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Editor's Note

With this issue of the Bulletin, we return to a more traditional and eclectic set of articles, ones that range from a site report to experimental archaeology to artifact studies. Shirley Blancke and Art Spiess lead off with a detailed review of the Flagg Swamp Rockshelter in Marlborough. This important multi-component site was excavated in 1980 prior to its destruction during highway construction. Although the site and its contents have been cited frequently in the archaeological literature over the past twenty-five years, no report has been available to the general public. I am grateful to Shirley and Art for their effort to bring the story of this site up to date. Mike Volmar follows with a discussion of dugout canoes in southern New England. In addition to a thoughtful review of the documentary and archaeological evidence, he also reports on the experience of replicating a dugout with traditional technology. For those who have never tried to take down a large tree with a stone axe, then convert it into a useable watercraft, Mike’s article provides a valuable cautionary tale on how ethnohistorical accounts correspond with reality. The final two articles look at unusual projectile point forms found in Massachusetts. Both are based on Bill Taylor’s extensive collections from the Titicut area. In the first, Bill discusses several Adena-related points and what they may signify in terms of the movement of people, ideas and objects. In the second, Jeff Boudreau and I describe two unusual PaleoIndian point forms, ones previously not recognized in Massachusetts. These partially fluted and unfluted points date from the end of the Younger Dryas climatic event 11,600 years ago, and signal the enormous changes that occurred both in the environment and the lives of Native people. As always, my thanks to all the authors for their contributions, to Shirley Blancke and Kathy Fairbanks for proof reading, and to Margaret K. Bradley for assistance with editing and formatting.

Last spring’s issue of the Bulletin carried an unusual feature on the inside back cover - the announcement for a series of artifact plates created by M.A.S. photographer Jeff Boudreau. Over the past year, Jeff has expanded this important series, with a special focus on Bill Taylor’s collections from the Taunton River drainage. The results are stunning – full size, full color images of diagnostic artifacts from several of Massachusetts’ best known sites. A black and white version of the Nemasket River plate is featured on the inside back cover of this issue as a sample. In addition to documenting these important collections, Jeff’s work serves another essential purpose – financial support of the M.A.S. Through his generosity, a significant percentage of all sales goes directly to the Massachusetts Archaeological Society. Now you can celebrate Massachusetts’ rich archaeological heritage and support the M.A.S. at the same time. When you’ve seen these posters, you will not forget them. So, do your part – buy these for yourself or as a gift for a friend, and when you see Jeff, thank him for his exceptional work on behalf of the Society.

James W. Bradley
The Flagg Swamp Rockshelter, Marlborough, MA: A Summary

Shirley Blancke and Arthur E. Spiess

Introduction

It is twenty-five years since the Flagg Swamp Rockshelter in Marlborough, MA, was excavated by the Institute for Conservation Archaeology, the former cultural resource management firm based at Harvard University. Flagg Swamp is considered by archaeologists to be one of the more important archaeological sites in New England on the basis of the degree of preservation of the fauna and flora, but it is largely unknown to the general public. In recent years archaeology’s public profile has been substantially raised through Massachusetts Archaeology Week (now Month) that takes place in October each year and helps showcase many important sites. Among those discovered by cultural resource management firms is the Pine Hawk site on the Assabet River in Acton, MA (Waller and Ritchie 2001), downstream from the Flagg Swamp Rockshelter. As a result of this excavation teachers in the Acton school system decided to include the archaeology of their immediate locality in their curriculum. One teacher had heard of Flagg Swamp and wanted to know where she might find an account of it. Since only a few copies of the unpublished original report exist and these are not readily available to the public, it seemed that a published summary might be useful to make knowledge of the site more accessible.

Blancke’s interest in the Flagg Swamp Rockshelter stemmed from teaching classes over many years at the Concord Museum where Flagg Swamp was contrasted to the Clamshell Bluff site in Concord (Blancke and Downs 1995), and more recently her interest focused on possible ritual implications of the Flagg Swamp bear finds (Bear Ritualism section). In discussing the site with Jim Bradley, editor of the MAS Bulletin, an invitation was extended to create a summary. Subsequently Arthur Spiess, the original mammalogist for the excavation, indicated a desire to develop further his work on the site’s elk remains. This new information is to be found in the Mammals section.

The Flagg Swamp Rockshelter Report

The 220-page Flagg Swamp Rockshelter Report was prepared by Frederick W. Huntington for the Institute of Conservation Archaeology at Harvard University with sections on the flora and fauna written by other specialists, Russell J. Barber, Joanna R. Roche, Leslie C. Shaw, and Arthur E. Spiess (Huntington 1982). The bulk of the report is descriptive with research questions and most of the analysis in the penultimate chapter. In order to get a sense of the report’s parameters from the beginning, Blancke created worksheets on which she could plot the data from the descriptive lists. The methodology employed was to take each section in turn, and where necessary create tables or figures that present important data in summarized or synthesized form. Most of the floral and faunal sections are straight summaries of the authors’ findings with no additional commentary, but there is an occasional new table created from the text, or explanatory information added to existing tables such as common names of species. The mammals summary was edited by Spiess who added his new elk data to it. It was necessary with Huntington’s sections on the features and artifacts to make new commentary, refining some of his conclusions and occasionally raising questions in the process. Authors and contributors to the original report are listed in their respective subsections. Generally details of methodology in the report’s subsections along with the original bibliography have been omitted. Most of the citations provided relate only to newer findings.
General Description. The rockshelter was discovered in 1978 during the course of archaeological surveying in connection with road building, and was excavated in 1980 before its destruction to make Route 85 in Marlborough and Hudson, MA. It faced southeast, providing shelter from the prevailing north winds of a New England winter.

"[It] was a relatively small habitation site occupied during the cold months of the year by small groups of people. The rockshelter... was formed by the differential erosion of portions of a small bedrock ledge that outcropped from the south face of a glacially-deposited ridge. The eroded ledge, which was oriented basically east-west, varied in degree of slope from almost vertical at its eastern edge to approximately 60° at its western limit. The resulting drip line enclosed an area of approximately 15 square meters (the terrace). The natural protective aspect of the rockshelter was enhanced by the construction of a stone wall along the drip line on the western two-thirds of the terrace. The rockshelter was situated 11 m from the northern edge of Flagg Swamp and the terrace of the site was approximately 3 m above the level of the swamp... The talus slope leading from the terrace to the edge of Flagg Swamp also showed considerable variation in slope, with the steepest portion being toward the western edge of the site and coinciding with that section of the terrace which was bounded by the stone wall (Huntington 1982: xv, 1)."

The rockshelter was occupied primarily in the Late Archaic but also through the Woodland periods, a time span determined both by the stratified deposition of diagnostic tools, and radiocarbon dates. The soil on the terrace was alkaline (pH ranging from 7.3 to 7.7), while the slope outside showed greater acidity (pH between 5 and 6) (Huntington 1982: Figure 5.4). This was attributed mainly to carbonates leaching from veins and exfoliated rock in the rockshelter, and it accounted for the excellent preservation of a large quantity of faunal and floral materials that more typically would have disintegrated in the acid New England soils.

Goals of the Excavation. Two seasons of archaeological survey resulted in questions being formulated for testing during the main excavation (data recovery phase). On the basis of the geographical location and size of the rockshelter, it was conceived as a winter camp for a small group functioning as an economic unit for a limited time, perhaps a hunting blind rather than a habitation site. The diversity of the artifacts, particularly stone points, suggested the rockshelter had been used over a long chronological span, so it was of interest to determine if there had been changes in styles of material culture that might imply the arrival of groups of people with different technologies, whether local or from elsewhere. Also testable were possible changes in technology not due to cultural grouping, and possible changes in the environment and subsistence strategies that might be dated relatively through stratigraphy or absolutely through radiocarbon dating. Reasons for the alkaline soil in the rockshelter that preserved the faunal and floral remains were also to be explored (Huntington 1982:147).

Methodology. A grid was established with the back wall of the rockshelter as arbitrary north. After making a contour map, meter square excavation units were dug across the terrace and to some extent down the slope, and a transect was extended to the bottom of the slope (Figure 1, see next page). On the terrace, Twenty-six out of thirty mapped units were excavated, and on the slope twenty-two out of a possible eighty units. Within the naturally occurring layers, arbitrary 5-cm levels (identified alphabetically) were excavated and screened. All observable cultural material was recorded and bagged on site, but because of time constraints, the rest of the material from the screens, labeled by level, was removed to the laboratory and water-screened there. The latter proved to be an important source of small artifacts and faunal and floral materials. Soil samples were collected for several different kinds of tests including determination of pH, flotation, and sediment
Stratum 4, approximately 50 cm in thickness, lay immediately below the top level, stratum 1, which contained Woodland artifacts in its top 15 cm. Stratum 1 averaged between 16 and 20 cm in thickness. Beneath stratum 4 lay stratum 3 and then stratum 2 (Figure 2). Down the slope stratum 1 was at the surface underlain by stratum 3 and then 2. All the strata consisted of silty sand with varying amounts of gravel and exfoliated rock. Stratum 1, at the top, was a dark layer containing roots and organic matter, and stratum 2, at the bottom, was the glacially deposited basal layer with Stratum 3 above it containing more exfoliated rock and gravel. Stratum 4, the main cultural stratum that contained most of the pit features and artifacts, was a grey ashy living floor soil littered throughout with bone (Huntington 1982:8). The stratigraphic composition of the rockshelter was rendered complex by the building of a dry stone wall during the Late Archaic. The existence of the wall affected the rate of deposition of the terrace strata both inside and outside of it that is reflected in the radiocarbon dates. Its base occurred in stratum 4, which did not extend beyond the wall on the south side of the terrace. The existence of Small Stemmed points in the deposit below the base of the wall showed that the rockshelter had been occupied before the wall was built.

The Features. The most visible feature on the terrace was the above-mentioned wall that enclosed two thirds of the western side of the terrace approximately along the drip line, whose purpose would have been to increase the degree of protection afforded by the overhang. It was a
curved wall of dry-laid stacked angular stones and pieces of roof fall that followed the edge of the terrace and bent back to meet the rock face at the western end and the rear of the rockshelter at the east end (Figures 3, 4: Feature AR). The wall encompassed the most protected portion of the terrace, and the amount of occupational debris inside it demonstrated that this was the main area of habitation (Huntington 1982:16). The area it enclosed was 8 square meters out of 12 square meters that were habitable within the drip line (Huntington 1982: 149).

Fifteen pits, described in twenty-nine pages of lists and profile drawings of individual features, comprised the bulk of the features. All were under the rockshelter overhang, thirteen inside the wall and two outside of it. Of those outside, one was close to the wall and the other further out on the terrace. One pit was on the slope. Most pits were bowl-shaped, and were originally fire pits reused for trash. Figure 3 shows the pits’ approximate horizontal positions in relation to the stone wall and the back wall of the rockshelter (top of diagram). Table 1 shows the pits’ floral and faunal contents arranged by stratigraphic level as well as the diagnostic artifacts located in them. It also shows which were radiocarbon dated. A schematic profile of pit depths and how they impacted each other is found in Figure 5.

A result of developing Table 1 and Figure 5 (see next page) was a refinement of Huntington’s conclusions. The clusters on the right of Table 1 represent my groupings of the pits into time periods that differ somewhat from Huntington. Huntington identified only two pits as Woodland, pits BN and AD, because they both started in the top 15 cm of stratum 1 that contained Woodland artifacts (cluster 1). All the rest he identified as Late Archaic. His two Woodland pits (BN and AD) were both located near the back wall of the shelter, one inside and one outside the wall (Figure 3). These pits intruded into the Late Archaic stratum 4 and pit AD also impacted two Late Archaic pits, BB and BE (Figure 5; Huntington 1982: 15, 16). The nineteen sherds occurring in pit AD were undoubtedly the source of the one or two sherds found in pits BB and BE (Table 1, Figure 5). Cluster 1A represents my argument that two more pits belonged to the Woodland period, since pits AE and AN also start in stratum 1 but
Table 1. Flagg Swamp pit features in approximate stratigraphical order showing floral and faunal contents and diagnostic artifacts.

<table>
<thead>
<tr>
<th>Strata</th>
<th>Flora: Nuts, Seeds*</th>
<th>Fauna**</th>
<th>Diagnostic Artifacts</th>
<th>C14</th>
<th>Cluster++</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>h z a n c s D E/C B/M X/N A T F S U</td>
<td></td>
<td>sherd s point+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,4</td>
<td>BN</td>
<td></td>
<td>SS</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1,4</td>
<td>AD</td>
<td></td>
<td>Mdw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,4</td>
<td>AE</td>
<td></td>
<td>Susq</td>
<td></td>
<td>1A</td>
</tr>
<tr>
<td>1,4</td>
<td>AN</td>
<td></td>
<td>SSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BB</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>BE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AP</td>
<td></td>
<td>SS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AF</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>BG</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AZ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>AV</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Flora: h= hickory, z= hazel, a= acorn, n= unidentified nut, c= chenopodium, s= other seeds

** Fauna: D= deer, E/C= elk or cervidæ, B/M= beaver or muskrat, X/N= fox or canidæ, A=bird, T= turtle, F= fish, S= shell, U= unidentified fauna.

+ Diagnostic points: Mdw= Meadowood, Susq= Susquehanna Broad, SS= Small Stemmed I, SS= Small Stemmed.

++ Clusters: 1, 1A= Woodland/Late Archaic mix; 2= Late Archaic, stratum 4; 3= Late Archaic, stratum 3.

at the bottom of it (Figure 5), and because the distribution of seeds points to it. Chenopodium and other seeds were found only in four pits, AD, AE, AN, and BB (Table 1). The first three of those pits were located in both strata 1 and 4, indicating Woodland pits impacting the Late Archaic, and the Late Archaic pit BB was impacted by AD (Figure 5). The implication is that the seeds really only belonged to stratum 1, the Woodland layer, and contaminated pit BB. The only floral remains in the Late Archaic pits were nuts (Table 1: cluster 2).

The presence of three Late Archaic projectile points (Susquehanna Broad, Small Stemmed I, and Small Stemmed) in Woodland pits AE, AN, and BN, respectively, is attributable to the pits intruding into the Late Archaic stratum 4. By contrast, Woodland pit AD contained an Early Woodland period Meadowood point. Two stratum 3 pits, AV and AY, were shallow bowls at the west end of the terrace under the rock wall and therefore predated it (Table 1: cluster 3). Feature BK, a collection of large cervid bones including elk found on the slope in stratum 3, was dated by radiocarbon to the Late Archaic (Table 2).

Apart from the distribution of seeds, sherds, and diagnostic points, the contents of the pits were very similar for both the Late Archaic and Woodland periods. Hickory and hazel nuts were in abundance in both periods, as were deer and turtle. Acorns were present but few in number. Other animal remains were scattered throughout, although the elk were only found in the Late Archaic. As for the non-diagnostic artifacts, nine pits contained hammer or retouch flakes, and five had hammerstones. The only other artifacts were an anvil, an abrading stone, and a unifacial cutting tool.

Radiocarbon dating. The data from the C14 analysis indicated that the Flagg Swamp
2. Within the wall, the Late Archaic living floor (stratum 4) and stratum 3 below it had dates ranging from 3500±70 B.P. (Beta 4051) to 3420±70 B.P. (Beta 4055) with a pit feature (BA) providing the earliest date from within the stone wall of 4200±120 B.P. (Beta 4059). The depths at which the dates occurred did not follow a straightforward sequence, but Huntington used them to assess the complex depositional history of the terrace and concluded that rates of deposition varied inside and outside the wall. It seems possible that in addition to differential rates of deposition, the inhabitants may have moved parts of stratum 4 to create space. The earliest date from feature AF of 4750 ±100 B.P. (Beta 4056) was thought to refer to an occupation before the construction of the stone wall.

The Artifacts.

The chronological sequence may be summarized by the relative positions of diagnostic artifacts on the rockshelter terrace (Figure 6, see next page). This figure is derived from information in the text and differs from Huntington's histogram (1982: Figure 1.5). Only

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**Table 2. Radiocarbon dates from rockshelter strata and features.**

<table>
<thead>
<tr>
<th>Terrace: inside the stone wall (Feature AR)</th>
<th>Terrace: outside the stone wall</th>
<th>On the slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Stratum</td>
<td>Depth (cm below surface)</td>
</tr>
<tr>
<td>N1E2</td>
<td>4</td>
<td>45-50</td>
</tr>
<tr>
<td>N0E3</td>
<td>4</td>
<td>55-60</td>
</tr>
<tr>
<td>N0E1</td>
<td>3</td>
<td>60-65</td>
</tr>
<tr>
<td>N1E0, Feature AK</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>N1E1, Feature BA</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*Bear skull excavation unit

---

Figure 5. Schematic profile of the pit features by 5 cm levels (Stratum 1 = Woodland, Stratum 4 = late Archaic).

Rockshelter's Late Archaic occupation lasted throughout the earlier half of the 4th millennium before the present, starting in 4200 B.P. or even as early as 4750 B.P., the latter date coming from deep pit AF outside the stone wall of the main living area. The stratum 1 dates meant to define the Woodland occupation were judged to be modern or contaminated, but a Contact Period date of 230±70 B.P. (Beta 4466) was obtained (Huntington 1982:9). No Contact Period artifacts were found but Huntington suggested members of the Marlborough Praying Town may have visited there. Dates from the terrace, the terrace features, and the slope are summarized in Table 2.

Table 2. Radiocarbon dates from rockshelter strata and features.
artifacts securely identified by depth in strata 1 and 4 have been plotted, which leaves out those in pits and other strata. At the top of stratum 1, from 5 to 15 cm, were three Woodland period types (two Levanna points and a Meadowood cache blade). Below them in stratum 4, eleven Late Archaic Small Stemmed points and Triangles extended from the top of the stratum at 20 cm down to 45 cm, and again from 55 to 70 cm. Only one Atlantic implement blade of the Susquehanna tradition occurred in close context to a Small Stemmed point within the living area defined by the stone wall (at 40 to 45 cm). Another Small Stemmed point occurred at the same depth as the second Atlantic blade (50 to 55 cm), but was in stratum 3 outside the western end of the wall and so had been displaced from the cultural level, stratum 4. A single Brewerton point of the Laurentian tradition occurred at the top of stratum 4 at 20 to 25 cm. These traditions are represented by only a few artifacts on the terrace, but more lay out of context on the slope.

The relationship between the artifact types associated with two out of the three Late Archaic traditions, the Small Stemmed Point and the Susquehanna traditions, raised an important

Table 3. Diagnostic artifacts at Flagg Swamp.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number in Rockshelter*</th>
<th>Stratum 1 (Woodland)</th>
<th>Stratum 4 (Late Archaic)</th>
<th>Feature (I.D.)</th>
<th>Slope**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levanna</td>
<td>2</td>
<td>1 (AD)</td>
<td>1</td>
<td>93</td>
<td></td>
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<tr>
<td>Meadowood</td>
<td>1</td>
<td>1 (AE)</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ceramic sherds</td>
<td>157</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Susquehanna Broad</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Atlantic blades</td>
<td>1</td>
<td>1 (BA)</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Atlantic blades:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>reworked scrapers</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Squibnocket Triangle</td>
<td>3</td>
<td>12</td>
<td>7</td>
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<tr>
<td>Small Stemmed I</td>
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<tr>
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<td>Vosburg-like</td>
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</tr>
</tbody>
</table>

* Includes all excavation units marked "N."

** Includes all excavation units marked "S." These are artifacts outside the rockshelter's cultural strata 1 and 4, most of them on the slope below the rockshelter in stratum 3, but other locations are included.
question for Huntington. It had been suggested that they represented groups occupying different ecological niches or groups occupying the same area in different seasons (Dincauze 1976, 1974). For either of these hypotheses to be supported by the artifacts, these traditions would need to occur separately in the stratigraphic profile. Huntington’s data interpretation indicated that artifacts of the Susquehanna tradition occurred concurrently with the Small Stemmed tradition (1982: Figure 1.5), and he concluded that the former were adopted as a tool form by the latter cultural group (1982:157-8). The distribution in newly-plotted Figure 6, however, shows that only one artifact of the Susquehanna tradition reliably occurred in the same context with a Small Stemmed point. This does not provide a sufficient basis for reaching any conclusion about cultural relationships.

Tables 3 and 4 are summaries of the diagnostic and other artifacts described in thirty-seven pages of text. These tables were created to summarize and compare the stratigraphic positions of the artifacts in strata 1 and 4 on the terrace, and stratum 3 on the slope, to better demonstrate how distinct from one another the Woodland and Late Archaic strata might be. A separation was made between those artifacts found in excavation units marked “N” that comprised the terrace units of the rockshelter where the cultural strata 1 and 4 contained finds in situ, and those in excavation units marked “S” that occurred down the slope from the rockshelter where artifacts lay in stratum 3, out of cultural context. The bulk of the stone artifacts came from the slope, where there were forty-five points, and sixty-five other. One or two artifacts found during the initial survey and in stratum 2 were also included in the latter category. Nondiagnostic types found uniquely on the slope were a notched axe of mylonite, a discoidal biface, cores, denticulate edge tools, and a notched net weight.

Table 3 indicates that the diagnostic stone types fall nicely into the stratigraphic layers where they ought to be, the Woodland types in stratum 1, and the Late Archaic types in stratum 4. A different situation pertains to the ceramic sherds, however. In the report, a bar graph of the sherds indicated that the bulk were in the top 30 cm below the surface, with a few being

Table 4. Nondiagnostic artifacts at Flagg Swamp

<table>
<thead>
<tr>
<th>Type</th>
<th>Number in Rockshelter*</th>
<th>Slope**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stratum 1 (Woodland)</td>
<td>Stratum 4 (Late Archaic) Feature (I.D.)</td>
</tr>
<tr>
<td>Abrading stones:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>grooved tabular</td>
<td>2</td>
<td>1 (AK)</td>
</tr>
<tr>
<td>Axe, notched</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bifaces:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>discoidal quartz pebble</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Bifacial point fragments:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>midsections</td>
<td>2</td>
<td>1 (AK)</td>
</tr>
<tr>
<td>tips</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Cobble hammerstones:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>large</td>
<td>1</td>
<td>2 (BA,AP)</td>
</tr>
<tr>
<td>medium</td>
<td>1</td>
<td>2 (AE,AK)</td>
</tr>
<tr>
<td>small</td>
<td>2</td>
<td>2 (BA,BA)</td>
</tr>
<tr>
<td>Cores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting tools:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bifacial</td>
<td>1</td>
<td>1 (BB)</td>
</tr>
<tr>
<td>unifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denticulate edge tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drills</td>
<td>2</td>
<td>1 (AD)</td>
</tr>
<tr>
<td>Milling stone</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Net weight, notched</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrapers:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bifacial</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>unifacial</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Untyped point fragments:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stemmed bases, tips</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Worked shell:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>freshwater</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>marine</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

* Includes all excavation units marked “N.”
** Includes all excavation units marked “S.” These are artifacts outside the rockshelter’s cultural strata 1 and 4, most of them on the slope below the rockshelter in stratum 3, but other locations are included.
living directly on top of it. The question that remains is to what extent. The following summaries of the time components proceed by taking the stratigraphic divisions of the tables at face value assuming that the degree of disturbance was minimal once the sherds are separated out.

**Woodland Period Artifacts.** The Woodland artifacts found in situ occurred in stratum 1, a 16-20 cm dark brown sandy layer containing roots, organic material and exfoliated rock, which was the top level of the rockshelter terrace. The stone artifacts numbered only eighteen of which two were Levanna points of rhyolite (felsite), two Meadowood points of gray and an unidentified chert, and a triangular Meadowood cache blade of rhyolite. A similar blade of brown chert was recovered during the survey phase (Table 3). Other Woodland stone artifacts were not significantly different from the Late Archaic types (Table 4). The following types were represented: scrapers or cutting tools that consisted of a working edge made on large irregularly shaped or ovate bifaces, or on a block-like flake; bifacially worked quartz pebbles with no defined edges; bifacial point fragments; large and medium-sized cobble hammerstones; and tabular abrading stones. There were also two pieces of worked shell, one a fragment of freshwater bivalve modified into the shape of a fishhook, and the other part of a marine whelk fashioned into a bead. The number of types was not large, and seems to indicate a limited range of activities. Debitage percentages based on a count of 492 were 30% chert, 29% quartz, 22% rhyolite (felsite), and 16% quartzite, with mylonite and argillite showing less than 1% (Huntington 1982: Table 2.4).

Ceramic potsherds numbered 250 altogether - 157 found on the rockshelter terrace, and the rest within a meter. They were tempered with crushed crystalline rock with rims slightly flared and flat or rounded at the lip, and a cord-wrapped paddle was used to fuse the coils of the construction method. Two types of decoration were used: most were cord-marked, 70% marked on the exterior, and 45% on the
interior surfaces, and a small number occurring in the top 15 cm had parallel incised lines on the exterior (Figure 7). Huntington likened them to Vinette I (Huntington 1982:66).

Late Archaic Artifacts. Stratum 4, the cultural level that contained the Late Archaic finds, occurred only on the rockshelter terrace and consisted of 50 cm of gray-brown, fine-grained silty sand with a very large quantity of exfoliated rock and gravel. It lay directly under stratum 1, the Woodland level. Of the forty-three stone artifacts of this component, fourteen were diagnostic types representing the three known traditions of the Late Archaic: Laurentian (Brewerton Eared-Notched points); Small Stemmed (Small Stemmed types II-IV, and Squibnocket Triangles); and Susquehanna (Atlantic implement blades, and Susquehanna Broad points). Three early types, a Vosburg-like point, Brewerton Eared point, and nine Small Stemmed I points occurred only out of context on the slope in strata 3 and 1. Perhaps they were cleared out of the rockshelter by later inhabitants. A distribution map of Small Stemmed points from the slope pointed to groups of Small Stemmed I and II points being stratified both above and below Small Stemmed III and IV, but Huntington did not think this represented a significant chronological distinction (Huntington 1982: Figure 5.3;154). It could have been the result of differential slippage down the slope.

The Laurentian and Susquehanna points were made largely of rhyolite, and the Small Stemmed ones of quartz, but argillite and quartzite were also utilized. One Atlantic point was of black chert and a Small Stemmed IV point was made of mylonite (metaquartz). A single notched axe from the slope was also made of mylonite. Debitage percentages based on a count of 3070 were 70% quartz, 18% chert, under 10% rhyolite (felsite), and 1% quartzite, with argillite, mylonite, and Cambridge slate showing less than 1% (Huntington 1982: Table 2.3).

The range of other types comprising twenty-nine artifacts (three from mixed pits) was slightly greater than for the Woodland, but broadly similar. There were a tabular abrading stone, ovate biface, a bifacial cutting tool, bifacial and unifacial scrapers, large and medium cobble hammerstones, point fragments, and worked freshwater shell. Unique to this layer were two drills, small cobble hammerstones, and marine and freshwater shell worked in a different manner from the Woodland. Two surf clams, a possible quahog shell, and a thick-shelled freshwater shell of the Margaritifera genus showed deliberate modification. One clam was broken along the umbo, a type of break typical of shell hoes or shovels. The other three shells had similar square breaks possibly started by a cut (Huntington 1982: 67-68, 124-5).

The Faunal and Floral Studies

Due to excellent preservation in the rockshelter, the faunal collection was one of the most complete from an inland site in New England. Recovered remains were from a total of thirty-three edible species: twelve mammal, five fish, four bird, four turtle, and eight freshwater bivalve species (Huntington 1982:69). White-tailed deer were predominant, but other species identified with certainty were beaver, black bear, bobcat, domestic dog, gray fox, elk or wapiti, marmot, muskrat, rabbit, raccoon, and skunk. The quantity of deer-family bone compared to fur-bearing animal bone was less in the Woodland period than in the Archaic, suggesting a relatively greater reliance on deer and elk hunting during the Late Archaic. The faunal studies supported and extended the seasonal finding from the mammal analysis that Flagg Swamp Rockshelter represented primarily a cold season camp, occupied from late fall through the winter to early spring. The faunal and floral studies made use of materials from three collection procedures, field excavation, screen residue, and flotation.

Mammals. The general methodological approach for mammals was to identify taxa through measurement of long bones, vertebrae, teeth, and other bones such as the pelvis, scapula, skull fragments, and patellae. In
addition, data was sought on age, gender, relative size, season of death, and number of individuals. These methods have been published in detail in Spiess (1979) and Spiess and Lewis (2001). Inferences were then made with respect to demography, hunting techniques, and the seasonal round in two different time components, the Late Archaic and the Woodland periods. Age and seasonality were determined from analyses of teeth, specifically deer teeth, to identify the time of eruption, wear patterns, and annual growth ring patterns at the time of death in relation to the known season of birth for New England deer. Degree of epiphyseal fusion of long bones also provided age determination.

The mammal assemblage was composed exclusively of Cervidae (white-tailed deer and elk or wapiti) and furbearing animals (Table 5). Mammal remains occurred in twelve Late Archaic features (Table 1) as well as being scattered over the whole extent of the rockshelter and intermittently down the slope (Huntington 1982: Figure 3.2). Only four Woodland features contained mammal bone, and the scatter was confined to the eastern half of the terrace (Huntington 1982: Figure 3.3). A list of positively identified mammals is provided in Table 5. White-tailed deer (*Odocoileus*) were by far the most abundant species, and the identification of elk/wapiti (*Cervus*) was a first in a southern New England archaeological context.

The identification of thirteen bones from the Late Archaic levels and features at Flagg Swamp rockshelter as *Cervus* (wapiti or elk) was done conservatively, since *Cervus* has rarely or never been reported for the fauna of Massachusetts. In the early 19th century, elk (*Cervus canadensis*) were distributed as far east as New York State and the Allegheny mountains of Pennsylvania (Murie 1951). Elk identifications in the

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Common name</th>
<th>Late Archaic</th>
<th>Late Archaic</th>
<th>Woodland</th>
<th>Woodland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervidae:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Odocoileus virginianus</em></td>
<td>white-tailed deer</td>
<td>240</td>
<td>21</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td><em>Cervus canadensis</em></td>
<td>elk, wapiti</td>
<td>11</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>large Cervidae</td>
<td>elk?</td>
<td>9</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cervidae indeterminate</td>
<td></td>
<td>15</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Rodentia:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Castor canadensis</em></td>
<td>beaver</td>
<td>15</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><em>Ondatra zibethicus</em></td>
<td>muskrat</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Marmota</td>
<td>marmot, woodchuck</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>rodent indeterminate</td>
<td></td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Sylvilagus</em></td>
<td>rabbit</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carnivora:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ursus sp.</em></td>
<td>bear</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Ursus americanus</em></td>
<td>black bear</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Procyon lotor</em></td>
<td>raccoon</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Canidae indeterminate</td>
<td>fox/dog/wolf</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Canis sp.</em></td>
<td>dog, wolf</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Canis familiaris</em></td>
<td>domestic dog</td>
<td>6</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>small Canidae</td>
<td>fox/dog</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>fox sp.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Vulpes/Urocyon</em></td>
<td>red or gray fox</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td><em>Urocyon</em></td>
<td>gray fox</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td><em>Lynx sp.</em></td>
<td>bobcat</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><em>Mephitis</em></td>
<td>skunk</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>small carnivore</td>
<td></td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Black bear cranium and mandible from NOE4 4A-C.
northeastern archaeological record are rare, and include Archaic period remains from the Hiscock site near Rochester N.Y. (Laub et al. 1988), and Woodland period material from the Shelburne Pond site in Vermont (Petersen et al. 1985:67). Adult Cervus are significantly larger than adult Odocoileus (deer), marginally larger than Rangifer (caribou), and significantly smaller than Alces (moose). Extensive series of Rangifer and Cervus skeletal measurements are available (Spiess 1979:90-91, 268-9), as are measurements for Odocoileus and Alces (Spiess and Hedden 1983, Spiess and Lewis 2001). Pollen reconstructions of mid-Holocene southern New England as deciduous mixed forest makes it unlikely that caribou would have been in the vicinity. The Flagg Swamp specimens of elk are described in the accompanying Table 6. Massachusetts was evidently marginal habitat for elk, a condition which may be reflected in slightly smaller body size (as shown in the measurements) in the Late Archaic Flagg Swamp sample than in modern comparative specimens.

In comparing bone fragments from the Late Archaic and Woodland components, remains derived from features were excluded because of possible mixing of components in the pits. From the Late Archaic strata 275 identifiable Cervidae and seventy-four furbearer bone fragments were recovered (ratio 3.7:1) compared to thirty-two Cervidae and nineteen furbearer remains for the Woodland (ratio 1.6:1). Even given the small size of the Woodland sample, the ratios proved to be statistically significant, and pointed to an interesting cultural divergence between the two time periods. This difference suggested a stronger reliance on deer hunting in the Late Archaic period although the overall species pattern between the two periods was quite similar. The main difference in furbearer species was that the beaver (Castor) had a higher number of remains in the Late Archaic.

With respect to seasonality, the Late Archaic faunal sample appeared to be a cold season hunting and trapping assemblage representing an occupation from winter through early spring (mainly December through March). The analysis of four Odocoileus teeth and one fetal deer bone pointing to the time of death of the mother made possible the seasonal determination December through March. The presence of marmot bone may have indicated hunting or trapping during the warm season (April or after). No seasonal determination

Table 6. Description of six elk bone identifications from the Flagg Swamp rockshelter, arbitrarily labeled 1-6.

<table>
<thead>
<tr>
<th>Table 6. Description of six elk bone identifications from the Flagg Swamp rockshelter, arbitrarily labeled 1-6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. S3E3 (1G #103) left M₃ exhibiting moderate wear. Too large for Rangifer, too small for Alces.</td>
</tr>
<tr>
<td>2. N1E2 (4C #81) left P₄ just beginning wear. Too large for Rangifer, too small for Alces.</td>
</tr>
<tr>
<td>3. S1E4 (1D), left (?) broken and charred distal astragalus with measurement #152 estimated to be 3.7 or 3.8 cm.</td>
</tr>
<tr>
<td>Comparable measurements from largest Rangifer males are 3.4-3.6 cm., and 4.0-4.2 for adult western Cervus.</td>
</tr>
<tr>
<td>4. S1E2 (9B #58) right astragalus. Measurement #151 is 6.01 cm. Comparable measurements from largest Rangifer are 5.0-5.3 cm., and 6.2-6.7 in modern adult western Cervus canadensis. Moreover, the specimen is definitely not robust enough to be adult Alces, and the bone structure and cortex are rugose enough to indicate an adult Cervid.</td>
</tr>
<tr>
<td>5. NOE3 (4-C #56), a phalange I distal fragment, with distal breadth (meas. 133,136) reconstructed as 2.5 cm. Largest male caribou range from 2.0-2.3 cm. A modern western male Cervus has yielded 2.6 cm. as a comparable measurement.</td>
</tr>
<tr>
<td>6. N1E6 (4D #92), a distal metapodial condyle, with measurement #123 estimated to be 3.32 cm. Largest male caribou measure 2.5-2.7 cm. Modern Cervus from western North America measure 3.3-3.9 cm.</td>
</tr>
</tbody>
</table>
could be made for the Woodland period.

A comparison of Odocoileus bone size with the size of deer taken in modern hunts suggested that in both Late Archaic and Woodland periods larger and more aged individuals (over 4 years of age) were being taken than in modern times. An analysis of cervid body parts showed no dramatic differences in frequencies either between the Late Archaic and Woodland components or within the Late Archaic. All portions of the deer skeleton were represented, pointing to the deer having been returned to the site in hog-dressed form. A lack of teeth suggested the disposal of heads off site. There was extensive breakage of long bones most of it appearing to be bone flaking for access to the marrow cavity. In addition to human processing some breakage may have been due to canid scavenging.

A black bear skull with associated mandible was found in excavation unit NOE4 in levels 4A-C, a Late Archaic stratum, together with a bear phalange (manus or claw). Another bear phalange was located in N1E2. NOE4 is situated immediately outside the eastern end of the wall that enclosed most of the rockshelter (Figure 3). The bear skull comprised an associated cranium and mandible with most of the teeth present. Their wear, and skull bone fusion, indicate that the animal's age was perhaps 5 to 6 years at the time of death (early adult). It was a large and rugose specimen, definitely a black bear, almost certainly a male, but approximating to the female body size of a small grizzly bear. Further, the mandible had been deliberately cut from the cranium as described below:

"The mandible is virtually complete, although both ascending rami have been sheared off with a blow from a straight-edged, sharp implement. The cranium has received more extensive damage. The calvarium has been removed just above the occipital condyles, with the left occipital condyle having been broken in the process. The cut passes anteriorly just above the tympanic bullae and bisects the orbits. The zygomatic bones also have been removed. When the mandible is positioned below the cranium, it is evident that the damage approximated a flat plane removing the top of the skull and upper face. The ascending rami and zygomatics were damaged in the process, thus it can be inferred that the jaw was articulated when the damage was done." (Huntington 1982:84, paraphrased from Spiess notes).

The Late Archaic mammal faunal sample from the Flagg Swamp Rockshelter appears to have been a cold season hunting and trapping assemblage. The Late Archaic occupants were primarily dependent on deer hunting with elk and beaver a secondary resource, and a variety of woodland furbearers were actively trapped. Reviews of elk ethology indicate that elk are more dependent on sedge and grass in winter than on browse, unlike white-tailed deer. Elk also gather into their largest sized bands in winter, so they are likely to have formed bands utilizing any swamp grass/sedge/meadow areas in valley bottoms near Flagg Swamp. The Woodland assemblage was very small and it is possible that elk had been locally exterminated by that time although the small sample size makes that inference uncertain. The only significant difference between the two time components was the greater ratio of Cervidae to furbearers in the Late Archaic possibly indicating a greater dependence on those animals in that period.

Bear Ritualism? The nature of the bear finds at Flagg Swamp Rockshelter are worth considering in light of current studies by David Mather of the University of Minnesota on the archaeology of bear ceremonialism in North America and Scandinavia (Mather 2005), as well as the classic study by A. Irving Hallowell (1926). It seems that sites generally have very few bear bones in relation to other species, and in the Northeast, thirteen sites, most with sparse bear finds, have been listed by Volmar (1996). One of those sites is Flagg Swamp Rockshelter.

One striking pattern in the finds at Flagg Swamp is that many mammal species are
represented, but deer far outnumber the rest (Table 5). The deer remains consist of bones from the body but not the head (thought to have been left at the kill sites), but by contrast, the bear remains comprise less than one individual represented by the skull (cranium and mandible or jaw-bone), and two phalanges (manus and claw). Spiess’s analysis of the skull indicated that the mandible had been cut from the cranium while still articulated, with the facial bones damaged in the process, presumably while the head was still covered with soft tissue. It is possible that the jaw was removed to make it easier to access the brain for eating, but there is another possibility - that it was cut in the process of ritual preparation of the skull. Hallowell (1926) indicated that the bear was widely revered in circumpolar areas as well as in other parts of the world including Northeast America where special emphasis was placed on the skull that often was hung from a tree (it was taboo for bear bones to be gnawed by dogs). Frank Speck described a particularly elaborate bear-skull preparation by the Naskapi. The jaw was separated from the rest of the hung-up skull, decorated with beads and ribbons of sinew to please the spirit of the bear, and kept in a birch-bark container (Speck 1977).

To support an argument of possible ritualism, perhaps some kind of deliberate “burial,” how the bones were situated in the ground is important. In the original report, the position of the bones in the grid was provided, but no further information. The skull and jaw-bone and one phalange were found together in a square just outside the stone wall defining the edge of the presumed living area of the rockshelter (NOE4), in a Late Archaic layer that contained a high concentration of animal bone. The other phalange was found inside the stone wall (within the living area) in a square against the rockshelter’s back wall (N1E2), and was listed as Late Archaic (Huntington 1982: Figure 3.9, Table 3.4). Coming from another source was the suggestive information that the jaw-bone was found placed on top of the cranium and covered with a stone. The following description that relates specifically to the Flagg Swamp excavation occurs in John Hanson Mitchell’s Ceremonial Time (1985):

“One afternoon one of the students struck something hard with her trowel. She began to clear around the object and in a few minutes had exposed the top of a flat stone to the open air. She and another worker gently lifted the stone, and there, carefully placed beneath it, they saw the skull of a large mammal. This was no ordinary find. The lower jawbone of the animal had been removed and had been placed on top of the head in a precise arrangement. Earth had been packed around the head and then the skull, with its detached jaw, was carefully covered with the stone. It was clearly a ritualistic burial of some sort. The students catalogued the position of the skull, then carefully removed it and packed it up for later analysis. Back at the laboratory at Harvard, the consulting mammalogist for the project identified the animal. It turned out to be a black bear.” (Mitchell 1985: 80-81).

Since Ceremonial Time appears to mix fact with fiction, the question arises whether the above description is factual. Mitchell describes this work as “folkloric,” meaning that he fictionalized characters but not the information. He believes he obtained this description from interviewing the excavation’s director, Fred Huntington, although he is not sure of his memory at this point in time, and his notes are not available for checking (J.H. Mitchell, personal communication). Twenty years ago Blancke noticed Mitchell’s information was not in the report and phoned Huntington who told her that it was accurate. At this point, however, he has no memory of these details (Fred Huntington, personal communication).

Interviews of some original crew members who were on the site or in the laboratory indicated that Mitchell’s description of the jaw-bone on top of the cranium was generally believed to be correct (also reported by Volmar 1996). However, not all memories concur twenty-five years down the road, and the only common
thread was that there was something special about the positioning. Amy Gazin-Schwartz who excavated in that area but does not specifically remember unearthing the bones, has the following recollection:

"I don’t remember that the bones were in a pit or other identifiable feature - they seemed to be just lying in the soil matrix... I think now that the interpretation of the deliberate nature of the burial came from the position of the bones, with the mandible right on top of the cranium, and both mandible and cranium ‘upright’... so, the mandible was sitting with the teeth pointing up, and the cranium was sitting with the dome pointing up. We thought, if they had just been tossed in a rubbish pile, they would not have ended up in that position.” (Gazin-Schwartz 2004).

Such a placing of the jaw-bone on top of the cranium would of course lend support to a ritual interpretation, but it may not now be possible to determine without a doubt the reality of this placement.

And what of bear claws or phalanges? Claws and the middle toe were often given as tokens to whoever brought back the carcass, frequently the wife, (Hallowell 1926), but there was no carcass at Flagg Swamp. On the other hand, a widespread belief that bears could survive hibernation by deriving sustenance from sucking their paws (Hallowell 1926) could have caused bear paws or claws to have been used as fetishes to ward off hunger. Among the Naskapi claws were not to be burned in case the bear could not then dig out his den in the fall when it came time to sleep in his bed (Speck 1977). Bears were hunted in winter when their dens could be identified by discoloration of the snow (Hallowell 1926).

My interview with John Mitchell provided another apparent local instance of bear skull ritualism. A bear skull find in Littleton, MA, was reported to him by the late Don Prouty whose land currently belongs to the New England Forestry Foundation. An employee of Prouty’s, now also deceased, was said to have found an intact bear skull surrounded by stones on Prouty’s land. While the uncertainties surrounding these reports leave them in the category of hearsay, the ethnographic materials of Hallowell and Speck lend credence to the possibility of the reality of such an interpretation.

Fish. There were 425 pieces of fish bone consisting of 214 vertebrae, as well as otoliths and scales, but many pieces were too fragmentary to be identified. The preponderance of fish samples from both the Late Archaic and Woodland components were of two anadromous species, with the quantity of tomcod exceeding alewife. There was also a small number of freshwater species, perch, book trout, and eel (Table 7). Both anadromous species were more or less evenly divided between the Late Archaic and Woodland components indicating a similarity of exploitation patterns. Fish remains were found in fourteen excavation units for the Late

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Common name</th>
<th>Vertebrae</th>
<th>Otoliths</th>
<th>Bones</th>
<th>Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microgadus tomcod</td>
<td>tomcod</td>
<td>44*</td>
<td>32*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pomolobus pseudoharingas</td>
<td>alewife</td>
<td>33</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anguilla rostrata</td>
<td>American eel</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Salvelinus fontinalis</td>
<td>brook trout</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Percidae:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Perca flavescens?)</td>
<td>perch (yellow?)</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

* Combined tomcod vertebra/otolith totals were 59 for the Late Archaic, 17 for the Woodland.
Tomcod otoliths are probably overrepresented due to large size.
Archaic component, and eleven for the Woodland. For both periods, the distribution was similar to the mammalian remains, concentrated on the terrace with some found down the slope (Huntington 1982:Table 3.7).

Seasonality of the fish sample was determined by a method that analyzes growth rings on bony and chitinous structures. Most of the data came from vertebrae showing a range predominantly from very late fall to late winter, a finding supported by data from otoliths and scales. A very small sample of vertebrae also indicated summer seasonality (Figure 8; Huntington 1982:Table 3.8). Body size could be inferred from the vertebrae and otoliths, and for tomcod 73% of the sample was judged to be small, while 11% represented a medium size, and 16% were large. A similar size range was obtained for the alewife. This range applied to the Late Archaic sample, but the relatively small size of the Woodland sample may have accounted for the Woodland fish falling in the small category only, rather than imply a change in exploitation patterns. The range in body size of tomcod and alewife for the Late Archaic suggested fishing methods such as nets that did not select for a particular size of prey. The winter seasonality, however, makes ice fishing with hook and line more likely, and the recovery of a fragment of shellfish hook and a small notched sinker supported this interpretation.

The small quantity of perch, brook trout, and eel, suggested that these freshwater species were not a major focus of the rockshelter inhabitants’ fishing activities, but were rather fortuitous. The American eel is a catadromous fish, but the immaturity of the eel vertebrae did not provide evidence of the exploitation of a Spring migration of mature eels to the sea. By contrast, tomcod and alewife enter estuaries and freshwater rivers in late fall to spawn, and tomcod have been found as far as sixty miles inland. The source of these fish for the rockshelter was the Assabet river a half a mile away.

Birds. The total number of bone fragments recovered for avian species from the Late Archaic and Woodland components was 266 of which most were too small to identify. The majority of the identified elements belonged to wild turkey and heath hen, the largest birds in the area. Both were associated with both the Late Archaic and Woodland occupations of the rockshelter (Table 8). The humerus of what was probably a saw-whet owl had been cut, and the Late Archaic inhabitants may have used the bird for its feathers. The screech owl and small sparrow-like bird were probably introduced naturally, and some small fragments may have been introduced in owl pellets.

The bone fragments of turkey and heath hen were very small and characterized by spiral fractures on long bones. These bones were the only remains within the rockshelter. The larger head and chest portions of these birds were not found so were deposited elsewhere. Three of the turkey bones were cut suggesting butchering, but the heath hens were likely consumed without butchering since none showed cuts. Complete use of the edible portions of the birds is apparent. Twenty

Table 8. Avian species at Flagg Swamp.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Common name</th>
<th>Bone elements</th>
<th>Elements with cuts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meleagris gallopavo</td>
<td>wild turkey</td>
<td>41</td>
<td>3</td>
</tr>
<tr>
<td>Tympanus cupido cupido</td>
<td>heath hen</td>
<td>19</td>
<td>-</td>
</tr>
<tr>
<td>Aegolius sp.</td>
<td>saw-whet owl</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(A. acadicus?)</td>
<td>screech owl</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Otus asio</td>
<td>small bird</td>
<td>6</td>
<td>-</td>
</tr>
</tbody>
</table>
percent of the fragments were burned, but this could have occurred after consumption. Since both species lived in the area year round, their presence does not demonstrate seasonality. The excavation units containing bird remains did not overlap for the Late Archaic and Woodland periods. The ten Late Archaic units were situated mainly in the middle portion of the shelter, within the wall and east of it. The Woodland avian remains were on the periphery of the main occupation deposit in six units that contained the wall, or were outside it, or were against the back wall of the shelter (Huntington 1982:Table 3.11).

**Turtles.** The total assemblage of turtle remains from the rockshelter consisted of 1009 pieces of shell, comprising carapace and plastron, and eight bones. Because of extensive charring (44%) and fragmentation, only forty-nine pieces could be identified (Table 9). Turtle remains were found in twelve Late Archaic excavation units, and five Woodland ones, in the same central area as the rest of the fauna. The spotted and painted turtles are aquatic species frequenting fresh water rivers and ponds with muddy bottoms. They hibernate in mud in late October or November, emerging in early spring in late March or April, or even as early as February. Of the terrestrial wood and box turtles, the wood turtle has a similar aquatic dormancy pattern to the aquatic turtles, and even the box turtle may hibernate in mud. It is likely that these turtles were collected from the swamp below the rockshelter that may have had more open water in the past, or have been brought from the nearby Assabet river. Only the aquatic species were certainly identified for the Woodland, but tentative identifications suggest all four species were exploited in both time periods. Aquatic turtles congregate to bask in the sun that probably accounts for their higher incidence because they were more easily collectible. The box turtle may ingest poisonous mushrooms making it toxic to humans. Given the primary emphasis on winter seasonality indicated by other fauna, it is likely the turtles were mostly collected at either end of their active season, in late fall or early spring.

**Molluscs – Gastropods.** The alkaline soils of the rockshelter and careful recovery procedures resulted in a large land snail assemblage estimated at between 8,000 and 10,000 individuals. A sample of 2,000 snails was taken from different excavation units, levels, and preservation environments, to represent the relative abundances of these species in the Late Archaic and Woodland components. There were eleven species, eight small and three large (Anisuspira alternata, Mesodon thyroidus, and Triodopsis albolabris). The Late Archaic and Woodland assemblages were very similar with species that tolerated a wide variety of environments. These species represented a highly selective spectrum difficult to interpret.

### Table 9. Turtle species at Flagg Swamp.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Common Name</th>
<th>Elements (carapace and plastron)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Late Archaic</td>
</tr>
<tr>
<td>Clemmys glutata</td>
<td>spotted turtle</td>
<td>22</td>
</tr>
<tr>
<td>Chrysemys picta</td>
<td>painted turtle</td>
<td>7</td>
</tr>
<tr>
<td>Clemmys insculpta</td>
<td>wood turtle</td>
<td>2</td>
</tr>
<tr>
<td>Terrapene Carolina</td>
<td>box turtle</td>
<td>1</td>
</tr>
<tr>
<td>? Tentatively identified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 10. Freshwater bivalve species at Flagg Swamp.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Late Archaic*</th>
<th>Woodland*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elliption complanatus</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>Anodonta sp.</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Strophitus undulates</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Alasmidonta undulate</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Alasmidonta sp.</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Lampsilis sp.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>unidentifiable Unionidae</td>
<td>22</td>
<td>10</td>
</tr>
</tbody>
</table>

*Measured in valves, except for unidentifiable Unionidae where fragments are used.
but due perhaps to the unique rockshelter habitat where the alkaline soils may have caused them to thrive. They were distributed all over the site where they appear to have lived, and were not brought from elsewhere. A single specimen of the aquatic Amnicola limosa was recovered from the Late Archaic component, and was probably accidentally transported to the site.

Molluscs - Freshwater Bivalves. Generally referred to as clams or mussels, freshwater bivalves were found in small quantities (Table 10). The Late Archaic and Woodland components were similar, though the smaller Woodland sample expectably shows fewer species. These bivalves live in the sand and mud of small rivers or in backwaters. Species diversity indicates they were probably collected from the Assabet river, a source with moderate diversity that was tapped continuously. Since 78% of the shells show some burning, it is likely they were baked in the eastern part of the shelter, the only location where they were found. Their small quantity could hardly have been significant in the diet since they could only have provided one or two meals for a single individual. Part of one robust shell, Margaritifera margaritifera, had been formed into what appeared to be a fishhook although shells are not known from the archaeological literature to have been used in this way.

Molluscs - Marine Bivalves. Only four specimens of marine bivalves occurred at the site, and since most were worked, it is likely they were all used as tools or ornaments. Three in the Late Archaic component were all from under the rock overhang. Two of these specimens were of the large and heavy-shelled surf clam that washes up on beaches (Spisula solidissima). One piece was broken along the umbo, a type of break that was typical of shell hoes or shovels, and the other had a square break that may have been started with a cut. The third was probably a quahog shell (Mercenaria mercenaria) and showed a similar square break along a possible cut. None of these breakage patterns is typical of unmodified, unused shells. The single specimen worked shell from the Woodland component was a portion of a small, cylindrical bead. The piece was too small for certain identification, but was probably made from the shell of a whelk (Busycon sp.).

Floral Remains.

The collection procedures resulted in the recovery of twenty definitively identified types of plants, and two that were tentatively identified. These were nuts and seeds that provided information primarily on seasonality and diet (Table 11, see next page). They represented economic plant species with seasonal ranges that extend from late summer into the fall, and two (dogwood and hawthorn), are available from autumn into the winter months. Only one, bayberry, has berries available throughout summer. The overwhelming indication of fall seasonality undergirded the faunal data that pointed to a cold season occupation. With the exception of bayberry that is usually found in coastal habitats, all of these species belonged to the mixed deciduous-coniferous forests of the area. It could not be determined, therefore, whether they were collected locally (within a 10 km radius of the site), or were transported from other places.

With respect to diet, there was a heavy reliance on nuts, a food source that is easily transported and may be stored for long periods. Charred remains of nuts and seeds occurred plentifully in both Late Archaic and Woodland levels, but particularly in the Late Archaic, which may have been due to the greater depositional time span of that component. Hickory nuts were by far the most abundant, their frequency being ten times that of hazelnuts and acorns, although the thinner shells of the latter may have preserved less well thus skewing the data somewhat. All these nuts may be eaten raw, ground and baked into cakes, or eaten as mash. Acorns, however, need processing to remove bitter-tasting tannin, and may be soaked, boiled, or roasted before grinding. One feature alone contained half the acorn shells from the site, and may have been such a roasting pit. It could as well indicate that
Table 11. Floral economic species at Flagg Swamp.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Common Name</th>
<th>Season of Availability</th>
<th>Environmental Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NUTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carya giabra</td>
<td>Pignut hickory</td>
<td>Oct.-Nov.</td>
<td>Dry or moist woods; well-drained soils</td>
</tr>
<tr>
<td>Carya ovata</td>
<td>Shagbark hickory</td>
<td>Sep.-Nov.</td>
<td>Rich soil; open woods for optimal</td>
</tr>
<tr>
<td>Corylus Americana</td>
<td>American hazelnut</td>
<td>Aug.-late autumn</td>
<td>Edge areas; thickets</td>
</tr>
<tr>
<td>Juglans nigra (?)</td>
<td>Black walnut</td>
<td>Oct.-Nov. or hillsides</td>
<td>Rich, well-drained soil; borders of woods</td>
</tr>
<tr>
<td>Quercus spp.</td>
<td>Oak</td>
<td>Sep.-Nov.</td>
<td>White oak group; rich soil</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Black oak group; rich soil, near streams</td>
</tr>
<tr>
<td><strong>SEEDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cornus spp.</td>
<td>Dogwood</td>
<td>Sep.-winter woods</td>
<td>Fertile, most soils; along streams; open</td>
</tr>
<tr>
<td>Crataegus sp. (?)</td>
<td>Hawthorne</td>
<td>Oct.-winter leaves:</td>
<td>Variable, depending on species</td>
</tr>
<tr>
<td>Myrica sp.</td>
<td>Bayberry</td>
<td>summer, autumn berries:late summer, spring</td>
<td>Sterile soils; usually found on coast, possibly by bogs</td>
</tr>
<tr>
<td>(pennsylvanica?)</td>
<td></td>
<td>September</td>
<td></td>
</tr>
<tr>
<td>Pyrus coronaria</td>
<td>American crab apple</td>
<td></td>
<td>Woods; thickets</td>
</tr>
<tr>
<td>Vitis labrusca</td>
<td>Northern Fox grape</td>
<td>Aug.-Sep.</td>
<td>Thickets; borders of woods</td>
</tr>
<tr>
<td>Vitis riparia</td>
<td>River grape</td>
<td>July-Oct.</td>
<td>Rocky stream banks; borders of woods</td>
</tr>
</tbody>
</table>

Nutshells were used as fuel in winter months as the features were extensively reused as trash pits for fire cleanings (Huntington 1982:141-2). A total of 183.6g of charred nut remains were recovered of which 153.9g were hickory (Huntington 1982:131). Seeds were also recovered, but were less plentiful due probably either to inferior preservation, or if used as food, they may not have survived in any number because they were eaten. In all thirty-six and a half seeds and seventeen smaller fragments were recovered (Huntington 1982:127-143).

Conclusions

Seasonality. It was proposed from the results of the initial surveys and the geographic location that the rockshelter was a winter camp, and because of its small size it was thought likely to have been a location such as a hunting blind for a particular seasonal activity rather than a habitation site. Although many of the faunal resources were available year round, the results of the faunal and floral studies overwhelmingly supported winter seasonal activity from mid-autumn to mid-spring, or November to March. This was true of both time periods, the Late Archaic and the Woodland. Fresh kills were assumed to have caused the winter season of death shown in particular by Cervidae teeth, and bones of anadromous fish, tomcod and alewives, pointed to their cold season inland spawning periods (Figure 8). Although turtles hibernate, they could have been caught at either end of the cold season or gathered from the swamp or other locations during hibernation. Abundant hickory and hazel nuts indicated autumn. A small quantity of freshwater fish and floral remains pointed to summer, but could have been brought to the site in the course of a group's relocation. Circumstantial evidence for a winter occupation was the quantity of bones crushed for marrow
Figure 8. Seasonality determinations in the Woodland and Late Archaic components.

<table>
<thead>
<tr>
<th>WOODLAND</th>
<th>LATE ARCHAIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervid tooth cross-section</td>
<td></td>
</tr>
<tr>
<td>Fish vertebrae (#):</td>
<td>Cervid teeth</td>
</tr>
<tr>
<td>Very late Fall (2)</td>
<td>Eruption pattern</td>
</tr>
<tr>
<td>Early Winter (3)</td>
<td>Wear patterns</td>
</tr>
<tr>
<td>Mid to late Winter (2)</td>
<td>Cross-section</td>
</tr>
<tr>
<td>Fish otolith cross-sections (#)</td>
<td></td>
</tr>
<tr>
<td>Very late Fall (0)</td>
<td></td>
</tr>
<tr>
<td>Early Winter (3)</td>
<td></td>
</tr>
<tr>
<td>Mid to late Winter (1)</td>
<td></td>
</tr>
<tr>
<td>Fish scales (#)</td>
<td>Cervid bones</td>
</tr>
<tr>
<td>Perch (1)</td>
<td>Feotal tibia length</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish vertebrae (#)</td>
<td>Fish vertebrae (#)</td>
</tr>
<tr>
<td>Very late Fall (8)</td>
<td>Very late Fall (1)</td>
</tr>
<tr>
<td>Early Winter (16)</td>
<td>Early Winter (6)</td>
</tr>
<tr>
<td>Mid to late Winter (11)</td>
<td>Mid to late Winter (5)</td>
</tr>
<tr>
<td>Late Spring to early Fall (2)</td>
<td></td>
</tr>
<tr>
<td>Fish otolith cross-sections (#)</td>
<td></td>
</tr>
<tr>
<td>Very late Fall (1)</td>
<td></td>
</tr>
<tr>
<td>Early Winter (6)</td>
<td></td>
</tr>
<tr>
<td>Mid to late Winter (5)</td>
<td></td>
</tr>
</tbody>
</table>

extraction, and the construction of a stone wall to protect a part of the rockshelter within the drip line.

Type of Occupation. The proposition that the rockshelter was merely a hunting blind was not supported by the artifacts. These indicated a habitation site, although projectile points, drills, and scrapers demonstrated an emphasis on hunting and processing. Hammerstones, cores, and antler tine flakers pointed to tool manufacture, a milling stone and cobble anvil to the processing of vegetable foods, and other tools to fishing and woodwork. Fires, trash pits, and charred faunal and floral materials indicated the preparing, consuming, and disposing of food resources on site. The varied food types indicated a diffuse subsistence
strategy that included hunting, fishing, trapping of furbearers, gathering of non-mammalian species, and use of vegetal foods. The small size of the enclosed area (8 square meters) suggested room for only one nuclear family over a winter season. This winter season camp for a small group would tie into the model of a central-based wandering system where small groups gather together during seasonal food abundance, and split apart at other times (Snow 1980).

Environment. That there might have been major changes in the environment over time, or in response to it, was not supported by the results of the excavation. The mammalian and other fauna, and the flora, demonstrated a basic continuity between the Late Archaic and Woodland periods, although there was some difference between the two with respect to elk and large Cervidae remains that occurred only in the Late Archaic. There was also a greater quantity of furbearers in the Late Archaic than in the Woodland period. A stable subsistence pattern was suggested by the fact that there was no statistical difference between the two periods in the proportion of projectile points to other artifacts. The use of the rockshelter declined during the Woodland period. This coincided with greater use of the coast due to coastal stabilization and establishment of soft shell clams after 3000 B.P. Decline in use was not due to environmental degradation.

Cultural Relationships. Huntington's distribution of points belonging to two different Late Archaic traditions, the Small Stemmed Point tradition and the Susquehanna, led him to conclude that it answered a question about the cultural relationship of the two traditions to each other. He found that Susquehanna points were a minority type occurring with Small Stemmed, and considered that they were tool forms adopted by people of the Small Stemmed Point tradition. This represented a technological adaptation or evidence of a trade network rather than the interweaving of two different peoples. A re-plotting of the data by Blancke (Figure 6) led her to the conclusion that the sample was too small to warrant any interpretation other than the chronological relationship of the traditions.

Postscript

The Assabet River, which flows near where the Flagg Swamp Rockshelter was located, provides a highway to the Sudbury and Concord Rivers of the Concord River basin, then on to the Merrimack and the sea. Since the Flagg Swamp Rockshelter report was written twenty years ago, many other sites have been identified and some investigated in the Concord River drainage, which provide a wider context for Flagg Swamp (Hoffman and Edwards 2002). In particular the extensive year round occupations at Cedar Swamp on the headwaters of the Sudbury River (Hoffman 1992; Rhodin 1992), and the summer encampments at the shell midden at Clamshell Bluff in Concord (Blancke and Downs 1995; Rhodin 1995) provide a fuller picture of the kind of subsistence pattern and use of resources indicated by the excavation at Flagg Swamp.

Acknowledgements

Special thanks are due to Fred Huntington for reading this manuscript and making suggestions, and to those members of the original team who were able to give their recollections of the bear finds: Amy Gazin-Schwartz, Eric Johnson, Michael Roberts, Tonya Largy, and Evan Haddingham who also successfully located Fred Huntington's address on the internet. I am also most grateful to John Hanson Mitchell for sharing his memories of writing Ceremonial Time, and additional information about bear ritualism.
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The Dugout Canoe Project

Mike Volmar

Introduction

The Dugout Canoe Project began as an experiment to use traditional Native American technologies. Archaeologists are reliant on just a few ethnohistoric sources that mention how Native Americans made dugout canoes using stone tools and fire. Numerous contemporary examples of dugouts exist, particularly at Plimoth Plantation's Wampanoag Indian Program, made by burning and scraping out logs. However, to the best of our knowledge, no one has attempted to fell a tree using only stone tools and fire. We wanted to see if we could cut down a live tree using these technologies, something that may not have been done in this area for several hundred years.

Documentary Evidence

Dugout canoes are probably the first type of boat ever made. People from all over the world made dugouts. They were widely used in North America before the arrival of Europeans. Dugout canoes were made by Native Americans across North and South America for transportation and to hunt fish with a spear, bow and arrows, or with hooks made from antler or bone. In Eastern North America, dugout canoes were typically made from a single log of chestnut or pine. Carefully controlled fires were used to hollow out these logs. The fires were extinguished at intervals to scrape out the burned wood with a wood, shell or stone tools, giving the canoes a flat bottom with straight sides. Canoes were propelled by either paddling or poling, depending on the nature of the water (Figure 1).

Much of what we know about Native American dugout canoes is based on a few ethnohistoric sources. The first, published in the late 1500s, are a series of woodcuts by Theodor De Bry. De Bry was a publisher of the works of Hans Staden and others. Staden had been shipwrecked during a voyage to Brazil. De Bry's illustrations of Staden's story, and of the New World, had enormous commercial appeal. They remain some of the most important early images of Native Americans. One of the most interesting aspects of De Bry's work for our purposes shows how Natives used fire to burn trees down (Figure 2).

In 1585 John White, an artist and cartographer, accompanied Sir Walter Raleigh on a voyage to...
North America (Feest 1978). White was at Roanoke for about thirteen months before he returned to England. During this period he made a series of watercolors of indigenous people, plants, and animals to provide Europeans with an accurate idea of the inhabitants and environment in the New World. Despite their extraordinary significance, the watercolors were not published until the twentieth century (Hulton and Quinn 1964). In 1590, De Bry made engravings based on White's drawings to illustrate an account of the same journey written by Hariot (Hariot 1590).

Samuel de Champlain (1613) was the first European to observe Natives along the Massachusetts coast making dugouts.

"Those who inhabit it have canoes all made in one piece, very easy to upset...After having taken much trouble and spent a long time in felling the largest and tallest tree that they can find with stone hatchets [my emphasis], they take off the bark and round it all but one side, where they set fires every little way all along the log. Sometimes they take red-hot pebbles, which they also put on it, and when the fire is too fierce they extinguish it with a little water, not entirely, but only enough to prevent the edge of the canoe from being burned. When it is as much hollowed out as they wish, they scrape it all over with stones. The pebbles with which they do the cutting are like our musket flints." (Champlain 1613 in Fowler 1975).

Dutch cartographer Johannes Blaeu (c.1599-1673), an investor in the Dutch colonies in North America, published a series of important images related to New England. Blaeu’s family ran the
largest printing press in Europe in the seventeenth century. After 1638 he became the chief cartographer to the Dutch East India Company. In 1629 his company began work on the first world atlas, publishing 3,000 pages in twelve volumes by the 1660s, the most expensive book in the world at the time. His 1635 illustration in *Nova Belgica et Anglia Nova* showing the southern New England coast depicts both birch bark and dugout canoes (Figure 3). This illustration was copied repeatedly by later illustrators (Salwen 1978). It is interesting to note that the illustrations by De Bry and White of dugout canoes show a different bow and stern design than the illustrations by Johannes Blaeu. This may indicate that there were regional or group differences in dugout canoe styles (see Sturtevant 1981).

An influential written account from Rhode Island provides us with information on Native techniques for making dugout canoes and the amount of time involved. In 1643 Roger Williams reported seeing a Native man:

"goe into the woods with his hatchet, carrying onely a Basket of Corne with him, & stones to strike a fire when he had feld his tree (being a chestnut) he made him a little house or shed of bark of it, he puts fire and follows the burning of it with fire, in the midst in many places: his corne he boyles and hath the Brook by him, and sometimes angles for a fish; but so hee continues burning and hewing until he hath within ten or twelve days (lying there at his worke alone) finished, and (getting hands) launched his boate; with which afterward hee ventures out to fish in the Ocean." (Williams 1643:106-107).

Williams describes *mishoons* or dugout canoes as made of "pine, oak or chestnut". He reports seeing various sizes of canoes, some built to carry just a few people as well as larger crafts that could fit thirty to forty individuals and observed that the Narragansett had at least four different words for canoes: *mishittouwand* — a great canoe, *peewasu* — a small canoe, *pau-

Figure 3. Depictions of birch bark and dugout canoes by Johannes Blaeu.

gautemissaund — an oak canoe, and *kowawwaund* — a pine canoe. Williams also noted that the word to paddle or row was *chemoshchemeck*. He suggests that besides their use for transportation, Native people used canoes with basic sails set on small poles, in naval battles between large groups of warriors in opposing canoe fleets, and for fishing using harpoons and nets (Williams 1643; see also Wood [1634] 1897).

About the same time, William Wood also made a series of observations about Native dugout canoes.

"Their Cannows be made either of Pine trees, which before they were acquainted with English tooles, they burned hollow, scraping them smooth with Clam-shells and Oyster-shells, cutting their outsides with stone-hatchets: These Boates be not above a foot and a halfe, or two feete wide, and twenty foote long. Their other Cannows be made of thinne Birch-rines, close ribbed on the inside with broad thinne hoopes, like the hoopes of a tub." (Wood [1634] 1897:96).

In 1658 the colony of Massachusetts banned the
use of canoes as ferries. On Nantucket there is a tradition concerning a group of young English settlers and an Indian capsizing on their way back to Nantucket from Martha's Vineyard. Everyone drowned except one Eleazer Folger (uncle to Ben Franklin) who was able to climb back in and bail the canoe out and eventually drifted all the way to Chatham, where he was rescued by a couple of Indians (Philbrick 2004). Canoes appear to have persisted in Native communities well into the 19th century in southern New England.

Canoes preserved in the archaeological record are relatively uncommon. Most of the examples found have been discovered in river or lake bottoms. In 2000 Archeologists discovered dozens of prehistoric canoes in Newman's Lake near Gainesville, Florida. The canoes range from 500 to 5,000 years old, with most built between 3,000 and 5,000 years ago. The wooden canoes had remained hidden and preserved at the bottom of the lake for centuries until water levels dropped during a dry spell. The canoes, likely used as fishing boats, were up to 22 feet long. Many had rounded sterns and bows. Tests on six canoes showed they were made of pine. For additional information, see www.nationaltrust.org/primer/list.asp_i=22.

Several dugouts or sites related to their construction, have been reported in southern New England. During the 1960s, extensive charcoal deposits were discovered on Martin's Pond in North Reading, MA, alongside diagnostic artifacts, small stemmed and eared points and a grooved axe (Petzold 1961). This Late Archaic site has been interpreted as the result of dugout canoe manufacture (Fowler 1975). In 1911, workers pumping water from Mountain Pond in Bethel, CT, during a drought discovered a Native American canoe. The vessel, which measured slightly more than 14 feet, was carved from a solid piece of American chestnut. For additional information, see www.mnh.uconn.edu/underwater/Dugout.

Kevitt (1968) reports a dugout canoe discovered in Great Pond in Weymouth, Massachusetts. The dugout canoe was made of eastern White Pine and C-14 dated to 445±100 B.P. (GeochronGX0541). This particular example shows evidence of contact period alterations including metal nails.

In 2001, three dugout canoes were located by recreational divers in a pond in central Massachusetts. A series of underwater dives has taken place to examine the canoes involving collaboration between Native people, state officials, professional divers and underwater archeologists. The dugouts are in good condition; however the bows are buried in lake sediment. In all three cases the Project Mishoon

![Figure 4. Dugout #2. Overall length 4.5m. Courtesy of Dave Robinson for Project Mishoon](image-url)
dugouts have square Sterns (Figure 4). A C-14
date of dugout #2 has yielded a date of 220±40
B.P. (Beta 162754). This information suggests
that dugout design changed during historic
times toward a more European boat design.
These dugouts are another reminder of
Massachusetts' rich Indian heritage. See http://
/projectmishoon.homestead.com.

Based on a systematic survey of surviving
dugouts in the Northeast, Plane (1991) divides
logboats into two loosely defined types:
coastal/river boats and lake boats. Plane argues
that 'while logboats had a source in Native
American culture, they were also integrated into
Euro-American culture [that] persisted beyond
the initial point of contact into the twentieth
century' (Plane 1991:15). She argues that most
surviving 'logboats' like the afore-mentioned
examples probably date to the contact or
historic period and may not be directly
associated with Native Americans.

**Methods**

At the beginning of the project, conventional
wisdom suggested that in Pre-Contact times
Native people would burn and chop trees down
with relative ease. Our project began in the late
Fall of 2000. We tried to cut and burn a white
pine tree (*Pinus strobus*) down for about six
hours and discovered a few facts. First, it was
difficult at best to burn the tree and chop at the
same time. The fire was too hot. Second, even
after 6 hours very little of the tree trunk burned
due to the high amount of moisture in the green
wood.

The moisture content in green wood varies over
the course of the year (growing vs. dormant
season and spring vs. fall) and according to
species. There may be a season when cutting
and burning a tree down might be done more
successfully. Similarly, some tree species might
be drier at specific points in the year. Girdling a

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**Figure 5.** Felling a tree with a stone axe.
tree during or before the growing season would encourage it to dry out and might significantly reduce the energy required to burn it down later in the year. However, this may also ignite a tree when attempting to fell it with fire. There are as yet undocumented reports of Pre­
Contact Native people packing clay around the base of the tree and some distance up the trunk to prevent this from happening (Coombs 2002).

Since we were working with a living tree with a high moisture content, we decided to switch to chopping exclusively to fell the tree. It took us thirty hours to chop the 36" diameter white pine tree down using only stone axes (Figure 5). Once the tree was down we used fire, wood scrapers and some modern tools, including a chain saw and steel adzes, to speed up the canoe production process and decrease expenses. Traditionally, stone adzes and fire would have been used. It took us about ten days to transform the tree trunk into a canoe using modern tools and fire (Figure 6).

Figure 6. Jeff Kalin working on the Fruitlands dugout.

Conclusion

The ethnohistoric literature suggests variability in the methods of dugout manufacture and ultimately the resulting design. Our experiment suggests that Champlain’s account of trees felled using only stone axes is most accurate. Burning and chopping down a live tree seems improbable at best. All accounts consistently describe the use of fire and scraping tools to shape the dugout once it is on the ground. The popularity of the De Bry illustrations may have overly influenced our understanding of dugout manufacturing process.

Evidence of canoe manufacturing has been identified in the archaeological record in Massachusetts (Petzold 1961). The dugout canoe manufacturing site at Fruitlands, and perhaps also at Plimoth Plantation, may be good locations to excavate as a comparative example for archaeological deposits to see the result of the dugout manufacturing process (Figure 7).

Based on this experiment we conclude that the
information provided by many ethnohistoric sources’ written accounts and illustrations is misleading or incomplete at best. Accurate information on how, and how long, it may have taken Native people to make a canoe using stone tools and fire probably varied by time period, location, the intended use (lake vs. ocean travel), wood type, and condition. It is probable that the introduction of metal tools significantly changed the time it took to make a dugout, possibly making it less of a communal activity. Also, it is unclear if green or seasoned trees were used to make dugouts in the 17th century. It is quite possible that both were used in different times and locations, with resulting differences in the manufacturing process.

It is quite probable that Native craftsmen were more knowledgeable about and adept at canoe construction than us. The ethnohistoric literature provides us with only an entry point for understanding Native lifeways. We can augment these sources by conducting experiments using stone tools, fire and other technologies employed by past Native American people. In so doing, we enhance our understanding of the past and our appreciation for traditional Native craftsmanship (Figure 8, see next page).

Acknowledgements

I would like to thank the many individuals and institutions who assisted in this research project and the subsequent exhibit at Fruitlands Museums, including illustrations from the Mashantucket Pequot Museum and Research Center, Plimoth Plantation, the British Museum, the Library of Congress and Cal State Long Beach. Steve Cook, Linda Coombs, Rae Gould, Vic Mastone, Cheryl Stedtler, and Doug Currie all provided helpful information for this article. Fruitlands conducted the dugout canoe project with Jeff Kalin, Primitive Technologies Inc, and with the project videographer Jonathan Williams. Several individuals gave freely of their time, and suffered multiple hand injuries as a result of helping to chop the tree down, including Michael Kempton, Jeff Collins and Craig White.
Figure 8. The Wampanoag Indian Program mishoons on the way to Aquinnah.

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Wood, William
Adena-related Points from the Titicut Area

William B. Taylor

Adena points are diagnostic of the Early Woodland period culture that is well-known for its elaborate mortuary and ceremonial objects. While many Adena-related sites are centered in the Upper Ohio Valley, sites also occur in neighboring states and date between 3000 B.P. to 1200 B.P. (Justice 1995:191-96). However these points are also found on sites further east in New York (Ritchie 1971:12) and New England. Fowler recognized these distinctive points in Massachusetts during the 1960s and termed them ‘Side-Notched #8’ or ‘Beavertail’ points (Hoffman 1991:21). The Massachusetts Historical Commission’s classification system describes Adena-like points as ‘extremely rare’ in eastern Massachusetts with some additional examples reported from the central part of the state (Keith 1965). These points are characterized by an ovate overall shape, clearly defined shoulders and a lobate, usually rounded, stem (MHC 1984:118-19).

Looking back over sixty years of collecting within the Titicut area, I recall finding at least six Adena-related specimens. Most recently, I discovered a fine Adena point while surface-hunting the North field of the Fort Hill Bluff site in North Middleboro (19-PL-163) in June 2003. This point is 4 inches (10.2 cm) in length, 1 11/16 inches (4.3 cm) wide and made of a fine grade of brown quartzite. There is a small fresh break on the tip point, undoubtedly plow damage, and an old break on the left shoulder (Figure 1a).

A second Adena-related point came from an old collection from North Middleboro. It measures 4 1/4 inches (10.5 cm) in length, 1 5/8 inches (4.1 cm) wide and is made of a grayish-brown felsite (Figure 1b). The small Adena point shown in Figure 1c was found at the Kravitz Field Site, located east of Vernon Street in Bridgewater. This site is just north of Titicut along Snow’s Brook and was found in the late 1990s. The material is red and white banded felsite that appears to be Mattapan felsite. It is 2 1/16 inches (5.2 cm) in length and just over 1 inch (3.1 cm) wide.

Two other unusual examples of Adena-related points have also been found in the Titicut area. One is shown in Figure 1d. With its squared off base and prominent shoulders, this point might be considered an Early Woodland period Kramer or Robbins point if it had been found in Ohio (Justice 1995:184-89). This point is made of felsite and measures 3 inches (7.6 cm) in length and just over 1 inch (3.2 cm) wide. It was found on the
It remains unclear exactly what these unusual points represent. A few of them are made from exotic material and may be the result of trade with or migration from the Ohio Valley. However most are made from local material and appear to be copies of the imported forms. Whatever they indicate, these Adena-related points provide important evidence for the movement of either people or ideas during the Early Woodland period.

One additional Adena point has surfaced recently. This large, rather thick specimen was found in Kane’s Field north of the Fort Hill Bluff site (19-PL-163) after spring plowing during the late 1930s (Figure 1f). It is 5 inches (12.7 cm) in length, 1 3/4 inches (4.5 cm) wide and is made of Marblehead felsite. Other excavators have also reported Adena-related points from the Titicut area. For example, Robbins mentions a broken Adena point found during MAS fieldwork at the Titicut Site (19-PL-161) in Bridgewater during the late 1940s (Robbins 1967:39 #12).

It remains unclear exactly what these unusual points represent. A few of them are made from exotic material and may be the result of trade with or migration from the Ohio Valley. However most are made from local material and appear to be copies of the imported forms. Whatever they indicate, these Adena-related points provide important evidence for the movement of either people or ideas during the Early Woodland period.

**Acknowledgement.** I would like to thank Jeff Boudreau for his fine photograph of these important points.

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Unusual PaleoIndian Points from Southeast Massachusetts

James W. Bradley and Jeff Boudreau

During a recent photographic survey of Bill Taylor's extensive collection from Titicut and adjacent areas of Southeast Massachusetts, at least four PaleoIndian points were discovered. A review of other collections from the area turned up two additional examples. Compared to other parts of the state, little PaleoIndian material has been found in Plymouth and Bristol counties. Aside from the Paleo components at Wapanucket (Robbins 1980:272-83), only a few isolated finds have been reported. For this reason, and because these are unusual PaleoIndian forms for Massachusetts, we describe them in detail here.

Although PaleoIndian points are generally recognized by their distinctive flute, not all PaleoIndian points were fluted. On transitional Mid to Late Paleo forms, fluting is highly variable and most Late Paleo forms were not fluted at all. The points described here fall into these two categories.

Holcombe points

The first unusual point is from the Hammond collection (now in the possession of Bill Taylor)

**Figure 1.** Holcombe-related points from the Three Mile drainage: a. the Hammond point, b. the DeCastro point.

and was found along the Three Mile River in Taunton during the early 20th century. This small point is 4.4 cm in length and 1.7 cm wide. Widest just above mid-section, the sides taper to a narrow slightly concave base (Figure 1a). There is no evidence of lateral or basal grinding. In terms of fluting, there is a single short flute on the obverse side while the reverse has a series of small thinning flakes instead of a flute. The material is a heavily weathered light gray felsite with small black phenocrysts and an iron-rich seam that runs diagonally across the point. This material is a visual match with the rhyolite from the Israel River/Mt. Jasper locale in northern New Hampshire.

Two similar points have been documented in other collections from Bristol County. One was also found along the Three Mile River in Taunton and is in the collection of Alan DeCastro. This small, somewhat asymmetrical point is 4.1 cm in length and 2.4 cm wide. It has been heavily reworked, shows no evidence of lateral grinding and is weakly fluted on both sides (Figure b). This point is made from a light green argillite, possibly from a nearby source in Rhode Island. A third point of this style was found along the Palmer River in Rehoboth several years ago by Jay Crandall. This point has the same basic form as the previous two. It is widest at mid-section and the sides taper slightly towards a shallow concave base. This too is a small, delicately-made point, only 4.1 cm in length, 2.1 cm wide, and .6 cm thick. The point is made from a 'dark red porphoritic volcanic' of unknown origin.

In the Midwest, these minimally fluted points have been termed Holcombe, after the large assemblage recovered from Holcombe Beach and other related sites (Fitting et al. 1966; DeVisscher et al. 1970). Among the distinguishing attributes of these points are an irregular
lanceolate shape, a straight to slightly concave base, no evidence of projecting ears, only occasional lateral grinding, and most significantly, a basal treatment characterized as often by thinning as by fluting.

In the Northeast, similar points were included in the Reagen site assemblage (Ritchie 1957:63, Plate 15 F, G, and p.69, Plate 18 E, N). While the Hidden Creek site in Connecticut (Jones 1997) may also be related, three sites recently excavated in Maine provide the clearest evidence for the Holcombe tradition in New England. At the Nicholas site, Wilson, Will and Cormier (1995) recovered four examples along with two miniature points and an array of other traditional unifacial tools. Of the four points, two were fluted on one side only; the other two were unfluted (Spiess et al. 1998:217-20). At the nearby Esker site, Will (1998) found a similar unfluted point base associated with a radiocarbon date of 10,090±70 B.P. or 11,603 cal yr B.P. (Spiess et al. 1998:218). A larger assemblage of similar points has been recovered from the Cormier site. Of the twelve points found by Rick Will and his crew, fifty percent are fluted on both sides while the remaining fifty percent are fluted on one side only. A sample of spruce charcoal from the site returned a radiocarbon date of 10,240±90 B.P. or 11,792 cal yr B.P. (Rick Will, personal communication). Based on the information from these sites, the name Cormier/Nicholas points has been proposed for these Holcombe equivalents in northern New England (Arthur Spiess, personal communication).

Agate Basin-related points.

Bill Taylor has at least three examples of unfluted Late Paleo points in his collection. The first was found at the Fort Hill Bluff site (19-PL-163) in 2001. It has a long thin shape with divergent sides that taper towards a thin narrow base (Figure 2a, see next page). The lower half of each side as well as the base is finely finished but not ground. This point is lenticular in section and exhibits very controlled flaking. It is 5.4 cm in length and 3.2 cm in width. It was found in two cross matching pieces. The distal end was not recovered. The material is gray felsite with white phenocrysts, possibly from the Marblehead area.

A similar, though less finished, example comes from the nearby Seaver Farm site (19-PL-162) in Bridgewater (Figure 2b, see next page). This point has the same morphological features as the Fort Hill Bluff specimen. Again, there is no evidence of grinding on the sides. The point was recovered in two cross-matching pieces and is 12 cm in length, 3.8 cm wide and is not as thin as the other two specimens. It is likely that this point was broken in an attempt to thin it at mid-section and never finished. The material is a weathered brown felsite, possibly of Blue Hills origin.

A third point was found at the Titicut site (19-PL-161) in the early 1940s. This piece, like the other two examples, has divergent sides that taper towards a finely finished, narrow base (Figure 2c, see next page). It is also lenticular in section. In this case, both the sides and base have been heavily ground. This point is 5.4 cm in length and 3.2 cm wide. Like the Fort Hill Bluff example, it is also made from a gray felsite with white phenocrysts, possibly from the Marblehead area.

Finely made unfluted points of this style are rare but have been reported from sites across the Northeast. Several examples are included in Ritchie's description of the Reagen site assemblage (Ritchie 1957:63, Plate 15 V and p. 69, Plate 18 J, K and P). In 1964, Funk and Schambach termed these 'Plano' points and described several examples from across New York state including the Hudson Valley (1964). Two additional examples were recently reported from sites on the east side of the Hudson River in Columbia County, New York (Schackne 2005:34-5). Well executed parallel or transverse flaking and lateral grinding are defining characteristics and differentiate these points from the superficially similar Greene Points of the Middle Woodland period. Herb Kraft noted these distinctive points from two sites in the Delaware valley in his report on the Plenge site.
(1973:81-3). At least two likely examples have been reported from Maine (Doyle et al. 1985:23; Spiess 1992). Recently, additional examples have been reported from the Mitis site in southern Quebec (Dumais 2000:96, figure 11, bottom row), the Mazza site in Vermont (John Crock, personal communication) and the Thorne site near Ossipee, New Hampshire (Boisvert 2004). In spite of their broad distribution, these points remain undated in the Northeast. One example that may be related is the large biface fragment from Weirs Beach, New Hampshire and associated with a radiocarbon date of 9,615±225 B.P. or 10,908 cal yr B.P. (Bolian 1980).

Since no single component site with a dated assemblage has been identified in the region, these points remain un-named. While it is tempting to continue Funk and Kraft’s use of the term ‘Plano’ point, this has become a catch-all for all unfluted Late Paleo points. As a result, we prefer to use the more technically specific term Agate Basin-related until there is agreement on an appropriate regional name.

**Conclusion**

To date, these point styles have not been reported in Massachusetts. Neither is included in the MHC typology (MHC 1984) or the revised MAS Handbook (Hoffman 1991). There are good reasons for this. First, these points really are a rare occurrence. Their distinguishing characteristics are subtle and this makes it easy to confuse or misidentify them, especially if damaged. Finally, when executed in felsite, the delicacy, fine flaking and other details so clear in chert are far less obvious. However, now that we know these distinctive points do occur in southern New England, we encourage our colleagues to keep an eye out for additional, well-documented examples.

The transition from the late Pleistocene to the early Holocene, especially the end of the Younger Dryas climatic episode 11,600 years ago, was one of the most dynamic periods of change in the long history of human habitation in New England (Newby et al. 2005). These points are a key class of evidence for understanding how Native people coped with that change.

**Acknowledgements**

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Copies of this and other of Jeff Boudreau’s posters may be ordered through the Robbins Museum or the Society’s web site. See the inside front cover for both addresses.

Most of these artifacts were originally in the William Greene Collection. Mr. Greene lived on Barlow Hill road in Middleboro, Massachusetts. He collected along a two mile stretch of the Nemasket River called "Westotch. "This area extended from the fish ladder on Warehouse Street to Osler Mill Park along Route 44. Sites were located on high ground on both sides of the river.