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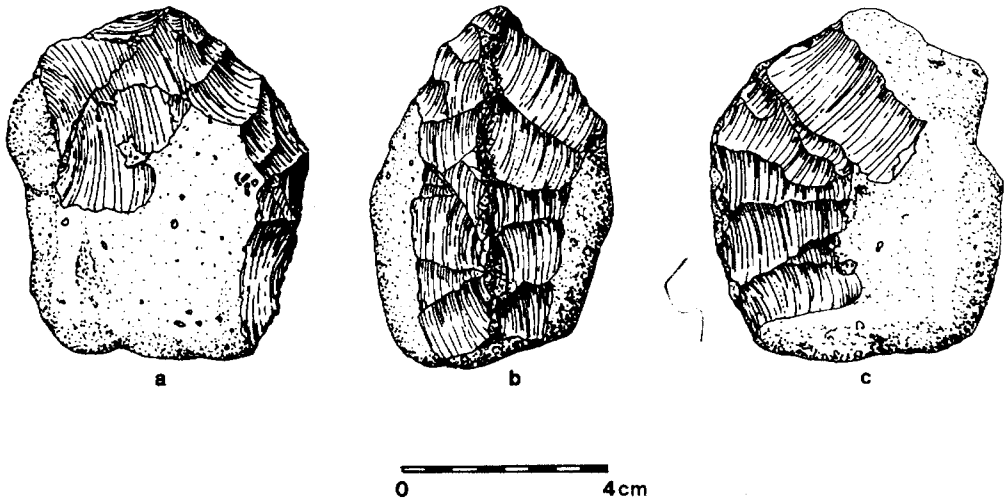

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MIDDLE ARCHAIC IN THE LOWER PISCATAQUIS RIVER, AND ITS RELATIONSHIP TO THE LAURENTIAN TRADITION IN CENTRAL MAINE

David Sanger and Bonnie Newsom

INTRODUCTION

James B. Petersen and his colleagues have made the upper Piscataquis River well known to those interested in the Archaic period of central Maine (Petersen 1991; Petersen et al. 1986; Petersen and Putnam 1992; Putnam 1994). As a result of this pioneering research, we have a nearly continuous cultural record that may extend back to roughly 10,000 radiocarbon years ago, an unmatched chronological sequence in northern New England and the Maritime Provinces. This remarkable record results from a favorable geological situation, one featuring multiple floods that created a palimpsest of sedimentary horizons on which successive generations of people camped. Brigham and Sharrow are two of the better known sites in this region.

There is a problem with this type of site, however. Excavation costs restrict the amount of area that can be excavated at any particular level. So that while the deeply-stratified sites offer archaeologists a wonderful chance to witness the broad outline of local archaeology, the information from any one time period is limited by the resources available to conduct extensive excavations. Recent research by the University of Maine has helped to extend our knowledge of Piscataquis River culture history through excavation of discrete Archaic and Ceramic (Woodland) components downstream of the Milo area sites. In this paper we focus on the Archaic; the Ceramic period is the subject of Newsom's (1999) Master's Thesis.

A major tributary of the Penobscot River, the Piscataquis and its tributaries drain a vast amount of central Maine (Figure 1). As such, it constituted a highway for travel into an extensive network of rivers, lakes, marshes and peatlands. In order to get to the upper Piscataquis sites from the Penobscot River, people needed to paddle approximately 33 km (20.5 miles), most of which is barrier-free. One might anticipate, therefore, that archaeological sites should be found in the lower reaches of the Piscataquis River. And indeed they are.

A longstanding interest at the University of Maine has been the kinds of environments and landscapes that existed contemporaneously with human cultures. Our research shows that past conditions differed considerably and may well have impacted the kinds of relationships between people and the environments that provided subsistence. We consider some of the newest research in this regard as it applies to our Piscataquis research program.

The recognition of a flourishing Middle Archaic in central Maine leads to the related questions of ancestors and descendants. In other words, did the Middle Archaic derive from the Early Archaic, and can we identify the role of the Middle Archaic in the establishment of Late Archaic culture types? Our lower Piscataquis data have little to say about the antecedent issue. However, we can consider the transformation into Late Archaic.

It is not realistic to speak of Early, Middle and Late Archaic as if these were somehow living cultures clearly distinct from one another. We, the archaeologists, define these periods of time and assign certain characteristics said to typify the time period. So that Middle Archaic is not an archaeological culture, just a convenient time period. On the other hand, a named entity such as Laurentian Tradition is a cultural statement, ideally involving a suite of artifacts, behaviors, time and space. That said, its designation is as arbitrary as any other taxonomic term that archaeologists use to communicate their ideas. As such, it should be subject to constant scrutiny and, if necessary, modification, if it ceases to suit our purposes as archaeologists.

The Laurentian Tradition, as defined by Ritchie (1965), is usually regarded as the first Late Archaic culture type in the interior of Maine (e.g., Bourque

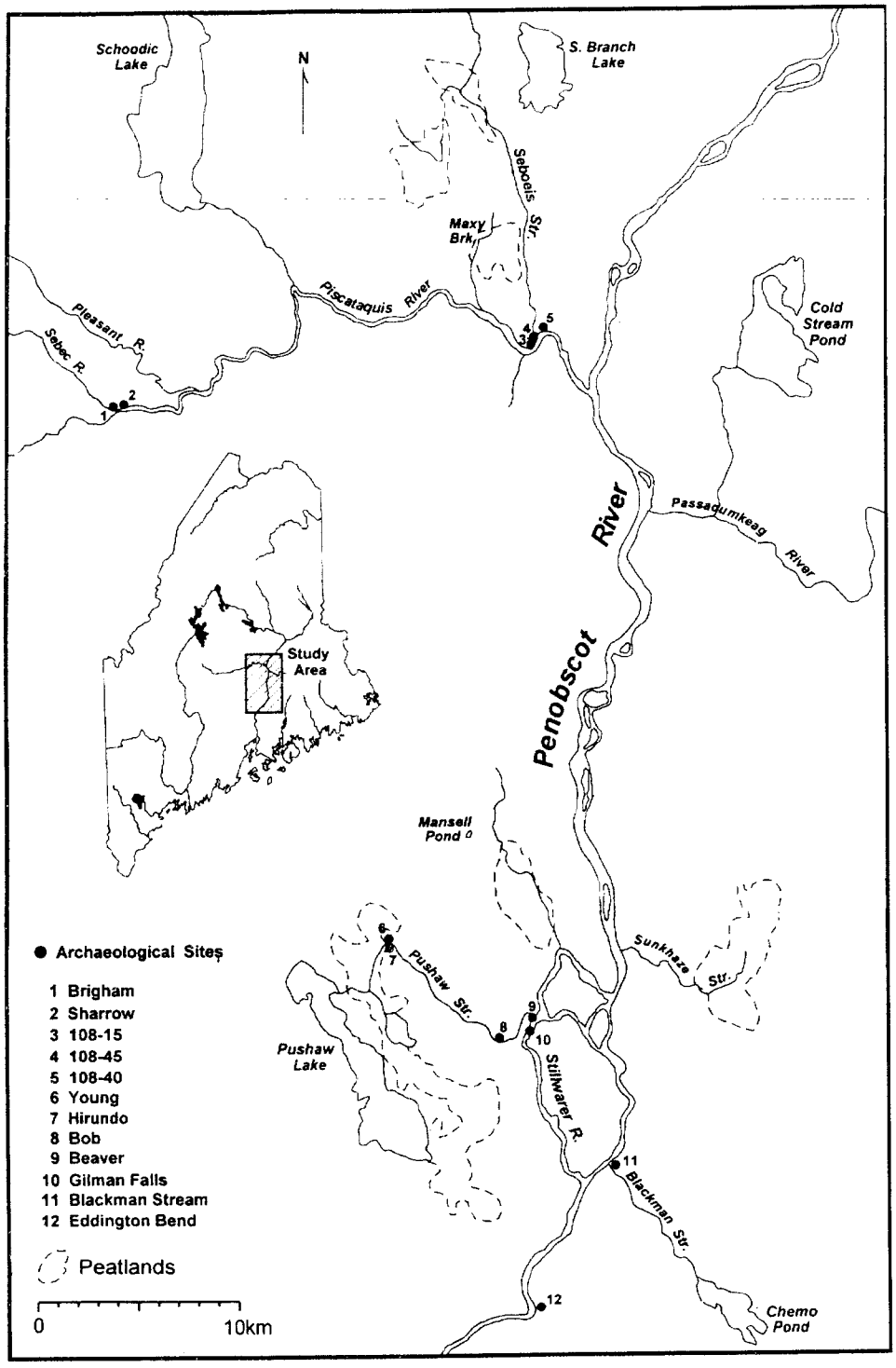

Figure 1. Location Map with Archaeological Sites and Wetlands

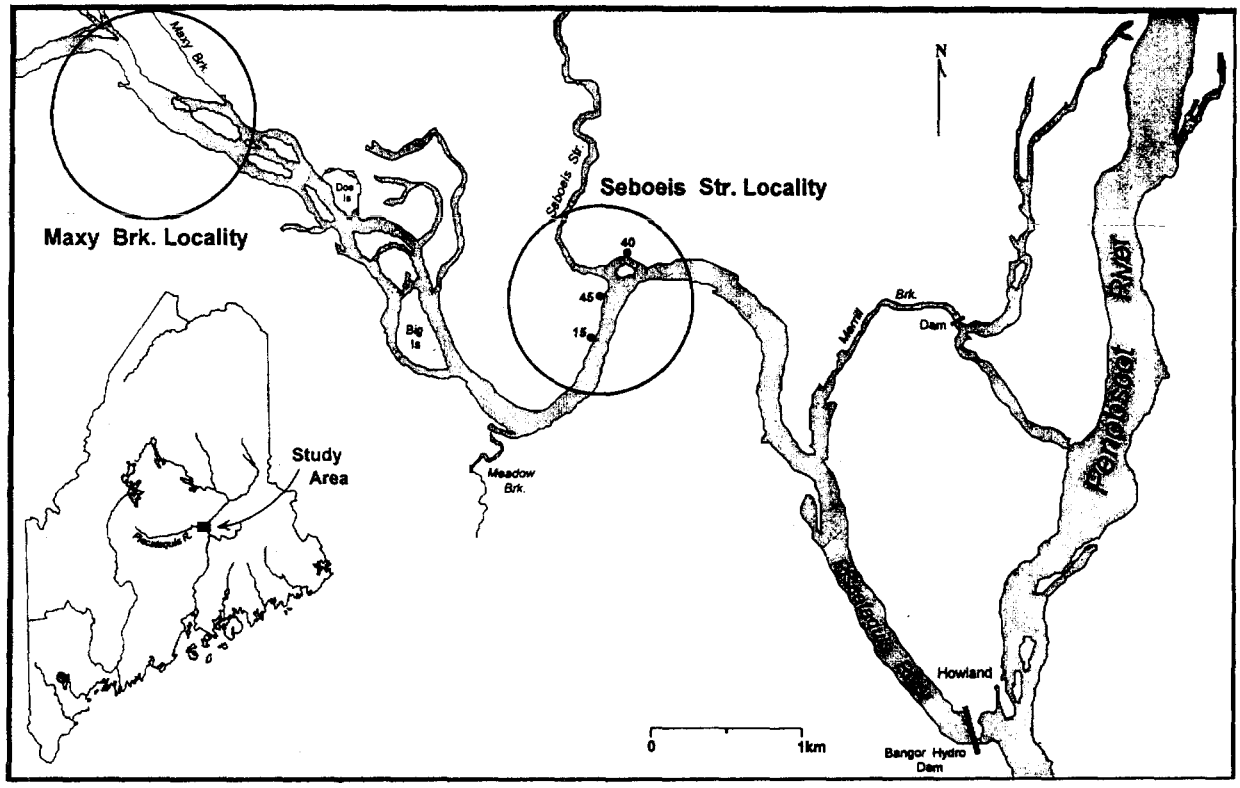

Figure 2. Howland Reservoir and Selected Archaeological Sites

1995; Cox 1991; Peterson 1991, 1995; Sanger 1975; Spiess 1990). A suite of artifacts, most often said to be similar to those of the Vergennes phase in the Champlain Lake area, identifies the tradition. Some of the so-called "diagnostic" artifacts may well have entered Maine via connections with the Lake Champlain area. Other artifacts have a lengthy history in Maine, one that pre-dates the Laurentian Tradition. We conclude this paper with a consideration of the origins of the Laurentian Tradition in central and eastern Maine.

HISTORY OF RESEARCH

Starting in 1995, the University of Maine initiated research into the archaeology of the Howland Reservoir, created by a hydroelectric dam at Howland, where the Piscataquis meets the Penobscot. The dam creates a pond approximately 7.6 km (4.7 miles) long. During the Phase I level surveys of 1995 and 1996 we identified 38 pre-European sites in the 30 km of reservoir shoreline (Mack et al. 1997). These sites cluster in 2 localities (Figure 2). The Seboeis locality consists of 17 sites in and around the confluence of Seboeis Stream and the Piscataquis. Upstream is the Maxy Brook locality, a cluster of 6 sites strung out along the north (left) bank of the Piscataquis close to the mouth of Maxy Brook.

We were not the first to work in the area. Smith (1929) noted the destroyed red ocher cemetery at the mouth of the Piscataquis, while Moorehead (1922) sent his crew up the river on the trail of red ocher. He reported digging at the mouth of Seboeis Stream and under an old saw mill. Our historical research indicates no presence of a mill, and it seems likely that Moorehead's "force" dug at the mouth of Schoodic Stream, upriver of our study area.

Based on survey and analysis, 18 sites underwent Phase II excavation in 1996 and 1997

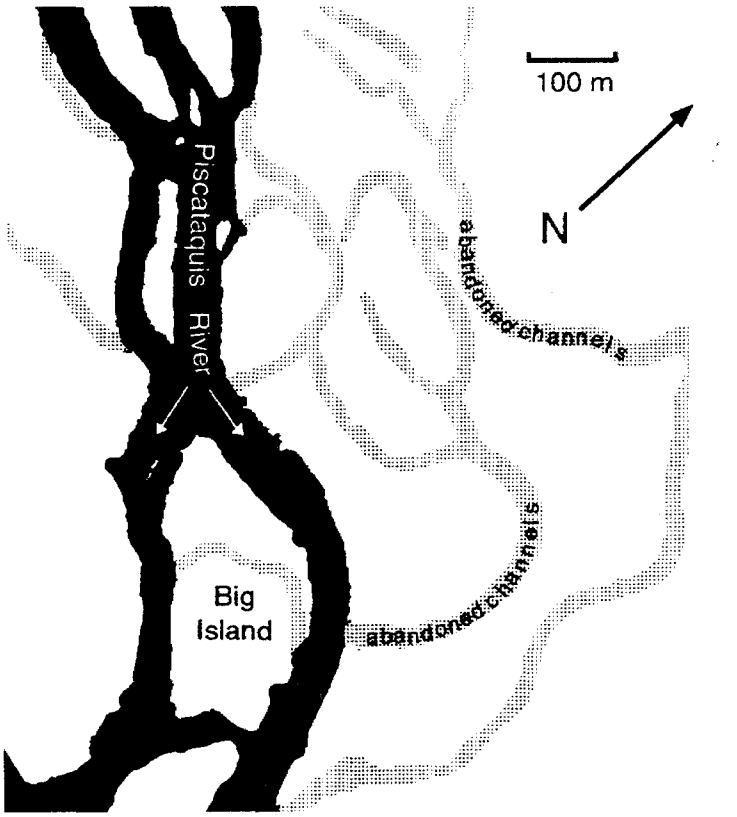

Figure 3. Modified Aerial Photograph of the Upper Part of the Howland Reservoir Showing Abandoned Channels of the Piscataquis River.

(Newsom and Sanger 1998). Although the amount of excavation varied, the aim was to ascertain eligibility to the National Register of Historic Places in accordance with criteria set out in the Maine State Plan (Spiess 1990). Unlike the Milo area, where representative assemblages are all stacked one on another, in the lower Piscataquis the components are spread throughout a number of sites. The reason for this is related to a different geological history.

GEOARCHAEOLOGY

According to Putnam (1994) the site contexts at Milo stem from a series of over-bank flood events that accumulated fluvial sediments. Some bank erosion occurred, but the predominant feature was aggradation and overall vertical building of sediments on which people lived season after season. In the lower Piscataquis, the history of deposition was not the same.

Two very different types of river channel are represented in the Howland reservoir. In the downstream portion, from Big Island to Howland, the river has stayed mostly within the confines of a fairly narrow channel. From Big Island upstream, the river has meandered around during the post-glacial period, leaving behind old channel remnants (Figure 3). Recognition of this fact led to the inclusion of a geoarchaeological model, developed in conjunction with geologist Alice Kelley. This model both affected the survey technique and helps to explain the current site distribution.

Two major conclusions derive from an understanding of the river's history. First, the current distribution of sites is an artifact of sedimentation and erosion processes. Therefore, the

number and location of sites reflects a history of peoples' choices followed by site preservation. The same geological processes have impacted the ages of the preserved sites. For example, all Archaic sites we found in the current reservoir are located in the channeled (downstream) portion of the reservoir. Unable to meander, the over-bank river deposits accumulated vertically, thus paralleling in a general way the geological situation found at Sharrow and other upper Piscataquis River sites.

Within the Howland reservoir, the riverbanks in the upper portion contain only Ceramic period sites. This is because the unconfined riverbanks were able to move horizontally, resulting in the pattern of meanders, as illustrated in Figure 3. As we dug down through the sediments we located only late Holocene-age sites (last 3000 years), and no Archaic sites overlying basal till and river gravel. We suspect that in the upstream reservoir area one might find Archaic stations deeply buried in the now-abandoned channels. These were not tested as they were considered to lie outside the impact zone of the current reservoir.

Finally, there is the influence of over 100 years of Euro-American settlement and river use, especially in the town of Howland, and construction that has occurred on both sides of the river just upstream of the dam.

Middle Archaic in the Middle Penobscot Drainage

The Middle Archaic, for our purposes, extends from 7,500 uncalibrated radiocarbon years ago to 6,000 years ago. We use uncalibrated radiocarbon dates throughout this paper, and simply refer to them as years before present (B.P.) Until the Milo area investigations mentioned above, little was known of this time period in central Maine. The discovery of deep alluvial sediments changed the situation radically. In addition to the Milo sites, we now have evidence from a number of locations in the Penobscot valley; including: Eddington Bend (Petersen and Sanger 1987), Blackman Stream (Sanger et al. 1992), and sites on Pushaw Stream, especially Gilman Falls (Sanger 1996a), as well as the Hirundo site (Sanger et al. 1977). The issue is no longer one of the presence or absence of Middle Archaic in Maine (Petersen and Putnam 1992); but rather, what was the nature of the cultures?

Ever since the publication of the Neville site in New Hampshire (Dincauze 1976), archaeologists have been alert to the presence of Neville and Stark points. On the basis of these and related biface styles, Spiess et al. (1983) postulated a Middle Archaic for western Maine. Research since that review suggests that sites which feature Neville and Stark-like points are much more common west of the Kennebec River. We know of no typical Neville and Stark points in well-dated contexts east of the Kennebec, although they certainly do show up here and there; for instance, in an undated context from the Hirundo site, and also at the Sharrow site, where 2 stemmed bifaces were recovered from suspected Middle Archaic levels. However, Petersen (1991:60,1) noted that they do not match precisely Neville and Stark types.

In some Early and Middle Archaic sites in northern New England, biface manufacture was decidedly limited, leading to Robinson's definition of a Gulf of Maine Archaic [technological] tradition in which the use of chipped bifaces was very restricted (Robinson 1992). Although the idea of a North American mid-Holocene technology devoid of, or at least featuring very few bifaces, seems counter-intuitive, excavation in a number of central Maine sites has demonstrated the accuracy of the observation that bifaces are either very infrequent, or even absent. For instance, at the Gilman Falls site on Pushaw Stream, nearly 150 square meters of excavation in Middle Archaic deposits yielded over 600 artifacts, but no chipped felsite or chert bifaces (Sanger 1996a). Indeed, in Zone 3 of this site, a Middle Archaic assemblage dated to between 6,300 and 7,300 B.P., a detailed study of felsite debitage failed to reveal a population of retouch flakes expected of typical biface manufacture. All the available evidence points to infrequent occurrence of Neville and Stark points in Penobscot River drainage Middle Archaic sites. Their absence should not be employed to deny the presence of

Middle Archaic populations inhabiting the area.

The 1987 excavation of the Blackman Stream site in Bradley provided us with our first real understanding of the importance of low-grade metamorphic rocks in Middle Archaic sites (Sanger et al. 1992). There, in a buried soil horizon dated to between 7,400 and 8,400 B.P., we recovered a large number of stone slabs that, at first glance, appeared not to be artifacts. However, their presence in the fine flood sands seemed incongruous to site supervisor Douglas Kellogg and geologist Alice Kelley, because the same deposition regime that laid down the fine sand could not be responsible for the much larger pieces of rock. Upon inspection, many of the slabs did show some evidence of deliberate shaping around the margins. Thereupon, we saved all such material. How many artifacts were discarded as "natural" over the years we can only guess.

A few years later, while excavating the Gilman Falls site (Sanger 1996a), we conscientiously collected these spalls for closer examination in the laboratory. Once alerted, it is possible to see that many of these pieces served as cutting or scraping tools with little modification other than some margin retouch. In the apparent scarcity of chipped bifaces, the low-grade metamorphic implements have become one of the best indicators of Middle Archaic technology for central Maine. We need to stress that this technology is not exclusive to the Early and Middle Archaic; it can also be found in some Late Archaic sites, an observation we think is important in any assessment of Late Archaic cultural roots.

Low-grade metamorphism (greenschist facies metamorphism) includes rocks known as granofels, phyllite, slate, and quartzite that occur in the Kearsage-Central Maine Synclinorium division, Paleozoic rocks widespread in central Maine (Osberg et al, 1985). Details of the lithology may be found in Berry (1994), an appendix of the Gilman Falls report (Sanger et al. 1994). Because they are so ubiquitous, and required so little work to make them into sharp-edged implements, they served as artifacts that could be quickly formed, utilized, and then abandoned. Sometimes, these are called "expediency" tools, whose amorphous shapes attract little attention and even less respect. Other tools are better formed. We abbreviate "low-grade metamorphic rocks" to LGM. Some of the classes of tools made from LGM include: spall tools made from edge-modified pieces; choppers; abraders (including rods); ground slate points; and ulus or semi-lunar slate knives.

Various porphyritic felsites (e.g., Kineo felsite, etc.), were also used. In some Middle Archaic sites, these formed the basis for a distinctive type of hammer stone. When we first encountered this artifact at the Hirundo and Young sites in the early 1970s, we called them "battered nodules" for lack of a functional term. Whereas most hammer stones have a generally rounded striking area, during the Archaic period we see the deliberate production of cobble-based, volcanic hammer stones which have a ridge created by bifacial flaking to an angle of close to 100 degrees, prior to use as a hammer (Figure 4). This ridge is frequently highly battered and crushed, as if it had been striking something hard. Interestingly, the side of the cobble opposite the crushed ridge often displays smooth, water-worn cortex, which would have protected the hand from the impact of striking. These tools may be confused with cores, which they are not, although it is conceivable that some of the flakes driven off the original nodules could have been used. An alternate potential function is as pecking stones with which to shape celts, gouges, and other ground and pecked implements. Because we now believe we have found a function for these implements, we are suggesting the term "ridged hammer stone" to refer to the deliberately created ridge used for a flaking and/or pecking activity.

Faced with a large number of ridged hammer stones at Gilman Falls, in association with hundreds of pieces of worked LGM, we experimented with the use of these felsite artifacts to reduce slabs of local LGM. Former UM student Bret Overturf and other knappers have found that they make admirable hammer stones for flaking of LGM, whereas the traditional rounded hammer stones tend

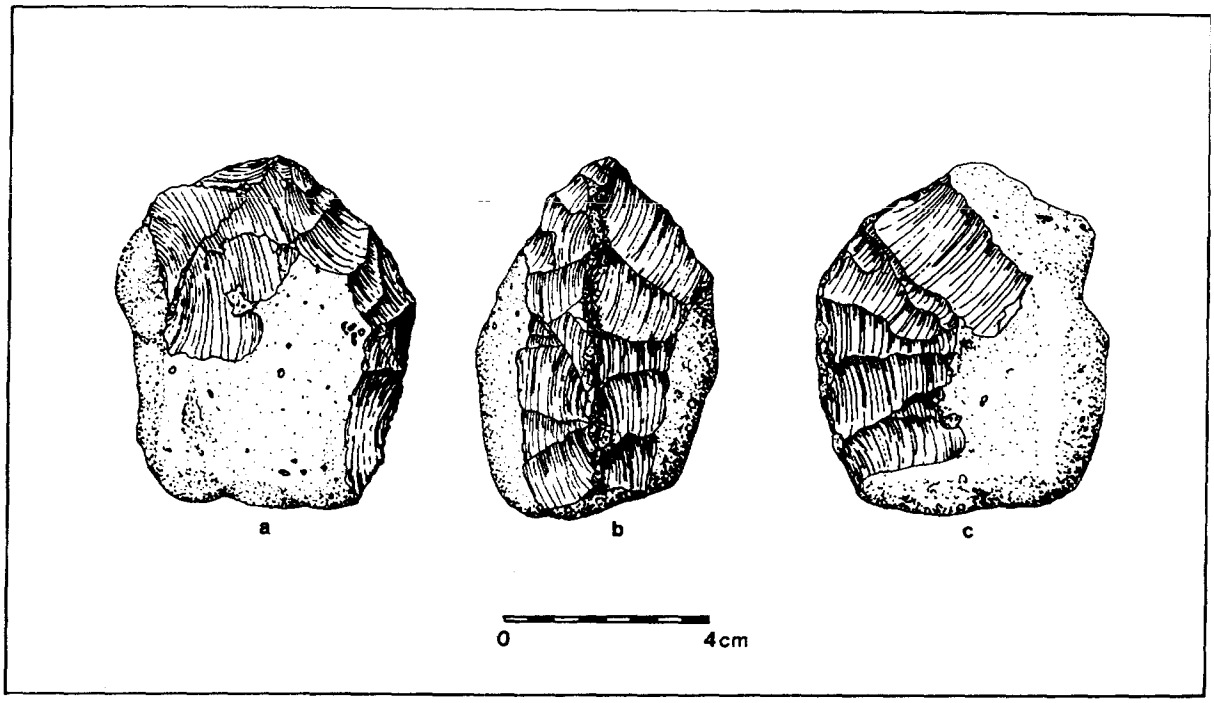

Figure 4. Drawing of a felsite ridged hammer stone. View b illustrates the battered ridge. Note: specimen is not from the Piscataquis River.

to crush the brittle edge.

The nature of LGM calls for a special approach to flaking. Massive rocks, such as felsite, may have to be reduced by bifacial flaking in order to thin a thick flake. LGM rocks have relatively thin bedding planes (a cm or less) that relate to their sedimentary origins, usually sand and silt in water bodies. Pieces of LGM quarried from outcrops in central Maine may be thin enough for an intended function. Yet the overall shape of the rock may need modification. In other words, reducing the thickness is not as crucial as reducing the width or length. Therefore, flaking scars do not run over the surfaces, but are restricted to the margins. Many of our archaeological specimens indicate that the edges were flaked from one direction only, in other words, unifacially. The blank was then turned over, and the other edge flaked unifacially. Looking at the specimens in cross section, the effect is two parallel planes (the natural bedding places) and parallel margins that are alternately beveled. In other words, a parallelogram. This technique reduces the width of the LGM spall without affecting its thickness. We have not seen this distinctive technique described anywhere else, but we doubt that central Maine sites are unique in this respect. Rick Will (personal communication, 1999), who has experimented making rods with LGM rocks, reports that a firm support beneath the blank is necessary to prevent breakage. In sum, the use of LGM involves a specialized hammer stone in addition to a particular strategy for reduction.

In short, while felsite was being collected and modified by Middle Archaic peoples in central Maine, it was not primarily to produce chipped projectile points. Rather it served to make hammer stones, traditional rounded ones for working felsite and other tough rocks, and specialized forms with an obtuse angle ridge—our ridged hammer stones—for reducing LGM and possibly pecking celts and gouges into shape.

In addition, Middle Archaic sites contain celts and gouges. The former artifacts vary little from those of later periods; however, the latter are distinctive. Middle Archaic gouges frequently exhibit long grooves, sometimes the full-length of the artifact, a form that occurs less often in Late Archaic assemblages. Partially-grooved gouges are also found in Middle Archaic sites.

Ground slate points ("slate" used in a general, not geological sense), made of LGM, also occur in Middle Archaic contexts. They are quite different from the long, elegant, often hexagonal-section "bayonets" of the Late Archaic cemeteries. In Middle Archaic habitation sites they may have roughly finished stems created by flaking, topped by a polished blade portion. A sub-class of slate point is quite small (usually less than 7 cm long) and features minimal shaping (e.g., Sanger 1996a, Plate 4). Robinson (1992) has called attention to the use of quartz made into thick scrapers as a hallmark artifact of his Gulf of Maine Archaic tradition. Middle Archaic sites in central Maine often, but not always, contain many quartz scrapers and masses of shatter brought about by flaking this intractable material.

Plummets and broad "slate" knives, or ulus, appear to enter the central Maine archaeological record about or after 6,000 B.P. (Petersen 1991; Sanger 1996a). In traditional terminology, this would place them at the Middle to Late Archaic boundary.

MIDDLE ARCHAIC IN THE LOWER PISCATAQUIS

Methodology

Prior to describing the sites, we review some of the field and laboratory methodology. Following a walkover survey conducted during a draw-down period of low water arranged by Bangor Hydro-Electric, we then moved to systematically-placed shovel pits. These were designed to identify the approximate limits of sites, in addition to gaining some idea of cultural content and stratigraphy. As mentioned above, in areas of obviously extensive disturbance, either natural or cultural, we skipped the test pitting strategy. Once a decision was made to proceed to Phase II investigations, we superposed a traditional grid over each site. In the absence of clearly defined stratigraphy, we excavated by 10 cm levels within 50 cm quadrants in 1 meter squares. All sediment was screened through either 1/4 or 1/8 inch mesh. On the basis of close examination of various profiles we developed a site stratigraphy with the assistance of geologist Alice Kelley. Most sites in the lower Piscataquis demonstrated a remarkably consistent, one might even say, "monotonous", stratigraphy.

Pleistocene till or gravel constituted "geological bottom" for most of our sites. Episodic flood events deposited layers of very fine, silty sand. Most sediment sequences became finer as they built upwards. Although there are exceptions, usually there was little differentiation and no good basis for dividing the soil column into meaningful stratigraphic units of less than the 10 cm levels from the surface.

In some sites we found buried soil horizons, remnant B horizons, indicative of periods of stability during which time soil development occurred, prior to reburial by flood events. These dark brown-to-red soil development horizons are not to be confused with cultural features, such as fire hearths. Neither should they be equated with strata in the sense of a depositional unit. They do indicate an unspecified period of time during which scouring or sediment deposition on the surface was minimal. This gave time for a forest soil (spodosol) to develop and made an attractive camping spot for Native people. As such, these units do constitute potentially useful interpretive packets.

Central Maine Middle Archaic sites usually contain few fire-cracked rocks when compared with Late Archaic and Ceramic period sites. Fire hearths do occur, however, as evidenced by stone arrangements and the presence of charcoal. Sediments in and around these hearths may contain small pieces of calcined bone, usually interpreted as food bones discarded into the hearth. Samples of feature fill were collected for subsequent finer sieving, and/or flotation, in the laboratory.

In the laboratory we examined the recovered specimens and their stratigraphic position before establishing cultural zones. Zones consist of an assemblage of artifacts that represent a reasonably short time, variously defined, within a stratigraphic context. They are not necessarily the same as a one-time occupation, although they could be. In some contexts we could distinguish Early from Middle Ceramic, but in others it had to be as coarse as Middle Archaic. In any event, it is worth emphasizing that zones are created by archaeologists for our convenience in analysis. Therefore, they cannot be compared from one site to another because they are idiosyncratic to each site.

To recapitulate, levels are excavation units, strata represent depositional units, horizons result from soil development processes, and zones are inferred cultural units.

Archaeological Sites

Site 108-15 ME is on the north (left) bank of the Piscataquis River in the Seboeis Stream locality (Figure 2). Positive test pits occurred for roughly 100 m along the terrace and about 10 m back. The bank is currently undergoing erosion. We tested and excavated about 12 m^2 including shovel test pits and 2 x 1m units. Like most sites in the reservoir, fine, silty flood sands overlie till to maximum depths of 1.3 m. We could not recognize any buried soil horizons. Most pits "bottomed out" at around 1 m. The site is capped by a forest soil supporting an immature mixed hardwood and softwood forest. An old access road that runs along the edge of the bank created little disturbance. Behind the elevated bank (levee) the land drops off into a swampy area.

On the basis of artifact distributions we recognize 2 cultural zones. Zone 1, the uppermost, is a Late Archaic component poorly represented at this site. It consists of a number of fire-cracked rocks (FCR), 2 felsite biface fragments, and much of the felsite debitage from the site. It should be noted that the assignment of 2 zones is not based on any readily apparent stratigraphic break. The biface fragments occur in levels 2 and 3 (10-20 cm and 20-30 cm below surface). One fragment, from level 3, is the tip portion only. The other, from level 2, is potentially more diagnostic (Figure 5:c). It consists of a basal portion, apparently fractured in manufacture. One side is broadly notched and could be described as either side-notched or corner-removed. Limited grinding occurs along the convex basal edge. This biface is very reminiscent of specimens from the Sharrow site, described as Laurentian Tradition artifacts (Petersen 1991), as well as from the Narrows site (Cox 1991), and several specimens from Hirundo (Sanger et al. 1977). According to radiocarbon dates and stratigraphic reconstructions, these broad-bladed, side to corner-removed bifaces date from roughly 5,800 B.P. to 4,300 B.P. in central and eastern Maine (Cox 1991; Mack et al. 1998; Petersen 1991; Petersen, et al. 1986; Sanger et al. 1977). The 108-15 biface came from Stratum III (excavation level 2), while Feature 1, in Strata IV and V (levels 4 and 5) was dated to 5930±70 B.P. Although the biface and the dated hearth are separated by a distance of nearly 20 m on the north-south axis of the site, the depositional units at the site appear relatively horizontal in this axis, which is parallel to the river. Therefore, while we cannot be sure the biface stratigraphically overlies the hearth, the chances are good that it does.

Zone 2, a late Middle Archaic component, is concentrated in levels 3-6 (20-60 cm below surface), strata IV and V. It contained the only feature from the site, a hearth consisting of a few scattered cobbles and charcoal in strata IV and V. A conventional radiocarbon assay produced an estimated age of 5930±70 years B.P. (Beta-108016).

Spall tools (n=53) constitute the most common artifact class (Figure 6:e). Most exhibit a round to semi-lunar plan view with some flaking or grinding to produce a convex cutting edge. Some still show signs of cortex. Next in frequency were the ridged hammer stones (n=12) (Figure 4) made of felsite. Other potentially diagnostic specimens attributed to Zone 2 include: 2 celts; a half-channel gouge (Figure 5:a); a stone rod (Figure 5:b); a ground

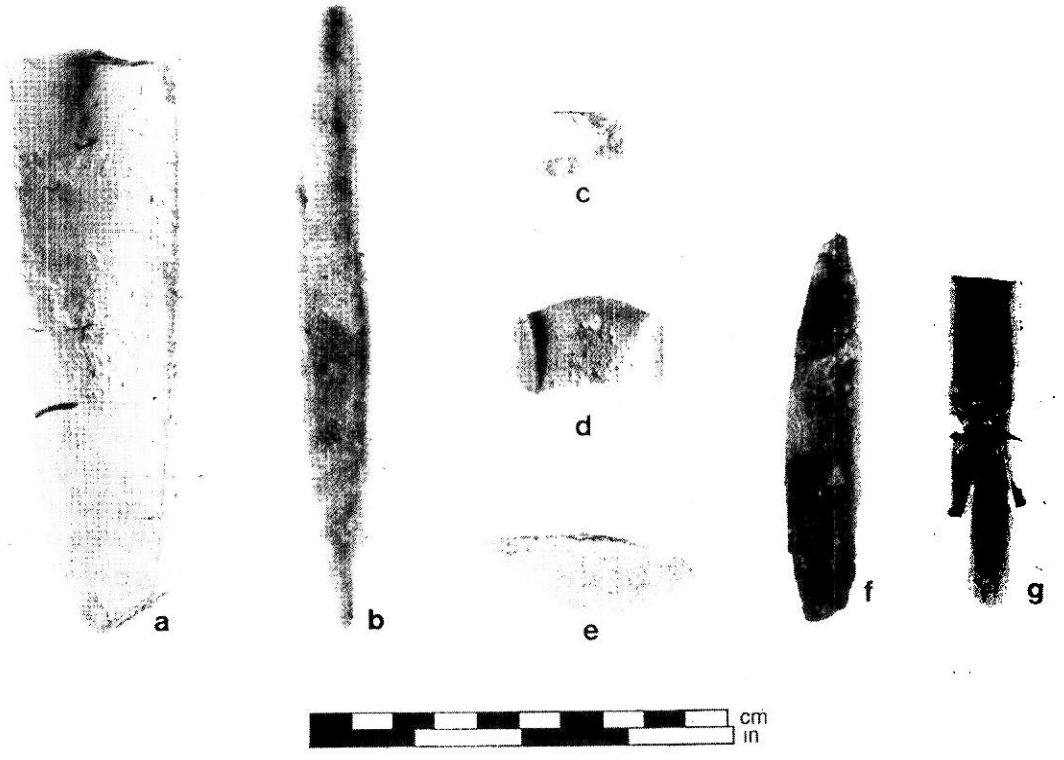

Figure 5. Archaic Artifacts from the Piscataquis River
a-Half-channel gouge; Zone 2; site 108-15
b-Stone rod; Zone 2; site 108-15
c-Basal portion of a notched biface; Zone 2; site 108-15
d-Gouge bit; Zone 2; site 108-45
e-Cutting edge of a ground slate ulu; Zone 2; site 108-15
f-Ground slate point fragment; Zone 2: site 108-15
g-Ground slate point fragment; Zone 2; site 108-45

slate point (Figure 5:f); an ulu fragment (Figure 5:e); choppers (Figure 6:d); and a grooved pebble (Figure 6:a).

Debitage totaled 3,487 flakes (20,225 g), of which 75 % is LGM. The next most common lithology is felsite (22%). Quartz (3%) and chert (<1%) complete the flake assemblage.

Part of the rationale to conduct Phase II research on site 108-15 was a high incidence (for an interior site) of faunal remains recovered in Phase I. Our sample includes 4,373 pieces weighing about 400 g. UM graduate students Jeff Sommer and John Mosher identified turtle, beaver, muskrat, bird, and deer, all animals common in the area today.

Site 108-45 ME is another of the Seboeis Stream locality sites on the north (left) bank of the Piscataquis River, but downstream of 108-15 (Figure 2). Phase I tests and over 9 m^2 of excavation disclosed a site roughly 55 m along the riverbank and 10-15 m wide. A low-lying wet area is behind the site. River erosion has created a

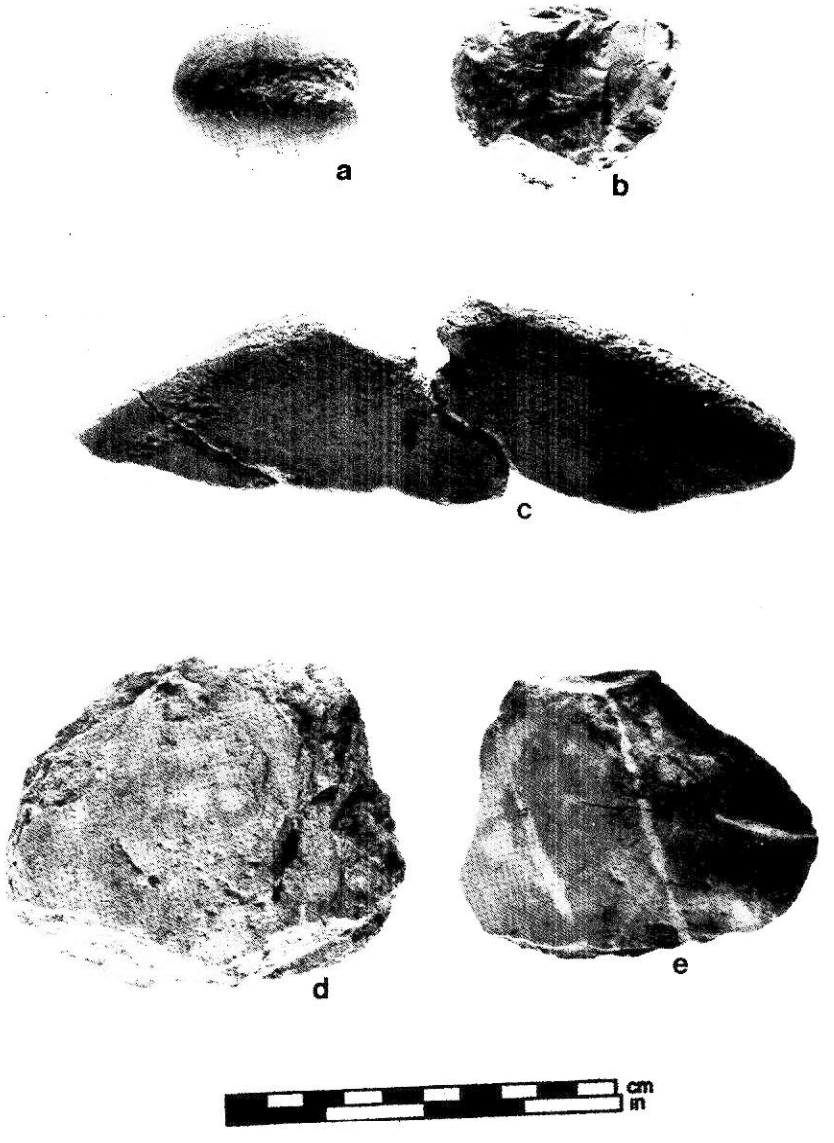

Figure 6. Archaic Artifacts from the Piscataquis River
a-Grooved pebble; Zone 2; site 108-15
b-Felsite ridged hammer stone; Zone 2; site 108-15
c-Low grade metamorphic (LGM) abrader; Zone 2; site 108-45
d-Small LGM chopper; Zone 2; site 108-15
e-LGM spall tool; Zone 2; site 108-15

steep bank. Average depth of excavation up to 1.5 m over till did not include a 30-50 cm cap of gravel fill brought in by the landowner, Mr. and Mrs. Andy Cummings, as a tent pad for their former commercial camp ground. Artifacts occurred to a maximum depth of 1.2 m. Over-bank flood sediments consist of fine silty-sand. No buried, remnant soil horizons were noted.

We divide this site into two cultural zones. Zone 1, the uppermost, is a Ceramic period (unspecified) zone identified on the basis of 6 crumbs of grit tempered ceramics and some undiagnostic biface fragments concentrated in depositional Stratum III (excavation levels 2 and 3). Nearly all chert flakes occur here, as do most of the felsite flakes and the bulk of the FCR. Three of 5 hearth features from the site are assigned to Zone 1.

Zone 2 is a transitional late Middle Archaic to early Late Archaic zone found below level 4 (40-50 cmbs), in Stratum IV and V. Most of the Zone 2 deposits occur at the northern (downstream) end of the site. Two features could be associated. Feature 4, in level 8 (80-90 cmbs), Stratum V, is a 55 x 60 cm, horseshoe-shaped hearth consisting of some FCR and charcoal. This was dated to 5890±70 B.P. (Beta-108019). In and around the hearth we recovered LGM, quartz and felsite flakes, a ridged hammer stone, and some calcined bone. Feature 3, spanning strata IV and V, consisted of large slabs of LGM, some standing vertically, deliberately placed. This feature measured 35 by 42 cm and extended down into level 7 (70-80 cmbs).

The artifact assemblage from Zone 2 is smaller than the corresponding zone at 108-15. To some extent this may be because Zone 2 at 108-45 occurred mostly at one end of the site, so that although the cubic meters excavated was roughly similar, Zone 2 deposits were less. A single biface tip portion with a ground margin could be associated with the top of Zone 2 (level 5). Alternately, it could be from Zone 1. As a specimen it is undiagnostic; however, its potential presence in Zone 2 is worthy of note. All other bifaces and fragments are from Zone 1 contexts (strata II and III—levels 2 and 3).

Zone 2 artifacts also include: a few (n=5) spall tools made of edge-modified LGM; a LGM chopper and miscellaneous LGM slabs; a ridged hammer stone; a rounded hammer stone; a gouge bit (Figure 5:d); an anvil stone; a slate point fragment (Figure 5:g); a rod fragment; and another ground stone fragment, possibly part of an ulu.

A LGM abrader was recovered in 3 pieces (Figure 6:c). Of particular interest is a bi-conically-drilled hole, approximately 7.2 mm in diameter. Although it derived from Stratum III (level 3), normally a Zone 1 context, it is likely a Zone 2 artifact displaced upwards. A fragment of a second flat abrader was also recovered. Perforated abraders occur in some Late Archaic burials sites (e.g., Cow Point [Sanger 1973], and the Overlock site [Robinson, personal communication]). The gouge bit, a confirmed Archaic-age artifact class, also occurred in level 3, thus reinforcing the possibility of Zone 2 specimens being introduced into Zone 1 strata by hearth construction or by natural events.

Just over 900 pieces of lithic debitage, weighing 5,868 g, were recovered. Zone 2 lithics contain proportionately less felsite but more quartz and LGM. Fifty-four of 56 total chert flakes occur in Zone 1 context, something we have come to expect of Ceramic period assemblages in central Maine.

Our excavations resulted in only 12 fragments of calcined mammal (unspecified species) bone, as analyzed by John Mosher.

Site 108-40 ME, the Eagle View site, is another Seboeis Locality station. Located at the north side of the confluence of the Piscataquis and Seboeis Stream, the site had been visited by collectors quite extensively in the past. The site is quite large, roughly 80 x 20 m, and deep: we recovered items to depths of 190 cmbs, at which point we stopped for safety concerns. In order to reach "geologic bottom" in this area we augured down to 340 cmbs, where we located the water table but met no "refusal" deposits. Some parts of the site had only 40-50 cm of sand over till. The overall impression is one of Holocene sand deposits draped over an

undulating Pleistocene till. We excavated nearly 16 m^2 during the Phase II testing in 1997.

We construct 2 Zones at 108-40. Zone 1 is a Middle Ceramic period assemblage located within strata I-III, which occurs in the upper 80 cm. Zone 2 is a small, early Middle Archaic component located in one 2 x 2 m excavation unit below 120 cmbs in Stratum IV.

Feature 4, a Middle Archaic hearth, consisted of a basin-shaped dark stain measuring 55 x 75 cm. It was associated with 2 pieces of FCR, a felsite scraper, 9 flakes (7 felsite and 2 unknown), and calcined bones of bird, mammal, turtle, and beaver. Charcoal from Feature 4 produced an age estimate of 7380±110 B.P. (Beta-108018). Unfortunately, the depth of the component prevented us from gaining a larger sample in our testing phase.

DISCUSSION

Our research in the Howland Reservoir indicates a Middle Archaic presence in several sites, not only the 3 described above. From the town of Howland, on the right bank, a long, full-length grooved gouge was recovered from a plowed field a couple of hundred meters back from the river. A burial may have been involved, although the artifact's owner could provide no addition information. It seems likely that erosion has destroyed any other Middle Archaic sites in the reservoir.

Just outside the reservoir area, but still in Howland, was a red ocher burial site reported by W. B. Smith in his book, *The Lost Red Paint People of Maine* (Smith 1929). In it he illustrated several artifacts, including rods, that Brian Robinson (personal communication) would place in the Middle Archaic time frame.

Wetland Adaptation

Constructions of Middle Archaic cultural activities must be sharply constrained by limitations imposed by the data recovered from sites. Aside from stone tools and a handful of calcined bones, we have little to go on. Our limited research, typical of Phase II testing, did not permit us to get large samples from the sites. However, on the basis of what we do have, we get the impression that the Howland Reservoir sites probably did not function as major campsites where families would spend substantial periods of time, or return to year after year. Site 108-15 has the densest artifact concentration. But exactly what that means is hard to say. Perhaps the small sites imply that people stopped for a short time, en route to other localities, such as the Milo area sites. Yet these too have limited samples available due to the nature of the sites and the exploratory research conducted to date. Nevertheless, it seems likely to us that sites like Sharrow, Brigham and others could have supported quite large gatherings on occasion, in part because of the favorable ecological setting and access to Sebec Lake and the Pleasant River system.

As mentioned earlier, the known Middle Archaic sites in the Howland Reservoir occur around the mouth of Seboeis Stream, our Seboeis locality. In part it may be the result of superior site preservation due to the channeling and overall stability of the riverbanks in that portion of the reservoir. It could also be related to the attractiveness of Seboeis Stream for Native peoples. Seboeis Stream drains a large wetland area that includes South Branch Lake. By ascending the stream it would be possible to access this highly productive ecosystem. However, canoe travel on the stream would depend on water levels as it is quite shallow and rocky in places. Conceivably, people could have camped around the mouth of Seboeis Stream until rains raised water levels in the stream to a point where it could be traveled by canoe.

Middle and Late Archaic sites in central Maine tend to be found in close proximity to wetlands. Is this an artifact of our still relatively small sample? Or are we detecting a pattern of settlement related to exploitation of wetlands, similar to that espoused by Nicholas (1991,1998) for southern New England? Could it also be that changes in the environment over time have either masked or affected the archaeological record in some way,

such that only those sites close to wetlands have survived? We suspect the association is culturally significant; that is, people found it desirable to be in close proximity to wetlands.

Our approach to the study of settlement pattern is straightforward. We begin by assuming that people make choices on the basis of need, tempered by the character of the landscapes available to them. During and after abandonment, the site will continue to be affected by a variety of geological, biological and cultural processes. Therefore, a study of settlement pattern must include the natural environment prior to, and during human activities, followed by an analysis of subsequent events which modify and influence our perception of the cultural record. In general, this model follows one set out by Schiffer (1987), who emphasized natural versus cultural "transformations" of the record. In short, we cannot divorce our analysis of human activities from the environments in which people lived. We must also consider the impacts of natural processes, or transformations, on the cultural record.

In an attempt to learn more about the history of wetland environments, we recently developed new data sets with the assistance of paleoecologist Heather Almquist-Jacobson and her colleagues at the University of Maine.

Mansell Pond is a small (4 ha) kettle-hole pond located in Alton, just south of the Howland Reservoir (Almquist-Jacobson and Sanger 1995). At this size, the pond should be yielding a very local vegetation pattern as revealed through the study of pollen in the sediments. The Middle Archaic falls into our Hemlock forest-phase 1 period (7400-6400 B.P.) and the White Pine forest-phase 2 period (6400-5700 B.P.). These were probably not highly productive forest types for people, because of the low levels of browse available for deer and other large mammals, and the scarcity of nut bearing trees. However, central and eastern Maine possesses a large number of wetlands that dominate the landscape in places.

In order to reconstruct wetland environments a large number of cores were taken from peatlands surrounding Pushaw Lake (also in the Alton area). These revealed changes during the Holocene from open lakes, to cattail marshes, to peatlands (bogs) (Almquist-Jacobson and Sanger 1999). The intermediate stage, the marshes, would have been the most productive areas from a human subsistence viewpoint, as they would have provided fish, fowl, aquatic mammals, and edible plants (Nicholas 1991). As the wetlands evolved into sphagnum bogs their attractiveness for people would have diminished, as the carrying capacity for edible species became reduced or eliminated.

A third component of the story involves water levels. We have known for some time now that water levels in northeast rivers and lakes were probably lower during mid-Holocene times (e.g., Harrison 1989; Webb et al. 1993). From Mansell Pond, a series of 6 cores across the pond resulted in a dramatic story of water levels (Almquist-Jacobson et al. In Review). Mansell Pond is lined with marine clay, which impedes any water flow to surrounding sediments. Just a few meters from the pond, gravel pit operations have produced a surface that is several meters lower than the pond with no signs of water seeping into the pit. There are no streams in or out of Mansell Pond, which makes it ideal for reconstructing water levels in the past due to climatic events. Our research indicates that water levels dropped steadily from 9,000 B.P., the earliest of 29 radiocarbon dates, to a low stand between 8,000 B.P. and 6,000 B.P. This time span encompasses the Early and Middle Archaic. The difference between modern Mansell pond level and the 6,000 B.P. low stand is nearly 6.5-7 m! The pond level rose quite rapidly after 5,000 B.P., when it slowed down, rising faster again by 3,500 B.P. and continuing until the recent. It cannot be merely a coincidence that the history of major flood events in the Penobscot River also reveals a period of renewed flooding after 6,000 B.P. For example, the sedimentation record at Gilman Falls site indicates a period of relative stability, with minimal sediment accumulation, between roughly 7,500 and 6,000 B.P., after which time there is evidence for repeated high flood events (Sanger 1996a).

This water level history would have had considerable impact on Native peoples utilizing the rivers, streams, and other wetland environments of central Maine. Not only would it have impeded water travel, by making already shallow streams even more "bony", but it would also have affected the aquatic species dependent on wetlands. For example, salmonids (trout and salmon) require cool waters and high oxygen contents (Scott and Crossman 1973). Lower and warmer water would result in less favorable habitats. In some cases, prime spawning and nursery habitat could have been eliminated.

In a recent analysis of attempts to revive Atlantic salmon runs in the Penobscot River, Shepard (1995) evaluated the impacts of temperature and water flow. He noted that in the hot summer of 1988 daily average water temperatures reached 27° C. (80.6 F.)—the lethal temperature for adult salmon—for 14 days. Water temperatures of 23° C. will inhibit any upstream migration behavior. In 1988, and then in 1990, there were over 40 days of such water temperatures in the Penobscot River around Orono. During a 10-day hot period from late June to early July 1988, fisheries biologists counted 70 dead salmon out of 200 released in Veazie, just upstream from Bangor. Other tagged fish of the same group were found dead elsewhere, apparent victims of hot water. As Shepard (1995:81) noted, "current mid-summer thermal regime of the main stem of the Penobscot River may represent a serious threat to migrating Atlantic salmon." Still warmer regimes suggest failure for the restoration program.

Low flow rates are also implicated in discouraging the upstream migration of Atlantic salmon. The Piscataquis River is an example where summer flow rates can become too low. Salmon placed in the empoundment above the dam in Howland did not migrate upstream, presumably due to low flow rates (Shepard 1995). Programs committed to restoration of wild Atlantic salmon to the Penobscot River might do well to take notice of past water conditions, and to consider the implications for the future if warmer summers are likely as part of global climate warming.

As noted above, the Middle and Late Archaic periods were characterized by low water levels in the Penobscot River and its tributaries, as well as in Mansell Pond. According to Webb et al. (1993), it was also a period of warmth, sometimes referred to as the Hypsithermal or Climatic Optimum, when average annual air temperatures are thought to have been warmer than today by as much as 2°C, while precipitation was less.

While we are not suggesting that Middle and Late Archaic peoples depended heavily on Atlantic salmon, research into its natural history has revealed the key variables that affect its success. Water temperatures and flow rates are clearly among the critical factors. The Atlantic salmon has received a great deal of attention from biologists because of its reputation as a game fish and highly politicized attempts to re-introduce it into the Penobscot River. Other species have not enjoyed the same degree of attention so we cannot speculate on the impacts of lowered water levels. Timing of runs would be significant; for example, early summer runs of alewifes and shad may not have been affected due to generally higher water levels in late spring and early summer. Atlantic salmon have also been observed in the mouth of the Penobscot early in the season, and this too may be an adaptive mechanism (Shepard, personal communication 1999).

An additional observation based on water levels involves the discovery of any sites originally located by lake shores. If our Mansell Pond data can be extrapolated with accuracy to other lakes and ponds in central Maine, Middle Archaic sites once located at water's edge would have been underwater by the onset of the Ceramic period (circa. 3,000 B.P.) Research on these and other related questions is continuing with the assistance of colleagues at the University of Maine. Until we can shed more light on environmental changes at the appropriate scale, we will have to be cautious when making statements regarding the relationships between site locations and aboriginal settlement patterns.

Now that we have developed some understanding of the lithic technology of the Middle Archaic period for central Maine we have to go beyond to a fuller appreciation of the other aspects of life, including of course, subsistence and settlement patterns. Ceremonial life is known almost exclusively through analysis of mortuary customs. People of the Middle Archaic period in central Maine participated in the distinctive Moorehead burial tradition (Robinson 1996b; Sanger 1973),

Our research in the Howland Reservoir sites may have something to say about the end of the Middle Archaic and the origins of the Laurentian tradition in Maine, a topic that has interested a number of archaeologists; (e.g., Bourque 1995;Cox 1991;Robinson 1996b; Sanger 1975, Sanger 1996a; Sanger et al. 1977; Wright 1995).

THE ORIGIN OF THE LAURENTIAN TRADITION IN CENTRAL MAINE

Howland Reservoir sites 108-15 and 108-45 lend support to a view that the differences between Middle and Late Archaic cultures in central Maine represent only the introduction of certain artifact classes and the lessening in frequency of others. In central Maine, sometime around 6,000 B.P., we see the introduction of ulus, plummets, and broad-bladed bifaces—the so-called Otter Creek type. There is no evidence to date that these arrived together as a complex, or cultural tradition.

At site 108-15 we may have evidence for the beginning of a biface tradition that becomes known as the "Otter Creek" point, named for sites along Otter Creek, Vermont, by Ritchie (1968, 1971). Based on a broad pre-form, and featuring corner-to-side notches, often accompanied by considerable stem grinding (Overturf 1995), bifaces of this genre appear by about 5,800 B.P. at the Brigham and Sharrow sites in Milo (Petersen 1991; Petersen et al. 1986). They may have lasted until at least 4,500 B.P. in central Maine. The specimen from Zone 1 at site 108-15, described earlier, stratigraphically overlies the date of 5930±70 B.P., and therefore may represent another example of corner-removed, broad-bladed bifaces entering the record in central Maine. Note, we are **not** saying Otter Creek points originated along the Piscataquis River. Neither do we suggest this particular specimen is 6,000 years old. Quite frankly, we don't know if there is a single point of origin for Otter Creek points, unless it was in the mind of the late William Ritchie, and we have no independent evidence of the antiquity. But clearly, by 5,000 B.P., and probably older, "classic" Otter Creek points, with deep, side-notches, nearly identical to those found in Vermont, occur in Maine. For example, a series was recovered from the Narrows site in Washington County (Cox 1991), from Sharrow where they may occur as early as 5,000 B.P.(Petersen 1991), and from the Hirundo site in Alton, Penobscot County (Overturf 1995; Sanger et al. 1977). Other sites in eastern Maine and the Maritime Provinces have also produced similar bifaces (Sanger 1975).

At the Sharrow site they occur until approximately 4,500 B.P. (Petersen 1991). Two decades ago, we published comparable dates from the Hirundo site in Alton, Maine (Sanger et al. 1977). Recent excavation and radiocarbon dating has confirmed what may be the end of the large, side-notched point tradition around 4,500 B.P., just a few km downstream from Hirundo at the Bob site (Mack et al.1998). Thus, there are no longer any acceptable grounds for terminating the presence of Otter Creek points in central Maine by 5,000 B.P. In conclusion, the large, side-notched points can be found between about 6,000 B.P. and 4,500 B.P. in central and eastern Maine.

The Otter Creek point has traditionally been the hallmark of the Vergennes phase of the Laurentian Tradition, often to the exclusion of other artifact classes, a habit rightly criticized (e.g., Funk 1988; Robinson 1996a). Ritchie's definition of the Laurentian Tradition is that of a generic cultural adaptation to the northern hardwood forests and wetlands of northern New England, and the St. Lawrence Valley (Ritchie 1965). We feel this remains an appropriate level of abstraction. Attempts to fine-tune the concept through the

identification of cultural phases have created problems. Among the several Laurentian phases Ritchie identified—nearly always from mixed collections, incidentally—was the Vergennes phase, based in large part on collections from Otter Creek in Vermont. This is the only Laurentian Tradition phase that currently makes any sense in central and eastern Maine.

A number of Maine sites contain artifact assemblages that are reminiscent of the Vergennes phase. Yet, as has been pointed out (e.g., Cox 1991; Robinson 1996a; Sanger 1996a), many of the artifacts were here in Maine sites **prior** to the appearance of Otter Creek points. These include ground slate points, stone rods, other LGM-based tools, ridged hammer stones, gouges, celts and, possibly, ulus and plummets. Although at this time we are not aware that the ulus and plummets are any older than about 6,000 B.P. in central Maine, the other classes most certainly have appropriate longevity in the region. Thus, the so-called Vergennes phase in Maine may be nothing more than an indigenous Middle Archaic lithic complex onto which ulus, plummets and Otter Creek-like points were added around 6,000 B.P. Quite possibly, the same comments apply equally well to New York; but, as Funk (1996) has recently noted, the Middle Archaic predecessors of New York Late Archaic cultures have proven remarkably difficult to find for reasons that are unclear.

We suspect that each of these artifact classes has a unique history. In all likelihood they did not pass through time as a tight-knit grouping. Broad-bladed bifaces appear more common in the mid-continent region (Bourque 1995; Funk 1988; Wright 1995), which does not appear to be a likely source for ulus or plummets. Robinson's (1992) Gulf of Maine [technological] tradition best describes a basic lithic pattern that underlies the Early and Middle Archaic of central Maine. Onto this basic stone technology that consisted of LGM tools, ridged hammer stones, quartz scrapers, slate points, gouges and celts, were added broad-bladed bifaces, plummets and ulus.

An in situ or continuity model for Laurentian

These observations contribute to support of a continuity or *in situ* model of cultural development for the interior of central Maine. The continuity model is not the conclusion one of us (D.S.) reached 25 years ago (Sanger 1975), long before we knew of the existence of a Middle Archaic for Maine. Then it appeared as if the artifact assemblage we call the Vergennes phase arrived as complex, the result of a population migration into Maine. Bourque (1995: 242,3) still favors this scenario, which we do not. On the basis of our interpretation of current evidence from Middle Archaic sites, the old migration hypothesis should be discarded in favor of the idea that indigenous populations either developed, or received, new classes of artifacts in the millennium 6,000 to 5,000 B.P.

Acceptance of this continuity model means that arguments over the cultural affiliation of the Moorehead burial tradition assume a different tone. People living in Maine, whether on the coast or in the interior, engaged in red ocher burials practices from perhaps 8,500 B.P. to the end of the Late Archaic. In other words, the Moorehead burial tradition is several millennia older than the Laurentian Tradition of Ritchie (1965) or the Moorehead phase of Bourque (1995), and persists until the end of the latter (Robinson 1996b). It cross cuts a number of culture types, as defined for Maine, in a way predicted by Sanger (1973) many years ago.

In conclusion, another way of thinking about the Laurentian Tradition, as it is currently manifested in central and eastern Maine, might be to consider the Otter Creek point as part of a biface tradition that comes into Maine for reasons yet unknown. But its appearance suggests more than a simple replacement of one biface style for another, because we have no strong evidence of a previous form. If this interpretation is correct, it implies the entry into Maine of both the biface style and an emphasis on biface manufacture. What else may have accompanied the bifaces is unknown, just as we do not understand the reasons for its acceptance in central Maine.

The Middle Archaic-Late Archaic continuity model builds on another, the so-called "two population model" (Sanger 1996b), which posits a cultural adaptation to interior Maine and its wetland environments that was distinct from a coastal cultural adaptation for much of the pre-European period (see also Robinson 1996a). In this model, the idea of a single group of people engaged in coast to interior seasonal migrations— such as those Speck (1940) described for the post European contact period—is rejected in favor of Native peoples adapted to coastal environments and those adapted to the interior.

CONCLUSION

Not that many years have passed since archaeologists speculated on the mystery of the missing Early and Middle Archaic here in Maine (e.g., Sanger 1977). Over a decade of work in the deeply stratified, alluvial sediments demonstrates that people have lived here, probably throughout the Holocene. This does not mean that human population levels stayed constant ever since the first pioneer wandered into what is now Maine. Proving people were here is much easier than defining population numbers however; we know of no way to get at actual population size given all of the assumptions that have to be made. There have been times when making a living in Maine would have been more difficult than others, with subsequent impacts on population numbers. We know that key resource procurement areas, such as wetlands, changed through time from lakes, to marshes, to peatlands (Almquist-Jacobson and Sanger 1999), while significant upland vegetation species underwent variability in terms of species mix (Almquist-Jacobson and Sanger 1995). We also know that water levels were lower (Almquist-Jacobson et al., In Review) and that temperatures were probably warmer (Webb et al. 1993). For people who made their living from hunting and gathering, changes in the environment must have impacted access to and availability of food resources. Unfortunately, the poor preservation of faunal and floral remains from interior Maine makes it difficult to document these changes in archaeological contexts. That does not mean, however, we should uncouple people and their activities from the environment, any more than we should employ environmental determinism.

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REFERENCES CITED

Almquist-Jacobson, H. and D. Sanger

1995 Holocene Climate and Vegetation in the Milford Drainage Basin, Maine, U.S.A., and their Implications for Human History. *Vegetation History and Archaeobotany* 4:211-222.

Almquist-Jacobson, H. and D. Sanger

1999 Paleogeographic Changes in Wetland and Upland Environments in the Milford Drainage Basin of Central Maine, in Relation to Holocene Human Settlement History. In *Current Northeast Paleoethnobotany*, edited by J. Hart, pp. 177-190. vol. 494. New York State Museum, Albany, NY.

Almquist-Jacobson, H.,Dieffenbacher-Krall, A.C., Brown, R. and D. Sanger

In Review An 8000-yr Holocene Record of Lake Levels at Mansell Pond, Central Maine, U.S.A., *The Holocene.*

Berry, H.N. IV

1994 A Lithological Comparison of Prehistoric Artifacts with Local Bedrock, in Sanger et al. *Gilman Falls: A Middle Archaic Quarry and Workshop in Central Maine*, Appendix A, pp 196-218. Report on File, Maine Historic Preservation Commission.

Bourque, B. J.

1995 *Diversity and Complexity in Prehistoric Maritime Societies.* Plenum Press, New York.

Cox, S. L.

1991 Site 95.20 and the Vergennes Phase in Maine. *Archaeology of Eastern North America* 19:135-161.

Scott, W.B. and E.J. Crossman

1973 *Freshwater Fishes of Canada*, Fisheries Research Board of Canada, Bulletin 184, Ottawa.

Dincauze, D. F.

1976 *The Neville Site.* Peabody Museum Monographs. Harvard University Press, Cambridge, Massachusetts.

Funk, R. E.

1988 The Laurentian Concept: a Review. *Archaeology of Eastern North America* 16:1-41.

Funk, R.E.

1996 Holocene or Hollow Scene? The Search for the Earliest Archaic Cultures in New York State. *The Review of Archaeology* 17(1): 11-25.

Harrison, S. P.

1989 Lake Levels and Climate Change in Eastern North America. *Climate Dynamics* 3:157-167.

Mack, K. E., B. Newsom and A. R. Kelley

1997 *An Assessment of the Cultural Resources in the Howland Reservoir: Results of Phase I Investigations.* Report on file, Maine Historic Preservation Commission, Augusta.

Mack, K. E., D. Sanger, C. Quinn and A. R. Kelley

1998 *Phase III Investigations of the Bob Site, Pushaw Stream, Maine.* Report on file, Maine Historic Preservation Commission, Augusta, Maine.

Moorehead, W. K.

1922 *A Report of the Archaeology of Maine.* Andover Press, Andover.

Newsom, B.

1999 *Ceramic Period Archaeology along the Lower Piscataquis River, Maine.* Unpublished Master's Thesis, Institute for Quaternary Studies, University of Maine.

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

Robinson, B. S.
1996a Projectile Points, other Diagnostic things, and Cultural Boundaries in the Gulf of Maine Region. *Maine Archaeological Society Bulletin* 36:1-24.

Robinson, B. S.
1996b A Regional Analysis of the Moorehead Burial Tradition: 8500-3700 B.P. *Archaeology of Eastern North America* 24:95-148.

Sanger, D.
1973 *Cow Point: An Archaic Cemetery in New Brunswick.* Mercury Series 12. Archaeological Survey of Canada, National Museums of Canada, Ottawa, Canada.

Sanger, D.
1975 Culture Change as an Adaptive Process in the Maine Maritimes Region. *Arctic Anthropology* 12(2):60-75.

Sanger, D.
1977 Some Thoughts on the Scarcity of Archaeological Sites in Maine Between10,000 and 5,000 Years Ago. *Maine Archaeological Society Bulletin*, 17: 18-25.

Sanger, D.
1996a Gilman Falls Site: Implications for the Early and Middle Archaic of the Maritime Peninsula. *Canadian Journal of Archaeology* 20:7-28.

Sanger, D.
1996b An Analysis of Seasonal Transhumance Models for pre-European State of Maine. *Review of Archaeology* 17(1):54-58.

Sanger, D., R. B. Davis, R. G. MacKay and H. W. Borns, Jr.
1977 The Hirundo Archaeological Project—An Interdisciplinary Approach to Central Maine Prehistory. In *Amerinds and their Paleoenvironments in Northeastern North America*, edited by W. B. Newman and B. Salwen, pp. 457-471. Annals of the New York Academy of Sciences. vol. 288. New York Academy of Sciences, New York.

Sanger, D., W. R. Belcher and D. C. Kellogg
1992 Early Holocene Occupation at the Blackman Stream Site, Central Maine. In *Early Holocene Occupations in Northern New England*, edited by B. S. Robinson, J. B. Petersen and A. Robinson, K., pp. 149-161. No. 9. Maine Historic Preservation Commission, Augusta, Maine.

Sanger, D., W. R. Belcher, J. Fenton, P. and M. Sweeney
1994 *Gilman Falls: A Middle Archaic Quarry and Workshop in Central Maine.* Report on file, Maine Historic Preservation Commission, Augusta.

Scott, W.B. and Crossman
1973 *Freshwater Fishes of Canada*, Bulletin 184, Ottawa, Fisheries Research Board of Canada.

Schiffer, M.B.
1987 *Formation Processes of the Archaeological Record,* University of New Mexico Press, Albuquerque, NM

Shepard, Steven
1995 *Atlantic Salmon Spawning Migrations in the Penobscot River, Maine: Fishways, Flows and High Temperatures,* Unpublished Masters Thesis, Department of Zoology, University of Maine.

Smith, W. B.
1929 *The Lost Red Paint People of Maine.* Lafayette National Park Museum, Bar Harbor, Maine.

Speck, F. G.
1940 *Penobscot Man.* University of Pennsylvania Press, Philadelphia, PA.

Spiess, A. E.
1990 *Maine's Unwritten Past: State Plan for Prehistoric Archaeology.* Maine Historic Preservation Commission, Augusta, Maine.

Spiess, A. E., B. J. Bourque and R. M. Gramly
1983 Early and Middle Archaic Site Distributions in Western Maine. *North American Archaeologist* 4(3):225-244.

Webb, T. I., P. J. Bartlein, S. P. Harrison and K. H. Anderson
1993 Vegetation, Lake Levels, and Climate in Eastern North America for the Past 18,000 Years. In *Global Climates Since the Last Glacial Maximum*, edited by H. E. J. Wright, J. E. Kutzback, T. I. Webb, W. F. Ruddiman, F. A. Street-Perrott and P. J. Bartlein, pp. 415-467. University of Minnesota Press, Minneapolis.

Wright, J. V.
1995 *A History of the Native People of Canada, Volume 1 (10,000-1,000 B.C.).* Mercury Series, Archaeological Survey of Canada Paper 152. Canadian Museum of Civilization, Ottawa.

SUSQUEHANNA TRADITION ACTIVITY AREAS AT THE WATERVILLE-WINSLOW BRIDGE

Arthur Spiess and Mark Hedden

INTRODUCTION

Archaeological data recovery at site 53.38 during the 1991 and 1992 field seasons ended archaeological work that had begun in the fall of 1987 as part of the planning for a new road and bridge connecting Kennedy Memorial Drive in Waterville with Route 201 in Winslow (Hedden 1994, Hedden and Spiess 1991, Spiess 1988, Spiess et al. 1990) The work at 53.38 completed the definition and excavation of a single-component early Susquehanna Tradition occupation associated with artifacts of the preceding Moorehead phase and/or Laurentian Tradition as a small site overlooking Messalonski stream. The excavations enabled us to complete mapping of concentrations of Susquehanna Tradition stone artifacts around several features (Figures 1 and 2) including fire-hearths that may have defined one or more lodge structures. Paleoindian artifacts and flaking debris were located on the edge of the Susquehanna Tradition occupation, with a single Late Paleoindian point found 130 meters away. This report is rewritten from Hedden (1994), and is a companion report to the overall site description and report on the Late Paleoindian component at the site (Spiess and Hedden 1999).

THE SUSQUEHANNA TRADITION — A BRIEF REVIEW

The Susquehanna Tradition (beginning roughly 4000 B.P.) composed of a chronological series of stone tool assemblages characterized by finely made, broad-bladed projectile points, of other stone and bone tools, and a mortuary tradition that contrasts strongly with those of the preceding cultural group(s) in Maine (e.g., Bourque 1995:97-168). The Susquehanna Tradition had probable antecedents and related cultures along the east coast as far south as the Savannah River (Bourque 1995:244-253). The climate was slightly warmer during the 4th millennium than today, and the forest was a hardwood dominated mixed hardwood-softwood association dominated by birch, beech, pine, oak and a variety of other hardwoods. Fire apparently was frequent circa 4300 to 3300 B.P. Along the coast, the waters of the Gulf of Maine were slightly warmer than at present, and tidal amplitude was lower. Thus, the environment was more similar to that of southern New England than it is today.

Whatever the cause and mechanism, the first centuries of the fourth millennium witnessed the spread of cultural uniformity in stone tool form, possibly in bone tool form and possibly in mortuary behavior across much of eastern North America. The earliest forms of large, broad projectile point associated with the Susquehanna Tradition include the Savannah River point from Georgia, Lehigh and Koens-Crispin points from Pennsylvania and the mid-Atlantic states (Kraft 1986), the Atlantic point from New England (Dincauze 1972), and the Snook Kill and Genesee Point in eastern and western New York respectively (Snow 1980, Funk 1976). The northwestern limits of this cultural unity are southwestern Ontario (Kenyon 1980) and the Satchell Complex of Ohio and Michigan. The northern limit appears to be the St. Lawrence river (Point-du-Buisson 4 and 5, Clermont and Chapdelaine 1982, Plourde 1987) and southwestern New Brunswick (Deal 1985). Contemporary cultures in the Mississippi and lower Missouri river valleys (Nebo Hill Phase, Titterington and Sedialia Phases) were distinctively different, using fiber-tempered ceramics, different lithic styles, and with a tradition of small scale horticulture at least a millennium older (Phillips and Brown 1983).

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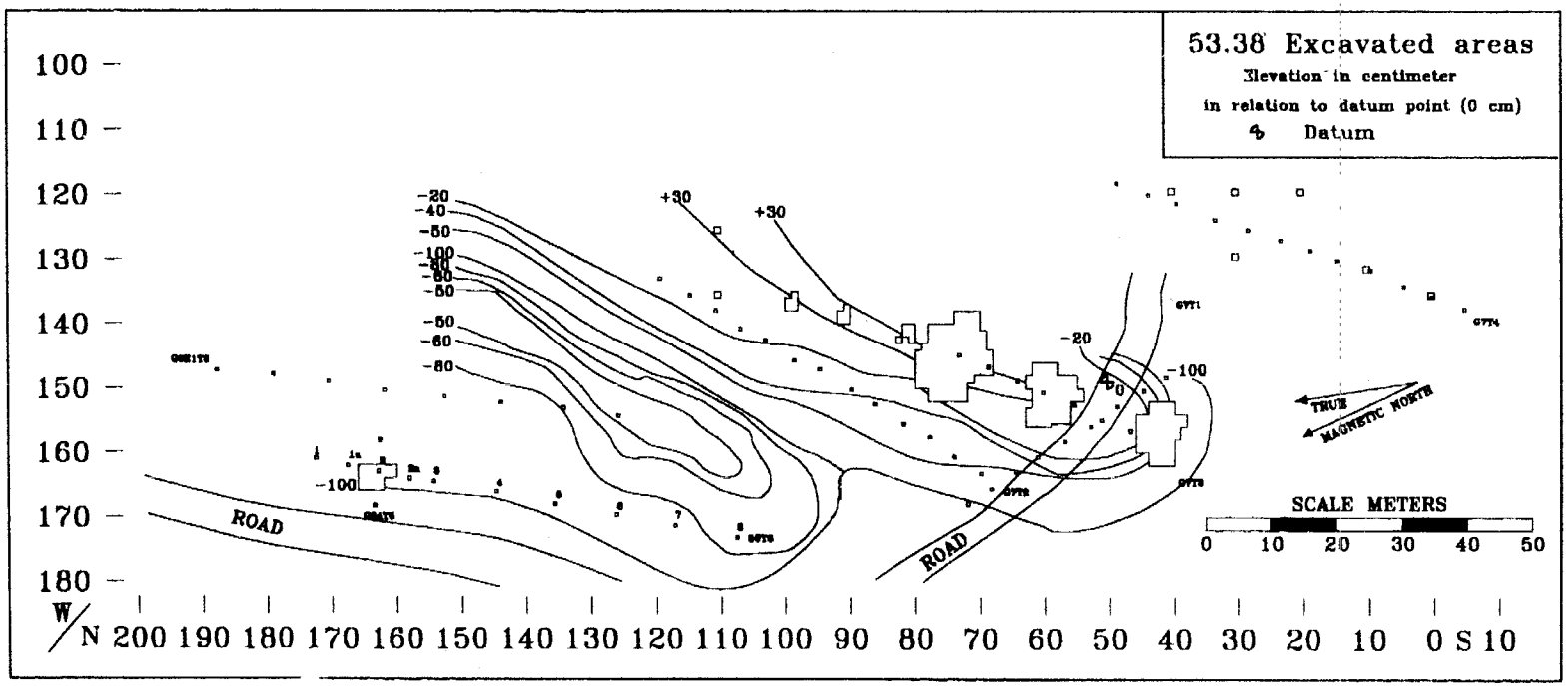

Figure 1. Map of the excavated area at site 53.38. The Susquehanna tradition occupation is enclosed in the rectangle from roughly 35 north to roughly 85 north. The excavated area at 165 north is a Late Paleoindian find spot. Other squares indicate test pits and 1 x 1 m test units.

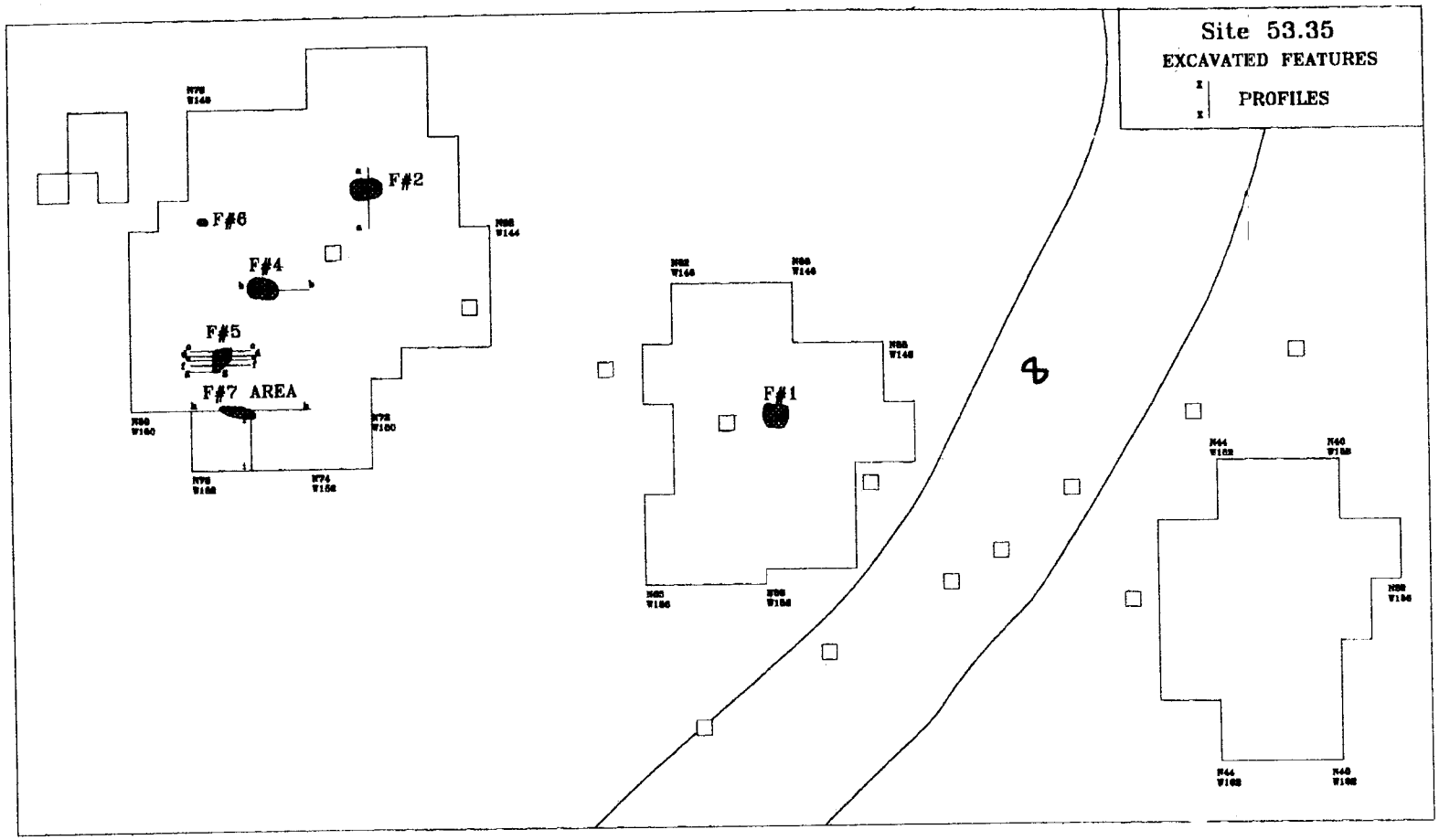

Figure 2. Closer view of the N35 to N85 area of excavation showing the locations of Features 1, 2, 4, 5, and 7, and profile transects through Features 2, 4, 5 and 7. (See Figures 5 and 6 for the profiles.)

In New York and New England the Susquehanna Tradition encompasses a well-defined sequence of phases or archaeological assemblages that clearly intergrade at temporal boundaries (Bourque 1995; Dincauze 1968, 1972, 1974, 1975; Funk 1976; Snow 1980) and reflect coherent change across the region. In eastern New York the River Phase, characterized by side-notched Normanskill Points, is succeeded by the Susquehanna Tradition. The earliest phase of the Susquehanna Tradition is marked by broad bladed, contracting stemmed Snook Kill points. In central and western New York the related and contemporaneous Batten Kill complex, characterized by Genesee points, is the first representation of the Susquehanna Tradition. Snook Kill and Genesee Points often occur together, with Perkiomen points (convex sided, broadly corner notched) a widely distributed minority type that may be contemporaneous or slightly later. In New York, the succeeding Frost Island Phase is marked by slightly smaller Susquehanna Broad points. A hypothetical continuing decrease in overall size and width ends with the Dry Brook Point type (Snow 1980:236).

In New England, large points from the Atlantic Ledges site (Dincauze 1972), and closely related Snook Kill points, are given temporal priority. A parallel trend in decreasing size and width to the New York is postulated, with the Wayland Notched point being an analogue for the Susquehanna Broad point in New York. Slightly smaller and narrower Coburn points end the sequence. Based on dates from New England and New York, the large Atlantic/Snook Kill points made their appearance around 3800 or 3900 B.P., and the smaller Coburn or Dry Brook points disappeared around 3200 or 3100 B.P. However, the exact timing of the sequence and the details of the trend toward smaller points (successional nature or contemporaneity of the point types) are questionable. The Susquehanna Tradition ends in New England and New York around 3100 to 2900 B.P. with the invention/arrival/evolution of a period transitional to Early Woodland, marked by Orient Fishtail points and extensive use of soapstone vessels, then by adoption of cord malleated ceramics.

Comparatively little is known about the general adaptation and life ways of the Susquehanna Tradition, and definitely not enough is known to examine changes over time and space. Although their contemporaries in the lower Mississippi Valley and Midwest knew horticulture, the Susquehanna Tradition is assumed to have had a general hunter-fisher-gatherer adaptation. Nut collecting may have been important. Charred butternuts are reported from the Camelot No. 1 site in New York (Funk and Rippetau 1977), charred hickory, butternut and walnut from the Claude 1 site (Trubowitz 1983) and hickory, acorn and walnut shells are reported from almost every hearth at the Savich Farm in New Jersey (Kraft 1986). Turnbaugh (1975) predicated a major explanatory hypothesis for the spread of the Susquehanna Tradition on the theory that they were focussed on anadromous fish. In a settlement pattern study of the Genesee Valley, Susquehanna Tradition sites are reported in four major physiographic zones, with concentrations around stream-river confluences (Trubowitz 1983). Although some of the sites are located in the river bottom there, and in the Hudson Drainage as well (Funk 1976), by no means are all sites tied to the riverbanks. The Ausable River sites reported by Kenyon (1980) contain both riverbank and upland sites, two of the former located on sandy soils. Snook Kill sites in eastern New York are mostly in river-related locations, which Ritchie (1980:136) implies that water transport was primary. Some of these Snook Kill sites are large, with artifacts and features thinly scattered over four acres or so. In Maine, the vast majority of Archaic habitation sites are located on water shorelines. A number of Susquehanna sites, however, are located well away from water. Thus, a diverse and poorly known set of economic factors, including hunting, fishing and nut gathering among others, might account for the Maine pattern.

Throughout the Northeast, most Susquehanna Tradition assemblages are made on local rhyolite lithic materials, or lithic materials moved over short

distances (less than 100 km). There is little evidence of long-distance trade in lithics, despite the geographically widespread similarity in artifact styles that change in parallel over time. There is also a widespread pattern of mortuary ceremonialism which includes frequent use of cremation of the deceased and, usually, of a tool kit to accompany the deceased, cremation in separate features (crematoria) from the actual interment pits and, often, grouping of the crematorium and interment pits into "cemeteries." This consistent mortuary behavior is found as far south as the Savich Farm in New Jersey (Kraft 1986) and as far north as Maine (Bourque 1995). We now turn our attention to several major research questions of broad geographic applicability in the Northeast.

Most researchers recognize the close relationship among assemblages assigned to the Susquehanna Tradition, and the contrast with its predecessors. So what is it? Is it a group of cultural traits initially showing similarity over broad geographic area caused by rapid population spread and replacement (whole or partial) of preexisting populations? Successful competition with preexisting populations must mean there was some difference in adaptation, which would be reflected in tool kit (evidently so), settlement pattern, subsistence, and group-identity-maintenance mechanisms such as funerary ceremonialism. Or, is the Susquehanna Tradition a widespread and successful mosaic of traits that were generally advantageous but were adopted with locally variable acceptance by indigenous populations? In that case, we might find geographic and temporal variability in trait distribution. Unfortunately, a reading of the literature from various subregions of the Northeast does not help. In the mid-Atlantic States, Late Archaic/Early Woodland components are rarely well separated, and cultural definition is a mess (our reading of Custer 1984, Kraft 1986). After examining a record rich with well-stratified assemblages in New York, Funk and Rippetau (1977) assume that diffusion, rather than migration, was the primary mechanism of trait movement. Dincauze (1975) says that subsequent to initial intrusion, the Susquehanna Tradition developed "in place, while maintaining close ties with the homeland", so that a single "cultural province" extended from Pennsylvania to southern Maine during most of the fourth millennium.

In viewing the large, well-made bifaces that characterize the early portion of the Susquehanna Tradition, Cross (1990, 1993) feels that craft specialists made the preforms. Biface production was separated between a specialist producer who made the preform and a consumer who may have retouched the haft portion of the stone biface to fit the "consumer's" handle for the piece. Therefore "biface production carried social meaning that extended beyond creating a sharp edge" for a point or knife (Cross 1993:80). In this view, part of the spread of the Susquehanna Tradition might have been the diffusion of a way of organizing how stone tools were made.

Bourque (1975) and Sanger (1975) both strongly endorse the idea of migration and population replacement in Maine with the advent of the Susquehanna Tradition. Sanger (1975:69) ascribes the migration to better preadaptation to environmental changes. Sanger and Bourque (1986) and Bourque (1995) reendorse the migration hypothesis for Susquehanna Tradition arrival in Maine, and raise the possibility that the new arrivals were moving into sparsely occupied or abandoned territory (abandoned by the Moorehead Phase circa 3800 for reasons unknown). Snow (1980) states that the Susquehanna Tradition is a "point tradition", not a whole cultural system persisting over five centuries. He hypothesizes (Snow 1980:248) that migration was not the cause of the spread of broadpoints generally, but that migration does fit the specific case of arrival of the Susquehanna Tradition in northern New England. Apparently, careful chronological control, comparison and contrast of material culture traits, and examination of subsistence and settlement patterns over much of eastern North America will be necessary to resolve this dilemma. We now turn to material culture traits and dates.

Early definitions of the "broadspear"

assemblages in Pennsylvania (Witthoft 1953) appear to be based upon mixed assemblages of more than one Susquehanna Tradition phase. Subsequent work has clarified the picture. Atlantic Phase points (Dincauze 1972) "are large, bifacially flaked stone cutting and piecing tools with wide, distinct shoulders above a tapered or straight stem." "Mansion Inn blades" (Dincauze 1968) have corner removed bases that exhibit a less defined stem. "Wayland Notched points" (Dincauze 1968) are side notched. These large bifaces are accompanied by several classes of tools often made on broken or reworked points: drills or awls, bifacial stemmed scrapers with convex bits, and some scraper-shaped pieces used as strike-a-lights (with pyrites in fire-starter kits). An identical group of reworked projectile points is reported for Snook Kill sites (Ritchie 1980:137-8), including stubby, reworked stemmed points with extreme wear on a blunt end, also strike-a-lights. Ovoid biface-scrapers are part of the Atlantic Phase assemblage (Dincauze 1976). Unstemmed, or slightly contracting stemmed, point preforms, called "Boats blades" by Dincauze (1968), are common. Snook Kill traits include Snook Kill points, scrapers and drills made on reworked points, ovate and stemmed knives, simple end scrapers, celts, plano-convex adzes, shallow-lipped gouges, choppers, and pebble hammerstones (Funk 1976:255). Axes tend to be fully grooved or three-quarter grooved, with distinctively deep grooves. The drills exhibit a long, narrow, diamond-cross section tip, with a variety of basal forms including an "old point" base, a simple rectangular base, and a T-shaped base. The drill, gouge, adze, and celt forms appear to accompany Susquehanna Tradition assemblages throughout the sequence, although there may be subtle chronological changes in these forms that are not yet recognized. One basis of Susquehanna Tradition technology seems to be production of a variety of tools on bifaces, including the diagnostic points and knives, but extending to reuse of broken bifaces for scrapers and strike-a-lights, and some extreme retouch into drills. Animal effigies of flaked stone have also been reported (Funk and Cox 1987). Winged, perforated atlatl weights are rare, but might be an Atlantic Phase trait: one was recovered from the Atlantic Ledges site (Dincauze 1972), and one from Stratum 3: Lower Zone at the Neville site (Dincauze 1976). Soapstone bowls are apparently absent from the Atlantic Phase/Snook Kill assemblages, but appear in Frost Island assemblages in New York. (Soapstone bowls continue into the later Orient Phase).

The Susquehanna Tradition occupations at the Turner Farm, designated *in toto* as Occupation III, must, on typological ground and on the basis of radiocarbon dates, fall early in the Tradition sequence. Bourque (1995) believes that Occupation III covers a 2 to 3 century span of time contemporary with Dincauze's Atlantic and Watertown phases. The Turner Farm trait list is the best currently available for the early Susquehanna Tradition in northern New England, although there is some hint of slight stylistic change within the few centuries represented there. Flaked bifaces dominate the Occupation III artifact sample (Bourque 1989 summarized in this paragraph), of which seven types are defined. (1) "Blades" are thinned preforms with straight, convex or concave bases, longer and wider than most finished tools, mostly conforming to Dincauze's Mansion Inn type. (2) "Boats blades", after Dincauze's definition, are unusually long with pointed or nearly pointed bases. Bourque does not think they are preforms for other tool types, although evidence for their use is inconclusive. (3) "Tapered stemmed blades" have stems with concave margins of uniform radius from blade base to stem base. These are among the thinnest bifaces in the assemblage. Evidence of use and wear is confined to some stem edge dulling on a minority of specimens. These points were included within Dincauze's Watertown blade type. (4) "Stemmed points" are finished bifaces with stem polish, blade breakage and retouch. This group is differentiated from tapered stem blades by the compound curvature of the stem margin. Stemmed points come in three varieties: slightly contracting stem, parallel stem, and expanding stem. Bourque says that his contracting and straight-stemmed

points are closely similar to Snook Kill and Atlantic blades. Expanding stemmed points more closely resemble Susquehanna Broad and Wayland and Dudley notched types, although the Turner Farm samples are larger than all Dudley notched specimens reported by Dincauze (1972). Contracting stemmed points are thicker than the other two varieties of point from the Turner Farm. All points are shorter, narrower and thinner than blades or tapered stemmed blades. (5) Notched points occur as a minority type, with clear, narrow corner or side notched basal modification. (6) Drills are extremely narrow bifaces with expanded bases. Many bases resemble stemmed point basal forms. The extreme length of unbroken drills demonstrates that they were not merely retouched points, however. (7) Gravers are included by Bourque (1995), although they are not bifaces as described: unifacially retouched, small thin flakes. Pecked and ground stone forms include gouges, adzes, large grooved axes usually exhibiting a lip bordering the groove, pendants, whetstones of soft abrasives, and beveled cobbles. This last class is composed of elliptical sub tabular water-worn pebbles with abraded margins. Bourque speculates that they functioned to dull biface edges in preparation for retouching.

A distinctive bone tool technology may accompany the Susquehanna Tradition stone assemblage. It is generally poorly reported, the Turner Farm sample (Bourque 1995) being an interesting exception. Basic forms and even manufacturing techniques differ between Occupation III at the Turner Farm and the preceding Occupation II. (Susquehanna Tradition bone tools are ground into form, while Occupation II tools are, initially at least, scraped into shape.) The vast majority of bone tools and artifacts from Turner Farm Occupation III were recovered from burials. These included incised cervid longbone diaphysis pieces with well-defined parallel incisions on the inside of the marrow cavity. These and other grave inclusions (small rounded bone pieces) Bourque suggest may have been gaming pieces. Multiple examples of ground turtle carapace were recovered. Two examples were in association with multiple small, rounded stone pebbles; it seems likely that turtle shell rattles were not a rare grave inclusion (Bourque 1995). Other bone artifacts include a bone gouge and bone harpoons. Twelve small, cylindrical copper beads are also reported (Bourque 1995).

Although the Susquehanna Tradition is a construct recognized by most contemporary archaeologists in the Northeast, clearly much basic stone and bone artifact attribute description and comparison has yet to be done. Full reporting of assemblages of limited chronological span has only begun. Although he board outlines of chronological change within the Susquehanna Tradition are suspected, they exist currently at the level of hypotheses without extensive testing and with some disagreement among the profession.

SITE 53.38 ENVIRONMENTAL SETTING AND SITE LOCATION

The site (53.38) is (was) located near the west bank of the Kennebec River, on a high terrace overlooking Messalonskee Stream, a major tributary of the Kennebec River. (Present tense is used for site description in much of the report, even through the site no longer exists.) Site 53.38 is located on a sandy area of low slope situated above the Union Gas Dam in Messalonskee stream. Most of the site is relatively flat (±1 meter relief), in a series of low ridges. The ridge tops are well drained, but the low areas between them are wet seasonally and damp after heavy rains. Field and laboratory methods of our work at the site were presented previously, as well as a more detailed site description (Spiess and Hedden 1999).

The project area lies near the northeastern limit of Fobes' (1946) Central and Southwestern Interior (Maine) Climatic Area. The project area was characterized by an average of 140 frost-free days between 1930 and 1944 A.D. The Central and Southwestern Climatic Area has the highest summer temperatures in Maine. Mean January temperature is approximately 16° F. The area is the northeastern

limit of many tree species, including white oak, chestnut and shagbark hickory. Thus, the project area is on the northeastern limit of the area in Maine most likely to have been able to support prehistoric agriculture, or a hunter-gatherer economy heavily reliant on nut trees or other plant species more common in southern New England. Mixed white pine and red oak is the dominant vegetation today in the project area, the pine more frequent on sandy soils and red oak more frequent on silty, dry soils. Charcoal identification from prehistoric features at site 53.38 does not contain any evidence of horticulture. The presence of charred acorn parts in a hearth feature indicates some use of the potential nut crop at the site.

RESEARCH BACKGROUND—
Susquehanna Tradition

Modern professional archaeological work in the Waterville-Winslow area began in the mid-1980s with an archaeological survey for the Benton Falls hydroelectric project on the Sebasticook River (Bradstreet and Duffy 1985), and a small test of site 53.20 by Bradstreet and Spiess (Spiess 1988; Spiess et al., 1990). Site 53.34 in the Benton Falls project area, extending approximately 300 m along the river bank, yielded a significant Susquehanna Tradition component (Funk and Cox 1987), probably of the Atlantic phase. Susquehanna Tradition activity at the site may have focussed on lithic reduction of locally available Kineo rhyolite river cobbles.

In 1987 and 1988, test excavations were completed under the former location of the Fort Halifax blockhouse, while additional excavations at Fort Halifax continued in the 1989 and 1990 seasons (Cranmer 1991). This work has yielded significant historic archaeological results and the discovery of stratified deposits of Ceramic and late Susquehanna Tradition occupations (Spiess 1989, Cranmer 1990). Well-stratified Terminal Archaic occupation layers were dated 3160±60 (Beta 29809), 3130±90 (Beta 29810), and 3100±80 (Beta 30913) and 3280±80 (Beta 24688) on charcoal from well-formed fire-cracked rock hearths. Susquehanna Tradition drill fragments of the diamond-shaped cross section form were found in these levels. The only diagnostic biface, ex situ, was a broadly side-notched late Susquehanna Tradition form similar to those from the Smith site at Williams Dam (Petersen 1991a).

In 1989, a survey of the Fort Halifax Reservoir on the Sebasticook River (immediately upstream from the site of Fort Halifax) was undertaken by the University of Maine at Farmington Archaeology Research Center under the general supervision of James B. Petersen. The survey (Bartone et al 1992) located a minimum of 30 aboriginal sites with evidence of occupations from the Early Archaic to the Contact periods (ca. 7000 B.C.-A.D. 1750). Six of these sites had Susquehanna Tradition components including both Atlantic phase (early) Susquehanna Tradition and late Susquehanna Tradition broadly side-notched points at various sites, and later Orient-like points. Diagnostic drills and obliquely-grooved axes were also found.

Further upstream on the Sebasticook River, survey behind the Burnham dam located nine archaeological sites (Wilson et al. 1994, Wilson personal communication 1999). At least two of the sites have Susquehanna Tradition components. Site 54.1 yielded a charcoal rich pit feature associated with a Susquehanna biface tip and radiocarbon dates ranging between 3715±60 and 3105±50 B.P. The pit may have been dug as an intentional modification of a spring. Subsequently, the amateur discovery of prehistoric wooden stakes used to construct a series of fishweirs in Sebasticook Lake has been radiocarbon dated to between 5000 and 1700 B.P. (Petersen et al., 1994), which includes the time period of the Susquehanna Tradition.

The initial Waterville-Winslow Bridge survey work occurred coincidentally with the work at Fort Halifax; and by the end of 1989 Phase I testing had been completed where called for at the four new sites (53.36, 53.37, 53.38 and 53.39) located in the project area (Spiess et al 1990). These sites included a probable Late Paleoindian component and a significant Susquehanna Tradition occupation at 53.38 near Messalonskee Stream, the subject of this report. Investigations at other sites turned up a

scatter of non-diagnostic materials along abandoned high channels of the east bank of the Kennebec River (53.39 and 53.37) as well as the large deeply stratified but sparsely occupied Ceramic period site with excellent contextual preservation of features on the present levee of the east bank of the Kennebec (53.36).

In the summer of 1989, a professional survey behind four dams on the Messalonskee system was initiated by the University of Maine at Farmington (Ferreira and Petersen 1990). The Messalonskee survey was completed during the 1990 season and located 33 previously unknown sites. Phase II excavations in 1990 and 1991 established a series of single component occupations beginning in the Early or Middle Archaic (ca. 7000-4000 B.C. through the Late Ceramic or Contact periods (A.D.1000 -A.D.1750 [Crock 1992:53]). For some reason, Archaic occupations were more prominently represented than those of the Ceramic period. Crock suggests that the higher water levels resulting from dam construction may have drowned later (Ceramic) sites while restoring the Messalonskee to stream levels approximating heights current during the Archaic periods.

A Phase I survey of the Edwards Dam impoundment between Waterville and Augusta identified 41 sites with prehistoric cultural material on the immediate riverbank, some with indications of intact occupations on higher terraces, as well as 4 sites in the impact area that have or may have intact remains (Will 1992). The minimum cultural period span of the sites in the Edwards impoundment is from the Late Archaic (ca. 5000 B.P.) through the Contact period. All of the site surveys cited contribute material evidence to trace back in time and fill out the historic reports of extensive aboriginal activity along this section of the Kennebec River Valley (Will 1992:11). Two sites in the Edwards impoundment have yielded Susquehanna Tradition components. A stemmed biface base, fire-cracked rock and dense concentration of rhyolite flakes was discovered eroding out of the bank at site 37.40. Testing behind the erosion bank failed to find intact material. Site 38.53, on the other hand, yielded two occupation levels deeply buried in river alluvium. Several features at 95 to 120 cm depth were radiocarbon dated to 3070±80 (Beta 81297) and 3030±70 (Beta 81298). These were associated with hardwood charcoal, calcined mammal bone and fire-cracked rock, but not stone or ceramic artifacts. Features located at 170 and 220 cm depth returned dates of 3490±70 (Beta 81299) and 3970±70 (Beta 81300) (Will et al. 1995:44-54), indicating that the entire Susquehanna Tradition sequence might be represented at the site. Again, hardwood charcoal and calcined mammal bone were associated.

Thus, site 53.38 falls in an area of the Kennebec River and lower Sebasticook River with multiple Susquehanna Tradition occupations, spanning the entire fourth millennium B.P., and probably indicating continual use of the area throughout the span of early and late manifestations of the Susquehanna Tradition.

THE MAIN SUSQUEHANNA TRADITION OCCUPATION AT 53.38

As a result of Phase II testing, we defined the Susquehanna occupation at 53.38 as running along a low ridge trending away from the steep bank that drops to Messalonskee Stream. We excavated contiguous test units outward from previously located concentrations until demonstrable prehistoric artifacts, flakes or FCR of any kind were no longer being recovered. This procedure uncovered a sequence of 3 hearth features (F2, F4 and F5) set in a line about 3 meters apart in the center of a large oval scatter of lithics ranging from artifacts to debitage to FCR (Figures 2 through 4). Two features described below (F6 and F7) appear to represent shallow wall trench segments, possibly to prevent surface water seepage into a large oval area ca. 12 meters long by 8 meters across. This area may have contained a single structure or "lodge." About 6 meters south of the lodge, Feature 1, a shallow fire-hearth with a concentration of many flakes and FCR, represents a satellite activity area which may or may not be contemporary with the lodge complex. In the sections below we

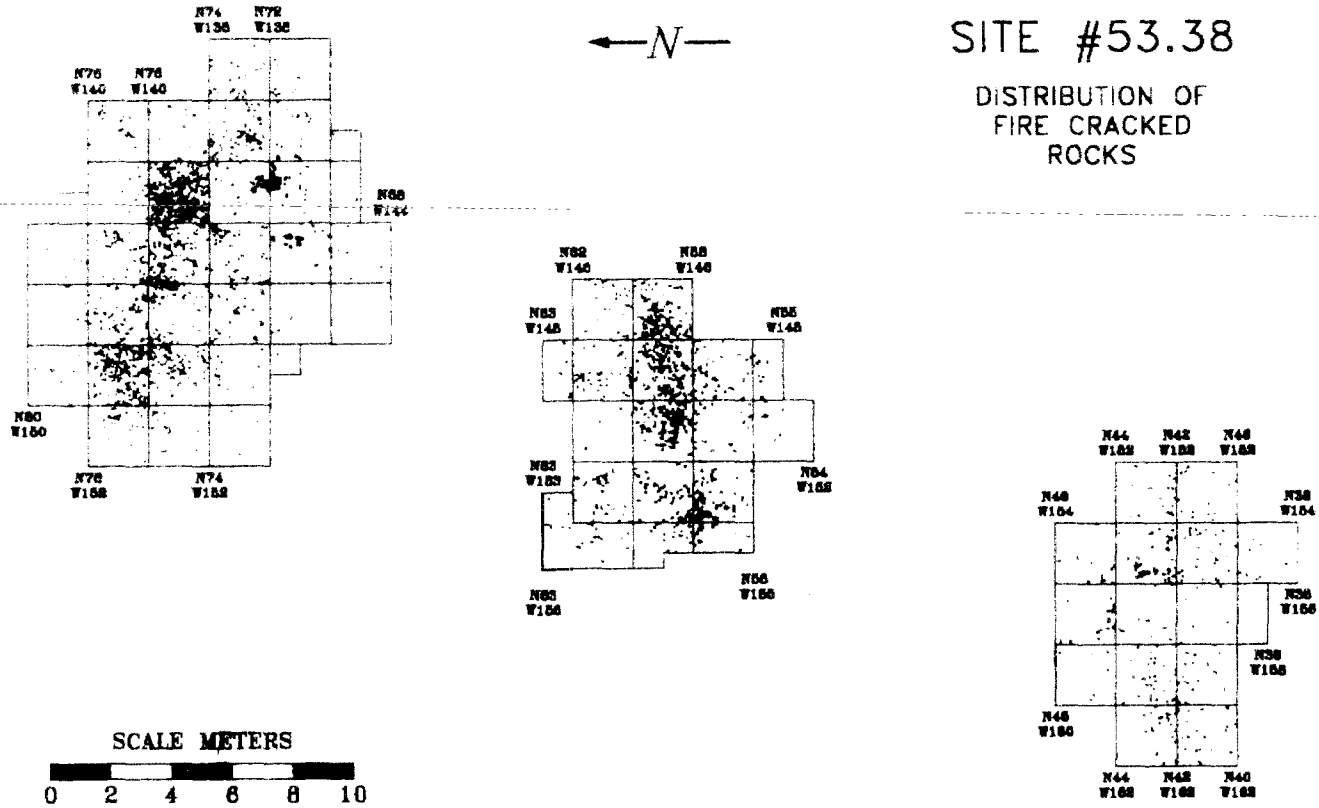

Figure 3. North 38 to N80 areas of excavation with piece-plotted fire-cracked rock distributions.

describe in detail the features, lithic artifacts, debitage and FCR recovered.

Features

Seven features, all associated with the Susquehanna Tradition locus, were identified at 53.38 and are described in further detail in Table 1. Feature 1 was a discrete concentration of FCR associated with numerous flakes and some Susquehanna biface fragments. The feature was probably an "outside" work area, most likely but not necessarily contemporary with the possible lodge structure 10 meters to the north. Features 2 and 4 through 7 were all associated with the possible lodge structure from N70 to N78 (Figures 5 and 6). Features 2, 4 and 5 were interior fire hearths set in a line about 2.5 m to 3 m apart with F4 the central hearth. F6 and F7 have a "wall trench" profile. The lack of cultural material in the Feature 6 fill is consistent with a trench feature excavated early in the occupation of the area (i.e. before occupation debris had been scattered on the ground surface).

Susquehanna Tradition Tools

Complete Susquehanna Bifaces

Six fragments of Susquehanna bifaces were found at 53.38 that could be rejoined to form 2 complete specimens (Figure 7). Both specimens are large, thin Atlantic phase broadspears with contracting stems (Table 2). Both are examples of what Dincauze calls Mansion Inn blades (Dincauze 1975). Both bifaces have a slightly asymmetric plan with one shoulder coming to a more acute point or ear than the opposite shoulder. Both specimens feature invasive retouching at the point of transverse fracture that indicates breakage occurring while

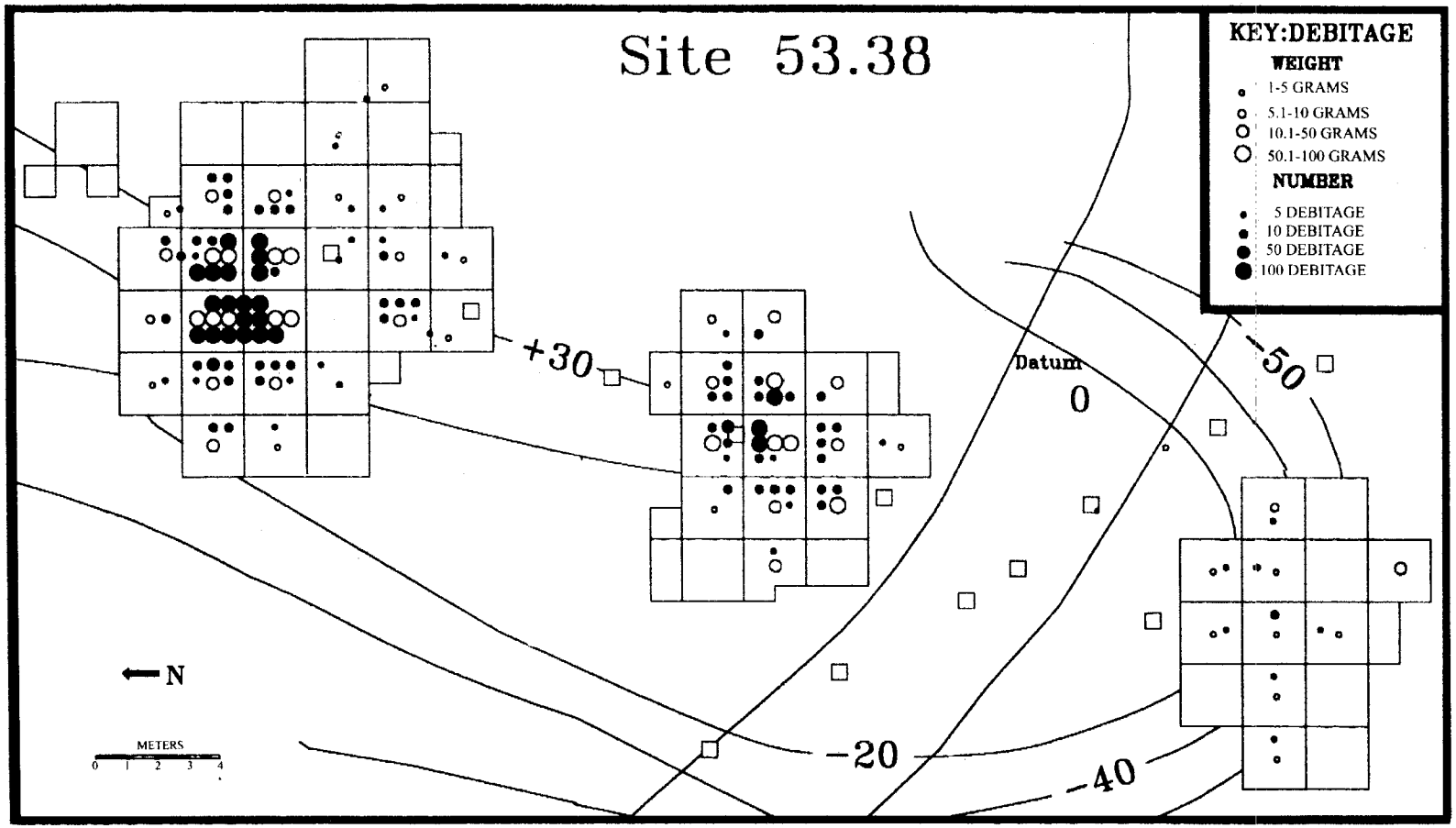

Figure 4. Distribution of debitage by number and weight in each square. Open circles indicate the weight of debitage in each 2 x 2 m square. Dark circles indicate the number of flakes in each quadrant (1 x 1 m) of each square. Dark circles located on square or quadrant boundaries indicate debitage recovered from balks or feature fill or other contexts that did not fall into one quadrant or another.

Table 1. List of Features.

Feature 1. A shallow circular basin-shaped hearth 60 cm. across, located in the southeast quadrant of N58W152. Over 130 densely packed fire-cracked rocks were recovered from this feature, extending from 10 o 54 cm below the surface.

Feature 2. A shallow circular pit filled with FCR, located in the SW quarter of the SE quadrant of N72W142. First identified by a cluster of 6 small FCR around a flat slab of local phyllite bedrock 15 cm across at 18 cm depth. FCR continued to appear below the flat slab to a depth of 28 cm, and extended southward over a 30 cm diameter area. No charcoal was noted in the feature fill. The dark stain of a plow furrow ran just to the east of the flat slab, and the plow had evidently scattered some FCR to the northeastward.

Feature 3. A half-rotten historic fence post, 3.5 cm in diameter, located at N70.20 W143.03, with an iron nail associated with its eastern side.

Feature 4. Large (90 cm NE/SW by 50 cm) oval, basin shaped fire hearth, running from N74W146 northwest quadrant to n74W148 southeast quadrant. The upper level of the feature was marked by 2 large cobbles (15 cm across) of fire-reddened granite among shattered local phyllite slabs. The phyllite slabs often set vertically (on end or side, rather than flat) as we uncovered them, extending to a depth of about 25 cm below surface. The larger FCR pieces were concentrated in the northeastern end of the pit area. The lower fill in the pit was characterized by dark yellowish brown (10 Y. 4/4) medium-coarse, gritty sand with charcoal, debitage and smaller pieces of FCR, extending from 25 to 38 cm below surface. Charcoal from the lower fill returned a radiocarbon date of 3520±90 BP (Beta-67015).

Feature 5. A large, oval basin-shaped pit oriented NW/SE, 1.3 m long by 0.9 m wide. First noted as a cluster of FCR, flakes and charcoal in a dark yellowish brown (10 Y. 4/6) stain centered at N76.95 along the west wall of W148 at 18 cm depth below surface. The concentration of FCR and feature fill was 32 cm long by 30 cm wide (N/S) at that depth. The feature fill stain *increased* in diameter to a depth of 35 cm. Debitage in the fill was recovered only to the depth of 25 cm. Apparently the upper portion of the basin had been steep-sided, and sterile (non-feature material) collapsed in around the margins of the feature after abandonment.

Feature 6. A circle of dark brown (10 YR 4/6) feature fill with chunks of charcoal, 18 cm in diameter, encountered at 22 cm depth centered at W143.62N77.43. Bits of charcoal continued to a depth of 30 cm below surface. A north-south profile shows an asymmetric basin-shaped pit with a steep wall to the north and a low, shallow slope to the south. No cultural material was recovered in the fill, but flakes and FCR were concentrated within 20 cm to the south of the feature in yellowish brown (10 YR 4/6) silty sand. No flakes or FCR were recovered immediately to the north of the feature. We interpret this feature as a "wall trench," or some sort of drainage or architectural feature associated with the wall of a structure. We presume that the outside of the structure is to the north, and inside to the south.

Feature 7. Dark yellowish brown (10 YR 4/6) stain in fine silty sand containing a scatter of FCR and flakes, extending obliquely from SW to NE across the southeast quarter of N76W152 and the southwest quarter of N76W150. Feature 7 is located a little over a meter west of Feature 5. A profile on the N76W150 west wall shows a trench profile with a steep slope to the northwest and a more shallowly rising slope to the southeast. Flakes and FCR were not found immediately to the northwest outside of the feature. We interpret this as another "wall trench" with a steep outside feature wall and gradually sloping inside feature margin.

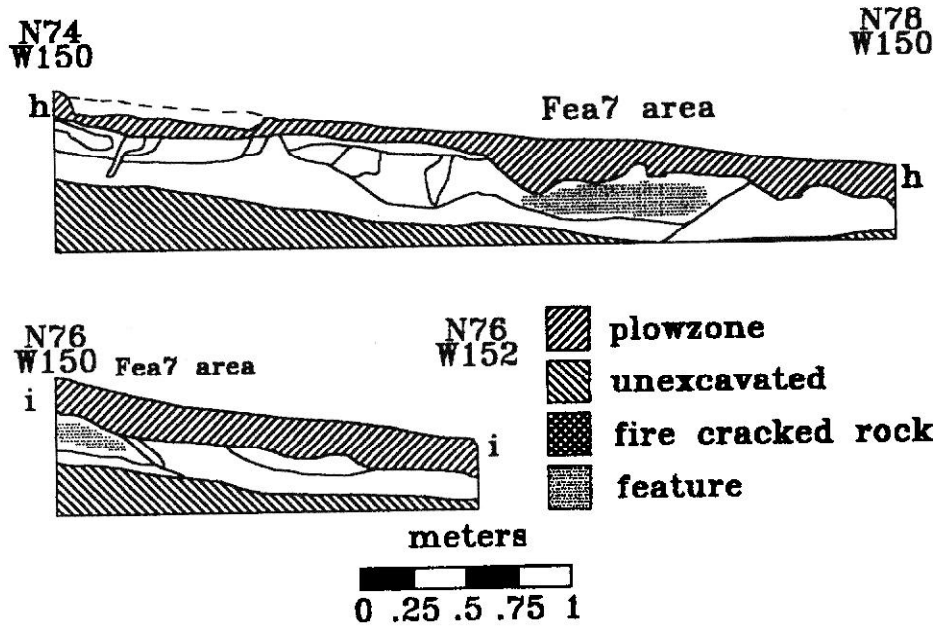

Figure 6. Profiles of Feature 7.

Figure 7. Susquehanna tradition bifaces from site 53.38: left 671/1749/1748; right 26/47/59. Biface tip 673 center.

Artifact #	Weight gr	Length	W1	W2	W3	W4	Th 1	Th 2	W1/Th 1 Ratio
26 47 59	26.8	87.0	34.1	45.3	27.1	13.1	7.1	9.4	4.8:1
671 1749/ 1748	22.1	78.6	32.0	39.4	16.0	14.0	7.1	8.5	4.5:1

Table 2. Complete Susquehanna tradition bifaces, each refit from three pieces. Four widths are given for each specimen: W1 is taken at that point midway between the tip and shoulder; W2 is taken at the shoulder; W3 is the width of the stem just below the shoulder; and w4 is the width of the proximal end of the stem. Thickness 1 is measured at the mid-point of the specimen, where W1 intersects the longitudinal axis. Thickness 2 is measured at the point where W2 intersects the longitudinal axis. Measurements are in

piece is a low lump just distal to the basal large flake removals. It seems logical that part of the next generation of resharpening or reuse of this piece was to have incorporated a thinner base, and that the piece broke during the attempt.

The stem of the smaller refit (#671, 1748 and 1749; see Figure 7, left) curves more sharply from well-defined shoulders to acute or sub-acute basal corners. The base of the stem is slightly scalloped on either side of a central peak apparently left from efforts to thin down the base with a deep invasive flaking. As with the larger refit, the stem is centered, the edges are sharp and delicately sinuous but the plan is asymmetric with one shoulder peaked or eared with a broken tip while the opposite shoulder is more obtuse. The blade appears to have been more heavily resharpened on the side with the eared corner. Large invasive flake scars occur above and below the transverse fracture. One scar extends across the fracture line and one on the opposite side ends at the break, probably causing the fracture. A series of 4 invasive flake scars surround a recalcitrant knob near the stem. As with the larger biface, efforts to rejuvenate this specimen by thinning the base and resharpening the edges apparently ended in the transverse fracture and discard of the fragments.

Large Stemmed Moorehead Biface

A proximal and anterior fragment (#665 and 667) of one stemmed biface was identified as a large Moorehead phase biface (see Figure 7). As is typical of Moorehead points, the striking platform is retained on the base of the stem. Both fragments of heavily patinated Kineo rhyolite were found within a meter of each other and fire hearth Feature 4. A short segment of the midsection, which connected the fragments, was not recovered, making the original length an unknown. The stem appears to have been ground. In plan, the two fragments appear to be asymmetric with one side of the stem longer than the other but the degree of asymmetry remains unclear without the missing midsection. The two fragments are oriented in Figure 7 according to the pattern of invasive flake scars, which appear to continue across the missing segment from the proximal fragment to the distal section. There is invasive flaking along one edge, which may represent an attempt to resharpen the blade. A single deep flake removal scar extends down from the shoulder on the longer stem edge.

Susquehanna Biface Preforms (Figures 8 and 9)

53.38.35 shows a broadly lenticular plan with some preliminary development of a contracting stem. The biface had been rejected after efforts to reduce a recalcitrant lump left invasive flake scars along one side and apparently broke off the tip. One surface of the Kineo Rhyolite has discolored and patinated to a tawny color with some pale green.

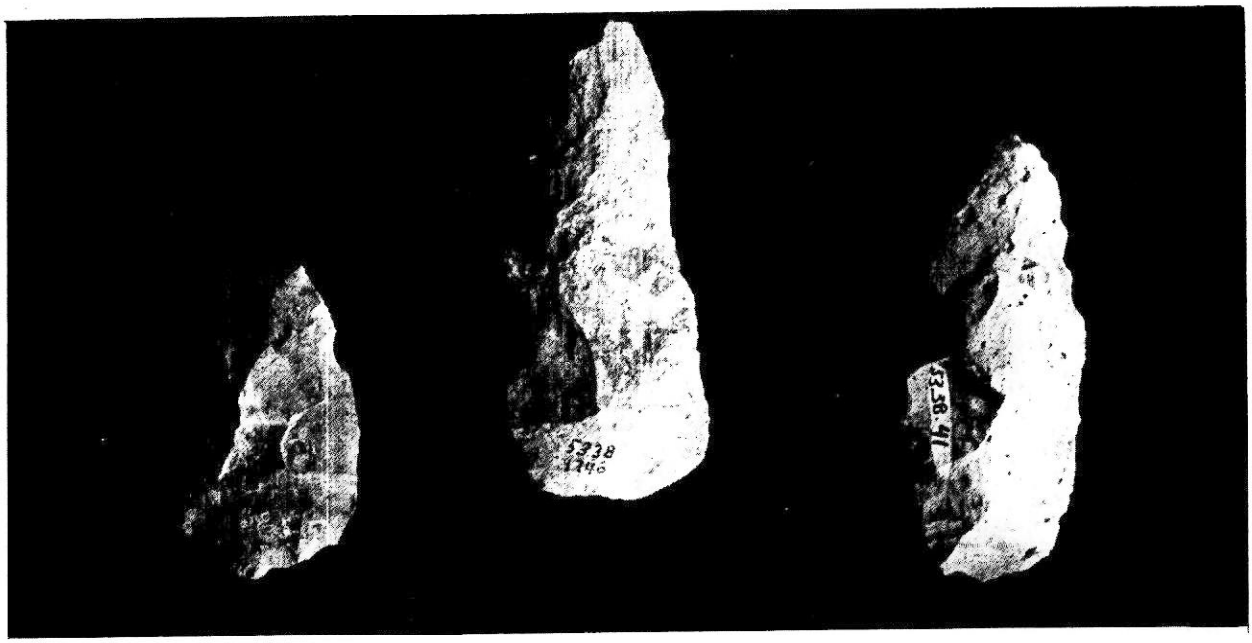

Figure 8. Susquehanna tradition preforms: center 1746, right 41. left 35.

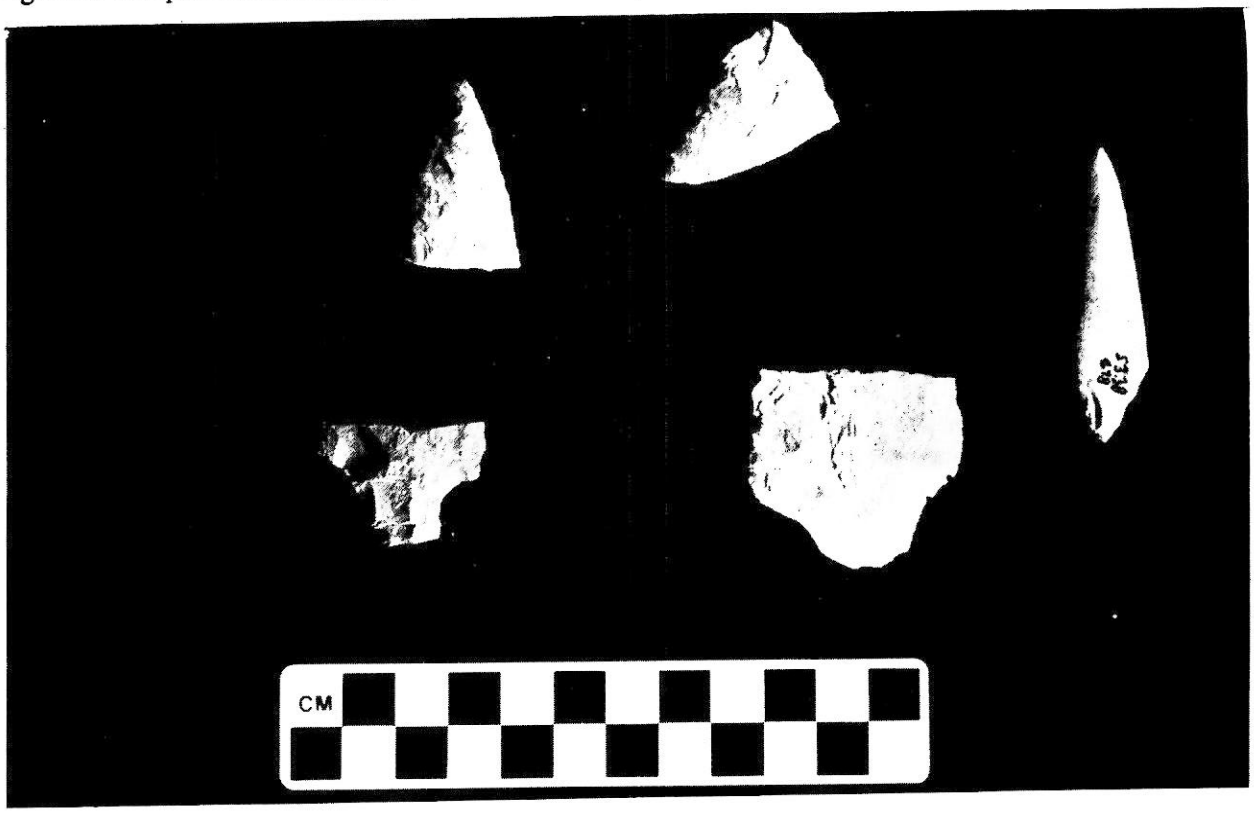

Figure 9. Reworked ground slate point (678) at right. Possible Moorehead phase biface base (667) lower left. Biface tips and Susquehanna preform base (677) also shown.

The opposite retains much of the greener hue of the original rock matrix.

53.38.677 is a large Atlantic phase Susquehanna biface with a well-defined rounded contracting stem, which slopes slightly to rounded shoulders. A transverse fracture just below an invasive flake scar near the center of one face suggests breakage during the finishing process. The edges below the shoulders show some grinding, probably connected with preparation for further retouch work. The rhyolite material has been discolored throughout by burning to a mottled light tan color.

53.38.1513, while less finished than the other specimens, has the broad Atlantic phase biface configuration with the crude beginnings of a contracting rounded stem and rounded shoulders. The specimen was developed on a large cobble cortex fragment and apparently abandoned early with a transverse fracture just below an invasive flake removal on the longer side. The Kineo Rhyolite lithic material was banded with a single white stripe running from shoulder to opposite edge, more or less parallel with the transverse fracture.

53.38.673 is a large Atlantic phase biface tip. The sides of the fragment are still expanding at the point of transverse fracture making estimates of the original size uncertain. The asymmetric cross-section along the oblique fracture shows on side to be more convex than the other. The edges feel dulled and an invasive flake scar near the tip indicates the thinning process was still in progress when the transverse fracture occurred. The material is greenish Kineo-Rhyolite with very little patination.

Three relatively thin and broad biface basal fragments show the characteristics of Susquehanna biface preforms (#35, #677 and #1513). Another tip fragment also falls into the preform group (#673). Secondary bifacial thinning is evident along extant unbroken edges, suggesting final stage preforms. These conform generally to Cresson's (1990:107) "large variant" broadspear "preforms." Cresson (1990:107) found, for his sample of Pennsylvania broadspear preforms, that an optimal width/thickness ratio of 5:1 to 10:1 and optimal edge angle of 35^{o}-55^{o} had been reached at the preform stage. Separate research by Custer (1991:56) on a broadspear sample from several mid-Atlantic states produced a mean width/thickness ratio of 4.9:1 for broadspears. While none of these specimens are complete, they all yield width and thickness measurements that are indicative of the whole specimen, with the possible exception of the tip fragment (#673). One example, #53.38.35, is the only one of the group showing evidence of unsuccessful efforts to remove recalcitrant raised areas of Kineo rhyolite on both faces. The edge angles of the 53.38 preforms fall within the range suggested by Cresson for broadspear preforms. However, as with the comparable group from 27.60 at Warren (Spiess 1993), the width/thickness ratios are smaller than either Cresson's or Custer's results. The smaller width/thickness ratios for the Maine Susquehanna Tradition preforms also apply to complete finished specimens and indicates a local tendency for relatively greater widths.

Finished Biface Tip and Stem Fragments

Only one finished or nearly finished biface tip fragment and a biface stem fragment were recovered in the Susquehanna locus. The point tip, 53.38.676, was made on Kineo rhyolite and shows fine bifacial retouching. The cross-section at the transverse fracture is sub-lenticular, i.e. thicker with a steeper angle at one edge. An invasive flake removal at the thicker edge suggests that the transverse fracture occurred during the final retouch. The edges are slightly dulled but do not show signs of use-wear. The point tip falls at the smaller end of the size range for Susquehanna biface tips recovered at 27.60 in Warren (Spiess et al 1993:Figure 9-2).

The stem fragment, 53.38.666, of Kineo rhyolite, shows a hinge fracture at the point of juncture with the shoulders of the biface. Metric dimensions are listed in Tables. The side edges were ground and invasive flake scars appear on one surface around a recalcitrant knob along the edge

of the hinge fracture. The base shows some preparatory grinding but was left unfinished. Like the point tip described above, the stem fragment falls on the smaller end of the range of measurements from the Susquehanna stem sample at 27.60 (Spiess et al. 1993:Figure 9-4) and apparently came from a biface still in the finishing stage. The specimen should be considered in the category of Formed Biface Preforms as defined in the 27.60 sample. The stem fragment was recovered from the fill of the Feature 4 fire-hearth and shows heavier patination on one side.

Ground Stone Tools from 53.38

Two fragmentary tools of ground slate, the tip of a point (see Figure 9, right) and a section of an ulu (not illustrated), were recovered from 53.38. The possible ulu fragment has a bifacially beveled edge. The tip of a beveled edge slate point (53.38.678) may be a fragment of a larger Moorehead phase bayonet, although it has been reworked into a shorter stemmed point. The fragment measures a maximum of 57.5 mm long by 15.5 mm wide by 4.5 mm thick and weighs 4.9 g. The piece was manufactured from a dark grey slate and exhibits fine striation marks along the beveled edges. In cross-section and plan, the point is symmetrically bi-convex. The base has been snapped off at steep angles on both sides so that end tapers to an acute irregular point. There was no attempt to reshape the broken edges which are not sharp to the touch. (A ground slate point of similar size, although with a strange, multiple-notched base, was recovered from site 53.15 in the Fort Halifax project impoundment [Bartone et al. 1992]). We believe that these scattered pre-Susquehanna Tradition artifacts may have been collected elsewhere (the Sebasticook river?) and brought to the site by Susquehanna Tradition occupants. There is no evidence in the horizontal distribution of materials on the site of a separate pre-Susquehanna occupation.

Hammerstones

Six hammerstones were identified. One was located in the lodge area (N76 W148), and one in the discard area (N40.6 W157.4). The remaining four were scattered around the hearth/activity area of Feature 1. Several other cobbles suitable in size and weight for use as hammerstones were recovered in the vicinity of Feature 1. Since these did not show any detectable signs of use, they are not included in this group.

Pecking stones, a related stone tool used in the production of pecked and ground stones, such as celts or plummets, may be represented by a single small cobble (53.38.32). Pecking stones tend to be round and are distinguished from hammerstones by cratering being present over a wide, random area of the artifact. The small ovoid cobble of metamorphosed sandstone, weighing 55.9 g, shows cratering over ca. 30% of the surface area but the cratering could be from natural causes. The specimen, located at N60 W152 NW, was found on the periphery of the Feature 1 work area but could have been used in the palm of the hand as an anvil stone, possibly for cracking nuts.

Abrasive Stones

Four abrasive stones (e.g., Figure 10), all of fine-grained sandstone, were recovered from 53.38. The distribution follows that of the hammerstones. Only one example was recovered from the "lodge" area of N74 W144; however, that specimen (53.38.684) was the most heavily utilized of the four recovered. The remaining three were scattered around the Feature 1 hearth area. One of these, 53.38.679, is a slab of sandstone with shallow thumb-size concavities ground in the flat surface and broad grooves along the edges.

Worked Flakes and Fragments

Four worked flakes and flake fragments with a combined weight of 34 g complete this assemblage and can be divided into subcategories of denticulates (n=2) and concave scrapers (n=2). The denticulates were both formed on large Kineo rhyolite flakes. 53.38.672 is a large cortex flake, which shows flake removal scars from thinning on the opposite side. The thickest edge had been retouched for 30 mm from the cortex side, leaving

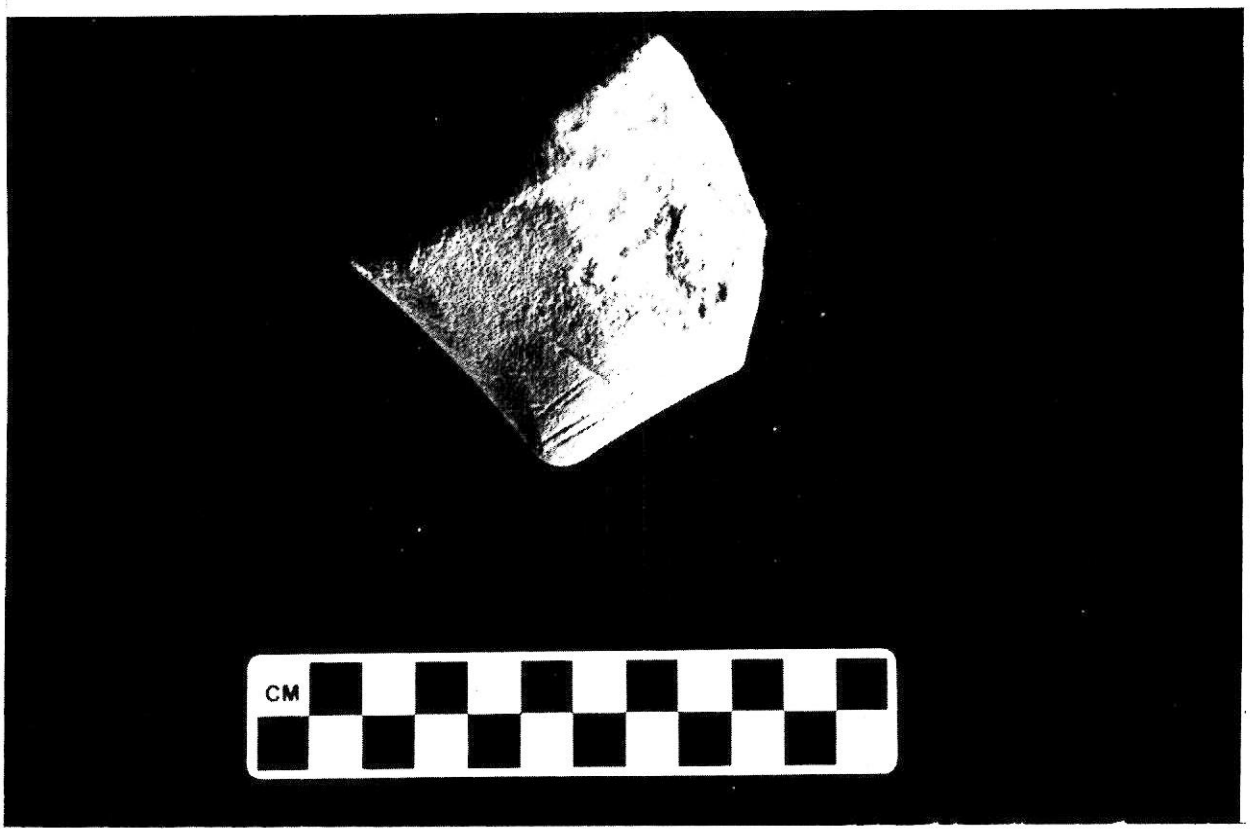

Figure 10. Abrasive stone of fine-grained sandstone.

an uneven slightly concave edge. 53.38.1747 is an elongate cortex flake with denticulate retouching along 23 mm of an edge opposite the cortex side. The tips of the denticulates feel dull to the touch but there are no signs of step-fractures from use-wear as a side-scraper. The serrated edge may have served for sawing wood or bone.

Both concave scrapers were made from small cortex flakes of Kineo rhyolite and feel dull to the touch with minute step-fractures from use-wear. These concave scrapers may have been used to shape shafts from wood and bone, as well as to shave bark and fibers from various plant materials. Artifacts of this type are often referred to as "spoke shaves" in archaeological literature. The utilized surfaces extended about 8 mm for both 53.38.674 and 1744.

Cores, Preforms, Debitage and Raw Material Usage in the Susquehanna Locus

The Susquehanna locus at Site 53.38 yielded substantial assemblages of lithic tools and debitage. The flaked lithic tool assemblage totaled 11 pieces, weighing altogether 190.1 g. The total weight of the debitage sample (1,750.3 g) is approximately 8.7 times more than the flaked artifacts. The debitage was also analyzed and characterized according to flake type and lithic material type.

The flaked lithic assemblage is dominated by Kineo rhyolite, constituting 97% (190.1 g/19.5 g) of the flaked tools and 96% (1685.5 g/1750.3 g) of the debitage, by weight. Other lithic material types in the debitage include a speckled rhyolite, a gray rhyolite, a grey-green to tan chert and quartz.

A surface inspection of the cobble lag in Messalonskee Stream immediately downstream from the Union Gas Dam showed relatively few cobbles of exotic rock material among local bedrock shatter (phyllite). Fine-grained granite, granite with coarse quartz veins and fine-grained metamorphosed sedimentaries were retrieved from the streambed for comparison to the lithics from 53.38, including the FCR. No Kineo rhyolite cobbles were noted during the surface survey of the cobble lag, so the Kineo rhyolite used at the site was imported from elsewhere, possible the Kennebec valley or Sebasticook stream valley nearby.

Large Cobbles and FCR with Pits and Abrasions near Feature 1

Five large cobbles marked by abrasions and pitted areas on two or more surfaces were located in or near the Feature 1 hearth. All are hefty water worn cobbles weighing between 1 and 2+ kilograms, similar to cobbles visible today in the bed of Messalonskee Stream. Only one (53.38.64) shows the typical fractures (Type 2, see FCR Analysis below) associated with fire-cracked rock. Two others exhibit some reddening (oxidation) from proximity to fire (53.38.33 and 39). Another example (53.38.46) has crumbly surfaces, similar to Type 6 fractures.

The identification of these cobbles as artifacts is problematical, as there is no consistent pattern to the scattered pits and abrasion marks found on the apexes and flat surfaces. Narrowly spaced abrasion marks found on sharpening or honing stones are not present. The cobbles are too heavy to be handled with the precision necessary for shaping other lithic tools though there is some battering on some of the apexes. The pits and abrasions could only be the result of impacts with another stone or other hard object such as an iron plow shear striking in an erratic manner. The development of patina over the pits and abrasions indicate that damage from a plow would not account for all the damage. One reasonable explanation for the impact pattern, or lack of pattern, would be that these were crushing stones, which because they were separated by the material being smashed or reduced, only occasionally struck on each other. In another section (below) we discuss the possibility that these rocks were used for crushing acorns.

Unaltered Rock of Local Origin Associated with Features

Some scattered phyllite fragments from the local bedrock were located around the feature area. These may have been utilized, but if they were the materials they were used on were soft enough to leave no visible sign of wear on the slate like rock fragments. A possibility is that they served as a source of red ochre. Limonite mineral is associated with quartz veins in local phyllite bedrock such as outcrops along Messalonskee Stream just below the site. The 1988 discovery of 10 pieces of red ochre in N68 W146 led to a suggestion we made earlier (Spiess, et al.1990:39) that phyllite was being mined and processed for red ochre.

Lithic Reduction

The lithic reduction series at 53.38 contains the products of various stages of stone implement manufacture, although initial core reduction debris seems to be rare. Aside from the finished artifacts identified at the site, other categories of artifacts among the lithic remains were recovered. Utilized lithic material and "rejected" artifacts were divided into the following artifact categories: block cores, early or intermediate preforms, rejected preforms, and utilized flakes (following Spiess and Hedden 1983). Several categories relating to cores and core reduction that would normally be expected in a complete artifact reduction series (e.g., "exhausted" cores, trimmed cores and core fragments) were not recognized in the sample of lithics from site 53.38. A short description and some discussion of each of the categories identified are presented below. Metric and other pertinent data are presented for each category in tabular form.

Rough Stone Cores

Cores of Kineo rhyolite or other high quality lithic tool material were not recovered from 53.38. Two large diabase cores, weighing 1.1 kg and 2.0 kg

Artifact #	Weight gr	Length	Width	Thickness	W/Th ratio	Provenience
35	22.2	60.1	36.9	11.6	3.2:1	N59.05W152.9
677	15.3	37.0	40.6	8.7	4.7:1	N61.82W149.57
1513	19.5	42.8	45.2	9.5	4.75:1	N76W147.5
673	6.6	29.7	33.8	7.9	4.2:1	N74.6W144.2

Table 3. Susquehanna biface preforms. All materials are Kineo rhyolite. Measurements are in grams and millimeters. Length, width and thickness are maximum measurements, in millimeters.

respectively, were found in N58 W152 in the vicinity of Feature 1. The smaller diabase core shows batter marks on the cobble cortex and typical core flake scars. The heavier core is a slightly coarser grained material with one battered area on a cortex surface and one sharp-edged flake removal scar, as well as other non-cortex surfaces which may be of natural origin. The initial identification was based on apparent core attributes but, since both rocks were associated with a large fire-hearth and show signs of reddening as well as use as anvil stones, the fresh appearing flake removals may be an unintentional by-product of use for another purpose (anvil or nutting stone), which we discuss below.

Intermediate Biface Preforms (rejected)

Two complete biface specimens from the Susquehanna locus and a biface fragment represent lithic preforms which have advanced beyond the stage of trimmed cores but, following additional invasive flaking and limited bifacial thinning, were abandoned because of an irremovable portion of the artifact created by the flaking process or a material flaw. Flake scars on these specimens are still quite large, often leaving a jagged or undulating edge. Both examples from 53.38 retain a cobble cortex striking platform on the base, indicating that they had been struck off a large Kineo rhyolite cobble core at a steep (to near vertical) angle. Both specimens are relatively thick in relation to their width and do not "fit" the typical Atlantic Phase broadspear configuration.

Specimen 53.38.41 exhibits a lump of unremoved Kineo rhyolite, isolated in the center of one face; evidently the cause for the rejection. Such a situation presents an insoluble lithic reduction problem. Given the relatively thick (width/ thickness ratio: 2.19:1); #41 might be a preform for a Susquehanna drill. The piece may have alternately been intended for a blade.

Specimen 53.38.27 is an early stage preform fragment of Kineo rhyolite, 40 mm long, weighing 2.4 g. The piece apparently broke from one edge of the preform during retouching. The fragment is marked by an undulating edge from the large bifacial flake removals characteristic of early stage preforms. The fragment could not be matched with a rejected preform. In this case, the lithic reduction process may have reached a successful conclusion.

Debitage

Debitage (waste flakes from tool manufacturing process) was sorted macroscopically by observed attributes of color, texture and composition into like groups of the same or similar rock material. The flakes were also classified by flake type. The flake type helps to suggest what stage in the manufacturing process the wastage occurred. The 5 different flake types defined were:

	Kineo rhyolite	speckled rhyolite	gray rhyolite	quartz	grey-green to tan chert
flake fragment	468	11	2	0	0
biface thinning	616	12	7	8	3
retouch	1338	6	5	3	10
core reduction	326	6	6	0	0
shatter	12	0	0	5	0
Total	2760	35	20	16	13

Table 4a. Flake types and raw materials, numbers.

	Kineo rhyolite	speckled rhyolite	gray rhyolite	quartz	grey-green to tan chert
flake fragment	215.8	5.8	1.0	0	0
biface thinning	357.5	4.7	4.0	3.7	0.6
retouch	107.3	0.8	0.5	0.2	1.0
core reduction	1104.0	16.9	18.9	0	0
shatter	0.9	0	0	5.7	0
Total	1685.5	24.4	24.4	9.6	1.6

Table 4b. Flake types and raw materials, weight in grams.

core reduction (CR), biface thinning (BT), retouch (RF), flake fragment (FF) and shatter (S). A breakdown of the numbers and weights for each flake type is presented in Table 4.

By far the most commonly used material was Kineo rhyolite (2760 flakes, weighing 1,685.5 g) All other varieties of lithic tool manufacturing materials totaled 101 flakes (64.8 g, about 4% of the total by weight and 3% of the total count). These other varieties in the order of frequency were a speckled rhyolite (N=35, 28.2 g), grey rhyolite (N=20, 24.4 g), quartz (N=16, 9.62 g), and a grey-green chert (N=15, 1.58 g).

Nature of Tool-Making Activity and Distribution in the Susquehanna Locus

The distribution of selected debitage material around features, including exotic lithic materials, indicate that the major lithic workshop areas were located within 2 meters of Features 1 and 4, and, even more specifically, the northwest sides of these two hearths. The remaining test units show relatively minor quantities of Kineo rhyolite debitage. We interpret this concentration of lithic workshop activity around defined hearth features at 53.38 as an indication that the debitage accumulation represents contemporary activity that went on while the features were in use.

The majority of recovered debitage (N=2570, 87.5% of total debitage) from 53.38 represent retouch of dulled tools or final thinning of a new tool. Retouch flakes (N=1406, 48%) include 17 chert flakes. Three other chert flakes with same grey green color are included among the biface thinning

flakes (N=670, 23%) for a total of 20. As all the chert flakes were recovered within a meter of Feature 1 (see Figure 2), they may represent the product of a single episode of resharpening a chert tool in the vicinity of Feature 1. Sixteen quartz flakes were scattered in the "lodge" and Feature 1 areas of the Susquehanna locus. There were no quartz artifacts recovered at 53.38. Quartz does not seemed to have been used for making finished tools in Susquehanna Tradition sites in Maine, though small quantities, similar to this sample, have been recovered in another Maine site (site 27.60; Spiess et al 1993:160 et seq.). Mudstone (N=2), slate (N=2), and a possible quartzite (N=1) are also represented as biface thinning or fine flakes in trace quantities at the site.

Single core reduction (CR) flakes of Kineo rhyolite came from the fill of Features 4 and 5. Another 4 preform reduction (PR) flakes of Kineo rhyolite came from Features 4 and 5 (2 each) along with a single PR flake of grey rhyolite in Feature 4. This distribution suggests that whatever primary reduction was done at 53.38 took place in the vicinity of these 2 features.

The remaining categories of flakes (BT, RF, FF and S) are the product of resharpening lithic tools (retouch flakes) or could have derived from either primary tool manufacturing or resharpening (BT, FF and S). Feature 4 fill had 133 flakes of this kind (126 KR, 5 grey rhyolite, 1 speckled rhyolite and 1 quartz. Feature 5 had 19 flakes (17 KR, 1 speckled rhyolite (BT), and 1 RF of grey rhyolite). Feature 1 had a single retouch flake of Kineo rhyolite. This concentration around Features 4 and 5 reinforces the previous inference from primary reduction flake distributions that primary lithic reduction at 53.38 probably occurred around hearth Features 4 and 5. The chert flakes scattered near Feature 1 represent a distinct problem in interpretation. Chert, a non-local lithic material, is not generally characteristic of Susquehanna Tradition sites in Maine, but does appear as a trace lithic material. No chert artifacts were found at 53.38.

Calcined Bone

The calcined bone sample from the 1988 excavation was carefully checked by Spiess. Several fragments were identified as domesticated animals, mostly pig. These and other fragments picked up in 1991 and 1992 had clear saw marks from a butcher's band saw. Because no calcined bone was recovered from the fill of the best preserved hearth feature (Feature 4), we concluded that the calcined bone recovered was most probably of recent to very recent (historic) origin, either dumped on the site along with other garbage or possibly part of a fertilizing effort associated with the initial 19th Century plowing.

Charcoal, Other Charred Material, and Radiocarbon Dates

About 6 grams of wood charcoal were recovered from hearth Feature 4. The feature was marked by a concentration of fire-cracked rock (FCR) around two large pieces of reddened granite set in orange-stained sandy fill at 15 to 20 cm depth. No charcoal was recovered until the initial layer of FCR had been removed. Large pieces of charcoal appear at 20-21 cm bd and were collected in 1991. This initial sample weighed 2.32 g. A quantity of smaller pieces was found in the orange sandy fill below (from 23 to 28 cm depth) after excavation was resumed in 1992. These came to a cumulative weight of ca. 5 g.

Because site 53.38 had plow damage to between 18 and 20 cm below the surface (perhaps limited to a single plowing episode) and all the hearth features show some damage from plowing, we kept the charcoal as two separate lots. The charcoal from the upper level of Feature 4 (ca. 20 cm depth) represents one lot and is considered as possibly contaminated as a result of plowing. Charcoal from 23 cm bd or lower, combined into one lot, was considered least likely to have been contaminated. The lot from the lower part of Feature 4 dated 3520±90 years BP (Beta 67015), a date consistent with other Susquehanna Tradition sites in Maine. Wood species identified from Feature 4 by Nancy Sidell (personal communication

	Feature 4 Upper	Feature 4 Lower
Sample weight		
> 2 mm	2.20	4.56
0.5-2 mm	0.12	0.54
Total	2.32	5.09
Sample Composition (> 2 mm, count)		
Wood	53	286
Bark	1	4 [a]
Pitch	6	22
Acorn nutshell	0	2 [b]
Acorn nutmeat	0	4
Total	60	318
Wood identifications		
Betula spp., birch species	1?	0
Fagus granifolia, beech	1	4
Pinus spp., pine	17	6
Quercus spp., oaks	5	20
(Red oak group)	(1)	(7)
(White oak group)	(2)	(13)
Diffuse porous species	1	0
Total	25	30

Notes

[a] 3 uncarbonized bark, 1 carbonized bark but identification questionable

[b] 1 cap attachment area, 1 seedcoat layer beneath pericarp but questionable ID

Table 5. Carbonized floral remains, identified by Nancy Asch Sidell. All samples from flotation processing, both light and heavy fractions analyzed. Feature 4 Upper catalogue numbers: 1443, 1444;1445. Feature 4 Lower catalogue numbers: 1753, 1754, 1755, 2455.

1993; Table 5) included beech, pine and oak—with oak dominant in the deeper charcoal lot and pine in the upper lot. Acorn parts (shell and nutmeat) were represented in the deeper charcoal from Feature 4. Sidell identified both white oak (*Quercus alba*) and red oak (*Q. rubra*) wood charcoal.

Fire-Cracked Rock (FCR)

Fire-cracked rocks are cobbles or fragments of cobbles, which show signs of alteration by heat. The alterations range from reddening and fine cracks to broken fragments with crenulated edges. From the Archaic through the Late Prehistoric period in Maine fire-cracked rock constitutes a major component of the culturally modified rock found in and near aboriginal sites. Experimental data developed by David Yoon (1986) indicates that the varieties of observed alterations on these cobbles can be replicated and explained as the result of a combination of strains related to expansion stress by heating in a fire, followed, in certain types, by contraction stress through sudden cooling in water. Yoon developed a typology of seven fracture types (0 to 6) that we have followed here, with one

Fracture Type	Feature 1 area N50 to N62		"Structure" area N68 to N 80		Discard Area N38 to N47		Total	
1	91	3.1 kg	77	11.4 kg	5	0.2	173	14.7
3	32	2.2	75	3.7	1	0.04	108	6.0
5	87	3.3	79	3.7	26	1.2	192	8.2
Sub-total Crenelated	*210*	*8.6*	*231*	*18.8*	*32*	*1.4*	*473*	*28.9*
2a, 2b	439	21.3	845	70.2	108	7.8	1382	99.4
4	1139	18.4	1299	48.2	165	7.1	2593	73.8
6	91	0.8	208	8.4	4	1.4	303	10.7
0	0	0	28	10.8	8	2.9	36	13.4
9	42	1.3	52	5.2	8	1.2	102	7.7
Total	1921	50.5 kg	2663	161.5 kg	325	21.9	4889	233.8

Table 6. Fire-cracked rock (FCR) counts and weights recovered from the Susquehanna activity area, listed by fracture type. Weights are in kilograms.

further addition (Type 9). We have ordered these types in a sequence in which the FCR with crenulated fractures are grouped together. Crenulated fractures only occur in Yoon's experiments, after a minimum of 7 to 13 cycles of first heating the cobbles and then placing them in a pot of cold water, interpreted as equivalent to the effects that would be expected from cooking with heated stones ("stone-boiling"). Dousing heated stones with cold water to produce steam (such as for a sweat lodge) produces a smaller number of crenulated fractures.

Some of the fracture types are more common in specific types of rock. Yoon (1986:25) found that 5 of the 6 basic patterns of breakage described above applied to all rock types but chert. The chert samples he tried exploded on the initial heating into Type 2 fragments, presumably because of their high interstitial water content. Yoon noted that Type 6 (crumbly) breakage was usually limited to coarse crystalline rocks, but could be found in sandstone and limestone as well. Rock of igneous origin (granite, diorite, gabbro, rhyolite, basalt, gneiss and quartzite) tend to be more resistant to thermal stress than those of sedimentary origin (sandstone, siltstone, mudstone, shale, limestone and chert).

Nearly five thousand fragments of fire-cracked rock (N=4889) weighing over 233 kg (233,823 g) were recovered during three seasons of excavation. These specimens were recorded by 3 coordinates or by a minimum of grid quarter quad and stratum, washed, weighed and sorted by fracture type, and described by rock attributes before being entered into a catalogue. Ten percent of the recorded sample was saved for further reference, and the remainder was discarded along a gravel road remote from any known prehistoric site.

The overall patterns of FCR distribution correlate with artifact and debitage distributions around 3 hearth features to suggest the nature of the activity in these areas and aid in the reconstruction of structural features. In the case of the north end of the Main Susquehanna Locus, the distribution of FCR is a large oval with thin scatter towards the

[redacted]

NE/SW plow scars and vehicular traffic over F 1 contributed to some dispersal of FCR that was originally more closely concentrated around Feature 1.

The lack of any identifiable pit or hearth feature and the close proximity of the N39-N48 area to the steep drop-off down to Messalonskee Stream

both white and red oak species were identified in the wood charcoal, along with some charred acorn nutmeat and shell fragments in the deeper charcoal from Feature 4. Red oak is still dominant in the deciduous species growing on the site today. As the literature concerning Native American use of acorns is not readily available, we have reviewed a number

of sources, which are cited below where pertinent.

No direct evidence of acorn processing at 53.38 could be detected beyond the charred acorn shells and nutmeats identified from Feature 4. Large cobbles associated with Feature 1, with an erratic pattern of pitting and abrasions could have been used as crushing stones. These hefty stones would have readily served for crushing the hard shells of acorns but they could have served for other purposes (props for cooking vessels or roasting sticks, post supports, all-purpose mauls.

Feature 1, an "outside" hearth area situated ca. 6 meters south of the lodge, probably served as a work area. Four large cobbles with flat surface areas were located in the feature fill with other FCR. There was no arrangement or pattern that could be interpreted as a deliberate working situation. These were initially identified as FCR and given FCR numbers in the field so that they could be located with field drawings. A rounded cobble (53.38.39) with some pitting, which exhibits no signs of alteration from heat, could have served as a mano. If these rocks were ever used in acorn preparation, they were finally simply heaped with other rocks in the hearth of Feature 1.

The situation of the site in an oak grove, the presence of charred acorn shell and nutmeat in Feature 4, and the outside hearth with cobbles suitable for crushing nutshells as well as for a number of other tasks represent suggestive but not convincing clues that site 53.38 around 3500 years ago may have been a place for gathering and processing acorns.

A review of the few ethnographic sources on acorn processing in the Northeast does not indicate a need for, or use of, specialized tools or unique constructions that would leave identifiable features in the ground in the preparation of acorns for food.

Native American Gathering and Processing of Acorns in Northeastern North America

As one of the few natural sources of starch and oil in the diet, acorns were an important food for northern hunters during prehistory and remained a backup source and delicacy even after maize became available in southwestern Maine about 800 years ago (Sidell 1999). Father Rasles observed that the (Norridgewocks) valued acorns as highly as corn (Thwaites:1959). White oak acorns had less tannic acid and required less treatment. Red oak acorns, which were high in tannic acid, needed more extensive treatment though leaching or other form of neutralizing the acidity. Russell (1980:83) quotes from Roger Williams to the effect that (Narragansett?) Indians dried acorn meal "and in case of want of corne, by much boyling they make a good dish of them; yea sometimes in plentie of corne doe they eat these akornes for a dayntie." Some groups, such as the Chippewa, preferred the bitter acorns of the red oak or black oak to the sweeter white oak acorns (Zeisberger 1885:128 as cited by Keene 1981), probably for reasons having more to do with keeping qualities and availability than with taste.

The sources cited above summarize some direct references to the use of acorns in New England. The citations establish that acorns were in the diet even after the introduction of maize as a starch source. We can assume that acorns were considerably more important before maize became readily available. However, these references do not clarify the steps followed to reduce tannic acid. Russell states that wood ashes were boiled with the acorns to reduce the tannic acid but does not give a source. Were other processes known to have been used among other Native American groups to reduce the tannic acid content such as leaching with warm water (California- Keene 1981:75) or cold water (California, Southeast- Driver 1969:91; Keene 1981:75). Could processes known to have been used in New England with the preparation of maize (parching in coals and hot ashes - Russell 1981:78) have been used to reduce tannic acid in acorns?
Keene (1981:74-5) cites sources for three different methods of processing nuts in general. The methods are listed under the headings "Nut Milk", "Nut Powder", and "Boiling". Nut milk involves crushing previously dried nuts in a mortar and mixing with water. The shells would sink to the bottom of the container. The milky liquid, described

as an "oily tough thick white substance", was kept for use in cooking. Acorns and hickories are specifically mentioned as treated this way but red and other acorns high in tannic acid would have required many changes of water.

In boiling the shells of the crushed nuts sink to the bottom and the oil rises to the top where it can be skimmed off and drunk as soup or stored as a thick oily gruel. The addition of wood ashes to reduce tannic acid is mentioned in sources from the Great Lakes to New England (Keene 1981:76; Russell 1980:83). It is not clear whether the ashes form a precipitate along with the shells or remain mixed with the oily gruel or whether the addition of ashes reduced or eliminated water changes necessary to clear the tannic acid. Experimental data could settle this question. Given the preference for red acorn in some groups, the scantiness of specific ethnographic data suggests that the procedure to reduce tannic acid may not have been particularly burdensome.

Keene (1981:73) cites a report that parching acorns "makes the shells brittle and easier to split" but also notes that the process dries and hardens the nutmeat, "making pulverization and mastication more difficult." This suggests that parching was not an option with red acorns where further leaching would also be necessary.

CONCLUSIONS

A Late Paleoindian component with 2 separate loci and an Atlantic Phase Susquehanna Tradition occupation (ca. 3600 years BP) were identified from cultural material excavated on the high sandy terrace of site 53.38. While there were traces of other possible Late Archaic occupations (Laurentian? Moorehead?) noted, these were not sufficiently distinct or separate from the Susquehanna component to be significant.

In the Susquehanna locus, a line of 3 hearth features within an oval scatter of debitage and FCR with traces of wall trenches conform to one oval lodge structure. The consistency in lithic artifacts, debitage distribution, lithic material and the fire-cracked rock combine to indicate that the Susquehanna component at 53.38 belongs to a single short term occupation, probably by an extended family group. Comparison of the FCR assemblage with a limited sample of other sites where we have been able to conduct an analysis of FCR fracture types suggests that the occupation at 53.38 was during a period of warm weather (i.e. May to October). This observation is not inconsistent with the suggestion from other evidence that the purpose of the encampment was to gather, and perhaps process, a supply of acorns sometime from late September through October when the harvest was available. The present location of the site in a mixed forest dominated by oak trees, the presence of which, 3500 years ago, is indicated by identified wood species in the dated charcoal from Feature 4, acorn shell and nutmeats in the same charcoal and large cobbles suitable for crushing hard nutshells in association with a hearth and work area located outside the lodge complex remain suggestive but not conclusive.

A small number of Moorehead phase or earlier Laurentian Tradition stone tool fragments were recovered in association with the lodge and workshop area of the Susquehanna locus. We could find no evidence of a Moorehead Period occupation within the area tested. We noted that the unretouched artifacts recovered showed signs of weathering and wear consistent with a period of surface exposure. We suggest that the association of these artifacts with the Susquehanna component is most likely a happenstance result of casual picking of abandoned Moorehead Period sites elsewhere by the Susquehanna Tradition occupants of 53.38.

We conclude that the circumstances of the Susquehanna occupation of 53.38 is not inconsistent with the current theory of a population migration into territories formerly occupied by Moorehead Period cultural groups who had apparently abandoned the area by ca. 3800 years BP (Sanger 1975:69; Sanger and Bourque 1986; Snow 1980). The range of the limited sample of bifaces, the lithic materials used and the nature of the hearths and structural features (lodge) are consistent with what

is known of Atlantic Phase Susquehanna Tradition sites in the Northeast and Maine, in particular. Site 53.38 offers a particular contribution to our understanding of settlement pattern for the Susquehanna Tradition, suggesting a linear series of hearths inside one structure. There is inconclusive evidence for subsistence pattern, suggesting a special case use of the oak forest for gathering acorns to help supplement a diet of hunter/gatherers that was specifically deficient in starches and oils derived from plants.

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REFERENCES CITED

Bartone, Robert N.,Catherine A. Quinn, James B.Petersen, and Ellen R. Cowie

1992 *An Archaeological Survey of the Fort Halifax Project (FERC NO. 2552), Kennebec County, Maine.* Report on file, Maine Historic Preservation Commission, Augusta.

Bourque, Bruce J.

1995 Diversity and Complexity in Prehistoric Maritime Societies: A Gulf of Maine Perspective. Plenum Press, New York and London.

Bradstreet, Theodore and Edna Duffy

1985 *Benton Falls hydroelectric project archaeological survey and testing: Phase I.* Report on file, Maine Historic Preservation Commission, Augusta.

Clermont, Norman et Claude Chapdelaine

1982 *Pointe-du-Buisson 4: Quarante Siecles d'Archives Oubliees. Recherches Amerindiennes au Quebec*, Quebec.

Cranmer, Leon

1990 *Fort Halifax Interim Report.* Report on file, Maine Historic Preservation Commission, Augusta.

1991 Blockhouses and Cellars: The 1989 and 1990 Archaeological Work at Fort Halifax. *Maine Archaeological Society Bulletin* 31:2:1-26.

Cresson, Jack

1990 Broadspear Lithic Technology: Some Aspects of Biface Manufacture, Form and Use History, with insights towards Assemblage Diversity. In: *Experiments and Observations on the Terminal Archaic of the Middle Atlantic Region,* edited by Roger Moeller, pp.105-130. Bethlehem,CT.

Crock, John
1992 Recent Archaeological Investigations in the Messalonskee Portion of the Central Kennebec Drainage. *Maine Archaeological Society Bulletin* 32:1:45-62.

Cross, John
1990 Specialized Production in Non-Stratified Society: An Example form the Late Archaic in the Northeast. Doctoral Dissertation, Department of Anthropology, University of Massachusetts, Amherst.
1993 Craft Specialization in Nonstratified Societies. *Research in Economic Anthropology* 14:61-84. JAI Press, Inc.

Custer, Jay F.
1984 *Delaware Prehistoric Archaeology: An Ecological Approach.* Univ. of Delaware Press, Newark.

Deal, Michael
1985 Final report on the 1983/4 excavations at the Mud Lake Stream site (BkDw 5), southwestern New Brunswick. Manuscripts in Archaeology 15, Historical and Cultural Resources, St. John.

Dincauze, Dena F.
1968 *Cremation Cemeteries in Eastern Massachusetts.* Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University. 59:1.
1972 The Atlantic Phase: a Late Archaic culture in Massachusetts. *Man in the Northeast,* 4:40-61.
1974 In introduction to archaeology in the greater Boston area. *Archaeology of Eastern North America* 2:39-67.
1975 The Late Archaic Period in Southern New England. *Arctic Anthropology* 12:2:23-34.

Driver, Harold
1969 *Indians of North America.* University of Chicago Press, Chicago.

Ferreira, Leigh C. and James B. Petersen
1990 *Archaeological Survey of the Oakland Project, the Rice Rips Project, the Automatic Project and the Union Gas Project, Kennebec and Somerset Counties, Me.* Report on file, Maine Historic Preservation Commission, Augusta.

Fobes, Charles B.
1946 *Climatic Divisions of Maine.* Maine Technology Experiment Station Bulletin 40, Orono.

Funk, Robert E.
1976 *Recent Contributions to Hudson Valley Prehistory.* New York State Museum Memoir 22, Albany.

Funk, Robert E. and Bruce Rippeteau
1977 *Adaptation, Continuity and Change in Upper Susquehanna Prehistory.* Occasional Publications in Northeast Anthropology 3. George's Mills, New Hampshire.

Funk, Thomas and Steven L. Cox
1987 *Phase II archaeological investigation of site 53.34, Sebasticook River.* Report on file, Maine Historic Preservation Commission, Augusta.

Hedden, Mark
1994 *Site 53.38 Waterville Bridge Ramp Approach Archaeological Data Recovery.* Report on file, Maine Historic Preservation Commission, Augusta.

Hedden, Mark H. and Arthur E. Spiess
1991 *Archaeological Survey for the Waterville-Winslow Bridge Construction Access Road. Report to the Maine Department of Transportation.* On file at Maine Historic Preservation Commission, Augusta.

Keene, Arthur S.
1981 *Prehistoric Foraging in a Temperate Forest.* Academic Press, New York.

Kenyon, I. T.
1980 The George Davidson site: An archaic "Broadpoint" component in southwestern Ontario. *Archaeology of Eastern North America* 8:11-27.

Kraft, Herbert C.
1986 *The Lenape.* New Jersey Historic Society, Newark.

Petersen, James B., editor
1991a *Archaeological Investigations in the Central Kennebec River Drainage: Phase II Data Recovery at the Smith and Smith's Landing Sites, Somerset County, Maine.* University of Maine at Farmington Archaeology Research Center. Report on file, Maine Historic Preservation Commission, Augusta.
1991b The Dennison Site: A Deeply Stratified Site on the Kennebec River. *Maine Archaeological Society Bulletin* 31:2:27-54.

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

Phillips, James and James A. Brown
1983 *Archaic Hunters and Gatherers in the American Midwest.* Academic Press, N.Y.

Plourde, Michel
1987 Profil des Occupations de l'Archaique Superieur sur la station 5 de Pointe-du-Buisson. *Recherches Amerindiennes au Quebec* 17:1-2:81-88.

Ritchie, William A.
1980 *The Archaeology of New York State.* Revised edition. Harbor Hill Books, Harrison, NY.

Russell, Howard S.
1980 *Indian New England Before the Mayflower.* University Press of New England, Hanover.

Sanger, David
1975 Culture change as an adaptive process in the Maine-Maritimes region. *Arctic Anthropology* 12:2:60-75.

Sanger, David and Bruce Bourque
1986 The Rise and Fall of the Susquenanna Tradition in Maine and the Maritimes. Paper delivered to the Eastern States Archaeological Federation conference. November, 1986.

Sidell, Nancy Asch
1999 Prehistoric plant use in Maine: Paleoindian to Contact Period. Pp. 191-224 in *Current Northeast Paleoethnobotany*, edited by John P. Hart. New York State Museum Bulletin No. 494. Albany.

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

Spiess, Arthur E.
1988 *Waterville-Winslow Bridge Project: Archaeological Report.* Report on file, Maine Historic Preservation Commission, Augusta.
1989 Prehistoric Occupations at Fort Halifax. Lecture delivered to the Maine Archaeological Society, October 1989.

Spiess, Arthur E. and Mark Hedden
1999 Late Paleoindian Occupation at the Waterville-Winslow Bridge. *Bulletin of the Maine Archaeological Society.*

Spiess, Arthur E., Mark Hedden, and Joan Robertson
1990 *Waterville-Winslow Bridge Location Phase II Archaeological Testing.* Report on file, Maine Historic Preservation Commission, Augusta.

Spiess, Arthur E., Mark Hedden, and Leon Cranmer
1989 *Archaeological Survey Report on the Dodge Point Parcel, Newcastle.* Report on file, Maine Historic Preservation Commission, Augusta.

Trubowitz, Neal
1983 *Highway Archaeology and Settlement Study in the Genessee Valley.* Occasional Publications in Northeastern Anthropology 8. George's Mills, New Hampshire.

Turnbaugh, William A.
1975 Toward an Explanation of the Broadpoint dispersal in Eastern North American prehistory. *Journal of Anthropological Research* 31:51-68.

Will, Richard T., James A. Clark, and Rebecca J. Cole-Will
1991 *Archaeological Survey of the Augusta Hydroelectric Project (FERC #2389), Kennebec County, Maine.* Report on file, Maine Historic Preservation Commission, Augusta.

Will, Richard T., James A. Clark, and Janet Cormier
1995 Phase II Archaeological Testing of the Augusta Hydroelectric Project (FERC #2389) Kennebec County, Maine. Report on file, Maine Historic Preservation Commission.

Wilson, Deborah, Richard Will, and Janet Cormier
1994 *Phase II Archaeological Survey of Eight Prehistoric Sites Located Within the Burnham Hydropower Project (FERC UL91-03-ME) Area, Waldo and Somerset Counties, Maine.* Report on file, Maine Historic Preservation Commission.

Witthoft, John
1953 Broad spearpoints and the transitional period cultures. *Pennsylvania Archaeologist* 23:1:4-31.

Yoon, David
1986 The Analysis of Variability in Fire-Cracked Rock. Honors Thesis, Department of Anthropology, University of Michigan, Ann Arbor.