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THE CEDAR SWAMP ARCHAEOLOGICAL DISTRICT:
A MODEL FOR CONSERVATION ARCHAEOLOGY

Curtiss Hoffman

Introduction

Archaeological research in the Northeast has until recent years concentrated on certain ecological zones: coastlines, major rivers, and lakes. These are areas in which early European settlers recorded major aboriginal base camps and concentrations of population. They are also areas in which archaeological remains are fairly abundant and visible on the surface as the result of plowing and erosion. Upland areas, and interior wetlands in particular, tend to be underrepresented in the archaeological record, even though there are historical accounts of Indians living in, or at least retreating to, upland swamps.

A series of recent studies by researchers all over the Northeast (Nicholas 1986, 1991; McBride 1984, 1990; Kiviat 1986; Thorbahn 1982; Mavor and Dix 1985, 1990; Funk 1990; Hasenstab 1991; Warfield 1986; Hoffman 1984, 1985a) have suggested that these environments are crucial to an understanding of prehistoric lifeways throughout the 12,000 years that people have occupied the Northeast. Upland swamps were sources of vegetable and animal foods, places of shelter during certain months of the year, permanent sources of water, and provided transportation corridors for water travel by dugout canoe from one drainage to another. There may have been some periods during which these environments would have been more important than others, for differing reasons. For example, Nicholas (1991) has shown that wetland resource diversity during the warm and dry Early Archaic period (c. 9,000 - 8,000 years ago) made these zones more attractive for settlement than other parts of Southern New England. The author (Hoffman 1985a) has suggested that from about 4500 to 2700 years ago, population pressures throughout the Northeast encouraged groups to move into environments increasingly upstream of major riverine zones, including upland swamps. A number of studies (Barber 1984; Luedtke 1987; Kenyon 1984; Feder 1984) have shown that during the Middle Woodland period (1500-900 years ago) the intensification of trade in exotic raw materials necessitated the use of waterways for transmission of these goods, while most settlements concentrated along the coast. During the Contact period (1620-1775 A.D.), Native Americans seem to have considered upland swamp zones as places of refuge from Europeans, and many of the battles of King Phillip's War (1675-1676) were fought there. Some of these areas continued to be used by Native Americans well into the 19th century (Mavor and Dix 1990; Leveillee 1992).

The series of four articles which follow were presented in 1989 as part of a symposium at the 50th Annual Meeting of the Massachusetts Archaeological Society. They demonstrate the potential for cultural resources in this zone, and encourage the preservation of such resources through the National Register process. They exemplify the Conjunctive Approach in archaeology (Taylor 1967), in which the work of field archaeologists is joined to that of geologists, palynologists, paleobotanists, paleozoologists, and historians to produce a more complete composite picture. The articles focus upon the Cedar...
Figure 1. Aerial photograph of Cedar Swamp (Cedar Pond in center), looking north (photo by Alan Morgan & Gordon Bernstein).
Swamp Archaeological District in Westborough, Massachusetts, which was placed on the National Register of Historic Places in May of 1988. This article and the two which follow it (Largy 1992, Rhodin 1992) contributed substantively to the National Register Nomination; the final article (Leveillee 1992) illustrates the advantage of placing such districts on the Register, since the sites they contain (even previously undiscovered ones) are thereby afforded the full protection of Federal and State laws.

Geological and Ecological Description of Cedar Swamp

The Cedar Swamp Archaeological District includes portions of the towns of Westborough and Hopkinton, Massachusetts, and comprises an area of 2675 acres (c. 1085 hectares). It is located within the Marlborough U.S.G.S. Quadrangle. The 300 ft. (c. 92 m) contour was chosen as the northern and southern boundary of the District on the basis of site inventories and geological data. The eastern and western boundaries follow existing roadways. (See Figures 1 and 2.) The bedrock in the eastern portion of the town of Westborough belongs to the Rhode Island Anticlinorium (Zen 1983), an area of Proterozoic metamorphism lying on the eastern edge of the Nashoba Thrust Belt. The immediate underlying bedrock in the vicinity of the District is a gradation of Westborough quartzite and Milford granite.
The Bloody Bluff Fault, the boundary between these two rock types, runs under Newtons Hill just north of the District. The interface between the two rock types was degraded by friction, so that the local varieties of Milford granite and Westborough quartzite are often difficult to differentiate macroscopically; and the Native Americans who quarried stone for knapping from cliff faces appear to have used both materials indiscriminately.

To the immediate north of the District, the major physiographic feature is Newtons Hill, which rises to a summit 548 ft. (c. 167 m) above sea level. The southern face of this hill contains large exposed ledges of quartzite and Milford granite, interbedded with vein quartz. To the northeast is a complicated terrain of scattered small hills with summit elevations between 350 and 450 ft. (c. 107-137 m). South and southeast is the watershed area between the Sudbury and Blackstone drainages, characterized by closely clustered hills with summits ranging between 450 and 550 ft. (c. 137-168 m). The Sudbury River has cut its channel between the last two areas, falling from 270 ft. (c. 82 m) at the Fruit Street Bridge at the eastern boundary of the District to 222 ft. (c. 68 m) at the Ashland town line, 2 1/2 miles (c. 4 km) downstream. West and northwest of the District is a narrow ridge of sandy soil separating the Sudbury and Assabet drainages. Both of these streams are tributaries of the Merrimack River.

During the late Pleistocene, the Laurentide ice mass pushed over the area, scraping large quantities of soil and bedrock off Newtons Hill. As the ice front retreated northwards after c. 15,500 B.P. (Stone and Borns 1987), it dammed the outflow of the meltwater, creating a large proglacial lake, Lake Assabet. While no surficial geological study of the Marlborough Quadrangle has been published, a study of the Assabet floodplain in the adjacent Shrewsbury Quadrangle by Shaw (1969) has indicated the presence of high-stage lake levels at the 320 and 300 ft. (c. 98 and 92 m) contours. The original Lake Assabet drained eastwards from the modern Assabet floodplain into the Sudbury drainage through what is now Cedar Swamp, via a channel south of Powderhouse Hill. As the glacier receded rapidly northwards and the land surface rebounded, the drainage of this lake altered to the modern Assabet floodplain (Stone and Peper 1980). Once lake levels dropped below 300 ft. (c. 91 m), Cedar Swamp was isolated as a large lake basin, Lake Sudbury, with an outlet into the Sudbury River. Palynological evidence (Sneddon and Kaplan 1987) suggests a further rapid drop in lake level around 6000 B.P., perhaps caused by the breakage of a silt dam in the Sudbury gorge. By Mid-Holocene times, lake levels are thought to have approximated the modern boundary of the swamp (Byron Stone, personal communication), the 280 ft. (c. 85 m) contour. (See Figure 3, derived from Hoffman 1990:30.)

Today, Cedar Swamp is characterized by large, flat, open expanses of cattail marsh with occasional stands of Atlantic White Cedar and white birch bounded by relatively open deciduous hardwood forest (oak, swamp maple, hickory, beech) with a few pines and hemlocks intermixed. There are also stands of hazel, low-bush and high-bush blueberry, royal and sensitive fern, and other bushy plants. Open water is found today only in Cedar Swamp Pond. While surrounded by hills on all but the northwest side, the District itself is relatively flat (see Figure 4, derived from Hoffman 1990:28). More than 80% of the area lies below the 280 ft. (c. 85 m) contour. The swamp is a natural habitat for many wild animal species; those observed by Ekblaw Chapter members during the course of excavation include deer, woodchuck, weasel, rabbit, chipmunk, field mouse, great blue heron, Canada goose, duck, and snapping, box, painted, and spotted turtles.
Figure 3. Glacial Retreats and Lake Levels in Westborough.

Figure 4. N-S elevation section of Cedar Swamp.
Previous Archaeological Research

The local collector C.C. Ferguson reported seven sites in Cedar Swamp to the Massachusetts Archaeological Society in 1939. Unfortunately, no information other than site location was submitted. During the 1960's, and into the early 1970's, many of the more obvious locations were explored by Raymond LeMire. In 1988 and 1989, he kindly turned over many of his artifacts to Ekblaw Chapter, along with his notes from the Cedar Swamp-3 excavation (Hoffman 1989). In 1979, members of the W. Elmer Ekblaw Chapter investigated a surface collection from St. Luke's Cemetery (Brierly and Cohen 1980). From 1980 to 1988, Ekblaw Chapter members worked under the author's supervision at several sites in Cedar Swamp under the aegis of the Westborough Historical Commission. These investigations have been conducted at the Reconnaissance Survey, Intensive Survey, Site Examination, and Data Recovery levels (Hoffman 1984, 1985b, 1986, 1987a, 1987b, 1987c, 1988, 1989; Warfield 1986). The Public Archaeology Laboratory, Inc. has also conducted surveys within Cedar Swamp (Leveillee 1989, 1992).

Prehistoric Sequence (see Figure 5 and Table 1).

No Paleo-Indian materials are known within the District, but three possible Paleo-Indian sites in the Assabet drainage are at locations above the 320 ft. (c. 98 m) contour. Early Archaic Bifurcate Base points are known from three locations in the Assabet drainage, all at elevations of 300 ft. (c. 92 m) or higher. A single Bifurcate of Marblehead felsite was recovered from salvage operations at the Bombard Site on the extreme western edge of the District in 1988, at about the 293 ft. (c. 89 m) contour. This suggests that lake levels during this phase were as high as 290 ft. (c. 88 m).

Points attributed to the Middle Archaic have been recovered from Cedar Swamp-3, Cedar Swamp-9, Cedar Swamp-20, the Bombard site, and the Muise site, in all four cases between the 295 ft. and 285 ft. (c. 90-87 m) contours. They are also reported from Assabet sites at similar or higher elevations. At Cedar Swamp-9, within a feature dated to 6490±100 B.P. (Beta-20875), a quartzite Neville preform was found, and another Neville and a U-base knife were recovered from a quartzite flaking station (Hoffman 1987c). At Cedar Swamp-17 (St. Luke's Cemetery) four Neville and four Stark points were recovered from the surface, along with several U-bases (Brierly and Cohen 1980); the latter are sometimes interpreted as stemmed point preforms (Dincauze 1976:70-71). The identification of Neville and Stark points as Middle Archaic diagnostics should be made with caution, especially at Cedar Swamp-3, where they have been recovered in reasonably secure association with Transitional Archaic and Early Woodland radiocarbon dates (Warfield 1986, Hoffman 1991). A probable Merrimack stemmed point made of Sterling argillite was recovered from salvage operations at the Bombard Site. It is the only such point known from the District.

Laurentian materials are infrequent within the District and tend to be associated with light flake scatters on hilltops: Cedar Swamp-1, -3, -6, -12, -17, and -24. All are at or above the 300 ft. (c. 92 m) contour. Their frequency is in marked contrast to the situation in the Assabet drainage, where the dated components at Charlestown Meadows have more Laurentian materials than any other site in New England (Hoffman 1983), and examples at several smaller sites are common. The implication is that Charlestown Meadows served as a seasonal base camp, while the Cedar Swamp sites may have been small task-group locations, possibly hunting stations.

Small Stemmed and Small Triangular points are common at sites within the district: Bombard, Cedar Swamp-3, -4, -8, -9, -20, and
Figure 5. Projectile points from Cedar Swamp-3 Site. Types: a: Neville-like; b,c,h: Neville Variant; d-g: Stark-like; i,j: Brewerton Eared Triangle; k-m: Small Triangle; n,p: Small Stem; o: Bare Island; q-u: Orient Fishtail; v: Susquehanna Broad; w: Lagoon?; x: Jack’s Reef Corner Notched. Materials: a,d-f,j,x: Westborough Quartzite; b: Cambridge Argillite; g: Sterling Argillite; c,h: Milford Granite; i: Braintree Argillite; k-p,w: Quartz; q,s-u: Blue Hills Felsite; r: Attleborough Red Felsite; v: Saugus Jasper.
Robinson Place. A quartz triangle occurred within a pit feature containing reddened earth and charred hickory wood dated to 4980±130 B.P. (Beta-27440) at the Bombard site. Soil disturbances containing reddened earth have been found to have a high correlation with cultural remains at Westborough sites (Warfield 1986). At Cedar Swamp-9, a quartz triangle was loosely associated with a pit feature radiocarbon dated to 4000±110 B.P. (Beta-20876) (Hoffman 1987c). The Cedar Swamp-8 site, an island largely destroyed by construction of a factory building, apparently contained at least two components of this phase (Hoffman 1989). Elevations tend to be lower, but remain above the 290 ft. (c. 88 m) contour for the most part. There is considerable evidence from elsewhere in southern New England (e.g., Ritchie 1969, McBride 1978, McBride and Dewar 1981, Kerber 1985) that these types lasted long after the close of the Archaic period in southern New England, perhaps as late as Contact. They certainly did so in Cedar Swamp.

Materials of the Transitional Archaic are infrequent in Westborough, perhaps because the classic Susquehanna manifestations were associated with riverine intensive gathering strategies unsuited for the uplands. In Cedar Swamp, only Cedar Swamp-3 and Robinson Place have Susquehanna materials; at Cedar Swamp-3 they are dated to 3720±70 B.P. (Beta-15197), from a processing station for deer and fish (Warfield 1986). Most of the materials are of Boston basin lithics. It is striking to note that only a few scraps of steatite have ever been found at Westborough sites,
Despite the fact that the major quarries for steatite in central New England are within nine miles (15 km) of the district (Fowler 1966). These pieces are probably associated with Late Woodland pipe-making rather than with the Transitional Archaic stone bowl industry (Johnson and Mahlstedt 1985).

The Early Woodland is well-represented at Cedar Swamp-3, with four radiocarbon dates of 2655 ± 155 (GX-10096), 2350 ± 85 (GX-10924), 2200 ± 85 (GX-10923), and 2130 ± 70 B.P. (Beta-15196) (Warfield 1986). Vinette Exterior-Smoothed Interior Cord-Marked pottery was recovered in good association with the first of these dates, along with an Orient Fishtail of Blue Hills felsite, from a deep bowl feature lined with slabs of Milford granite. The Early Woodland saw the largest component at this site, characterized by the construction of large communal facilities: a roasting pit, an earth oven, and complex disposal pits. These are associated with a series of quartzite/Milford granite pointed- or lobate-stemmed points more closely resembling Starks than Rossvilles. Since Small Stemmed points and Small Triangles are now known to continue into Early Woodland, it is not surprising to find them here also, extending as far south as the swamp margin. There was a strong tendency toward the use of exclusively local quartz, quartzite, and even Milford granite, all of which may be obtained in the drift at the site itself. Occupation on the kame crest was repeated and sufficiently dense to create an almost continuous midden (Warfield 1986). At another Early Woodland site, Robinson Place, surface collection recovered a suite of Small Stems and Orient Fishtails, as well as what may be a set of tools from a shaman's medicine bag: 3 quartz crystals, a smoothed beach cobble of Hingham felsite, and 6 argillite cylindrical rods which were chipped to tapered ends (Hoffman 1987). The presence of this Early Woodland material at the headwaters of the Sudbury River was unanticipated, since many archaeologists in the region have posited a decline in population and a retreat to the coastal zone for this period (e.g. Dinaauze 1974, Snow 1980).

Middle Woodland occupations within the District include Cedar Swamp-26, with a radiocarbon date of 1150 ± 90 (Beta-17207); Cedar Swamp-3, with a thermoluminescence date on a grit-tempered rocker-stamped vessel of 1230 ± 130 B.P. (Alpha-2631) and a radiocarbon date of 970 ± 70 B.P. (Beta-15195) from a red earth feature associated with a quartzite Jack's Reef corner-notched point (Warfield 1986); and Cedar Swamp-4, with a small pit dated to 1090 ± 110 B.P. (Beta-19922), in association with a possible Stark point of Milford granite and a felsite Neville base. A Jack's Reef Pentagonal and two Fox Creek Stemmed points have also been recovered from this component at the site (Hoffman 1987b). A modest increase in the utilization of exotic jasper characterizes these components.

Late Woodland is represented at Cedar Swamp-4, with a hearth feature dated to 390 ± 80 B.P. (Beta-19921) associated with a Madison Point. Five other Madisons or Levannas were found with this component, as well as Early Late Woodland interior-exterior net-marked ceramics (Hoffman 1987b). The site is a small knoll overlooking Cedar Swamp Pond, most probably a hunter's camp. No evidence of horticulture has been found in Cedar Swamp; it probably remained an area for hunting and gathering of wild resources to the end of prehistory.

So far, Contact period (350 - 200 B.P.) materials have yet to be identified within the District, although there is an oral tradition of Indians coming up from the swamp seeking winter handouts well into the 19th century. Rather than habitation, this is likely to relate to the Colonists' desire for cedar shingles for house and boat construction. John Eliot states that "Unto which work of moyling in the swamp [the Indians] are fitter than many English, and many English choose to buy [shingles] of the Indians than to
make them themselves" (cited in Metcalf 1988). The cedar stands are much more accessible during the winter when the surface water in the swamp is frozen than at any other time of year. While Eliot established praying towns at Hassanmesit (Grafton), Okemmokamesit (Marlborough), and Magunkaquog (Ashland) during the 1650's and 1660's, there is little 17th century historical record of Native Americans in Westborough. The Cedar Swamp-2 Site (Leveillee 1992) may be a 19th century cedar logging station used by Native Americans within the District.

Research Value of the District

The Cedar Swamp Archaeological District is likely to continue to yield information important for increasing our understanding of Massachusetts and southern New England prehistory. Many of the sites within the District possess considerable integrity of materials, environmental and cultural contexts, and internal site configuration. Even those sites which have been more than 50% disturbed are capable of yielding significant information on many research questions of importance to New England archaeology. The sites contain data appropriate to addressing the following research topics: (1) changing settlement and subsistence systems through time; (2) inter- and intra-regional group relationships; (3) technical aspects of lithic and ceramic technologies; and (4) relationship of land use to environmental change in an upland setting.

Settlement and Subsistence Systems

The sites within the Cedar Swamp Archaeological District provide a unique opportunity to explore subsistence and settlement system models in a relatively unspoiled setting. In order to do this, it will be important to establish whether these sites represent entirely separate occupations or activity areas by different groups of people over time, or whether they represent parts of a settlement system which are all or in part contemporaneous. Either conclusion would have important consequences for our understanding of prehistoric behavior in temperate forest zones. If different, they would suggest a foraging mode of subsistence, with small groups taking up residence for short periods only, as part of their seasonal round. If contemporaneity can be established, at least relatively, it will be possible to posit a collecting system (Binford 1980) in which task groups are dispatched from base camps to specific gathering loci. To illustrate the type of difference involved, the Early Woodland component at Cedar Swamp-3 is a likely candidate for a base camp, given its size and the dense aggregation of features, artifacts, and debitage on the kame crest. By contrast, Cedar Swamp-21 and -29 appear to represent hunting stations, characterized by very light scatters of small flakes, probably the result of tool maintenance. They are either locations of activities performed by groups dispatched from Cedar Swamp-3 or another base camp in the region, or they represent a diffuse foraging strategy unrelated to any base camp. These strategies may have been sequential within the region, and not necessarily only in the order presented above. The Late Woodland in the uplands may have seen a return to foraging from a more intensive exploitative strategy.

Inter- and Intra-Regional Relationships

Newtons Hill is a major source of Westborough quartzite, as well as vein quartz. Outcrops distinct from the main body also exist, at Cedar Swamp-9 and -15. These materials are highly suitable for manufacture of chipped stone tools. Milford granite is also readily available there, and appears to have been deemed suitable for tool-making. Glacial action plucked vast quantities of these materials from the hill and deposited them in Cedar Swamp's kames and
kame terraces, where they were available on site for knapping. From at least Late Archaic times onward, Westborough quartzite was transported as far afield as the Boston Basin (Hoffman and Nelson 1984). Conversely, materials from outside central Massachusetts (feldspar and argillite from the Boston Basin, chert from New York State and Pennsylvania) are found in Westborough assemblages. At sites in southeastern Massachusetts, north-to-south glacial deposition cannot be ruled out as a means of transport of the lithics used for tool-making. However, the flakes and artifacts of Boston Basin materials at Westborough sites and those of Westborough quartzite at Boston Basin sites were moved along an east-west axis, so they must represent human transport. Thus, the lithic resources of the District represent an interesting opportunity to test models of social interchange. This once again may fall out along a model of foragers vs. collectors, the foragers moving to the uplands to acquire lithics, and the less mobile collectors engaging in reciprocal trade with other semi-sedentary groups.

In the uplands, because settlement was more marginal and possibly more sporadic, the reasons for increased or decreased social isolation may have fluctuated over prehistory. For example, Paleo-Indian and Early Archaic lithic preferences were for exotic cherts and chalcedonies with some use of Boston Basin materials; Middle Archaic diagnostics in the Assabet drainage tended to be made on Boston Basin lithics, although, curiously, this does not seem to apply to many Neville, Stark, and Merrimack points within the Cedar Swamp District, which tended to be made of local materials. Laurentian materials represent the first clear concentration on local quartzite, with a mix of Boston Basin lithics and a small proportion of New York State cherts. Small stemmed assemblages were dominated by quartz, sometimes to the exclusion of local quartzite. The Transitional Archaic assemblages at Cedar Swamp-3, Robinson Place, Charlestown Meadows, and Town Wells I again show links to the Boston Basin. The Cedar Swamp-3 and Robinson Place Early Woodland assemblages seem to have relied almost exclusively upon local lithics again. The late Middle Woodland assemblages at Cedar Swamp-3 and at Assabet drainage sites include both Boston Basin materials and a small proportion of exotic cherts. The latter is also true of the Late Woodland assemblage at Cedar Swamp-4, whereas the deeper component at that site was almost exclusively dominated by local lithics. These variations in lithic preference must reflect some dimension of social interaction, either intra-group movement of people to resources (foraging) or inter-group movement of resources to people (collecting).

Ceramic design variations can also be studied in this manner, as Kenyon (1984) has shown for the Merrimack generally. Her impression is that ceramics from the Assabet and Sudbury drainages bear much stronger stylistic relationships to those in the Boston Basin than they do to ceramics in the rest of the Merrimack drainage (Victoria Bunker, personal communication). Some Cedar Swamp ceramics also show impressions of cordage or basketry on their outer or inner surfaces. So far, all of this material displays a Z-twist (counter-clockwise), which is also characteristic of ceramics downstream from Westborough (Petersen et al. 1987).

A model in which increasing investment in local group "equity" results in increasing sedentism and isolation has been proposed by Filios (1983). One material correlate for this model is increasing feature size, complexity, and density. It works well for the Cedar Swamp data through the Early Woodland period; subsequently, it breaks down. Most of the features from Cedar Swamp-9, the oldest dated site in the District, are fairly small, simple, and shallow. The same is true of most of the features from the dated Late Archaic components there and at the Bombard site. The dated Transitional Archaic feature from
Cedar Swamp-3 is a more complex affair: wedged against the glacial drift is an assemblage of quartz preforms, hammers, and flakes associated with deer and fish bone and pounding tools (Warfield 1986; Bellantoni and Dorr 1986). The Early Woodland features at that site show a very complex history of usage (Hoffman 1987a). However, the Middle Woodland pits at Cedar Swamp-3, -4, and -26 are again fairly simple and shallow, suggesting a return to a simpler mode of social organization. The Late Woodland hearth at Cedar Swamp-4 is again associated with a complex midden deposit (Hoffman 1987b).

This data has important implications for the study of regional as well as local prehistory. As Westborough is located close to the watershed of the Merrimack and Blackstone systems, it will be interesting to compare Cedar Swamp material with contemporary recoveries in the Blackstone. This would allow critical evaluation of current hypotheses of river basin territoriality (e.g. Snow 1980). This is especially interesting in light of the nearly total absence of steatite from Westborough assemblages, despite the fact that the major quarries for this material are located in the Blackstone drainage just to the west. This material was traded widely to sites throughout eastern Massachusetts, including some burial sites in the lower Sudbury and Assabet drainages (Dincauze 1969), but evidently the trade did not follow a direct overland route. It probably followed the Blackstone River southeastwards into Narragansett Bay, and thence up the Taunton River or along the coast, and then back up the Merrimack and Concord Rivers. Westborough's Transitional Archaic populations were out of the main line of this trade, despite their geographical proximity to its sources.

Lithic Technology

Since Cedar Swamp sites are sources of workable lithic material, many of them exhibit wide ranges of tool manufacture and maintenance behaviors. Cedar Swamp-3, in particular, has been studied in terms of lithic technology (Hoffman 1985b). Large blocks of vein quartz and slabs of quartzite were extracted from the soil matrix and shattered; fragments from the resulting shatter were worked into preforms and finished tools. The early stages of the manufacturing process are better documented within the District than at most other locations, especially for quartzite.

It furthermore appears that the inhabitants of Cedar Swamp during certain periods were utilizing not only the high-quality quartz and quartzite abundantly available, but also poorer grades of the same materials, grading off into the friable Milford granite described under the geological section. Unmistakable tools and flakes of these materials are reported from Cedar Swamp-3, -4, -9, -26, and -27. Further investigation could explore the reasons why these inferior materials were utilized. Utilization seems to have peaked during the Early - Middle Woodland periods, perhaps resulting from relative cultural isolation from sources of better stone.

In addition to the flaked stone industry, pecked stone tools are found at Cedar Swamp sites, in relatively small numbers. These were made for the most part of non-local materials and relate to woodworking, which may in turn provide clues as to water transportation into the swamp. Cedar Swamp-3 and -4 are still accessible today from the Sudbury River by canoe. A well-made gouge of Braintree slate was recovered close to the edge of the wetland at Cedar Swamp-4, suggesting a relationship to dugout canoe making.

Relationship to Environmental Change

In Westborough there is reason to suggest that glacial lake Assabet separated at some time after deglaciation (c. 15,500 B.P.) into two or three large basins, one of which was the precursor
of the modern Cedar Swamp. It is suggested by Dean (1986) and Stone (personal communication) that Lake Sudbury stood to at least the 290 ft. (c. 88 m) contour, with a high lake level at the 300 ft. (c. 92 m) contour, from Paleo-Indian to Middle Archaic times (10,000 to about 6,000 years ago). Because the northern and southern sides of the basin are relatively steep (see Figure 4), sites of this time period are infrequently found within the District. It is possible that some of the old 320 ft. (c. 98 m) terraces south of the swamp may contain early materials. Only on the west side of the district were there flat, sandy rises suitable for campsites; the sole Bifurcate point found within the District is from this area.

Following a probable Mid-Holocene drawdown of lake levels (Sneddon and Kaplan 1987), Middle Archaic materials occur at four sites on the periphery of the swamp, all just about at the 290 ft. (c. 88 m) contour. Late Archaic (6,000 - 3,000 B.P.) materials are reported from both peripheral and insular locations at or above the 290 ft. (c. 88 m) contour; and by Early Woodland times (by c. 2000 B.P.) modern water levels had been reached and all available surfaces could be exploited; many were. By Middle Woodland times, major settlements had shifted to the coast and the number of sites in Westborough declined. However, Cedar Swamp-4 was still a locus for hunting activities at the end of the Late Woodland period, and the swamp was used by Indians during the winter for extractive purposes well into 19th Century (Leveillee 1992).

Thus, the evidence we have suggests that as lake levels lowered throughout prehistory, human settlements tracked them, taking advantage of newly exposed flat areas for a variety of purposes: hunting, gathering, food preparation, tool-making, and transportation. This model of settlement is capable of being tested using both environmental studies and further archaeological research. The paleobotanical and paleozoological studies which follow this paper have been useful in supplementing the archaeological record in exploring this research area.

Conclusions

There is every reason to expect that as they were exposed, all reasonably flat locations within the District supported prehistoric cultural activities of different periods from as early as 8500 B.P. onwards, for a variety of possible reasons. Many of these sites are much smaller than those in lowland areas, but they are also more likely than lowland sites to contain the remains of only a single occupation, a situation which is highly desirable for archaeologists attempting to interpret prehistoric lifeways and the reasons for changes in them over time.

In summary, the significance of the Cedar Swamp Archaeological District is evidenced by the presence of relatively intact archaeological deposits which can provide information important to the understanding of the prehistory of Massachusetts and southern New England. The Cedar Swamp Archaeological District has largely escaped serious impacts through a combination of good fortune, neglect, and a growing understanding of wise land-use planning. However, sites on the margins of the District are increasingly threatened by development pressures; we have lost major portions of the Cedar Swamp-9, Bombard, and Robinson Place sites during the past few years. The purpose of creating a National Register District was to assist town planners in further conservation of the valuable cultural resources in this 2700-acre tract of wildland. The successful nomination of the Cedar Swamp District means that the cultural resources of Cedar Swamp will very likely be preserved for future generations of archaeologists.
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Zen, E-An, editor  
THE CONRAIL SITES AND THE CEDAR SWAMP ARCHAEOLOGICAL DISTRICT

Alan Leveillee

When I was initially asked to present this paper, I think it was in November 1988, I assumed that I would be discussing the preliminary results of the data recovery program of the Cedar Swamp #1 and #24 sites. I thought we would have just finished the fieldwork and that I would base my discussion on that aspect of the research. Well, perhaps the one constant in the archaeological equation is and will be that things don't go as planned. While we had braced ourselves for a field season through the winter in the Cedar Swamp, it was not to be. The data recovery is now scheduled for summer 1989. Realizing that the data recovery is still ahead of us, I'd like to take the opportunity of today's discussion to focus upon process. I'd like to offer some observations on misconceptions I've encountered during my brief association with the district and share some general insights that the project has provided me.

The Public Archaeology Laboratory, Inc. first became involved with the District in July of 1988 when the Consolidated Rail Corporation requested a proposal to conduct site examination investigations in sections of an island within Westborough's Cedar Swamp. The small island, now bisected by an existing railroad easement, is home to six sites which are listed as contributing elements of the Cedar Swamp National Register District. Three of the sites, Cedar Swamp #1, #2, and #24, on the northern half of the island, have the misfortune to be situated in the planned location for a railroad switching station, a place for transferring automobiles from open to enclosed rail cars.

Site examinations of Cedar Swamp #1, #2, and #24 were necessary to evaluate the integrity, chronological affiliations and internal configuration of the sites as well as to consider their potential to contribute further to our knowledge of the District and regional prehistoric lifeways. The Public Archaeology Lab was contracted to do the site examination with the knowledge that development would take place regardless of our findings. Nonetheless we planned to approach the sites objectively.

The well-documented work at other sites within the district, in particular Cedar Swamp #3, provided a wealth of information and some indications as to what we might expect. The National Register Nomination form itself was a most useful document in that it summarized the work to date in the swamp and provided a contextual research framework. Even though the Cedar Swamp #1, #2, and #24 sites were listed as contributing elements to the district, relatively little archaeology had actually gone on there. The backdirt from several unsystematically potted trenches yielded chipping debris and a Brewerton projectile point fragment which indicated the presence of the sites and eventually resulted in their inclusion within the district.

As we began our site examination fieldwork it became clear that we had been operating under a misconception. Once in the field, it dawned on us that these three "sites" might not be the only ones out there. Usually we employ a phased approach to potential site areas. First a reconnaissance, then a systematic intensive survey to locate sites, then a site examination. We now found ourselves in a dilemma. The 22-acre island had not been systematically surveyed.

In the field we utilized a multi-staged
sampling strategy that provided some coverage across the entire project area; we then focused upon higher densities of materials and features. Our results indicated that cultural material was scattered across the entire island. The project area contained a number of sites, or more appropriately components, which we were then able to concentrate upon.

The suspected earliest occupation of the project area is concentrated in the northwest section of the island, atop the slope overlooking the swamp. Testing in this location has yielded a relatively high density of debitage, a Neville projectile point and a drill. A Middle Archaic affiliation is suspected. The processing of floral and faunal resources during a Laurentian occupation is indicated by a concentration of materials in the north central section of the island. Here a half spherical pit feature of fine sandy oxidized soils contained a variety of chipping debris, deer bone fragments, hazelnut fragments and charcoal. The feature had a radiocarbon age of 5,190 ± 70 years B.P. (Beta 28056). Another Laurentian deposit in the west central section of the island along the swamp margin is represented by a low density lithic scatter and an associated Brewerton point.

A third chronologically distinct utilization of the project landscape is reflected in a concentration of rhyolite chipping debris and three small associated features, charcoal from which yielded a radiocarbon date of 1,700 ± 80 B.P. (Beta 28119). The large number (197 pieces) of debitage concentrated in proximity to these features indicates a discrete lithic workshop area. The radiocarbon date indicates a Middle Woodland cultural affiliation.

An apparent Late Woodland component on the site is located to the immediate north of the existing railroad cut, upon higher elevations in the central section of the island. A high density and diversity of debitage and a hearth feature dating to 570 ± 50 years B.P. (Beta 28118) dominate this loci of activity. In this component a single ceramic fragment was recovered from a burnt rock platform/hearth feature. The location of this component on higher ground away from the swamp margin may suggest different activities and target resources during this particular prehistoric occupation.

A small knoll with an elevation of 300 feet is situated in the east central project area. It is the location of a low density of prehistoric cultural material as well as a historic period component. A "cellar hole" depression is surrounded by low densities of kaolinite pipe fragments, redware ceramic fragments, and structural material (glass, nails) as well as chipping debris. Since documentary sources describe Native American occupation within the swamp into the nineteenth century, it is possible that native groups were affiliated with the structure.

To summarize our findings, we concluded that seven different areas within the proposed facility should be targeted for further excavation within the scope of a data recovery program. Thanks to the talents and efforts of Brona Simon and Peter Mills of the Massachusetts Historical Commission and of Marie Bourassa of the Army Corps of Engineers and with the help of Curt Hoffman, a comprehensive data recovery plan has been formulated for the Cedar Swamp #1 and #24 sites. We look forward to what we expect will be a multi-disciplinary research effort relying on some of the expertise represented at this conference.

One of the misconceptions I have encountered during my involvement with the Cedar Swamp district is exemplified by people saying to me "but the sites are on the National Register, aren’t they protected?" Indeed not; they are recognized, but not protected. A second misconception is a notion that all the sites within the district are known and that we needn’t look for others. We need to think of the Nomination form as a planning document, not a finished product.
My experience in the project has also reinforced, for me, the notion that we have a long way to go before contract archaeology is utilized effectively for the preservation of sites. I find myself more and more drawn toward educational programs directed at the grass roots level.

I'd like to take the remainder of this paper to touch upon a subject related to the theme of the Massachusetts Archaeological Society 50th anniversary conference, the issue of how do we justify doing archaeology into the coming decades. First, this is not a simple world where resolution to complex problems will be found in popular song lyrics or on prime time television. This is an era in which *Time* magazine names Earth the planet of the year and warns that it is endangered, while the circulation demands of that magazine result in the cutting of over one hundred thousand trees. This is a world in which Exxon is a major corporate giver to science and education while now responsible for an ecological catastrophe.

Archaeology is important, and there are two related reasons why. One is that history as a string of politically significant events is not reality and its recorders cannot be objective. As Voltaire said, "History is agreed upon lies." The human experience is most accurately studied by considering the day-to-day lives of individuals within a society or culture and that is what we as archaeologists do. Secondly, we must consider our position as organisms on this planet. Earth is in fact not endangered; we are. On a cosmic or geological time scale we, as a failed species, will not be gone long before the synergistic systems of the planet repair the damage which we have done. A new Garden of Eden for a new species. If we are to avoid rejection by our host planet we must understand how we have, throughout our brief stay here, interacted with our environment. Archaeology is one of the lines of that investigation.
CHELONIAN ZOOARCHAEOLOGY OF EASTERN NEW ENGLAND:
TURTLE BONE REMAINS FROM CEDAR SWAMP
AND OTHER PREHISTORIC SITES

Anders G. J. Rhodin

Turtles have been used by man for a long time. Primitive tribes around the world have often based a large proportion of their resource utilization on local turtle populations. In South America, the large riverine species *Podocnemis expansa* was so heavily exploited that early Amazonian explorers estimated that literally millions of adult turtles and their eggs were harvested and consumed by the natives every year. Modern Amazonian tribes continue to use the same turtle resources, but by now they have dwindled to mere fractions of their former abundance.

The use of turtles as a food resource was also widely practiced by prehistoric man in New England. Though never reaching the same degree of utilization as in the tropics, turtles were nonetheless an important component of the local subsistence diet. At the Cedar Swamp sites, turtle bone remains constitute approximately 23% of the salvaged faunal material (Warfield 1986).

The Cedar Swamp sites at Westborough, Massachusetts have yielded a total of 260 fragments of turtle bone. Of these, 223 are from the Cedar Swamp-3 site, 1 from Cedar Swamp-2, and 36 from Cedar Swamp-4. Nearly all the fragments are calcined bone less than 1.0 cm in size, with most being less than 0.5 cm. Of the 260 fragments, only 40 (15.4%) are identifiable to species (see Table I). This low percentage is due to the small and fragmentary nature of the material. Preliminary analysis of much of this material has previously been published (Rhodin 1986).

Of the 260 turtle fragments recovered, 165 (63.4%) are from two single Cedar Swamp-3 features (#6 and #12) interpreted as shallow red earth middens (Warfield 1986). Feature #6 has been radiocarbon dated at 970 ± 70 B.P. (Beta 15195; Hoffman 1988). Much of the other bone recovered has also been found associated with midden features. Of the 198 fragments recovered from identifiable features, 94.9% are from shallow red earth middens, and only 5.1% from deep red earth storage pits.


The most common turtle species found at the Cedar Swamp sites is the painted turtle (*Chrysemys picta*), represented by 17 fragments (43% of the total). The painted turtle is a small aquatic species averaging 5 to 7 inches (13-18 cm) in carapace length. It is an abundant, highly gregarious species, often seen basking in great numbers on logs and rocks, and is easily the most conspicuous member of the New England turtle fauna. In Massachusetts, it is active from about April to October, and does not estivate during the warm
Table I. Identified turtle bone fragments from Cedar Swamp sites.

<table>
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<th>Species</th>
<th>Feature</th>
<th>Quadrant</th>
<th>Element</th>
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<td>С100W19-B</td>
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<tr>
<td></td>
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<td>S107W29-B2</td>
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</tr>
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<td>left epiplastron</td>
</tr>
<tr>
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<td></td>
<td>S107W30-A3</td>
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<td></td>
<td>S107W30-B2</td>
<td>costal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>seventh neural</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>marginal</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
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<td>xiphiplastron</td>
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<td>S69W20-B2</td>
<td>entoplastron</td>
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<td>CS4</td>
<td>S143W164-A3</td>
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<td></td>
<td></td>
<td>marginal</td>
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<td>Chelydra serpentina (snapper)</td>
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<td>Surface</td>
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<td></td>
<td></td>
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<td>left postorbital</td>
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<td>scapula</td>
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<td></td>
<td></td>
<td>S69W20-A3</td>
<td>costal</td>
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<td>Clemmys guttata (spotted)</td>
<td>CS2</td>
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<td>right seventh marginal</td>
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<td>Terrapene carolina (box)</td>
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<tr>
<td></td>
<td>CS3-12</td>
<td>S98E11</td>
<td>xiphiplastron</td>
</tr>
<tr>
<td></td>
<td>CS4</td>
<td>S139W169-B2</td>
<td>nuchal</td>
</tr>
<tr>
<td>Sternoterus odoratus (musk)</td>
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<td>S107W29-B2</td>
<td>right seventh marginal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S107W30-B2</td>
<td>right second marginal</td>
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<tr>
<td></td>
<td>CS3-12</td>
<td>S99E11-B2</td>
<td>right fifth costal</td>
</tr>
<tr>
<td></td>
<td>CS4</td>
<td>S143W169-A3</td>
<td>marginal</td>
</tr>
<tr>
<td>Clemmys insculpta (wood)</td>
<td>CS4</td>
<td>Surface</td>
<td>left hypoplastron</td>
</tr>
<tr>
<td>Pseudemys rubriventris (redbelly)</td>
<td>CS4</td>
<td>S139W169-A3</td>
<td>plastron fragment</td>
</tr>
</tbody>
</table>

summer months.

The second most common turtle species is the snapping turtle (Chelydra serpentina), represented by 8 fragments (20%). Of the turtle species recorded at Cedar Swamp, it is the largest, with individuals reaching 12 to 15 inches (30-38 cm) in carapace length. It is a highly aquatic species, which does not bask but can often be
found close to shore in mud shallows. It is active from April to October, and is often found wandering on land during nesting season in June. Large individuals can weigh from 30 to 50 pounds (13-23 kg) and yield a good quantity of delicious meat. Commercial exploitation of snappers for meat and soup still occurs in our society today.

The third most common turtle species is the spotted turtle (Clemmys guttata), represented by 5 fragments (13%). The spotted turtle is a small aquatic species, averaging 4 to 5 inches (10-13 cm) in carapace length. Though now somewhat uncommon and localized, it was historically a relatively common and often locally abundant turtle, usually found in cranberry bogs and other shallow ponds and marshes with extensive vegetation. In Massachusetts, it is active from about March to October, usually with a period of relative estivation during the warmest summer months. It emerges from hibernation earlier in the spring than the painted turtle and is often replaced by the painted turtle in the same habitat during late spring and early summer as the temperatures rise. Of the 5 fragments of spotted turtle bone found, two demonstrate signs of seasonality. Both are plastral fragments showing four distinct peripheral growth zones. Of these four growth zones, the most recent one is ca. 1.5 to 2 times as wide as any of the preceding ones. This means that the turtle had grown more rapidly in its most recent growing season and also that the animal had probably been caught at the very end of this very active growing season. This can mean that it was either caught late in the fall just before hibernation or early in the spring, just before starting a new growth zone. It is unlikely that it was captured in the middle of the summer, as one would then expect to see an incomplete growth zone of a much lesser width. Due to the fact that spotted turtles are most easily captured in the early spring when they emerge from hibernation, and less apt to be found in the fall as they settle into hibernation, it appears likely that these animals were captured in about March or April.

The next most common species of turtle at Cedar Swamp is the box turtle (Terrapene carolina), represented by 4 fragments (10%). In Massachusetts, this species occurs at the extreme northern limit of its range. It is a moderately common, though solitary, small terrestrial species, averaging 4 to 6 inches (10-15 cm) in carapace length. It typically occupies woodlands and fields but can also be found in marshes and swamps. It tends to emerge from terrestrial hibernation somewhat late in the spring, usually after painted turtles in April, and often partially estivates during hot periods in the summer.

As common as the box turtle is the musk turtle (Sternotherus odoratus), also represented by 4 fragments (10%). This is a common, very small aquatic species, averaging 3 to 4 inches (7-10 cm) in carapace length. It is the smallest turtle found at Cedar Swamp, with very little edible meat. It is also known as the stinkpot turtle and exudes an extremely foul smelling musk when handled. It is active from about April to October and is most easily encountered in marshes or shallow still bodies of water with extensive aquatic vegetation.

The next turtle species found at Cedar Swamp is the wood turtle (Clemmys insculpta), represented by one fragment (2%). The wood turtle is a moderately common, solitary, medium-sized terrestrial species, averaging about 6 to 8 inches (15-20 cm) in carapace length. Its habitat is similar to the box turtle, except that it hibernates in streams, and it is active somewhat earlier, from about March to October.

The last turtle species found at Cedar Swamp is the redbellied turtle (Pseudemys rubriventris), also represented by a single fragment (2%). The presence of this species in the Cedar Swamp turtle fauna was not recorded in the earlier report on this material (Rhodin 1986). The single fragment was found at Cedar Swamp-4 in quadrant S139W169, level A3, and measures 10 x 7
mm in size and 4.5 mm thick. The bone represents a fragment of plastron and is identifiable as *Pseudemys rubriventris* by its thickness and the presence of the typical irregular finely sculpted surface pattern. The redbelly was the second largest turtle available to the local inhabitants, reaching a carapace length of 10 to 12 inches (25-31 cm). Like the smaller painted turtle, it is a conspicuous barker and also active from about April to October. It is good to eat, and as recently as the turn of the century was commonly sold in food markets in the Chesapeake Bay region and Washington D.C.

**The Redbelly Turtle.**

The redbelly turtle is currently extremely rare and restricted in New England. It is an interesting species that has a disjunct modern distribution. During the last interglacial period it was probably contiguously distributed all along the emergent continental shelf from North Carolina to New Hampshire. The northeastern population of the species now appears to survive only in one small area of Plymouth County of Massachusetts. This population is now isolated, endangered, and protected by the U.S. Fish and Wildlife Service. Until recently, it was felt to represent a distinct subspecies, *Pseudemys rubriventris bangsi*, but recent morphological investigations have failed to differentiate it from the southern populations of what used to be the nominate subspecies, which is currently distributed along the coastal Chesapeake Bay region from southern New Jersey to northeastern North Carolina. A recovery plan for saving the remaining Massachusetts populations is currently in effect (U.S. Fish and Wildlife Service, 1985), and knowledge gained through archaeological studies is helping us to understand the redbelly’s former range and helping us to formulate a conservation policy based on documented former localities.

The former New England distribution of the redbelly turtle was wider than it is now, and it appears to have become locally extirpated at least partially through the predatory pressure of prehistoric man. Several other instances of the occurrence of redbelly turtle material in prehistoric midden deposits in New England have been recorded. Bullen (1949), Waters (1962, 1966), and Rhodin and Largy (1984) have recorded midden finds at Ipswich, Martha’s Vineyard, and Concord. The present record extends the former range of the redbelly turtle to Cedar Swamp, Westborough, at the headwaters of the Sudbury River, a range extension of ca. 25 km southwest of the Concord record. It also represents the first record of this species as having formerly occurred in Worcester County, Massachusetts.

An additional fragment of *Pseudemys rubriventris* bone has also recently been found at the Watertown Dairy site on the Sudbury River in Wayland, Massachusetts by Tonya Largy (see Largy 1983, for site description). I have examined and identified the fragment, a surface find of calcined bone of obvious archaeological origin, measuring 9 x 7 mm and 2.5 mm thick. The piece represents a carapace fragment showing a suture line and typical subparallel carapacial rugose striations. The fragment is very slightly concave, probably representing the medial third of the right 8th costal of a subadult animal with the vertebral-pleural suture just lateral to the costiform process.

The finds of redbelly turtle at Cedar Swamp and Watertown Dairy confirm the former widespread distribution of the species in the southern extent of the Merrimack River drainage basin, especially in the Concord and Sudbury drainages. The present and former distribution of the redbelly turtle is illustrated in Figure 1.
Figure 1. Map showing present and former distribution of the redbelly turtle, *Pseudemys rubriventris*, in eastern New England. Lettered stars represent modern material: A. present known distribution, Plymouth County, Massachusetts; B. single recent find of dead animal, Parker River, no confirmed population known to exist; C. possible small living population, Naushon Island, not confirmed, disputed in the literature. Solid triangles represent archaeological midden redbelly material: 1. Cedar Swamp, Westborough, Massachusetts; 3. Shell Heap, Concord; 4. Ipswich, Merrimack River drainage; 5. Martha’s Vineyard; 6. Watertown Dairy, Wayland. Open squares represent prehistoric midden materials with no evidence of redbelly turtle: 2. Flagg Swamp, Marlboro (Huntington and Shaw 1982); 7. Nantucket (Little 1983; Carlson 1990); 8. Sewall’s Falls, Concord, New Hampshire (Howe 1988); 9. Olsen site, Cushing, Maine (Downs 1987); 10. Hog Island site, Maine (French 1986). Major rivers of the Merrimack drainage basin are noted on the map: a. Merrimack River, b. Concord River, c. Sudbury River. Further analysis of the chelonian zooarchaeology of sites 1, 2, 3, 8, and 9 is also presented in this paper.
Table II. Chelonian zooarchaeological analysis of five eastern New England prehistoric sites. See text for sources of data and site descriptions. Only Flagg Swamp material not identified by Rhodin. N = number of identified fragments of turtle bone, % = percentage of each species’ occurrence in each faunal assemblage as based on number of bone fragments found.

<table>
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<tr>
<th>SPECIES</th>
<th>CEDAR SWAMP</th>
<th>FLAGG SWAMP</th>
<th>CONCORD SHELLHEAP</th>
<th>SEWALL'S FALLS</th>
<th>OLSEN SITE</th>
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<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
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<td>PAINTED</td>
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<tr>
<td>TOTALS</td>
<td>40</td>
<td>100</td>
<td>49</td>
<td>100</td>
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</table>

Figure 2. Graphic representation of the chelonian zooarchaeological analysis presented in Table II. Horizontal lengths of solid bars represent the percentage of each species’ occurrence in each faunal assemblage, with the total for each site adding up to 100%, and the scale identical for each site.
Chelonian Zooarchaeological Analysis.

A chelonian zooarchaeological analysis of the turtle fauna recorded at Cedar Swamp sites can be performed in conjunction with other eastern New England midden finds. For the purposes of this paper, I compare Cedar Swamp with four other sites where the chelonian material has been sufficient to yield significant results. These sites are recorded on the map in Figure 1 (sites 1, 2, 3, 8, and 9) and the chelonian zooarchaeological analysis in Table 2 and Figure 2. In addition to Cedar Swamp sites, they are: Flagg Swamp Rockshelter, Marlboro, identifications of turtle bone by Huntington and Shaw (1982); Shell Heap, Concord, Massachusetts, identifications by Rhodin and Largy (1984) and Rhodin (1986); Sewall’s Falls, Concord, New Hampshire, identifications by Rhodin, preliminary findings published by Howe (1988); and Olsen site, Cushing, Maine, identifications by Rhodin, preliminary findings reported by Downs (1987), site described by Spiess and Eldridge (1985).

Of the four archaeological sites within the Merrimack River drainage basin, three are in the Concord River drainage. One site is from northeastern coastal Maine. The eight species of turtles recorded from these sites compose essentially the entire present freshwater and terrestrial turtle fauna of eastern New England. Only three other species could possibly be peripherally included: the estuarine diamondback terrapin (Malaclemys terrapin), which is presently confined to a few isolated localities on Cape Cod and the Connecticut shore, the freshwater bog turtle (Clemmys muhlenbergii), which is extremely rare and exists only in a few small disjunct populations in extreme western Massachusetts and Connecticut, and the eastern mud turtle (Kinosternon subrubrum), which reaches the northern limit of its present-day range in the greater New York City area, possibly including extreme southwestern Connecticut. One species found at Concord Shell Heap has not yet been recorded from Cedar Swamp: the Blanding’s turtle (Emydoidea blandingii), which has a markedly limited, disjunct distribution in New England, and has only infrequently been recorded from local prehistoric sites (Rhodin 1986; French 1986).

Of particular note in comparing the five turtle assemblages are the relative percentages of painted (Chrysemys picta) vs. spotted (Clemmys guttata) turtles. Because of the habits of these two species, it sometimes becomes possible to infer patterns of seasonal site usage based on their relative frequencies in New England prehistoric faunal assemblages. Within a given natural habitat where the two species are locally microsympatric (i.e., occur together), spotted turtles are extremely common and easily captured in the early spring from about March to about May, and then become increasingly difficult to locate as they begin to estivate or become more cryptically active under the vegetation during the warmer summer months. During the same time intervals, painted turtles are relatively scarce in the early spring months and then become increasingly common as the weather warms and remain active and conspicuous during the summer. By comparing the percentages of painted vs. spotted turtles in an assemblage it may be possible to predict whether the site was utilized primarily in the early spring or in mid-summer.

For example, the Flagg Swamp Rockshelter in Marlboro was a winter habitation site subsequently abandoned for the summer (Huntington 1982). Of the turtle fragments identified by Huntington and Shaw (1982), 74% represent spotted and only 20% painteds. This supports the conclusion that Flagg Swamp was a winter site where the inhabitants probably began collecting spotted turtles in the early spring as soon as they began to emerge in March, but probably stopped collecting and moved to a summer habitation site before painted turtles became more common in the
later spring months.

In contrast, the Concord Shell Heap site has 38% painted turtles and only 1% spotted. This would suggest that the site was primarily a summer habitation, not occupied until the late spring when the weather was warm enough to cause most of the spotted turtles to disappear into estivation. Alternatively, it is possible that the site was also used in the early spring, but that no suitable spotted turtle habitat was found in the area. This hypothesis would appear less likely since spotted turtles are presently relatively common in the greater Concord area.

The percentages of painteds vs. spotteds for Cedar Swamp are intermediate between those for Flagg Swamp and Concord Shell Heap. Painted turtles accounted for 43% and spotted turtles 13%. This may suggest that the site was neither exclusively a winter to early spring habitation nor strictly a summer site. Instead, the percentages support the probability that Cedar Swamp was an all-year habitation, where spotted turtles were collected in the early spring months and then primarily painted turtles in the later spring and summer months. The two spotted turtle plastral fragments found with visible growth zones support the supposition that spotted turtles were being collected at the site during the early spring months. The higher percentage of painted turtles supports the probability that the site was also being actively used during the summer months. These findings support Warfield’s (1986) conclusion that Cedar Swamp was a relatively permanent habitation where the inhabitants had created a structured site with a complete social group subsisting on a wide local resource base.

The extremely low percentages of either painted or spotted turtles at Sewall’s Falls site in New Hampshire suggest a local scarcity of these species. The correspondingly high percentage of wood (Clemmys insculpta) and snapping turtles (Chelydra serpentina), more cold-tolerant than either painteds or spotteds, suggests that Sewall’s Falls site was inhabited during a period of time when the climate there was colder than it is now. The percentages of turtles in the prehistoric fauna are more similar to some areas of present-day Canada such as northern Nova Scotia, where wood and snapping turtles are abundant but painted turtles uncommon and spotted turtles not known to occur. The present-day turtle fauna of the general Sewall’s Falls area resembles that of prehistoric Concord Shell Heap or Cedar Swamp (with the exception of redbelly and box turtles, which are not known to occur in New Hampshire).

The percentages of painteds and spotteds at Olsen site in Maine suggest an all-year habitation at the northern limit of the range for spotted turtles, where painteds constitute the majority of the relatively depauperate turtle fauna, but spotteds were collected when available, and the cold-tolerant wood turtle was relatively abundant. The absence of snapping turtles from Olson site is surprising but may simply reflect the relatively small size of the sample available for analysis.

Both Sewall’s Falls and Olsen sites are located north of the northern range limit of redbelly and box turtles, so their absence in those faunas is not surprising, and the distribution of Blanding’s turtles is extremely disjunct, so their absence is not unexpected. Box turtles (Terrapene carolina) were only common at the two summer or all-year habitation sites within the current range of the species, Concord and Cedar Swamp, and relatively uncommon at the winter site, Flagg Swamp. Wood turtles (Clemmys insculpta) were only common at the two northern colder climate sites, Sewall’s Falls and Olsen site, less common at the southern warmer weather sites, Concord, Flagg Swamp, and Cedar Swamp. Musk turtles (Sternotherus odoratus), though foul smelling and very small, were obviously utilized by prehistoric man, being found at three of the five sites. Their use in the diet of prehistoric man has also previously been noted by Adler (1968). The redbelly
turtle \((Pseudemys\)\) rubriventris\), as discussed above, was found at three sites where living populations no longer occur. The evidence suggests at least partial extirpation at the hand of prehistoric man. A similar pattern of human-induced local prehistoric extinction has been documented for box turtles in northern New York state (Adler, 1970).

In conclusion, analysis of the chelonian zooarchaeology of prehistoric sites can augment our understanding of the resource utilization patterns of the inhabitants, the climate and seasonality of the habitation, and the historical distribution and population trends of the turtle species encountered. Cedar Swamp and the other sites examined in this paper confirm the value of this type of faunal analysis.

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U.S. Fish and Wildlife Service.

Warfield, Ruth

Waters, Joseph H.

A BRIEF NOTE TO CONTRIBUTORS

The Editor solicits for publication original contributions related to the archaeology of Massachusetts. Manuscripts should be sent to the Editor for evaluation and comment. Authors of articles submitted to the *Bulletin of the Massachusetts Archaeological Society* are requested to follow the style guide for *American Antiquity* 48:429-442 (1983). Additional instructions for authors may be found in the *Bulletin of the Massachusetts Archaeological Society*, Volume 51:98 (1990).
Plant macrofossils found in southern New England sites consist of both carbonized and non-carbonized materials. These include wood and bark, nutshell, seeds, stems, roots, leaf and stem galls, and various parts of coniferous trees (needles, the fascicles which hold the leaf bundles together, and cone scale tips). All of the above were recovered from Cedar Swamp, Westborough, Massachusetts. Since little is known about how long these materials preserve in New England’s acidic soils, most analysts are wise to consider only carbonized remains as being of prehistoric origin unless there is reason to think otherwise (Minnis 1981).

Flotation, the recovery method used, is a water separation process which removes macrofossils from their soil matrix. When dried, they are examined under magnification ranging between 10X and 200X, using a binocular dissecting microscope. Then, the specimens are identified to the nearest taxonomic level. One hundred twenty-four samples of both floated and dry-sifted materials have been analyzed from two sites in Cedar Swamp, CS-3 and CS-9.

Context and extent of disturbance on a site must be considered when interpreting archaeobotanical remains. CS-3, in particular, shows quite a bit of disturbance from rodents. One was even caught in the act during excavation. Strauss (1978, 1981, 1985) and Hoffman (1987) have discussed various origins of disturbance from both natural and human processes. Hoffman’s (1987) article, "Culture’s Pitfalls: The Evidence for Prehistoric Backfilling", is based partially on data from CS-3. He has proposed that several large features were backfilled with basketloads of dirt, possibly from elsewhere on the site. Imagine what this means in terms of moving plant materials from one locus to another.

Another factor to consider is feature density, which is fairly high, especially at CS-9. Hoffman (1987:44-45) has calculated that 23% of the horizontal area of the site is made up of features, some of which bisect each other. Except for selected features, I hesitate to make firm statements regarding the plant species represented at this site because the original context of deposition is unclear and disturbance has been demonstrated.

A site visit was made in early October, 1985 to inventory species growing there today. Trees, woody shrubs, herbaceous plants, vines, mosses and ferns were noted. Tree species include red maple (Acer rubrum), black cherry (Prunus serotina), birch (Betula, sp.), stump sprouts of the American chestnut (Castanea dentata), white pine (Pinus strobus), hickory (Carya, sp.), and oak (Quercus, spp.). Both white and
red oak groups are represented. The diameters of the trees indicate they are fairly young. The hickories and oaks probably are between thirty and fifty years of age. The few birches noted are definitely being crowded out. However, their presence indicates early succession in a previously open area.

Shrub species include hazelnut (Corylus, sp.), maple-leaved viburnum (Viburnum acerifolium), witch-hazel (Hamamelis virginiana), sheep laurel (Kalmia angustifolia), sweet pepperbush (Clethra alnifolia), swamp azalea (Rhododendron, sp.), arrowwood (Viburnum, sp.), highbush and low-bush blueberry (Vaccinium, sp.), and spiraea (Spiraea, spp.).

Vines of wild grape (Vitis, sp.), dewberry (Rubus, sp.), and greenbrier (Smilax, spp.) are there today. Also present are low growing species, such as wintergreen (Gaultheria hispidula) and pippsissewa (Chimaphila maculata). Herbsceous species such as knotweed (Polygonum, sp.) and pokeweeds (Phytolacca americana) are also present.

Wetland species include several species of ferns (Filicinae), sphagnum moss (Sphagnum, sp.), sedges (Cyperaceae) and cat-tail (Typha, sp.). Water-lilies (Nymphaeaceae) grow in Cedar Swamp Pond, but these can not be seen from the site. All species listed commonly grow in acidic soils of temperate regions. Many are economic species having uses as food, medicine, beverages, firewood, tool handles, etc. These species are native to the area (Jackson 1909; Seymour 1982) and could have grown on or near the site in prehistoric times.

WOOD DATA

Charred wood of both white oak (leucobalanus group of Quercus) and red oak (erythrobalanus group of Quercus) was recovered from both CS-3 and CS-9. White oak acorns were valued most by foraging peoples because, with their lower tannin content, they required less processing than red oak acorns. However, only tiny fragments of acorn shell and one acorn cup fragment were recovered. Sycamore (Platanus occidentalis) was also present on both sites but is not seen today.

Hickory (Carya, spp.) wood and nutshell was identified at CS-3, while only a solitary questionable fragment of nutshell was found at CS-9. Oak and hickory would have been valued as firewood since both are rated among the highest in British Thermal Units (U.S.D.E. 1980:4).

The gymnosperm, or conifer wood in the samples can be classed as Pinaceae, either pine (Pinus, sp.), spruce (Picea, sp.), or larch (Larix laricina, sp.), based on the presence of resin canals (Core, Cote and Day 1979:90). Atlantic white cedar also was identified at both sites. The significance of its presence in Feature 9 at CS-3 lies in how nicely it correlates with Sneddon and Kaplan’s pollen study (1987). The C-14 date of 2130 ± 70 B.P. (Beta 15196, uncorrected for C-13; Hoffman 1988), is very close to estimated arrival for cedar at mid-zone at 2200 B.P. (Sneddon and Kaplan 1987:9).

American chestnut was another late-arriving species. Davis (1983:172) concludes that it moved slowly northward from the Appalachians and did not reach Connecticut until 2000 years ago. Chestnut wood (Castanea dentata) was present in four features at CS-3: Feature 3, Feature 6, Feature 23, and Feature 24. Feature 6 yielded a C-14 date of 970 ± 70 B.P. (Beta 15195, uncorrected for C-13; Hoffman 1988), with a range of 900 B.P. to 1040 B.P. This date is supported by the association of a Jack’s Reef corner-notched point (Hoffman 1988). Thus, this species can indicate a terminus post quem, i.e., a date after which the species was available as a resource.

The presence of a species in features can provide clues to site structure. At CS-3, various
parts of pitch pine (Pinus rigida) were recovered from more than one flotation sample. The extreme difference in plant materials identified from two adjoining units, thought to be the same shallow feature, helped discriminate between the feature and a second shallow feature, a tree which probably burned in place. Feature 4, which spanned two units, S99/W19 and S100/W18, appeared to be one large feature during excavation. However, the unit map included a line demarking a possible separate feature in the second unit. When the flotation samples were analyzed, S100/W18 was replete with fascicles, charred needles, cone scales and bark chips of pitch pine. The sample from S99/W19 contained hickory wood, a diffuse-porous wood, and a fragment of hickory nut.

SEEDS AND NUTSHELL

Uncharred seeds from Feature 4, S100/W18 (CS-3) also included one seed of Gramineae (the grass family), a number of seeds tentatively identified as Cyperaceae (sedge family), and Leguminoseae (legumes, subfamily: Papilionoideae, which include the clovers). The clovers are introduced into New England from Eurasia. They are not prehistoric. Their presence may indicate CS-3 was used as pasture at one time, along with evidence provided by the presence of stone walls. A dry cartpath connects with CS-9, to the northwest, where Jason Chamberlain operated a dairy farm until the mid-19th century (C. Hoffman, 1987 personal communication).

Species of charred nutshell and berries found at CS-3 include hazelnut (Corylus, sp.), huckleberry (Gaylussacia, sp.), and blackberry/raspberry (Rubus, sp.). The wild species from this site commonly grow in this area. Many are listed in the plant inventory. Any of these may have been deposited on the site in a number of ways, both accidental and cultural. Assuming these seeds were charred shortly after becoming available, their preservation would point to a summer through fall season of occupation.

Sometimes both carbonized and non-carbonized seeds of the same species are recovered from a single feature or the same unit. Perhaps the uncharred seeds are products of earlier generations of plants, which are deposited in the seed bank (naturally deposited seeds awaiting an opportunity to germinate). Years later, if land is cleared by burning, either in late prehistoric or in historic times, the seeds buried just under the leaf litter might be charred while their ancestors, buried more deeply, escape charring.

Charred and uncharred seeds of Sumac (Rhus, sp.) and sweet-fern (Comptonia peregrina) were identified from the same provenience. Both species are indicators of disturbed soil and both have economic uses. Sumac berries are used to make a beverage which has been compared to lemonade. Sweet-fern is an early successional species that thrives best in disturbed sandy soil and full sunlight. It relies on root sprouts for extending its range. Studies by Del Tredici (1977) of a clear-cut area in Connecticut show that seeds of sweet-fern retain their viability in the soil for a period of seventy years. Since many uncharred, degraded nutlets are present at both sites, this species is evidence that CS-3, especially, was once more open.

Two charred seeds of an aquatic species identified from CS-3 are Potamogeton, sp., pondweed, which grows in shallow ponds and waterways. Its rhizomes are farinaceous and edible (Fernald and Kinsey 1958:85), and would have been a reliable food resource. Two charred seeds tentatively identified as Potamogeton were recently reported from Feature 37 dated to 590±70 B.P. at the Morgan site, a Late Woodland farming community in the Connecticut River Valley (Lavin 1988:18). One charred seed tentatively identified as Chenopodiaceae, goosefoot family, was recovered from Feature 2, CS-3.
This seed was larger than most species in this genus, but shared other diagnostic characteristics, including its form after being carbonized.

OTHER PLANT PARTS

Other plant parts include a carbonized fruit capsule of the heath family (Ericaceae) from CS-9. Its value is primarily as a seasonality indicator. It is not edible in itself. Various genera in this family flower in May through early July. The fruits are formed in late July through early September, depending on the microenvironment and climatic variation. This specimen contains the mature seeds within, implying this specimen was charred before the end of the season when seeds are expelled. It could not have been charred in this exact state of maturation at any other time. I examined herbarium specimens collected in Worcester County by members of the New England Botanical Club in the months of November, December, and January, and found that the seeds had not yet been expelled from their capsules. Thus, the archaeological specimen might be assigned seasonality ranging from summer through early winter.

Other species recovered from CS-9 include a charred stem of white water-lily, Nymphaea [odorata]. Its presence suggests a range of occupation extending from early June through fall. Since water-lily buds, leaves, seeds and rhizomes had food value, this resource encompasses several seasons. The plant dies back in the winter when shallow ponds freeze over and would not be easily available. The rhizomes of this species measure around 5 cm in diameter and would be a storable resource after parching or drying for winter use. Frederick Coville (1902) reported in detail how the Klamath Indians of Oregon harvested and processed seeds of Nymphaea polysepala, the great yellow water-lily. Huron Smith noted use of both the yellow and white water-lily among the Potawatomi (1933:65), Menomini (1923:42-43, 69-70) and Ojibwe (1932:376,407), who used both species as food and medicine. Closer to home John Josselyn, in New England Rarities Discovered [1672], writes, "Water Lilly, with yellow flowers, the Indians eat the Roots, which are long a boiling, they taste like the Liver of a Sheep... (Josselyn 1972:44)".

CONCLUSION

Archaeobotanical recoveries from sites in Cedar Swamp are not plentiful, but the species identified provide clues to subsistence and season of occupation, assuming these were carbonized contemporaneously with occupation of the site. Several ideas come to mind when considering the charred wood from Cedar Swamp. I suggest that charcoal samples be identified to species before being submitted for radiocarbon dating. The species could be both identified and dated, and these data would be valuable to those studying forest succession and migration of species during the Holocene. In addition, I see an important implication for the archaeologist trying to interpret a site on a limited budget. For example, the presence of chestnut wood in a feature allows that feature to be dated to the Middle or Late Woodland, in the absence of other diagnostics.

When all data are considered, Cedar Swamp was an ideal place to live year round. Plant, mammal, reptile, bird and fish resources were plentiful. Firewood was available and fresh water, too. The late Allen Morgan, Director of Sudbury Valley Trustees and a well-known birder, stated that even in the coldest months of winter when Cedar Swamp pond is frozen, the outlet remains open water for one-quarter mile downstream, providing habitat for birds which might be added to the family larder. According to Morgan, in recent times, kingfisher and wood duck have been observed on the open water in February.
Considering plant resources alone, the site catchment area could have provided fresh or storable carbohydrates for a small band of several families to live year round supplemented by meat obtained from fishing, hunting and trapping. The recovery of lithics representing more than one component, the recovery of ceramics, the presence of many features, and the recovered faunal assemblage all support the conclusion that resources in Cedar Swamp were deemed important enough to draw people again and again through time.

Acknowledgments: I would like to thank Dr. Hollis Bedell, Wood Anatomist at the Bailey-Wetmore Laboratory of Plant Anatomy and Morphology, Harvard University, for her assistance in identifying the sycamore wood from CS-3 and CS-9 and for suggestions regarding the water-lily stem. Thanks also to Mary Walker, New England Botanical Club, and Dr. Gerald Kelso, National Park Service, who contributed helpful comments. Editor Elizabeth A. Little provided gentle editorial guidance.

TABLE I. CARBONIZED PLANT SPECIES FROM CS-9 FEATURES

| WOOD:          | Oak, red & white                          |
|               | Atlantic White Cedar                      |
|               | Sycamore                                   |
|               | Pine family (Pinaceae)                     |
|               | Diffuse-porous species                     |
| SEED:          | Sweet Fern* (C. peregrina)                 |
|               | Blackberry/raspberry (Rubus)               |
|               | Huckleberry (Gaylussacia)                  |
| FRUIT:         | Heath family** (Ericaceae)                |
| NUTSHELL:      | Acorn? (Quercus)                           |
|               | Hickory? (Carya)                           |
| STEM/ROOT:     | Fragrant water-lily (Nymphaea odorata)**   |

Fea. 3          Fea. 9          Fea. 15          Fea. 3          Fea. 16          Fea. 147

*Seeds may be used as a nibble; leaves as tea; available mid-summer through fall.
**Species include Sheep Laurel, Sweet Pepperbush, Maleberry, plus others; fruit forms late July-early September. Leaves used as tea; some species as greens in scarce times.
***Both roots and seeds are edible; flowerbuds available in spring; seeds and roots available in autumn.
### TABLE II. CARBONIZED PLANT SPECIES FROM CS-3 FEATURES

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<th>WOOD:</th>
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<th>Fea. 9; C-14 age: 2130±30 B.P.</th>
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<td></td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>Hickory</td>
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<tr>
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<td>Pine family (Pinaceae)</td>
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<tr>
<td></td>
<td>Sycamore</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Diffuse-porous species (more than one species)</td>
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</tr>
<tr>
<td>SEED:</td>
<td>Birch (Betula)</td>
<td>Fea. 4</td>
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<td></td>
<td>Sweet Fern (C. peregrina)</td>
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<td>Grass family (Panicoideae)</td>
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<td>Self-heal (Prunella vulgaris)*</td>
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<td>Clover (Papilionoideae)*</td>
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<td></td>
<td>Sumac (Rhus, sp.)</td>
<td>Fea. 8</td>
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</tr>
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<td>Pondweed (Potamogeton, sp.)</td>
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<td>Chenopodiaceae</td>
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<td>Hickory (Carya)</td>
<td>Fea. 3, 4, 13, 15</td>
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<td></td>
<td>Hazelnut (Corylus)</td>
<td>Fea. 2, 5/9, 6, 7, 8, 12, 13</td>
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<tr>
<td>PITCH PINE (Pinus rigida):</td>
<td>Needles</td>
<td>Fea. 4</td>
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</tr>
<tr>
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<td>Fascicles</td>
<td>Fea. 4</td>
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<tr>
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<td>Cone scale tips</td>
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<td></td>
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*introduced

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Strauss, Alan E.

U.S. Department of Energy
IN MEMORIAM: FREDERICK M. CARTY, 1951-1991

James W. Bradley

With the death of Fred Carty this past summer, the archaeological community in Massachusetts lost an important, if often unrecognized, member. Fred had a lifelong interest in the prehistory of eastern Massachusetts. Joining the M.A.S. in 1964, he quickly became active in the affairs of the Society especially as a member of the South Shore Chapter. Over the next twenty years, Fred remained an active participant in Massachusetts archaeology and made many substantial contributions, especially in the areas of lithic technology and our understanding of early sites (Paleo through Archaic) in the Neponset and other drainages south and west of Boston.

This was the area where Fred grew up and which he knew best. Born in Boston in 1951, Fred was raised in Holbrook and graduated from Holbrook High School in 1969. From 1969 to 1973, he attended Beloit College in Wisconsin receiving a B.A. in anthropology in 1974. Through field schools, Beloit also provided Fred with the opportunity to participate in archaeological fieldwork outside Massachusetts. He excavated at the Cahokia site in East St. Louis (1971), assisted in the salvage of a Late Woodland effigy mound in Wisconsin (1972), and worked on both survey and excavation projects in Costa Rica (1973). Costa Rica also gave Fred his first professional publication (Carty and Lange 1975).

After returning to Massachusetts, Fred continued to pursue his interests in local prehistory. He worked for the Institute for Conservation Archaeology during the late 1970s and was involved in the survey and excavation of several sites in southern New England. In 1979 Fred, along with David Anthony and Linda Towle, joined the State Survey Team of the Massachusetts Historical Commission. Established to assist State Archaeologist Valerie Talmage in verifying and expanding the information contained in MHC's prehistoric site files, the team published an initial methodology (MHC 1980a). With his knowledge of typology and local lithic sources, Fred was an important contributor to the team.

Over the next few years, the Survey Team inventoried several major institutional collections, adding these data to the MHC files. Fred was a member of the team as they completed examination of the collections at the Bronson Museum, Attleboro (MHC 1980b, 1981c); the Peabody Museum at Harvard (MHC 1981a); and the Robert S. Peabody Museum in Andover (MHC 1981b). Even after he left the Survey Team, Fred continued to provide assistance to the State Archaeologist. His preliminary report on the Gills Farm site (Carty 1983b) provided the basis for listing this important Middle Archaic district on the National Register of Historic Places. Among the other important sites Fred brought to the attention of the State Archaeologist was Neponset Wamsutta, the first large Paleo-Indian site recorded in the Neponset drainage (Carty 1984; Carty and Spiess, in preparation).

My best memories of Fred are from those times when we were in the field together. He was a person at home in the natural world, one who
saw the landscape and its resources in a way that few of us do. Particularly vivid is the memory of a visit to the Blue Hill River site, a Late Archaic lithic workshop. The ground was covered with spalls, as well as scarred boulders, of Braintree slate. When I asked Fred what these were, he picked up a large stone hammer and deftly struck off one of the boulders a slab-like spall similar to those on the ground. An ulu preform, he explained, as he started to trim and shape it. We did not take time to finish the object, but there was no question that Fred could have done so and then gone on to use the tool he had made.

This was Fred’s special contribution, a willingness to experiment, along with a desire to understand and use traditional technology in ways that native people did. This approach, he believed, would help us better understand and interpret the archaeological record. In addition to his published work (Carty 1983a), Fred’s knowledge helped to bring other projects to completion (MHC 1984) and continues to challenge and inspire those who knew him.

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