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PROFILES, MYSTERY BONES, AND POTS: THE SOUTH PIKE BAY SITE

Andrea K. LeVasseur
Chippewa National Forest

The Chippewa National Forest conducted archaeological investigations of the South Pike Bay site (21CA38, FS#0903020085) located on two terraces on the south shore of Pike Bay of Cass Lake, at the South Pike Bay Campground. This paper summarizes results of these 1997-99 investigations, which focused on the preceramic occupation of the upper wave-cut terrace and a description of the site as a whole.

Soil and topographic conditions suggest that Late Paleoindian and Early Archaic occupations are situated on the upper wave-cut terrace, which probably formed during very high postglacial water levels. Rapid, probably windblown, sediment deposition on the terrace is consistent with dry, prairie-like conditions. Radiocarbon dating for the upper terrace sediments, performed on carbon extracted from within phytoliths, indicated occupations from about 8500 to 7400 years ago. An abundance of tools, other artifacts, faunal remains, and features were found on the upper terrace; 20 projectile points were recovered, including Agate Basin, Durst Stemmed, Parkdale Eared/ Oxbow, and HiLo. Woodland ceramics were poorly represented but included Brainerd, Blackduck and Sandy Lake wares. At least 10 features were evident. Nine of these appeared to represent lithic work areas, while one may have been a deposit of discarded cooking/ heating stones or from another unknown use. The primary animals identified from the faunal assemblage were deer, bear, and turtle, with small mammals, fish, birds, and mollusks present in trace amounts. Calcined bear paw fragments suggest cultural practices beyond subsistence.

There appear to be at least three beach shorelines on the lower terrace: the current shoreline and two that are abandoned. The lower beach terraces formed after a reduction in water levels, and were occupied by Initial Woodland and later peoples. Radiometric dates were not obtained on the lower terrace sediments. However, artifact comparisons suggest that all of the material on the lower terrace dates from Initial Woodland to recent, including Laurel, Brainerd, Blackduck, and Sandy Lake ceramics, with no identifiable earlier materials.

INTRODUCTION

During the 1997-99 field seasons the Chippewa National Forest conducted an archaeological investigation in the South Pike Bay campground using Forest Heritage Program personnel and volunteers in the Passport in Time program. The purpose of the investigation was to evaluate the eligibility of the site for listing on the National Register of Historic Places, and to examine selected research topics. This paper provides a summary of the results of the 1997-99 investigations, which focused on the preceramic occupation of the upper wave-cut terrace and a description of the site as a whole. More detailed information may be found in LeVasseur and Yourd (2002).

The site is situated on the south shore of Pike Bay in Cass Lake. A National Forest campground, boat access, and picnic area with swimming beach currently occupies the area. At South Pike Bay, as at many places along the shoreline, uplands are wave-cut by water levels that were significantly higher than today. These wave-cut features form embankments that steeply rise about 20 to 30 feet above the lake. Archaeological remains were found on this upper terrace, as well as lower beach terraces adjacent to the present lake shoreline.

South Pike Bay was an attractive area for habitation because it was a terminus of a major portage route connecting Leech Lake and Cass Lake. Early written accounts of the area make mention of this portage. Henry Schoolcraft's account of the 1820 Cass expedition, for example, describes the portage as a deeply worn path that appeared to have been used for centuries (Schoolcraft 1855). The first written account noting evidence for the presence of settlement at South Pike Bay prior to the arrival of Europeans is that of Jacob Brower published in 1898 (Brower 1898).

Between 1895 and 1970 there appears to have been no investigation of the site conducted by professional archaeologists. During the latter half of the twentieth century avocational archaeologists and artifact collectors recovered large collections at South Pike Bay. The largest reported collection is that of E. Farrel Creech, which comprises approximately 800 grit- and shell-tempered ceramic sherds including smooth, net-impressed, and woven cordmarked surface treatments.

In 1970, the University of Minnesota conducted the first controlled archaeological test excavation at South Pike Bay. The work was conducted as part of the "Wild Rice Transect" study under the direction of Elden Johnson.

The most extensive archaeological investigation of the South Pike Bay site was conducted 1985-87 by Christina Harrison under contract with the Chippewa National Forest (Harrison 1987). Fieldwork conducted for this study included the excavation of 97 shovel tests and 6 formal test units covering a total of 5.75 square meters. With the exception of four shovel tests placed on the upper terrace behind the boat access, excavation was confined to the campground and picnic areas located on the lower terrace.

Culturally diagnostic artifacts recovered during Harrison's study included Brainerd, Laurel, Blackduck and Sandy Lake ceramics. A test unit in the campground area yielded an almost completely reconstructible Brainerd vessel (Fig. 4). A comparatively small quantity of lithics and two

possible hearths were also noted. Harrison suggested that the campground could be characterized as a series of discontinuous archaeological deposits representing several smaller campsites. She also identified a preceramic component located on the upper terrace.

Archaeological excavation undertaken as part of the review process for a number of Forest Service projects supplemented the information derived from the above research. These examinations included shovel testing of the upper terrace for a proposed hiking trail, shovel testing and formal excavation of new toilet facilities in the campground, shovel testing along the upper campground access road for proposed tree salvage, and excavation of an area to serve as a sign footing for a campground fee station.

RESEARCH TOPICS

Research topics of small scale included recognizing of natural and cultural site formation processes, determining the spatial distributions of the archaeological deposits, identifying of cultural components present and whether they can be separated spatially or by other means, determining the function of features or activity areas, and recovering information regarding subsistence practices. Three larger-scale research topics were also of interest in this investigation: assessing the applicability of proposed preceramic contexts, identifying and describing preceramic occupations through aspects of lithic technology, and examining whether and how water oriented settlement varies with reference to local topographic settings throughout the Holocene.

PRECERAMIC CONTEXTS

It is unknown whether the Archaic traditions or complexes that have been proposed as exhibiting distinctive tool assemblages and subsistence patterns outside the region can be usefully applied within the Headwaters area. The cultural contexts adopted for purposes of statewide preservation planning in Minnesota for the Archaic period include Prairie Archaic, Eastern Archaic, Lake Forest Archaic and Shield Archaic (Dobbs 1989, Anfinson 1987 and 1990, Hohman-Caine and Goltz 1995a). Application of these contexts and their potential subsistence-settlement systems may prove to be problematic in the Mississippi River headwaters where ecotones have shifted dramatically during the Holocene. The utility of such contexts is an open question that needs to be tested in this region. A fundamental issue to be addressed for the preceramic occupation(s) includes determining cultural affiliation and evaluating potential regional contexts.

LITHIC MATERIALS PROFILES

Many of the great difficulties in deriving reliable information from relatively sparse lithic sites presumed to be preceramic results from small sample size and lack of diagnostic artifacts or datable features. Unfortunately, in the Headwaters area, possible preceramic cultural affiliation is usually defined more through an apparent absence of ceramics than through the presence of positive attributes. In recent years, lines of analysis that may help to rectify this problem involve the material types used in lithic reduction.

For many years, archaeologists have noted apparent changes through time in the use of lithic material types. This has led to the hypothesis that certain lithic material "profiles" appear during specific cultural periods. A *profile* is a description of lithic source materials characteristic of certain time periods. These profiles may reflect differential exposure of materials sources at different times, the convenience of sources to human settlements or activity areas, or simply cultural preference for certain materials. If profiles can be tied to time periods, they may serve as an aid to temporal identification and cultural affiliation, similar to use of ceramic styles and projectile point types. To test this hypothesis, some researchers have attempted a comparison of lithic material type profiles among sites of known cultural affiliation.

Based upon analysis of lithic collections from several sites, Hohman-Caine and Goltz (1995a) propose that in the Headwaters region the lithic profiles of Archaic sites exhibit use of locally available cherts and less exotic cherts than the preceding Paleoindian and later Woodland Tradition sites. They also observe that Archaic sites exhibit more frequent use of Tongue River Silica. During the Paleoindian period, there is high use of both eastern and western raw materials (Bakken 1997), while Woodland sites exhibit substantial use of western raw materials. Results are preliminary and engender some difficulty because they are based on relatively small sample sizes; however, if lithic material profiling proves viable it has the potential to contribute significantly to identification of cultural affiliation, especially in the absence of other indicators.

WATER ORIENTED SETTLEMENT PATTERNS

Another area of research that has potential for regional application concerns how changing water elevations have affected placement of water oriented settlement in local topographic settings. For more than two decades archaeologists have noted that in some settings within north central Minnesota, sites or the distribution of cultural components within sites varied in a pattern, with the earlier components located on features elevated above and at greater horizontal distances from today's active shorelines while the more recent components are located at lower elevations closer to water.

Research (e.g., Winkler et al. 1986) has documented that lake levels have varied considerably during the Holocene. Palynologists have observed that shallow lakes in central and southern Minnesota dried up completely during the mid Holocene. The general model is that water levels were considerably higher than today during early postglacial times, that they were much lower than today during the peak of the dry period during the mid Holocene, and that water levels began to return to levels more similar to today by about 5,000

B.P. The magnitude of the fluctuation may have been considerable. Almendinger (1988), for example, determined that lake levels dropped by as much as 6 m in some lakes in west-central Minnesota during the mid Holocene. A drawdown of the same magnitude occurred during the same time period at the headwaters of the Mississippi River (Anderson 1993).

In collaboration with other researchers, Goltz has proposed (e.g., Grigal et al. 1976; Hohman-Caine and Goltz 1987; Harrison 1987) a more detailed reconstruction of past water levels in the Mississippi Headwaters region that is specifically applicable to the Cass Lake basin. This model has been developed through detailed analysis of landforms including abandoned terraces and beach ridges. The formation and chronological placement of such features are explained in this model through the effects of widespread climatic change during the Holocene coupled with the more localized effect of the successive downcutting of outlets of lake systems including Bemidji, Cass and Winnibigoshish. This downcutting eventually led to capture of the main stem of the Mississippi River from its original postglacial course.

Harrison (1987) presented this model as a framework for describing the sequence of formation of the wave-cut upper terrace and the beach ridges of the lower terrace at South Pike Bay. That sequence is also described in some detail in Hohman-Caine and Goltz (1987) and Goltz (1988):

- Early Holocene. *12,000 to 8,000 BP:* Basins formed from the wastage of ice blocks. High water levels were present throughout the landscape. Through time the development of river channels lowered Cass Lake to an elevation of about 1308 ft. By 9,000 B.P. erosion had enlarged the lake basins and the elevation in Cass lowered to about 1307. Cass Lake is not part of the main stem of the Mississippi. Cass Lake drains southward through South Pike Bay and Moss Lake into the old Mississippi channel which then flowed from Lake Irving to Steamboat Bay of Leech Lake through the Necktie River channel.
- Mid-Holocene. *8,000 to 4,500 BP:* This period is generally warmer and drier than today. Lake levels may have dropped as much as 30 ft during maximum sustained aridity. Shallow lakes and some streams dried up. Lowered levels caused additional down cutting of stream channels when stream flow did occur.
- Late Holocene. *4,000 BP:* Return to more cool and moist climate. Water surface elevation in Cass Lake returned to about 1306 to 1308 ft. *3,000 BP to 1,000 BP:* The divide between Cass Lake and Winnibigoshish was breached causing abandonment of the southern outlet for Cass Lake and the elevation of Cass dropped to about 1303 ft. *1,000 BP to Present:* Early in this period the divide between Lake Bemidji and Cass Lake was breached and put Cass Lake on the main stem of the Mississippi for the first time. Gradual down cutting of channels lowered lake levels. Earlier shorelines were abandoned. Elevation of Cass Lake dropped to about 1298 ft. With construction of Knutson Dam at the outlet of Cass Lake, normal pool elevation is 1301 ft.

If this model is sound it has clear implications for the understanding of archaeological site distribution in the Headwaters area. It predicts that in the Cass Lake basin, for example, shoreline remains of Paleoindian and early Archaic occupations will be found above an elevation of about 1308 ft, that water-oriented Archaic sites of the mid Holocene are now under water, that Archaic sites during the early part of the late Holocene will be found above elevations of 1306 to 1308 ft, and that where a range of elevations are suitable for habitation, the earlier Woodland occupations that were immediately adjacent to water will be higher than those later Woodland occupations that were also immediately adjacent to water. The changing course of the Mississippi River may also have affected primary travel routes as well as riverine settlement, and this may be reflected in the distribution of sites through time.

This model has been applied with some success to archaeological studies in the Headwaters. Some researchers, however, are skeptical of its validity and it remains to be fully tested. Application of a model such as this can be complicated by a number of variables such as use of higher terraces as a matter of cultural preference, seasonal variation in settlement pattern, and the use of higher terraces as overlooks throughout the Holocene. Beach ridges may also have served as overland travel routes in some settings long after they were abandoned by a lower lake level.

SITE CHRONOLOGY

The glacial history of the Upper Mississippi drainage basin is one of the most complex in the world, with a stratigraphic record of overlapping tills and deposits of reworked tills from earlier glaciations. By about 12,000 years ago, glacial ice from the St. Louis sublobe had retreated, leaving blocks of ice buried under glacial drift and outwash deposits. Depressions were enlarged and filled as the ice rapidly melted with the warming climate, and numerous lakes were formed. For a short time, tundra or dwarf shrubland may have existed near the ice margins, but this was rapidly replaced by a spruce forest containing birch, aspen, elm, ash, and cedar from about 12,000 to 9,800 years ago (McAndrews 1966).

Between 8500 to 4000 years ago, the Headwaters region became dominated by an oak savanna/prairie with xeric deciduous forest surviving along lakeshores and rugged topography, which provided firebreaks. The Leech-Winnibigoshish Lake area probably was the northern limit of the savanna, which reached its easternmost limit in Minnesota and Wisconsin between 8000 and 7000 years ago. Natural fires and wind erosion were significant factors shaping the landscape and vegetation patterns. Studies at Elk Lake in Itasca Park suggest that the savanna/prairie period had three climatic subdivisions: an early dry phase from 8500 to 5400 years ago, a somewhat wetter phase from 5400 to 4800 years ago, and a dry phase from 4800 to 4000 years ago (Dean 1993;

Bradbury and Dieterich-Rurup 1993). Conditions were unstable and variable, but generally became increasingly warmer, drier, and windier. Lake levels were significantly lower and many small, shallow lakes dried up. Lake Winnibigoshish's basin was exposed, providing sand that was deposited to the southeast in a large dune field (Grigal et al. 1976). Most rivers and streams, including the Mississippi, probably flowed only intermittently. The availability of water and aquatic resources probably had a major effect on human subsistence strategies.

The oak savanna was invaded by white pine and other conifers about 3700 years ago, and this marks a significant climatic reversal. Cooler and moister conditions allowed the mesic deciduous forest species to survive, but prairie species almost disappeared. Sometime during this period the Lake Winnibigoshish basin was flooded and the Mississippi River diverted its course from Leech Lake through Lake Winnibigoshish. The modern faunal assemblage probably appeared about this time also. Although wild rice probably appeared at least 9000 years ago, its habitat was probably limited until after 3700 years ago, after which its range and density significantly increased. Jack, white, and red pine were well established in the Headwaters forests by 2000 years ago. There have been many minor climatic fluctuations in the last 4000 years that did not result in major vegetational changes, but probably had significant effects on the subsistence strategies of human populations.

The Cass Lake basin is within the broader landscape unit known as the Bemidji Sand Plain, which is characterized by well-drained sandy soils supporting pine-dominated communities with occasional aspen and hardwood stands interspersed throughout. At South Pike Bay the soils are classified as Psammentic Eutroboralfs, which are well-drained and excessively drained sands and loamy sands (U. S. Department of Agriculture 1997). Excavation units on the upper terrace generally displayed up to 10 cm of dark brown loamy sand overlaying fine sand to about 40 cm. Very fine sand continued to at least 110 cm. Rust colored mottling and compaction appeared about 80 cm and increased with depth. The Chippewa National Forest soil scientist was consulted and offered the opinion that the very fine sands were probably windblown (D. Shadis, pers. comm.). Other than a color and textural change at about 40 cmbs, there is no obvious stratigraphy, either natural or cultural.

A palynological peat core from Ten Section Lake was analyzed and gives an indication of the time of paludification of the channel (Janssens and Middeldorp 1997) adjacent to the South Pike Bay site. Zone A (310 cm depth) found the mineral contact dated to 9500 B.P. calibrated at 2 sigma. Zone B (310 to 180 cm) was the lake phase, dated 9500 to 4000 B.P. at 2 sigma. Zone C (180 cm to surface), called the "floating mat/tamarack island phase," dated from 4000 B.P. to present. This indicates that open water existed from 9500 to 4000 B.P. and that paludification of the channel occurred gradually after the mid-Holocene warming, beginning about 4000 B.P.

Radiocarbon dating was obtained for the upper terrace sediments. The site has poor organic preservation, so plant phytoliths were extracted for radiocarbon dating of the carbon trapped within the silica microfossils (Mulholland 2000). Four sediment samples from the South Pike Bay site were selected for radiocarbon dating. The samples represent a series of depths (40-45 to 90-95 cm) from a stratigraphic column that correlates to different cultural occupations in the site.

A sub-sample of 600 g was taken from each sample; varying amounts of phytoliths were present after the extraction but all four samples yielded enough carbon for an AMS date. Samples 1 (40-45 cmbs) and 2 (60-65 cmbs) were very similar in age (7624 to 7521 B.P., calibrated at 2 sigma.) Sample 3 (80-85 cmbs) is slightly younger than samples 1 and 2 at 7390 to 7425 B.P at 2 sigma. Sample 4 (90-95 cmbs) was distinctly older by about 1000 years (8500 to 8200 B.P. calibrated at 2 sigma). Mulholland concluded that:

> The dates are roughly in stratigraphic order, with only sample 3 younger than the samples above it. However, this is not as significant as the fact that samples 1, 2, 3 are all very close in age. Samples 1 and 2 are especially similar, with less than 1 sigma difference in the conventional ages and almost complete overlap between the calibrated ages at 2 sigma. For all practical purposes, these two samples indicate the same age even though they are separated by 20 cm of sediment. That such a thick section of the sediment column has the same age could be a result of extremely thick deposition over a short period of time. Alternatively, the sediment could represent mixed materials, either mixing of phytoliths of different ages within each sample or mixing of the entire section of sediment. It is difficult to determine which explanation is most likely without additional sediment data.
>
> The difference between sample 4 and the others is therefore that much more striking. Sample 4 is approximately 1000 years older than samples 1 to 3; however, it is separated by only 5 cm from sample 3. Not much else is much different between the samples, although there is a greater percentage carbon in sample 4 and a slightly lower delta C13 value. Again, this must be interpreted in conjunction with other sediment data. Sample 4, 90 to 95 cm, may be actually 1000 years older than sample 3 (80-85 cm) with a much greater rate of sediment deposition indicated in the higher samples. On the other hand, sample 4 may represent a less mixed context either in terms of initial deposition or within the sediment column. (Mulholland 2000:6-7)

There is some evidence of vertical mixing of materials. Two fragments of a Durst Stemmed projectile point that fit together were found at 50 and 60 cmbs, and many shatter fragments of a distinctive material that appears to represent a single reduction event were found from 70 to 85 cmbs. This mixing is easily explained by burrowing animals and normal forest processes such as tree fall, where the root ball brings soil to the surface and subsequently the load is dropped and redistributed.

Figure 1. Projectile points from the upper terrace, South Pike Bay site (21CA38).

ARTIFACTS

A total of 20 projectile points were recovered from the upper terrace (Fig. 1). Diagnostics included Parkdale Eared/Oxbow, HiLo, Durst Stemmed, and Agate Basin styles. One projectile point had been excessively resharpened to a blunt tip or scraper.

Three large anvils were recovered in units 01S28E (associated with Feature 1), 09N04E and 10N08E, at 60, 65 and 55 cmbs respectively. A small anvil was found in unit 12N07E at 40 cmbs. It is roughly rectangular and exhibits a concentration of pitting from battering in the center of the opposite flat surfaces. The battering suggests use as an anvil, although it is possible it was used as a hammerstone to strike material during the bipolar reduction process. None of the rounded edges or prominent points shows battering, as would be expected with normal hammerstone use in percussion reduction.

A total of 12 bifaces were recovered in 11 units. Three of the tools were complete, the rest fragments. One is an over sharpened and discarded ovate biface of siltstone that resembles TYPE IIA (Harrison et al. 1995:29) of the Reservoir Lakes Complex.

One large wedge of siltstone was recovered. It exhibits exterior cortex on two sides, was unifacially worked, and is not the product of bipolar reduction.

Other artifacts of note included 20 scrapers, 1 graver, 6 retouched and 6 utilized flakes, 1 trihedral adze, 48 hammerstones, 2 unidentifiable copper fragments, and 1 blue glass seed bead.

Forty-one checked pieces and 18 unworked raw materials were recovered. These rejected materials were predominantly quartz and chert, following the same general pattern of material utilization as found for debitage (see below).

A total of 102 cobbles were recovered from the upper terrace. The largest and most distinctive concentration of cobbles was found in Feature 5 (see below).

Debitage includes the discarded waste products of knapping. In this study, these were considered to be waste flakes, shatter, and cores. A total of 30,536 items were recovered from the upper terrace. Of these, 25,838 items or 85% of total were lithics. (Bone fragments were the second largest category at 14%.) Debitage used in quantitative data manipulation was limited to that from the 1997-99 units. The 1997-99 data set included a total of 24,184 debitage items.

Debitage included all stages of manufacture; however, large early-stage reduction flakes were less abundant than later stages. The lower frequency of large flakes suggests that they were removed for further work and use as tools. Bipolar reduction was evident in two recovered cores. The number of debitage varied from 162 to 1582 pieces per square meter.

Thousands of ceramic sherds have been recovered by collectors and archaeological excavation from the lower terrace over the past several decades. Grit tempered ceramic surface treatments are predominately woven cord but include net/other fabric, and smooth. Rims include several clear examples of Sandy Lake, Blackduck, and Brainerd ware (Fig. 2). Types that may be present in small numbers include Laurel and St. Croix/Onamia. The Laurel-like ware is represented by two sherds having a push-pull dentate stamp design. The St. Croix-like ware is represented by three sherds with a simple dentate stamp applied over a cord marked surface (Fig. 3).

The most prominent ceramic recovery on the lower terrace was the broken remnants of a nearly complete Brainerd vessel (Fig. 4), one of only two entire Brainerd Ware vessels known to exist.

In contrast to the lower terrace, shovel tests and formal excavation units on the upper terrace of the South Pike Bay site during the late 1980s and 1990s yielded few ceramics. A total of 188 ceramic sherds, about half of which are less than 1 cm in length, have been recovered during these excavations. This is a comparatively small sample from an excavation of over 54 m^2 and represents only about 0.5% of the total artifact assemblage. In the campground on the lower terrace, ceramics were recovered much more frequently than lithic artifacts (Harrison 1987).

Despite their small numbers, the ceramics recovered from the upper terrace demonstrate that the archaeological deposits in the upper levels date to the Woodland period (ca 3,000 BP to 300 BP) and that the same range of Woodland cultural components is represented on both terraces.

Shell-tempered (Sandy Lake) ceramics were found primarily in the upper 15 cm while Brainerd rims and body sherds are evenly distributed between 0 and 40 cmbs. The apparent difference in vertical distribution may be a result of the difference in age of the two components. Elsewhere in north-central Minnesota, Sandy Lake ware occurs from about A.D. 1100 to Historic times (Anfinson 1990, 1987). Radiocarbon dates from charred organic crusts on Brainerd vessels recovered throughout the Mississippi Headwaters area indicate an approximate age range of 2,000 to 3,000 BP (Hohman-Caine and Goltz 1995b).

LITHIC MATERIALS

In their analysis of lithic materials frequencies during different time periods, Hohman-Caine and Goltz (1995a) postulated the following (also summarized in Table 1):

- Archaic sites show high Tongue River Silica (also called silicified sediment). Knife River Flint is almost absent.
- Brainerd sites show low to absent Tongue River Silica, low Knife River Flint and moderate quartz and Swan River Chert.
- Late Woodland sites have no Tongue River Silica, but are high in Knife River Flint.

Figure 2. Selected rim sherds from the Creech collection, South Pike Bay site (21CA38).

Figure 3. Creech collection, South Pike Bay site (21CA38): Laurel, left; St. Croix, right.

Figure 4. Reconstructed Brainerd Vessel, South Pike Bay site

- Chert is highest during the Archaic, lowest during the Paleoindian and Woodland.
- Gunflint Formation is low or absent except for the Paleoindian period.
- Knife River Flint is low or absent except during the Late Woodland.
- Swan River Chert is present on all sites except Paleoindian and often dominates the assemblage.
- Tongue River Silica is moderate in frequency in Brainerd and Archaic sites, and low in other time periods.

To develop a lithic profile comparable to Hohman-Caine and Goltz's work, materials were organized generally following their categories. Tables 2 and 3 were computed by averaging the percent debitage or tools for each time period. Time periods were organized into Woodland 0 to 39 cmbs, Archaic 40 to 79 cmbs, Paleoindian 80 to 105 cmbs, based on the results of radiocarbon dating and ceramic distribution. Low frequency was 0 to 33%, moderate was 33 to 66%, and high was 66 to 100%. A single tool was considered low regardless of percentage and is noted with an asterisk in lieu of percent. (Single tools and the "other" category not shown in the tables cause percentage totals less than 100%.)

Overall, distribution of debitage materials throughout the time periods represented on the upper terrace shows little variation (Table 4). Chert dominates the assemblage, followed by quartz and Tongue River Silica. There are smaller amounts of siltstone and other Gunflint Formation materials, and Knife River Flint. Swan River Chert and a variety of "other" materials such as agate, basalt, quartzite, Hixton Silicified Sandstone,

Table 1. Postulated materials frequency for Mississippi Headwaters sites (Hohman-Caine and Goltz 1995a).

Material	Paleoindian	Archaic	Initial Woodland	Late Woodland
Chert	Low	High	Low	
Gunflint Formation	Present	Low or absent	Low or absent	Low or absent
Knife Lake Siltstone	high			
Knife River Flint	Low or absent	Low or absent	Low or absent	Present to high
Swan River Chert	Low or absent	Present to high	Present to high	Present to high
Tongue River Silica	Low or absent	Moderate to high	Moderate	Low or absent
Quartz	Low or absent		Moderate	

Table 2. Debitage Material Frequency, South Pike Bay Site (21CA38).

Material	Paleoindian	Archaic	Woodland
Chert	Moderate (39%)	Moderate (37%)	Moderate (39%)
Gunflint Formation	Low (5%)	Low (4%)	Low (3%)
Knife Lake Siltstone	Low (9%)	Low (9%)	Low (6%)
Knife River Flint	Low (4%)	Low (5%)	Low (6%)
Swan River Chert	Low (<1%)	Low (1%)	Low (1%)
Tongue River Silica	Low (11%)	Low (19%)	Moderate (15%)
Quartz	Low (23%)	Low (20%)	Low (23%)

Table 3. Tools Raw Materials Frequency, South Pike Bay Site (21CA38).

Material	Paleoindian	Archaic	Woodland
Chert	High (80%)	Moderate (34%)	Moderate (38%)
Gunflint Formation	Absent	Moderate (60%)	Low (*)
Knife Lake Siltstone	Low (*)	Low (13%)	Low (17%)
Knife River Flint	Absent	Low-moderate (33%)	Low (20%)
Swan River Chert	Absent	Low (*)	Absent
Tongue River Silica	Absent	Low (12%)	Absent
Quartz	Low (*)	Low (*)	Low (24%)

rhyolite, Cedar Valley Chert, and Arcadia Quartzite are present in insignificant amounts. There is a slightly higher use of siltstone, Gunflint Formation, and "other" materials, and less Tongue River Silica during the Paleoindian period. Use of Knife River Flint shows slightly more in the Woodland. Tongue River Silica seems to be highest during the Late Archaic and Initial Woodland.

The near absence of Swan River Chert was unexpected. Although its misidentification as quartz or chert may be a factor in its low numbers in this collection, it is unlikely to be significant. The difference in the amount of Swan River Chert in comparison to chert and quartz is so great that even a large number of materials classification errors would not increase the amount significantly.

Six flakes of Arcadia Quartzite and several of Cedar Valley Chert were tentatively noted. These materials have not been identified in the South Pike Bay area before. Bakken (1997:19) identified the source of these material as a region of southeastern Minnesota and nearby parts of Wisconsin.

Analysis shows much greater variation of materials through time for tools compared to debitage (Table 5). A total of 94 tools were included in the study. Although this is a fair number of tools, small sample size may be a factor. Chert was heavily dominant in the Paleoindian assemblage, with siltstone and quartz also present in low quantities. No other materials are present. Archaic tools were mostly Gunflint Formation materials, Knife River Flint and chert. Siltstone, Tongue River Silica, Swan River Chert, and quartz were also present in small quantities. Woodland tools were mainly chert, quartz, and Knife River Flint, with a few of siltstone and one of Gunflint Formation material. Swan River Chert and Tongue River Silica are absent.

Differences between South Pike Bay upper terrace and Hohman-Caine and Goltz's results include higher chert in Paleoindian and Woodland periods, lower than expected siltstone during the Paleoindian, lower chert, Swan River Chert, and Tongue River Silica in the Archaic, and higher chert and lower Swan River Chert and quartz than expected for the Woodland assemblage.

The distribution of lithic material types recovered by depth indicates that stone from eastern and western sources (Bakken 1997) was utilized throughout the periods of occupation. The best indicator of this is through comparison of the distribution of materials such as Gunflint Formation and Knife Lake Siltstone that outcrop only in northeastern Minnesota and adjacent parts of Ontario, with materials such as Knife River Flint which occurs primarily as exposed lag deposits in western North Dakota, or Tongue River Silica which appears to occur primarily in tills of central and western Minnesota and the eastern Dakotas. While these material types are observed in glacial till in Minnesota, flintknappers report that the quality of materials in the till is poor and that quarry sites would provide the best source (e.g., Romano 1994).

Although eastern and western materials are present at all depths, the proportion of Knife River Flint and Tongue River Silica generally increases in comparison to Gunflint Formation and Knife Lake siltstone through time. Although this trend is not dramatic, it generally supports the observations presented in Hohman-Caine and Goltz and others. There are numerous explanations possible (including chance), but from a cultural perspective it is tempting to suggest that cultural connections of the earlier occupants of the site were stronger toward the boreal (eastern) side of the ecotone and that it shifted toward the prairie (western) side of the ecotone with time.

FEATURES

At least ten features were noted within the upper terrace excavated area. Features were defined by a grouping of items in a manner that appeared to be unusual or distinct from the majority of the excavated area, and appeared to indicate a human activity of some kind. Nine features appeared to represent lithic work areas, and generally consisted of a large concentration of debitage, cores, hammerstones, raw unworked cobbles, and in some cases, large anvil stones.

Feature 5 was distinctly different from the others. It consisted of a rock concentration that may represent a deposit of discarded heating/cooking stones, or from another unknown use. The feature contained nine unmodified cobbles of various materials and of similar size, about 5 to 7 cm (2.5 to 3 inches) in diameter. None of these cobbles showed evidence of battering, except one of chert that may be a checked piece. Lithic debitage was relatively sparse, and there was also a small soil discoloration and a small amount of thermally altered rock.

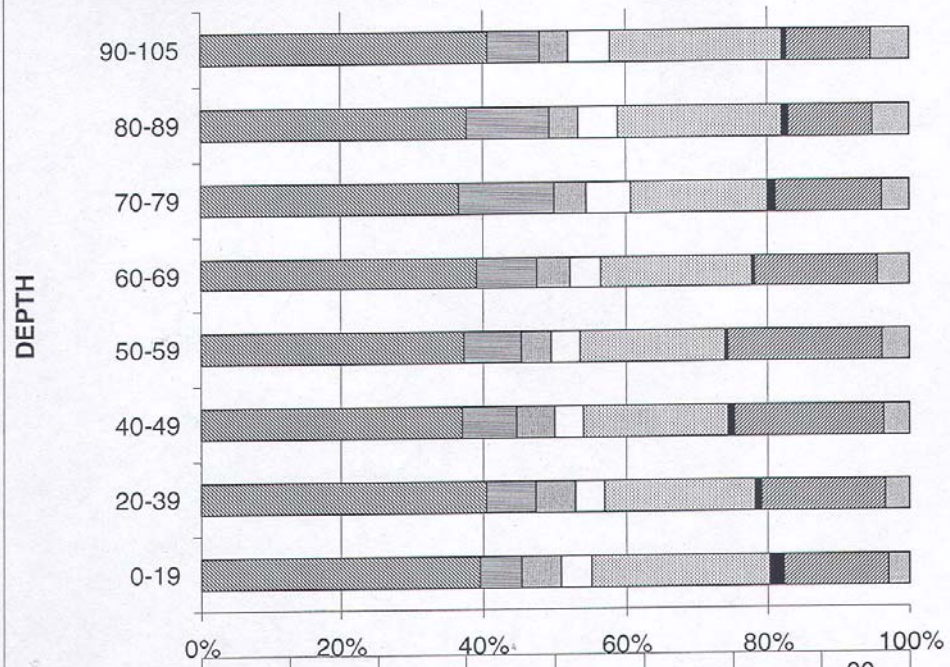
FAUNAL ANALYSIS

A total of 4,909 bone fragments were examined during the analysis (Mather 2002b). Although the faunal assemblage is highly fragmented and poorly preserved, the animal remains do provide insights relative to the cultural components of the site and archaeological formation processes. The primary animals identified are deer, bear and turtle. Other animals, including small mammals, fish, birds and mollusks are present in trace amounts. The majority of the bone fragments could not be identified. Nearly all of the preserved bone is calcined, and it can be assumed that much evidence of the fauna utilized by people at the South Pike Bay site has been lost through natural taphonomic processes.

The presence of black bear (*Ursus americanus*) is demonstrated by three bone fragments from the paw. All are from one excavation unit and it is possible that they are all from the same animal, or even the same paw. The calcined bear paw fragments are of particular interest in that they hint at cultural practices beyond subsistence alone. Bear remains are often under-represented on archaeological sites due to ceremonial traditions regarding bears shared by many cultures (including the Dakota and Ojibwe) of the circumpolar north. Bears play a primary role in the subsistence economy of these peoples, but they and their remains are treated in a reverent manner. Ceremonial treatment of the bear is generally associated with the inter-related processes of the hunt, feast, and disposition of the physical remains, often with a particular emphasis on the head and paws (Hallowell 1926; Shepard and Sanders 1985). Archaeological evidence of intentionally burned bear paws, presumably ritual in nature, has been documented at several sites in Minnesota (Mather 2002a). The calcined fragments described here may fit with this pattern, although the context in this case is not definitive.

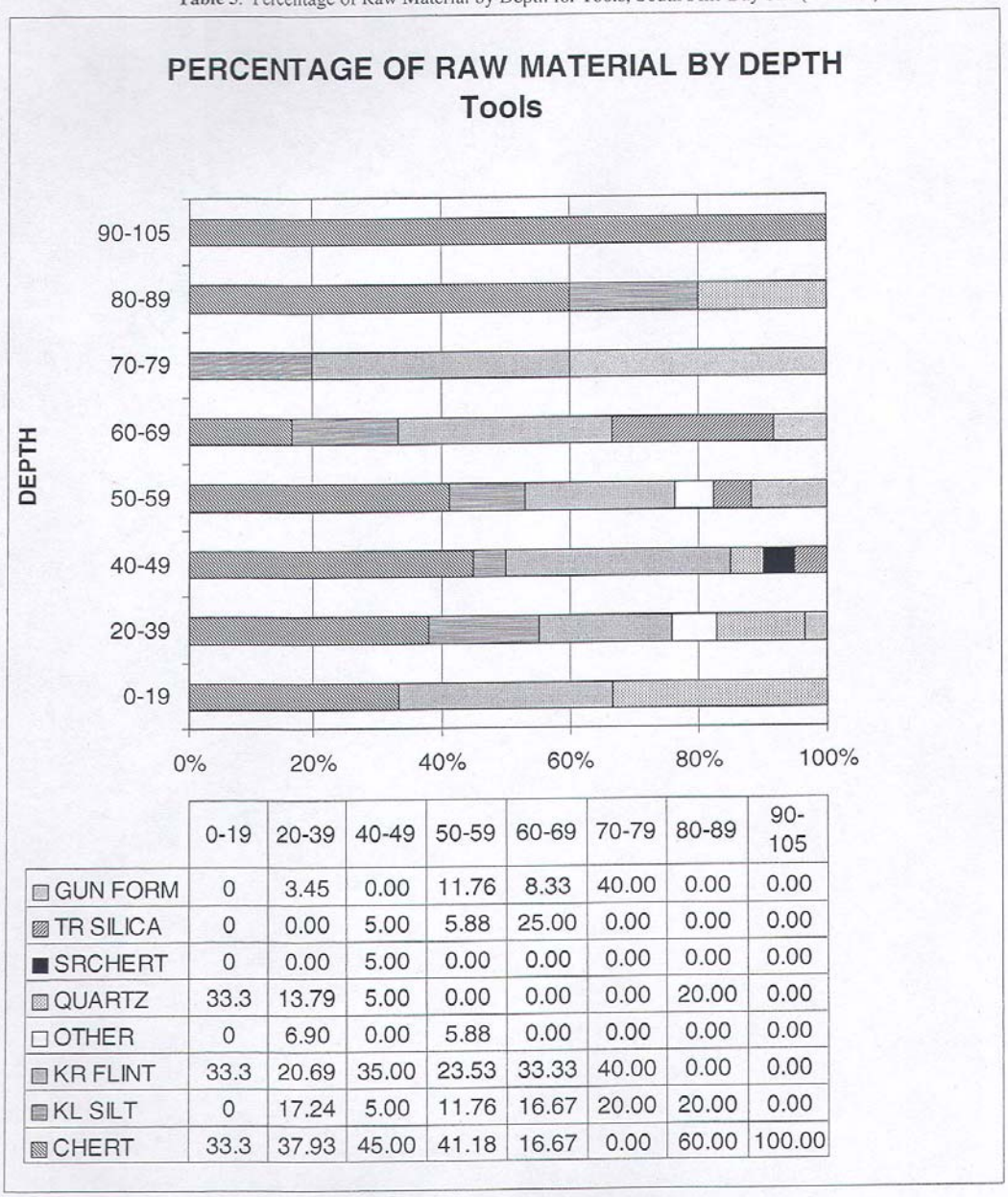
One small bone fragment (the "mystery bone" Figure 5) appears as though it should be taxonomically diagnostic, although it could not be identified. This bone fragment is interesting as a result of its unusual yet distinctive appearance, and its provenience. It has a hard, white exterior characterized by tightly spaced parallel ridges. The interior of the bone, exposed by its fragmented state, appears to be solid bone such as might be expected in the root of a tooth or possibly the interior of an antler. Despite its distinctive morphology, the fragment could not be matched with any of

Table 4. Percentage of Raw Material by Depth for Debitage, South Pike Bay Site (21CA38).



	0-19	20-39	40-49	50-59	60-69	70-79	80-89	90-105
GUN FORM	2.85	3.44	3.49	3.71	4.4	3.88	5.08	5.28
TR SILICA	14.84	17.42	21.21	21.93	17.4	14.94	11.86	11.92
SRCHERT	1.94	0.93	0.97	0.47	0.44	1.15	1.1	0.68
QUARTZ	25.12	21.3	20.37	20.23	21.17	19.2	22.93	24.25
OTHER	4.45	3.97	3.98	4.1	4.43	6.34	5.58	5.83
KR FLINT	5.59	5.58	5.29	4.27	4.62	4.56	4.09	4.07
KL SILT	5.82	6.93	7.67	8.08	8.48	13.45	11.76	7.45
CHERT	39.38	40.42	37.02	37.21	39.07	36.48	37.59	40.51

Table 5. Percentage of Raw Material by Depth for Tools, South Pike Bay Site (21CA38).



	0-19	20-39	40-49	50-59	60-69	70-79	80-89	90-105
GUN FORM	0	3.45	0.00	11.76	8.33	40.00	0.00	0.00
TR SILICA	0	0.00	5.00	5.88	25.00	0.00	0.00	0.00
SRCHERT	0	0.00	5.00	0.00	0.00	0.00	0.00	0.00
QUARTZ	33.3	13.79	5.00	0.00	0.00	0.00	20.00	0.00
OTHER	0	6.90	0.00	5.88	0.00	0.00	0.00	0.00
KR FLINT	33.3	20.69	35.00	23.53	33.33	40.00	0.00	0.00
KL SILT	0	17.24	5.00	11.76	16.67	20.00	20.00	0.00
CHERT	33.3	37.93	45.00	41.18	16.67	0.00	60.00	100.00

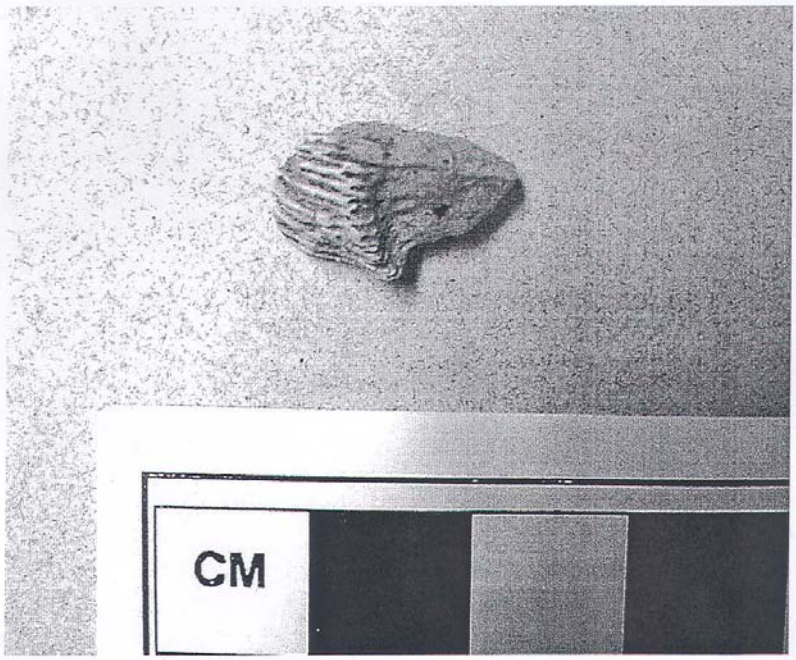


Figure 5. Mystery bone, South Pike Bay site (21CA38).

the "usual suspects" of the Minnesota fauna. The provenience of the fragment indicates possible association with a Paleoindian component. Assistance in identifying this specimen is welcome.

CONCLUSIONS

An issue identified for South Pike Bay is the determination of cultural affiliation and the applicability of the Lake Forest, Shield, Eastern or Prairie Archaic contexts. These contexts have been only tentatively defined for Minnesota (Dobbs 1989). Some researchers have noted that there seems to be no visible transition between Late Paleoindian and Archaic other than use of a different hafting technique as reflected in projectile point bases.

The Archaic component of the upper terrace at South Pike Bay appears to most closely match the Prairie Archaic context. The remains are located within what was a prairie ecotone from about 8500 to 7400 years ago, when the terrace was inhabited. Although bison was not found, the tool assemblage appears to generally match the context description. Also, projectile points and some other aspects of the assemblage are similar to 21CE1, the Itasca Bison Kill site (Shay 1971), a Prairie Archaic site of roughly contemporary age (ca. 8000-7000 B.P.) in north-central Minnesota.

Overall, distribution of debitage materials throughout the time periods represented on the upper terrace shows little variation. Differences between South Pike Bay upper terrace and Hohman-Caine and Goltz's results include higher chert in Paleoindian and Woodland periods, lower than expected siltstone during the Paleoindian, lower chert, Swan River Chert, and Tongue River Silica in the Archaic, and higher chert and lower Swan River Chert and quartz than expected for the Woodland assemblage.

Discrepancies between South Pike Bay upper terrace and Hohman-Caine and Goltz's results may result from several factors. (1) There may be some stratigraphic mixing at South Pike Bay. However, it is unlikely that the entire stratigraphic column to a depth of over one meter on all of the terrace is disturbed. Radiocarbon dates seem to suggest very rapid soil deposition with some stratigraphic mixing *within the Archaic component.* This should not significantly affect the materials sample for the Archaic period. Mixing between the Archaic and Paleoindian or Archaic and Woodland may bias the data, but such mixing is not indicated from this sample. (2) A more likely source of influence on the data is the nature of the prehistoric human activities at the site. South Pike Bay upper terrace seems to have been heavily used for the production of stone tools, as evidenced by the features or activity areas that were identified. Little evidence of domestic activities was recovered. Tool production may bias the sampletoward more debitage of fewer materials versus tool

maintenance, which may tend to show smaller amounts of more varied materials. Hohman-Caine and Goltz analyzed 15 prehistoric sites, some of which undoubtedly had major functions other than tool production. (3) There may have been more convenient access to materials sources of certain types and these convenient materials have biased the sample. (4) The South Pike Bay occupation represents only about 1000 years of the early Archaic period and may reflect a different pattern of materials use than during the more recent Archaic. (5) The South Pike Bay sample size is much larger than those used by Hohman-Caine and Goltz in their analysis.

Although this attempt to describe lithic profiles for different time periods has perhaps raised more questions than it has answered, we hope it can serve as a point of comparison for further inquiries of this nature.

Archaeologists have noted that in some settings within north-central Minnesota, sites or the distribution of cultural components within sites show a patterned variation with the earlier components located on features elevated above and at greater horizontal distances from today's active shorelines, while the more recent components are located at lower elevations closer to water. South Pike Bay has so far supported the model of changing water elevations having affected placement of water-oriented settlement in local topographic settings. There appear to be at least three beach shorelines on the lower terrace: the current shoreline and two that are abandoned. Radiometric dates were not obtained on the lower terrace sediments. However, using artifact comparisons, all of the material on the lower terrace appears to date from Initial Woodland to recent, including Laurel, Brainerd, Blackduck, and Sandy Lake ceramics, with no identifiable earlier materials. Radiocarbon dating was obtained for the upper terrace sediments and indicates that its earliest occupation was from about 7400 to 8500 years ago. In general, these data suggest that the late Paleoindian and early Archaic occupations are situated on the upper wave-cut terrace, which probably formed during very high postglacial water levels. Rapid, probably windblown, sediment deposition occurred on the terrace and is consistent with dry, prairie-like conditions. The lower beach terraces formed after a reduction in water levels, and were occupied by Initial Woodland and later peoples.

The South Pike Bay site was found to be eligible for listing on the National Register of Historic Places. With dedicated stewardship, it will continue to provide insights into the past for future generations.

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