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Editor’s Note

Welcome to the Spring 2011 issue of the MAS Bulletin! This special issue celebrates the inauguration of Bridgewater State University (formerly Bridgewater State College), which formally took place last September.

Bridgewater State has a long history of association with the Massachusetts Archaeological Society. It has given the Society five of its presidents. Two alumni, Arthur Lord (1962 - 1964) and Darrell Pinckney (1998 - 2000), and three faculty members, Ralph Bates (1971 - 1973), George Horner (1978 - 1981), and myself (1981 - 1984, 1992 - 1996) have served in that office. Four additional Bridgewater alumni/ae currently serve on our Board of Trustees: Adrienne Edwards, Philip Graham, Susan Jacobucci, and Jane Lopes. Over the past twenty years, numerous students have worked as interns at the Robbins Museum, cataloguing collections and helping to set up displays. Another alumnus, Thomas Doyle, obtained from his family members the remarkable ethnographic collection of Native American dolls which graces our front gallery.

Recent cooperation between the University and the Society includes the formulation of a marketing plan for the Museum under the direction of Jodie Kluver of the Political Science Department, and the completion of a project to scan all of the back issues of the Bulletin of the Massachusetts Archaeological Society by the staff of Bridgewater State’s Clement Maxwell Library. These issues are now available on two CD-ROM disks through the Museum store, and are fully searchable .pdf files. We look forward to yet greater cooperation between these two institutions in the future.

All of the articles in this issue are by my current or former students. Each article represents a new direction in archaeological research which holds the potential for productive future investigations.

Susan Jacobucci has developed a number of important skills in archaeological lab work since graduating from Bridgewater State in 2001, including use-wear analysis. This is an important source of information on the actual behaviors of pre-Contact people, because, as she shows, field identification (under conditions of varying light conditions, unwashed artifact edges, and low magnification) can be inaccurate. I recently attended a symposium at the Northeastern Anthropological Association’s annual meeting at which the percentage of flaked stone items which actually were found to have definitive use-wear was only around 39%; an additional 30% fell into the “indeterminate” category. At the Little League site, 73% of the tools examined had definitive use-wear, and 13% were “indeterminate”. As I told Susan when I learned of the other study, “now I don’t feel so bad.”

Katelyn Cummings was a very efficient member of the 2010 field team at the Little League site. Since she was taking the course for graduate credit, I asked her to undertake a research project related to the excavation, and her article is the result. She examines the use of arkose, the most locally available lithic material. This material links the site closely to the Wapanucket site 3 km to the south, where slabs of arkose which could only have been quarried near our site were used to line the burial pits (Robbins 1980:223-229). While it is an inferior material for edge tools, her work shows that it was nevertheless used by the local inhabitants.

Matt Caerulius worked at the Little League site in the summer of 2007, and during the following academic year he took on the project of examining the fire-cracked rock samples collected that year, with the assistance of Dr. Brian Evans at MIT. This should be regarded as a pilot study; while the results are inconclusive, they point towards interesting avenues for future research.

Finally, Jeff Moore, who worked at the Little League site in the summer of 2009, has undertaken a preliminary study of the large Whiting Collection donated to the Robbins Museum in March of that year, as a follow-up to the article published in the Fall 2009 issue of the Bulletin by Jeff Boudreau. This is the beginning of a larger study which will eventually link all of the provenienced artifacts in that collection to environmental locations and help to create a GIS model of human settlement in the area of Plymouth and the adjacent towns.

As usual, I wish to thank our very capable proofreaders, Bill Moody and Kathy Fairbanks, for their close attention to details and their rapid responses to the articles in draft. I wish to note one error in
last Spring’s issue. In the Leonard article, figures 1 and 3 on pages 28 and 35 were inadvertently trans-

posed.

Curtiss Hoffman

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Use-wear Analysis on Artifacts Recovered from the Third Terrace of the Middleborough Little League Site

Susan Jacobucci

Introduction

The Middleborough Little League Site, located in southeastern Massachusetts, is a multi-compo-
nent, pre-colonial archaeological site composed of several dated occupations spanning the Early Ar-
chaic through Middle Woodland periods. The site has been formally excavated by the Bridgewater
State University field school for several seasons under the direction of Dr. Curtiss Hoffman, who first carried out test excavations in 1996. To date, 2,575 edged stone artifacts which were recovered from the third terrace of the site have been sub-
jected to a five-year program of low-power use-
wear analysis (see Jacobucci 2010, 2009, 2008, 2007, 2005). This paper synthesizes the results of this analysis. Identified use-wear embedded on the edges of the Little League Site artifacts illustrates patterns of wear associated with general processed materials, while acknowledging the percentage of accuracy of the identification of tool functions that were assigned in the field. Use-wear analy-

sis has proved helpful in revealing which areas of the site were used primarily for hide-processing, wood-working, butchering or bone tool manufac-
ture activities, and demonstrates that certain lithic materials were favored over others for specific tool functions.

Microwear analysis, as defined by Andrefsky
(1998:5), is an “attempt to determine the functions of stone tools by examining direct evidence in the form of use-wear on the tool surfaces, particularly near the edges.” Lithic microwear use-wear analy-

sis was jump-started in the 1930s by Sergei Se-
menov (Andrefsky 1998:5). His published work, Prehistoric Technology, utilized artifact models, which he fashioned from metal tools, and com-
pared evidence of wear developed on these mod-
els to use-wear present on prehistoric stone tools (Odell 2004: 8). Since that time, other use-wear studies employing experimental archaeology have appeared in print (see Geneste and Maury
1997; Keeley 1980; Knecht 1997a and b; Pagoulatos 1992; Roberts 1980; and Sussman 1985 among oth-
ers). In detecting how people may have employed stone artifacts, the tool owner or user’s behavior comes to light (Sheets et al. 1975: 369).

Do our current day perceptions of tool use bias our interpretations of how tools were utilized in the past? Shanks (2007: 592) gives a nod to archae-
ologists’ “creative process” when it comes to art-
ifact analysis and describes how these processes, which include translation, mediation, and meta-

morphosis, oftentimes transform recovered arti-
facts into something they originally were not. Ar-
chaeologists should heed cautions not to impose their own definitions onto recovered artifacts, in essence making the artifacts their own, as dem-
The lithic artifact classification system in and of itself must also be scrutinized, simply because once an artifact is classified as a “type” its assigned name is oftentimes weighty. The labels we assign to artifacts can cause them to be organized into assemblages “on the basis of perceived relationships” (Sheets et al. 1975: 369). In order to avoid falling into these superficial associations and into the potential these biased relationships possess to cloud an analyzer’s interpretation of artifact use-wear, the stone samples recovered from the Middleborough Little League Site were initially examined without making reference to the excavator’s field artifact classifications. The underlying goal of these analyses was to accurately define past behaviors or practices associated with these tools by determining how the stone edge tools were originally used and what materials these tools were used on.

Low-power microwear analyses carry several advantages over high-power methods. To begin, the equipment necessary to employ a low-power examination, such as hand held lenses and dissecting microscopes, is relatively simple to use (Odell 2004: 147). Low-power microwear techniques also afford the analyst the ability to methodically scan all sections of a sample and to process large collections somewhat swiftly (Odell 2004: 147-148). By utilizing low-power analyses, the accuracy of identifying “wear location and tool motion have been shown to be quite high” (Odell 2004: 148). Even though the ability to identify correctly what materials the samples came in contact with has not been demonstrated with precision, broader material categories have been (Odell 2004: 147). As such, the low-power use-wear study of stone edge artifacts recovered from the Middleborough Little League site only identifies broad use-wear categories, such as “cut” and “scrape”; and general materials, such as animal bone, flesh, hide and wood, that the tools were used to process.

“As much as archaeologists frequently portray stone tools as straightforward indications of unchanging Native American cultural patterns, they deserve closer attention,” writes Silliman (2009: 224) who suggested that several lithic tools and flakes associated with a colonial period house foundation situated on the Eastern Pequot Tribal Nation Reservation probably were not utilized by the occupants of the house, but merely curated. There is no evidence to tie the tools recovered from the Middleborough Little League Site to the actual people who utilized them -- only to the people who disposed of them. Nevertheless, I cannot assume that the people who disposed of them did not use them, since many of the tool types were recovered with lithic flakes, which are oftentimes by-products of tool production and resharpening. Even though these tools can be linked to a handful of known functions as determined by their wear patterns, there is the possibility of other functions, known in pre-colonial times but unknown today, which could have produced similar wear patterns. The evidence the Little League artifacts supply, besides identifying preference for certain lithic materials, is an explanation as to how artifacts were probably utilized prior to being discarded. To date, seventeen features that were recovered from the third terrace of the Little League Site have been radiocarbon dated. Since these features span approximately 6,000 radiocarbon years, use-wear analysis particularly on artifacts recovered from these contexts affords the opportunity to examine aspects of Native American cultural patterns, including practice and choice associated with stone tool use and lithic material selection, and assists in understanding some of the pre-colonial lifeways in southern New England as they changed or remained the same over millennia.

Methods

Before the stone samples that were recovered from the third terrace of the Middleborough Little League Site were made available for analysis, all specimens were washed, measured, weighed, lithic material was identified, and artifact type was determined in the field according to Hoffman's (1991) revised classification of Fowler’s 1963 edition (Personal Correspondence C. Hoffman 2008). The stone edge tool samples were constructed out...
of fifteen lithic materials (see Figure 1). Quartz was overwhelmingly represented and comprised approximately 78% of the total analyzed Little League assemblage, supporting the results of an earlier examination of stone cobbles that were recovered from the site (see Gonsalves 1999). This analysis indicated that quartz cobbles are as prevalent in the immediate vicinity of the Little League Site as they are throughout New England (see Boudreau 1981; Nicholas 1981; Ritchie 1981), perhaps

<table>
<thead>
<tr>
<th>Lithic Material</th>
<th>Material Used on:</th>
<th>Scaping Results</th>
</tr>
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</table>
| White Quartz    | Beef Bone        | Tool Edge: sharp, jagged, not uniform  
|                 |                  | Sides adjacent to edge: rounded        |
|                 |                  | A groove formed on the underside of the tool on some specimens |
| White Quartz    | Suede            | Tool Edge: rounded, pitted, and wider than the edge used to scrape bone  
|                 |                  | Use-wear: Uniformly smooth, consistent, and possessed a waxy/dull luster |
| White Quartz    | Oak and Cedar    | Tool Edge: widest of all, smooth, and crystals appeared crushed  
|                 |                  | Use-wear: predominantly uniform        |
|                 |                  | Sides adjacent to utilized edges: shiny |
| Grey Arkose     | Suede            | Tool Edge: rounded, pitted, rough, and some of the crystals located along the edge were crushed |

<table>
<thead>
<tr>
<th>Cutting Results</th>
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| White Quartz    | Antler           | Tool Edge: narrowest of all edges, consistently jagged and sharp  
|                 |                  | Sides adjacent to edge were slightly rounded |
| Grey Arkose     | Suede            | Tool Edge: jagged, sharp and crystals along the edge were crushed and numerous |

**Figure 1. Identified Lithic Materials**

**Figure 2. Results of Use-Wear Experimentation**
explaining why quartz artifacts figure prominently at many New England Native American sites (Barber 1981: 1). Artifacts constructed out of various hued felsites were next most numerous at the Little League Site, and represented approximately 9% of the analyzed collection. Even though arkose and argillite are the local bedrock, arkose artifacts comprised roughly 6% of the assemblage, while argillite artifacts comprised approximately 3% of the collection. Together, basalt, chalcedony, chert, coalstone, feldspar, granite, granodiorite, hornfels, quartzite, and sugar quartz made up roughly 4% of the remaining lithic types.

Each piece of the Little League collection was next examined for use-wear under low power magnification of 10x-40x. A blind analysis of the samples as mentioned was conducted, without making reference to the excavator’s initial classifications. I next attempted to conclude whether or not use-wear was evident on the 2,575 stone samples. If use-wear was observed, a determination was then made of the sample’s function and, if possible, an identification of the broad material the tool was used to process. The use-wear on the specimen was compared to use-wear featured on replica lithic tools that were created and used in all studies (see Figure 2 for results of the use-wear experimentation), to use-wear associated with bone cutting, wood whittling, deer butchering, and bone scraping activities featured on replica obsidian and chert tools from Barbara Luedtke’s comparative collection (which is housed at the University of Massachusetts, Boston) for the 2010 analysis, and to descriptions of wear on artifacts featured in published sources (Boudreau 2008; Keeley 1980; Odell 2004; Pagoulatos 1992; Ranere 1975; Roberts 1980; Sussman 1985). Keeley 1980; Odell 2004; Pagoulatos 1992; Ranere 1975; Roberts 1980; Sussman 1985).

Results and Analysis

The results of the use-wear analyses on the 2,575 stone specimens that were recovered from the third terrace of the Middleborough Little League site identified four main use-wear categories: “cut,” “scrape,” “spokeshave” or “wedge,” which resulted in twenty-four use-wear and material combination groupings (see Figure 3). All of the use-wear categories correlated with a function except two, “none” and “undetermined.” If use-wear was not observed on a specimen’s edges, it was grouped into the “no use-wear” category, and reclassified as a flake; many of these specimens weredebitage flakes. Samples that were difficult to de-
termine whether or not they exhibited use-wear along their edges were included in the “undetermined” grouping and should be re-examined at a later date under higher magnification. Nevertheless, use-wear was not discounted for these specimens and the assigned artifact type was not reclassified.

The majority of specimens could only be grouped into broad use-wear categories. Even though the observed use-wear on these artifacts is distinctly indicative of a use-wear function such as “cutting” or “scraping” for example, no determination could be made as to the kinds of materials the majority of these samples were used to process. For this study “butchering” was defined as the “processing of fish and larger animals for food” (Odell 2004: 186). Use-wear indicative of “butchering” identified artifacts with sharp and non-uniformly jagged edges.

- Artifacts classified in the “cut-butchering” grouping described samples that had very sharp and jagged edges (see Figure 4).

- Artifacts assigned to the “scrape-butchering” grouping had slightly rounded, but still sharp and not uniformly jagged edges.

- “Cut-butchering” and “scrape-butchering” categories identifies tools that were used to butcher game, especially artifacts with sharp jagged edges that were used to cut through or scrape materials of differing densities such as animal flesh, hide, and bone.

- The “cut or incise/bone” designation corresponded to a sample possessing an edge which exhibited use-wear similar to wear evident on the edge of the fashioned quartz tool that was used to cut deer antler and similar to use-wear evident on the bone cutting tools from Barbara Luedtke’s comparative collection for artifacts examined in 2010. The edges of tools categorized as such were generally narrow, uniformly sharp and jagged, with bifacial edge wear.

- Samples designated in the field as “wedges” were specimens that exhibited “crushing scars” on one end (Hoffman 1991: 40); however, some of these samples possessed “crushing scars” on both ends; while more than a few were grouped into the “undetermined” category. Low-power use-wear analysis has also revealed that some of the artifacts that were identified as “wedges” in the field possessed “scrape” use-wear and were used to process wood.

- The majority of specimens identified as spokeshaves in the field possessed scraping use-wear and for this paper are included in the “scrape” use-wear category. Although it was hypothesized that spokeshaves were used to smooth wood surfaces (Hoffman 1991: 40), some stone specimens identified as such exhibited “butchering” use-wear and were probably used to scrape meat from bone. A few stone specimens possessed evidence of both “cut” and “scrape” use-wear, while others were used to process more than one material. For example, Artifact #3565, which is a clear quartz utilized flake, possesses both “cut” and “scrape” use-wear, and was probably used to process game. Artifact #9114, a quartz knife midsection, possessed “scrape” use-wear and another quartz knife midsection, Artifact #637, exhibited both “cut” and “scrape” use-wear.

These findings corroborate the contentions of ethnographers and ethnoarchaeologists who maintain that “artifact form” does not always correlate with “artifact function” (Andrefsky 1998: 197). This conclusion should not be surprising, since many of the tools we use today have both intended and unintended uses. Screwdrivers, for example, are not only used to tighten and loosen screws, but they are sometimes used as wedges to pry open paint can lids. Low-power use-wear analysis has also verified that some of the Little League tools were not discarded after they were initially damaged, because they exhibited secondary use-wear that sometimes appeared along the tool’s broken edge. For example, Artifact #3138, a white quartz point fragment, possesses “scrape” use-wear and was used to butcher game. This find reveals the resourcefulness of the person who owned and probably crafted the original tool.
Out of 2,575 examined stone edge samples, 1,851 specimens, or approximately 72% of the total assemblage (not inclusive of the “undetermined” category, which represented roughly 13% of the total collection), exhibited varying degrees of use-wear (see Figure 5 for breakdown of major use-wear categories). A relatively high percentage of samples comprised of certain lithic types, such as argillite, arkose, granite, and granodiorite, were placed into the “undetermined” category. For example, roughly 33% of argillite tools and approximately 18% of arkose tools were placed into this category; while roughly 9% of felsites and approximately 10% of quartz artifacts were included in the “undetermined” grouping. Perhaps this find attests to the difficulty of identifying use-wear on materials such as arkose and especially for argillite in the field (Personal Correspondence C. Hoffman 2007; see also Cummings 2011). About 15% of the assemblage did not possess use-wear; however this figure includes specimens that were originally classified as preforms, an artifact type typically not associated with use-wear.

“Scrape” use-wear was the most common tool function in the assemblage, with approximately 42% of the collection possessing this type of use-wear, versus roughly 25% of the collection grouped into all combined “cut” categories. Quartz specimens made up approximately 90% of all the samples associated with all combined “scrape” categories. The majority of quartz specimens possessing use-wear, roughly 70%, had “scrape” use-wear. The “scrape/butchering,” “scrape/butchering & hide,” “scrape/hide,” and “scrape/wood” groupings were almost exclusively comprised of quartz.

“Cut” use-wear was the second most common form of use-wear. Even though quartz specimens analyzed for this study comprised the majority of artifacts exhibiting use-wear, roughly 27% of the artifacts with “cut” use-wear were constructed out of quartz. Preliminary indications of tool function revealed that specimens constructed out of lithic materials other than quartz more often than not were artifacts which possessed cutting functions, such as blades, choppers, flake knives, projectile points, semi-lunar knives, and stemless knives. Interestingly, this preliminary observation held up after the low-power use-wear analysis was completed. Approximately 72% of felsite specimens with detectable use-wear possessed “cut” use-wear, while only roughly 28% of felsite specimens exhibited “scrape” use-wear. Similar results
were evident with argillite, arkose, chert, hornfels, quartzite, and sugar quartz samples. For example, approximately 71% of argillite and arkose samples, 61% of quartzite and 63% of hornfels samples that possessed visible use-wear not inclusive of the “undetermined” category had “cut” use-wear, clearly indicating that these seven lithic types were favored for cutting activities.

“Wedge” was the third major category of use-wear that was identified on the Little League artifacts. Interestingly all artifacts possessing “wedge” use-wear were constructed out of quartz. The physical properties of quartz, such as its hardness and fracture (Pough 1996: 272), perhaps made this material not only a suitable substance to use on hard surfaces over extended periods, but the manner in which this material fractures creates ready-to-use sharp-edged tools (Gramly 1981: 70).

Quartz flakes were popular tools at the Middleborough Little League Site. Quartz flakes exhibiting use-wear represented approximately 44% of all analyzed specimens which possessed use-wear. Roughly 66% of quartz utilized flakes were used to “scrape”. Quartz utilized flakes were used to butcher and process game and for woodworking activities. The majority of quartz utilized flakes were unmodified before use. Many of these tools were most likely expedient tools. Whether these quartz flakes were merely by-products of lithic re-

duction sequences that were then curated for later use or if they were intentionally created on the spot as the need arose is not known.

A small collection of 63 projectile points and point fragments that were recovered from the third terrace of the Little League Site was examined. Approximately 68% of the points and 88% of all point fragments exhibited “cut” use-wear, a type of wear that could be expected to appear along the edges of a projectile due to the artifact penetrating and slicing its way through animal hide, meat and bone. Roughly 13% of the examined projectile points possessed “undetermined” use-wear (see Figure 6). However, approximately 42% of the small stemmed points were categorized into the “undetermined” use-wear category, while the remainder of these point types were utilized to “butcher” game. This finding perhaps supports Boudreau’s (2008: 17) observation regarding small stemmed points: “… many of these [small stemmed points] were not projectile points at all but rather incomplete pieces, rejects or other kinds of tools such as gravers or drills.” Interestingly, approximately 28% of the examined points were used as knives to butcher or process game, with 80% of the Brewerton Side Notched points utilized in this manner. This finding supports the results of other studies which indicate that projectile points had other functions besides use as projectiles (Knecht 1997: 8; Finlayson and Mithen 1997).

The Middleborough Little League use-wear analysis has verified that animal processing and woodworking were two ongoing activities that took place on the third terrace of the site with animal “butchering” activities more evenly distributed across the terrace. Roughly 44% of the analyzed specimens which possessed “cut” or “scrape” use-wear were utilized to slaughter and process game; while, approximately 12% of all artifacts exhibiting use-wear were used to process wood.

Use-wear results, particularly on artifacts associated with radiocarbon dated contexts, provide opportunities to examine facets of Native American cultural history in southern New England regarding stone tool use and lithic material selection that took place over centuries. Upon closer inspection of several dated features -- 126, 99, 69, 50, 27, and 19, which dated to 1315±260 B.P., 2870±270 B.P.,

Figure 6. “Undetermined” Use-wear on a Merrimack Point
A variety of tools fashioned out of an assortment of lithic materials, such as argillite, arkose, felsite, hornfels, and quartz were recovered from Feature 126, which dated to the Middle Woodland period. A biface tip, flake scraper, and utilized flakes were recovered from this feature. Many of these specimens possessed “cut” and “scrape” use-wear and were employed to process game and animal hide.

Feature 99, which dated to the Early Woodland period, contained a steepedge scraper that was used to scrape hide, utilized flakes used to cut and scrape game, and a flake scraper used to process game and hide. Interestingly, this feature also contained charred hazelnut and hickory shell fragments, charred hardwoods, oak and pine (Jacobucci and Largy 2008). This finding reveals probable food and wood fuel preferences and some of the tree types that were growing in the vicinity of the site at this time.

Feature 69, like Feature 99, contained a majority of artifacts that were used to process game. Artifacts such as a clear quartz utilized flake were used to “scrape” bone, and a graver was used to “scrape” game. Even though this feature was contemporaneous to Feature 99, it was stratigraphically deeper than most features; however, like all features, the majority of artifacts were recovered from upper 10 cm of the undisturbed B horizon. These two dated features verify that game processing was going on in two different areas of the site at roughly the same time.

A steepedge scraper and a utilized flake used to scrape wood as well as several other utilized flakes and a flake scraper that were used to scrape and cut game were recovered from Feature 50, which dated to the Transitional Archaic period. The bulk of artifacts contained within this feature were comprised of quartz, while there were two artifacts constructed out of coalstone.

The majority of artifacts recovered from Feature 27, which also dated to the Transitional Archaic period, were comprised of white quartz; however, artifacts constructed out of arkose, argillite, and felsites were also identified. In addition to five steepedge scrapers, other artifact types such as utilized flakes, a biface tip, flake knives and scrapers and a variety of other scraper types such asthumbnail, end, and oval, were represented in this feature. It appears that both game butchering and woodworking were taking place simultaneously at both of these sections of the site.

Feature 19, which dated to the Middle Archaic period, among other artifacts contained a grey arkose flake knife, which possessed “cut” use-wear and was used in “butchering” practices, thus verifying a long history of game processing that took place at the Little League Site.

The low-power use-wear analysis also verified the reliability of field artifact identifications (see Figure 7). Percentages of field identification accuracy over 70% were associated with tools identified as endscrapers, flake knives, spokeshaves, steepedge and thumbnail scrapers. Lower levels of accuracy were associated with artifacts that were identified in the field as knife midsections, scraper bits, wedges, worked pieces, and utilized flakes. Interestingly, some form of use-wear was associated with roughly 81% of artifacts that were identified as utilized flakes, not inclusive of utilized flakes that exhibited “undetermined” use-wear.

Conclusion

The low-power use-wear analysis of 2,575 stone specimens that were recovered from the third terrace of the Middleborough Little League Site detected four main use-wear functions, “cut,” “scrape,” “spokeshave” and “wedge,” as well as broad materials, such as “game” and “wood” the artifacts were used to process. The results of this examination highlight a history of human agency and some of the practices concerning broad tool form and use that took place on this southern New England landscape. Several activities such as game processing and wood-working took place at the site over many millennia, as verified by the more in depth analysis of artifact content from several features. The content of these features perhaps provides a glimpse of cultural memory that stood the test of time, with these memories carry-
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<td>Flake Scaper</td>
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<td>33</td>
<td>11</td>
<td></td>
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<td>9</td>
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<td>11</td>
<td>13</td>
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<td>11</td>
<td>1</td>
<td>40</td>
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<td></td>
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<td></td>
<td></td>
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<td>318</td>
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* Spokeshave use-wear included in “scrape” category.
The Little League use-wear analysis verified that people inhabiting the landscape preferred certain lithic material types for specific activities. Even though quartz dominated the majority of all assigned tool functions in the assemblage, this lithic type was preferred to “scrape” a variety of materials as opposed to “cutting” them, and was favored in woodworking activities. The percentages of argillite, arkose, and felsite specimens identified as having “cut” use-wear were higher in contrast to the number of artifacts constructed out of these materials that were used to “scrape” substances.

A variety of predominately local lithic materials, such as those represented in nearby rock outcrops or stones that were transported to the site in glacial drift were utilized by the people occupying the Little League site landscape. Nevertheless, some non-local materials were identified, such as a brown chert stemless knife and a grey chert Lamoka point. It would be interesting to accurately source some of the exotic lithic types and artifacts constructed out of felsites not glacially deposited at the site (e.g. Attleboro red) to gain a better understanding of “trade and exchange networks, territory sizes and locations, and social differences marked by differential access to certain raw materials” instead of relying on “more casual and impressionistic methods” used to identify lithic material especially since many lithic types “overlap visually” (Luedtke 1993: 56, 58). Barbara Luedtke (1993: 56) suggested that more “systematic methods” of lithic identification be employed. I have started to analyze some of the rarer lithic types and felsites that were recovered from the Little League Site and contained within Luedtke’s lithic comparative collection with X-ray fluorescence technology to source some of the lithic types utilized at the Little League Site. These findings will be reported on in the future.

The opportunistic nature of the people occupying the Little League Site was revealed by the large quantity of expedient tools, such as utilized flakes and flake scrapers and knives, that were examined in this study. These tools were most likely created in the immediate vicinity and discarded after specific uses. Nevertheless, there were also several artifacts that were probably curated for longer periods due to the greater degree of use-wear worn into their edges. Several stone specimens possessed evidence of two functions, such as “cut” and “scrape” use-wear, revealing that the form of an artifact does not always correspond to its use (Andrefsky 1998: 197).

The low-power use-wear analysis also revealed the necessity for this type of examination, as many of the identified use-wear functions differed from the initially assigned field functions that were based on artifact form. Prime examples of this observation were evident on use-wear identified on the collection of projectile points and point fragments that were recovered from the third terrace of the Little League Site. Some of the complete points analyzed in this study, such as a Neville point (#1011) possessed “scrape” use-wear. This analysis revealed that assigned artifact labels can be weighty, but not always accurate especially when they speak to how an artifact was used. The findings from this analysis support Odell’s observation (1988: 335) that people assume artifacts identified as projectile points, for example, were employed “primarily in a projectile mode,” when in fact the majority of the examined point specimens from the Middleborough Little League collection had wear which was not consistent with use as points. Many of the projectile points exhibited “cut” use-wear, with several of these artifacts being used to butcher game.

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the Middleborough Little League Site. Report submitted to Bridgewater State College, Bridgewater, Massachusetts.


A Lithic Analysis of Arkose at the Middleborough Little League Site

Katelyn Cummings

Introduction

“Chips can tell us just as much about the past as artifacts.” In his article, “Chips” from the 1961 *Bulletin of the Massachusetts Archaeological Society*, Arthur Smith argued that archaeologists could no longer be exclusive towards what they collected at sites. Chips, he believed, could reveal information regarding flaking techniques, or with closer examination, the chip could actually be a crude blade. Since the 1960’s, changes in archaeological excavation have occurred, and chips of all shapes, sizes and appearances are now collected and analyzed in a laboratory.

This article brings into question the exclusivity of archaeological analysis. One may notice that quartz, felsite, and slate produce a large quantity of some of the best artifacts recovered from Native American sites in New England (Lord 1958). Many scholars dedicated time and research to understand how these rocks were formed, their physical and molecular components, and the various forms...
of human manipulation performed on these rocks. Although this research is vital to understanding Native American cultures, it is, unfortunately, exclusive. Little analysis has been dedicated to the stones less commonly used for artifacts. For example, in Alan Strauss’ article, “Lithic Analysis of a Mudstone/Argillite Workshop,” the archaeologist determined the boundaries of the site where there was a decrease in cultural debitage and where arkose rubble became numerous. It is possible that artifacts could have been dismissed because they were made of arkose and are now lost. Although Strauss may have overlooked the importance of sandstone, he suggested that the study “of poor grade raw materials used in prehistoric tool manufacture must continue.” (Strauss 1976)

Although several scholars have noted that some artifacts recovered from sites in the Northeast are made of sandstone, they mention this rarely, and they remain focused on the more popular materials. Therefore, this article will analyze the use of arkose at the Middleborough Little League Site in Middleborough, Massachusetts, on the banks of the Nemasket River. The analysis will discuss which artifacts were commonly made of arkose, which were rarely made of arkose, and why. This is done in hopes of gaining a greater understanding of the use of this poor grade raw material in prehistoric tool manufacture.

Hypothesis

Based on the statistics presented in Figure 1, the highest percentages of arkose artifacts are tools such as knives, choppers, and scrapers. It can be determined that Native Americans frequently used arkose to compose tools used for cutting, chopping and scraping due to the high percentage of arkose artifacts as well as the stone’s physical properties. Arkose, sedimentary sandstone, is medium-grained and is composed of feldspar and quartz. This composition causes arkose to have an “angular fragmentary nature” which does not produce the fine chipping seen in igneous rocks such as quartz. Greywacke, a sandstone relative of arkose, is also described as having sharply angular grains (Bishop 1974). Medium to large grained stones were often used as crude tools rather than as finely crafted artifacts because flaking of large grained stones causes the fracture to go between grains rather than across, thus the stone will break (Lord 1958). Due to its nature, arkose was therefore used to create larger, sharper instruments such as scrapers, choppers and anvils. It is also due to these physical properties that arkose was rarely used for projectile points, flake scrapers, flake knives, and utilized flakes because arkose does not have the conchoidal fracture qualities of quartz or felsite. Without the quality of conchoidal fracture it becomes difficult to control how the stone will flake.

The experimentation of William S. Fowler demonstrated that larger-grained stones are better used for smoothing surfaces, similar to today’s sandpaper, thus supporting the concept of arkose used for abraders and scrapers (Fowler 1975). Anvils also composed a high percentage of arkose artifacts, which is possibly due to the rough nature of arkose. Charles McGimsey (1963) proposed two basic techniques of stone working which relied on the use of an anvil. By striking the desired stone on the anvil, the rough surface of the arkose helped the stone worker to achieve the desired flaking.

Methods

Professor Hoffman compiled a list of all the arkose artifacts collected at the Middleborough Little League Site from both the first and third terrace. It was first determined how many of the specific arkose artifacts there were. Because some artifact types were so numerous, Professor Hoffman suggested the aggregation of artifact types. In Figure 1, “Other knives” includes biface tips, knife midsections, semilunar knives, stem knives and stemless knives. “Percussive tools” includes hammerstones, mortars, nutting stones, pecked pebbles, pestles, and pounding stones. “Other chipped stone tools” includes endscrapers, Neville Variant Points, oval scrapers, and spoke shaves. “Tools in process” includes ground flakes, cores and preforms. “Other stone tools” includes abraders, celts, digging tools, and ground stone fragments.

Following the aggregation of artifact types, the arkose artifact types were divided by the total number of artifact types to produce the percentage of stone tools composed of arkose. Calculations were
conducted in order to determine the average sizes of each type of artifact, including its length, width, thickness and weight. The standard deviation was calculated in order to determine the precision of the measurement. Because the measurements vary so greatly, the standard deviation is relatively high among several artifact types. This demonstrates the immense variety of artifact types, but it suggests that new methods of identification may be necessary.

A study was conducted using *A Handbook of Indian Artifacts from Southern New England* to gain an understanding of the various artifact types, including structure, use, and age. Other research included an examination of arkose properties and in-depth reading of articles in the *Bulletin of the Massachusetts Archaeological Society* to understand the local findings in Southeastern Massachusetts archaeology.

**Results**

Arkose tools only make up 8.3% of all the artifacts found at the Middleborough Little League Site thus far. Although this percentage is small, several of the arkose artifact types make up a large percentage. For example, arkose choppers make up 64.4% of all choppers found at the site. Arkose anvils make up 52.6%. The following tool types: “other knives”, “other stone tools”, and “other chipped stone tools” make up the remaining top five types of arkose artifacts (see Figure 2).

The choppers are on average $113.39 \pm 54.5$ mm long, $80.67 \pm 33.2$ mm wide, $22.87 \pm 14.1$ mm thick, and weigh $391.93 \pm 84.9$ g. These averages suggest the choppers were just about the size to fit in a person’s hand. The anvils, on average $834 \pm 3821.2$ mm long, $131.52 \pm 52.2$ mm wide and $46.42 \pm 48.8$ mm thick, are relatively long and thin, which suggests they could have been used as either lap or block anvils.

Contrary to the hypothesis, the sizes of the “other knives”, 23% of which are arkose, are relatively small. The stem and stemless knives are on average $53.38 \pm 19.22$ mm long, $40.81 \pm 14.51$ mm wide, and $11.45 \pm 4.89$ thick; and $53.03 \pm 16.28$ mm long, $40.13 \pm 11.84$ mm wide, $9.48 \pm 4.72$ mm thick, respectively. This raises the question as to whether these forms of knives were intended to be created with arkose or if they were merely utilized because they had been flaked off from another arkose tool. The components of “other stone tools”, 22% of which are arkose, ranged in size, but they are most relatable to the size of the choppers and knives – possibly used in the hand or hafted. Abraders on average are $42.65 \pm 14.7$ mm long, $34.40 \pm 8.8$ mm wide, $9.10 \pm 2.2$ mm thick, and the one celt is $81.5$ mm long, $44.5$ mm wide, and $24$ mm thick. The average size of the arkose utilized flake, which is a mere 3.0% of all utilized flakes, is very similar to the size of the abrader. Furthermore, the nutting stones and hammerstones, which are part of “percussive tools”, 3.6% of which are made with arkose, relate to the sizes of the celts and ground stone tools respectively.

Thus it may be determined that Native Americans did have the ability to manipulate arkose into smaller sizes, regardless of its flaking abilities. This raises the question: if the size of the material being manipulated doesn’t matter, then why are some small tools made with arkose and others not? It may be determined that the arkose tools were casually used due to convenience rather than purposeful manipulation. Further research must be conducted regarding this matter, preferably an analysis to determine what types of flaking, if any at all, were involved to produce these instruments.

Where the size of arkose artifacts does not affect the prevalence of artifacts, one may suggest that Native Americans used arkose for its sharp and fragmentary nature for certain artifacts and held a preference for other materials for other artifacts, as suggested by Charles F. Walcott (1954; also see Jacobucci this volume). Walcott (1954) suggested that there is a pattern of stone use in which there is a tendency to use felsite when available, but other stones such as quartz or shale in increasing degree when available. Therefore, a possible reason Native Americans turned to arkose is due to its local availability and the fact that it is easy to quarry (Loomis 1948).

**Discussion**

The previous comparisons were necessary in order
to demonstrate that the size of arkose artifacts is not a reason as to why some forms were preferred, as was previously believed. Further discussions will include a more in depth look at the properties of arkose, the various common and uncommon types of arkose artifacts and suggestions as to why arkose was or was not preferred.

Properties of Arkose

In order to understand why certain materials were chosen to create artifacts, it is first important to understand the origin of the rocks themselves. Igneous rocks, like felsite, are cooled molten rock. When the molten rock is pushed upwards out of the earth, it cools quickly, resulting in small grained dense rocks. Arkose is a sedimentary rock which forms from particles of older rocks that have been exposed to weathering such as water and wind and broken down. It is also categorized as clastic. Eventually these particles gather in a lake or valley and become cemented together to form horizontal layers. The combination of the thick masses of sedimentary deposits and pressure causes the sedimentary bed to form. It is possible that arkose was more prevalent at Little League site because of the ancient course of the Nemasket River. At one point, the river flowed up to the third terrace and then it was gradually reduced to the second and the first. The river therefore, could have been a gathering place for the sedimentary rocks to form causing a large sandstone deposit. The sole arkose outcrop in the Nemasket valley is located within 500 m to the southwest of the Little League site (Hartshorn 1960) (see Figure 3).

Lord (1958) suggests the sandstone materials were of little use in creating artifacts because they could not be finely chipped like quartz and felsite. “The sandstones are sometimes used as crude tools but the clastic group is of little use in general.” (Lord 1958) He believed that only the finer grained materials were used to create the smaller, finer tools. Although this seems logical, the results from the Middleborough Little League Site show a smaller range of sizes among the arkose tools, namely the knives and scrapers. Thus, it is necessary to examine the various typologies in order to determine if there is reasoning for an arkose preference.

Choppers

The chopper is related to the oval scraper; both are irregularly shaped and vary in size. They are characterized by the sharp or rough edge suitable for scraping. As Fowler suggests, the oval scrapers are generally smaller than the chopper (see Figure 4). This relates well to the results gathered from the Little League Site. He writes that the stone composition is not durable enough to be used for chopping or cutting anything, although use wear may appear on a few edges; this is because the oval scrapers are commonly made from sandstone. This assumption relies on the idea that the choppers were employed for cutting hard materials such as wood; however, they could have been used for cutting meat or bone, or for digging. Fowler (1962) conducted a hafting experiment in which he attached scrapers to a haft. He seemed convinced that the cultural use of a scraper included hair removal on hides because it was similar to what the Sioux used them for. Although it is possible, cultural uses cannot be authenticated without proper knowledge.

Regardless of the exact use of scrapers, using them on the softer materials might not have resulted in marks of use-wear. This description suits Lord’s argument that sandstone materials were used for larger rough instruments because of their sharp and nondurable nature. The fact that the arkose choppers comprised 64.4% of all choppers demonstrates that there was a strong preference for arkose over other materials. In contrast to Lord’s argument, the chopper is classified as a formal tool in which there is a “greater degree of patterning” that denotes conscious planning. Chipped stone tools are created through percussion flaking and the concept of conchoidal fracture (Hoffman 2009). Although arkose does not possess this quality, Native Americans harnessed a way to flake arkose into a useful chopping tool.

Anvils

Arkose anvils make up 52.6% of all anvils at the site (see Figure 6). Due to the high percentage, it can be presumed that Native Americans maintained a preference for arkose anvils. Anvils are characterized by one or more flat surfaces with little evidence of human alteration. The smaller sizes are described as lap anvils, which aided Native Americans in creating stone tools or for pounding foods like nuts or seeds (Hoffman 2009).
According to a study in stone working conducted by Charles McGimsey III (1963), the method of using an anvil and a hammerstone, direct percussion, produced the best results for flaking cores. There are two methods of flaking a core: percussion, striking a stone with another stone, and pressure flaking, in which pressure is applied to a thin edge of a stone until a small chip breaks off. McGimsey determined that the anvil and hammerstone was the best technique for removing large flakes to rough out and trim the hard stone. This technique also allows for thinning a thick flake. (McGimsey 1963) Another method, indirect percussion, produced good results. This method required the person to place the hard stone on the anvil and then strike it with a billet. This study makes it apparent that the anvil was incredibly helpful when constructing stone tools.

This raises the question as to why arkose was used as an anvil rather than a hard stone such as quartz. Perhaps the less dense material of the arkose allowed for more controlled fracturing of the core to occur. It is also possible that the softer sandstone may absorb more of the shock resonating from the pounding; whereas a hard stone such as quartz would not absorb it. Further experimentation testing an arkose anvil against another material would need to be conducted in order to confirm this. It also tends to fracture along bedding planes, providing large flat surfaces suitable for use as anvils.

Other Knives
The category of arkose “other knives” makes up 23.1% of all artifacts of this type (see Figure 5). It is evident that the preference for arkose is greatly decreased. The stemless knife makes up a large percentage of “other knives,” it is irregularly chipped with a serrated edge. A common thread between arkose artifacts is that they are irregular in shape, possibly due to the inability to control flaking. Although the stemless knife is smaller than the other types, it was still utilized as a knife. It once again raises the question of whether this was the intended use for the arkose, or if a person just used the arkose stemless knife because it was convenient.

The semi-lunar knife is commonly made with slate, a durable hard stone, however there is a small percentage composed of arkose, about 33%. It is chipped and pecked into shape similar to a winged atl-atl weight (see Figure 7). (Fowler 1974) The use of arkose for a semi-lunar knife defies the previous understandings of arkose and its nondurable fragmental nature. There must be another reason for the use of arkose to create semi-lunar knives that is not yet evident. The semi-lunar knives are categorized as formal tools, therefore there must be some decision making used in deciding to use arkose.

Other Stone Tools
22.5% of “other stone tools” are made with arkose. Most important are abraders and digging tools. 88.8% of abraders are made with arkose, which demonstrates a strong preference at the Little League site. An abrader has rough facets caused by rubbing and grinding the stone (see Figure 8). The facets were created through use rather than through design. Fowler (1962) suggested that abraders were used as wood-working tools similar to today’s sandpaper. Through his experiments, he found that coarse large grained materials, such as arkose, work well for smoothing green wood, whereas finer grained stones work better on dry wood. This was further confirmed in Fowler’s 1975 article which discussed sharpening stones. He concluded that rough grained stones were better at wearing away rough surfaces as opposed to the fine grained stones. It is also possible that abrading stones were used in shaping pottery, to thin and shape the irregular edges of the pot (Hoffman 2009).

As a sharp irregularly shaped tool, it is possible to see why arkose worked so well as a digging tool, 50% of which were made of arkose (see Figure 9). It can be presumed that this is because of arkose’s sharp irregular forms which allowed it to act similar to today’s hoe or shovel. Whether used in the hand or attached to a haft, it is evident the properties of arkose would have produced a fine digging tool.

Other Chipped Stone Tools
Arkose chipped stone tools make up 15.9% of all artifacts, the fifth most common type of arkose tools. The types included in this heading include oval scrapers, spokeshaves, and endscrapers. Although 15.9% does not demonstrate a large preference for arkose, it shows that Native Americans most likely used it when the arkose was more
available and prevalent. 20% of all oval scrapers were made of arkose, the smaller version of the chopper previously discussed. As Fowler stated, the stone composition of arkose is not durable enough, thus there might have been a preference for harder stones in this category rather than arkose.

It is also interesting that spokeshaves are not commonly made of arkose. A spokeshave is described as a filer to remove knots and unwanted bulges but “only when the wood was still green” (Hoffman 2009). This is surprising because it would be assumed that most spokeshaves were composed of arkose based on Fowler’s suggestion (Fowler 1962); however, only 19.3% of spokeshaves were made of arkose (see Figure 11). Further experimentation must be conducted, and larger samples of spokeshaves must be analyzed. Perhaps there are other large grained materials at Little League that were preferentially used for oval scrapers and spokeshaves. There are also fewer end scrapers than would be imagined. End scrapers were supposedly used to remove hair from skins; however they are described to have convex blades. It may be due to the fragmentary nature of arkose that it could not be properly shaped, resulting in only a small number of end scrapers.

Utilized Flakes, Flake Scrapers, Flake Knives

Native Americans rarely used arkose to create utilized flakes, flake scrapers, and flake knives: 3%, 4.1%, and 14% respectively (see Figure 10). The reason lies in the description of a flake scraper: “any flake of hard durable stone, which has one or more edges sharpened by reworking.” (Hoffman 2009) As previously mentioned, arkose is neither hard nor durable, therefore it is obvious why it was not used for a flake scraper. When creating a flake scraper or projectile point, the percussion technique worked well for thinning and flaking off thick flakes; however, once these flakes have been produced, they are often subjected to pressure flaking to neaten the edges and refine the form. (McGimsey 1963) Arkose will flake in between the grains because it is sandstone, but felsite or quartz will flake across the grain, producing a fine conchoidal fracture and allowing for refinement. (Lord 1958)

A similar answer explains why arkose flake knives and utilized flakes are rare as well. A utilized flake and flake knife are often retouched with minute serrations. Because arkose is so fragmentary, the minute retouching would be very difficult, therefore these forms of knives and flakes are rarely used with arkose and more so with harder stones such as quartz.

Percussive Tools

3.6% of percussive tools, such as hammerstones, mortars and nutting stones are composed of arkose. Hammerstones are commonly hard durable stones that are spherical or egg-shaped. Once again, arkose is not a heavy and durable stone. Other stones such as quartzdiorite and granodiorite were often used rather than sandstone. 2% of hammerstones were composed of arkose, which demonstrates a strong preference for other materials. Grano- and quartzdiorite are also heavier in specific gravity than sandstone, which would make pounding less effort if one only needs to lift it up and let gravity do the rest. 25% of all nutting stones were made of arkose. Nutting stones are similar to anvils; however, they are slightly smaller and aptly named for pounding nuts. It is possible that fewer nutting stones were made of arkose because it lacks the hardness of other stones, therefore making the nut cracking slightly more difficult.

Tools in Process

Arkose makes up a mere 3.7% of “tools in process”, preforms, cores, and ground flakes. Cores are especially low; only 0.8% of them are made of arkose. This goes back to the use of arkose for flake knives and projectile points. Because of its physical properties, it is not a suitable material for fine pressure flaking. Thus, pressure and percussion flaking techniques would rarely be used on arkose, so arkose cores used for flaking are rare. Furthermore, it is evident that many arkose tools were used as is. They were rarely refined and chipped into a form, but instead the rough edges were caused through use wear rather than by design. It is possible that some arkose tools were pecked or pounded into shape, but they were not refined so greatly as to produce a large number of ground flakes. As for the preforms, it is evident that arkose tools were often used for scraping or cutting, therefore an oval scraper could have come
from a chopper, but could itself be a preform for a spokeshave (Hoffman 2009). Thus, preforms are difficult to identify.

Conclusion

Several conclusions have been made regarding the use of arkose for stone artifacts at the Middleborough Little League Site on the banks of the Neskasket River. Lord (1958) previously believed that sandstone tools were commonly used for larger, sharper instruments. From the Little League data, it appears that size does not determine whether or not arkose will be used, because many of the arkose tools are small in size. It is possible that the choice to use arkose was determined as to whether or not the intended artifact required pressure flaking and minute refinements. Arkose’s physical properties would not sustain the pressure, and the tool would most likely fall apart. This may be why the harder stones such as quartz and felsite are used because they possess the qualities of conchoidal fracture.

Due to the nature of the statistics, it can be determined that many arkose artifacts were commonly used for scraping or cutting in various manners, whether it was used on wood, bone, meat, or soil. These arkose artifacts, characteristically identified by their irregular shapes and sharp edges, suggest that arkose tools were more casually used because they did not require the fine shaping of other tools nor would they withstand it. It is possible there was a preference for arkose for these tools because it was easily quarried and available, and required little alteration. Therefore, the determining factor that suggests when arkose will be used is whether or not the tool in mind requires refinement.

These are the most relevant answers provided for the hypothesis and questions proposed, but a researcher’s work is never finished. New questions have arisen that can only be answered through further research and experimentation. For example, further understanding must be gained regarding the choice of anvils. What occurs when someone uses percussion flaking over a felsite anvil rather than a sandstone anvil? Will this reveal the answer as to why arkose is so commonly used? Furthermore, why are spokeshaves not predominantly made with arkose? Among this research, it would be interesting to determine which materials were most commonly used for each specific tool. Such research would reveal not only the properties of the material, but the decision-making and cultural processes of the people who used them.

In conclusion, it could have been Arthur Smith’s suggestion that began the method of collecting flakes, and now they are an important aspect of archaeological inspection. But now we must consider Alan Strauss’ suggestion to investigate the less prevalent materials used in stone tool manufacture. Regardless of who claims the credit, as the minute tasks and details are examined, researchers can gain new tools and information to interpret the past.

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Loomis, F.B.

Lord, Arthur C.

McGimsey III, Charles R.

Smith, Arthur George.

Strauss, Alan.

Walcott, Charles F.

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Figure 1: Arkose Tool Types at the Little League Site
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<td>9%</td>
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</table>

Figure 2. The Five Most Common Types of Arkose Artifacts

Figure 3. Arkose Quarry near Site

Figure 4. Arkose Chopper

Figure 5. Arkose Knives

Figure 6. Arkose Anvil
Figure 7. Arkose Semi-Lunar Knives

Figure 8. Arkose Abraders

Figure 9. Arkose Digging Tool

Figure 10. Arkose Flake Scraper

Figure 11. Arkose Spokeshave
Fire-Cracked Rock Analysis at the Middleborough Little League Site

Matthew Arthur Caerulius

Introduction

Research done on fire-cracked rock (FCR) samples taken from the Middleborough Little League Site was designed to give further insight into previous human impact at the site. Twenty-seven fire-cracked rock samples were taken from features excavated at the Middleborough Little League Site during the 2008 summer season. In addition, eight control samples were taken from off the site. The analysis of the fire-cracked rock samples was done to find specific evidence of human impact. In this case, the evidence took the form of alteration to the samples that could not be attributed to natural phenomenon. This work was overseen by Dr. Curtiss Hoffman, as part of the ongoing analysis of the Middleborough Little League Site.

Methods

After thin-sectioning, two methods were utilized to try to determine whether the samples had undergone alteration by human influences. The first of these methods had a twofold approach, which first was to observe the number of cracks in each sample to indicate how rapid a degree of thermal shocking was present. If the sample had undergone a rapid heating event, it would be evident from the large number of cracks running throughout the sample. This would increase the likelihood that it was altered by human agency. To illustrate, if one of the samples were heated slowly by a natural phenomenon such as a forest fire, it would result in a smaller number of cracks. On the contrary, if the sample were deliberately thrown into a fire by human agency, it would be heated very rapidly and this would result in a large number of cracks. The second part to this method was to observe “crack healing,” within the samples (DeMartin et al 2004, Siddiqi et al. 1997). Crack healing is the phenomenon where, given enough time and water inundation, the cracks begins to present crystallization that slowly closes the crack. The theory is that it would take a great deal of time for this to happen. Those samples showing greater crack healing, would have been heated at an older relative age and would therefore less likely to have been altered by human interference. At the same time, those samples showing a large presence of cracks, more of which were unhealed, would be of a younger relative age and more likely to have been altered by human interference. This analysis was accomplished by observing the samples under a petrologic microscope, courtesy of Professor Brian Evans of the M.I.T. Earth and Planetary Sciences Department. The samples were observed at 25x and 100x resolutions. Higher resolutions showed no discernable differences from these two lowest resolutions.

After initial observation, the results for this method were inconclusive in determining how the samples were altered. Also, after reviewing information provided by Professor Evans (personal communication 2008) concerning this phenomenon, it appeared that there was no direct connection between crack healing and human alteration. This brought about a series of observations under the parameters of the second method. This method was to observe the samples using a grid of ten micron intervals to determine not only the number of cracks but also their length. Again, a larger number of cracks would be indicative of a rapid heating event, as well as longer cracks. Part of this method was also to try to correlate the crack measurements with the C-14 and typological dates that were associated with some of the samples. If the relative age determined by the observation method matched or was close to the age indicated by the dating, then it would increase the likelihood that it was altered by human intervention. This was done using a light microscope, courtesy of Dr. Michael Krol of the Bridgewater State College Earth Sciences Department.

Observations

As stated before, the first method was to observe the number of cracks and crack healing. The samples were sorted by rock type and then observed under the above parameters. The first rock type
observed was the arkose samples. The arkose control sample had a few major cracks detectable at lower resolution (1 per every 100 microns). At higher resolution, cracks did not go past mineral boundaries. There was no crystallization present.

As shown in Figure 1, five out of the eight samples showed only cracks present and did not show evidence of crystallization. These would have been more likely to have undergone a rapid heating event and were more likely to have been altered via human agency. Two out of the seven that presented cracks showed evidence of crack healing, which, according to the criteria would identify them as the older samples. One did not present any cracks at all, which leaves two possible explanations. The sample could be an older sample, and least likely to be altered by human agency, or it could have been misidentified as a fire-cracked rock in the field.

The next rock type observed was argillite. The control sample had 3 major cracks. Under higher resolution no cracks bypassed mineral boundaries. There was no evidence of crystallization. Only one sample from the site presented evidence of crack healing. The others had cracks that bypassed mineral boundaries, and have to be viewed under the criteria that this was evidence of a rapid heating event and that therefore that they would be younger samples (see Figure 2).

From these observations it was shown that there were an equal number of cracks bypassing mineral boundaries as there were not. The one sample showing evidence of crack healing would have to be an older sample in relative age according to the criteria.

The most frequently represented rock type was granite. There were three granite control samples: one was a normal control sample, another was heated rapidly then allowed to cool slowly, and the third was heated rapidly and then quenched in water for rapid cooling. The unaltered control sample showed no crystallization; however there did not seem to be any cracks bypassing mineral boundaries. Under higher resolution there were some bypassing cracks but they were very few in number. The slow-cooled sample showed no cracks that bypassed mineral boundaries. Under higher resolution, no crystallization was present. The quenched granite sample showed many cracks (12 for every 100 microns). Higher resolution revealed that crystallization was present within these cracks (see Figure 3).

Of the on-site granite samples observed, four were younger and were more likely to have been altered by human intervention. Five showed evidence of crack healing, and would thus be older and less likely to have been altered by human agency. However, this seemed to be in conflict with the evidence presented by the quenched granite sample.
of crack healing, and would thus be older and less likely to have been altered by human agency. However, this seemed to be in conflict with the evidence presented by the quenched granite sample.

Two other rock types were represented at the Middleborough Little League Site. One conglomerate sample and two granodiorite samples were observed under the criteria concerning crack healing, and presence of cracks. The conglomerate sample showed no cracks that traversed mineral boundaries. At higher resolution there seemed to be crystallization present, suggesting the possibility of it being an older sample in relative age. Of the two granodiorite samples, one was observed as having some cracks, but no crystallization. Higher resolution showed that no cracks bypassed mineral boundaries. This would be a relatively younger sample. The other granodiorite sample presented 3 cracks for every 100 microns. At higher resolution these cracks showed evidence of crystallization. This would place this sample at a relatively older age.

After utilizing this particular method of observation, the findings from the samples were inconclusive. This was due, in part, to the difficulty of discerning the micro-cracks within the sample. Also, without any quantitative analysis of the cracks or crystallization, there was not a definite determination of whether or the samples were altered by human intervention.

The second series of observation of the samples was done with the method of viewing the samples at ten micron intervals. Again, the theory accompanying this method was that the greater the number and length of cracks, the more indicative it would be of a rapid heating event. This would elevate the likelihood that the sample was altered by human intervention. There were also three additional control samples observed from the site. As a second piece of evidence, the number and length of cracks were compared with dates taken from features from which some of the samples were retrieved. If the number and length of the cracks correlated to the date of the feature from Figure 4 shows the data observed for each of the Middleborough Little League Site FCR samples. The three additional control samples: MBOLL FCR 1, MBOLL FCR 2, and MBOLL FCR 3, showed no evidence of cracking whatsoever. With this information a comparison was made with the samples which were dated both by typology and carbon-14 dating methods.

In Figure 5 (courtesy of Dr. Curtiss Hoffman), it is shown that there was no clear pattern correlating the number and length of cracks to the dates of those samples. This shows that the relative age of the fire altering event determined by the criteria did not match the age determined by dating.

**Conclusion**

For the reasons stated above, the current FCR analysis of the Middleborough Little League Site is only partially conclusive. While all but one of the samples examined showed signs of rapid heating, no correlation could be made between the relative age determined by the criteria and the actual dates of the features from which the samples were taken. Thus, it was clear that these particular criteria for determining relative age were unreliable. If in the future a criterion could be found that would correlate to these dates, then perhaps a more definitive conclusion could be made about the age of these samples.
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Figure 4. Micro-crack Analysis of All Samples
Although archaeology for the entire continent had been in its infancy during Mr. Whiting’s more active years through the 1940’s and 1950’s, some of the artifacts analyzed today are of significant importance, even if they had not been seen the same way when they were first recovered. This collection is composed of artifacts that are primarily from Plymouth County, offering the observer a...
rare glimpse into the past of the area, where Mr. Whiting’s primary interests had been as well. The collection itself is relatively large and encompasses over five thousand catalogued artifacts with almost equal numbers of uncatalogued pieces as well. The exact number of identified and proveniened artifacts is 4,508. However, this article will only address a portion of these artifacts as the identification had been undertaken in two large parts and has yet to be collaborated. The reader should be aware that, though the numbers may be realistically higher, the patterns detailed in this examination still hold true without the addition of the full count of artifacts.

Unlike previous collections accessioned by the Robbins Museum, the Whiting Collection is the first collection to be inventoried with an accompanying Geographic Information Systems (GIS) map. Mapping archaeological sites onto the ESRI ArcGIS program, my project will be one of many that will prospectively house the Museum’s entire archaeological inventory on a single network of computers with interactive spatial analysis models. This data will be added to the GIS archives of the Massachusetts Historical Commission and the future GIS library at the Robbins Museum.

Through the analysis of the Whiting Collection using GIS, I have worked to:

- Reconstruct the settlement patterns of the Pre-Colonial inhabitants of the Northeast,
- Address how these settlement patterns have evolved,
- Analyze the spatial relationship of sites.

Procedures

The first, and most challenging, part of my project involved continuing Jeff Boudreau’s organization of the proveniened artifacts by sites. Jeff Boudreau had originally started work on the Whiting Collection prior to my start at the Robbins Museum (Boudreau 2009). It had been his idea to sort the collection by site, keeping a running list of site names as he went. I do not have an exact number of artifacts Mr. Boudreau had sorted, but I would estimate the number at almost half. Unfortunately, he could not see his task through, and his project became my opportunity. This not only meant handling over five thousand artifacts but also looking up each artifact in Whiting’s catalogue to ascertain its location. Interestingly enough, some artifact listings even came with side-stories that encompassed the activities of the day and how the artifacts had been recovered (e.g. Artifact ### had been found with artifact ###). Not only did this mean that some artifacts were associated, but also that I have been looking at something personal.

These locations varied from as specific to “Horatio Pierce’s Garden” to being as general as “Brewster”. Although “Horatio Pierce’s Garden” is very specific, it is not possible to locate this site without extensive deed research or spending hours perusing over old directories. These sites also ranged in notoriety as well. Some sites are extremely well known amongst the archaeological community, such as “Nook Farm”. However, some sites are unknown, such as “Mrs. Ford’s Farm” and the “Bayview Fruit stand/Garden”. Because of this, it will not be possible to locate 100% of these sites and thus, unfortunately, this report will not include the entirety of the Whiting Collection.

After sorting all of the artifacts with legible labels, the second step of this research involved cross-referencing the locations from the Whiting Collection with known and reported sites as listed in the MHC inventories as well as the Robbins Museum’s own inventory of known sites. This process meant scanning over the United States Geologic Survey’s (USGS) topographical 7.5-minute quadrangle maps for street names, geographic features, and landmarks in order to find such sites as “Halfway Pond”, “Outlet of the Billington Sea”, or “Gunner’s Exchange Pond”.

All of this data was then entered into a Microsoft Excel file containing:

- Site Names: for easier identification purposes
- Site Numbers: pertaining to sites already registered with MHC or the Robbins Museum
- Quadrangle map/Town: for the purpose of identifying using the topographical maps
• Easting/Northing: for identifying the location of a site in today’s UTM system
• Sub-drainage system: for erosion mapping, location, and identifying possible links in cultural trends
• Elevation: for settlement patterning; preference for high/low locations
• Stream rank: for MEPA guidelines; may be used for settlement patterns as well (The Massachusetts Environmental Protection Act lists archaeological sites as non-renewable resources, therefore granting them the same protection as endangered habitats and ecosystems. Streams of certain ranks or higher are considered to be large enough to sustain human activity which could mean a possible archaeological site, requiring test excavations and analysis.)
• Distance to water: a guideline for any human population
• Soil type/Soil description: an indication of what to expect in the field for digging conditions/artifact recoveries; possible settlement pattern showing preference for areas based on drainage characteristics.
• Aspect: a possible settlement condition for cultural and/or physical preferences; wind direction, sunrises, or certain vantage points are some possible reasons.
• Slope: a possible settlement condition; defensive locations, ease of travel, and shelter construction are some examples of how terrain slope could be utilized.
• Archaeological periods: for temporal associations; to ascertain what sites were used contemporaneously and/or evolved in function based on typology
• Locus: physical description of area today, such as “lake bluff”; possible settlement preference; indication of what to expect if excavations were to be undertaken
• Function: how the site had been utilized previously based on typology
• References: previous work done to support/dispute positions.

The actual data collection for this research came next, with the identification and counting of artifacts per site. This process became easier as I became more familiar with the forms of tools, the typologies, and the identifying marks of certain tools. This was done with the aid of Dr. Curtiss Hoffman, when available, *A Handbook of Indian Artifacts from Southern New England* (Fowler 1991), and *A New England Typology of Native American Projectile Points* (Boudreau 2008). These typologies were used in order to determine relative ages of occupation and general activities per site. However, it should be noted by the reader that if a site features a strong component of a specific time period, that this does not necessarily mean artifacts of indeterminate age are automatically associated with that same period as well. The sites from each period of occupation are noted on Figures 1 - 9. Figure 10 provides a table of sites from each period. Because of the time it would take to properly identify this entire collection, I have left out portions of the collection that came from already well-documented sites, so as to better meet my goals and research objectives in the time I had. Some sites being excluded from identification are “Nook Farm”, “Bartlett Pond”, and “Hatherley’s Farm”. Although unfortunate, this strategy was nonetheless important to the completion of this work.

These artifacts correspond to 165 identified sites. Their locations are noted on Figure 11. However, only sixty-three sites have been located within an approximate area of Mr. Whiting’s collecting zone. This means that we can reasonably say 40% of these artifacts came from an approximate location with some certainty. These sites lie within the jurisdiction of twenty-one towns in Massachusetts. This number is expected to change as efforts to pinpoint unknown sites will hopefully yield new locational information. The towns, in descending order based on the number of sites which have been identified within them, are:

<p>| | | |</p>
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<td>4.</td>
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<td>6.</td>
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<td>17.</td>
</tr>
</tbody>
</table>
Among these 4,508 identified artifacts, all major time periods are represented. Looking at dateable objects alone, however, I see a strong Late Archaic component to this collection as a whole. Within the Late Archaic component alone; and almost 54% of the total number of artifacts have come from just three sites; Union Bridge in Norwell, Bay Farm (see Figure 14), and the Browne Site on Eel River. Artifacts used in these typologies include points and point-preforms (points started but not finished), certain knives (Boats blades, Atlantic utility blades etc.), pottery, steatite bowl fragments, plummets, and some task-specific tools.

From the 910 identified artifacts, ninety-five pieces have been identified as knives. This includes stemmed and stemless knives, tips of blades, and ceremonial knives as well. The knives have been recovered from twenty-one sites. A total of twenty-eight knives are stemmed and four are stemless knives. Twenty-one knife preforms have also been identified from eleven different sites. Two ceremonial blades have been identified coming from separate sites. One knife, made of rust-colored felsite, Mr. Whiting recorded in his journal to have come from Jackson Brook, the only artifact currently known to have been recovered from this site. However, the other ceremonial knife, a picturesque Boats blade, came from the Burgess Pasture Site (see Figure 15, second row from bottom, right).

Seventy-nine scrapers have been identified so far, derived from twenty-five individual sites. This figure also includes steep-edge scrapers. Steepe edge scrapers so far number thirteen, coming from only six sites. It should be noted, however, that seven of these steepedged scrapers were recovered at a single site on Neil Gate Street near the North River alone.

Only four pestles have been identified at this time, coming from three sites. Two of the pestles were recovered from the Browne Site. Steatite fragments numbered thirteen. These fragments come from four different sites, but most abundantly from the Browne Site located on Eel River. The number of steatite fragments recovered here is ten.

The Browne Site (see Figure 13)
The total number of artifacts Mr. Whiting recovered from the Browne Site is 156. Jesse Brewer makes reference to the Crib Browne Estate located along Eel River, saying “William W. Whiting and I dug this site for at least seven years and each got several hundred artifacts here” (Brewer: 1967). He also goes on to say “This was the most prolific site I have ever seen around Plymouth”. With Brewer’s description and the sheer number of artifacts Mr. Whiting recorded, it is my firm belief that we are talking about the same site. This site shows a very strong Late Archaic component, along with relatively smaller Middle and Transitional Archaic components. This site shows activity ranging continuously from nine thousand years ago to as recently as four hundred years ago. However, looking at the components most represented by artifact typologies, the site may date as far back as eight thousand years ago to twenty-seven hundred years ago. The Browne Site also has the only identified corn planter found so far.

The Browne Site is one of the most informative sites in this collection. The sheer number and volume of artifacts recovered from this site provide a sizeable amount of data for investigation. This site had the highest number of both steatite fragments and pestles. Several other large stone tools were also gathered by Mr. Whiting. These artifacts include a gouge preform, a hatchet, four hammerstones, four net sinkers, four cores, several styles of scrapers, knives, projectile points, and a corn planter. This site, without a doubt in my mind, had been either a permanent or semi-permanent habitation site. The corn planter shows an obvious use of maize horticulture which indicates some more permanent settlement. To top it all off, there are also steatite fragments. These fragments also indicate the Transitional Archaic period, and it is not common to see habitually mobile peoples carrying such heavy objects, unless they held a personal/religious/ritual significance. Assuming this site had been occupied for extended periods of time continuously, it is no surprise to see the number of artifacts coming from this site. Preforms and cores
show that tool-making was present, also explaining the high number of artifacts. Projectile points, knives, and scrapers show that there had been hunting, food-processing, and hide-processing as well. The net sinkers recovered, coupled with the site being forty feet from a water source with anadromous fish, leaves no doubt that the inhabitants utilized fishing as a means of nourishment.

Seeing that there are signs of fishing, hunting, and horticulture, the inhabitants of this site may have had a very diverse diet. Also, it would go without saying that the inhabitants were well educated on exploiting resources in a variety of ways. Hunting, fishing, and horticulture are activities involving three distinct methods of action. Hunting requires the frequent mobility of the party and/or group. Fishing, presumably with nets, involved setting the nets then returning later to collect the rewards. Farming demands daily attention and constant stewardship to deter pests and scavengers. These three subsistence strategies show that southeastern Massachusetts’ earlier residents were versatile and recognized different resources to take advantage from the same piece of land.

However, as early settlers observed, inhabitants of the area did practice all three activities, dependent upon the season. Taking the Browne Site’s location into context, this observation may hold true. This site is roughly sixty meters from the Eel River, a river that hosts anadromous and catadromous (eel) fish runs. The remains of the Browne Site show that inhabitants were competent craftsmen, and possessed the tools of skillful survivalists in a very dynamic environment.

Union Bridge Site
Among the remains from Union Bridge in Norwell one sees an abundance of projectile points. In total, there are fifty-five projectile points from this one site. Forty-five of these points date to the Late Archaic period. The rest of the projectile points date within the range of Middle Archaic to the Early Woodland. Out of these sixty-five artifacts recovered, thirty are small-stemmed points, constituting almost half of the artifacts recovered. Also recovered from this site were a drill, four knives, and two scrapers, along with a gunflint.

Burgess Pasture Site (see Figure 15)
The Burgess Pasture site only lacked a diagnostic representative of the Early Archaic period. This is the only site that showed a nearly continuous human presence over ten thousand years. This site, being on the property of Fred Burgess’ heirs, is roughly seventy-five yards away from the Nook Farm Village. Mr. Whiting believed this site to most likely have been a part of what he referred to as The Nook Farm Village Camp. Mr. Whiting’s article titled, “The Burgess Pasture Site”, explains that he and Jesse Brewer frequented the area around Nook Farm. However, unlike the Nook Farm Village, this site had only a few pieces of pottery, in contrast to the quantities of this material recovered from the main site. Many of the artifacts recovered from the Burgess Pasture Site were also noted to be made of the same stone as those recovered from Nook Farm. Mr. Whiting referred to the types of stone as “stocks” and recovered an enormous specimen of garnet-colored felsite, in which he believed to be the primary source of “stock”, or resources, for the stone tools made at Nook Farm and Burgess Pasture (Whiting 1949).

The Burgess Pasture site is, without a doubt, the most peculiar site within this collection. For one thing, as previously mentioned, it is the only site with almost every time period being present, with the exception of the Early Archaic. There are enough projectile points (totaling thirty-nine) to consider the site to be of importance for hunting. Also, the relatively high numbers of knives and scrapers present show that activities at this site definitely involved the processing of food and/or clothing. Given this site’s rather close proximity to a well-known habitation site, it appears that the Burgess Pasture Site had been a processing site for the game taken down during hunting trips. The broken atlatl weight may also indicate the method by which the game had been taken down. However, when considering the Boats Blade and paint stones, defining the site function exactly becomes tricky. Possibilities for explaining this evidence include the practicing of hunting magic before or after a hunt, assuming the artifacts were contemporaneous. The site may have also been a ceremonial stop at one time, then a processing site at another. With equal-sized components present from the Late Archaic and Late Woodland, and some trailing remains of other time periods, it is
hard even to venture a guess as to in which period this site had been more heavily utilized.

**Neal Gate Site**

The site, located at the intersection of Neil Gate Street and the North River, has the single-highest component of steep-edged scrapers in the entire collection. Based on a use-wear analysis conducted for Dr. Hoffman by Susan A. Jacobucci (2011), steep-edged scrapers were used primarily, if not exclusively, for the purpose of wood-working. However, what the underlying goal of this wood-working could be is not clear. Carving effigies, wooden beams, or even handles forhafting are all possible without any other material remains. Adding the knife preforms, a single drill, and four bifaces as well, there are definite signs of crafting of various tools being performed at this location. Looking at dateable artifacts, there is an overwhelmingly strong component from the Late Archaic, going along with the collection as a whole.

**Discussion**

Although there are sixty-three precisely located sites in the Whiting Collection (see Figure 12), only twelve will be used in this discussion. These sites are:

1. Alden Farm
2. Bay Farm
3. Billington Sea (near Outlet)
4. Browne Site
5. Burgess Pasture
6. Blanchard’s Farm
7. Dahlia’s Farm
8. Harlowe’s Farm
9. Holme’s Farm
10. Nipper’s Farm
11. Henderson’s Farm
12. Neil Gate St. (North River)

These twelve sites are in the top four deciles calculated by ArcGIS, based on total number of artifacts. Each of these sites has at least thirteen artifacts. Of course, it should be restated that these artifact totals were gathered with a bias and were based mainly on point and pottery typologies, which are approximate guidelines at best. These twelve sites also constitute 73.3% of the total artifacts I identified. There are some distinct characteristics that many of these sites share. A majority of the sites seem to be located on or near fresh water sources with anadromous fish present, and have southerly aspects. The Burgess Pasture Site is the only site with over one hundred artifacts not located on or near a river. Dahlia’s Farm and Blanchard’s Farm appear to violate every portion of this general characteristic. Neither site is located near a presently known source water, therefore making it less likely that they would have had access to visible sources of fresh water and anadromous fish. Both sites also have northerly aspects.

However, only four of the sites meeting the criteria above have archaeological remains that signify the presence of fishing. These sites are:

- Browne Site
- Billington Sea (near Outlet)
- Harlowe’s Farm
- Henderson’s Farm

Of course, the exploitation of anadromous fish would indicate some sort of seasonality with respects to diet. The inhabitants of these sites may also have only occupied them during the fishing season rather than year round. This means that the same group of people may have produced several sites in the area over the course of a human lifespan.

Ten of the twelve sites also have stronger Late Archaic components than any other time period; some only show Late Archaic tool typologies. Blanchard’s Farm is the only site where the Late Woodland phase is more dominant, although most multi-component sites do have almost equal Late Woodland and Late Archaic components. Harlowe’s Farm is the only site in which the Transitional Archaic component is the most representative time period, although the Late Archaic is close behind.

Using the same criteria which generated these twelve sites, except focused on the time periods individually, we see some differences. A simple logarithmic scale based on the total number of artifacts can be used to get a general idea to the degree a site was utilized. The scale would look
something like this:

- 1: No Significance
- 10: Low Significance
- 100: Medium Significance
- 1000: Significant
- 10,000: Very Significant

Going by this logarithmic scale, there are very few sites that could be considered potential centers of habitation, of medium significance. These sites are:

- Bay Farm
- Browne Site
- Burgess Pasture
- Dahlia’s Farm
- Neil Gate St.
- Henderson’s Farm

Only Bay Farm and the Browne Site have Transitional Archaic components with at least ten artifacts. The Browne Site, therefore, shows sufficient archaeological remains to suggest continued utilization from 2,300 to 5,300 years. With an actual archaeological dig, it would not be unimaginable to expect at least one thousand artifacts to be recovered from the Burgess, Browne, or Bay Farm sites. The Browne Site and Bay Farm are also the only sites with a Late Woodland component large enough to register moderately on this scale.

**Conclusions**

What I have accomplished so far is only the foundation of what will assuredly become a larger and more complicated investigation. I hope for more sites to be registered with a greater understanding of their physical locations and risks to their academic value. Sadly, some areas are still facing destruction in our age, such as the Great Herring Pond. This site had been one of Mr. Whiting’s favorite collecting grounds, but is now slowly being developed. The same is true of the Billington Sea. Unfortunately, the Morton State Park is the only section on its shores left completely untouched by the advancement of the town of Plymouth.

Tragically, the legacy of the pre-Colonial inhabitants is being lost. As Kathleen Shaw Anderson noted in her article “Archaeology and the First People of Middleborough and Neighboring Towns: A Bibliography” (1997), the introduction of commuter rail services in Middleborough and Bridgewater has spurred new land development for the previously rural towns of Plymouth County. With the construction of new homes and businesses, many known archaeological sites are now threatened by the encroachment of bulldozer, with undoubtedly many more sites still yet to be discovered facing the same threat. With this research, and the advances GIS holds for archaeology in general, mitigating this threat would be the greatest reward possible for my efforts.

**Acknowledgements**

This project would not have been possible without the interest and enthusiasm of William W. Whiting and his daughter, Charlotte Beal, and her donation of the entire collection to the Robbins Museum as well.

**References Cited**

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Boudreau, Jeffrey

Brewer, Jesse

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Fowler, William S. (revised C. Hoffman)

Jacobucci, Susan A.

Office of Geographic Information, Department of Fish and Game.

Whiting, William W.

Figure 1. The Only Paleo-Indian Site in the Whiting Collection

Figure 2. Early Archaic Sites

Figure 3. Middle Archaic Sites

Figure 4. Late Archaic Sites
Figure 5: Transitional Archaic Sites

Figure 6: Early Woodland Sites

Figure 7: Middle Woodland Sites

Figure 8: Late Woodland Sites

Figure 9: Contact and Historical Sites

Figure 11: A map of the located sites from the Whiting Collection
Figure 12: Map Showing the Proximity of the 12 Sites Mentioned

Figure 13: Artifacts from the Browne Site

<table>
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<tr>
<th>Period Name</th>
<th>Date Range (years ago)</th>
<th># of Datable Artifacts</th>
<th>% of Datable Artifacts</th>
<th>Abbreviation</th>
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<td>200 YA - Present</td>
<td>3</td>
<td>.56</td>
<td>HI</td>
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¹ Because of the lack of material from these periods represented in this collection, I have decided to merge them together in this table, as well as any discussions pertaining to them.
CONTRIBUTORS

Matthew Caerulius graduated from Bridgewater State College in 2008 with a B.S. in Anthropology (Public Archaeology Concentration). He undertook the analysis of fire-cracked rock as a directed study under Dr. Curtiss Hoffman at Bridgewater State and Dr. Brian Evans at MIT. This work was partially funded under a grant from Bridgewater State’s Center for the Advancement of Research and Teaching.

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Gookin, Daniel

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