THE MAINE ARCHAEOLOGICAL SOCIETY INC. BULLETIN

VOLUME 34:2

SPRING 1994

Officers for 1994

Permanent address
The Maine Archaeological Society, Inc.
P. O. Box 982
Augusta, Me. 04333-0982

MAINE ARCHAEOLOGICAL SOCIETY BULLETIN

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VOLUME 34 NUMBER 2

FALL 1994

THE BOOTHBY GRAVEL PIT SITE (ME 7.39)
EAST LIMINGTON, YORK COUNTY

Nathan D. Hamilton and John P. Mosher

INTRODUCTION

In July 1993, Nathan Hamilton of the University of Southern Maine was contracted by R. W. Gillespie and Associates to perform phase II testing at a prehistoric aboriginal archaeological site. Phase II testing at the "BOOTHBY Gravel Pit" site followed a Phase I archaeological survey directed by Deborah Wilson in the summer of 1991 (Wilson 1991). Wilson's survey had resulted in the discovery of one potentially significant prehistoric site located in the town of Limington, Maine. Phase II testing is often required by the Maine Historic Preservation Commission (MHPC) to ascertain the potential significance and boundaries of previously identified prehistoric archaeological sites.

Archaeological site significance can rarely be determined from a Phase I survey. Sampling procedures employed in a Phase I investigation are usually not intensive or developed to determine site size, integrity of deposits and cultural affiliation. Thus, the Phase I reconnaissance survey of the Boothby Gravel Pit Project was neither designed nor able to address these issues which are necessary in order to proceed with nomination to the National Register of Historic Places. Phase II testing of this site, following recommendations outlined in Wilson (1991), was deemed necessary by the Maine Historic Preservation Commission in order for the agency to determine whether or the "Boothby Gravel Pit" site (ME 7.39) qualifies for inclusion on the National Register of Historic Places.

Two notable surveys in York County were performed in the late 19th and early 20th centuries. Henry Mercer, an archaeologist from the University of Pennsylvania, surveyed the York River in 1897 (Mercer 1897) and recorded a few shell midden sites (Will and Cole-Will 1986). Twenty years later, a field crew under the direction of Warren King Moorehead canoed up the Saco River as far as Salmon Falls in a quest for "Red Paint" village sites (Moorehead 1922).Until recently, however, with the advent of contract archaeology in the state, York County has not received the attention by prehistoric archaeologists that other areas of the state have garnered (*e.g.*, Spiess, Cranmer and Hedden 1990; Cowie and Petersen 1988, 1989).

The rapid economic development of this part of the state during the 1980s helped revitalize archaeological interest in York County. State and federal environmental laws implemented since the 1960s and 1970s have required many private contractors and utilities to support archaeological investigations on parcels subject to permit review. For instance, in 1987 and 1988, the University of Maine, Farmington surveyed and tested a portion of the Saco River from Route 25 in Standish to Route 35 in Hollis (Cowie and Petersen 1988a, 1989). Between 1989 and 1991, the University of Southern Maine surveyed three parcels on the Saco River; one in Cornish, one in Baldwin, and the other in Fryeburg (Hamilton and Mosher 1989; Mosher *et al.* 1991). Most recently, Phase II excavations were conducted at three sites along Central Maine Power Co.'s Inland Corridor (Mosher *et al.* 1992).

Some of the archaeology that has taken place in York County has been the result of federal and state grants. In the summers of 1985 and 1986, archaeologist Richard Will performed a canoe survey of the banks of the York River in an attempt to assess the significance of the sites found by Mercer nine decades ago, and to test an existing model of prehistoric site location (Will and Cole-Will 1986).

Even with current investigations, the prehistoric culture history of the Saco River is not well known. Sites representing all of the major prehistoric time periods have been found in York County, but not in significant numbers. For instance, Paleoindian, Late Paleoindian, and Early and Middle Archaic sites are generally few and far between in the southern part of Maine, but are better represented north and west of the Saco River drainage and elsewhere in New England. (Will and Cole-Will [1986] examined a projectile point from Cape Neddick which resembles some of those attributed to the Middle Archaic). This paucity of sites was, until the last few years, explained in terms of low resource potential and a corresponding low human population. Prior to this project, only one known prehistoric site older than the Late Archaic period has been reported for the Saco River drainage (Cowie and Petersen 1989).

The results of Phase II testing at the Boothby Gravel pit site indicate that the Little Ossipee drainage was occupied by prehistoric hunter-gatherers during the Late Archaic (4000-3000 B.P. [B.P. means "before present"]). Phase II archaeological investigations were directed by Nathan D. Hamilton, Ph.D., Principal Investigator and supervised by John P. Mosher. Field and Laboratory work was accomplished through the efforts of Paul Ridlon and Mark Miller.

ENVIRONMENTAL SETTING

The physical environment has undoubtedly made a tremendous impact on human settlement throughout prehistory. In Maine, prehistoric sites are almost always associated with the many bodies of water which comprise all or portions of the major river drainages. At least one model of prehistoric settlement in New England (Snow 1980) is based on the premise that cultural groups tended live in a particular drainage. Interdrainage movement from the coast to the interior was accomplished by canoe on the numerous ponds, lakes and streams. Site 7.39 is situated on the Ossipee River in the Saco River drainage (McCrea *et al.* 1980). The sections that follow briefly outline the physical geography of river basin in order to provide an environmental baseline for considering the prehistoric human settlement and occupation of York County, Maine.

Saco River Drainage

At more than four-and-one-half times the size of the southern Maine coastal river basins to its south, the Saco River drainage encompasses an area of some 2715 square kilometers in Maine and New Hampshire. Beginning in Saco Lake near Crawford Notch in New Hampshire's White Mountains, the Saco River flows southeasterly for about 120 kilometers before emptying into Saco Bay at Saco, Maine. Elevations in the mountainous portion of the drainage often surpass 1525 meters culminating with an elevation of 1917 meters above sea-level on Mount Washington. Down stream at Bartlett and Conway, New Hampshire the terrain is likewise steep and rough with elevations reaching 884 meters above sea-level (McCrea *et al.* 1980:10).

At Fryeburg, Maine, the Saco diverges with one branch following the course of a flood control canal built in the 1800s, and the other flowing northerly toward Kezar Lake before rejoining with the canal course. Between Fryeburg and Cornish, the Saco is located within the Northern New England Uplands with elevations ranging from 152 to 244 meters above sea-level. At East Limington the Northern New England Upland gives way to the Seaboard Lowlands.

Many rivers and streams flow into the Saco during its 120 kilometer long journey to the Gulf of Maine. The Little Ossipee River joins the Saco at East Limington. Site 7.37 is located a few kilometers about the confluence.

The Saco River drainage covers all of the climatic divisions of Maine: Northern Maine; Intermediate Upland and Foothills; Central and

Southwestern Interior; and Coastal Section. This project lies within two of the milder climatic divisions, the Central and Southwestern Interior and Coastal Section. Here, the average temperatures for January and July are 20 and 64 degrees Fahrenheit. Snowfall averages about 189 cm near the coast and 193 cm on the foothills. The growing season on the coast, at an average of 164 days, is about one month longer than it is in the uplands at the source of the Mousam River (Fobes 1946).

The presence of an array of water bodies continues to attract both human and animal populations. McCrea *et al.* (1980) identify numerous species of fish dwelling in the Saco River that may have been available for human consumption throughout prehistory. These include, but are not limited to, salmon, three species of trout, and white perch. Mammals available for food and furs would have included deer, moose, possibly caribou, and bear, as well as, otter, mink, and raccoon (Godin 1977). Migratory and residential bird species including several ducks, grouse, and turkey were probably taken as well.

The Saco River and its network of ponds, lakes, streams and rivers, were not only a source of food, but also an important transportation system for Native American populations following sweeping environmental change around 10,500 to 10,200 years ago. Changing climatic conditions encouraged the development of heavy forest cover making overland travel more demanding on human populations. The logistics of moving hunting/fishing/gathering parties from peripheral camps to base camps was undoubtedly made easier by the development of watercraft. Cook and Spiess (1981), (and more recently Spiess [1991a]) have argued that the location of sites on some small streams are best explained by aboriginal use of birch bark canoes, at least by the early portion of the Susquehanna Tradition (4000 - 3500 B.P.). Prior to the Susquehanna, Native Americans probably fashioned watercraft from tree trunks as suggested by the proliferation of woodworking tools at many Maine sites beginning in the Early Archaic period (*ca.* 10,000 B.P.). Dugout canoes would have been too unwieldy to negotiate some streams and probably too heavy to portage across falls or narrows. However, they may still have been used extensively along the coast.

CULTURAL SETTING

Phase II archaeological investigations at the Boothby Gravel Pit indicate that Site 7.39 is of Late Archaic Susquehanna tradition affiliation. The following discussion addresses briefly the Late Archaic Susquehanna tradition, but not other periods (*e.g.*, Paleoindian or Early Archaic) of Maine prehistory which are not relevant to this report.

Late Archaic

The Late Archaic period dating from around 6000 B.P. to about 3000 B.P. has been divided into a number of complexes, traditions and phases, although some of these are not found in southern Maine. Along with the variability in traditions is an apparent increase in site numbers locally and throughout the region, which may indicate a larger Native American population and/or successful adaptation to the evolving landscape.

The Late Archaic period in Maine begins around 6000 B.P. with the arrival of Laurentian tradition technology. Sites dating to this early portion of the Late Archaic fall into the Vergennes Phase (Ritchie 1965). Vergennes Phase sites, distributed from the Champlain Valley east to Maine, are identified from Otter Creek bifaces which are long side-notched points with a concave base. In southwestern Maine, Laurentian materials, including Otter Creek, Brewerton, and Vosburg-like points, were found at five site locations on Sebago Lake (Hamilton *et al.*, n.d.; Hamilton 1985). A possible Vosburg-like point has also identified at a site on the Mousam River in West Kennebunk (Spiess, Cranmer and Hedden 1990). Sites from the Vergennes related components are more well-known from the Kennebec River north, but the Laurentian cultural tradition is best known from New York and Vermont (Funk 1988; Ritchie 1965).

Following the Vergennes phase in

northeastern prehistory is a second aspect of the Laurentian Tradition known to archaeologists as the Brewerton phase. Cultural materials identified as "Brewerton" have been documented at several sites in the Sebago Lake region (Yesner, Hamilton and Doyle 1985) as well as in the Merrymeeting Bay area of the lower Androscoggin. Wilson, Cox and Bourque (1989:13) have proposed that Merrymeeting Bay may be the eastern boundary of the culture. However, a little to the north and east of Merrymeeting Bay at the outlet of China Lake, Trautman and Spiess (1991) report Brewerton material at the Cates Farm in East Vassalboro.

The Small Stemmed Point tradition (6000-2000 B.P.) is a third aspect of the Late Archaic period and has been identified in Occupation I at the Turner Farm site in Penobscot Bay, from the Nevin site (Hamilton 1988) and from southwestern coastal Maine (Casco Bay) and Sebago Lake. Others have been identified in the lakes region of western Maine and New Hampshire (Dincauze and Williams 1973; Robinson 1985). While sea-level rise and tidal amplitudes have probably inundated or destroyed many Early and Middle Archaic sites located along the Maine coast (*e.g.*, Robinson 1991), Small Stemmed Point sites do not appear to have been damaged as badly and are likely the oldest yet known occupations in Casco Bay (Yesner 1983). Sites with Small Stemmed Point components often show a subsistence base of large terrestrial mammals such as deer, avifauna such as ducks, and marine resources like clams, sea urchin, cod and swordfish (*e.g.*, Bourque 1976; Hamilton 1985; Spiess and Lewis 1990).

Susquehanna Tradition

People of what is known as the Susquehanna tradition lived in Maine sometime between 4000 and 3000 years ago at the end of the Late Archaic period. Because of the significant differences in lifeways evident from their cultural remains and, notably, their burial patterns, some archaeologists argue that Susquehanna populations replaced earlier Moorehead phase people (Sanger 1975; Sanger and Bourque 1987). Others argue that the Susquehanna tradition developed in place. According to Spiess, the location of some Susquehanna tradition sites on small seasonal streams would indicate a reliance on the birchbark canoe which is a northern invention.

With the Susquehanna tradition a stone tool technology based on large, well-made bifaces emerges. And these artifacts have been used to establish temporal affiliations. In the Mid-Atlantic states diagnostic bifaces are identified as Snook Kill, Susquehanna Broad, Genesee, Perkiomen, and Orient fishtail points. In New England, archaeologist tend to find Atlantic, Susquehanna Broad, Orient, Mansion Inn and Wayland Notch bifaces (Dincauze 1972; Snow 1980; Spiess 1991a). Sites attributable to the Susquehanna Tradition prior to this project have been found throughout the state of Maine including on the Saco River at Steep Falls by avocational archaeologist Richard Doyle (Cowie and Petersen 1989).

The end of the Archaic period, and the Susquehanna tradition, in northeastern prehistory occurs with the adoption of ceramic technology sometime around 3000 radiocarbon years ago. The Ceramic period is divided into three main sub-periods: Early (2900 to 2200 B.P.), Middle (2200 to 1000 B.P.) and Late Ceramic (1000 to 450 B.P.) period based on changing vessel forms, temper types, and decorative techniques.

FIELD METHODOLOGY

A strategy of field work at the Boothby Gravel Pit was designed to attain the goals of Phase II testing. According to MHPC guidelines, the purpose of Phase II testing is to assess a site's potential for inclusion on the National Register of Historic Places. In order to justify nomination to the National Register and/or to recommend further client sponsored archaeological investigations, the dimensions of a site, its cultural affiliation, and the presence or absence of potentially significant feature information has to be assured for each site.

Field work at the site began with a partial walkover survey, which was spent attempting to find the site. Once the site was found, Phase I test pits were easily located and reflagged. Following the clearing of vegetation and the identification of Phase I test pit locations, each site was mapped using a transit and stadia rod. Benchmarks for reckoning site elevations were established at the base of trees or on rocks not likely to be affected by development. Site elevations were recorded in meters in the field and later converted to feet to be transposed onto base maps provided by R.W. Gillespie and Associates.

Shovel test pits measuring 50 by 50 centimeters were arbitrarily placed around those excavated during the Phase I survey in order to better define the limits of the site. A total of 10 test pits and six one meter square test units were excavated during Phase II testing. Each test pit and test unit was hand excavated using both flat shovels and mason's trowels.

Two methods for vertical proveniencing of artifacts and soil changes were employed. In test pits excavation proceeded by natural levels distinguished by color and/or texture. Test pits were employed primarily to identify the boundaries of the site.

For test units, excavation proceeded by arbitrary ten centimeter levels within natural strata. An advantage to this procedure is in the ease of determining artifact concentrations vertically over the entire site. Prior to the excavation of test units, wooden stakes were placed at the corners of each unit. A string line was attached to the stake at the highest corner and tied off at one of the other corners. Vertical proveniencing of *in situ* artifacts was accomplished by transit and stadia rod. *Ex situ* artifacts (those found in the screen) were provenienced to a particular ten centimeter level. Positions of charcoal concentrations, rocks, and observed changes in soil composition were measured to the nearest centimeter, both horizontally and vertically, using a metric tape.

Sediments were passed through 6.3 mm (1/4") hardware mesh attached to shaker screens to facilitate the retrieval of cultural remains. Because sediments consisted of well-drained sands and silts, screening of materials was a comparatively easy task. However, many often fragmented, noncultural pebbles and cobbles in the sediments hindered the field identification of cultural remains. Test pits and test units were considered completed when at least five to ten centimeters of culturally sterile sediments were excavated.

Artifacts, were bagged separately with their provenience information recorded on cards by the field crew. Charcoal samples were collected by hand as encountered, unless too small to be retrievable. Flotation was carried out on five gallon samples from Feature 1 and the "fire floor". The excavation block containing artifactual remains were photographed with 35mm cameras in black and white, and color slide format.

SITE ME 7.39

Site Location and Description

Site ME 7.39 is a small camp site situated west of Hardscrabble Road on the Boothby Sand and Gravel Pit Project in the Town of East Limington, Maine (Figure 1, folio). Route 25 is located less than a kilometer north of the site. The site is 15 meters in length and 5 meters in width for a surface area of some 75 m^2.

The site (Figure 2, folio) is situated on a northeast facing fluvial terrace which is bounded by three remnants of paleo river channels. The Little Ossipee flows from west to east, just 27 meters northwest of the site. During the spring snow melt, the Ossipee overflows its banks and deposits silt and sand on the low lying landscape. In July, 1993, after a relatively dry summer, the meander channel in front of the site was dry.

The area adjacent to, and overlooking the site has been cut for timber in the past. A moderate number of large trees on or near the site including pine, spruce, birch, and oak with a generally clear understory (see Slides).

Archaeological Investigations

Nine shovel test pits were excavated at the site during phase I survey and one feature (Feature #1) was identified. An *in-situ* fire hearth and flaked stone debitage were recovered in TP-3. Fire-reddened rock was recovered by Wilson in test pits

2 and 6.

In July 1993, we found all of Wilson's Phase I test pits, including the expanded TP-3 which had produced cultural remains. After a preliminary meeting with A. Spiess, MHPC, it was decided that a minimum of eight additional test pits be excavated at the perimeter of the Phase I test area. Additionally, it was agreed to extend Wilsons TP-3 from a 1x2 m to a 2x3 m unit in order to define the known feature and increase the sample of lithics as well as charcoal for radiometric assay. Prior to the excavation, Hamilton attempted to surface collect the bank of the meander and river with no cultural remains identified.

A transit station was set up southeast of the excavation area at the top of the levee. The station is adjacent to Phase I test pit 4 and a base line running parallel to the bank edge was established at an azimuth of 000 degrees (reckoned from magnetic north). The elevations of all Phase I and II test pits and units were recorded, as well as the compilation of three x-section profiles of the levee deposits.

Eight standard test pits (STPs) were excavated at Site 7.39. Being all sterile they failed to extend the boundaries beyond Phase I investigations. A focused effort on Wilson's TP-3 excavation included the establishment of a 2x3 excavation block with her 1x2 m expanded test pit at the center of the block. As part of Phase II requirements, the western two-thirds of the 2x3 m block was excavated to 150/160 cm below ground surface. Excavations revealed the presence of a Late Archaic occupation associated with Feature 1 and strata F3. This occupation is a small locus and clearly is intact along the terrace to the southeast of the excavation block.

The distribution of materials and superposition of Feature 2 suggest that the site may be multicomponent. A flood deposit of ca. 20 cm apparently separates the two cultural deposits. The multicomponent nature of the site may also be confirmed by the differences in lithic reduction activities. In Feature 1, the debitage is all bifacial thinning flakes. Superior to this in Feature 2, the flakes are small chunks or spalls from core reduction.

Two 20 liter soil samples were removed from strata F3 and all feature fill for processing in the laboratory. The soil samples were screened with 6.0 mm, 3.35 mm and 1.0 mm mesh. No additional flakes were recovered, however, a moderate sample of charcoal was obtained.

Stratigraphy

Excavation Block 1 provides a representative profile of the stratigraphy (Figure 3, folio) at Site 7.39. A black organic root mat with fine silty/sand dominates the upper 5 cm of the sediment column. Beneath the root mat the B^1 horizon is a dark brown (10YR4/3) fine sandy/silt. The B^1 horizon is separated from the B^2 horizon in the east wall by an A^1 of very dark grey/brown (10YR3/2) fine silty/sand, about 5 cm in thick. The B^2 horizon of brown (10YR5/3) fine silty sand extends to depths of 35-40 cm below ground surface. Horizontally, the B^2 is rather even across the underlying B^3 horizon. The B^3 horizon of yellowish brown (10YR5/6) fine silty sand appears to represent a flood deposit on the F3 cultural deposit. The F3 layer is a dark yellowish brown (10YR4/4) layer containing abundant charcoal and smaller amounts of fire-cracked rock. The F3 deposit is about 60 to 70 cm below ground surface. Underlying the B^3 and F3 is C^1, a yellowish brown (10YR5/8) fine sandy/silt.

A single radiometric assay was run by Beta Analytic Laboratory on a 62 gm sample of charcoal. The assay produced a date of 3490±80 B.P., or 1530 B.P. (Beta 66244), which places the occupation represented in stratum F3 within the Late Archaic Susquehanna tradition.

Cultural Remains

The sample of flaked stone debitage is small secondary flakes or fragments of rhyolite. The 21 flakes were recovered between 37 and 68 cm below the ground surface. Vertically, the flakes were distributed in the two by six m excavation block. Nine flakes were recovered in association with

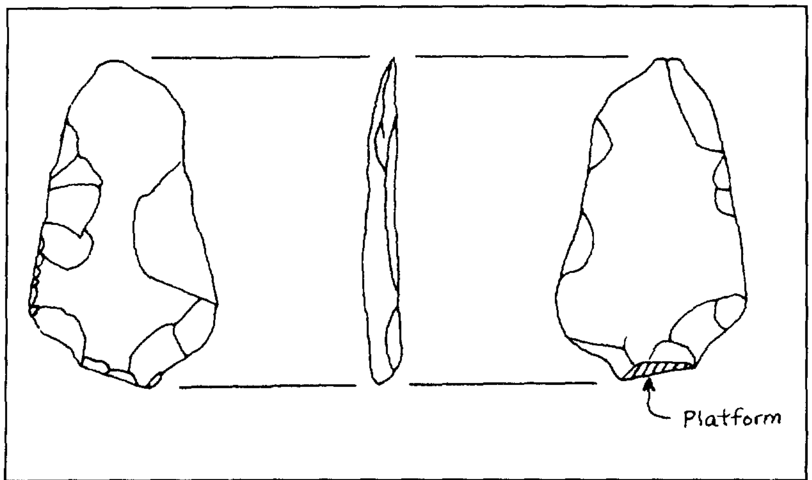

Figure 1. The Boothby Gravel Pit biface.

Feature 1, a fire-cracked rock, and charcoal hearth. Four flakes were recovered in Feature 2, a cluster of fire-cracked rock. All other flakes were in association with the dark brown buried surface.

A single fragmented flaked stone biface (Figure 1) was recovered from site ME 7.37. The specimen was manufactured on a flake of Kineo rhyolite and the bulb of percussion is evident on the base. The measurements for the biface are as follows: length, 43.4 mm; width, 24.8 mm; thickness, 6.2 mm; blade length (L), 36.4 mm; basal platform width, 10.2 mm. This biface is dated directly by the radiocarbon date.

The Boothby biface is very similar to several bifaces recovered at the base of the Great Diamond Island site in southern Casco Bay. At Great Diamond, the comparable Type III: stemmed biface recovered in stratum IIB is basally thinned and manufactured on Kineo rhyolite. A radiocarbon date on the Susquehanna tradition component in Stratum II at Great Diamond is 3540±190 B.P., which overlaps at one sigma with the Boothby site date.

Regionally, the Susquehanna or Broadspear "tradition" appeared at about 4000 B.P. and persisted until after 3400 B.P. (Borstel 1982:64-65; Dincauze 1976:113-114; Ritchie 1969:219-223; Sanger *et al.* 1977; Turnbaugh 1975). This cultural manifestation referred to here as a cultural complex for the Gulf of Maine has been variably considered to be contemporaneous with the small stemmed point tradition (Yesner et al. 1983) and/or an intrusive cultural group (e.g. Dincauze 1975; Sanger 1975; Turnbaugh 1975).

A variety of Susquehanna sites are know form the Gulf of Maine and adjoining interior regions (e.g. Borstel 1982; Bourque 1976; Bourque and Cox 1981; Dincauze 1968, 1972, 1976; Hamilton et al 1984; Robinson 1979; Sanger et al n.d.b.; Yesner 1984). Subsequent Terminal Archaic manifestations may be present in the Gulf of Maine, but remain to be well defined.

RECOMMENDATIONS

Site 7.39 in East Limington, Maine appears to be a single component Late Archaic ephemeral camp site. Currently, this site is the only well isolated Late Archaic period site in the Saco drainage. It represents one of the poorly known periods of northeast prehistory and is therefore, significant. The well defined site geology and rather abundant floral remains could contribute immeasurably to what is currently known about prehistoric human inhabitants of the middle to late Holocene.

ME 7.39 is not undergoing erosion and in fact appears to be building from sediments deposited recently during spring flooding. The site is not in or near the impact zone of the proposed expansion of the sand and gravel operations. Therefore, no further investigation at Site 7.39 is necessary.

The site is eligible for nomination to the National Register of Historic Places. After a discussion with R. Gillespie of R. W. Gillespie & Associates Geotechnical Engineers it was determined that no gravel extraction activities would impact the existing site area. The site currently <u>not</u> undergoing erosion.

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THE YINDRA-BARUS SITE: AN ARCHAIC INDIAN CAMP ON ANDROSCOGGIN LAKE

Don Matson and Arthur Spiess

INTRODUCTION

This site on Androscoggin Lake in Wayne, Maine was located in the fall of 1992, partly by accident, partly by design. Citizens of Wayne and literature about the town identified a so-called "Indian carry" at the southern end of this lake, which is part of the Androscoggin River watershed. The carry was used historically by Abenaki Indians of the Anasagunticook tribe who lived in the area until about 1750. At that time, the tribe's last members left central Maine seeking refuge in Canada from colonial militia and the encroachment of white settlers. Their descendants now live primarily at St. Francis, near Quebec.

Wayne was settled by colonists from Cape Cod in the early 1770s. It soon became a farm town. Route 133 travels through it, originally serving as a stagecoach road from the town of Winthrop, five miles east, to Livermore Falls, about ten miles northwest of Wayne.

In September, 1992 Don Matson visited the well-identified entry site of the carry — a wide, worn-down path across a peninsula of land between the Dead River and the western shore of Androscoggin Lake. Also visited was Norris Island, int he middle of the lake north of the carry, reportedly the site of a historic Indian cemetery excavated at earlier dates by amateur and professional archaeologists. Through observation, it was judged that the opposite end of the carry — where the Anasagunticook transported canoes and belongings to Wilson Pond as part of a seasonal journey to the Kennebec River watershed — was the beach area in a cove on the lake's southeastern shore (known locally as Perkins Beach.)

Later that month, Matson walked along the beach and edge of a lakefront camp owned jointly by the Yindra and Barus families. At the foot of a narrow path from the camp cabins to the beach, the tip of a stone implement was observed emerging from the soil. After retrieving it, Matson proceeded to dig in the immediate area for about four square feet, but found nothing else at that time.

SITE LOCATION

The camp property slopes gently toward the lake, ending in a sand beach about 30 feet wide in mid-summer. The beach is usually under water up to an earth bank bordering the camp during spring flooding. Erosion of the property's slope due to rain and flooding may account for the relatively shallow layer of topsoil on the property and the large amount of silt mixed with sand extending into the lake.

The Yindra-Barus camp, like adjoining property on either side, is lightly wooded; tall, thin oaks and small fir and pine trees. There are two cabins side by side at the eastern end of the lot on level ground. Behind the cabins, across an access road, the woods are dense and strewn with granite boulders. The terrain rises about half a mile to a ridge between Androscoggin Lake and Wilson Pond. Hardscrabble Road follows the several mile long ridge north to Wayne and south to Monmouth at an average altitude of about 350 feet. Nearby high points are Bishop Hill (546 feet altitude) on the southwest corner of the lake, and Morrison Heights (664 feet altitude), overlooking the lake's eastern shore.

EXCAVATION

Excavation on the Yindra-Barus property began in September, 1992 and was done carefully with permission of the owners. It was limited to two areas and a small mound (Figure 1). The goal of excavation was to try to define a prehistoric Indian camp at an interior site in Central Maine and determine what

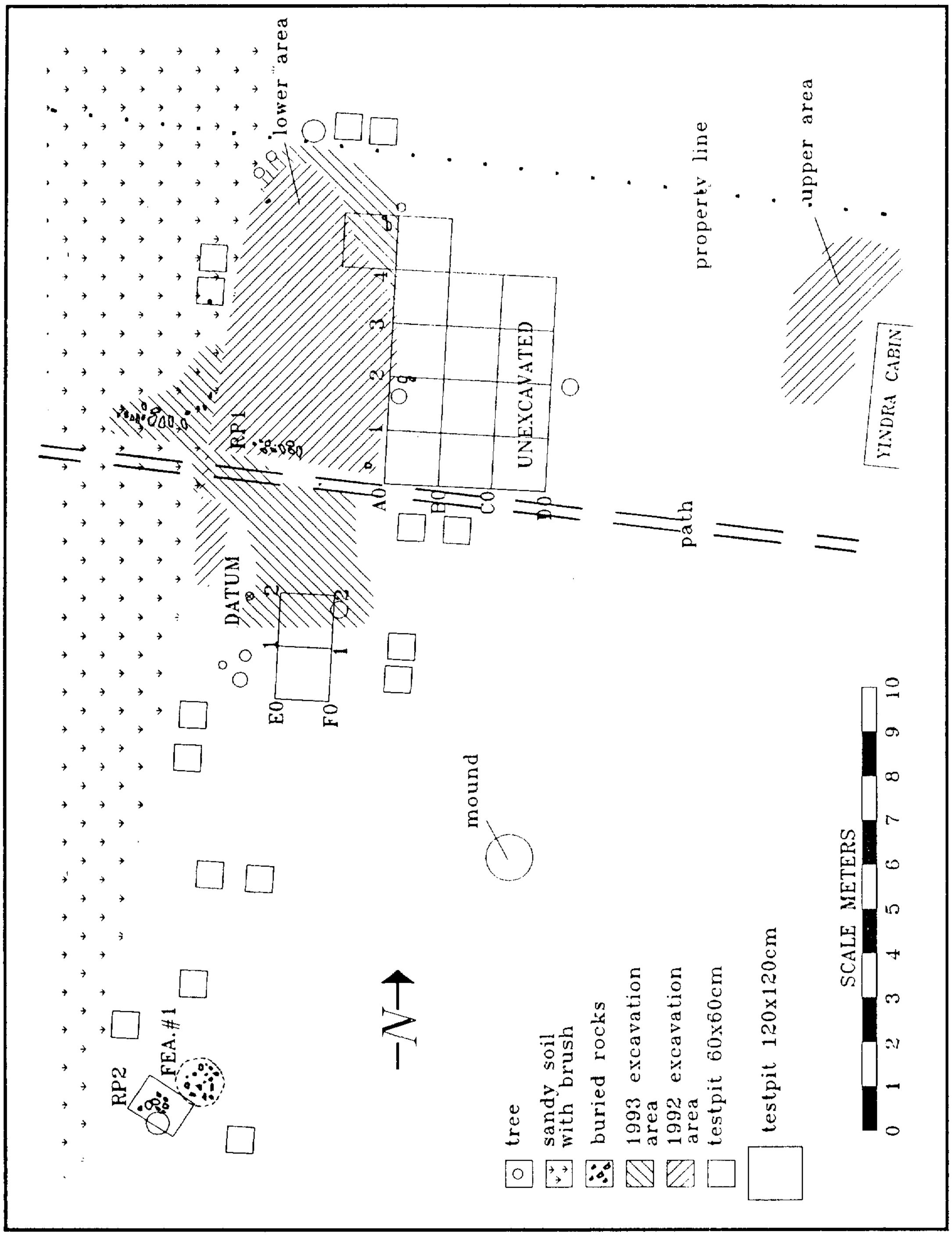

Figure 1. Map of Yindra-Barus site excavation areas. Square designations provided for areas excavated with square layout.

kinds of activities took place there.

Test holes were dug on the property and on an adjoining property in 25 places. This consisted of digging a square 60 cm. by 60 cm. down through topsoil until reaching undisturbed sand or clay. Most of the test holes yielded topsoil no more than 20 cm. deep. The layer beneath is gravelly sand or pure sand. Underneath that is yellow-gray sandy clay or bluish-gray Marine clay. The Marine clay extends beneath the beach sand and under the lake. The area surrounding Androscoggin Lake is mapped by the 1985 Surficial Geologic Map of Maine as "till;" a heterogenous mixture of sand, silt, clay, and stone which includes boulders.

SITE DESCRIPTION

Excavation started with a small, moss-covered mound near the center of the Yindra-Barus camp With John Yindra, Matson dug out the mound to a depth of 60 cm. Below 10 cm. of topsoil, the mound was entirely sand. About 25 cm. down, there was a 2.5 cm. wide grayish layer of sand mixed with ash, with bits of charcoal in the mix. Below it lay another 20 cm. of sand, then hard-packed, sandy, yellow-gray clay which appeared undisturbed. No artifacts or objects were found.

Upper area

In the fall of 1992, excavation with a long-handled spade and small trowel began on a slightly rising bank of land directly at the base of the Yindra cabin (Figure 1). Topsoil in this area averaged 20 cm. deep. Beneath it lies a dense yellow sand layer of varying depth, usually about 15 cm. Below that is hard-packed, yellow-gray sandy clay. At the northeast corner of this area, the tip of a large rock shows above the surface. On either side of this rock, about 12 cm. deep, are three smaller rocks. Together, they form a semi-circle of seven rocks having the appearance of a fireplace. Inside the semi-circle, also about 12 cm. deep, were 50 smaller rocks and rock fragments, many reddened and several with charcoal stuck fast to their surfaces. They were removed. There was also evidence of an ash layer mixed with these rocks. It is unclear whether this feature, so close to the surface, is a modern or ancient fireplace.

On the slope of this bank, south of the semi-circle of rocks and under 20 cm. of topsoil, was a broken, eroded piece of stone (artifact #2) with a single artifact: a worked, smooth surface and front edge intact, apparently part of a gouge.

Lower area

The lower excavation area is located along a bank which descends through bushes and brush in sandy soil to the beach (Figure 1). Throughout, roughly 20 cm. of topsoil lies over 15 cm. of gravelly sand. Beneath that is sandy, gray clay which changes to Marine clay as the bank begins its descent toward the beach.

Excavation on the slope of this bank began in the fall of 1992 where the first stone implement was found. Some digging by modern owners of the property had apparently disturbed the soil in this area, as evidenced by discovery of occasional nails, pieces of old barbed wire, and a plastic squirt gun (!) in the top 10 cm. of soil. Grass and roots and several inches of topsoil were removed by spade. Most of the subsequent digging was done by trowel, though occasionally an artifact was struck during excavation by spade.

Directly alongside the path to the beach, fifteen large, mostly flat rocks and a number of smaller rocks were uncovered beneath 10 cm. of topsoil, positioned together in a slightly curved line. The rocks showed no evidence of reddening of fire-cracking, and were sketched in position, removed, and placed nearby. Also in the area immediately surrounding these rocks, a variety of quartz chips and pieces were found scattered under 10 to 20 cm. of topsoil. Digging in this area turned up a quartz hammerstone, a narrow, smooth-edged abrader broken into three pieces, and a large chert blade, as well as several flakes of chipped gray stone. At the northern corner of this lower area, next to a pile of a dozen small stones and one large rock, an eroded brown stone that had been shaped and smoothed was uncovered. At the end of November, both areas were refilled with topsoil.

Excavation of the lower area resumed in May, 1993, lasting through mid-June. Photos were taken

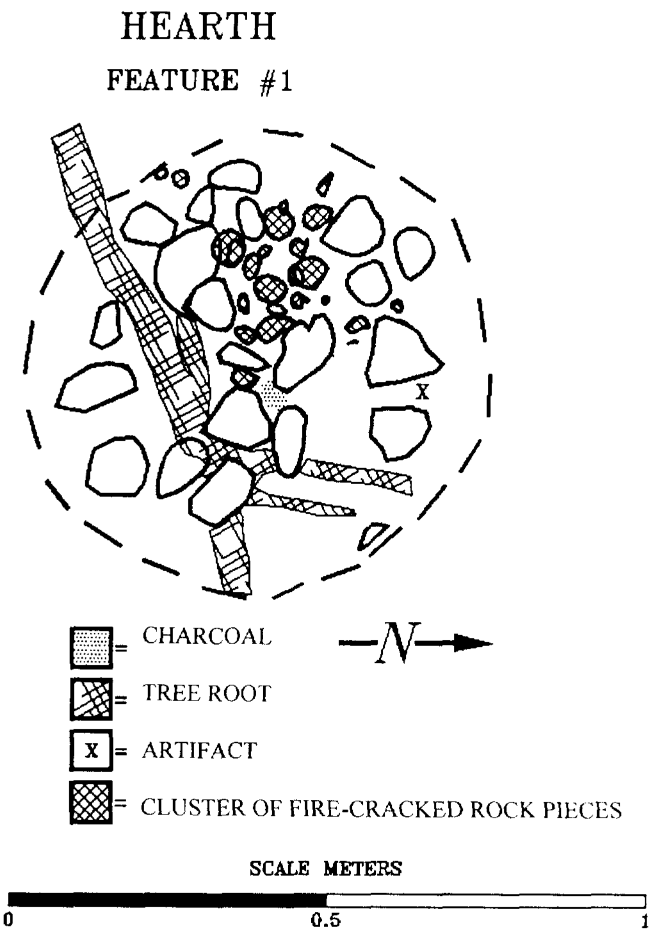

Figure 2. Hearth feature #1.

of the site and a field notebook kept. A grid was set up along the east perimeter of last fall's digging using the 6'-8'-10' method (Robbins and Irving 1981) and keyed to a small tree which served as the datum. Stake A0 was placed 177 inches due northeast of the datum. The total grid area planned for excavation was 192 square feet, each grid square being 4 feet by 4 feet. Plans were also made to search for a hearth in or near the lower area and excavate several small areas along the edges of the previous fall's digging.

The method used to look for a hearth was not sophisticated, but minimally destructive to the site, and in this case, worked. Assuming that large rocks grouped together up to 30 cm. below the surface could be an indication of human activity, a long, sharpened stake was used to probe the topsoil along the lower area bank. The stake was thrust approximately 30 cm. into the ground every six inches along a straight line from the bank's northwest corner to the property's edge at the southwest corner. Then moving six inches perpendicularly, the pattern was repeated from the southwest corner back to the northwest corner, and so on back and forth along the bank.

Eventually, the stake struck two objects in a row beneath the surface. The top layer of grass and soil in a 60X60 cm. square at the strike location was removed by spade, then a trowel was used to uncover two rocks. Further excavation revealed twenty similar-sized rocks in a rough circle about 70 cm. in diameter, resting about 20 cm. below the surface on gravelly, yellow sand (Figure 2).

All rocks showed signs of fireplace use: reddened surfaces and firecracks. A large root from a nearby oak tree had travelled through the circle from southwest to northeast, displacing several rocks. Near the center of this rock circle about 10 cm. deeper in a mixture of silt and sand lay a cluster of 30 smaller stones; mostly broken granite pieces, reddened by fire. The sand in which this cluster was located was brown in color. Bits of charcoal were found. Next to the largest hearth rock, at a depth of 20 cm., a rough-surfaced, knife-shaped stone, was found.

When this feature was entirely exposed, it was sketched in detail. Removal of the rocks turned up no other artifacts. A test square in the immediate area turned up a large pile of rocks nearby, many reddened and firemarked. The conclusion of this report discusses the possible purposes of this hearth and rock pile more fully. (The artifacts recovered during 1992-1993 excavation are listed in Tables 1 and 2 below.

THE ARTIFACT ASSEMBLAGE

The Yindra-Barus site artifact assemblage consists of the 32 pieces with provenience noted in Table 2, which we shall describe in greater detail below, plus 40 pieces of debitage and core fragments. These 40 less diagnostic pieces comprise 6 rhyolite

Table 1. Artifact discovery: narrative outline

Upper area, fall 1992

Gouge fragment (Figure 6: left).

Lower area, fall 1992

Quartz pecking stone (Figure 12: left). Also, stone abrader in three pieces. Chert knife at the center of lower area, lying flat on surface of gravelly sand layer (Figure 4). Nearby, flat gray stone flake chipped on one surface. Eroded piece of smooth brown stone: probable celt fragment (Figure 6:right).

Lower area, spring 1993

Excavation of two 4'X4' squares along the south edge of the lower area (E0, F0- E2, F2). Quartz chips of varying size and a palm-sized piece of quartz with an apparent scraping end (Figure 12; right) . Just outside the border of E1,F1-E2,F2, at the base of a large oak tree, a 7.5 cm. side-notched biface (Figture 5:right). At the base of this oak tree to the north, two pieces of an abrader smoothed on top and bottom with ends missing. Also in E1, F1-E2, F2: several chips of a tannish-white, chalky stone, and the tip of a biface. A fist-sized, flaked brown rock with an edge (Figure 10: left). Along the path bordering the lower area, a biface tip of tannish, white stone, and a similar piece of material perhaps used as a scraper. Where the path descends the bank toward the beach, a triangular gray stone with point broken off (Figure 11: right). Square A0, B0-A1, B1: several quartz chips and a triangular quartz piece with a drill-like point. Square B1,C1-B2,C2: plummet (Figure 5: left); a large and small piece of a 'chopper" (Figure 10: right). Also found in this square: a rounded, worn chert core. At the corner of this square by the base of an oak tree, a small broken stone rod (Figure 8: lower left). Square A1, B1-A2, B2: two flakes of gray stone. Square B2,C2-B3,C3: a broken quartz and garnet tip, possibly a scraper. No artifacts in square A2,B2-A3,B3, but darker and deeper soil toward the north. Grid extended one square north (A4,B4-A5,B5) and one square west of that. Square A4,B4-A5,B5: a flat flake with a rounded, sharp edge. Square to the west of A4,B4-A5,B5: two large rocks next to each other about 10 cm. deep. A final irregular area extending from this square west to the base of two pine trees was excavated. In this area, a large gouge (Figure 7). Also, a piece of white quartz with a serrated edge, possibly a scraping tool and a pointed chert tip. Digging increasingly difficult due to the tangle of tree roots. At this point, excavation at the site ended. (Return to site in the fall of 1993 to re-examine digging at E1,F1-E2,F2: a stone tool 16 cm. deep just outside that square (Figure 9).

Table 2. Yindra-Barus site artifact find location, depth and description.

Artifact Number	Location at Site	Depth in Topsoil	Comment
1	lower area	tip exposed in eroded path	stone rod: front end
2	upper area	20 cm.	gouge: front end
3	lower area	15 cm.	quartz pecking stone
4	lower area	20 cm.	abrader: 3 pieces
5	lower area	20 cm.	chert blade
6	lower area	20 cm.	includes cutting edge?
7	lower area	15 cm.	celt, back end
8	inside hearth	20 cm.	knife-shaped; rough, grainy surface
9	lower area	20 cm.	biface; spear point
10	lower area	18 cm.	biface tip
11	lower area	15 cm.	core
12	lower area	15 cm.	

13	lower area	18 cm.	biface tip
14	lower area	15 cm.	
15	lower area	15 cm.	
16	lower area	20 cm.	
17	A0,B0-A1,B1	16 cm.	drill-shaped point; wedge?
18	B1,C1-B2,C2	17 cm.	plummet
19	B1,C1-B2,C2	17 cm.	abrader; 2 pieces
20	B1,C1-B2,C2	15 cm.	core
21	B1,C1-B2,C2	15 cm.	stone rod: front end
22	A1,B1-A2,B2	16 cm.	
23	A1,B1-A2,B2	16 cm.	
24	B2,C2-B3,C3	12 cm.	quartz and garnet fragment
25	lower area	17 cm.	chert flake
26	lower area	18 cm.	gouge
27	lower area	18 cm.	scraper?
28	lower area	18 cm.	
29	lower area	18 cm.	broken
30	lower area	15 cm.	spoon-shaped; rough, grainy surface
31	test square next to hearth	14 cm.	pecking stone: battered
32	lower site	16 cm.	abrader?

or other volcanic rock flakes, four larger polycrystalline (white, or "bull") quartz core fragments, and 30 smaller polycrystalline quartz flakes, core fragments and shatter (Figure 3).

Among the 32 artifacts listed in Table 2, we can differentiate at most two different cultural occupations. The possible second component is represented by one artifact. (There are no ceramics from the site, and no lithic artifact hint of a ceramic component.) It is possible that the site location is "single component" in the sense that it is all Laurentian Late Archaic, related to the Vergennes phase.

Maine archaeologists have learned much about the Laurentian Late Archaic in recent years (eg. Cox 1991, Petersen 1991) and a preceding, related Middle Archaic (e.g. Petersen 1991; Robinson et al. 1992, Sanger et al 1993) before an arbitrary temporal dividing line placed at 6000 B.P. Since learning to recognize these components, whose "diagnostic suite" of stone tools really isn't very "diagnostic", they have begun to be noticed around many interior lakes, streams and rivers (e.g., Trautman and Spiess 1992, Hedden and Spiess 1994, and this report, of course). We will try to weave some of what has been learned in terms of tool typology into the description below.

One large, Kineo rhyolite biface (36.13.5, Figure 4) represents the possible cultural anomaly in the assemblage. This piece is 168 mm long, 68 mm wide, and 14 mm thick, rather thin for its width (1:5) thickness to width ratio. Many of the flake scars from the last episode of biface thinning travel 1/3 to 1/2 of the distance across the face of the piece, which is remarkably good work on Kineo rhyolite. The edge has been trimmed carefully with 5 to 10 mm long retouch flakes, only a few of which end in step fractures. The first time Spiess saw this piece he thought: Susquehanna tradition preform, of course.

At present we are not so sure of the Susquehanna tradition attribution, for two reasons. The first is that there is nothing else in the collection that even hints at the Susquehanna tradition. (Admittedly neither are there any of the large, thin biface reduction flakes that necessarily resulted from manufacture of this piece, which means that the piece was made elsewhere.) Secondly, 36.13.6 is not a preform, at least not in the sense that it is destined to be directly made into a stemmed Atlantic phase or similar Susquehanna tradition point. This piece was hafted and apparently used as a knife. The hafting modification is quite clear. Along one edge (the upper in Figure

Figure 3. Quart core fragments and shatter.

Figure 4. Large felsite biface.

4) there is a broad notch about 20 mm above the base, while the other edge has a narrower shallow notch about 10 mm above the base. The edge of the base between these two points has been lightly to heavily ground to dull it, in clear contrast to the sharper distal edges.

Large, well-made rhyolite bifaces turn up around Maine's inland lakes quite frequently. Some of these come from clear Susquehanna

Figure 5. Plummet and Otter Creek-like point.

Figure 6. Gouges or celts, highly eroded.

from traditional contexts or associations. Some do not. At this point we want to raise the possibility that some of these large, well made bifaces are *not* Susquehanna tradition markers, but may be earlier Archaic pieces.

Leaving aside the question of the cultural attribution of 36.13.5, all the rest of the material from the assemblage could be Laurentian Late Archaic in age. The only other remotely diagnostic biface (36. 13.10, Figure 5) is an Otter Creek point or close relative. This point is relatively long and narrow (74 mm x 24.5 mm) but thick (9 mm), made on a light gray mudstone or argillite. The edges are convex (rather than straight for much of the length just above the notches), and the broad side-notches are slightly asymmetrical. Notch depth is 3.2 and 3.9 mm, and notch width is 8.5 mm. The notches and base have been heavily ground. This point falls within the range of variation for Otter Creek points from site 95.20 (Cox 1991: 141-142).

Artifact 36.13.18 is a plummet (85 x 48 mm, 119.4 grams), which is poorly pecked and asymmetrical (Figure 5:left). The suspensory knob is very slightly set off from the body by a lightly pecked and shallow groove. This is by no means a finely-made Moorehead phase style of plummet, although the suspensory knob is slightly better defined than most of the plummets from site 95.20 (Cox 1991:145).

There are three eroded, ground stone tools which are either gouges or celts. A gouge bit fragment (36. 13.2, Figure 6 left) and apparent celt bit (36.13.7, Figure 6 right) were pecked from some volcanic rock full of gas vacuoles. This material preserved very poorly, and the only grinding or polishing that survived is the distal 3 cm around the gouge bit. The gouge bit is very shallow, a maximum of 5 mm dip

Figure 7. Large gouge, specimen 36.13.26.

from the edges to the middle of the channel, and the channel was only 30 to 40 mm long.

There is one large gouge in the collection (36. 13.26, Figure 7), originally more than 210 mm long, which has eroded asymmetrically. The knobs and grooves around the proximal end appear to be an artifact of erosion and dissolution of the meta-sedimentary rock, rather than original. We assume that this piece was originally symmetrical because the bit section has survived so. The gouge channel, barely visible to the lower right in Figure 7, is very broad (30 mm) and shallow (5 mm maximum), and relatively short (55 mm).

The most common "ground" stone tools in the collection are ground stone rods (4 examples, Figure 8), and three other elongate but less well formed stones which were probably used as abrasives (the largest illustrated in Figure 9). The stone rods have fine grit, roughly 120 to 240 grit as compared with modern sandpaper. The less well formed probably abrasive stones have sharper grit, up to 40 grit. Stone rods are common in some Middle and Laurentian Late Archaic contexts in Maine, and they may be quite well finished and elaborated in mortuary contexts (Robinson et al 1992). Fragments similar to those at the Yindra-Barus site have been found at site 95.20 (Cox 1991).

Felsite or rhyolite flake cores,and the large flakes driven from them, are common at some Middle Archaic and Laurentian Late Archaic sites (Cox 1991:142, Petersen 1991). There are two such cores from the Yindra-Barus site (36.13.2, and 36.13.12 in Figure 10 left), and a fragment of one (36.13.16, Figure 11, right). The very large (up to 80 mm x 100 mm) felsite flakes from the site may have been utilized, but the combination of patination on all specimens and slight natural erosion (water worn?) on several makes it difficult to be definitive.

Tabular pieces manufactured from phyllite or other schistose metasediment have only recently been recognized as a key element in this lithic assemblage of some Middle Archaic and Laurentian Late Archaic

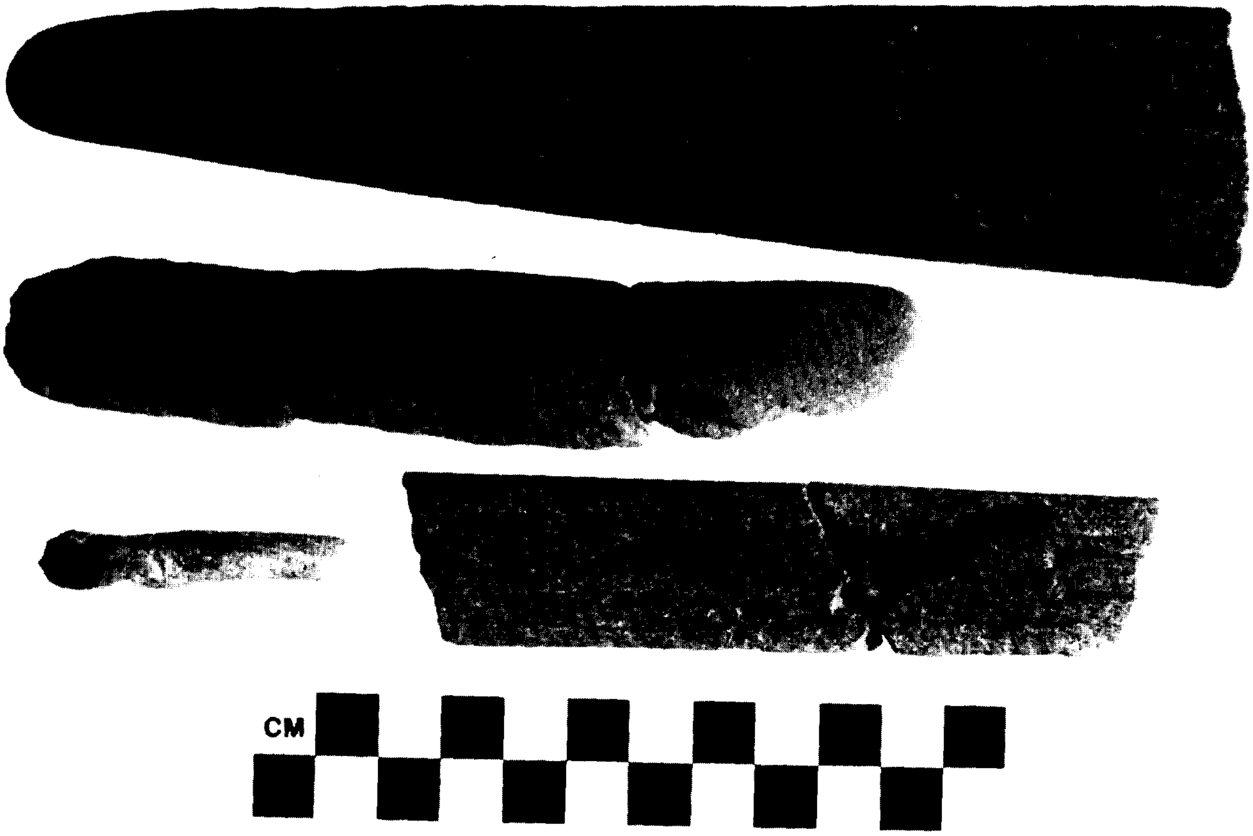

Figure 8. Stone rods.

Figure 9. Probable abrasive, eroded.

Figure 7. Large gouge, specimen 36.13.26.

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Figure 10. Flake core left, phyllite tabular piece right

assemblages. Many of these pieces appear to have functioned as crude choppers (eg. Cox 1991), but with their dull edged they must have been used on bark or some sort of vegetable matter. Sanger et al. (1993) have recently recognized a quarry and manufacturing locality for these and other phyllite tools near Gilman Falls, northwest of Bangor. One phyllite-like tool, perhaps a chopper, exists in the Yindra-Barus collection (refit from two pieces, 36.13.19.1 &.2, Figure 10: right).

Pecking stones, rounded pebbles pecked all around into spherical forms, are a Middle Archaic and Late Archaic form associated, apparently, with the manufacture of pecked and ground stone gouges, celts and other tools. Spherical pecking stones may be more common in Late Archaic

Figure 11. Pecking stone, left; flake core, right.

Figure 12. Quartz pecking stone, left.

cultures like the Moorehead phase, where pecked stone tools were more completely "pecked-all-over" than in earlier Laurentian and Middle Archaic assemblages. There is, however, one (36.13.31, Figure 11:left) from the Yindra-Barus assemblage. One spherical quartz hammerstone, less spherical and pecked over less than 50% of its surface exists (36. 13.3, Figure 12: left).

There is one of the thick, humpbacked quartz endscrapers in the collection that usually accompany Laurentian Archaic and some Middle Archaic assemblages. This piece (36.13.9) is a truly huge endscraper, very clearly horse-hoof in shape (Figure 12: right).

Sanger's work at the phyllite quarry and manufacturing site near Gilman Falls (Sanger et al 1993) identified a new formal tool type, an elongated hammerstone pecked at either end with some larger flake removals, often with a thick, copper edge, termed a "battered nodule" (Sanger et al 1993:109). Battered nodules have been found at other sites (Hedden and Spiess 1994), so the association is not necessarily exclusively with phyllite tool production at that one site. Perhaps the tool type is associated with chopper production on phyllite-like meta-sedimentary rock. In any case, there are none of these tools in the collection.

Nor is there any ground slate. There is one large (52 x 39 mm) quartz fragment, triangular in cross section, which served as a wedge or piece esquillee.

CONCLUSIONS

These conclusions are quite general and drawn on a preliminary basis. Further professional exploration of the area may significantly alter the assumptions made.

The Yindra-Barus site shows all the signs of being a Late Archaic period Indian camp situated along a well-traveled route from the Androscoggin River watershed to the Kennebec River watershed. The lakeside location of the site and the types of artifacts found suggest that the people who camped

The lakeside location of the site, and the type of artifacts found, suggest that the people who camped here were engaged in many activities associated with prehistoric (and historic) Indians; fishing and hunting, preparing and cooking food; cutting down trees and branches for woodworking and dugout building; and producing or transporting tools for these activities.

Quartz chips found scattered throughout the lower area of the site indicate that this material was worked directly here to produce rough stone tools such as the pecking stone, scrapers, and wedges. No significant numbers of chert flakes were found to accompany chert artifacts. These chipped stone items must have been brought to the site from elsewhere, part of the Archaic Indian's traveling kit. Ground stone artifacts were perhaps also brought from elsewhere, and were apparently discarded when broken or left behind when work at the camp ended.

The Yindra-Barus site appears to be a place of habitation for a small group of people; a hunting and fishing party, or a family. The pattern in which artifacts were distributed may indicate a living quarters/workshop where a variety of tools were kept and used. There is a certain logic in setting up on a lake shore to benefit from easy access by canoe, a supply of fresh drinking water, and a breeze to diminish insects and heat.

The gouges generally fall in the category of tools used to make dugout canoes, the primary means of Archaic waterway transportation.

If the hearth (feature 1) is an Archaic one, it may have served to roast both fish and game, plentiful in spring and fall. An interior camp, the Yindra-Barus site probably saw occupation during both these seasons. Long, cold winters in Central Maine over the last several thousand years would have made life on frozen Androscoggin Lake difficult at best.

The hearth may have served another purpose: as part of the dugout-making process. A model of a Tlingit Indian village (the Tlingits are a coastal Alaskan tribe) in the Museum of Archaeology at the University of Pennsylvania, painstakingly made by one of the village's inhabitants, provides a possible clue. The model included a scene of dugout-making. The villagers used large fire-heated rocks to produce charcoal on the surface of a log selected to be the dugout. The charcoal was then gouged out, and the process repeated until the log was considerably hollowed out. In this model, a circular hearth lay next to the dugout-in-progress. The hearth was stacked with burning logs, on top of which rested large rocks in the flames. A pile of rocks lay next to the hearth, awaiting similar use. The of this model's hearth to the Yindra-Barus hearth reinforces the impression that the site was a locus for dugout-making.

How large is the site in its entirety? Are there other Archaic campsites close at hand? Are there Archaic gravesites nearby? Of the artifacts found, there is incontrovertible evidence of craftsmanship and purpose. Someone's artistry made possible the beautifully-shaped chert blade, a stone leaf left behind in an old world for discovery by a newer one.

The Yindra-Barus site is a place where Archaic people lived and worked and looked out across the lake to where they had journeyed from. With the seasons, they set up camp and took advantage of natural opportunities. Then, as always, they moved on.

EDITOR'S NOTE:

This article is the result of an amateur excavation of a late Archaic site. Archaeological materials from the site were brought to the attention of the Assistant Editor who wrote this report to preserve the information that was retrieved. The apparent lack of screening of excavated materials, and stratigraphic control, limits the effectiveness of this work. The MAS cannot support such practices which are beyond the training or experience of our members.

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HEDDEN: A PALEOINDIAN SITE ON THE KENNEBUNK PLAINS

Arthur Spiess and John Mosher

PROJECT INTRODUCTION

This is the first report on the 1992 and 1993 seasons of excavation at the Hedden site (Maine Archaeological Survey site number 4.10). The excavation is a joint project of the Town of Kennebunk and the Maine Historic Preservation Commission (MHPC), partially funded by the Certified Local Government grant program of the MHPC with Historic Preservation funds from the National Park Service, Department of the Interior. The Maine Historic Preservation Commission (Spiess) is providing detailed technical advice on the project. John Mosher is the project assistant employed by the Town.

The Kennebunk Plains property, on which the Hedden site is located, was acquired by the State of Maine, Land for Maine's Future Board, in 1990. The Hedden site was discovered in 1990 by a Maine Historic Preservation Commission survey crew, led by Mark Hedden, using survey funds provided by the Land for Maine's Future Board. The land is currently managed for wildlife habitat by the Dept. of Inland Fisheries and Wildlife. By mutual agreement between IFW and MHPC, archaeological excavations can take place only in the fall, after one or more species of rare birds has finished nesting and several rare species of plants have finished blooming and gone to seed. A maximum of $40m^2$ can be excavated in any one year, and the sod and plant cover must be carefully replaced over the excavated squares. The artifacts recovered from the site are the property of the State of Maine. They will be temporarily housed at MHPC and ultimately transferred to the Maine State Museum for long-term curation. The Hedden site was listed on the National Register of Historic Places on October 16, 1991, and it is monitored for unauthorized digging.

Paleoindian sites are between 10,000 and 11,000 years old. Paleoindians, in Maine, lived at the end of the last ice age as the land was changing from open tundra or patchy spruce woodland and tundra to forest. Some Paleoindian groups hunted now-extinct mammoth and mastodon, and many groups in the Northeast also hunted caribou, as well as a variety of small game. These are the first people to move into northern New England after the ice age. They lived in small bands, perhaps a few families most of the time, and moved on foot over what still seem vast distances to us today. It is not uncommon, for example, for rock raw materials to have been brought from Burlington, Vermont, or from the lower Hudson valley into Maine. Most Paleoindian sites consist of a few loci or concentrations of stone tools, but the range is between one and 40 such concentrations (Spiess and Wilson 1987). Each locus or concentration covers a small area, between 10 and $50m^2$, and must represent the debris from a short term occupation (in or near a family's tent, for example), or a short-term group activity, such as quarrying, hunting, or manufacturing clothing or tools. Wood is rarely preserved as charcoal on these sites, and bone is rarely preserved even as calcined (burned) bone. However, these people made their stone tools from a limited number of high-quality stone sources (mostly cherts). Identification of the stone materials help archeologist "read" some of the interconnections between groups of Paleoindians living all across the Northeast. Moreover, the stone tool materials preserve traces of use-wear, so that we can often reconstruct some of the range of activities at a site just from the stone tools. Thus, any Paleoindian site that is minimally disturbed can contribute to understanding region-wide settlement patterns and patterns of travel and exchange. These and similar lines of reasoning comprise the "scientific" purpose for the Hedden site investigations.

Paleoindians sites are seemingly rare in the New England-Maritimes region, and almost all of them have been found shallowly buried (surface to 30 cm, or 1 foot) in sandy soils (Spiess and Wilson 1987; Wilson and Spiess 1990). The vast majority of these sites have been discovered by chance, or during planning for a construction project, as some or all of their stone tools have been exposed on the surface. We have had no indication of Paleoindian sites being deeply buried by ancient sand movement, until the discovery of the Hedden site.

The site consists of one confirmed and excavated locus (Locus 1) within a sand dune terrain that covers more than 10 hectares (100,000+ square meters). Locus 1, completely excavated, yielded a small collection of stone tools and stone flaking debris which is reported here. The Paleoindian occupation, however, lies on a glacial outwash (pebbly sand) surface which was subsequently covered with deep windblown sand that has protected the surface for many millennia. A widespread scatter of wood charcoal is associated with the geological contact or surface upon which the Paleoindians lived. This charcoal has provided dates of around 10,500 B.P., and promises to provide information on the vegetation cover of the site at or near the time of Paleoindian occupation. Therefore, much of the site's importance resides in its geological context and paleoecological potential, which will be reported in a subsequent issue of the *Bulletin*.

1992 AND 1993 EXCAVATION METHODS

The 1992 excavations commenced on September 24, 1992, and continued for 15 days through an unbroken stretch of dry, clear weather during which it was a pleasure to be outdoors. Our primary task was to excavate a block of contiguous squares around grid location E100 N168, which contained a distribution of flakes and stone tool fragments which we will henceforth refer to as Locus 1. We accomplished the excavation of 26m^2 to a depth averaging about 1 meter (Figure 1). Ancillary tasks included helping our geological consultant, Kathleen Callum, with testpit excavation and soil sample collection, and some minor surveying tasks.

In 1993 we excavated 16m^2 around the margins of Locus 1, recovering a few more tool fragments. The focus of the season's work, however, was in producing a topographic map of the site and excavating an interrupted trench of 5 1x2m units from Locus 1 uphill across the crest of the sand dune (Figure 2). Kathleen Callum worked closely with the crew, and we focused on deciphering the geological context of the site. Some of the 1x2m units were hand excavated to about 1.8 m depth, and tested deeper with a 3" bucket auger. Profiles were drawn of all walls around Locus 1 and one long wall of each unit in the interrupted trench.

Our general field methods were as follows. Prior to a square's excavation the sod layer was carefully removed by shovel and carried to a plastic sheet located several yards away from the block of excavation squares, after the roots and base of the sod were inspected for adherent artifacts. (There weren't any.) This step was undertaken in order to preserve endangered plant species native to the barrens, and to allow quick regeneration of a plant cover after refilling the squares and sod replacement. As an added precaution, top soil (black "A" horizon) was sifted and piled separately from the underlying sands; and when the excavation was refilled the topsoil was replaced on top of the soil column, just under the sod. Excavation was accomplished by hand using shovels and mason's trowels.

Each 2x2 meter square was designated by the grid co-ordinates of the southwest corner of the square. Each square was subdivided into four 1x1 m quadrants which were designated NE (northeast), SE (southeast), SW, NW. Each 1x1 m "quad" was in turn subdivided into four 50x50 cm "quarter-quadrants" designated NEqNEqq, etc. Excavation proceeded by 5 cm levels and 50x50 cm quadrants, and all dirt (except the sod) was screened through $^1/_8$" mesh hardware cloth. While seemingly cumbersome at first glance, using this system means that the most "coarse" provenience for any find was a 50x50 cm quarter quad in a particular 5 cm level. Excava

Figure 1. The center of Locus 1 under excavation in 1992. John Mosher at left, Maxine Collin in center.

tion was accomplished with square-nosed shovels where finds were sparse, and with trowels where finds were common. All flakes and artifacts found *in situ* (as opposed to those found on the screen) were located on the grid system by measuring from the nearest wall in centimeters for the north and east dimension, and vertically in centimeters from the southwest corner of the square using a line level and tape. The elevation below vertical datum (N100 E100) of the corners of these squares were measured to the nearest centimeter with a transit and stadia rod. Thus, many pieces were recovered with 1 cm accuracy in three dimensions.

Each artifact (flake or tool) that had been recovered *in situ* with a 1 cm provenience in three co-ordinates was placed in a small plastic bag (sandwich baggie) with a data card. Objects recovered from the screen from a single provenience unit (50x50 cm x 5 cm) were placed as a group in a baggie with a data card. In the laboratory, all objects which were large enough on which to write an individual catalogue number (mostly anything over 1 cm or 1/2 in maximum dimension or larger) were labeled with India ink with a unique catalogue number. The artifact description and raw material, plus provenience information, was entered into a Knowledgeman data-base computer catalogue. John Mosher spent a considerable amount of time, with some success, in refitting fragments of the same artifact. For example, a Saugus-like rhyolite endscraper was refit from three pieces, and 7 out of 10 pieces of a worked piece of crystal quartz were refit. In at least one case, a green chert endscraper, three sequential hafting retouch flakes were refit on

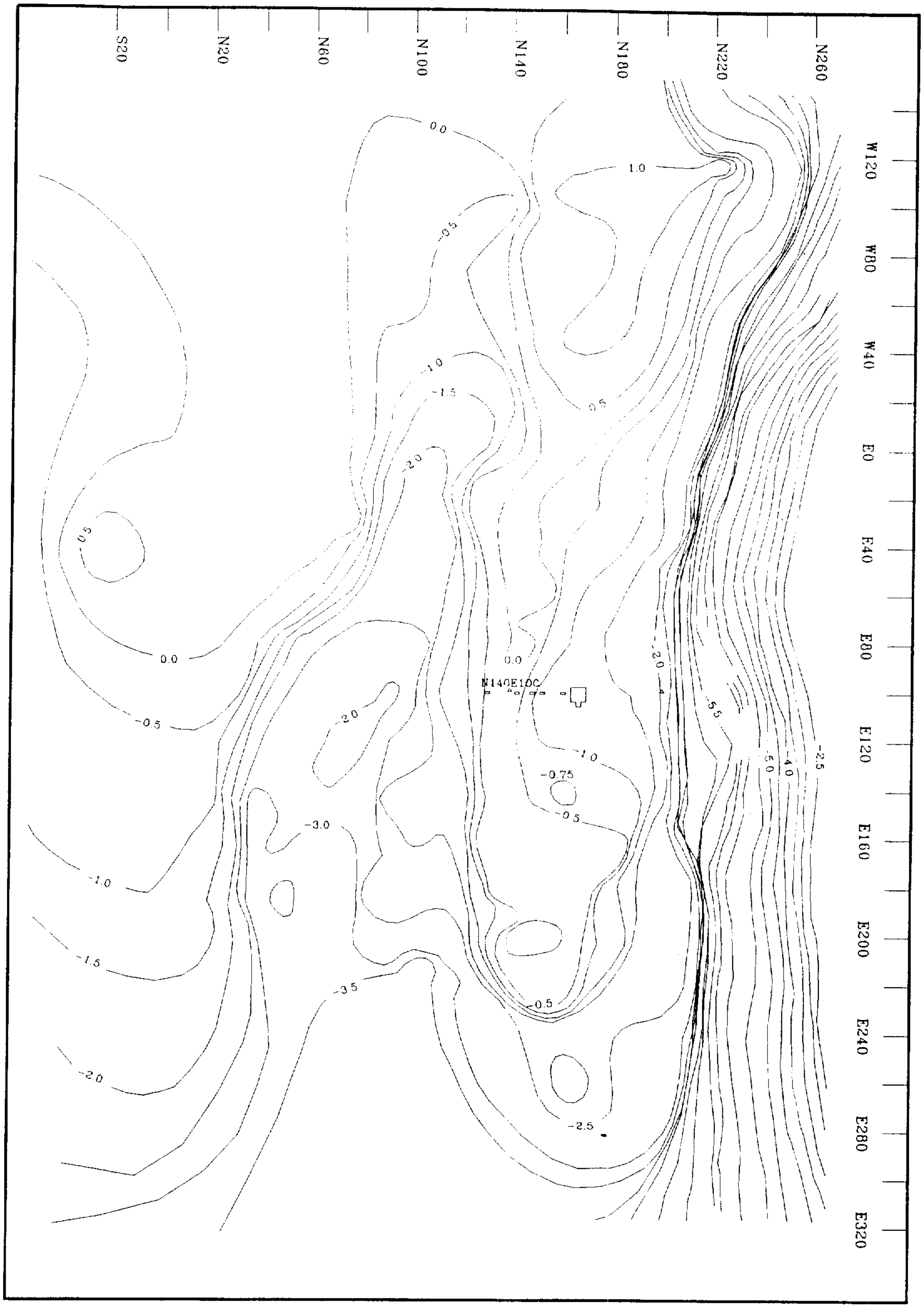

Figure 2. Sand dune topopgraphy on the Kennebunk Plains. 6x6 m excavation unit, and interrupted trench of 1x2 m excavation units leading up to dune crest visible at scale toward center of map.

the proximal end of the tool. (In this latter case the tool was not broken; the flakes had been removed intentionally by a workman among the site's inhabitants.) We will return to the issue of refits as they pertain to horizontal and vertical distribution patterns below.

STONE TOOLS AND DEBITAGE

Worked or flaked stone fragments (lithics), account for the entire range of artifacts found at the Hedden site. They are, therefore, one of the few sources we can draw upon to reconstruct life on the Kennebunk Plains around 10,500 years ago, the estimated age of the site. In three seasons of field work over 800 tools and flaked stone fragments were recovered from a roughly six by eight meter elliptical "locus" located on the side of the dune, or from test pits placed along the East 100 meter line south of locus 1. Stone tools are few, about 22 in all, but many are indicative ("diagnostic") of the Paleoindian period and none indicate any other period of occupation. The collection includes a biface fragment, five endscrapers, a blade or limace fragment, three graver/perforators, a crystal quartz scraping tool, three uniface fragments and seven utilized flakes. A number of diagnostic artifact types are conspicuously absent, namely fluted points which are the most recognizable type of the period, pièces esquillées (small wedge-shaped tools probably used to split wood, bone or antler), and drills.

Those tools which are present were made from cherts, a rhyolite, a jasper, crystal quartz and quartzite. Some of their sources are well known. Munsungun chert is from outcrops north of Baxter State Park near Munsungun and Chase lakes. The brown jasper is from southeast Pennsylvania. Coxsackie chert is from the central Hudson River valley of New York State, and the various gray cherts may be from western Vermont or New York as well. A pink-patinated fine-grained volcanic (rhyolite) comprises a large amount of the lithic material, too. We originally thought that it might be Saugus rhyolite from a quarry north of metropolitan Boston. However, this material has been examined by Barbara Luedtke (Univ. of Massachusetts-Boston), who has done much research into lithic identification, and pronounced definitely not to be Saugus rhyolite (Luedtke to Deborah Wilson 1994). Therefore, we will call it Saugus-like rhyolite, implying a superficial resemblance, without implying anything about its source.

Flaked stone debris (debitage) accounts for the remainder and the majority of the assemblage. In fact the tool to flake ratio (with utilized flakes counted as tools) is almost 1:66, which is far less tools for a given number of flakes than the ratio of 1:16 reported for the Michaud site (Spiess and Wilson 1987: 33). We return to the tool to flake ratio later on in the discussion.

Analysis Methodology

In the laboratory, lithic specimens were sorted by color and material (if known), weighed on an electronic balance to 0.1 gram, counted, given sequential catalog numbers (0001-1000) and listed on an IBM compatible computer using KnowledgeMan and/or dBaseIV software. Artifacts and debitage were labeled in indelible ink with site number and catalog number, unless the item was too small. Many of the retouch and flake fragments were either labeled with catalog numbers alone or left unlabeled.

Flakes, or "debitage", utilized flakes, and stone tools were analyzed following procedures developed by Spiess in the course of his research (see Spiess and Wilson 1987). Each artifact was identified as to known material source (*i.e.*, Munsungun chert, Saugus-like rhyolite) or unidentified material color (*e.g.*, dark gray chert) and morphological functional type — *i.e.* biface, endscraper, uniface fragment, etc. Debitage (the waste material that results from making stone implements) was sorted into two general and five specific flake type categories identified as follows. The two general flake types include microflakes and flakes. Microflakes are tiny specimens, one cm in maximum dimension or smaller in size, that are often indicative of tool sharpening or resharpening. Flakes are larger than one cm, but also include flake fragments under one

Table 1. Distribution of raw materials by number of tools, microflakes, and flakes from the Hedden site. Computer codes used during analysis appear in parentheses after each material.

RAW MATERIAL	TOOLS[1]	MICROFLAKES[2]	FLAKES[3]	WEIGHT	TOTAL
Chert, Coxsackie (CC)	2	159	108	37.69	269
Chert, Munsungun (CM)	1	3	6	1.75	10
Chert, Tan (CT)	0	0	1	0.10	1
Chert, Gray 1 (Cg1)	4	33	17	10.32	54
Chert, Gray 2 (Cg2)	2	51	20	8.55	73
Chert, Gray 3 (Cg3)	3	26	8	6.14	37
Chert, Gray 4 (Cg4)	3	52	10	3.70	65
Chert, Brown (CdyB)	0	2	4	0.75	6
Jasper, Pennsylvania (JPA)	1	0	0	3.80	1
Rhyolite, Saugus-like (RS)	8	159	103	39.30	270
Quartz, Crystal (QC)	3	14	24	18.60	41
Quartzite, Brown (QBr)	1	2	2	0.61	5
TOTALS	29	503	306	131.31	832

[1]Tools include utilized flakes and tool fragments.
[2]Microflakes include unutilized flakes smaller than 1 cm in greatest length.
[3]Flakes are unutilized specimens 1 cm or larger, but also includes flake fragments smaller than 1 cm.

cm in size. Specific flake types include "core reduction", "biface thinning", "retouch", "fragment", and "shatter". Core reduction flakes exhibit quarry cortex and weigh less than 50 grams (anything larger than 50 grams is considered a core fragment). Biface thinning flakes have a prepared striking platform with a beveled edge or step fracture, and a significant striking platform. In addition, there may be some flake scars on the platform itself. Retouch flakes are small and thin, usually under 1.5 cm in length, and exhibit delicate striking platforms. A flake fragment is a flake with broken edges. It lacks many of the features, like a striking platform, that identify a flake. Shatter flakes are generally small chunky bits (usually quartz) with no clear flake form or platform.

Flakes greater than one cm in length, primarily biface thinning flakes, were measured to 0.01 mm using digital calipers. Two measurements were taken; greatest length measured from corner to corner, and thickness at midflake measured about halfway between the platform and distal end. Measurements were also taken on unifacial and bifacial retouch flakes when possible (some retouch flakes were too small to measure).

Once flakes and tools had been sorted by like material or color an attempt was made to refit broken pieces. The most successful refit job is a quartz crystal that fractured into a number of pieces, six of which could be reglued. Another success is a Saugus-like rhyolite endscraper which had broken into three pieces. In all twelve tools or flakes, composed of 35 individual pieces and a weight of 36.90 grams, were refit.

Raw Materials

Researchers in things Paleoindian have long recognized that a detailed study of lithic sources is instrumental in deciphering the movement patterns of these ancient hunters. A detailed microscopic and trace chemical study of raw materials was not attempted here. Instead, materials that "look" like known materials (microscopically and macroscopically) such as Saugus-like rhyolite, Pennsylvania jasper or Coxsackie chert are assumed to be those materials. Others, such as the dark gray opaque cherts are similar to those found in the Champlain Valley and therefore *could* be from around Burlington, Vermont.

The Hedden site stone assemblage was sorted into 11 groupings based on color, fossil content and rock type. Nearly all are high quality cryptocrystalline cherts and rhyolite, but there is also quartzite and crystal quartz present. Material types from the Hedden site are presented below along with their computer code used in the analysis. Table 1 illustrates the distribution of raw materials by tools, flakes and microflakes, and by weight and number. The second table is a list of descriptions used to identify and differentiate between lithic raw materials.

Tools

The stone tool inventory for the Hedden site is quite meager when compared with concentrations from other Paleoindian sites. And, unlike other sites of this time period, the Hedden site lacks fluted points. About twenty complete and fragmented stone tools were recovered from Locus 1 at the Hedden site. They are described below by morphological type.

Bifaces, tools which have been intentionally flaked on both the top (dorsal) and bottom (ventral) surfaces, are represented by a single fragment (4.10.230) found in square N164 E100 at a depth of 15-20 cm. Made from Saugus-like rhyolite, it is 17.67 mm long and 5.20 mm thick, and weighs 0.6 grams (Figure 3, middle).

Table 2. Lithic raw materials used at the Hedden site.

Chert Coxsackie (CC) Waxy mottled grayish-green 5G4/2 to dark greenish gray 5G4/1 chert with a moderate number of radiolaria. This material patinates to an olive green.

Chert Dark Yellowish-Brown (CdyB) Translucent, dark yellowish brown 10YR4/2 to grayish brown 5YR3/2 chert. This rock patinates to an olive gray and appears to be more fossiliferous than the Munsungun, Coxsackie and unidentified cherts present in the collection.

Chert Munsungun (CM) Grayish red 10R3/2 waxy and opaque chert with occasional white subrounded microphenocrysts and a moderate number of radiolaria.

Chert Gray 01 (Cg1) Patinated dark gray to olive gray chert which is waxy and opaque. This rock has a moderate number of radiolaria as well as a few small light gray speckles.

Chert Gray 02 (Cg2) Banded dark gray N3 chert with translucent greenish gray 5GY6/1 edges and a moderate number of radiolaria. This material is the most translucent of the cherts appearing at the Hedden site.

Chert Gray 03 (Cg3) Medium gray N5 waxy chert with white speckles and a moderate number of radiolaria. It patinates to a greenish gray 5GY6/1 or light olive gray 5Y6/1.

Chert Gray 04 (Cg4) Banded yellowish 5Y7/2 to olive 5Y5/1 gray opaque chert with tiny black speckles.

Jasper Pennsylvania (JPA) Dark yellowish brown jasper.

Quartzite Brown (QBr) Moderate brown quartzite 5YR3/4 with quartz and feldspar inclusions.

Rhyolite Saugus-like (RS) A moderate pink 5R7/4 to dark reddish brown 10R3/4 volcanic material with some white banding and a few white inclusions. It patinates to white or light gray.

Quartz Crystal (QC) Clear to slightly milky quartz.

Figure 3. Limace fragment (4.10.186) at left; biface fragment (4.10.230) center; utilized flake (4.10. 008/026 of Coxsackie chert at right.

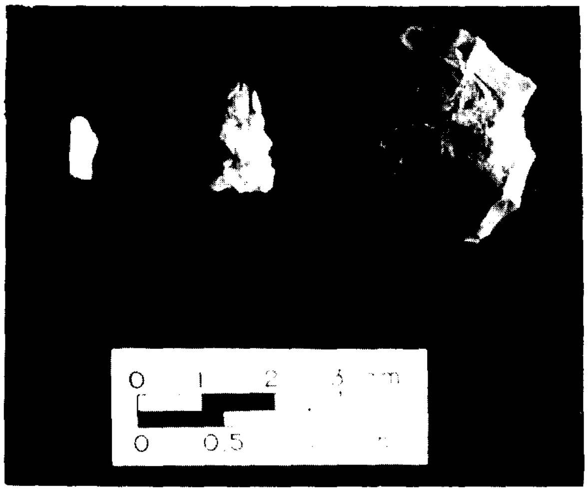

Figure 4. Endscrapers from the Hedden site. Left, 4.10.249/245/250 of Saugus-like rhyolite; second from left, upper, 4.10.003, dark gray chert; second from left, lower, 4.10.708, Coxsackie chert; second from right, 4.10.709, Pennsylvania jasper; right 4.10.248 and refit haft thinning flakes, Coxsackie chert.

A number of "experimental" archaeologists have attempted to make fluted points in order to figure out how Paleoindians might have approached flint knapping. One of the better studies by an archaeologist describes a 9-stage biface reduction sequence for Eastern Paleoindian fluted points (Callahan 1979). In Callahan's scheme the first three stages of biface reduction are performed at the quarry. First, the "rind" or cortex is systematically struck off of a quarry block, exposing fresh material below. Next, the knapper strikes a large but relatively thin piece of stone off the block with a hammer (antler). Gradually, this piece of stone is shaped by a process called pressure flaking into the basic form of the finished tool, known as a "preform". Then, the preform is "medially thinned", a process by which irregularities, humps, hinge terminations and step fractures are removed before fluting and final sharpening is accomplished. Examination of the Hedden biface fragment indicates that it was removed from an early stage preform, probably Stage 3 or 4. Step fractures appear along the working edge, which has an angle of about 42^0. These tiny step fractures indicate that the biface edge had been ground or dulled, a preparation step before another round of biface thinning. Thus, this fragment was removed during an episode of work on a Stage 3 or 4 biface preform. If we do not find the point or preform from which this piece was removed, then it must have been moved to another site by its owner. The piece has been polished and its edges worn by wind borne sand. The shallow depth at which the biface fragment was found indicates that it was sandblasted and moved on a bare sandy surface sometime after it was discarded.

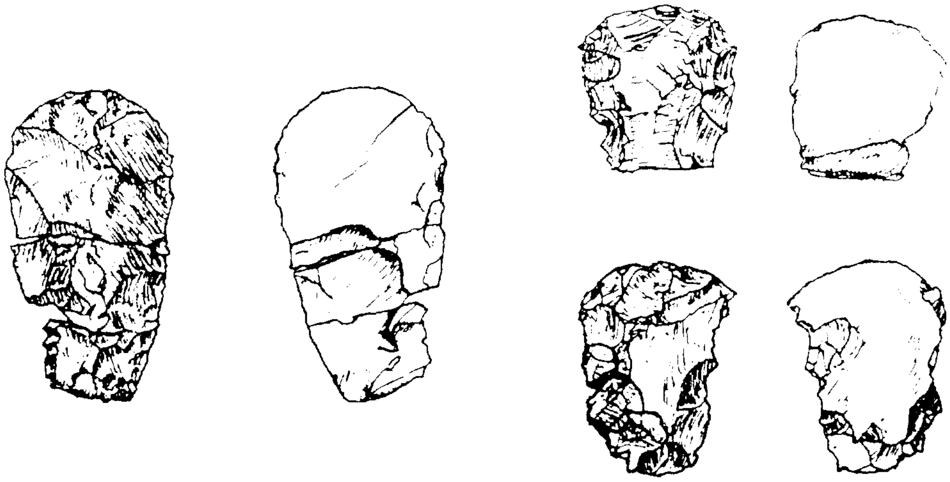

Figure 5. Line drawing of three endscrapers showing in Figure 4, with dorsal and ventral views.

Endscrapers

The most common "formal" tool at the site are endscrapers, of which we have four complete and possibly one fragmentary examples (Figures 4 and 5). Endscrapers are often trianguloid in shape with a convex bit used to scrape a variety of materials. Most likely they were fitted to some type of handle, both to protect the worker from cutting himself or herself and to provide greater leverage and stability while scraping such things as wood, bone and antler. While hafting of these tools is only assumed since no handles or hafts (wood or bone) have ever been found, a number of researchers report that some specimens exhibit features such as notching that probably provided an anchor for some type of lashing material. To this we add our observations.

The first specimen (4.10.003) is a dark gray waxy chert (Cg2) measuring 22.63 mm long and 19.64 mm wide. Its working edge forms a 65^0 angle and it exhibits some stepped microflaking. The left edge of the tool exhibits a shallow concavity near its base and has been intentionally dulled from the bit to the concavity, again probably evidence for hafting. The second endscraper (4.10.249/245/250) is made from a piece of Saugus-like rhyolite and is one of the refit "successes". It was found in three pieces, in the center of the site, and at depths ranging from 45 to 99 cm below ground surface. Reglued the piece measures 41.82 mm in length, 21.41 mm in width and is 7.42 mm thick. It too is trianguloid in shape with a convex cutting edge contour. Its cutting edge forms a 55^0 angle that has been severely

Figure 6. Fragments of a crystal quartz artifact, with several refit.

shape with a convex cutting edge contour. Its cutting edge forms a 55° angle that has been severely undercut by stepped microflaking. It is also one of the few examples in the collection to exhibit quarry blank cortex, indicating that the flake on which it was made was removed from a chunk of rock at the Saugus-like rhyolite quarry or elsewhere early in the flaking process.

The third specimen (4.10.248) in this tool class was formed from a flake of Coxsackie chert. Like the preceding example, this scraper is also a refit success. The tool itself was found in N167 E99 while three uniface flakes from its left edge were found in N166 and N167E100 between 31 and 75 cm below ground surface. This specimen, with a length and width of 28.86 mm and 20.19 mm respectively, has a heavily worn bit with a spur on its upper right edge and a concavity on its middle right edge. Some researchers call them "spurred scrapers" arguing that the (graving?) spur is a purposefully formed tool that outlived its usefulness. Reformed and resharpened these "spurred" scrapers found new life as endscrapers. Others reason that the spur is not the remnant of a recycled tool but the result of continued resharpening of a hafted tool. As the bit was worn closer and closer to the handle, its corners would become more difficult to maintain. Assuming that it is not broken or lost first, an endscraper bit will eventually form a straight edge with spurred corners. That this endscraper exhibits a spur, a concavity and a heavily step-flaked bit suggests that it had outlived its usefulness and was discarded at the site following a final episode of retouch.

The final near-complete endscraper to consider (4.10.709) is made from a flake of Pennsylvania jasper. This specimen, a distal fragment, is trianguloid in shape like the other examples in the collection, and it exhibits some quarry blank cortex on the dorsal surface. The bit is convex and deeply undercut with an edge angle of 77°. The left lateral edge of the bit exhibits tiny scalar microflaking with only slight invasive step microflaking - perhaps from edge grinding. The right lateral half of the bit also exhibits scalar microflaking but with significantly more step microflaking than on the left. Moving to the lateral margins of this piece, the right lateral side exhibits a combination of tiny, ≈1 mm and longer scalar microflake scars with some invasive step microflaking, again probably a result of edge grinding for hafting. The edge angle on this side varies from 38° to 49°. The extant length of the right side is 20.83 mm. On the left is a transverse fracture running from approximately 6.37 mm posterior to the edge of the bit to the midline of the piece. Within this 6.37 mm is some evidence for scalar microflaking and possibly some edge grinding.

Uniface Fragments

In addition to complete specimens, seven uniface fragments and a crystal quartz scraper were recovered in Hedden site deposits. Let us begin with the uniface fragments (a uniface is any stone tool flaked on one side only. Endscrapers and sidescrapers are examples). Three of the specimens (4.10.222, 239 and 545) are made from a dark gray chert (Cg1). The specimens weigh, in order presented, 0.2 grams, 0.3 grams and 0.3 grams. The fourth, a patinated gray chert like that of retouched flake 4.10.253 and utilized flake 4.10.252, has a ground platform. It weighs 0.4 grams. The next fragment is also made from a patinated dark gray chert (Cg3). It exhibits a crushed platform and weighs 0.4 grams. At present we cannot say more about these tools, except that they represent additional scraping tools which have not been recovered. Maybe they were reused after having been broken.

The next specimen under consideration is made from a flake of Coxsackie chert (4.10.708). Use wear on this piece is confined to two areas: the left lateral edge and either the proximal or distal end. On the lateral edge, small scalar microflake scars with some invasive step microflaking can be observed along the entire length. This appears to be the result of edge grinding (intentional dulling if part of an end-scraper?). The other area of use appears along the distal (or proximal) end. Here, the implement has hinged out into a feathered edge. Use wear appears in the form of bifacial scalar microflaking, with distinct flake margins. Polishing of some of the arrisses is evident. This specimen may be a fragment from an endscraper that snapped at some point during the manufacture/resharpening process and has yet to be recovered. The use wear on the feather edge may be a result of reuse as a cutting tool for soft material like meat or hides.

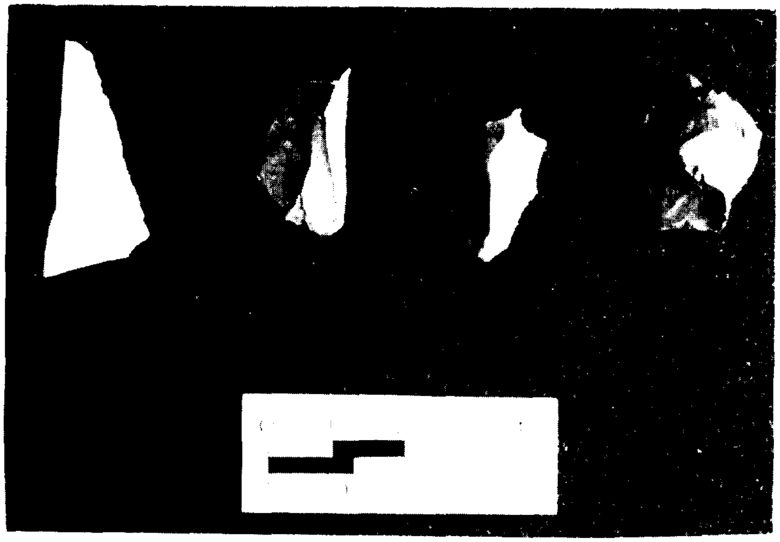

Figure 7. Gravers and perforators. Left to right: 4.10.244, utilized flake of Saugus-like rhyolite; 4.10.243, Munsungun chert; 4.10.246 gray chert; 4.10.240 gray chert.

Our seventh uniface fragment is comprised of three refitted flakes (4.10.520, 513, and 603) made from a patinated dark gray chert (Cg4). One half of the piece consists of quarry blank cortex while the other half exhibits a combination of tiny scalar and step microflake scars. This refitted tool fragment measures 17.44 mm in total length, 10.63 mm at its maximum width and 4.04 mm thick.

One of the most puzzling tools we have to describe is a quartz crystal which apparently shattered in a dozen or so fragments, presumably as it was being worked (Figure 6). Six of these fragments were refit to form a thin, rectangular implement. It measures 38.99 mm long, 38.14 mm wide, 7.43 mm thick, and weighs 11.08 grams. The proximal end of the piece has been unifacially flaked to a point. The distal edge appears to have been lightly ground. Based on the form of the work, the knapper may have been attempting to make a biface or a pointed implement, or perhaps the ground edge was going to be used as a scraping edge.

Limace

A single fragment of a blade or possible *limace* (4.10.186) was recovered from the Hedden site (Figure 3:left). *Limaces* are, as described by Gramly (1988:11), "slug-shaped" unifaces. Generally long and narrow, they are known variously as flake-shavers (Grimes and Grimes 1985), perforators (MacDonald 1985) and groovers (Jordan 1960). This specimen, measuring 9.80 mm long, 8.53 mm wide and 3.76 mm thick, is made from a brown quartzite. Flaking is bifacial and the flake scars are deep, about 1.5 mm on average. Like the biface fragment described above, this specimen has been badly worn from wind-borne sand. According to Grimes and Grimes (1985) *limaces* were probably

Table 3. Utilized and Retouched flakes from the Hedden site.

Catalog #	Material	Level (5cm)	Flaketype	Use (U)/ Retouch (R)	Length (mm)	Thickness (mm)
242	RS	19	CR[1]	U	25.52	2.07
244	RS	23	CR	U	35.57	5.84
2	RS	1	BT[2]	U	17.65	2.19
731	RS	10	BT	U	29.31	1.82
252	Cg1	14	CR	U	24.13	3.52
404	Cg1	7	BT	U	12.13	1.62
8	CC	Surface	BT	U	32.90	1.93
253	Cg3	14	BT	R	27.06	3.09

[1] Core Reduction
[2] Bifacial Thinning

hafted in a socketed handle and used to whittle or shave hard materials such as bone, ivory, wood, or antler, perhaps for cleaning out the inside of a socket or hole.

Gravers and Perforators

Three tools in this type class are present in the assemblage (Figure 7). Each was made on irregularly shaped flakes like those at the Michaud site (Spiess and Wilson 1987:69-71). Gravers and perforators are so-named for their pointed tips. Some of the more delicate of these tools are presumed to have been used to scratch designs on wood, bone, ivory or antler. Others were likely used to perforate bone for making needles, and hide for clothes, tents, etc.

The first specimen (4.10.246) is made from a gray, patinated and fossiliferous chert. It exhibits an expanding tip which is centered on a dorsal flake ridge. The lateral edges are steeply retouched on the dorsal surface and unmodified on the ventral, except for a single flake which was removed from the tip. Graver/perforator 4.10.240 is made from a dark gray chert (Cg2). It is concavo-convex in shape and displays "edge nibbling" on the right lateral edge from the platform to the distal end thereby forming a sharp tip. Two tiny scalar microflakes removed from the tip on its ventral (bottom) surface may be use-related rather than from intentional retouch.

The third specimen (4.10.243) differs from the other two in that is a "snapped" graver. A snapped graver is a flake with a sharp tip due to having been snapped naturally or intentionally. This graver is made from a Munsungun chert biface thinning flake with quarry blank cortex on its dorsal surface. Its tip is centered on a flake ridge. It is 25.63 mm long, 17.95 mm wide, and weighs 0.98 grams.

Utilized and Retouched Flakes

The most common tool types represented at the Hedden site are utilized and retouched flakes (Table 3, Figure 8). Called "cutters" by Gramly (1982, 1988) and others, they are simply the residue of tool reduction that were used to cut or scrape different types of material.

The difference between the utilized and retouched flakes is as follows. A utilized flake is an unmodified piece of sharp stone that shows wear along one or more of its feathered edges after having been used to cut meat or scrape wood, bone, antler or ivory. A retouched flake, on the other hand, is a sharp piece of stone that has been intentionally flaked to perform a particular function.

The Hedden site has produced eight utilized and one retouched flake to date. All are either biface thinning flakes or core reduction flakes. Five of the utilized specimens are of Saugus-like rhyolite, one is of Coxsackie chert, and the other two are of a dark gray chert (Cg1). The single retouched specimen is a unifacially worked cutting tool made from a light gray chert (Cg3). This serrated tool was made on a bifacial thinning flake with the retouch appearing on the left lateral side. It was found together with two fragments from its proximal end, at a depth of 70 cm below datum in N168E100, and was apparently used on soft or possibly medium material such as hide or soft wood.

Three core reduction flakes, 24.83 mm in average length and 2.80 mm in thickness, were either picked up at the quarry (or possibly another campsite) and curated for later use, or were from a core that was reduced at the Hedden site. In any case, three core reduction flakes were used to cut soft material such as animal hide. Two of the specimens are made from Saugus-like rhyolite (4.10.242 and 244) and exhibit a combination of bifacial and unifacial edgewear with some arris polishing along both lateral edges and on their distal ends. The other specimen (4.10.252) is a banded and mottled olive gray chert. It too has bifacial flaking on the left lateral side, but most of the usewear appears on the distal end in the form of a concavity. This chert specimen was also used to cut soft material.

The remainder of the utilized flakes were made on bifacial thinning flakes of three different material types, Coxsackie chert (4.10.8), Saugus-like rhyolite (4.10.2 and 731), and a banded gray chert (4.10. 404). Together the specimens average 23.00 mm in length and 1.89 mm in thickness. Two of the specimens (4.10.8 and 4.10.404) exhibit light bifacial scalar microflake scars and the third has unifacial microflaking scars. Utilized flake 4.10.731 exhibits a combination of light bifacial and unifacial scalar microflake scars. Each was used to cut soft material.

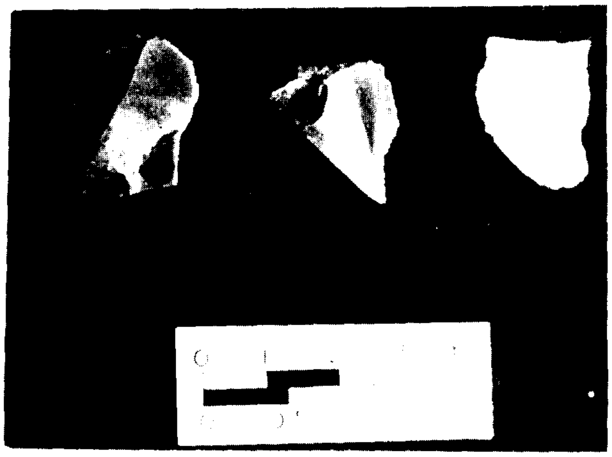

Figure 8. Left: serrated retouched flake (4.10.253/ 625); middle, utilized flake of gray chert (4.10.252); right, utilized flake of Saugus rhyolite (4.10.242).

Debitage

The unmodified flake stone sample, the debitage, was sorted into categories based on the criteria outlined in the Analysis Methodology section (above). In this section we examine the types of debitage recovered and what they might suggest about Paleoindian flint knapping. Of the five types of flakes (biface thinning, core reduction, shatter, retouch and flake fragments) shatter and flake fragments were not examined other than for quantification purposes. Before proceeding, we should point out that the analysis of the byproducts of flaked stone technology has not received the attention that other types of material culture (stone tools, pottery, bone implements, etc.) has, partly because there is no agreed-upon standard procedure for analyzing them (or what the data mean once it has been done) and because stone flakes are not particularly exciting to work with. But in order to understand the types of choices Paleoindian flint knappers made in making tools, we have to examine the flakes.

Archaeologists have only a few windows from which to view prehistoric technology. We can watch modern day stone tool-making foragers at

Table 4. Statistics for Biface Thinning Flakes[1] from Locus 1 at the Hedden Site

	Wgt. g	Length mm	Thick mm
Minimum	0.10	6.18	0.82
Maximum	3.50	35.57	5.84
Mean	0.54	10.42	1.87
S^2	0.35	38.58	0.68
Σ	0.60	6.21	0.82

[1] Includes only measured flakes.

work (though most, if not all have given up stone), or read about them in the ethnographic literature. Or we can learn to make stone tools ourselves and study the step-by-step process of taking a chunk of stone and fashioning it into an endscraper or fluted point.

Core Reduction

Core reduction flakes, debitage in which much of the exterior consists of a cortex or "rind" are few and far between at the Hedden site. In fact a total of six have been recovered from Locus 1. All but one of the flakes is Saugus-like rhyolite and three of these comprise a single tool, an endscraper. The other two Saugus-like flakes were not modified and are therefore simply reduction debris. The sixth core reduction flake, a piece of dark gray chert (Cg1), was picked up by a flint knapper for use as a cutting tool. That so little core reduction debris has been recovered from Locus 1 indicates most of the raw material reached the site not as unmodified blanks but as pieces of stone well on their way to becoming finished tools.

Biface Thinning

Of the total of 808 utilized and unutilized pieces of debitage from Locus 1, only 68 are clearly bifacial thinning flakes, and of these 52 were either complete enough to measure or were unutilized (utilized flakes are treated separately in this analysis). Summary statistics for all biface thinning flakes (n=56, weight=30.35 g) which were measured appear in Table 4.

Each of the major raw material types are represented by biface thinning flakes with Coxsackie chert (n=26) and Saugus-like rhyolite (n=21) dominating. The remainder are distributed, from highest to lowest in number, as follows: gray chert Cg1 (n=8), crystal quartz (n=4), gray chert Cg3 (n=2), dark yellow brown chert (n=2), and Munsungun chert and gray chert Cg2 with one apiece.

The fact that so few recognizable bifacial thinning flakes have been recovered from Locus 1 indicates that occupants spent very little time in the manufacture of bifacial implements. And, since so few core reduction flakes (n=6) have been recovered, flint knappers at the Hedden site may not have been involved in extensive preform manufacturing either. One way of gauging the size of some of the preforms that were being worked upon (since we have no complete or fragmentary examples) is to measure biface thinning flakes that show evidence of biface edge on both the proximal and distal ends. Two Coxsackie chert biface thinning flakes fit this description. One (4.10.585) measures 31.26 mm in length and the other (4.10.86) is 24.36 mm long. Thus, one biface preform was at least 24.36 mm wide at some point along its length.

Even though the evidence for biface reduction as a major activity is not compelling, it does not mean that knappers did not spend a lot of time maintaining bifacial implements. As we will see in the following analysis, bifacial retouch flakes are

Table 5. Unifacial and Bifacial Retouch Flakes Statistics

	Bifacial[1]			Unifacial[2]		
	Wgt. g	Length mm	Thick mm	Wgt. g	Length mm	Thick mm
Minimum	0.05	4.49	0.51	0.05	4.18	0.88
Maximum	0.60	15.28	3.32	0.30	15.79	3.76
Mean	0.09	8.80	1.08	0.11	8.89	1.62
S^2	0.00	4.14	0.13	0.00	6.88	0.32
Σ	0.06	2.03	0.37	0.06	2.62	0.57

[1] n=151, wgt=13.25 g.
[2] n=48, wgt=5.15 g

clearly more numerous than are unifacial retouch flakes even though unifacial tools are more numerous than are bifacial tools (11:1).

Retouch

Retouch flakes (n=566) account for the majority of the debitage found in Locus 1 at the Hedden site. This type of debitage is usually 1.5 cm in greatest dimension or smaller, with a delicate striking platform. An attempt was made to sort retouch flakes further into two categories, bifacial and unifacial, since both bifaces (one fragment) or biface thinning flakes, and unifaces appear at the site.

In order to define what a unifacial retouch flake looks like, we have to find some and describe their basic features. The obvious choice of attack is to refit flakes with the tools from which they were struck. Mosher has spent a bit of time conjoining artifacts and flakes with pretty good success. A total of 35 flakes and tool fragments could be put back together (see Refit Section). From this activity, we have compiled some identification criteria for bifacial and unifacial retouch flakes.

As noted earlier, a retouch flake is usually small in size, about 1.5 cm in greatest length or less, with a delicate striking platform. Our sample of retouch flakes includes 562 specimens of which only 224 were large enough to be measured. As can be seen from Table 5, there is very little difference in overall length or weight between unifacial and bifacial retouch flakes although there is a slight difference in thickness.

There are, however, obvious qualitative differences. By our observations, uniface retouch flakes exhibit either a crushed platform, or a significant amount of stepped microflaking just above the platform. This is the kind of damage one would expect to find on a scraper, a tool which needs constant resharpening (estimated in some studies as necessary after 100 strokes or so) if used on medium to hard materials. Platforms on unifacial flakes may or may not have flake scars but the angle of the platform is usually very steep compared to that of bifacial retouch flakes. Another characteristic of uniface retouch flakes is that the ventral surface tends to be more concave, and that the overall shape of the flake is more irregular. This irregularity may be due in part to endscrapers being less difficult to manufacture or maintain. Bifaces, particularly later stage preforms and near complete points, are harder to make, are more prone to breakage and much less forgiving to cavalier attempts at flint knapping. Thus, biface retouch flakes appear to be more uniform in shape because biface thinning and retouch demands greater control from the knapper.

Bifacial retouch flakes exhibit little if any

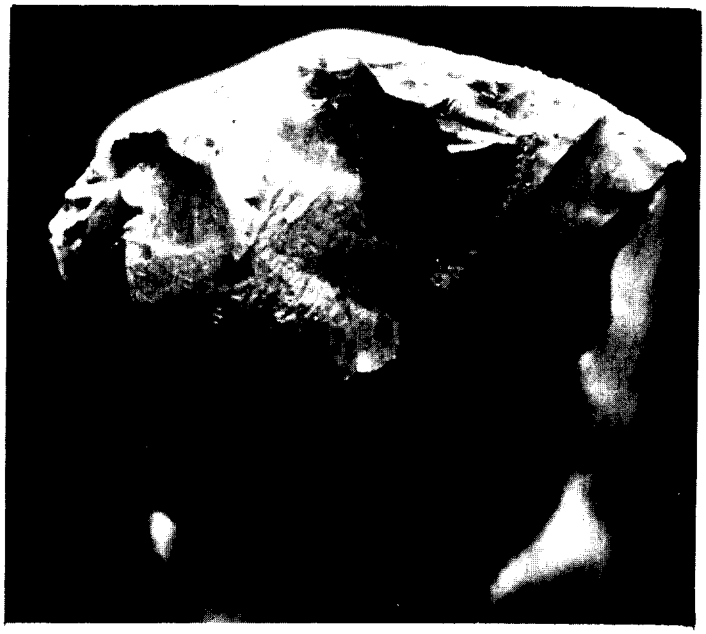

Figure 9. Macrophoto of edge of Coxsackie chert endscraper (4.10.248) showing intensive step flaking along the edge.

stepped microflaking except in the form of grinding. They are comparatively thinner than their unifacial counterparts and they sometimes exhibit part of a biface edge peeled away. Moreover, the angle of the platform is more acute for a bifacial retouch.

Use-Wear Analysis

A limited use-wear analysis was performed on tools and utilized flakes using the "low-power" method described in Spiess and Wilson (1987:175-179) that followed criteria in previously published studies (*e.g.*, Tringham *et al* 1974; Ahler 1979; Brink 1978; Odell 1980, 1985, 1986; Rule and Evans 1985). The low-power method involves the examination of a tool edge using a 10-80x power dissecting microscope. Under a microscope the pattern of flake removal, that is the negative flakes along the tool's edge, provides clues as to the tool's function and its duration of use. The analyst is concerned with identifying where these removals or flake scars appear along the tool edge, the form and shape of flake scars present, and whether or not flake margins appear polished, scratched or abraded. The scars left by flaking are either scalar or step-microflakes. A step-microflake terminates in a rough, fractured edge due to contact with a medium to hard material. Scalar-microflakes do not terminate in a fractured edge. Rather they often appear triangular or elliptic in shape. Polishing, scratching and abrasion of flake margins may be indicative of repeated use in the same way that a knife blade becomes polished and scratched. But a tool can also have a polished edge if it is carried around in some type of pouch, or otherwise abraded.

The formal tools in the Hedden collection, exemplified by the end-scrapers, exhibit the most intense use and the greatest wear (Table 6). Scalar retouch along the length of each bit has been obscured by invasive step micro-flaking in the form of edge undercutting or crushing. This invasive step microflaking is common to each of the endscrapers, although the intensity of the undercutting varies. Four of the specimens, two of Coxsackie chert (Figures 9 and 10), another of Pennsylvania jasper (Figure 11), and the other of Saugus-like rhyolite (Figure 12), appear to have been used to scrape medium hard to hard substances such as bone, ivory or antler. The fifth endscraper, of dark gray chert, was apparently retouched before being tossed aside (Figure 13). Its edge exhibits only minor step-microflaking which may indicate either limited use or use on a slightly softer material such as wood or bone. Wear appearing along the sides of the endscrapers appears to be in the form of intentional edge grinding or dulling rather than from use. Grinding or dulling was probably accomplished to prepare the tool for hafting.

Two of the graver/perforators, one of dark gray chert and the other of Munsungun chert, have naturally occurring tips in triangular cross-section that show light use wear. The dark gray chert specimen exhibits primarily unifacial retouch along

Figure 10. Macrophoto of the edge of Coxsackie chert endscraper 4.10.708, showing extreme step flaking.

Table 6. Endscraper/Uniface Use-wear Notes.

#249 Saugus-like rhyolite (RS) with some quarry blank cortex. The bit has scalar microflaking with severe invasive stepped microflaking undercutting present. Flaking along distal edge is up to 2.3mm wide. Its right lateral edge is dulled; the left lateral side has quarry blank cortex and minor modification near the proximal end. Light polishing of arrisses and projections with some obscuration of flake margins is apparent. This specimen was used to scrape medium to hard substances.

#003 Dark gray chert (Cg2) which apparently snapped in half and is missing the proximal end. A retouched concavity is present on lower left lateral edge. Some invasive step flaking but also scalar retouch is present on left lateral side and on the distal end. This tool looks like it was recently retouched and put into use - light polish and obscuration, probably snapped during use.

#248 Coxsackie chert (CC) with a graver spur on right hand margin of distal end. Scalar microflaking use wear on distal margin with intrusive step flaking and large step flaking scars laterally (intentional dulling?). Grinding is evident on left lateral margin near corner of bit edge.

#709 Pennsylvania jasper (JPA). This specimen exhibits tiny scalar microflake scars on the right half of the bit with little step microflaking. The left side, however has significantly more step microflake scars. Overall, the bit is severely undercut at an angle of 77°. Grinding is evident on the right lateral side. Most of the left lateral side is missing. This scraper was used on medium to hard substances.

#251 Large quartz crystal (QC) with unifacial retouch on the proximal and distal edges. The distal edge was retouched into a point on the dorsal surface. Non-random scalar microflaking dominates along left side of distal edge with large and deep 1mm step microflakes on right side. On the proximal end, bifacial non-random scalar microflaking with possible grinding appears on ventral surface, but does not appear to be from use.

its right lateral edge with some invasive step-micro-flaking indicated on its tip. It appears to have been used to perforate a substance of medium density such as soft bone or wood. Rotational wear is not apparent. The tip on the Munsungun chert specimen is quite delicate in comparison to that made from dark gray chert. Few and randomly placed scalar microflakes on the tip are indicative of use on a soft material such as animal hide or light use on a medium material such as soft wood. A third graver/perforator is made from a light gray patinated chert biface thinning flake. Its tip was formed by intentional unifacial retouch. Most of the wear in the form of scalar microflaking and arris polishing appears on the left side of the tip (Figure 14), indicating clockwise rotation into a fairly soft substance like hide or a medium substance like softwood.

Figure 11. Macrophotograph of the working edge of Pennsylvania jasper endscraper 4.10.709, showing moderate step flaking.

Table 7. Gravers/Perforators Use-Wear Notes

#243 Munsungun chert (CM) bifacial thinning flake forming a snapped graver. Its tip is delicate and triangular in cross-section with tiny random scalar flake scars and lightly polished arrisses. This tool may have been used to perforate soft materials such as animal hide.

#240 Dark gray chert (Cg2) biface thinning flake which broke, forming a triangular tip in cross-section. The piece has a unifacially retouched edge angle of about 52° with large scalar microflaking and some invasive step microflaking. It has some lightly polished arrisses and projections, but does not appear to have been used in a rotary fashion. It may have been used to incise or engrave bone, wood or ivory.

#246 Light gray patinated chert (Cg3) formed from a biface thinning flake. Intentional scalar retouch was used to form its tip. Light polishing of flake arrisses appears on both sides of the tip although the most use wear appears on the left. This tool may have been used to incise or engrave bone, wood or ivory.

Use-wear on utilized and retouched flakes differs from that observed on formal tools (Table 8). Wear on fresh flake edges appears as either unifacial scalar microflaking with arris polish and obscured flake margins, or as random bifacial scalar microflaking. Based on a number of use-wear experiments (*e.g.* see Appendix 2 in Spiess and Wilson 1987), bifacial flaking suggests a sawing motion typical of cutting, while unifacial flaking is indicative of scraping in which only one side of the tool is drawn across the material being scraped or whittled. The distribution of flake scars, either random or grouped, is indicative of the intensity of use. Random flaking suggests less intensive use than do grouped flakes. For instance, a utilized flake with random bifacial scalar microflake scars was probably used to cut soft material such as meat or hide, an activity requiring a sawing motion.

A utilized or retouched flake with grouped unifacial scalar and step microflaking on it suggests use as a scraping tool on soft or medium material like hide or perhaps soft wood. Nearly all of the utilized flakes and the only retouched flake from the Hedden site exhibit random bifacial scalar microflaking. We interpret these specimens to be cutting tools that were used on a soft material such as animal hide. One specimen made from Saugus-like rhyolite exhibits unifacial scalar microflaking. Polish on this flake tool, if present, is obscured. It was probably used to scrape or whittle a soft material such as hide.

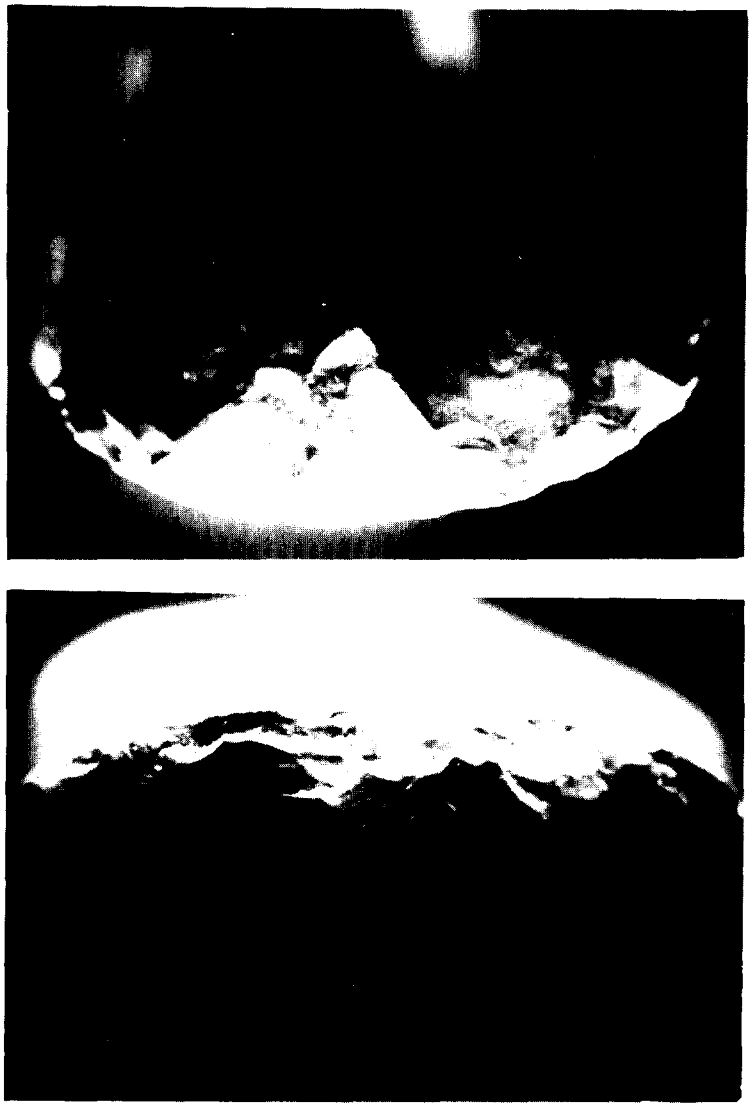

Figure 12. Two macrophoto views of the edge of the Saugus-like rhyolite endscraper, showing exteme and extensive step flake wear.

Table 8. Utilized/Retouched Flake Use-Wear Notes

#242 Saugus-like rhyolite (RS) bifacial thinning flake, snapped with missing platform. Specimen exhibits bifacial edge use wear in the form of closely-spaced and small scalar flakes on left lateral edge and on distal end. Random bifacial scalar flaking present on lower right lateral edge. Light polish on arrisses and projections on the distal end. Some step microflaking appears on both the left lateral and distal ends although wear is predominantly scalar; occasional scalar microflaking on right lateral edge. This piece was used to cut soft material.

#244 Large Saugus-like rhyolite (RS) core reduction flake exhibiting quarry cortex, snapped with platform missing. Random bifacial microflaking on distal end, with light unifacial scalar microflaking on both lateral edges. The upper right distal edge exhibits scalar microflaking, a steep angle with occasional step microflaking. There is also some occasional random scalar microflaking along lower 2/3rds of right lateral side with tiny scalar microflaking on left lateral side. Polishing of arrisses is light on its distal end. This utilized flake was used to cut soft material.

#2 Saugus-like rhyolite (RS) biface thinning flake, snapped in half. Occasional unifacial scalar microflaking is present on right lateral side, but no step fractures. Polish, if present, is obscured. This utilized flake appears to have used to cut soft material.

#731 Saugus-like rhyolite (RS) biface thinning flake. This specimen exhibits predominantly unifacial scalar microflaking on the dorsal surface of the left lateral edge, with a couple of scalar microflake scars on the ventral surface. Most of the wear is confined to the center third of the edge. Polish, if present is obscured by the natural sheen of the material. This specimen was used to cut soft material.

#252 Banded gray chert with olive gray mottling (Cg1) core reduction flake with non-random bifacial microflaking concentrated on its distal end, forming a concavity. This specimen has a steep edge angle with scalar microflaking and slight edge obscuration and polishing. Some step microflaking and random scalar microflaking appears on its left lateral edge. This tool was probably used to cut soft material.

#404 Banded gray chert with olive gray mottling

Figure 13. Macrophoto view of the edge of endscraper 4.10.003, showing a relatively unused, recently retouched or resharpened edge.

(Cg1) bifacial thinning flake with hinge termination. Non-random bifacial scalar microflaking appears on its lateral edge with polish on some of the arrisses. Most of the flake scars appear on ventral surface. This tool was probably used to cut soft material.

#253 Light gray (Cg3) chert bifacial thinning flake with a unifacially retouched and serrated edge. Small bifacial random scalar microflakes are present with lightly polished and obscured arrisses. Two flakes were refitted to the proximal end suggesting that tool broke and was discarded. It appears to have been used for cutting soft or possibly medium density material.

#8 Coxsackie chert (CC) bifacial thinning flake with light, random bifacial scalar microflaking on lower left edge. This specimen apparently snapped in half with the distal half unutilized. This cutting tool was also used on soft material.

We are uncertain what the scalar flaking and crushing on the edge of hte piece of crystal quartz (Figure 15) means. It may have been a preparatory step before further attempts at biface thinning, or it may be some sort of scraping-type use wear.

Tool Use and Discard

In this section we discuss the life cycle of the tools present at the Hedden site, their probable function, and how they relate to the function of the site. From this examination we can make inferences about Paleoindian behavior. Nearly all the stone tools we have to describe were used by the site's inhabitants to make other tools. Stone tools include the endscrapers, a *limace*, an assortment of gravers or perforators, and about a half dozen utilized and retouched flakes. Let us begin our examination with the endscrapers.

As discussed in previous sections of this report, four endscrapers made from four different types of raw material were used by hunters sometime during their stay at the Hedden site. From a use-wear standpoint, we have surmised that these tools were probably hafted, that they were used to scrape fairly tough materials (i.e., wood, bone, antler, or ivory), and that they had been resharpened a number of times, and eventually discarded amongst flaking debris.

Each of the endscrapers represents a different phase in the life cycle of a stone tool. The most complete example (4.10.245, 249, 250) of this tool class is made from Saugus-like rhyolite. Found in three pieces and in different levels, this specimen probably broke into thirds fairly soon after being put into the arsenal. From the tool we know that it was made from a piece of quarry block cobble that was either struck off at the quarry, perhaps in Massachusetts, or from a block at Hedden or another site.

Deller and Ellis (1992) have argued that quarry reduction by Paleoindians was not a haphazard affair, but one that was efficient and systematic. Flakes were struck off primarily (but not exclusively) from the tops of quarry blocks and at right angles to the bedding plane (Deller and Ellis (1992: 13). Whether or not there is some mechanical advantage to working stone in this manner is not apparent since later cultures made good stone tools even if their reduction sequence lacked the systematics of a Paleoindian sequence. What is clear is that

Paleoindians (at least around the Great Lakes) approached flint knapping within a particular mindset. Our Saugus-like specimen more closely resembles Deller's and Ellis' (1992:18) less common (at least in the "Parkhill Complex" as it is known to archaeologists) "normal side-corner blank" characterized by a pronounced dorsal ridge separating a top surface from a side surface. In any case, a core reduction flake was picked up and saved by a flint knapper to be transformed into a scraper.

The reduction sequence possibly began with the knapper removing a large flake from the left corner of the bit, and one from the right side of the base. Both flakes helped remove part of the dorsal ridge which in turn "thinned" the scraper under production.. Then, several smaller flakes (less than 1.5 cm in length) were removed from the working edge to form a convex bit. That the bit still maintains its convexity suggests that the tool was not used very much before it broke and was discarded. Finally, the entire right side and part of the left of the tool was intentionally dulled by pressure-flaking.

Invasive step-flaking along the length of the bit clearly indicates that the tool was used to scrape a medium to hard substance like bone, wood, or ivory. It may be that in doing so, whoever used the tool or thinned its base after scraping with it for a while, may have accidentally broken it near the haft. A large fragment of the endscraper is missing from left side near the base that has yet to be recovered. At this point, the knapper may have tried to shape the tool for rehafting, only to snap it once again.

The dark gray chert endscraper in the Hedden site collection may be a bit "further along" in the life cycle. It too is wedge-shaped with a convex bit. But it differs from the Saugus-like specimen in that it was discarded after, or soon after, having been resharpened. The original proximal end of the scraper is missing, leaving in its place a hinge fracture where it snapped at the handle. The fracture may have occurred during an episode of resharpening because several scalar microflakes have been removed from the still convex bit. In two places near the corners, tiny invasive step flake scars appear, and they are also present along the left side of the tool. These may have been missed in the resharpening process, or they indicate that the tool was resharpened and reused, if briefly. Along the right side, however, secondary retouch apparently obliterated any step microflaking that may have been present.

Figure 14. Macrophoto of graver/perforator tip, 4.10.246.

The knapper seems to have made an attempt to salvage the piece for further use. Along the lower left side of the scraper near its new base a concavity has been flaked into it. A number of researchers believe that these notches represent hafting points. If so, then in all probability the person resharpening this piece decided to make notches at the base as an anchor for some type of lashing material. Since the other side lacks a notch, the knapper may have rejected the scraper as not worth saving.

If the first two endscrapers represent early phases in the lifecycle of this tool class, the next two specimens under consideration clearly represent the near end of the spectrum. Unlike our first two finely

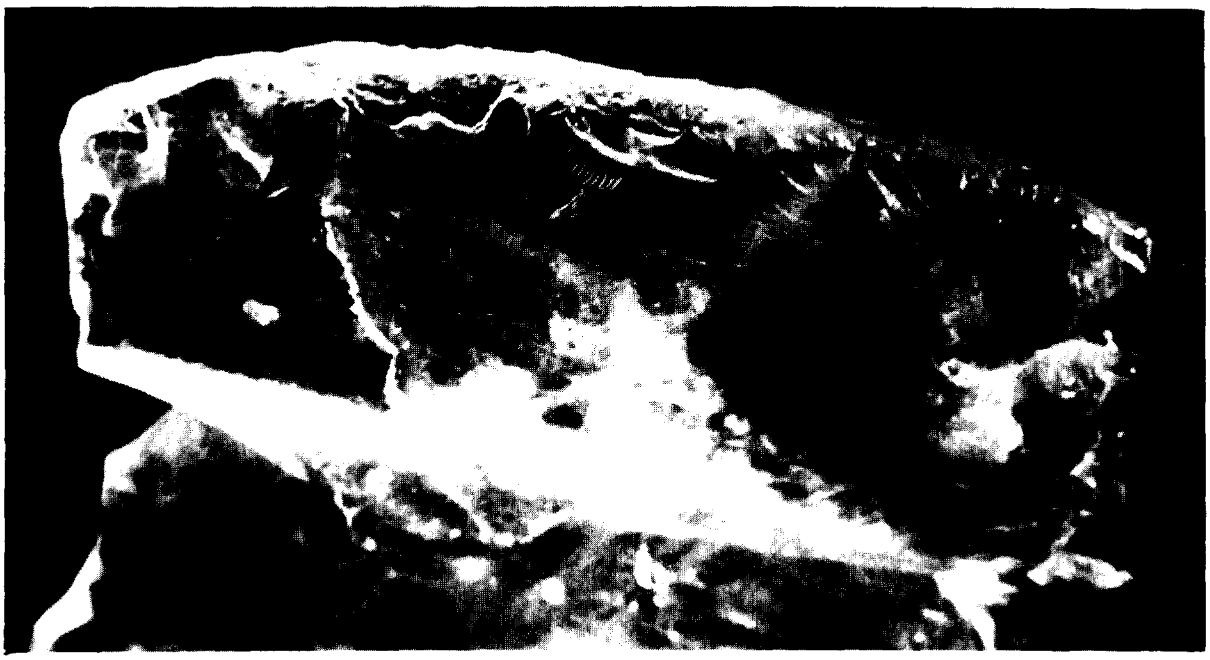

Figure 15. Macrophoto of crushing and scalar flaking on the edge of the piece of crystal quartz (4.10.241/247/251).

formed specimens, one of the endscrapers (4.10.248) is "ragged" in appearance from countless resharpening episodes and none-to-successful thinning attempts. It is made from Coxsackie chert and also boasts a convex bit. This specimen, like that made from Saugus-like rhyolite, is roughly triangular in cross-section and exhibits some bedding cortex on its lower right dorsal surface. Bedding planes are clearly discernible and run perpendicular to the bit.

The working edge of this specimen is marked by several steep scalar microflake scars. Invasive crushing is conspicuous along much of the edge so the tool was still in use when it was discarded. The bit has retained its convex shape but its right corner has been formed into a spur from several episodes of resharpening. The left side of the scraper within a centimeter of the bit edge has been intentionally dulled. The right side, proximal to the spur, also exhibits some step flake scars but they are unevenly and randomly spaced.

Prior to the disposal of endscraper 4.10.248, the knapper may have been attempting to thin it for rehafting. The right side of the scraper has a small concavity approximately midway between the proximal and distal ends. On the left, an attempt was made to reduce the thickness of the distal end by removing several flakes. Three of these flakes could be refit to the tool. The thinning attempt seems to have failed. From the bit to approximately the midpoint of the left side the edge is very steep, perhaps too steep for successful thinning.

The last of the endscrapers (4.10.709), a fragmented piece of Pennsylvania jasper, was apparently being resharpened when it snapped. The right side of the bit exhibits scalar microflake scars with extensive step microflake scars. By contrast the left side of the bit has comparatively little step microflake damage. From the center of the bit to the left lateral corner, the knapper apparently attempted to reduce the angle of the bit from its present 77^0. In the attempt, one large flake terminated in a hinge fracture which left behind a blocky chunk of material at the center of the bit on the dorsal ridge.

Next, an attempt was made to remove material from the left side of the tool, perhaps to aid in removing the blocky chunk left along the dorsal ridge. At this point the knapper either applied too much pressure, or the material failed. The piece split in two along a diagonal plane taking with it a good portion of the dorsal surface (this part hasn't been recovered yet).

The remaining "formed" tool under consideration is a fragment from a *limace*. *Limaces* were probably used to hollow out the ends of bone, wood, antler or ivory to receive some type of peg, stone tool, or even a foreshaft. Grimes and Grimes (1985) have argued that "flakeshavers" were certainly hafted and used on hard substances. Since they are long and thin, and delicate, these tools probably broke with some frequency and had to be continually replaced or rehafted. This specimen is likely part of the proximal end of a *limace* that broke in its haft.

We now turn our attention to simple flake tools which includes gravers or perforators, and a variety of cutting tools. Each was found among flaking debris suggesting that they were opportunistic types of tools. That is, while a biface or lump of stone was being worked the knapper picked up appropriately shaped flakes that could be used either "as is" (cutters), or, with a little modification, as gravers and perforators.

Three gravers or perforators have been found at the Hedden site. Two of these (4.10.240 and 4.10.246) have been retouched to form a spur, and one (4.10.243) has a naturally formed spur. The retouched graver/perforators show little use wear except in the form of light arris polishing and scalar flake scars at the tip. The "snapped" graver shows equally light use wear. Previously we suggested that they were used for a variety of engraving or incising functions, perhaps to make designs in wood or bone, to make needles, or for some other purpose. It appears that whatever their function these tools outlived their usefulness and were tossed away.

The utilized and retouched flakes appearing in the collection may also have had a relatively short shelf-life. Utilized flakes are, initially, razor-sharp but dull very quickly. Retouched flakes have steeper edge angles that will hold an edge longer than would a utilized flake. Easy to come by, these tools were picked up, used to cut or scrape, then discarded. Perhaps in the case of the cutting tools they were tossed away without a second thought. The gravers or perforators, on the other hand, may have been kept in leather pouches as ready-made tools, or they too were tossed away.

This brings us now to site function. We know that some biface thinning occurred at the Hedden site because there is ample evidence for such activity. If we were to divide the collection up into raw materials, we would find that there are bifacial thinning flakes and bifacial retouch flakes made from all of the major raw materials. We also have a fragment from a Stage 3 or 4 biface. However, bifaces and bifacial thinning flakes are not well represented. That biface retouch flakes are three-fold more common than are uniface flakes suggests that bifacial tools like fluted points — if not being made on site — were clearly being maintained as part of their regular activities.

The common denominator for nearly all of the tools described throughout this report is that they were used to manufacture other tools. Endscrapers may have been used to whittle or scrape wood or bone to fashion shafts for spears, and for making other things such as pack frames, tent poles, and maybe sleds or toboggans. *Limaces* would have useful for making sockets in tool handles, while gravers and perforators may have been used to incise designs or make needles. Moreover, cutting tools may have been used to cut meat and hide, perhaps for making rawhide line.

At this locus, then, and over a period of a few weeks Paleoindians used a variety of stone tools, some manufactured on site, others probably brought in from elsewhere, to make the items that made survival on the Kennebunk Plains more than 10,000 years ago possible.

HORIZONTAL ARTIFACT DISTRIBUTION

Locus I is roughly elliptical in shape, encompassing an area of about 48 square meters. A total of 23 stone tools, 300 flakes and 501 microflakes (flakes < 1 cm), manufactured from some twelve visually distinguishable raw materials, were recovered from Locus I.

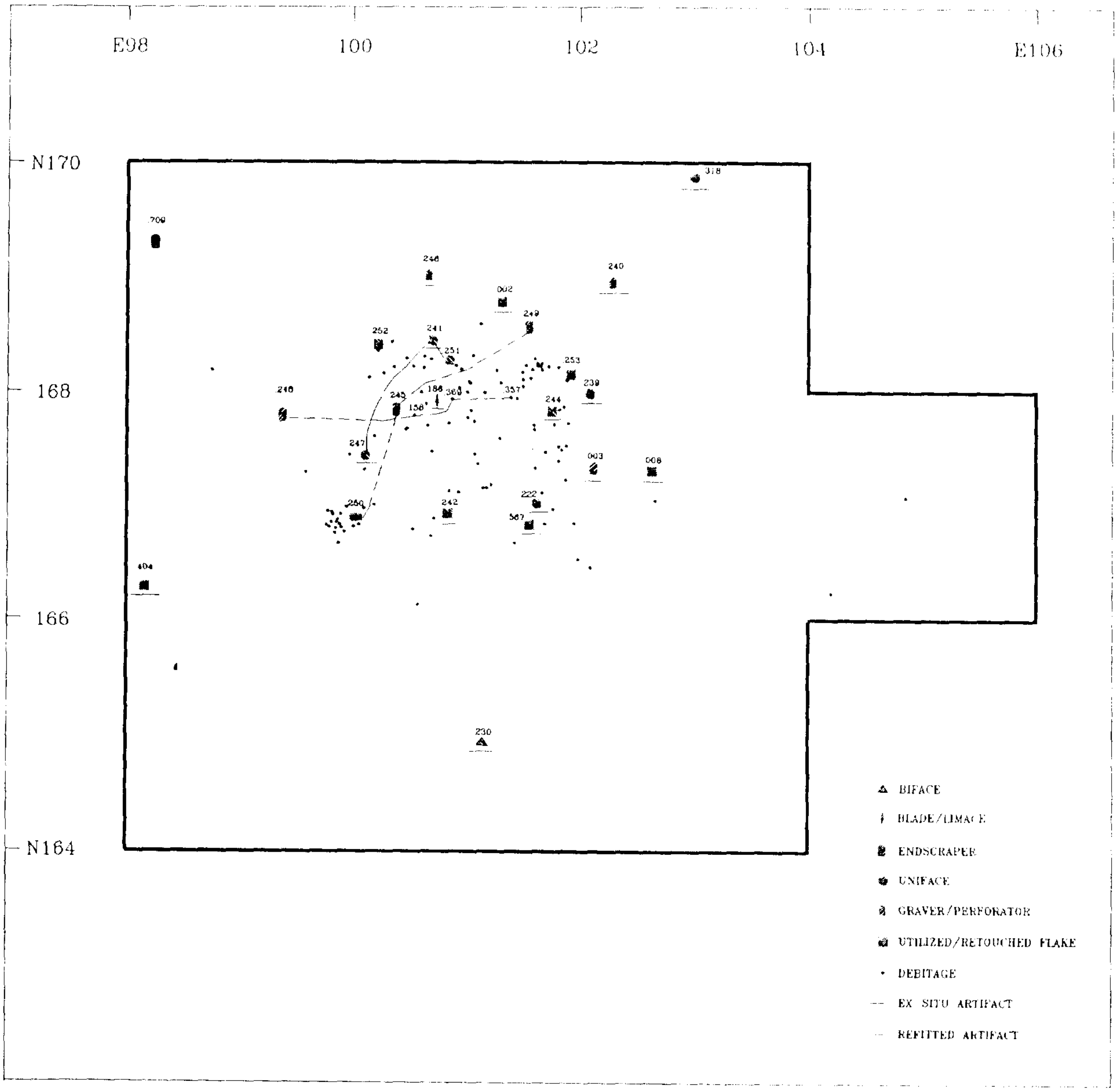

Figure 16. Horizontal distribution map of Locus 1, showing debitage recovered and mapped *in situ*, and all artifacts. Artifacts recovered *ex situ* were recovered in the screen, and mapped here by placing them in the middle of the 50x50 cm quarter-quad excavation unit from which they came.

Tools and flakes found *in situ* (in place), as well as artifacts found *ex situ* (provenience to a 50x50x5 cm unit), have been plotted on a site map, where refitted specimens have been joined with lines (Figure 16). Flakes found in the screen were counted to produce a total flake distribution map (Figure 17). The pattern of *in situ* artifacts closely follows that of the materials found in the screen, allowing us the opportunity to describe and interpret the patterning.

The majority of both flakes and microflakes

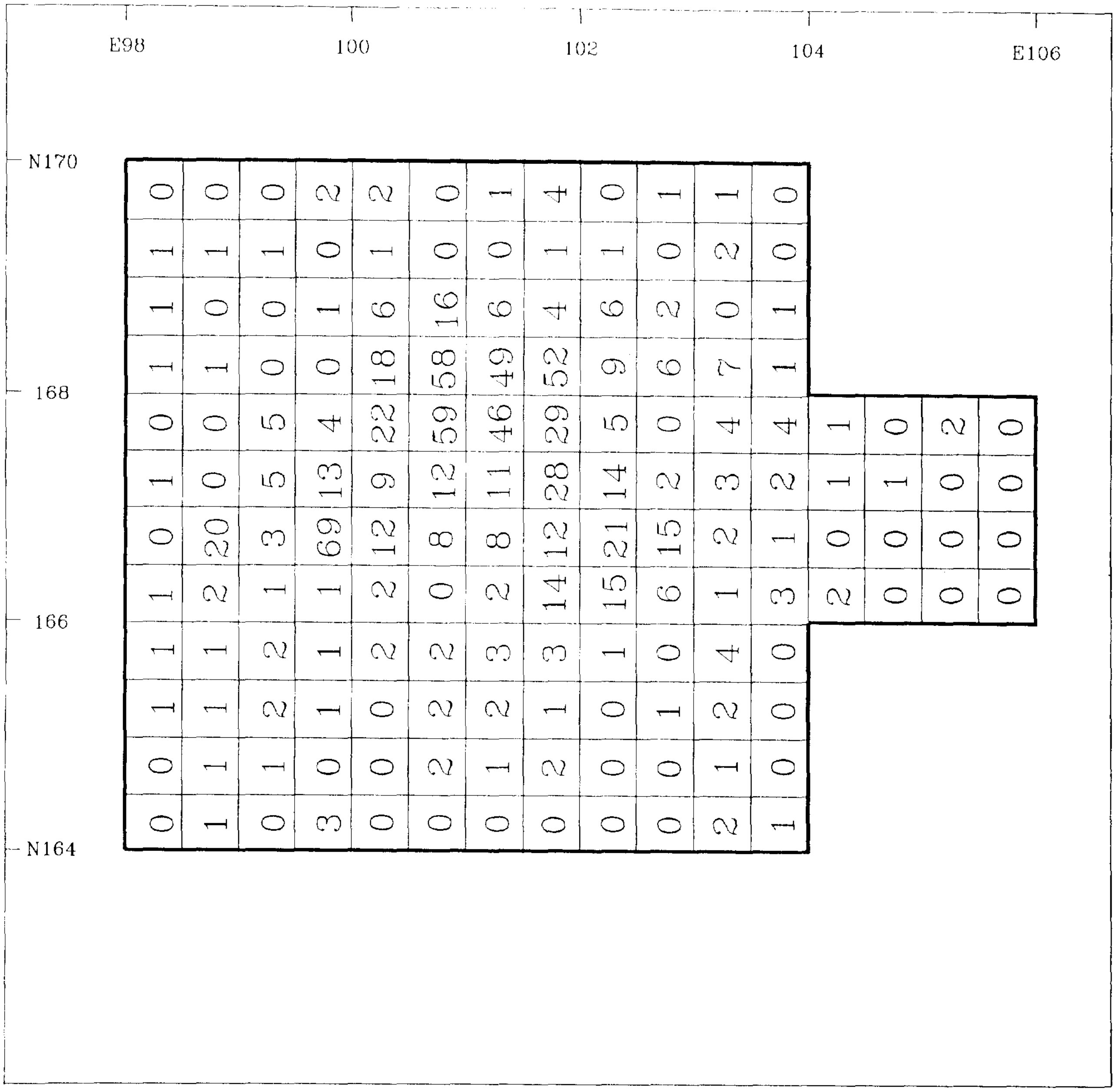

Figure 16. Counts of all flakes recovered by quarter-quad from Locus 1.

were distributed between E99-102 and N166-168 in three overlapping concentrations. One of these concentrations is comprised primarily of Saugus-like rhyolite flakes, distributed in an oval pattern trending northeast-southwest. On either end of this oval are two pieces of the Saugus-like endscraper among small pockets of waste flakes. Nearly all of these waste flakes are (uniface?) retouch flakes less than 1 cm in greatest length, although biface thinning flakes appear as well.

Coxsackie chert flakes also appear in an oval pattern, but are more widely distributed than are the Saugus-like rhyolite flakes. This concentration extends in a near straight line from the southwest corner of N168E100 to the southwest corner of N166E102, east to the southwest corner of N168 E100. The gray cherts seem to be concentrated in a circular pattern between E100-102 and N101-103, which is more-or-less between the Saugus-like rhyolite and Coxsackie chert concentrations. Thus, whatever the ultimate cause of the deposition of this debitage, each raw material evidently was worked during a different work episode with a slightly different spatial focus on the living surface.

Stone tools were recovered in definitely non-random, but not simple patterns, both on the periphery and in the midst of the flake concentrations. Five of the utilized flakes (23.10.4, 10, 2, 8, and 252), and all of the gravers or perforators, were found adjacent to pockets of flakes of the same material. This spatial pattern suggests that these tools were modified from flakes at the spot, used, and discarded without the tool user moving much distance.

Endscrapers also were mostly recovered among flakes of the same material The specimen made from Saugus-like rhyolite, found in three pieces and rejoined, appears to link two pockets of Saugus-like rhyolite flakes into a single episode of stone reduction or resharpening. An endscraper made from Coxsackie chert was found on the periphery of the flake distribution. However, three uniface retouch flakes from the tool's lower left side (refit, apparently a haft retouch attempt), were found together in the upper third of the concentration of Coxsackie chert flakes more than one meter away from the scraper. Evidently, this endscraper was tossed a short distance after failure to trim the haft successfully.

Three of the tools, a biface fragment, an endscraper, and a utilized flake, were found well away from most of the flakes on the periphery of the Locus. The endscraper, made from Pennsylvania jasper, is clearly unrelated to any of the flaking episodes at Locus 1, since thus far no jasper has been identified in the debitage. These tools were apparently discarded by tossing them a short distance toward the periphery of the work area.

Vertical artifact distribution will be discussed in conjunction with the soils data in the next report. However, we note that the refits between fragments of the same tool, and other data, indicate that the entire vertical distribution of Paleoindian material was derived from a single occupation.

DISCUSSION: LOCUS 1 ARTIFACTS AND ACTIVITIES

The work so far at the Hedden site contributes to our understanding of New England-Maritimes Paleoindian in several topics, especially when the Hedden site assemblage is compared with other assemblages from the region (e.g.,. Spiess and Wilson 1987). Because the data are solely stone tools and fragments, and their patterning in the ground, the understanding focuses on what we can learn from stone tool use, manufacture, and discard patterns.

While we are certain that the site is fluted-point Paleoindian in age (circa 11,500 to 10,200 B.P. or so) based upon the types of stone tools and suite of raw materials we have recovered, we have not yet recovered a fluted point base. The attributes of fluted point manufacture changed slightly over the millennium or so of their manufacture, so we can use fluted points to place the site earlier or later in a typological sequence. Unfortunately, because of the small size of the assemblage and lack of fluted point bases, at this time we cannot place the site to some limited portion of the fluted point Paleoindian sequence, which hampers our comparisons with other sites slightly.

Tool Kits and Paleoindian Activities

Paleoindian was a culture whose economy was definitely based on hunting. Yet a hunting economy must be supported by a variety of wood, bone, antler, skin, and perhaps basketry items (Osgood 1940). The stone tools that we recover are just the hardest and least perishable of these items, and we must use them (plus assumptions and knowledge of ethnographically-recorded stone-tool using cultures) to infer what else was being made and used. Perishable objects that would probably have been in their cultural repertoire include skin clothes and footwear, skin tent covers, perhaps skin bags, and certainly rawhide line, woven basketry and mats, wooden cooking and eating implements, wooden handles for stone tools (such as endscrapers), spears, and digging implements, bone or antler buttons, fasteners, bone needles, and perhaps bone spear points. They probably also had complex artifacts made of a combination of materials, such as backpacks which may have combined a wooden frame, rawhide or sinew line, and hide covering, or snowshoes, which are a combination of whittled and bent wood, and rawhide.

Stone was used to make spearpoints (bifaces) as one of its primary functions. Here at the first locus excavated at the Hedden site, however, there is remarkably little evidence of the manufacture of bifacial implements, and there are certainly no discarded or broken spearpoints.

Other stone tools in the Paleoindian tool kit are tools to make other things. The tool kits that we recovered (lost or discarded/used up items) include the following. Three endscrapers have been heavily used to whittle or scrape a hard or medium (bone, antler, or wood) substance. A *limace* fragment was discarded; limaces were used to clean out the inside of a hole or hollow, probably in a wood or bone item. For example, they might have been used to finish the inside of a socket or of a narrow, deep hole made to receive a wooden peg or rawhide lashing. We also recovered gravers or perforators, used to do relatively delicate engraving or incising. The wear on these items shows that they were used on wood or bone, not (only) on skin or hide. Five utilized or retouched flakes were used for cutting soft material, and one was used to scrape a soft material such as hide or a soft wood or plant material. Such work could be done with the production of hide clothing, or even cutting rawhide line.

If all these tools were used and discarded during the manufacture of one large item, which we consider unlikely, it was a complex item with hide, wood and possible bone or antler parts, such as snowshoes, a pack, or a toboggan. More likely, these tools were discarded as they wore out over an occupation of several weeks during which time they were used to make a variety of items with hide, whittled or scraped wood, and perhaps bone components.

Use of Lithic Resources

One of the pieces of information that we can derive from stone tools is an identification of the kind of material from which they were made. Many of the materials used by Paleoindians are cherts or glassy volcanic rocks which have known bedrock outcrop sources or source areas. (There is some argument among archaeologists and geologists about whether fancy laboratory techniques should be used before making such assignation. We believe that in many cases, microscopic and macroscopic [visual, including petrographic thin section] examination is sufficient.) Paleoindians, with rare exceptions, got the rocks they used for most of their tools right from bedrock outcrops. We can see that in the Hedden site collection on pieces of the Saugus-like rhyolite, with bedding or quarry exposure cortex. The large piece of crystal quartz, too, exhibits an exterior crystal surface that has not been rolled or transported by glacier or stream. The same pattern happens with other materials on other sites in the New England-Maritimes region (Spiess and Wilson 1987), although in the mid-Atlantic states Paleoindians certainly used stream cobbles. Thus, when we identify a bedrock source for the stone material, we know that the Paleoindians (in the Northeast at least) went there to get the rock.

There is some debate how much of this material was moved by casual trade from group to group, and how much was obtained by people walking to and from the quarry source directly (Spiess and Wilson 1989). Most authors feel that all but the rarest materials on a particular site were obtained by walking to and from the quarry. Some authors feel that trips to quarries were part of a regular seasonal cycle of movement across the landscape of New England, while Spiess (Spiess and Wilson 1989) feels that some part of the population (perhaps young men, or a particular family) made special trips to the quarries. Perhaps they knew they would likely meet other people from distant bands at these locations.

In any case, many Paleoindian sites in New England used rock obtained from multiple sources as far away as Burlington, Vermont, the lower Hudson river valley in New York, eastern Massachusetts, and Munsungun Lake north of Baxter State Park in Maine. The Hedden site is no exception. The three majority materials are Saugus-like rhyolite from an unknown source, Coxsackie chert from the Lower Hudson valley, and crystal quartz, which is found in largest crystals in western Maine from Auburn, Paris, and Bethel west into the White Mountains.

The amounts of these materials discarded at the Hedden site are rather small. The total weights of all flakes and tools that we recovered (and that the Paleoindians lost or discarded) of these three materials are: Saugus-like rhyolite, 32.3 gr; Coxsackie chert, 31.7 gr; and crystal quartz, 18 gr. The total weight of the assemblage of 21 tools, 252 flakes, and 700 or so microflakes that we have recovered so far is 108 gr. Elsewhere, Spiess (1984) has speculated on the amount of stone needed to supply a Paleoindian band or family for a year. In the case of the Hedden site, if we assume that the occupation lasted two weeks, then about 3 kg (about 7 pounds) of stone would supply their needs for a year. It would not be impossible to walk to a distant quarry once every year or two and bring a few kg back to southern Maine.

"Poor Player" Functional Analysis

As MacBeth says: "Life is but a walking shadow, a poor player that struts and frets his hour upon the stage" (Shakespeare, *MacBeth*, Act 5, Scene 5). In a sense, single occupation sites like the Hedden site provide us with a glimpse of the stage and the poor players upon it. If we follow the lines of reasoning presented above, and add a few more assumptions, we can place the Hedden site (the "stage") in some sort of a sequence of behavior of what preceded the occupation ("off-stage"), and what might have followed it ("off-stage"). For example, stone tools have definite use lives, of varying lengths. They will be discarded after they have broken (and are not reused or reshaped into another tool form), or after they have been resharpened so many times that they cannot be resharpened efficiently again, or if they are simply lost. Endscrapers, we feel, are used up relatively quickly. (Other archaeologists feel that endscrapers had longer use lives [Lothrop 1988]). The wooden or bone handles in which they were hafted probably lasted for years and years, while the bits were resharpened many times a day during intense work episodes, and had to be replaced several times in a year, or perhaps more frequently. Utilized flakes, of course, are most often picked up, used, and discarded. However, some especially fine cutting tools such as channel flake fragments may have been kept for some time, for example as part of a sewing kit. Archaeologists have also noticed, at other Paleoindian sites, that biface preforms are carried around and worked on in episodes (leisure time?, or when the artisan "felt" right). Thus, a biface would be carried across the landscape, reduced to a spear point in several episodes, used, perhaps resharpened, maybe even rehafted, eventually broken and discarded.

When we assume that a Paleoindian group was resupplied with a new lump of raw material (say a kilogram or two) on an irregular basis, then we can envision that the new material would be used up as it gradually replaced older stone tools. In fact, at the Hedden site, it seems that the gray chert or cherts may have been brought in as a relatively old "supply". The Saugus-like rhyolite, which is the majority material, comprises a much newer supply, evidenced by the large number of tools, large amount of flaking, and quarry block cortex on some tools and flakes. The Coxsackie chert is a bit harder to interpret. This material includes a used-up discarded endscraper, and a bunch of flaking debris which includes many definite biface thinning flakes. We suspect that the supply of this material is "older" than the Saugus-like rhyolite, and that it included a biface (maybe a point preform) which had been curated and transported around for awhile. The crystal quartz likely entered the site as one huge crystal, recently picked up in the White Mountains or western Maine foothills.

The Munsungun chert in the collection is a small minority. Does it represent the very old (a couple of years?) remains of a supply of this chert, or trade for a small piece with someone the group encountered along the way?

It looks like the gray chert and Coxsackie chert, perhaps both from New York or the Hudson valley(?) are earlier supplies, and the Saugus-like rhyolite and crystal quartz are newer. Does this mean the group moved eastward across southern New England and then northward into southern Maine in its most recent wanderings, with individuals making expeditions to relatively near lithic sources. Possibly, but not necessarily. To test this hypothesis we would have to find other sites of the same age, and examine their raw material content.

Pending further excavation, it seems that the Coxsackie chert biface or point that was worked on at the Hedden site was hauled away and used or discarded elsewhere. Moreover, we would expect another site in the sequence used by this group to contain Saugus-like rhyolite as an "old" material, with some other lithic material as a new supply. In this way we can begin to see the stage, and the players entrance and exit.

ACKNOWLEDGEMENTS

We owe a deep debt of gratitude to a private donor from western Maine who gave the Maine Historic Preservation Commission a cash donation for archaeological fieldwork in that part of the state in 1992. We used $7500 of that donation to pay most of the professional crew who worked at the Hedden site, and therefore to provide match for the Town of Kennebunk CLG grant.

Richard Erb, Town Manager of Kennebunk, deserves special thanks for his patience and assumption of the extra administrative work load that a CLG survey entails. The Maine Department of Inland Fisheries and Wildlife deserves thanks for understanding, moral support, and permission to excavate.

In addition to the authors and our geological consultant, our professional crew included Thomas Buchanan, Maxine Collins, John Cooper, Mark Hedden, Kaare Mathiasson, and Elizabeth Trautman. Three volunteers, who each donated several days of their time and added a great deal to the work effort and general camaraderie deserve special thanks: William Burgess, Dan Clapp, and Bob Jankovich. Other volunteers, who all worked hard and made a contribution include: Liz Gould, Peter Miller, Louise Newcombe, Laura Ross, Barbara Sharood, Elizabeth Spiess, Eben Talmage, and Norm Buttrick and a group of Freeport High School students.

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