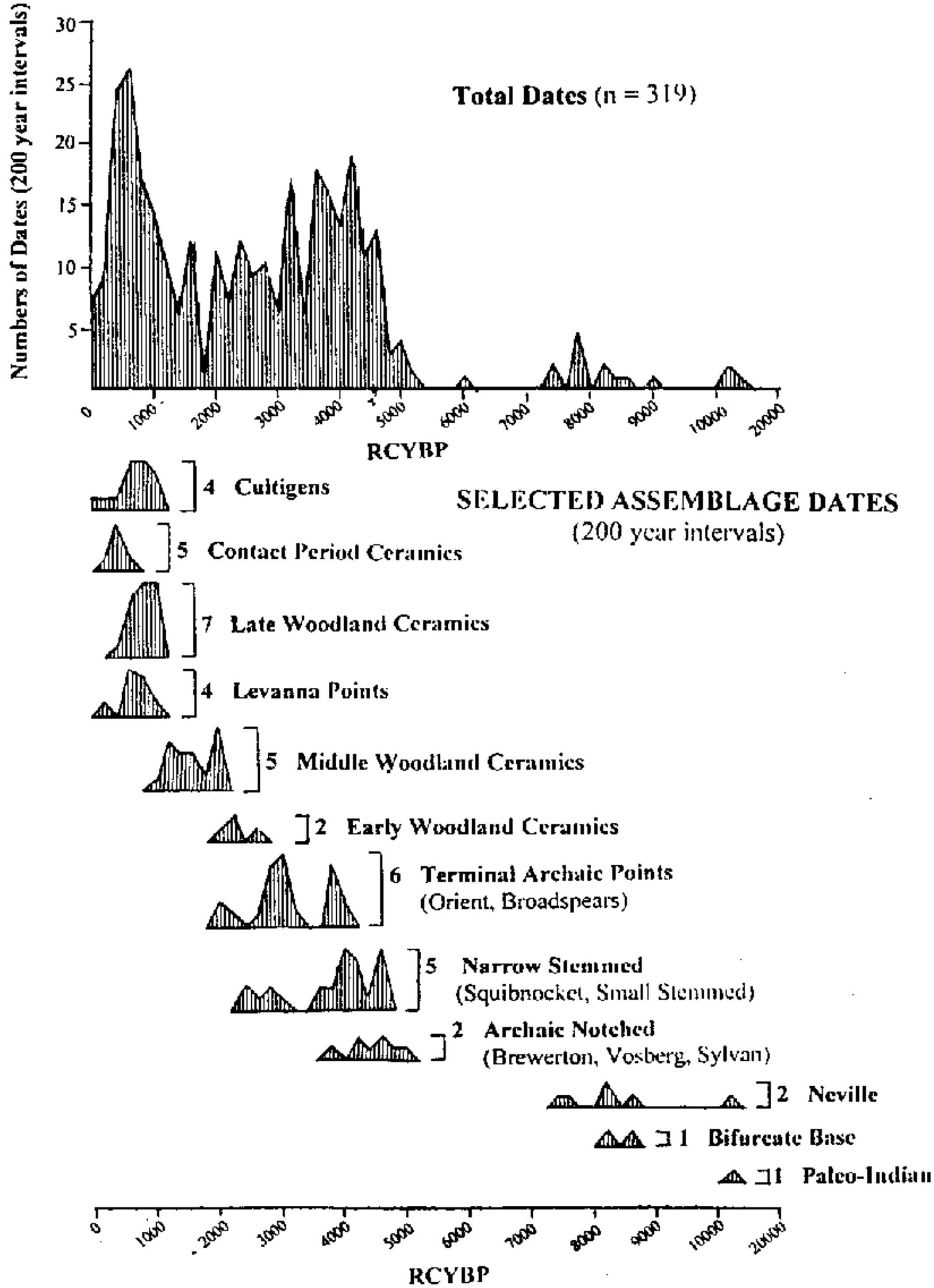

Figure 1. Connecticut radiocarbon dates (Reeve 1997:Figure 7).

(Cassedy 1998:206). Subsistence and economy in the Middle Woodland period retained a foraging base, with an increase in shellfish use among inhabitants of the coastal zone.

TECHNOLOGY

In addition to advances in chronology and survey-derived data, several studies since 1984 have addressed issues of Early and Middle Woodland artifacts, technology and relevant explanatory theories. In this section I will review some of these contributions.

Lithics

In 1991 Dr. Ken Feder of Central Connecticut State University identified a cache of sixteen large Middle Woodland blades, brought to his attention by an individual who had found these in his backyard (Feder 1996). Subsequent testing recovered 14 more, for a total of 30. When excavated, nine blades were stacked in three, tightly clustered layers. Five blades were oriented in a North - South line. The 30 blades ranged in size from 4.6 - 7.1 inches in length, which is quite large for Southern New England examples. Their average width was 1.8 inches. Charcoal in association dated 1630±80 BP, or about the third to fourth century AD, during Middle Woodland times. This was a fascinating discovery. The blades were probably deposited together for storage, and may have had a ceremonial use. Feder felt that they were undoubtedly the work of a single toolmaker, an attribute rarely identifiable in New England prehistory.

Another perspective on the individual in prehistory is provided by a fascinating study of Middle Woodland toolmaking in Massachusetts by Barbara Luedtke, with implications for analyses of Middle Woodland lithic tool kits in Connecticut (Luedtke 1998). In archaeological testing at the Telephone Trench site on Thompson Island in Boston Harbor, Luedtke recovered projectile points, bifaces, perforators, scrapers, hammerstones and worked bone. The artifacts were examined under a microscope at 45X in an analysis of form and wear patterns. Nineteen sherds, some bone, shell, plant remains and fire-cracked rocks, were also part of the assemblage, but probably not part of the lithic "tool kit". Luedtke considers arguments supporting the idea that these artifacts were part of an integrated tool kit, perhaps used at a workshop area of the site. Presuming these lithics to be in association, she develops a series of interesting ideas. Several of the projectile points suggest functional, as well as temporal differences. The consistency of material (Braintree hornfels), suggests the maker's home territory was near the Neponset River. She raises the interesting possibility that the form of scrapers and perforators in the kit may turn out to be diagnostic of Middle Woodland cultures. Other interesting hypotheses are discussed as well. This study, although carried out on materials from Massachusetts, presents an interesting challenge for Middle Woodland lithic analysis in Connecticut, both in the future and retrospectively. The "tool kit" concept provides us with a view of individually-based lithic production and use and suggests that a more sophisticated set of interpretations can be derived from excavated lithic materials than previously thought possible.

Ceramics

An important New England-based study discussing the relationship between ceramics and steatite vessels was published by Curtiss Hoffman (Hoffman 1998). As part of a wider study of the Archaic to Woodland transition, Hoffman came upon what he calls the "serendipitous discovery emerging from the study," that the earliest ceramics in New England (Early Woodland Vinette I ware) exist both earlier and coeval with steatite vessels, which have always been presumed to be the earliest regional vessel form. Hoffman has collected an impressive set of radiocarbon dates (976) and in analyzing these has discovered, for example, that more than a third of the Vinette I dates (24 of 67), have means earlier than the beginning of Early Woodland times ca. 1000 BC (3000 BP). These dates are distributed in a wide geographic area of New England. In Connecticut, specifically, corroborating evidence is seen in the Iroquois Gas Pipeline data which reported four mid-fourth millennium BP dates associated with pottery, from a site in the lower Housatonic drainage. This is a period well before the traditional beginning of the Early Woodland, in the third-millennium BP (Millis *et al.* 1992). Hoffman concludes that:

> The evidence from radiocarbon dated contexts indicates that steatite and pottery appear to have served different but contemporary functions within Transitional Archaic and Early Woodland cultural complexes of the Northeast. Pottery appeared in exclusively domestic contexts in the study area sporadically starting in the late fifth and through the fourth and early third radiocarbon millennia, long before steatite vessels made their appearance in the early fourth radiocarbon millennium in both domestic and ritual contexts. After a period of coexistence, which included a limited extension of the use of pottery into ritual contexts, pottery emerged as the dominant technology for durable containers in the region in the late third radiocarbon millennium.

In the future, detailed studies might be undertaken to explore the ramifications of this conclusion, including trace element analysis of steatite and clay sources, studies of variability in pottery thickness, temper, finish, shape, and coil size, and investigation of food residues from vessel interiors and soot residues from exteriors. (Hoffman 1998:53).

Hoffman has produced an important finding, which has the potential to re-orient our understanding of traditional diagnostic artifacts for the Late Archaic and Early Woodland, both in Connecticut and in New England as a whole, as well as re-define our understanding of the origins of the region's ceramic forms.

Within the study of Connecticut Middle Woodland ceramics, Lucianne Lavin produced an interesting study on the Windsor tradition (Lavin 1998). In this work, Lavin reconsiders the idea that the Windsor is the indigenous ceramic tradition in Connecticut and the Long Island Sound region. She begins her analysis with an historic overview of the tradition and its dates, phases and styles throughout the region. Windsor tradition dates, decorative motifs and types are seen in Table 1.

TABLE 1: CULTURAL SEQUENCES OF THE WINDSOR TRADITION (Lavin 1988:3)

Time Span*	Phases	Major Pottery Styles
Historic	Hackney Pond	Incised collared ceramics, Niantic Stamp and Drag
AD 1200 - AD 1650	*Niantic***	Niantic Incised, Niantic Stamp and Drag, Niantic Punctate, Niantic Stamped, Niantic Linear Dentate, Hollister Plain, Windsor Brushed, Sebonac Stamped
AD 950 - AD 1200	*Sebonac*	Sebonac Stamped, Windsor Brushed, Windsor Cordmarked, Windsor Fabric-marked, Hollister Plain, Hollister Stamped
AD 750 - AD 950	Shantok Cove	Shantok Cove Incised, Hollister Stamped, Windsor Brushed, Windsor Fabric-marked
AD 300 - AD 750	*Clearview*	Clearview Stamped, Matinecock Point Stamped
AD 1 - AD 300	Fastener	Clearview Stamped, Matinecock Point Stamped, Vinette I
1000 BC - AD 1	*North Beach*	Vinette I

* Time spans are approximate based on available radiocarbon dates which at present are few. Some pottery styles overlap time spans.

** Phases in italics are Smith's (1950) original phases for the tradition

After presenting the traditional version of Connecticut's Windsor ceramic sequence and types, she describes a more recent set of findings which challenge the relationship between the traditional phases, their dates, ceramic forms, distributions, settlement patterns and ecological relationships. Based on more recent interpretations she then presents a new hypothesis to explain the origins of the Windsor ceramic tradition. Her argument is that the Windsor tradition was carried into the region through a population movement from the Mid-Atlantic during Middle Woodland times, ca. 300 - 600 AD. People moving into the region practiced a marine-estuarine-based economic system, with a distinctive technology for marsh exploitation. They produced ceramics which included shell tempers, textile-impressed and scraped surface treatments (Lavin 1998:10). She feels that the Windsor immigrants came into our region, which was already populated by foraging societies using artifacts of the Point Peninsula tradition, which Lavin has identified in numerous assemblages in Connecticut.

Following presentation of this hypothesis, Lavin uses Rouse's (1958) study outlining the criteria necessary to demonstrate archaeological migrations, to argue that the local data do in fact support a migration hypothesis, with a subsequent geographical and temporal linkage of Windsor ceramic distributions to historic period languages. Lavin suggests that the prehistoric carriers of the new Windsor tradition vessels were the ancestors of the native people who spoke the Unquachog, Quiripey, Hammonasset, Wangunk and "River Indian" languages of the contact period (Salwen 1978). She concludes her study with the statement that the hypothesis is still in a working stage and she suggests the kinds of additional information needed to strengthen these ideas.

I find Lavin's study to be a provocative re-analysis of ceramic styles, long thought to be well-understood with respect to chronology, style, and classification. This work will need corroboration with additional information as the author suggests. However, even in its initial formulation, it has breathed a new vitality into the study of Connecticut's Middle Woodland ceramic heritage, which can only have a positive effect on future work in this field.

ADVENT OF HORTICULTURE

Since 1984, the search for domesticated plants or cultigens, on New England as well as Connecticut archaeological sites has been an important research objective. Archaeological advances and new theories have created a heightened awareness of archaeobotanical data and their importance in addressing questions related to prehistoric economics, settlement patterns, and overall cultural complexity. Lynn Ceci's article (1979) on maize cultivation in coastal New York, with its provocative conclusion that sustained maize use was a late prehistoric phenomenon, and the increasingly common use of flotation recovery methods in most current prehistoric excavations, have combined to set the stage for an explosion of new evidence and theorizing about the emergence of the earliest horticultural economies in Connecticut, as well as Southern New England.

An explosion in the data has indeed occurred since 1984, and it has generated a well-supported evidential basis for understanding the emerging horticultural economies of the Late Woodland period. However, the relevant question here is: what impact, if any, have these new data had on our understanding of the evolution of horticulture and the use of cultigens during Middle Woodland times in Connecticut? This subject is usually viewed in relation to two categories of cultigens: maize and all other possible domesticates.

Maize

Recent studies in Connecticut have documented the use of maize on Late Woodland sites with increasing intensity, as the Late Woodland developed into the Final Woodland and Contact phases. (Bendremer and Dewar 1993; Bendremer 1999; Lavin 1988). There is little evidence of maize use on Connecticut sites during the Middle Woodland. A 985 AD maize date for Selden Island in the lower Connecticut River Valley is controversial because the supposed maize kernel is difficult to identify and may not be maize. Another early Connecticut corn sample was dated at Mago Point along the Southeastern coast, with a standard deviation range from 1047 - 1268 AD (Bendremer 1993). Therefore, the current available evidence strongly suggests that maize is not present in Connecticut prior to AD 1000. Furthermore, most specialists are convinced that the documented presence of maize does not necessarily indicate its sustained contribution to the society's economy. Most evidence of intensive maize horticulture contributing significant nutritional support within an overall economic system, clusters in middle Late Woodland to late Woodland times in Connecticut (Bendremer and Dewar 1993).

Other Cultigens

While Connecticut prehistoric foraging economies involved much plant use, the question of whether pre-Late Woodland non-maize cultigens were used is problematic. The radiocarbon dates for beans and squash all fall within the Late Woodland period (Bendremer 1993). Chenopodium storage was documented in the Connecticut River Valley by McBride (1978). In a recent study by George and Dewar (1999), it appears that chenopodium was not domesticated. At the Burnham-Shepherd site in Central Connecticut (Bendremer 1993), 12 beans (*Phaseolus vulgaris*) were identified by Kaplan. Sunflower seeds (*Helianthus annuus*) were also discovered at this site. In addition, 34 sunflower seeds were recovered from a grass-lined pit at Burnham-Shepherd, and these may indeed be a domesticated variety (Bendremer *et al.* 1991). These data, while important, do not at present indicate that non-maize cultigens were significant dietary elements in Connecticut, prior to the beginning of the Late Woodland period ca. 1000 AD.

DIRECTIONS FOR FUTURE RESEARCH

In contemplating directions for future research in Early and Middle Woodland Connecticut prehistory, the review above suggests that there are several lacunae in the current literature. It has been known for sometime now that within the highly developed coastal estuarine and riverine zones in our state, much evidence of the ancient Woodland inhabitants has been destroyed through intensive land modification, architectural development, and industrialization. Thus, the site distributional data we do have are fragmentary reflections of the once robust remains of prehistoric settlement dynamics and variability. One way to expand our knowledge of these periods is to sponsor broad regional surveys within poorly developed regions of the state which have at least some important attributes related to Woodland patterns of site placement. In a sense, we only have a little time left before development projects will eliminate forever the fragmentary information that has survived in the ever diminishing archaeological record.

In a similar vein, it would be desirable to excavate intensively Woodland sites using methods designed to reveal horizontally extensive contemporaneous components, so that intra-site spatial patterning data may be collected. This is important because much current archaeology in our state is, out of necessity, carried out under one or another type of cultural resource management mandate aimed at program-specific compliance. We have known for a long time that such work, while important and professionally directed, also often is constrained by compliance limitations and structures that preclude the investigation of archaeologically-specific research questions. Thus, understanding the use of space in Woodland villages and at other sites would help us study many questions which have been difficult to solve. For example, one interesting body of information might be collected on structural and spatial patterning, reflective of kinship forms and population dynamics, which would help us understand whether emerging sedentary-based economies were related to changes in social organization. So far, we have had limited data on such topics.

Another area of interest in future Woodland studies is the refinement of our artifact-based chronological system, especially regarding the Early and Middle Woodland ceramic sequence and its variability in decorative types, functional types, and distributional patterns. If chronology were refined, provocative ideas such as Lavin's Windsor migration hypotheses could better be evaluated.

Yet another topic which has been intensively investigated during the last fifteen years is the relationship among plant use, domestication and changing economic adaptations during the Early and Middle Woodland periods. The interesting question is whether more rigorous collection, processing, and analytical methods will enable investigators to understand whether plant use during the Middle Woodland was qualitatively different than its use during Early Woodland and Late Archaic times. Phrased another way, one may ask whether, in the decades to come, our knowledge of early cultigen use including maize would be pushed back to Middle Woodland times? Today this is a tantalizing question because recent intensive research has placed early cultigens use around 1000 AD, just at the traditional end of Middle Woodland times.

Another critical area for future research is the careful reconstruction of prehistoric environments in Connecticut. As more paleoecological information becomes available, explanatory hypotheses can become more rigorous and interesting in the areas of cultural-ecological relationships among Early and Middle Woodland societies (Kerber 1999).

Finally, in a recent book on Southern New England Native people from 1500-1650 (Bragdon 1996), Kathleen Bragdon has argued that contact period Southen New England groups were organized as chiefdoms (Bragdon 1996:43). One interesting test of this model for archaeological studies of Early and Middle Woodland societies would be to chart the conditions and advancement of material, economic and settlement patterns, as a way to discern whether the archaeological record prior to 1000 AD suggests social forms which finally developed into chiefdom-level complexity in the subsequent Late Woodland period.

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Research Note:

Since 1984 several hundred Connecticut CRM archaeological reports have been produced. Some of these are located in the Office of the State Archaeologist, but this file is not complete. The entire corpus of reports is in the historic archives section of the Thomas Dodd Center at the University of Connecticut. The reports are not organized by project name or prehistoric period, and no index exists for the contents of these reports. The reports as a group cannot be perused at the Dodd Center. Rather, they must be requested individually by town name. Therefore, archival research focusing on Early and Middle Woodland components discovered in Connecticut CRM research since 1984, was not possible to perform, given the time available to complete the research for this paper.

THE LATE WOODLAND REVISITED: THE TIMES, THEY WERE A-CHANGIN' (BUT NOT THAT MUCH)

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ABSTRACT

In terms of subsistence/settlement patterns, technology, and even chronometrically, the Late Woodland period means different things in different regions; it is not a unifying concept for pre-contact cultures east of the Mississippi. Nevertheless, the Late Woodland can everywhere be understood as the culmination of a series of essentially uninterrupted cultural trajectories, the origins of which can be recognized far back into the Archaic. To this uniformitarian view, we can admit to a few significant "punctuations," in the sense of significant alterations in those cultural trajectories. Therein lies the utility of the concept of the Late Woodland. While there is no obvious breakpoint between the Archaic and the Woodland or between any of the sub-periods of the Woodland, changes with roots in the Archaic do exhibit what can be called a florescence in the Late Woodland and significant novel cultural behaviors were injected into the mix during this time.

Fifteen years ago, on the pages of this journal, I accepted the assigned task of writing a synthesis of the Late Woodland period in Connecticut (Feder 1984). I approached the entire concept of the Late Woodland in a skeptical and even curmudgeonly fashion that, if I do say so myself, stood in stark contrast to my callow youth. Contrasting the Late Woodland to other time periods in Connecticut's culture history, I pointed out that the Late Woodland marked no intrinsic alteration of prehistoric lifeways in Connecticut. There was no cultural deflection that marked the start of the period, no discontinuity in aboriginal economic, social, or political trajectories, no catastrophic or even uniformitarian alteration of the environment, no change in the ecological hand dealt the native inhabitants of Connecticut, no watersheds in cultural evolution, in fact, nothing in the archaeological or paleoenvironmental record that screamed out to us that the behavior of the ancient people of our state had altered so significantly in a short time period that it was demonstrably necessary to define a new period of cultural history.

THE LATE WOODLAND: FIFTEEN YEARS LATER

It is fifteen years later. Now, no longer in the infancy, but in the middle-age of my archaeological career, with an expanded database of fifteen more years of archaeological survey, excavation, analysis, and interpretation by a host of Connecticut archaeologists, with the maturity (and gray hair) that only time and experience can confer — and, to be sure, with sober reflection upon the intemperateness of my remarks in Bulletin 47 — I now would like to say just one thing: I was right (well, mostly)! And here, once again, I have been asked to summarize a time period whose reality, utility, and temporal boundaries, are questionable.

It seems to me that, one way in which an archaeological time period might be useful, beyond simply allowing us to divide up our chronologies into more manageable bites, rests in the potential that the people who actually lived during the periods that we define and distinguish today might be expected to agree, at least in partial measure, with our divisions. Specifically, we might hope that if we could travel back in time and present a tribal elder with our segmented chronologies, they would respond: "Ah yes, what you are here defining as the beginning of the 'Late Woodland' correlates very well with a significant change in how our people lived their lives. And yes, right here, at the end of what you call the Late

Woodland, another major change was faced by our people. You are right to divide up our history in this way."

Would that we could travel back in time to determine such things. Of course, we cannot reverse time's arrow, but we do have the archaeological record to rely on. And that record does not reflect the sort of sea-change in ancient culture that would fully justify our distinguishing the Late Woodland from the period of time that precedes it.

To be sure, the prehistoric cultures of Connecticut were not stagnant during the last few thousand years. Material culture, subsistence, and settlement patterns changed, but such changes surely were evolutionary (more about these evolutionary developments later). But our definition of the beginning of the Late Woodland as a sub-period of the Woodland is somewhat capricious, merely marking an arbitrarily defined timepost along a continuum of cultural change with no particularly important cultural or environmental hook upon which to hang our chronological hats.

THE "LATE WOODLAND": A COMMON CHRONOLOGICAL FRAMEWORK?

"But surely," you might respond, "Our periodization of prehistory, in Connecticut and elsewhere, might be a bit arbitrary, its function more heuristic than illuminating, its source more etic (serving our purposes for analysis in the present) rather than emic (reflecting a state of affairs both recognizable and meaningful to those who lived it). So what?" you might reasonably say. "The equally important purpose in our periodization of time in North American archaeology in general is to provide archaeologists with a common temporal framework, a shared chronological scaffolding that allows all of us to talk about Archaic hunter-gatherers, Woodland farmers, and, for that matter, Late Woodland subsistence patterns, and to be on the same page, in other words, to mean the same thing, whether we are in Connecticut, Alabama, Michigan, Louisiana or Ontario."

A VIRTUAL LATE WOODLAND

Brilliantly phrased, of course—and would that it were true. A recent perusal of temporal definitions of the Late Woodland belie this otherwise rather reasonable argument. Table 1 presents beginning and ending dates for the Late Woodland as presented in twenty-five North American web sites devoted to archaeology. The sites were located using the Sherlock search engine of search engines provided in the Mac OS (version 8.6). Rather than having to use search engines individually, Sherlock allows you to conduct a single search of all designated search engines, essentially simultaneously. Windows users take heart; Bill Gates is sure to appropriate this element of the Mac OS for use in some upcoming version of his operating system.

Sherlock is configured on my computer to search for hits on a term or terms in the following, most common and broad-based internet search engines: Alta Vista, Direct Hit, Excite, GoTo.com, HotBot, Infoseek, LookSmart, Lycos, and Yahoo!. While I can make no claim that my search in Sherlock identified all internet sites where the Late Woodland was defined behaviorally and chronologically, I believe that my search using most of the major search engines resulted in a pretty thorough, if not entirely inclusive, listing. I am also confident that my listing is reasonably complete because there was a significant amount of redundancy in the list that Sherlock produced; many of the resulting internet locations turned up on more than one of the search engines listed above.

The places that house the web sites listed in Table 1 represent a fairly broad geographical sample of America from the Mississippi Valley region and east; in other words, the "woodlands" of eastern North America where the Woodland period and Late Woodland sub-period are commonly used in the subdivision of prehistoric time. Specific states and provinces where these web sites reside are (alphabetically): Alabama, Connecticut, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, New York, Ontario, Ohio,

TABLE 1: WEB SITES WHERE THE TERM "LATE WOODLAND" IS USED, DEFINED, AND TEMPORALLY BOUNDED. The many and diverse beginning and ending dates given on these web sites are provided here. Also, the various lengths proposed for the late woodland based on the data provided on these web sites appear here.

State/Province	Beginning AD	Ending AD	Duration	Source	Web Address
Connecticut	750	1600	850	ArchNet	http://archnet.uconn.edu/regions/northeast/culthist/cttime.htm
Alabama	600	1000	400	Archaeology of the Southern US homepage	http://members.tripod.com/~Archaeology/time.html
Illinois	600	1350	750	Center for American Archaeology	http://www.caa-archeology.org/~nsf/Evie.htm
Illinois	250	1300	1050	3rd Grade Class at Mt. Carroll Elementary School	http://www.mount-carroll.il.us/school/museum/page4.html
Illinois	250	800	550	State Board of Education	http://www.lth6.k12.il.us/Schools/hbe/woodind.html
Indiana	700	700	0	Indiana University	http://www.gbl.indiana.edu/abstracts/86/helmkamp_86.html
Iowa	400	1300	900	University of Iowa	http://www.uiowa.edu/~anthro/webcourse/naarch/hopewell.htm
Iowa	300	1000	700	Iowa State Archaeologist	http://www.uiowa.edu/~osa/cultural/wood.htm
Louisiana	400	1000	600	Tulane University	http://www.tulane.edu/~kidder/n%20am%20lect%2028%20outline.html
Michigan	400	1650	1250	on-line course	http://server.uofdhigh.k12.mi.us/~rbuchta/natamer/tsld013.htm
Minnesota	450	950	500	Minnesota State University Museum	http://emuseum.mankato.msus.edu/prehistory/minnesota/taxonomy/periods/latewoodland.html
Minnesota	600	1680	1080	St. Cloud State University	http://eleftheria.stcloudstate.edu/minnsett/cultural.htm
New York	1400	1600	200	New York Institute of Anthropology	http://www.hofllnk.com/~bayside/nyia/propoint.html
Northern Ontario	1000	Contact		Canada	http://www.civilization.ca/membrs/archaeo/ceramiq/pot11e.html
Ohio	500	1200	700	Ohio Historical Society	http://206.244.97.143/products/flint/people/ltwdpeop.html
Ohio	450	1000	550	Cincinatti Museum Center	http://www.cincymuseum.org/sites.htm
Ontario	900	Contact		Heritage Marketplace	http://www.adamsheritage.on.ca/pre/lwood1.htm
Ontario	500	1650	1150	Ontario Archaeological Society	http://nexus.sscl.uwo.ca/assoc/oas/points/latewood.html
Ontario	1600	Contact		Cataraqui Archaeological Research Foundation	http://web.ctsolutions.com/carf/document/prehist.html
South Dakota	700	1000	300	South Dakota State Archaeological Research Center	http://www.sdsmt.edu/wwwsarc/collectn/pots/88-20.html
South Dakota	950	1250	300		
Southeast	500	1000	500	Southeastern Archaeological Center, NPS	http://www.cr.nps.gov/seac/woodland.htm
Tennessee	600	900	300	University of Tennessee Tranportation Center	http://www.ra.utk.edu/tc/arch/culture.html
Texas	500	1600	1100	Caddoan Mounds	http://www.skiles.net/caddo/t%26t/t-00004.htm
Western Ontario	900	1550	650	London Museum of Archaeology	http://www.uwo.ca/museum/virtual_tour/navigation4.htm
Mean Dates	648	1256	685		

South Dakota, Tennessee, and Texas. Also represented on a single web site was the American Southeast region (specifically: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, and South Carolina).

The specific producers of the individual web sites represent a broad variety of sources as well. Web sites used here where the Late Woodland is defined and temporally bounded include those produced and maintained by the National Park Service of the United States, various universities (anthropology department pages, university course materials, general information pages), museums (general information pages and web sites associated with permanent exhibits), historical societies, research centers and institutes, state archaeologist offices, individual archaeologists, as well as the third-grade class at the Mt. Carroll Elementary School in Mt. Carroll, Illinois.

So, how about the notion that the concept of the Late Woodland at least provides a common chronological framework for archaeologists (or even third-graders) in their discussion of the late prehistory of North America? The dates provided in the web sites as shown in Table 1 indicate otherwise.

WHEN DOES THE LATE WOODLAND BEGIN?

For example, Connecticut, as represented on the ArchNet site, establishes the beginning of the Late Woodland at AD 750. The beginning dates for the Late Woodland as represented in the rest of the web sites range from an early placement at AD 250 (by web sites maintained by the Illinois Board of Education and, probably not coincidentally, the previously mentioned Mt. Carroll third grade class located in Illinois) to the remarkably late date of AD 1600 by the Cataraqui Archaeological Research Foundation in Ontario. This puts the range of beginning Late Woodland dates as represented in the web sties at a remarkable 1350 years. Beginning dates for the Late Woodland are spread out fairly evenly throughout this range; overall, the mean starting date for the Late Woodland as presented in the web site sample is AD 648.

WHEN DOES THE LATE WOODLAND END?

The Late Woodland ending dates provided in the web sites are similarly widely dispersed. Three of the sites identify the endpoint of the Late Woodland as "contact," obviously with Europeans, but there is no clear indication of what is meant by contact in these cases: first contact by explorers, earliest permanent European settlement, a certain threshold of European population density? ArchNet places the end of the Late Woodland at AD 1600. This ending date conforms pretty closely to earliest *substantial* European contact with Connecticut natives (actually, it appears to be a conveniently round number that predates such substantial contact by a couple of decades at least), but not first contact; that would be AD 1524 or soon thereafter with the exploration of our coast by the explorer Verazzanno. The latest specific date provided for the end of the Late Woodland is AD 1680 by a web site produced by St. Cloud University in Minnesota, which sounds like a contact date in that part of the continent. On the other extreme, the earliest endpoint of the Late Woodland is given as AD 700 by a website maintained by Indiana University. This actually places the end of the Late Woodland at a time *before* it even begins according to seven of the other web sites surveyed! AD 700 also is the date given on the same Indiana University site for the beginning of the Late Woodland. Perhaps the Late Woodland was an extremely short-lived phenomenon in Indiana, lasting maybe only a few months, say, from July to September. Or perhaps this was only a typo after all. However, fully nine of the web sites examined — without typos — mark the end of the Late Woodland at AD 1000 or before. Eliminating the Indiana University page, endpoints for the Late Woodland have a range, therefore, of 880 years, not quite as large as the range for beginning dates. The mean date for the end of the Late Woodland is AD 1256.

HOW LONG DID THE LATE WOODLAND LAST?

How long did the Late Woodland last? This figure ranges widely as well. Again ignoring the Indiana University error, the duration of the Late Woodland ranges from only a couple of centuries in our neighbor to the west, New York State, as published in a web site maintained by the New York Institute of Anthropology, to more than a millennium (more precisely, 1250 years) as presented in an on-line course in Michigan. The mean duration of the Late Woodland (eliminating the obvious error on the Indiana University site) is 685 years; its range is 1050 years. The Late Woodland duration is only 850 years in Connecticut (according to ArchNet).

DOES THE LATE WOODLAND CONCEPT CONTRIBUTE TO A COMMON CHRONOLOGY?

A time period with a start date that varies by as much as 1350 years, whose end date varies by nearly a millennium (880 years) and whose length varies by more than 1000 years, can hardly be called a unifying concept for North American prehistorians. It provides us with no common frame of reference, it cannot represent part of a shared chronological vocabulary. In fact, the term "Late Woodland" may be nearly ubiquitous, but its chronological meaning is far from the same across the geographic and temporal extent of its use. Though it is a firmly entrenched concept — and one unlikely to be abandoned by researchers as a result of my diatribe — one is nevertheless obliged to ask: If "Late Woodland" would have meant little if anything to the ancient inhabitants of Connecticut in terms of demarcating a distinct period of their own history *and* if it means something different to most of the researchers using the concept, of what practical use is it?

THE LATE WOODLAND: PART OF AN EVOLUTIONARY CONTINUUM

As I maintained in 1984 and as it can be viewed today, the Late Woodland can be understood as the culmination of a series of essentially uninterrupted cultural trajectories, the origins of which can be recognized far back into the Archaic. To this uniformitarian view, we can admit to a few significant "punctuations," in the sense of significant alterations in those cultural trajectories. Therein lies the utility of the concept of the Late Woodland. While there is no obvious breakpoint between the Archaic and the Woodland or between any of the sub-periods of the Woodland, changes with roots in the Archaic do exhibit what can be called a florescence in the Late Woodland and significant novel cultural behaviors were injected into the mix during this time. The most important of these, are:

1. Increase in apparent base village size as seen at many sites in Connecticut including Shantok Cove (Salwen and Ottesen 1972), the Hollister site (Lavin 1980), Morgan (Lavin 1988a, 1988b; Lavin *et al.* 1993), Burnham-Shepard (Bendremer *et al.* 1991), and Meadow Road (Feder 1983). This is mirrored in eastern Massachusetts (Dincauze 1974). In this regard, we can cite discoveries like the substantial and at least semi-permanent structure(s) at Griswold Point with associated dates of AD 1170 and AD 1440 (Juli and Lavin 1996). Juli and Lavin's identification of a postmold pattern similar to one identified by Ritchie (1969) on Martha's Vineyard is indicative of a wigwam more than five meters across and hints at the tantalizing possibility of nucleated villages developing in the Late Woodland.

2. Increase in degree of sedentism based on feature size and artifact density, as seen at the sites listed in #1, above. McBride and Dewar (1987) and Lavin (1988a) support the notion that Late Woodland times saw an increase in site size as well as intrasite variability, reflecting larger

community size as well as, perhaps, indicating the concentration of a greater number of activities carried out at these increasingly large settlements. It is Lavin's (1988a) perspective that these larger villages became more sedentary during the Late Woodland. In the interior, Lavin sees horticulture as playing an important role in this shift. Horticulture was not a major factor along the coast but, in Lavin's view, an increased reliance on marsh resources available at coastal locations allowed for increasing sedentism there and also led to cultural elaboration supported by a sedentary lifestyle in a rich environment. Her view is supported at sites like Greenwich Cove in Rhode Island where Bernstein (1993) shows that the faunal assemblage indicates year-round exploitation and, therefore, year-round occupation of the site.

3. Within a general trend toward semi-sedentary and sedentary settlements, the Late Woodland also is characterized by an increasingly complex pattern of land use. For example, Juli (1994:29) proposed a detailed model reflecting a seasonal cycle of land use that included winter nucleated villages in sheltered uplands (based on descriptions by Roger Williams (1997) for seventeenth-century Rhode Island), the break-up of these villages in the early spring with a removal to spots where the runs of anadromous fish could be most easily exploited, late spring horticultural villages with men retaining mobility for hunting and fishing, and summer and late fall camps for shellfish collecting, hunting game, and gathering. In the Farmington Valley, several of the sites located in the 1986 survey of Peoples State Forest date to the Late Woodland, specifically the thirteenth century AD and appear to be just such inland, upland, hunting camps that, following Juli's model, may represent task specific late spring encampments or, possibly, summer and late fall hunting camps (Feder 1990). Several similar inland, upland sites have also been found in an on-going survey being conducted by the author in the McLean Game Refuge in Simsbury and Granby, Connecticut. One of these sites, Firetown North, has produced an abundant amount of chippage, primarily hornfels, several spear points, a very small amount of calcined bone, and a few sherds. Firetown North has been dated to AD 1040 (Feder n.d.).

4. Florescence of trade networks involving prehistoric people in Connecticut within a wider social interaction sphere, probably including the inhabitants of the Hudson valley of New York State (Feder 1980/81, 1984).

Archaic people, for the most part, practiced lithic procurement behaviors which can be characterized as "parochial"(Dincauze 1973, 1974; Snow 1980). As Calogero and Philpotts (1995) phrase it, "Quarrier/knappers living in the New England region had a host of rock types from which to choose, and their choices, in turn, reflect New England's geological diversity." For example, the use of various local quartzes and quartzites seems ubiquitous during the Archaic. Also, Calogero (1991) and Calogero and Philpotts (1995) have shown that hornfels, a metamorphic rock produced locally when molten basalt overflowed and baked Tertiary sandstones in the Farmington Valley, also was widely used in Connecticut, often in Archaic contexts. Fine-grained hornfels possesses flint-like characteristics and was used extensively where it was available. For example, the Alsop Meadow site, dating to 4950 BP, produced a lithic assemblage of more than 16,000 artifacts (primarily debitage), of which more than 95% were hornfels.

During the Early and Middle Woodland sub-periods, the percentage of exotic lithics tends to increase. In the Roaring Brook phase of the Middle Woodland period (2000 - 1500 BP) as defined by McBride (1984), sites excavated in the Lower Connecticut Valley commonly exhibit percentages of exotic lithics in the 5 - 10% range. At Selden Creek phase Middle Woodland sites (1200 - 1000 BP), the range is 40 - 50%. During the Middle Woodland and extending into the beginning of the Late Woodland, non-native hornfels is seen in the Lower Connecticut valley (Tryon and Philpotts 1997). Tryon and Philpotts indicate that the hornfels in question resembles material identified in New Jersey.

It is during the Late Woodland, however, that we can recognize a significant increase in the frequencies and percentages of non-local lithics, particularly at the large base village sites, where the percentage of exotics range up to 100% (Feder 1980/81, 1984; McBride 1984). We can infer from this the probable intensification of trade networks to facilitate the procurement of these desirable raw materials. Thus, it is likely that one of the most important and unique features of the Late Woodland was a widening of the social interaction sphere, resulting from the impact of the socially bonding effects of trade (Feder 1984).

Along with this, Lavin *et al.* (1993) also see evidence in Late Woodland ceramic assemblages for increasing interaction between people to the west in New York and the aboriginal inhabitants of Connecticut. For example, at the Morgan site, Lavin, Gudrian, and Miroff assign most of the ceramics to the Windsor Tradition, but also note the increasing presence through time of Point Peninsula and Owasco tradition ceramics. These researchers maintain that the increasing frequency of sherds representing these non-native ceramic traditions reflect, "increasingly stronger social interactions over time with participants in the Point Peninsula and Owasco ceramic traditions to the west. The latter groups apparently introduced the Morgan residents to maize horticulture and collared pottery vessels, both of which occur earlier in interior New York than in southern New England" (Lavin *et al.* 1993:98).

Recently, Lavin (1998) has gone beyond this model of increasing social interaction between Connecticut's native inhabitants and people to the west and based on the ceramic evidence hypothesizes an actual population movement of people into our state from the Mid-Atlantic region during the Middle Woodland.

It is now apparent that, although the beginning of the Late Woodland cannot be viewed as representing the inception of a horticultural subsistence system in southern New England — at least not a system reliant on tropical cultigens — it was during the Late Woodland that maize, beans, and squash were introduced into the subsistence mix. This is one very significant instance in which a novel behavioral pattern was introduced, producing a "punctuation" in the otherwise uniformitarian cultural trajectory of aboriginal Connecticut.

There is no evidence for any of the Mesoamerican triad of crops in Connecticut much before AD 1000; the oldest Connecticut site where maize has been discovered is Selden Island dating to sometime in the tenth or eleventh century AD. However, evidence for a substantial contribution of maize to the aboriginal diet dates to at least two centuries — and more likely three centuries — later. Mago Point (Bellantoni and Dorr 1985), the Morgan site (Lavin 1988b), and Burnham-Shepard (Bendremer *et al.* 1991) date to the twelfth to fourteenth centuries AD. These sites post-date the earliest evidence for maize in New York to the west, suggesting a possible source for the tropical cultigen complex. Substantial numbers of maize kernels have been recovered at these interior Connecticut sites and, given the vicissitudes of preservation, even these few sites where maize has been found may reflect a broad and general shift — at least inland — to an economy that included maize as an important (but by not necessarily primary) component in the diet toward the end of the Late Woodland. The complex storage feature identified and analyzed by Bendremer *et al.* (1991) at Burnham-Shepard adds further support to the notion that maize was an important part of the subsistence quest of the inhabitants of that site and probably elsewhere in Connecticut's interior at this time.

As noted by McBride and Dewar (1987) and as discussed by George (1997b), evidence for a Late Woodland shift to an economy that included tropical cultigens is not nearly as clear along Connecticut's coast. There, though there is some evidence of corn also initially at about AD 1000, there are no coastal sites — at least none yet — that have produced substantial quantities of maize, beans, or squash, and certainly no evidence exists for large or fixed facilities for storing agricultural products. George (1997b) suggests that the highly acidic, relatively infertile soils of the coast precluded reliance on maize. He also suggests that in an area already quite rich in seasonally available natural food sources, the demands of domesticated crops would have led to scheduling conflicts with other, robust and better known subsistence items. In other words, why risk starving by shifting to a new, alien, and poorly known food source, when nature's bounty is more than sufficient?

Interestingly, Bernstein (1992, 1993) has found a similar pattern in coastal Rhode Island. In his analysis of subsistence remains recovered at eight sites located on Narragansett Bay, he found that even in Late Woodland times, deer, shellfish, and, in particular, hickory nuts, provided the bulk of the aboriginal diet; he found virtually no evidence for the use of maize by these coastal inhabitants of our neighboring state to the east. He suggests that rather than cultivation of the tropical cultigen complex that characterized much of the rest of the New World, "increase in subsistence output was seemingly achieved through an intensification of the collection of a few key resources and an overall diversification of the food base" (Bernstein 1993:1). This conforms well with Ceci's (1982) hypothesis that large, coastal, agricultural villages reported by seventeenth-century European explorers (for example, Mourt (1963) at Plymouth) and settlers were an effect of contact and, as Pagoulatos (1990) suggests, resulted from the desire on the part of natives to position themselves geographically so as to obtain better access to shell sources for wampum production, and to locate themselves at the best places to facilitate trade with explorers and colonists.

The evidence, though not enormously abundant, nevertheless implies the introduction of maize into Connecticut sometime after AD 1000 (Juli 1994). It was a more important part of the subsistence base in the interior than along the coast, but even in the interior, a mono-crop economy did not develop. Instead, as George (1997b) indicates, maize likely represented merely an addition to and not a replacement of an already productive, indigenous subsistence system that included a broad array of native plant foods including nuts, seeds, roots, and fruits. Lavin (1988b:17) found precisely this at the Morgan site. Though evidence for the use of maize was extensive in the fourteenth-century AD component of that site, the list of native plants exploited by the inhabitants is long and includes hickory, chestnut, black walnut, and chenopodium, among several others. The analysis by Medaglia *et al.* (1990) on Nantucket in their determination of the carbon isotope profile of human bone in an attempt to reconstruct the native diet, by no means answers all of our questions, but conforms (as well as might be expected) to the view that Late Woodland diet included a broad array of local plants as well as introduced tropical cultigens.

The numbers of different species of nuts, fruits, annuals, and grasses/sedges recovered archaeologically from the Late Woodland sites George (1997b) discusses are substantial and required the exploitation of a number of microenvironments. George (1997b:23) goes on to imply at least the possibility that some of these native species were being subjected to processes that we might here explicitly call artificial selection. He proposes that perhaps the notion that the concept of domestication arrived with tropical cultigens upon their appearance here after AD 1000 may need to be reassessed just as it was when an indigenous "agricultural revolution" was evidenced for the American midsouth (Smith 1989, 1992). Though evidence is scarce, George (1997a) points to the morphology of at least a portion of the chenopodium remains at the Burnham-Shepard site as supporting this contention; some of the chenopodium remains recovered there exhibit a seedcoat (testa) thickness and surface morphology that resembles the domesticated version of this species.

The general pattern of an initial, sudden appearance of maize and a gradual period — centuries in duration — of acceptance of it as a significant contributor to the diet repeats earlier shifts seen to the west. For example, Hart and Sidell (1996) trace the shift to agriculture in the Susquehanna River system in Pennsylvania. Maize appears in the archaeological record there rather suddenly at around AD 800. Sedentary agricultural villages where the tropical triad of maize, beans, and squash are key components in the diet are not seen there for more than four hundred years. Even then, after AD 1250, maize is just one component of a broad based diet that includes domesticated chenopodium, sunflower, and little barley. Chilton (1999) presents a strong argument for the same pattern in southern New England. Dozens or even hundreds of maize kernels recovered in Late Woodland contexts in Connecticut do not necessarily add up to a subsistence system with maize at its core. As Chilton (1999:171) suggests, "maize was only part of a diverse subsistence-settlement system of the New England interior." How significant a role maize actually played is a question that remains to be answered by archaeologists working in southern New England.

The point is made; though both occurred during the Late Woodland, neither the point in time represented by the initial introduction of maize into Connecticut nor the time of its widespread acceptance as a significant component in the subsistence quest occurred at the beginning of this period.

THE WOODLAND CONTINUUM

At the onset of the Late Woodland, prehistoric technology and material culture are not marked by a great divergence from previously established pathways. However, as mentioned before, neither are they stagnant. For example, it is useful to consider the development of ceramic technology during the Woodland period.

When the Woodland itself was defined, the appearance of ceramic technology was the one distinguishing feature by which we separated this period from the previous Archaic. Throughout the Woodland in Connecticut, ceramics reflect evolutionary changes in form, design, and temper. The Late Woodland of Connecticut is chronologically segmented by reference to these continuous and developmental changes in ceramics (see Table 2)

TABLE 2: BREAKDOWN OF THE LATE WOODLAND AS PROVIDED ON ARCHNET

Connecticut Phases of the Late Woodland and Early Contact Periods	Begins	Ends
Hackney Pond	1600	1700
Niantic	1500	1600
Selden Creek	700	1500

Much of the Woodland pottery found in Connecticut, is considered to belong to the Windsor tradition. Also, East River tradition pottery has been found in southwestern Connecticut and Owaso tradition ceramics are found in the western part of the state.

The common morphological theme underlying the Windsor Tradition during the Early and Middle Woodland is its simple conoidal shape. More rounded forms appear in the Late Woodland and incorporate necks, collars and shoulders. Among the ceramic types defined for the later Middle Woodland and the Late Woodland in Connecticut are Windsor Brushed, Sebonac Stamped, Hollister Stamped, Selden Island, Windsor Plain, Shantok Cove Incised, Niantic Stamped, and Hackney Pond (Lizee *et al.* 1995).

Selden Creek Phase pottery types within the Windsor Tradition include the above-mentioned Selden Island, Sebonac Stamped, and Hollister Stamped. Selden Island ceramics are characterized by an elongated, conoidal shape with a restricted neck and shell stamping including the rocker dentate application of the lateral edge of a quahog or oyster shell. Temper is mineral or shell and mean sherd thickness is between 5 - 8 mm (Lizee 1994). Sebonac Stamped is a bit later than Selden Island, but it represents no revolution in ceramic technology or style. Here again, pot shape is largely conoidal, with shell stamp decoration common, with the shell edge impressed at a right or oblique angle to the rim. Crushed shell is the dominant temper and sherds tend to be between 7 - 10 mm in thickness. The use of shell as temper as well as in its use as a tool in impressed decoration is a reflection of the coastal focus of the Selden Island and Sebonac Stamped potters.

Hollister Stamped pottery is defined and recognized along Connecticut's coast, but also in the upland and interior river valleys. Pot shapes are the familiar elongate conoidal, but globular vessels are known as well. Shell is found used as a temper, but away from the coast temper consists of crushed minerals. Surface treatment includes the use of a blunt, single point tool—probably a sharpened antler tine or wooden stick—to produce a series of horizontal rows of impressions. Sherd thickness ranges between 6 - 8 mm.

Windsor Plain pottery is characterized by elongated conoidal and globular forms. Temper tends to be finely ground shell and mineral fragments. The surfaces of Windsor Plain ceramics are smooth; sherd thickness ranges widely from 4 - 12 mm. With so few defining characteristics, Windsor Plain tends to be a category into which any plain ceramic sherds are placed.

Shantok Cove Incised pots are elongated globular. Medium to coarse-grained shell temper was added to the paste; grit-tempering is also known. Decorative treatment included incised lines, and cord marking, with cord marks sometimes smoothed over.

Niantic Stamped ceramics are dated to the very end of the Late Woodland; the form continues well into the Contact period. Pot form is far more complex than seen previously with globular bodies, constricted necks, collars, and castellations. Medium to fine-grained shell and mineral temper was added to the clay. Decorations include shell stamping, often with triangular designs, over surfaces that exhibit smoothing or smoothed over cord marking. Niantic Stamped sherds are usually quite thin, ranging from 3 - 8 mm.

Hackney Pond ceramics also date to the very end of the Late Woodland and forms extend into the historical period. Pots are globular with collars. Hackney Pond clay is extremely fine with little or no temper added to the paste. Surface decoration includes incised designs and shell stamping. Sherds are very thin, ranging between 3 and 7mm.

WOODLAND CERAMIC EVOLUTION IN THE FARMINGTON VALLEY

We can next look at developments in ceramic technology that began in the Early Woodland and culminated in the Late Woodland by focusing on a number of sites from a single region, the Farmington Valley (Figures 1, 2).

Loomis II

The Loomis II site is located immediately south of the confluence of the Connecticut and Farmington rivers in the town of Windsor, Connecticut. Loomis II is situated just north of and stratigraphically above Loomis I, a small stemmed, quartz point occupation associated with a radiocarbon date of 3495±150 BP (QC-708).

Loomis II appears to be a single component, early Middle Woodland village site based on size, features, and artifact content. This site is associated with a radiocarbon date derived from charcoal recovered from a hearth of 1940+95 BP (QC 707). Two sherds from Loomis II were submitted for thermoluminescence analysis. Dates of 1500±20% BP (Alpha-3308) and 980±20% BP (Alpha-3309) were obtained. While the first date falls within a single standard deviation of the radiocarbon date, the second is significantly younger and may represent a more recent occupation of the site.

The lithic assemblage reported on more fully elsewhere (Feder 1980/81) consisted of a variety of triangular, flint and quartz projectile points and a single red jasper Jack's Reef corner notched point. Lithic material in general included flint, red and yellow jasper, smoky quartz, crystal quartz, and quartzite.

The ceramics recovered at the site were primarily thick-walled and coarse-pasted, with large quantities of sizeable pieces of mineral grit including angular fragments of quartz and quartzite. In a typical piece of pottery, fully 29.5% of the sherd by volume was made up of grit >1.0mm in size.

Interior sherd surfaces exhibit clear evidence of brushing, with marks running parallel to the rims. Most exterior surfaces show no evidence of decoration. A few sherds (16%) show fabric impressions, a few (11%) show dentate stamping, with very few (5%) showing cordmarking, exterior brushing (5%), or incising (3%). Sherd thickness at Loomis II ranged from 3.8 mm - 14.2 mm with a mean of 8.2 mm (standard deviation 1.5 mm).

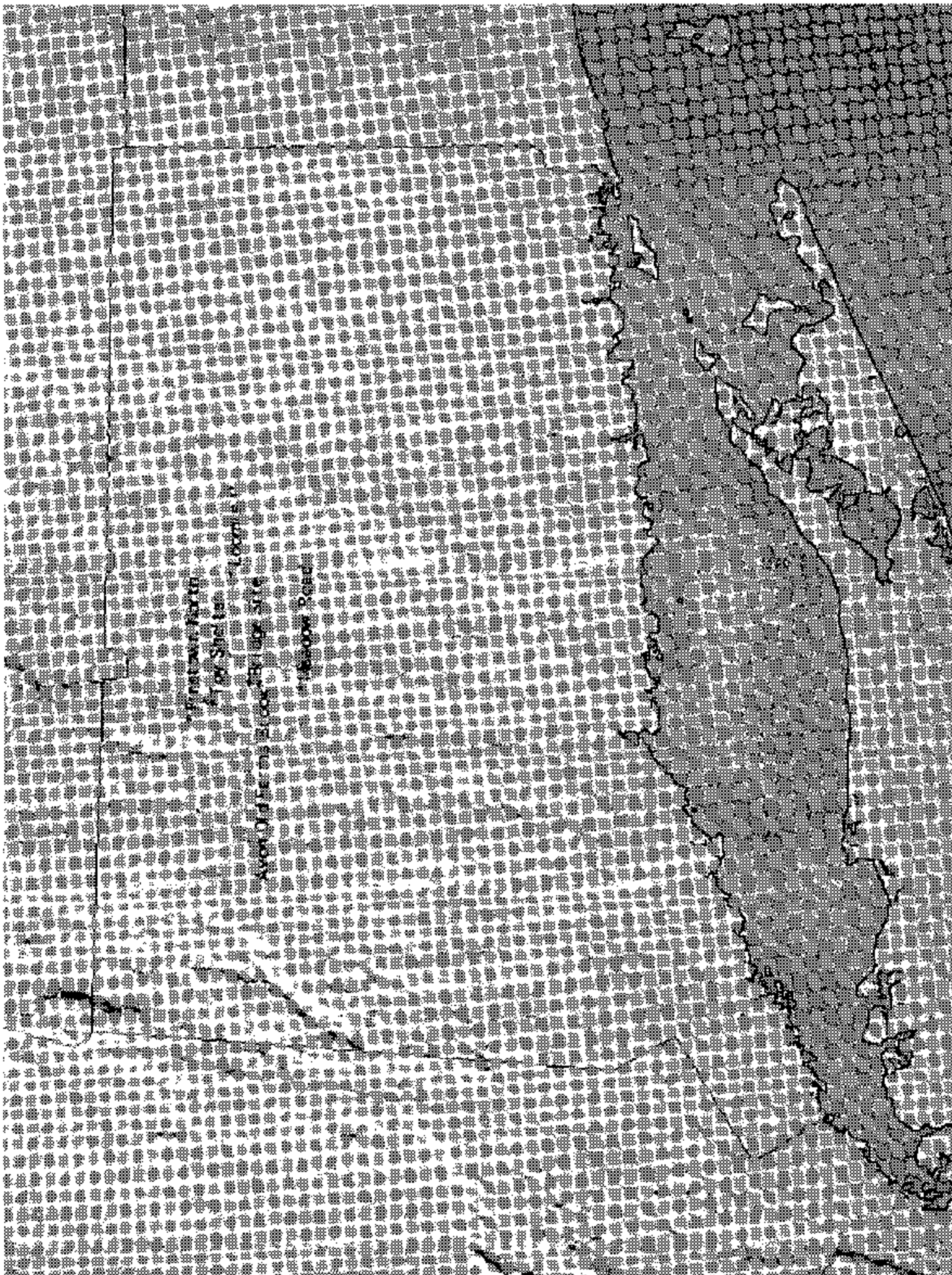

Figure 1. Map showing the location of the Farmington Valley and the sites mentioned in the text.

Figure 2. Sample of sherds from the Farmington Valley sites mentioned in the text: Loomis II (two sherds on far left); Bridge site (three sherds in center); Meadow Road (three sherds on far right).

One interesting feature of the sherds from Loomis II was the quite noticeable tendency for exterior sherd surfaces to exfoliate from the sherd body. Viewed in cross section, the sherds have a sandwich-like appearance. This may indicate the application of what amounts to a self-slip, perhaps as part of an attempt by makers to smooth exterior surfaces and to cover grit temper that might otherwise have been exposed.

Old Farms Brook II

The Old Farms Brook site is a multicomponent occupation located at the confluence of Old Farms Brook and the Farmington River in the town of Avon, Connecticut. A Late Archaic component, Old Farms Brook I, dated to 4220+250 BP (QC-952) with associated Brewerton material is overlain by a ceramic component (Old Farms Brook II) which is, in turn, overlain by a small Late Woodland occupation with Levanna flint triangles (Old Farms Brook III). All three components are stratigraphically distinct and separated by culturally sterile strata.

The very small assemblage of ceramics at Old Farms Brook II (just twelve sherds) indicates a great degree of similarity with the pottery just summarized for Loomis II. The Old Farms Brook II sherds are thick-walled with coarse grit temper consisting, as was the case at Loomis II, of angular fragments of quartz and quartzite, along with small pieces of mica. The paste used here, while coarse, is a bit finer than that used at Loomis II; only about 16.5% of the volume of the typical sherd body consists of grit >1.0 mm in size. Sherd interiors exhibit some brushing. The exterior surfaces of 42% of the sherds show dentate stamping, 8% show incising, and 8% were brushed.

As was the case at Loomis II, Old Farms Brook II sherds exhibited a tendency to loose thin fragments of primarily exterior and, to a lesser extent, interior surfaces, again suggesting the application of a self-slip. Sherd thickness ranged from 5.9 mm - 9.2 mm with a mean thickness of 7.5 mm (1.1 mm standard deviation). Though the Old Farms sherds are similar to those recovered at Loomis II, a thermoluminescence date derived from the Old Farms Brook II material produced a date of 370±20% BP (Alpha-3310).

Bridge Site

The Bridge site is located approximately 150 m south of the Old Farms Brook site. Both of these sites, along with a number of others (Fisher I, II, and III) constitute what amounts to a nearly continuous scatter of prehistoric archaeological material along this particular section of the Farmington River in the town of Avon, Connecticut. Bridge, however, is horizontally, artifactually, and stratigraphically distinct from the Old Farms Brook site.

The Bridge site has been radiocarbon dated to 730±70 BP (Beta-12940). However, the complex and disturbed stratigraphy at the edge of the site where the dated material was collected renders this date problematical and appears to be too recent based on ceramic typology. A thermoluminescence date derived from a sherd at the site, 2650±20% BP (Alpha-3907), is more reasonable.

The ceramics from Bridge are quite different from those seen at either Loomis II or Old Farms. Sherds are thick, but possessed of generally finer quartz grit temper. At Bridge, only 9.4% of the matrix of a typical sherd consisted of grit >1.0mm in size. More than half of the sherds (54%) exhibited cord-marking on their interior and exterior surfaces. Cord marks ran parallel to rims on the exterior surfaces; marking on interior surfaces was perpendicular to the rim. Incising was identified on 13% of the sherds and fabric impression was seen on 13%. Brushing was apparent on only one sherd and 18% of the ceramic fragments had no surface treatment or decoration.

Sloughing off of the exterior as well as interior surfaces is, once again, common on many of the sherds and is interpreted as indicative of the application of a self-slip. Sherd thickness ranged from 7.4 - 12.8 mm with a mean of 10.3 (standard deviation of 1.1 mm). Rims were consistently thinner and straight.

Toy Shelter

The Toy Shelter is a rockshelter occupation located in Canton, Connecticut. The site was occupied throughout the Archaic and Woodland periods. Ceramics from the upper stratigraphic zone were quite distinct. Exterior design was rare with 94% of the sherds showing no surface treatment. Cord-marking appeared on 6% of the sherds, fabric impression on 7%, and brushing on 7% of the sherds. Incising and stamping occurred on just one sherd each. Sherd thickness ranged from 5.5 mm - 11.3 mm with a mean of 8.2 mm (standard deviation, 1.1 mm). No absolute dates were determined for the sherds or the occupation level.

Meadow Road

The Meadow Road site is the only certain Late Woodland occupation examined in this sample of Farmington Valley Woodland period sites. It is located on the floodplain of the Farmington River, in the town of Farmington, Connecticut. It is approximately 100 m south and west of the confluence of the Farmington and Pequabuck rivers, immediately south of the great bend in the Farmington River from which, supposedly, the Farmington derived its aboriginal name: Tunxis Sepus.

The Meadow Road site is situated at the eastern margin of a large, flat, alluvial terrace possessed of an almost continuous scatter of primarily Late Archaic material. A relatively small encampment of no more than about $100m^2$, Meadow Road's lithic artifacts include some quartz triangular point fragments, quartz, basalt, hornfels, and flint cutting and scraping tools, basalt flake cores, and debitage. The site has been radiocarbon dated to 830±70 BP (Beta-12939). In addition, two sherds were dated by thermoluminescence to 720±20% BP (Alpha 3312) and 510±20% BP (Alpha-3311). This second, younger date is problematic, having exhibited anomalous fading in counting. It can be interpreted only as indicating that the sherd is equal to or greater than that age, which is in line with the radiocarbon date and the other thermoluminescence date from the site.

The ceramics from the site are quite different from those described previously. Most sherds are extremely thin-walled with very fine paste; there appears to be, essentially, no temper added to the clay. Only trace amounts of grit >1.0mm was identified in a typical sherd. Most sherds (76%) exhibited no form of exterior surface decoration. Detailed, fine-line incisions were located on 17% of the sherds (primarily, but not exclusively, on rims). These incisions consist of clusters of usually thin, parallel lines abutted up against other clusters of parallel lines at acute angles to each other. Fabric impressions (3%), cord marking (2%), and dentate stamping (3%) occur on a few sherds.

Sherd thickness ranges from an incredibly thin 2.6 mm - 8.9 mm with a mean of only 5.5 mm (standard deviation 1.6mm). Rimsherds fall on the low end of the thickness range and tend to be either straight or everted. It should also be pointed out that the Meadow Road ceramics do not exhibit the sandwich-like cross-section of the pottery found at the other sites discussed here. The potters at Meadow Road may not have felt the need to apply a self-slip with no coarsely gritted paste to cover up.

COMPARISON AND DISCUSSION

As can be readily seen there is a great amount of variability in Farmington Valley ceramics and some rather consistent changes through time. At the same time, it should be noted that there are consistencies among the sherds recovered at individual sites and, equally clearly, there are differences between those found at different sites.

For example, there are clear differences in mean sherd thickness (Figure 3) — from a high of 10.3 mm for Bridge, to a low, of 5.4mm for Meadow Road. Radiocarbon dates and thermoluminescence dates agree on a significant point; in the Farmington Valley, sherd wall thickness tends to decrease through time.

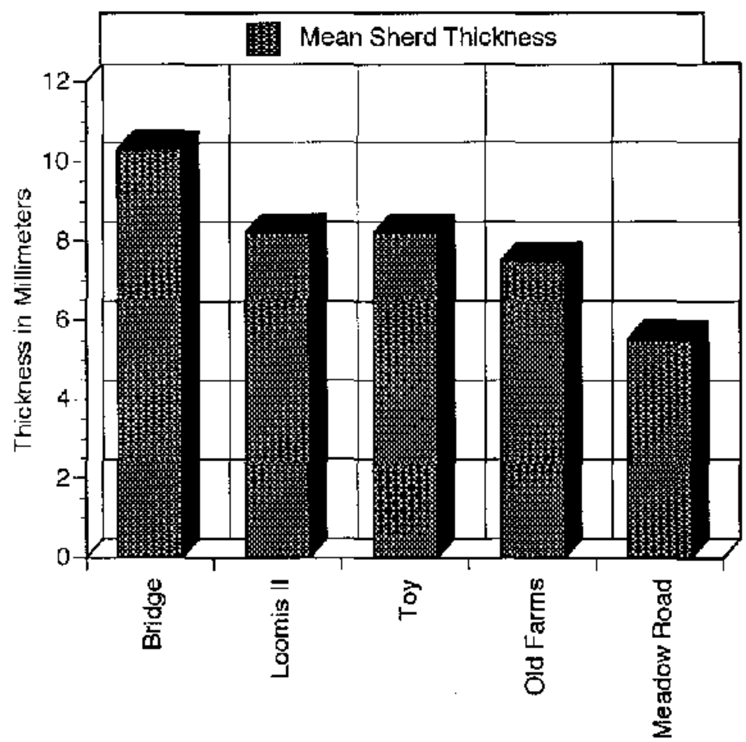

Figure 3. Bar graph showing mean sherd thickness for Farmington Valley sites mentioned in the text.

This likely indicates the refinement of ceramic technology in Farmington Valley throughout the Woodland period from early to late.

Of course, the statistic of the mean obscures some of the variability within individual site samples and sherds from the same pot may vary in thickness. However, a glance at Figure 4, indicates that sherd thickness is more or less normally distributed for each of the site samples with the exception of Meadow Road. The distributions of sherd thickness for Loomis II, Toy, and Bridge (Old Farms has too small a sample to determine the nature of its sherd thickness distribution) exhibit a single peak, and their means and medians are respectively the same (these are features of a normal distribution or "bell curve"). It is quite interesting to note that the distributions of sherd thickness for Loomis II and Toy are nearly identical (the peak for Toy is higher only because of a larger sample size). Note also that the form of the graphed distribution of sherd thickness for Bridge is the same as that for Loomis II and Toy (a normal curve clustered tightly around the mean indicating a small standard deviation). However, the sherd thickness distribution at Bridge is shifted approximately two standard deviations to the right (i.e., the sherds are significantly thicker). Thus, though there was certainly internal variability within sites and even within the same pots, these differences fall within a normal distribution.

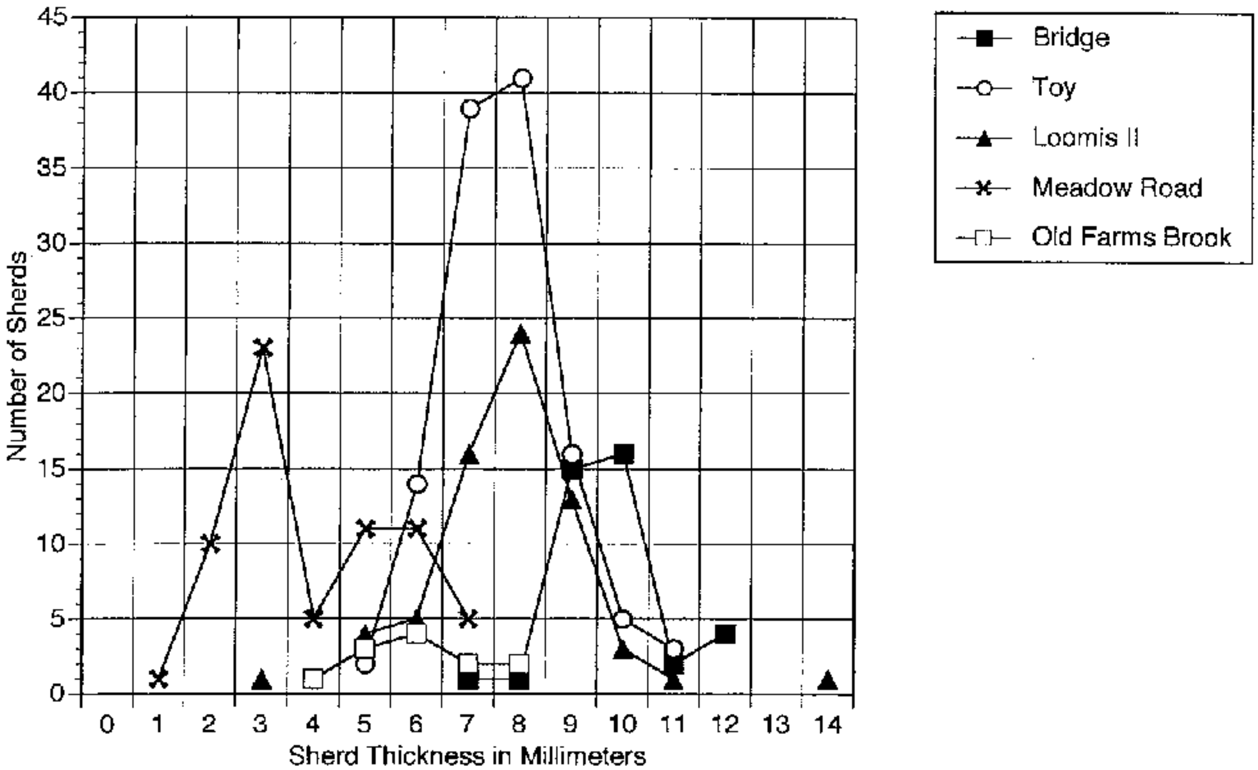

Figure 4. Line graph showing distribution of sherd thickness for Farmington Valley sites mentioned in the text. Note that most of the thickness distributions exhibit a near-normal distribution.

The distribution for the Meadow Road sherds is not normal, but bimodal. The two-peaked nature of the distribution is probably indicative of two different pots or pot types present at the site. In other words, there are two, distinct normal distributions shown here, combined in the same curve. It does not seem likely that single pots would vary bimodally in thickness.

Also, a matrix size analysis was performed on materials from each of the sites. Sample sherds from each site were ground in a mortar and pestle, the matrix was passed through a series of nested screens (2 mm, 1 mm, .5 mm, .25 mm, .125 mm), and the volume of each of the fraction sizes was measured. Care was taken in this process to grind all clay matrix, but to leave all temper intact. As nearly all of the temper for all of the sherds examined consisted of angular fragments of quartz or quartzite, this was readily accomplished.

Two typical sherds (in terms of thickness, apparent temper, as well as interior and exterior color) were sacrificed from each of the sites for this analysis. Since the Meadow Road sherds exhibited a bimodal distribution for thickness one sherd from each of the modes was selected. Figure 5 exhibits the results of this analysis (for one of the two sherds sacrificed for each of the sites since the two analyzed from each of the sites were so similar). The horizontal axis of the graph represents the size of the sherd matrix that passed through each of the nested screens. The vertical axis represents the standardized fraction of the total sherd that passed through the screens. Since the sherds used in this analysis were of different sizes, it was necessary to standardize the values to aid in site to site comparison. This simply involved dividing each of the volume figures for the different size fractions for individual sherds by the volume that passed through all of the screens (i.e., that fraction <.125 in size) for each sherd. That renders the first value on the graph 1.0 for each the sherds (dividing the volume of the <.125 fraction by itself); the rest of the figures are, therefore, all relative to the <.125 fraction and then can be read as simple ratios.

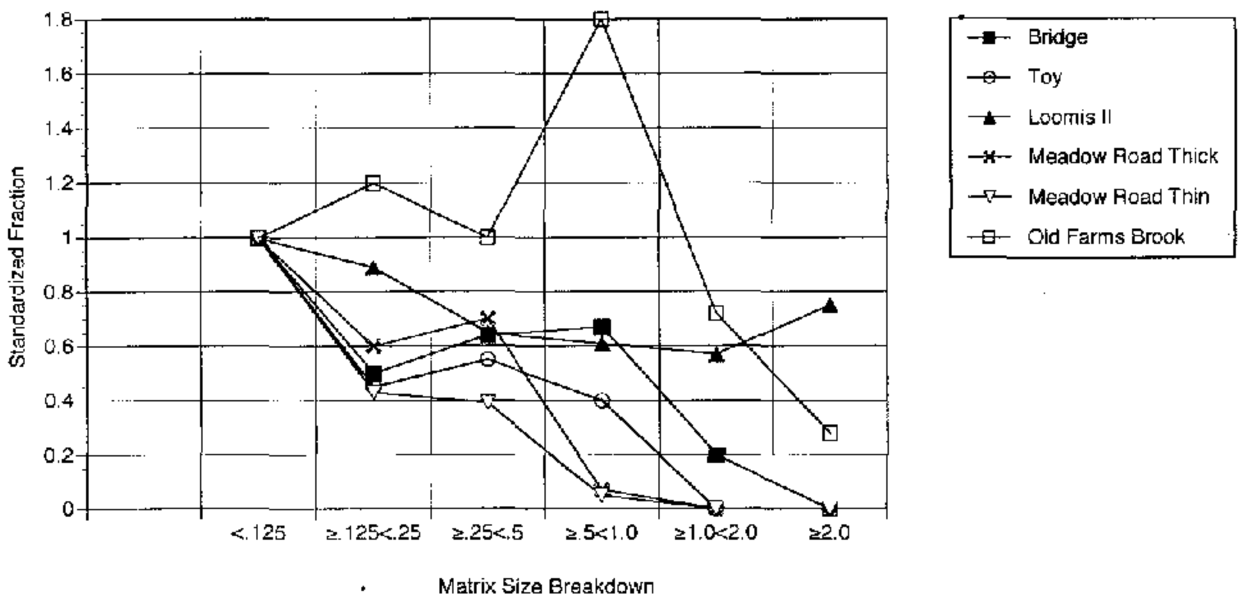

Figure 5. Sherd matrix analysis. The horizontal axis of the graph represents the size of the sherd matrix that passed through each of the nested screens (2 mm, 1 mm, .5 mm, .25mm, .125 mm). The vertical axis represents the standardized fraction (proportion) of the total sherd that passed through each of the screens.

As can be seen in Figure 5, each of the sherds selected for analysis exhibits a unique "signature" for the clay/temper sizes used at the sites. Clearly, the Late Woodland Meadow Road material (for both of the types tested) consisted of the finest clay matrix (the thinner sherd was finer than the thicker one) and the Old Farms Brook II sherd was the coarsest. The Loomis II sherd shows fairly consistent, high values across the entire temper size spectrum while the Bridge site sherd shows a sharp dropoff in size fraction above .5mm.

SUMMARY OF FARMINGTON VALLEY CERAMICS

Note that no standard pottery "types" have been assigned to any of the pottery described here. This has been quite intentional. It is at least potentially the case that in our application of chronological types (for ceramics or lithics), we obscure the regional variability that almost certainly characterized prehistoric material culture. Therefore, rather than attempting to fit the ceramics from these Farmington Valley sites into accepted categories defined at sites located elsewhere in Connecticut specifically and the Northeast generally, descriptive statistics of the Farmington Valley sherds has been emphasized. It is hoped that, in so doing, and in focusing on variables most closely related to construction methodology (sherd thickness, and clay matrix characteristics), the essential nature of Farmington Valley ceramics has been communicated.

That being said, there are, of course, some consistencies between traditional ceramic types and pottery from the Farmington valley. The ceramics from Bridge, with their thick walls, coarse-grit temper, and interior and exterior cord marking seem to fit into the Vinette type of the North Beach Stage of the Windsor tradition (though some additional, non-cord marking motifs are present). On the other hand, the stamped ceramics from Loomis II and Old Farms Brook share characteristics with those defined by Lavin (1980) as Fastener Stage material. The Loomis II date places it within the early Middle Woodland. It is about 125 radiocarbon years older than the Tuthill site where the type was defined (Lavin 1987).

At Meadow Road, the thin-walled, fine pasted ware with incised rims would seem to fit, at least in part, into McBride's (1984) Hackney Pond Stage, However, there are some stylistic differences in terms of color (McBride characterizes the sherds as being tan, the Meadow Road sherds are, for the most part, black) and surface treatment (incising at Meadow Road is not confined to rims).

A number of conclusions can be drawn from this analysis of Farmington Valley ceramics:

1. Ceramics from the Farmington Valley can be reasonably subsumed under the Windsor tradition.

2. The four stages of Smith (1950) and Rouse (1947) and the expanded seven stages of Lavin (1987) seem to represent culturally valid and analytically reasonable categories in Woodland ceramic chronology.

3. On the other hand, there is a great deal of regional ceramic variability that belies the universality of such neat categorizations.

4. We should not let our application of tradition or stage categories obscure this regional variability -- we should not mask variability we should celebrate it, and

5. We should expand our focus on the cultural significance of inter-regional variability, even within the modern political boundaries of so small a state as Connecticut. Snow's (1980) suggestion of discrete cultures ensconced in their own river valleys remains a viable model. Ceramic variability among these river valleys and clusters of co-occurring traits with valleys and adjacent regions—for example, Windsor pottery in the lower Connecticut valley and along the coast on either side of its delta—may provide supporting data for this perspective (Lavin 1980, 1997; Lavin and Kra 1994).

THE FUTURE OF THE LATE WOODLAND

In 1984 and here, fifteen years later, I have begun by questioning the validity and utility of the very concept of "Late Woodland," and then I have gone ahead and used the concept anyway. Clearly, it represents an artificial construct and not a "natural" segment of Connecticut's culture history. As an artificial construct, it can be as useful or as useless as we make it. Things do change during the Late Woodland as we define and bound it in Connecticut. These changes were not catastrophic but were, instead, essentially uniformitarian; part of a continuum of change with roots deep in prehistory. That continuum, that trajectory of culture history, admittedly experienced "punctuations," most significantly when extremely productive tropical cultigens were introduced into the subsistence systems. The only fundmental discontinuity in the Late Woodland cultural trajectory occurred when an alien group entered the picture. Though the beginning of the Late Woodland cannot be obviously defined or objectively measured, its ending is absolutely and clearly definable and recognizable: contact with Europeans.

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CONNECTICUT'S RECENT PAST: PERSPECTIVES FROM HISTORICAL ARCHAEOLOGY

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ABSTRACT

Historical and industrial archaeology within Connecticut has demonstrated many strengths during the last 15 years. In particular, the dichotomy between Native American studies and Euro-American research has decreased. Connecticut's industrial and forensic archaeology studies are of national note, while additional investigation of minority populations appears warranted.

In an earlier retrospective (Gradie and Poirier 1984), we were decidedly ambivalent about the theoretical and methodological underpinnings of historical archaeology undertaken within the state of Connecticut. We are still somewhat ambivalent, although not necessarily for the same reasons. Historical archaeology in Connecticut has undergone important changes in the last 15 years, most of them for the better. Our earlier analysis was something of an anomaly in an "anniversary" volume which otherwise focused upon prehistoric archaeology (Lavin 1984). However, Salwen (1989) favorably agreed with our critique that Connecticut's ethnohistoric and Contact studies were two narrowly construed.

In 1984, we offered several observations. Most of the state's historical archaeological research appeared overly particularistic. For the most part, projects were designed to answer very narrow questions about particular sites, usually in association with the proposed restoration of a museum-type historic structure. Research was frequently mandated by federal regulations and therefore designed to facilitate project-related requirements. This was not that great a problem as the Connecticut archaeological community had heretofore proposed few theoretical or methodological questions. There were important exceptions such as Daniels Village (Bartovics 1982) and Phoenixville (Worrell *et al.* 1980), which investigated issues of settlement archaeology, and Fort Shantok which tackled issues of Native American acculturation (Salwen 1966; Williams 1972; Williams *et al.* 1997). For the most part, historical archaeological studies tended to be narrowly focused. The residences of noteworthy individuals, Revolutionary War sites, and important industrial complexes comprised the majority of the investigated sites. At best, historical archaeology in Connecticut was designed to extend the local historical record, rather than to further understanding of broader historical and cultural processes.

The succeeding 15 years have demonstrated that historical archaeology in Connecticut has many strengths. First, it has survived a management-by-neglect approach and the general absence of an academic institutional base; in addition, the number of historical archaeologists has increased remarkably. Second, the dichotomy between Native American studies and Euro-American studies which was particularly apparent in 1984 is no longer as prominent. This gap promises to narrow further since the Mohegan, Mashantucket Pequot, and Schaghticoke tribal nations have developed archaeological research programs (McBride 1995; McBride and Grumet 1996; Bendremer and Garrity 1997; Lavin and Dumas 1998; Mancini 1999). In addition, industrial archaeology has expanded beyond the straight-forward identification and commemoration of prominent industrial monuments to a broader study of technological innovations, industrial processes, and cultural-environmental-technological linkages (Clouette and Roth 1991; Brick *et* *al.* 1998; Gordon 1992, 1995; Gordon and Tweedale 1990; Kirby 1998; Gradie and Poirier 1991; Poirier and Gradie 1996; Stewart 1997; Raber 1999). Connecticut's historical archaeologists have also undertaken significant investigations with respect to forensic archaeology (Bellantoni and Cooke 1996; Bellantoni *et al.* 1997; Poirier and Bellantoni 1993). Finally, attempts at organizing and/or synthesizing the disparate data collected over the past 25 years have been pursued (Keegan and Keegan 1999; Poirier and Donohue 1991).

However, for the most part, historical archaeology in Connecticut still emphasizes investigation of the Anglo-American population. While not ignored, minorities are under represented; the preponderance of the non-Anglo-American research has concentrated on historic Native American sites. This statewide trend reflects the traditional concern of historical archaeology in Connecticut, which has been to illustrate the material culture of a colonial past. Much of this archaeology is the result of mitigation-related efforts. These studies were initiated either pursuant to federal and state regulatory requirements or because private development had created an emergency threat to *in situ* preservation. Since Anglo-Americans comprised the majority of Connecticut's pre-1840 historic population, it is not unreasonable to expect that their archaeological remains would be the most frequently encountered in the archaeological record.

In Connecticut, Anglo-American archaeology possesses two characteristics: 1) a focus on elites and 2) an 18th century emphasis. Several explanations for this research orientation are apparent. In general, 18th century sites have been relatively easier to locate than 17th century resources and are often more historically prominent than later 19th century sites. In addition, 17th century sites have suffered a disproportionate rate of destruction from subsequent development. For example, many of Connecticut's 17th century colonization sites coincide with modern urban areas. Alternatively, other 17th century settlements were obliterated by 19th century railroad construction and 20th century gravel mining (Juli 1991). Wood (1997) has noted that 17th century settlers focused on natural resources which have largely disappeared, such as, extensive coastal and inland riparian marshes that provided hay for cattle. Thus, we have little understanding of Connecticut's 17th century Anglo-American landscape and lack a workable predictive model for locating such archaeological sites.

Those few 17th century Connecticut sites which have been examined tend to be anomalous. For instance, a 17th century house site was accidentally discovered on the north lawn of the Oliver Ellsworth House; unfortunately, the surviving remains had been badly disturbed by 20th century landscaping. This site was startling; not only was 17th century colonial domestic material recovered, but also artifacts which have been traditionally assigned to Contact archaeological sites including native-modified European flint and a Jesuit ring. A less disturbed 17th century component, which was discovered on the south lawn, was tested but not excavated (Gradie 1993). Preliminary investigation has also been undertaken at the contemporary Henry Whitfield House (Juli 1999), one of the few genuine 17th century structures still standing in Connecticut and the oldest stone dwelling still extant in New England. It is odd, but likely, that Connecticut archaeologists have a better understanding of 17th century Native American material culture and settlement patterns, rather than knowledge of its Euro-American colonists.

As noted previously, archaeological evidence from the 18th century is more frequently encountered and in general, associated research tends to over-emphasize colonial elite populations. Lonetown Manor (Reeve 1997), the Oliver Ellsworth Homestead (Gradie 1993), the Butler-McCook House (Poirier *et al.* 1982), the Governor Samuel Huntington Homestead (Juli 1997; Stachiw 1999), and the Hathaway House (Peterson and Gradie 1993) are noteworthy examples. Coincidentally, residences of certain non-elite individuals, which have been examined archaeologically, were often occupied by someone who was historically prominent, such as the Nathan Hale Homestead (Garman 1995).

For the most part, investigation of non-elite archaeological sites has resulted from federal and/or state regulatory reviews. Of particular note are Viets Tavern (Gradie 1987), Newgate Prison and Copper Mine (Raber *et al.* 1999), Rochambeau-related campsites (Harper *et al.* 1999), and the Samuel Goodell House (Harper, personal communication 1999) (Figure 1). Community concern generated archaeological investigation of the locally-threatened Alden Tavern site (Archaeological Research Specialists 1997; Harper 1999). A remarkably-preserved early 18th century homestead in Andover (Harper, personal communication 1999) and a similar one recently exposed in Lebanon suggest our understanding of 18th century domestic structures is too limited.

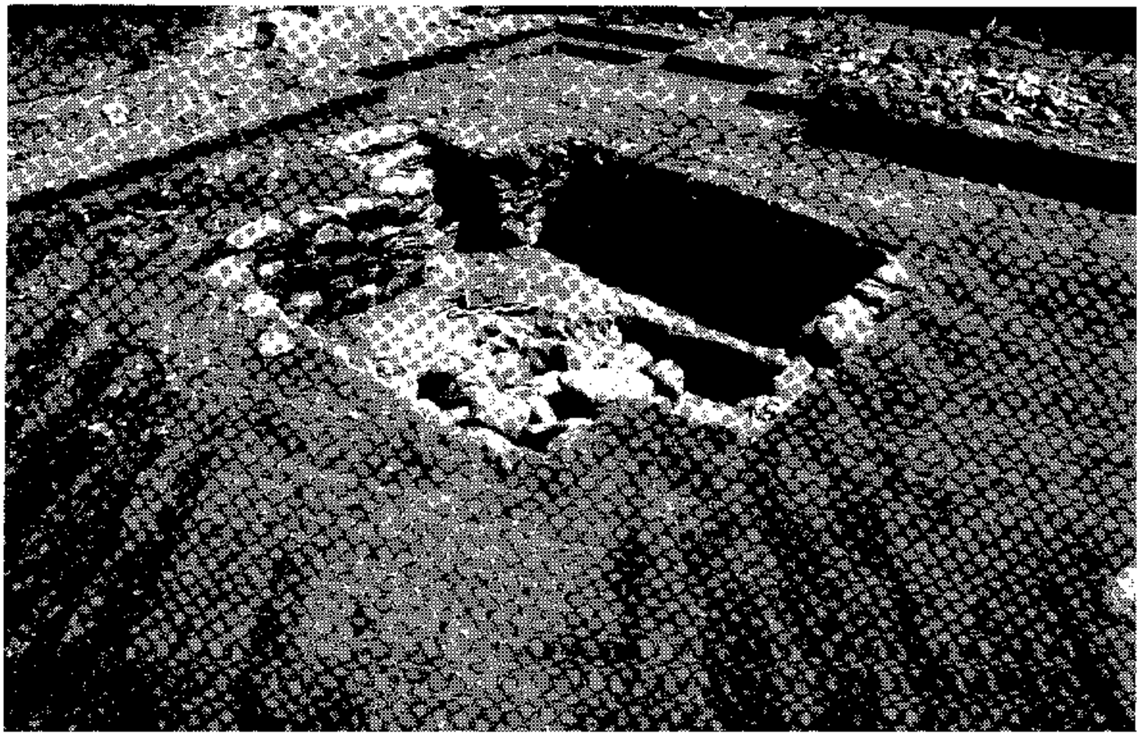

Figure 1. Ephraim Sprague House Site, ca. 1703 - 1750, Andover, Connecticut. (Courtesy of Allen Phillips and PAST Inc.)

Nineteenth century archaeological sites are both qualitatively and quantitatively distinct from the 17th and 18th centuries. First, there are simply greater numbers of them and most are associated with extant structures. Second, these later sites exhibit far more diversity and complexity. The processes of industrialization, urbanization, and ultimately suburbanization present new and different challenges. Conversely, it's easier to link particular archaeological sites to a broader array of surviving documents including photographs and maps (e.g., George *et al.* 1998; Keegans Associates 1998). Archaeological sampling strategies which take into account such variables as social class, ethnicity, and occupation in the context of a community or region should be possible. Unfortunately, an overarching synthesis of available historical and archaeological data into a broad understanding of the settlement, development, and social processes of 19th century Connecticut has not been developed.

Investigation of Native American survival, adaptation, and acculturation processes after the arrival of Europeans has been a strength of Connecticut archaeology. Tribal recognition efforts have facilitated detailed reconstructions of post-contact tribal histories. These extensive analyses of 17th and 18th century documents relating to Native American history within the state have demonstrated the unbroken continuation of tribal identities (Hauptman and Wherry 1990). Furthermore, tribal research has continued with appointment of archaeological staff by the Mohegan and Mashantucket Pequot tribes, as well as, the latter's establishment of a world-class museum and research center.

Intensive archaeological investigations within the Mashantucket Pequot reservation have provided an unparalleled opportunity for understanding tribal history in the post-contact era. Archival and archaeological data reveal that the Mashantucket Pequot response to colonial domination was not immediate and radical cultural change. Rather traditional cultural and subsistence patterns continued, albeit on a restricted scale. The 18th century witnessed the appearance of a gradual division within the tribe. The existence of two fixed residential communities within tribal lands, each with a settlement pattern and dwellings exhibiting distinct native or European architectural attributes, suggests a split between traditionalist and acculturated factions (McBride 1990). Documents further implicate an increased dependency on the colonial economy as reservation and off-reservation lands became insufficient to support tribal members (McBride 1990).

The Mohegan and Schaghticook tribes have likewise initiated historic and archaeological research which is complementing tribal knowledge of their respective ancestral lands. It will be critical to assess whether similar patterns of cultural response to Anglo-American domination are observed on these reservations or whether each tribal group fashioned an unique reaction to their particular economic, social, and political situation.

Feder's (1994a, 1994b) archival and archaeological examination of the Lighthouse community located in rural Barkhamstead represents an important glimpse of historic Native Americans residing off-reservation during the late 18th and early 19th centuries. The Lighthouse community is fascinating for its historic context of displaced Native Americans, Euro-Americans, and possibly African-Americans, their individual and collective marginal social status, and the consequence of that marginalization. The Lighthouse settlement provides important archaeological data concerning an organized community of outcasts, who successfully survive outside the colonial-sanctioned context of a purposefully set-aside reservation or governmental recognition as a native community. However, a lack of equitable access to resources and opportunities and a general ostracism by colonial neighbors seem to be the primary forces which defined this community's history. Archaeological comparison with similar multi-cultural and multi-ethnic communities would provide critical information for better understanding the complexities of the off-reservation Native American experience in Connecticut. McMullen and Handsman's (1987) observations on extant Native American basketry represent an alternative ethnohistoric approach. Specifically, the interpretation of the cultural nature of symbolic design on woodsplint baskets as a means of recovering a native world view mostly ignored in traditional historical studies.

Historic archaeological research in Connecticut has significantly changed within the last 15 years. For instance, Connecticut scholarship on technological and industrial processes, particularly the archaeological analysis of iron-steel production and small-scale waterpower operations, is of national note. Likewise, geographic information systems (GIS) analysis of the 17th century Connecticut Path and Rochambeau's 1781 - 1782 march across Connecticut has yielded analytical insights on Connecticut's historic transportation corridors (Gradie *et al.* 1998; Public Archaeology Survey Team Inc. and Keegans Associates 1999). Another strength of Connecticut historical archaeology is its extensive public education efforts (Feder 1994c; Poirier and Feder 1995; Kearns *et al.* 1997; Stewart *et al.* 1996; Skinner *et al.* 1998; Keegan and Keegan 1999; Harper, personal communication 1999). In addition, the state's archaeological community has embarked on new archaeological initiatives regarding underwater resources (Bellantoni, personal communication 1999) and African American communities (Perry, personal communication 1999).

Osteoarchaeology has infrequently contributed to historical archaeology within Connecticut because the investigation and/or disturbance of grave sites and cemeteries is both illegal and unethical (Connecticut General Statutes Section 10-388 *et seq.*). However the accidental, construction-related discovery of two unmarked burial grounds in southeastern Connecticut during the last decade has provided a rare opportunity for forensic archaeological studies. The Mashantucket Pequot's Long Pond cemetery, which dates to the late 17th and early 18th centuries, provides insight into the health and material conditions of late Contact period native populations (Welters *et al.* 1991; Poirier and Bellantoni 1993). The mid-18th to mid-19th century Walton Family Cemetery provided similar data for a rural agrarian Anglo-American population (Office of State Archaeology 1993). Both burial grounds have yielded important insights into population mortality; a significant percentage of burials in both cemeteries were children and young adults. Of particular interest, some burials in the Walton Family Cemetery demonstrated evidence of tuberculosis, including an adult male whose remains were desecrated subsequent to his burial. The latter archaeological evidence provides a tangible connection with historically-reported 18th century vampire folk beliefs in southeastern Connecticut (Bellantoni and Sledzik 1994; Bellantoni *et al.* 1997).

The Native American Graves Protection and Repatriation Act mandates the comprehensive re-examination of archaeological collections reposited with federal agencies and federally-assisted museums concerning the identification and cultural affinity of Native American materials from grave-related contexts or that are of significant cultural patrimony. In this regard, the Office of the State Archaeologist, the Mashantucket Pequot Tribal Nation, and the Mohegan Tribe have worked in partnership to professionally inventory pertinent materials from the University of Connecticut's Anthropological Collections. Repatriation requirements have provided an important opportunity for reassessing original inventory catalogs and associated provenience data for state-administered collections (Bellantoni 1999 personal communication). Similarly, repatriated material has added immeasurably to tribal understanding of their cultural heritage.

SUMMARY OBSERVATIONS

What have historical archaeologists learned about Connecticut in the last fifteen years? In apparent contrast to its culturally complex northern neighbors (Yentsch 1983), Connecticut seems to display little diversity throughout the 17th and 18th centuries. It was predominately a rural society of bad roads, small-to-medium sized farms with a dispersed settlement pattern. The fledgling industrial base reflected its agricultural origins and was mostly grist mills, saw mills, fulling mills, blacksmith shops -- all attributes of the infrastructure of a rural economy. Connecticut's 17th and 18th century lifeways and associated material culture seem somewhat modest when compared with that of contemporary export-oriented colonies. In many respects, Connecticut was a poor, insular, and inward-looking colony. Nonetheless, colonial settlers precipitated a "rapidly applied, large-scale, drastic alteration of land use, cultivation practices, water management, and animal husbandry" on the Connecticut landscape (Thorson *et al.* 1998).

In light of these historical roots, why was Connecticut so spectacularly successful in the 19th century? Industrial archaeological studies have provided some preliminary insights concerning the state's 19th century technological sophistication (Gordon 1983, 1989, 1992; Gordon and Tweedale 1990) and its understanding of natural-industrial interfaces (Gordon 1982, 1985; Gradie and Poirier 1991; Raber and Gordon 1996). In addition, the high level of literacy and self-sufficiency demanded by the economic and social position of Connecticut within the 18th century Atlantic economy may have created the underlying conditions that later fostered the state's intensive industrialization. It would be interesting to assess and understand to what extent late 18th century industry in Connecticut was designed to meet strictly local demands, rather than a national consumer-oriented market. The transformation of Connecticut from a rural agrarian society into a 19th century technological marvel continues to be an intriguing paradox that requires further investigation.

Likewise, Connecticut archaeology still hasn't resolved its methodological and conceptual difficulties with respect to Contact and ethnohistorical studies. The standard research strategy continues to perceive Native Americans as a population socially and materially distinct from Europeans. They were in fact an important component of a larger population that includes Native Americans, African Americans, and Anglo-Americans. In the early 17th century, the Native population was large, politically powerful, and economically self-sufficient. Over time, this equation shifts and Native Americans become an increasingly marginalized segment of Connecticut's overall population. Few researchers have specifically addressed the historical and archaeological complexities of the interconnected linkages of the Native and Anglo-American worlds in 17th century Connecticut. In light of the ever-expanding role the Native American community is playing in contemporary Connecticut's economy and politics, it is an issue worthy of additional attention and research focus.

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