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The Ontario Archaeological Society
P.O. Box 62066
Victoria Terrace Post Office
Toronto, Ontario, Canada M4A 2W1
Telephone: 416-406-5959
Email: oasociety@ontarioarchaeology.on.ca
Website: www.ontarioarchaeology.on.ca

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Information for Authors

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Christopher J. Ellis, Editor
Ontario Archaeology
Department of Anthropology,
Social Science Centre
The University of Western Ontario
1151 Richmond Street North,
London, Ontario, Canada N6A 5C2
oaeditor@ontarioarchaeology.on.ca

Editorial

With this issue I have officially become the Editor of *Ontario Archaeology* (*OA*). I am honored to have been entrusted with the editorship of our flagship publication and of course, will do the best job I can fulfilling the trust that the OAS has placed with me. This particular issue is not all of my making but includes a combination of articles submitted and ushered through the review process by former editor Dr. Andrew Stewart and myself. We need to acknowledge the great job Andrew did as editor of our journal and he has been of immense help in my transitioning to this new position. I am very pleased to note that he has agreed to stay on as book review editor and as editor for the short contributions series on individuals who have made substantial contributions to our Ontario archaeological knowledge called "Profiles"—a series Andrew initiated. In addition, several of the members of the editorial board and editorial advisory established under Andrew's tenure have agreed to stay on including Mathew Boyd, Alicia Hawkins, Susan Jamieson, Suzanne Needs, Shari Prowse and Ronald Williamson. Suzanne also assisted in copy editing certain submissions in this issue. I also would like to acknowledge David Robertson who has tirelessly spent many volunteer hours over the last decade or more getting *OA* into a camera-ready format for submission to the printers including this issue. I am extremely grateful that he agreed to carry out this task one last time for this particular issue.

It is not an easy task to edit a journal such as *OA* and I admit there are some parts of the job I look forward to with some reservations. Most notably, on many previous occasions in my editorial role with the newsletter of the London OAS Chapter (*Kewa*) I have lamented the fact that despite the increasing pace of archaeological fieldwork in Ontario, notably in CRM, getting people to submit articles for potential publication can be like pulling teeth. Many CRM practitioners lament a lack of time to work material up for publication and based on my interaction with many of them I actually see a widespread crisis of confidence—at least some practitioners seem to believe they do not find much of academic interest and that they are second-class archaeological citizens. We need to change this erroneous perception. There are simply some astounding finds being made in the CRM field and we need to get these on record. On the academic side, archaeologists in that milieu seem to be more and more under pressure to publish in "prestigious international journals" rather than more regional and local journals such as *OA*. I am certainly in favour of bringing Ontario archaeological work to a broader international audience. However, I also think it is an academic's duty to also bring that work to a more local audience including both the professional and non-professional membership of the OAS. A more balanced approach, which I have tried to follow in my own work, is needed and let's face it, not every site or find is of international significance. At the same time, as I see it, it is an academic archaeologist's ethical responsibility to write up and publish every site they work on, not just the spectacular ones or the ones a researcher can make of widespread theoretical and methodological interest, and *OA* is an ideal outlet for such work–promotion and tenure committees have to be made aware of that fact.

In any case, *OA* also has been well behind in its publication schedule in the recent past due to a dearth of submitted papers although thanks to some herculean efforts by Dr. Stewart, and the development of theme issues put together by guest editors, we are very close to being back on time. I am actually optimistic that we will be able to keep to schedule or close to it and for two reasons. First, a number of individuals already have begun editing and putting together special theme issues based on past conference symposia so we will not have to depend simply on individual submissions. Second, and without dwelling on details, and despite what I said above, I really believe I can see signs that CRM archaeology in Ontario is evolving *as a whole* into a more mature, professional discipline. I believe with that professionalism will come a real, more widespread and consistent effort to publish CRM archaeological research in *OA* and other academic or scholarly outlets. Regardless of my optimism, I urge the reader to consider submitting original research articles for possible publication in *OA*—the more the merrier.

Christopher Ellis

The Mortuary Features of the Tillsonburg Village Site

Michael W. Spence

Excavation of the late fourteenth century Tillsonburg Village site (AfHe-38) produced 14 features containing human bones. These included not only primary and secondary burials but also a primary burial feature from which most of the skeleton had been exhumed. A fourth mortuary feature category, the sorted deposit, was represented by five of the features. These held skeletal elements that had apparently been discarded during the process of sorting the skeletons from exhumed primary burials to prepare them for the subsequent secondary burial. This mortuary feature type is probably more widespread in Ontario Iroquoian settlements than has been recognized, and can provide important information on the social context of mortuary practices. In the case of Tillsonburg Village the nature and location of these sorted deposits suggest that the exhumation and sorting of subadult primary burials was done by the longhouse social unit while the processing of adults commanded a wider audience.

Introduction

This paper provides new information from the fourteenth century, Middle Ontario Iroquoian Tillsonburg village (AfHe-38) concerning Iroquoian mortuary practices and their variability. In particular, the site provides evidence for a mortuary feature type, the sorted deposit, that has not been widely recognized on Iroquoian sites.

Middle Ontario Iroquoian Mortuary Practices

The Middle Ontario Iroquoian stage in fourteenth century southern Ontario has been characterized as a time of population expansion, growing reliance on maize horticulture, and increasing village size and stability (Wright 1966; Dodd et al. 1990; Ferris and Spence 1995). Many of the larger villages were probably a result of the amalgamation of previously distinct communities, and village plans suggest the development of more extensive and formally organized social groups. There may also have been higher levels of communication and interaction across the region, reflected in a somewhat more homogeneous material culture.

Burials suggest a continuation of the basic mortuary practices of the preceding Early Ontario Iroquoian stage (Williamson 1990; Spence 1994; Williamson and Steiss 2003). At or shortly after death a person would receive a "primary burial," although this could mean actual burial in the ground, exposure on a platform, or some other form. At a later point in time, which varied considerably, most of these burials were evidently exhumed for a more final and usually collective "secondary burial." The exhumation would sometimes be incomplete, as body segments had decomposed and fallen apart over time in the primary burial and were then overlooked in the exhumation. The degree to which this occurred would reflect the amount of time that had elapsed since death and the characteristics of the primary burial environment. In platform burials decomposition would be particularly rapid.

Furthermore, it seems that the individuals being transferred to secondary burials often went through a selection process. Their bones were apparently sorted and the larger elements or those believed to be most important, perhaps incorporating some essential part of the deceased's spirit, were retained for the secondary burial. These usually included the cranium, mandible, and long bones of the arms and legs. Other elements might also be retained, particularly if decomposition was not advanced and they still adhered to the larger elements. Smaller and more peripheral elements, like the bones of the hands and feet, were more likely to be discarded during this sorting process. These elements might be left behind (overlooked or simply ignored) in the primary burial, or they might be deposited in another pit. This latter kind of feature will be referred to here as a "sorted deposit." Its nature and location are important, since the feature can offer a clue to the segment of the community that participated in this aspect of the mortuary proceedings. An excellent example of this is David Robertson's (2004) analysis of the Middle Ontario Iroquoian Hutchinson site, where several of the features are sorted deposits. Each contained a mix of disarticulated adult and subadult remains, consisting primarily of the smaller and more peripheral parts of the skeleton. Robertson (2004:114-115) notes that the small number of individuals represented in the site suggests that only a part of the parent community, perhaps a kin group, was processed there.

There are, then, four types of feature that may include some human skeletal elements: the primary burial, the exhumed primary burial, the secondary burial, and the sorted deposit. However, these features still encompass a great deal of variety. The exhumation of primary burials and their transfer to a secondary burial, for example, may occur annually or only once every decade or so, perhaps when the community moves to a new location or some other important event occurs. These latter features, ossuaries, were apparently already part of the mortuary programme of some Early Ontario Iroquoian societies (e.g. Johnston 1968, 1979; Mullen and Hoppa 1992). Also, a secondary burial feature might include all of the village dead from the previous year, or decade, or it might include only those from a particular segment of the community like a lineage. These, and numerous other dimensions of variability, are not easily identified in archaeological remains. Further complicating matters is the likelihood that, as in the Early Ontario Iroquoian stage (Spence 1994), burial practices were not uniform across southern Ontario. The considerations governing the inclusion of elements in the secondary burial, for example, probably varied from place to place, as did the timing of the reburial event.

It is likely that sorted deposits have frequently escaped archaeological attention because of their modest presentation. They can also be difficult to distinguish from other features. Both exhumed primary burial pits and sorted deposits are likely to include only the lesser bones of the body, those that were overlooked or discarded. Perhaps some of the elements in an exhumed primary burial feature would still be in their original positions, having become separated from the rest of the body by decomposition and so not displaced during the exhumation. Both features may (but need not) contain some elements that are still articulated with one another. One way to distinguish the two is by their dimensions. An exhumed primary burial pit must be large enough to have held a complete corpse, while a sorted deposit may be considerably smaller. The discarded bones may be placed in a pit prepared especially for the occasion, and so probably quite small, or they may simply be discarded in a nearby conveniently open garbage or storage pit. In the latter case they might be confused with the casual disposal of body parts of an executed captive, although a close analysis of the skeletal elements and their treatment may resolve the question. Needless to say, the identification of sorted deposits and their distinction from other features with human bone will require careful excavation and equally careful examination of all bone in a site.

The Tillsonburg Village Site

The Tillsonburg Village site (AfHe-38), on the outskirts of the modern town of Tillsonburg (Figure 1), is an extensive village of the late fourteenth century, the latter part of the Middle Ontario Iroquoian stage (the Middleport substage). Archaeologix Inc. (now Golder Associates), under the general direction of Jim Wilson, conducted excavations on the western part of the site in 2000-2001 (Figure 2), and returned in 2008 to excavate the eastern part (Figure 3; Golder Associates 2009). Arthur Figura was the principal field investigator.

The total excavated part of the village covers about 13 hectares, with a minimum of ten widely spaced longhouses (Golder Associates 2009:133).

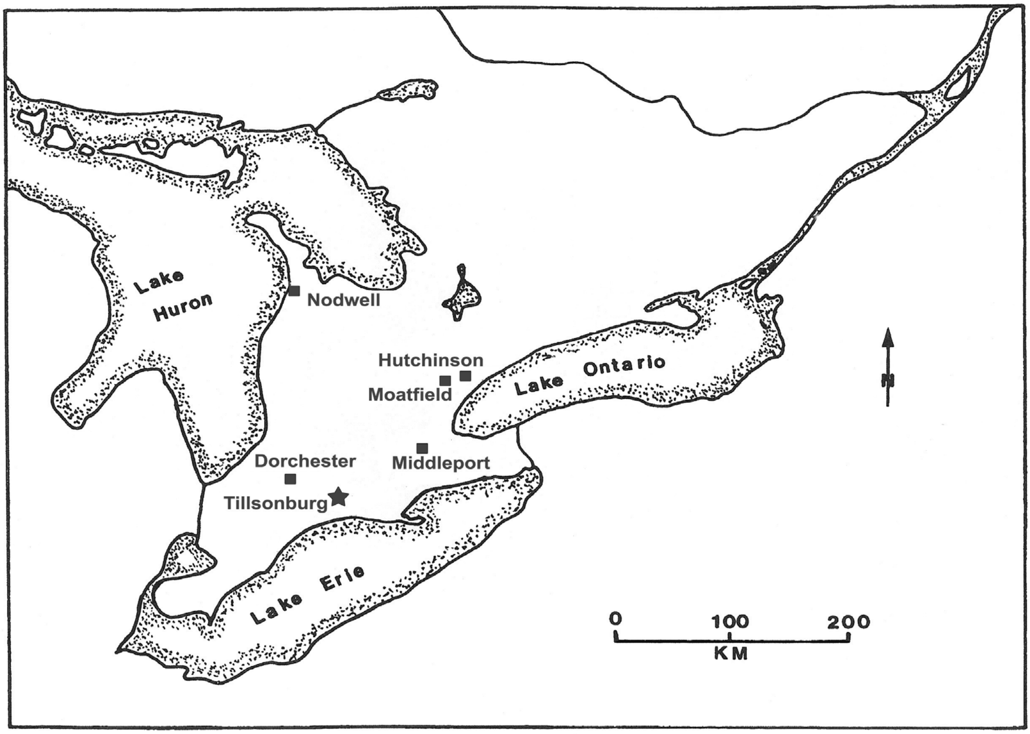

Figure 1. *Middle Ontario Iroquoian sites of southern Ontario discussed in text.*

There was no palisade. No overlapping structures were present, although longhouse 1 in the western sector expanded considerably during its period of use (Timmins 2009:65, Figure 3.6). Ceramic data suggest that the houses throughout the site were occupied contemporaneously, not sequentially (Timmins 2009:61; Golder Associates 2009:132). Immediately beside longhouse 15 in the eastern sector was what appears to have been a very insubstantial longhouse, with two long parallel walls but very few internal features and no detectable ends (Figures 3-4). Golder Associates (2009:29) suggest that it could have been a longhouse that was started but not completed. Alternatively, it might have been temporary housing for the first people to occupy the site, sheltering them while they cleared fields and started building more substantial structures.

Five features with human bones were located and removed in the 2000-2001 work (B1-5; Figure 2). They have been reported by Ginter (2001), who did most of the burial excavation and all of the analysis. In the 2008 work nine more features, containing 13 individuals, were recovered. I was responsible for the excavation and analysis of those features (Spence 2008). The following report will deal primarily with the 2008 series, but will start with a brief summary of Ginter's (2001) data on the 2000-2001 series.

The 2000-2001 Mortuary Features

Five burials, with five individuals, were recovered in the 2000-2001 excavation (Table 1; Figure 2). Following is a brief description of each. For further data, see Ginter (2001). Although some of the Tillsonburg Village features are sorted deposits rather than actual burials, that term will be used here to maintain consistency with prior notes and reports.

Burial 1

B1 was the primary burial of an infant, flexed on its right side. It was in longhouse 5, near its southwest end. The lengths of the humerus and femur indicate that B1 is a newborn who died at or very shortly after death (Table 2).

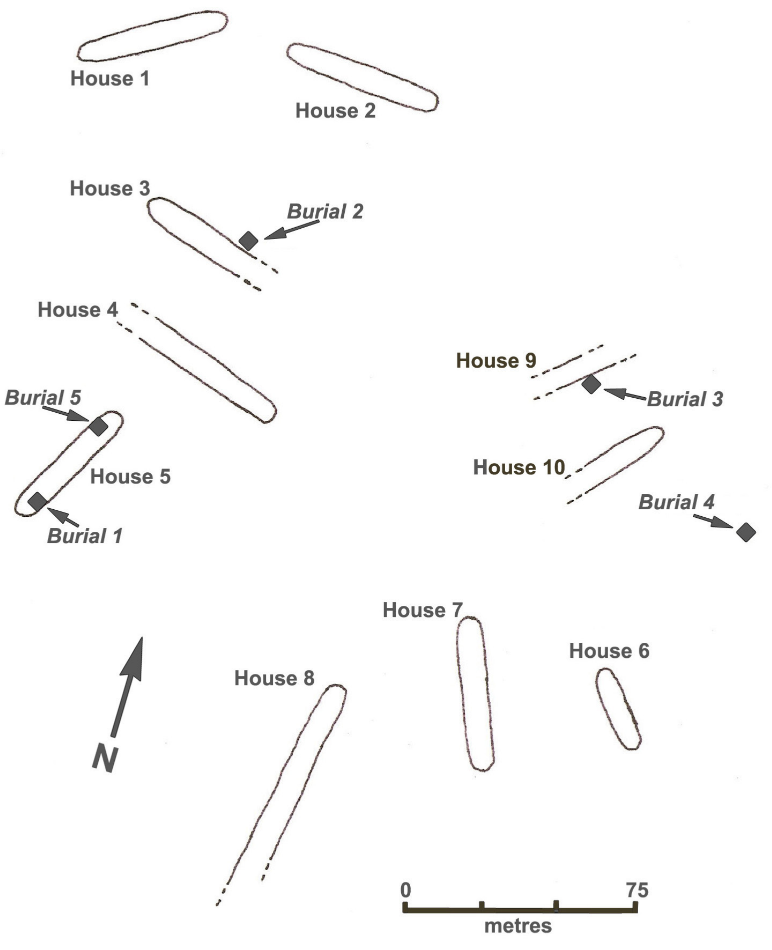

Figure 2. *Mortuary features of Tillsonburg Village, west sector.*

Burial 2

B2 was an exterior burial, very near longhouse 3. The bones are of an adult, but are very fragmented and poorly preserved. Disturbance of the feature by an excavation to plant a post, probably in the Historic period, makes interpretation difficult. The bones as found were not articulated or otherwise organized, but do include both large and small cranial and postcranial elements. B2, then, cannot with confidence be placed in a mortuary feature category.

Burial 3

B3 was a small exterior pit, 30 by 25 cm, very near longhouse 9. It held a number of adult bones, primarily ribs and vertebrae, with only a few vertebrae still in articulation. The feature was probably a sorted deposit rather than an actual burial.

Burial 4

Although extensively disturbed in the initial levelling of the area, enough was recovered of B4 to show that it had probably been the primary burial of a child of about 8-12 years. The actual burial feature was not located, but the distribution of the displaced remains indicates that it was probably an exterior burial rather than in a longhouse.

Burial 5

B5 was in feature 63, a semi-subterranean sweat lodge in longhouse 5. The feature was at the opposite end of the longhouse from B1. B5 had been disturbed. The recovered bones include parts of the cranium, the mandible, a clavicle, and some vertebrae and ribs. Various indicators

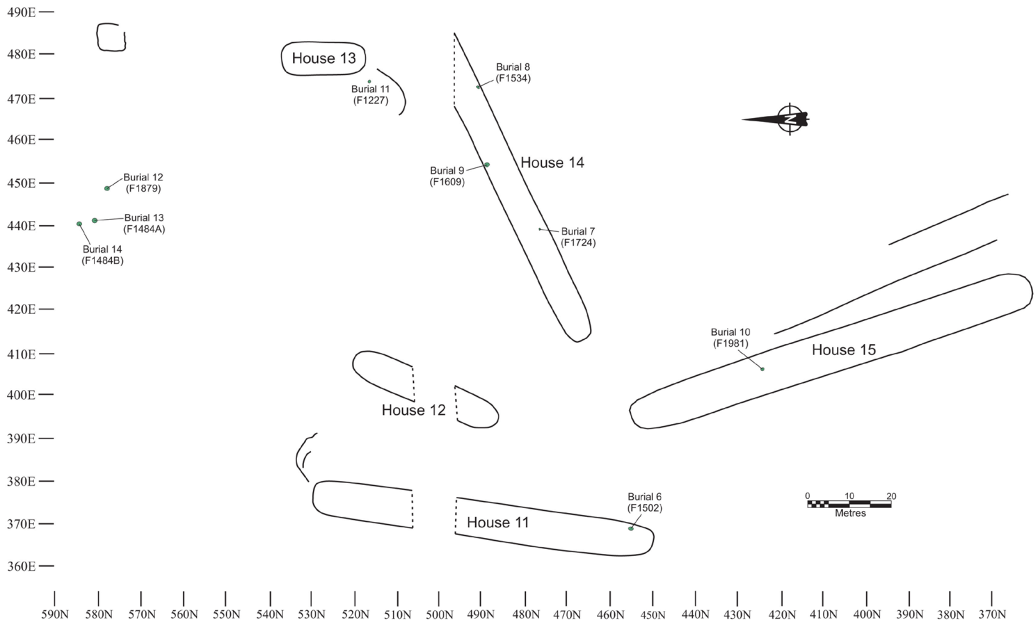

Figure 3. *Mortuary features of Tillsonburg Village, east sector.*

Table 1. *Tillsonburg Village features with human bone.*

Burial	Feature	Dimensions (cm)	Age	Location	Category
1	197	15 x 14	newborn	longhouse 5	primary
2	—	38 x 38	adult	exterior	uncertain
3	—	30 x 25	adult	exterior	sorted deposit
4	—	—	8-12 years	exterior?	primary
5	63	160 x 107	6-12 months	longhouse 5	uncertain
6	1502	130 x 90	13-15 years	longhouse 11	primary
7	1724	75 x 40	2-3 years	longhouse 14	primary
8	1534	90 x 50	4-6 years	longhouse 14	primary
9	1609	140 x 120	adult	longhouse 14	exhumed primary
10	1981	59 x 45	13-16 years	longhouse 15	sorted deposit
11	1227	80 x 70	adults (2)	exterior	secondary
12	1879	40 x 35	adult	exterior	sorted deposit
13	1484A	40 x 35	adult	exterior	sorted deposit
14	1484B	60 x 45	adults (3)	exterior	sorted deposit

suggest an age of 5-18 months, most likely in the 6-12 month part of that span. Unfortunately, the disturbance makes it very difficult to say whether B5 was a primary or secondary burial.

The 2008 Mortuary Features

In the 2008 season I was able to examine all but one (B9) of the features containing human remains before they were fully excavated (Figure 3). That initial examination was done only of their surface exposures, since we did not want to disturb them any more than was necessary to verify that they were indeed human burials or at least contained human skeletal material. Later, with the permission of Six Nations, I conducted the full excavation of the features so that they could be moved to a reburial cemetery where they would be safe from future disturbance. In the course of that work I was able to make some additional observations, which corroborated and expanded upon those made in the initial examination. Unfortunately,

Table 2. *Subadult longbone lengths (mm).*

Element	B1*	B4*	B7	B8
humerus	62L, 62.5R	—	142R	—
ulna	58L, 59R	—	123R	—
radius	52L, 52R	—	112L	—
femur	70L, 70R	310L	193L	216L
tibia	63L, 63R	266L	160R	—
fibula	58L, 60R	250L	153R	—

* from Ginter (2001); L = left; R = right

the situation did not permit a careful examination for cutmarks on the bones, with the exception of some of the Burial 11 long bones (see below).

The age-at-death of some adults was difficult to determine because crucial elements were either missing or poorly preserved. The subadults, on the other hand, could be aged with reasonable accuracy. Dental development is preferable to skeletal development for subadult age determination because, less impacted by environmental factors, it usually is less variable in its timing and more broadly applicable (Ubelaker 1978:46). However, there are also reliable methods based on the size and development of skeletal elements, some of which have been used here (Merchant and Ubelaker 1977; Saunders and Spence 1986; Scheuer and Black 2000).

Burial 6

B6 was in feature 1502, located in the storage space at the south end of longhouse 11, about one meter from the east wall (Figure 4). It was the primary burial of an adolescent, flexed on the right side, head to the north and facing west. The arms were flexed in front of the body, placing the hands in front of the face. The legs were tightly flexed, the knees in front of the chest.

The permanent teeth have all erupted except for the third molars, which have not breached the alveolus. Ubelaker (1978:Figure 62) assigns an age of about 15 years to this general stage of development and eruption. The lower third molars are at the "root ½" stage, reached at about 15-16 years of age (Scheuer and Black 2000:Table 5.26).

The ilium and ischium have joined but the pubis remains separate. Several epiphyses are still unfused: the head and medial epicondyle of the humerus; the proximal and distal radius, tibia and femur; the proximal fibula; and the metacarpal heads. However, the distal epiphysis of the humerus and the proximal epiphysis of the ulna have joined. In general, this level of skeletal development indicates an age of 12-16 years at the outside, and more probably about 13-15 years (Scheuer and Black 2000).

Unfortunately, skeletal development had not reached the point where a reliable assessment of sex would be possible.

The cause of death for B6 is unknown. Although deaths in this age category are uncommon (Merrett 2003:177-178), no evidence of perimortem trauma or a severe pathological condition is visible in the skeleton. However, three hypoplasia lines on the lower canines indicate three successive episodes of health stress in childhood, the two latest lines marked enough to suggest episodes of some severity. It is possible that the poor health suffered by B6 early in life had some lasting health impact, increasing B6's vulnerability to later infections.

There are no caries, abscesses or other forms of dental pathology.

Burial 7

This burial was a primary one in feature 1724 of longhouse 14. It was located less than half a metre from the entrance to a large sweat lodge under the south wall of the house (Figure 5). A subadult burial in a very similar context was found at the Myers Road site (Ramsden et al. 1998:78, Figure 2.2). B7 was a child, flexed on the left side with the head to the east and facing south. The position was much like that of B6, with the knees pulled up in front of the chest and the hands resting in front of the face.

All of the deciduous teeth have erupted but the permanent first molars have not yet breached the alveolus. Ubelaker's chart (1978: Figure 62) would place B7 at about 3-5 years of age. However, the long bone dimensions suggest a slightly younger age, about 2.5-3.5 years (Table 2; Merchant and Ubelaker 1977; Scheuer and Black 2000). The long bone dimensions of B7 are virtually identical to those of Burial 6 of the Keffer site, a child ages 27.1 months by the

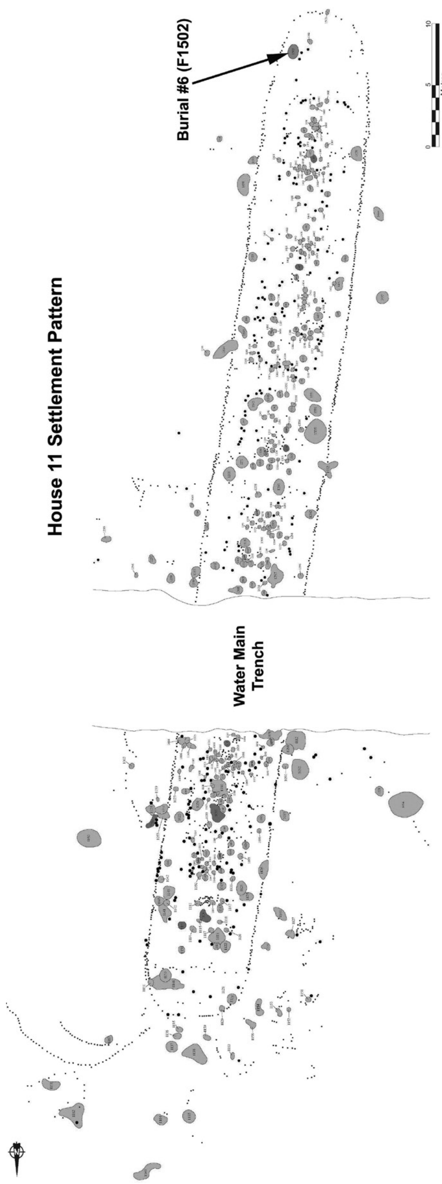

Figure 4. *Longhouse 11.*

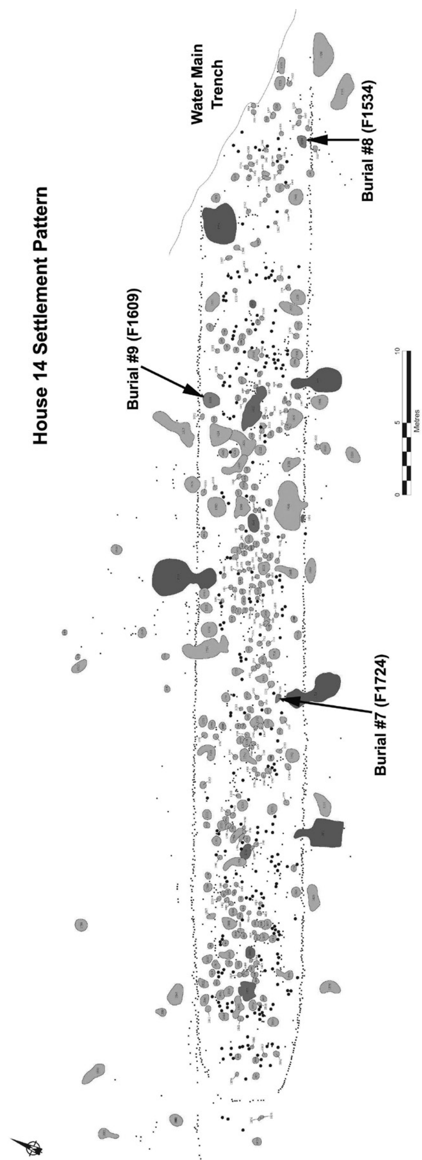

Figure 5. *Longhouse 14.*

Moorrees et al. (1963) standards (Saunders and Spence 1986: Tables 3-4). Given the fact that the Ontario Iroquoian sample reported by Saunders and Spence (1986) would have been more closely related to the Tillsonburg Village people than the Arikara and European series used as bases for the other studies, an age of 2-3 years seems most likely.

The enamel of the anterior teeth and some of the molars is soft and white, chalky in appearance. This appearance seems to be an effect of the burial environment. However, B7 did have some serious dental problems. There are large antemortem chips off the mesial corners of both maxillary medial incisors. The maxillary first molars had been lost antemortem, with abscesses at both sites. Both maxillary canines have caries, on the distal surface of the right canine and the lingual surface of the left canine. On the mandible there are large caries on the occlusal surfaces of the left first and second molars, but no abscesses are present.

Burial 8

B8 was located in feature 1534, by the south wall in the eastern part of longhouse 14 (Figure 5). Although the east end of the house was cut off by a modern trench, the distribution of features in the immediate vicinity of the burial suggests that it was in the house proper rather than in a storage cubicle at its end. B8 was the primary burial of a child flexed on the left side, head to the northeast and facing south. The left arm was straight, diverging slightly from the body axis to place the hand in front of the pelvic area. The position of the right arm is not known because its elements were displaced during the initial testing of the feature. The legs were flexed, the upper legs extending almost straight out from the body but the lower legs doubled tightly back beside them.

All of the deciduous teeth and the permanent first molars have fully erupted, a stage that Ubelaker (1978:Figure 62) would place at about seven years. However, in terms of dental development the permanent first molars are at the root ½ (mandibular) and root ¼ (maxillary) stages, to which Trodden (1982:Table XIII) assigns ages of 5.51 ± 0.67 years (score 8) and 4.83 ± 0.69 years (score 7) respectively. The length of the femur, the only measurable long bone, suggests an age of about 3.5-4.5 years (Merchant and Ubelaker 1977; Scheuer and Black 2000:Table 11.6). All things considered, an age in the 4-6 year span is most likely.

There are no dental abscesses, but caries are present on three of the deciduous teeth. A large caries occurs on the occlusal surface of the lower right second molar, a smaller occlusal one on the lower right first molar, and one of moderate size on the distal surface of the upper left first molar.

Burial 9

B9 (feature 1609), by the north wall and about 20 metres east of B7 in the central part of longhouse 14 (Figure 5), was fully excavated before my work on the site started. The few human bones in the pit were scattered and disarticulated, so there was no clear indication to the excavation crew that it was in fact a burial feature. The elements in the pit were six fragmented ribs from both left and right sides, a thoracic vertebra, the right patella, the left clavicle, a fragment of the proximal end of the left fibula, one proximal and one middle hand phalanges, left metacarpal II, the left third cuneiform, and three maxillary teeth: a canine and two premolars (none with caries).

The heavy wear on the premolars indicates that B9 was a middle-old age adult. Given the recovered elements and their scattered distribution in the feature, it is likely that B9 represents the material overlooked or discarded during exhumation. The size of the pit, 140 by 120 cm, suggests that it may have been the original primary burial pit rather than a specially prepared sorted deposit.

Burial 10

B10 was in feature 1981, located slightly off the midline in the middle portion of longhouse 15 (Figure 6). The skeletal elements in the pit were few and had no articulations: one left and one right ribs, part of a cervical vertebra, a left scaphoid, a left talus, a right second cuneiform, left metatarsals III and IV, a small tarsal too poorly preserved for identification, and a permanent mandibular right second molar.

The bones are of adult size. However, the heads of the metatarsals have not fused, an event that usually occurs between 11 and 13 years in females and between 14 and 16 years in males (Scheuer and Black 2000:466). The second molar has fully developed but has no distal contact facet, indicating that the third molar had not fully erupted or had erupted only recently. This evidence would suggest an age between 13 and 16 (Scheuer and Black 2000:Table 5.26; Trodden 1982:Table XIII; Ubelaker 1978:Figure 62). B10, then, is probably between 13 and 16 years old.

B10 was evidently not a primary or secondary burial, but probably the remnants discarded during the processing of an exhumation for secondary burial. Feature 1981, 59 by 45 cm, was too small to have held the body of a person of B10's age, so it must have been a sorted deposit.

Burial 11

B11 was in feature 1227, located outside but very near longhouse 13, inside an arc of postholes extending from near the house's south entrance (Figure 3). The pit held a complex deposit of skeletal elements from two adults (Table 3). It had been impacted by ploughing and the initial levelling of the site. A number of long bone fragments were scattered across the top of the deposit, showing that the intrusion had damaged and displaced some of the feature contents. Nevertheless, enough elements remained in place to determine the nature and structure of the deposit.

Only long bones and crania were present (Table 3). There were no traces of mandible, torso elements, hands or feet. The damage to the feature could not have been responsible for their complete absence. The duplication of most elements indicates that two individuals were

Table 3. *Skeletal elements from Burial 11.*

Element	Number and Side
cranium	2
humerus	2L, 2R
ulna	1L, 2R
radius	2L, 2R
femur	2L, 2R
tibia	1L, 1R
fibula	2L, 2R

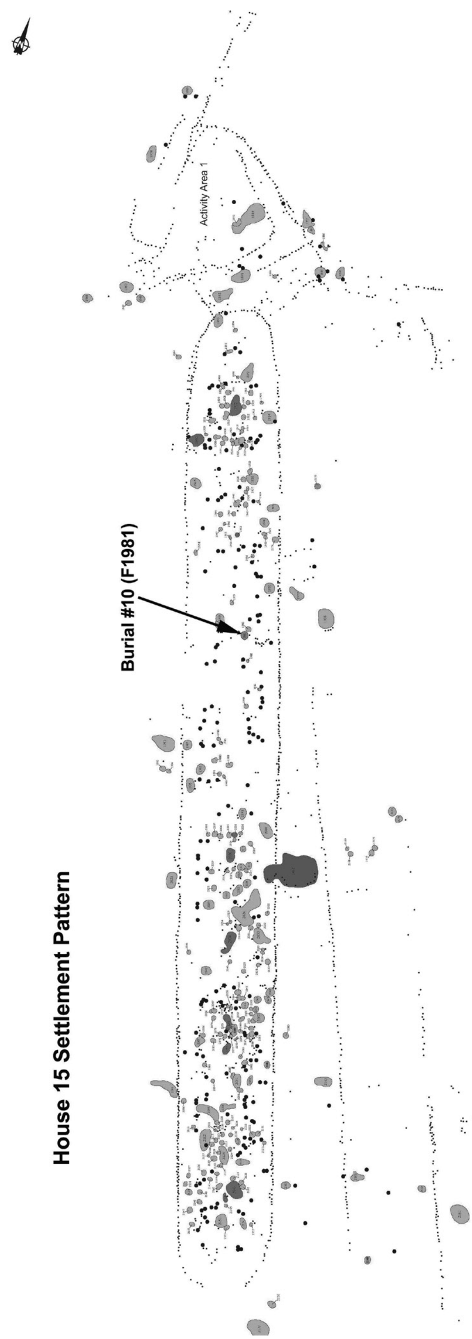

Figure 6. *Longhouse 15.*

present. Even the tibiae, represented by only one element from each side, were from two people; the two elements differed in size. There was not a single instance of articulation in the pit.

The deposit had a clear organization. One set of long bones rested in a north-south orientation along the west side of the pit. A second set had been deposited in a northeast-southwest orientation, their southwestern extremities intersecting the central and southern portions of the north-south set. The earlier damage to the feature left it unclear which of the two sets had been placed there first, but at least some elements of the northeast-southwest set were beneath, and so must have preceded, some of those in the north-south set. The two crania, both badly damaged, were together in the south-central and southeast part of the pit, i.e. south of the northeast-southwest set of long bones and east of the north-south set.

However, beyond this basic organization there was no structure to the deposit. Each of the two long bone sets included elements of each kind and from both individuals. There had been no attempt to differentiate or separate the bones of the two people.

The bones are all adult, that is, there is full epiphyseal fusion of the long bones of both individuals. A maxilla fragment shows antemortem tooth loss with socket closure of the left third molar, suggesting a middle-old age person, but it is not clear to which cranium the fragment belongs. The cranial fragments include a large and a small mastoid process, suggesting a male and a female. A frontal bone fragment with small supraorbital ridges and sharp superior orbital margins also suggests a female. The long bones could be separated into a larger and a smaller person, based on their size (Table 4). Comparison with the later Neutral series from the Grimsby site (Jackes 1988) places the smaller person in the female category and the larger one among the males (Table 4).

B11, then, was the secondary burial of two individuals, an adult male and an adult female. The dimensions of feature 1227 (Table1) show that it could not have been the primary burial pit of either person, let alone both. The selection of bones from both individuals for inclusion in the secondary burial was quite rigid, with only crania and long bones accepted. It is also worth noting that no cutmarks were seen in the assemblage. Parts of the long bones where these would be expected, if forcible dismemberment had been necessary to reduce the bodies for secondary burial, were examined with a hand glass: the femoral necks, the distal metaphyses of the humeri and femora, the humerus heads, and the olecranon processes of the ulnae. Both individuals were represented. Apparently both bodies were in a state of advanced decomposition or had even become fully skeletonised in the primary burial, allowing their processing without cutting.

Burial 12

B12, in feature 1879, was located well beyond any of the longhouses, at the site's northern periphery (Figure 3). The small pit held the partially articulated elements that had been sorted out and excluded from the secondary burial of a single adult. The fusion of the secondary epiphyses of all the vertebrae and the medial epiphysis of the clavicle indicate a full adult, but the individual's sex cannot be determined from the recovered elements.

At the core of the deposit was an articulated torso lying on its right side, extending from the sixth cervical to the fifth lumbar vertebra, with most of the associated ribs still in articulation. The vertebral column rested with the fifth lumbar at the deepest point in the pit, at its south end, curling sharply around and up from there to the cervical at the highest and most northerly part of the feature. The curvature was tight enough to suggest some loosening through decomposition of the associated muscles and ligaments. This is also indicated by some other torso elements. Only 7 of the 12 left ribs were present in the deposit. The left scapula, left clavicle, sternum, manubrium and sacrum were all near but not in their proper positions, while the right scapula and clavicle and both innominates were absent. The sacrum was near but separate from the fifth lumbar vertebra, resting inside the basal part of the column's curve. The coccyx is in the proper articular position but had not fused to

Table 4. *Burial 11 long bone dimensions (mm).*

Element	Dimension	Larger Person	Smaller Person	Grimsby Male Mean*	Grimsby Female Mean*
humerus	head vertical diameter	45R	41L	44.2	39.6
humerus	epicondylar breadth	63L, 61R	54R	60.1	54.5
humerus	trochlear breadth	45L, 45R	40R	42.6	39.3
femur	maximum length	446L	—	458.5	420.8
femur	head vertical diameter	43L, 44R	41L, 41R	46.1	42.2
femur	epicondylar breadth	74R	—	—	—

* from Jackes (1988:Tables 6, 9)

the sacrum. It appears that the torso had decomposed to a considerable extent before its exhumation and subsequent deposition in feature 1879, and perhaps had started to fall apart as it was being placed in the pit.

Also in the pit were the partially articulated remnants of both feet and hands, and the right patella. The patella was by itself at the west edge of the feature. Just east of it, lying inside the curve of the torso, were the two hands. The left hand, oriented with the fingers pointing south, rested on top of the right hand, with its fingers pointing west. The right hand included, in articulation, all of the carpals and metacarpals and some of the phalanges. The overlying articulated segment of the left hand included only two carpals (the hamate and one too poorly preserved to identify), metacarpals I-IV, and several phalanges. The phalanges of the two hands were somewhat mixed, but in total there were 10 proximal, 3 middle and 6 distal phalanges.

The right foot was lying as an articulated segment along the east edge of the deposit, resting on its left side, toes to the south and the sole of the foot oriented west, against the vertebral column and scapula. It included all seven tarsals, metatarsals I-IV, and three proximal, one middle and one distal phalanges. The left foot was at the south edge of the pit, its elements together but for the most part not in articulation. They included the calcaneus, cuboid, navicular, metatarsals IV-V, and one proximal and one distal phalanges.

In sum, a largely complete torso, both hands and both feet (and one patella) were placed in the pit. All the body segments were in a partially decomposed state at the time of their deposition there. Several elements were not present in feature 1879: some ribs, the left patella, the right scapula and clavicle, both innominates, several hand and foot bones, most of the cervical vertebrae, all of the long bones, the cranium, the mandible and the hyoid. Some of these had undoubtedly been transferred to a secondary burial. Others may have been left behind in the primary burial pit or discarded elsewhere.

One element in feature 1879 belongs to a different individual, the unfused head of a subadult right humerus. It was lying near the hands, and was the only bone of this second person in the pit. Its size suggests a child of about 5-7 years of age. Its inclusion in the feature, though probably not deliberate, has important implications. Perhaps the adult and child had been placed together in the primary burial feature but were processed for secondary burial at different locations, the bones of the child first being carefully separated (with that one exception) from those of the adult.

Burial 13

B13 was in feature 1484A, also located in the north periphery of the village and about ten metres west of B12 (Figure 3). A still articulated complex of thoracic vertebrae one through five, the left and right first ribs, right ribs two and three, the right scapula and the right clavicle rested dorsally, with the proximal end to the south (Table 5). At the north, west and east sides of the torso segment there was a variety of disarticulated elements, including another thoracic vertebra, the sixth cervical vertebra, the left clavicle, and numerous bones of the hands and feet (Table 5). Several bones of the right wrist were clustered together but not actually articulated.

B13 is an adult. The secondary epiphyses of the vertebrae and the medial epiphyses of the clavicles are fully fused. Sex cannot be determined. Feature 1484A was too small to have been a primary burial pit, so it is classified here as a sorted deposit.

Elements	Burial 13	Burial 14
dental	0	2 upper, 1 lower premolars
vertebra: cervical	1	14
vertebra: thoracic	6	28
vertebra: lumbar	0	9
rib	1L, 3R	>22
scapula	1R	1L
clavicle	1L, 1R	1R
sternum	0	2
manubrium	0	1
sacrum	0	2
patella	0	3L
hand: lunate	1R	1R
hand: scaphoid	1L, 1R	2L, 1R
hand: trapezoid	1R	2R
hand: trapezium	1R	1L, 1R
hand: triquetral	0	1L
hand: capitate	1R	1L, 1R
hand: pisiform	1R	0
hand: hamate	0	3L, 1R
hand: metacarpal	RIII-IV	LIII-IV; RI-IV, RII-IV
hand: phalanx	3	14
foot: calcaneus	0	2L, 3R
foot: talus	0	2L, 2R
foot: navicular	1L	1L, 2R
foot: cuboid	0	1L, 1R
foot: first cuneiform	1L	1L, 2R
foot: second cuneiform	1L	1R
foot: third cuneiform	0	1R
foot: metatarsal	LIV; RI	LI, III, V, V; RIV, IV, V
foot: phalanx	2	7

Table 5. *Skeletal elements of burials (sorted deposits) 13 and 14.*

Burial 14

B14 was in feature 1484B (Figure 3), located only four metres north of 1484A (B13). It held the disarticulated and partially articulated remnants of three adults (Table 5). The number is based on MNI counts of three for the second cervical vertebra, left patella, left hamate and right calcaneus.

Most of the bones were not in articulation, but several articulated segments were distributed through the pit. There seems to have been no attempt to keep the remains of the three individuals separate from one another. The articulated segments were:

1. three thoracic vertebrae and their associated ribs (some articulated with the vertebrae and some not) at the northwest edge of the feature
2. two thoracic vertebrae, with no associated ribs, a short distance south of the above segment
3. a cuneiform and metatarsal at the east edge
4. a set of eight thoracic vertebrae in the centre, with no associated ribs
5. a twelfth thoracic vertebra, the left and right twelfth ribs, and lumbar vertebrae one through three in the south part of the pit
6. in the east part, an articulated right wrist and hand segment that included five of the carpals, four metacarpals and two proximal hand phalanges
7. two separate sets of 5-7 ribs each, each set from only one side and with no associated vertebrae, from the centre and south of the feature
8. several tarsals and metatarsals from a right foot in the south of the pit

The full roster of bones from the pit, including those in the articulated segments noted above, is presented in Table 5. The 28 thoracic vertebrae must by count include some from each of the three individuals. Since all have fused secondary epiphyses, all three individuals are full adults. There were no unfused epiphyses or epiphyseal surfaces in the pit. Also, the single clavicle has a fused medial epiphysis. The lower premolar has heavy wear, suggesting that at least one of the adults was middle age or elderly. No sex identifications were possible.

The three teeth recovered from the deposit are all premolars, two maxillary and one mandibular. These are all single-rooted teeth, and so likely to fall out during the decomposition of the alveolar soft tissues. Their presence suggests that the crania and mandibles had been nearby, and thus that the processing of the primary burials for secondary burial had taken place in the immediate vicinity of feature 1484B. Of the three teeth, only one of the maxillary premolars has a caries.

During the excavation of features 1484A and 1484B, care was taken to compare corresponding elements between the two burials. The purpose of this was to determine whether any particular individual was represented in both features, a possibility raised by their proximity. No matches in size or morphology were found, indicating that four distinct adults are represented, one confined to feature 1484A (B13) and the other three to feature 1484B (B14). Also, none of these was represented in nearby feature 1879 (B12), nor was the B12 adult represented in feature 1484A or 1484B. Nevertheless, the three features, or any two of them, could still have been contemporaneous.

Feature 1484B was only 60 by 45 cm. Too small to have been the primary burial pit of even one adult, it must be a sorted deposit. During the sorting process, which had probably occurred in the immediate vicinity, all of the long bones, innominates, crania and mandibles were separated and retained for secondary burial. However, not all of the other bones went into feature 1484B. There were, for example, only 1 scapula, 1 clavicle, 14 of a possible 21 cervical vertebrae, 2 sacra, 3 patellae and 1 manubrium in the sorted deposit. The other elements of these categories, and numerous others, were missing from the pit. It seems likely that some of these, perhaps still attached by soft tissue, were included in the secondary burial.

Discussion

Late Woodland mortuary programmes were complex, and it may be that a major component of the data base we usually have to deal with, in-village primary burials, is biased. They are the people who were excluded from the community's principal mortuary track, which culminated in a final secondary burial. The question then arises of why they were shunted into an alternate mortuary track, in effect to be separated in death from the rest of the community. Among the Huron of the early seventeenth century reasons included age, health and the cause of death (Trigger 1976:52). Although we cannot be sure that these were also true of societies two to three centuries earlier, there is reason to believe that there was some continuity in practice (Forrest 2010; Robertson 2004:111-112).

A first step in reconstructing the Tillsonburg Village mortuary programme is to estimate the population size of the village, and from that the number of people who might have died over the course of its occupation. One important line of evidence for this is longhouse size, specifically longhouse length. The distribution of features in the longhouses of the Dorchester Village site, an early fourteenth century settlement near London, suggests that each house was divided into several residence segments, averaging about 6.5 metres in length (Spence 2006). These calculations exclude the house ends, which were often used for storage rather than residence.

However, Timmins (2009) has analyzed the settlement pattern exposed in the western part of the Tillsonburg Village site during the 2000-2001 excavation, and finds that house segments there were more like nine metres in length. The spacing of features in longhouses 11, 14 and 15 of the eastern sector also suggests a residential segment closer to nine than six metres (Figures 4-6). This figure, then, will be adopted for Tillsonburg Village as a whole.

There are several problems with such demographic calculations. For one, they usually assume full and contemporaneous occupation of all the houses, and an even spacing of families throughout each house (Varley and Cannon 1994). Also, most investigators have assumed, following a Jesuit description of the Huron, that there were two families living in each residence segment, one on each side of the central corridor. However, the Dorchester Village data suggest that this was not always the case (Spence 2006). Some longhouses there do have a symmetrical distribution of features, those along one side of the corridor being essentially a mirror image of those along the opposite side. This is what would be expected if there were two families per segment. Other houses, however, have an unbalanced feature distribution, suggesting one family per segment. In the eastern part of the Tillsonburg Village the distribution of features in longhouses 11 and 14 seems generally symmetrical (Figures 4-5). In house 14, for example, there are two sweat lodges along the north wall and three along the south wall. House 15, on the other hand, appears to have a less balanced distribution (Figure 6). Both models will have to be considered in calculating the population of Tillsonburg Village.

The 2000-2001 excavation in the west sector of the site uncovered, in whole or in part, ten longhouses. Timmins (2009:66) calculates a population of 500-800 for the area. The five longhouses excavated during the 2008 work in the east sector included about 270 metres of residential space (excluding storage cubicles at the ends), or about 30 residential segments. The number of occupants, at six people per family (Warrick 1984:98) and either one or two families per residential segment, would have been roughly 180 or 360. The total population of Tillsonburg Village, then, would have been some 680 people under the one-family model, or 1160 people under the two-family model—or somewhere between these two figures if there had been some mix of one- and two-family residence.

Data from the 1300 AD Moatfield Ossuary in Toronto indicate a crude death rate of 30.6/1000/year (Merrett 2003:177). In other words, about 3.06% of the Moatfield population would have died each year. If we accept this figure for Tillsonburg Village, about 20-40 people would have died annually in the village as a whole. Then, if we further assume a total duration of ten years (probably a minimal estimate) for the village, some 200-400 people would have died over the course of its occupation. Yet there are only 14 features with human remains, representing a total of 18 people, and at least half of these are just the discarded remnants from sorting for secondary burial.

The vast majority of the community dead, then, may still lie in multiple secondary burials outside the village. There might be only a single large ossuary, if the reburial ceremony were held only once every several years, for example when the village moved to a new location. This was apparently the case with Moatfield, and even with some Early Ontario Iroquoian communities (Spence 1994; Williamson et al. 2003). However, it is also possible that the event was annual, as seems to have been the case with still other Early Ontario Iroquoian communities and perhaps with Dorchester Village (Spence 1994, 2006). It is not clear which mortuary cycle was followed at Tillsonburg Village.

One line of evidence lies in the condition of the exhumed burials (Spence 1994:15). The sorted deposits contained either totally disarticulated (B10) or only partially articulated (B3, 12-14) skeletal elements, and the one secondary burial had no cutmarks. This indicates that the bodies had become extensively decomposed in their primary burials. Forensic experience in southern Ontario shows that a body will retain some integrity for several months if buried in the ground. If the Tillsonburg Village burials were being exhumed from the ground annually, many would still have been largely intact with a cover of soft tissue requiring forcible removal. This would suggest that the mortuary cycle was longer than a year.

However, there is another possibility. Perhaps most of the dead were exposed on platforms rather than buried in pits. An exposed body can decompose considerably within as little as a month in summer, allowing bones to be separated and removed with little need for cutting. Although there is no direct evidence for platform burial at Tillsonburg Village, it is noteworthy that only one exhumed primary burial pit (B9) was identified in the site. The five undisturbed primary burial pits (B1, 4, 6-8) were all of subadults, and since they had not been exhumed they were apparently not following the normal community mortuary track. We therefore cannot assume that their burial form was typical. With the evidence presently available, then, the question of the length of the mortuary cycle, and for that matter the nature of the primary burial, cannot be resolved.

There are indications that adults and subadults were treated differently in the mortuary programme. The undisturbed primary burials were all subadults, ranging from newborn to the early teens. Furthermore, all but B4 were in longhouses. The one subadult sorted deposit (B10) was also in a longhouse while the adult sorted deposits (B3, 12-14) were exterior features, though B3 was near longhouse 9. Also relevant here is the subadult humerus epiphysis with B12. It suggests that, although that child and the adult who contributed all the other bones in the pit had been exhumed together, their remains had then been sorted separately.

Presumably the major elements of the subadults represented in B10 and B12 received a final burial together with adults in a collective secondary burial (e.g., Merrett 2003). Up to that point, however, adults and subadults were handled in quite different spatial, and presumably social, contexts. The mortuary processing of the subadults occurred in the context of the family, in or very near the house. A few apparently never moved beyond that stage. The adults, on the other hand, usually received their mortuary treatment beyond the house. The area of B12-14, where five adults were sorted for secondary burial, was some 60 metres from the nearest house. The relevant social context for adult mortuary ritual, then, may have been some broader portion of the community, perhaps the entire village.

The exceptions to this were B9, an adult who was initially buried in a longhouse, and B11, the secondary burial of a man and woman associated with longhouse 13. B11 is anomalous in its longhouse association and its exclusion from the community's collective secondary burial, but it is not clear why these two people were diverted from the final step in the community's mortuary programme. One other potentially relevant feature of B11 was the particularly rigid selection of bones for the secondary burial. Both crania and most or all of the long bones were retained but everything else was excluded. In contrast the sorted deposits, although they included numerous elements from the torso, hands and feet, never included all of them. Particularly notable is the total absence from the sorted deposits of mandibles and innominates. This suggests that the collective secondary burial(s) would have frequently included elements beyond the crania and long bones, perhaps because they were sometimes still securely attached by soft tissue. The rigid selection evident in B11 thus stands out from the other site evidence, though it is difficult to say whether it was simply one extreme in a continuum of variation or another aspect of the unique nature of B11.

As noted above, the five unexhumed primary burials at Tillsonburg Village were all subadults and, with the likely exception of B4, were in-house burials. Forrest (2010; see also Williamson 1979) has noted this pattern at Draper and other Ontario Iroquoian sites, and suggests that some of the burial beliefs and practices described by seventeenth century French observers may also have been in play in the preceding century. The Tillsonburg Village evidence may push that still a century earlier, though we should exercise some caution here. One difference is that only one of the five Tillsonburg Village primary burials was an infant (0-1 year), while seven of the twelve primary burials at Draper were infants. Also, we can be sure that many more infants died at Tillsonburg Village than the one we found, so the question arises of why only this one received a primary and final in-house burial. Clearly other factors were involved but the small size of the Tillsonburg Village sample does not allow us to be any more specific. Future investigators of fourteenth to sixteenth century villages should keep these questions in mind. It seems likely that there was considerable variation in mortuary programmes both spatially and through time, although these variations may have been built on an underlying core of commonly held practices, in particular the transfer of single primary burials into collective secondary burials.

Conclusions

The Tillsonburg Village settlement pattern is anomalous among Middle to Late Ontario Iroquoian communities (Timmins 2009). The longhouses were widely dispersed over an unusually large area. To judge by the absence of a palisade, the community apparently enjoyed a period of peace and perhaps took advantage of that to maintain a little more distance among neighbours. The sprawling nature of the settlement, with relatively large distances between longhouses and a variety of longhouse orientations, suggests the absence of well defined multi-house social units. This feature might explain why subadult mortuary proceedings took place within or very near the longhouse and seem not to have involved the larger community. Adult mortuary proceedings, on the other hand, occurred in the open, suggesting the participation of a larger segment or all of the community. In contrast, the sorted deposits of the enigmatic Hutchinson site in the Rouge River watershed show a mixture of adult and subadult remains, indicating their processing together for secondary burial. However, the small size of the site suggests that the remains were drawn from only part of the community, perhaps a kin group (Robertson 2004:114-115). Apparently each Middle Ontario Iroquoian society developed its own mortuary response to local social concerns.

Despite a thorough excavation of the site and the death of at least 200 of its residents over the duration of its occupation, only fourteen mortuary features have been identified. The majority of burials must be located outside the village. These interments are quite likely in the form of one or several multiple secondary burials, which would be very difficult to find. However, with the limited evidence available to us we cannot entirely dismiss the possibility of a cemetery of undisturbed primary burials, or perhaps some combination of the two.

The five individuals found in the excavation of the west sector were reburied in 2001 in a small cemetery at the west edge of the site, overlooking a pleasant, wooded ravine. On November 12, 2008 the thirteen individuals from the east sector were also reburied there, in a ceremony conducted by an Elder from Six Nations.

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Les fouilles archéologiques du site du village Tillsonburg (AfHe-38), qui date de la fin du quatorzième siècle, ont mis au point quatorze vestiges contenant des ossements humains. Ces derniers ne contenaient non seulement des sépultures centrales et de deuxième degré mais aussi les aménagements et les traces d'une sépulture centrale où plusieurs squelettes avaient été déterrés. Une quatrième catégorie de caractéristique mortuaire, le dépôt trié, a été représentée dans cinq de ces vestiges. Ces vestiges de dépôts triés contenaient des éléments squelettiques qui avaient apparemment été abandonnés lors du processus de tri des sépultures centrales exhumées. Les ossements qui n'avaient pas été jetés et qui avaient été sélectionnés des sépultures centrales, avaient été envoyés ailleurs pour une sépulture ultérieure de deuxième degré. Dans les peuplements iroquoiens, en Ontario, les aménagements et les traces mortuaires des dépôts triés sont probablement plus répandus que préalablement reconnu et ils peuvent fournir d'importants renseignements quant au contexte social des pratiques mortuaires. Dans le cas du village Tillsonburg, le style et l'emplacement de ces dépôts triés suggèrent que l'exhumation et le tri des sépultures centrales subadultes étaient exécutés par l'unité sociale de la maison-longue tandis que le traitement des adultes était dirigé par un public plus vaste.

Michael W. Spence
Department of Anthropology
Social Science Centre
University of Western Ontario
London, Ontario, Canada N6A 5C2
spence@uwo.ca

Promoting Archaeology through Cultural Resource Management and Museums: Case Studies from Ontario, British Columbia and Great Britain

Lori D'Ortenzio and Christine Saly

This research seeks to illustrate the potential to increase the exposure of Ontario archaeology through the use of outreach programming in cultural resource management and museums to provide a potential liaison between archaeologists and the general public. A comparative analysis is conducted with the use of case studies from Ontario, British Columbia and Great Britain to identify the similarities and differences between government structures and types of outreach programs utilized by selected museums. An examination of government expenditures and the limitations placed on cultural resource companies that prohibit ease of public access to archaeological sites in Canada and in Britain is conducted to show differences in how archaeology is portrayed to the public. We discuss the possible ways of presenting archaeology to the public through various forms of media. An analysis of museum outreach programs also identifies the potential for museums and cultural resource firms to collaborate with educational institutions.

Introduction

Awareness of archaeological work conducted within Ontario is noticeably lacking within the public consciousness. The public has little involvement in Ontario archaeology and this may be attributed to the separation of commercial cultural resource management firms and the general public. This research seeks to illustrate the potential to increase the exposure of Ontario archaeology through the use of outreach programming in cultural resource management and museums. Outreach programming may function as a liaison between archaeologists and the general public. A comparative analysis using case studies from Ontario, British Columbia and Great Britain identifies the similarities and differences between government structures and types of outreach programs utilized by selected museums. An examination of government expenditures and the limitations placed on cultural resource management firms which prohibit ease of public access to archaeological sites in Canada and in Britain, is conducted to demonstrate differences in how archaeology is portrayed to the public. The possible modes of presenting archaeology to the public through various forms of media are discussed with an emphasis on online resources. An analysis of museum outreach programs also identifies the potential for museums and cultural resource firms to collaborate with educational institutions.

Cultural Resource Management

Archaeologists in Canada have a sporadic history of working with the general public to promote archaeology, especially when compared to archaeologists in Great Britain where much of their heritage is protected by motivated members of the public. While the reasons for this difference are numerous, significant aspects that determine public access to archaeology may be how cultural resource management (CRM) or archaeological heritage management (AHM) in Great Britain is conducted in the two countries. Public access to Ontario archaeology may also be affected by variations in government expenditures that reflect the value Canadian and English societies place on their heritage.

In Ontario, British Columbia and Great Britain the majority of archaeology is conducted with a federal or provincial permit. This type of archaeology places certain limitations on the character of the work and public access to archaeological sites. Specifically, the requirements of strict scheduling, low funding, and legal liability often limit or prohibit public involvement. This is paradoxical since CRM work has been mandated by various federal and provincial laws as being in the public interest. However, the public has little involvement in CRM archaeology. What can be done to encourage the promotion of archaeology in Ontario, and what limitations do CRM companies face when they undertake these archaeological projects? This section will explore these and other concerns relating to the promotion of archaeology in CRM work.

Variations in Government Expenditures

Archaeology has changed fundamentally as a result of the exponential growth in land development activity since the early 1990s (Birch 2007:122; Ferris 2002:60). CRM archaeology can now be regarded predominantly as operating within the business sector, in a competitive economic climate. This situation is different from the education sectors that have a clear focus on research. Archaeology has changed from operating primarily in a research domain to a situation where it is now a private-sector service. In the public services, resources are mainly obtained from funding provided by the culture and heritage branches of government. In response to these changed circumstances we examined the differences in government expenditures versus population counts in Ontario, British Columbia and Great Britain to determine variations in the amount of money spent in each region on culture and heritage. For the purpose of this paper we limited our research to government disbursements for CRM and museums only and did not include government funding for university sectors.

In order to understand variations in government expenditures we compared the regional differences in government spending from 2008, with the most recent 2006 population count of each region (Figures 1 and 2). Although simplified for our purposes, if one were to break the funding down on a per person basis, it is clear that British Columbia spends more per person on cultural heritage. Ontario spends approximately $24.25 on culture and heritage per person, whereas British Columbia spends $85.85 per person. Great Britain spends as little as $11.23 per person on culture and heritage; however there is an Ancient Monument Act that contributes additional funds that are allocated specifically to the preservation of existing archaeological monuments. It is interesting to note that although Alberta was not part of the study, government spending in the province is $167.98 per person on culture and heritage.

Variation in government expenditures versus regional populations may be the result of many factors. Disparities in regional spending may indicate differences in public interest within each region. What is clear is that the diminishing resources for archaeological projects in most regions affect archaeological research and ultimately public access to that knowledge.

Government and Heritage

In Ontario and British Columbia, legislation has been passed that emphasizes the identification and protection of cultural sites, especially those located on public lands. These laws make it illegal to develop any federal lands without first conducting a cultural resource survey in order to identify and asses any cultural sites that may be affected (Doroszenko 2008). Archaeologists are obligated to report research findings to the province in accordance with the reporting requirements stipulated in the *Ontario Heritage Act* of 1974 (Doroszenko 2008:266). A Canadian heritage responsibility that is absent in Great Britain is the partnership between First Nation Peoples and archaeologists. In Ontario and British Columbia there exists a protocol between Aboriginal peoples and archaeologists to make it a practice for archaeologists to consult with members of the Aboriginal community. For example, in Ontario, archaeologists working for

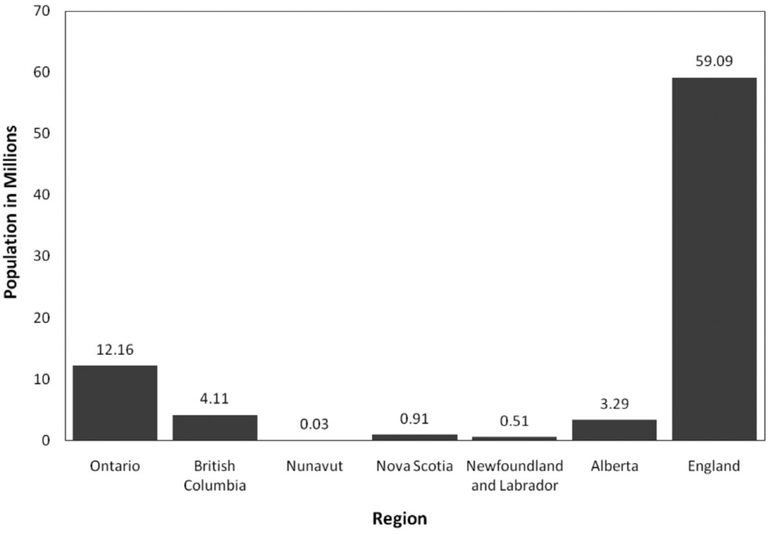

Figure 1. *Population counts for each region (in millions).*

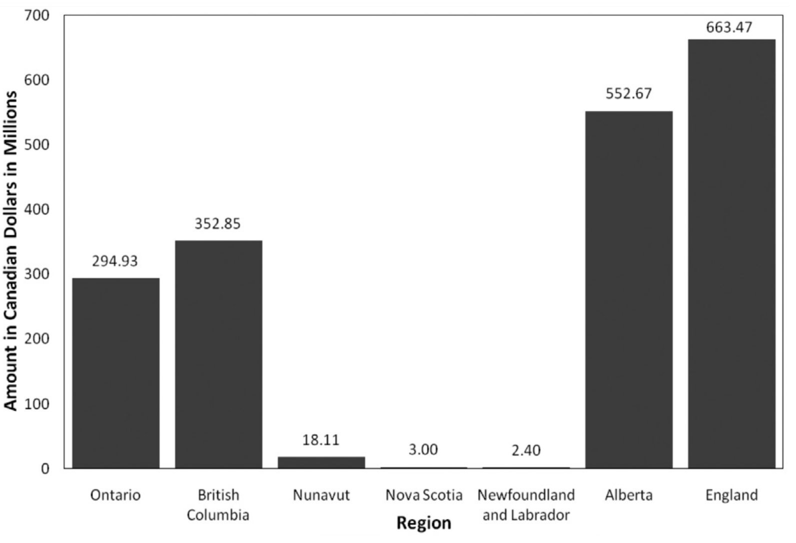

Figure 2. *Government expenditures for culture and heritage in each region (in Canadian dollars).*

the Ministry of Transportation (MTO) have an established record of contacting Six Nations whenever Ministry of Transportation has any projects in the Oshwekan or Brantford district. In fact, the Planning Act requires local First Nation people to be informed of any land development project situated within one kilometre of their territory (Williamson 1985; Ministry of Culture 2004). First Nations groups are consulted regarding archaeological assessments and heritage concerns, therefore ensuring that Ontario and British Columbia are politically committed to investing in First Nations heritage.

First Nations communities have a deep interest in their heritage and traditional cultural knowledge. CRM companies ideally can work with First Nation peoples on a variety of different projects, including the development of websites and other teaching resources to promote cultural awareness. They can develop protocols for archaeological investigations within traditional territories, repatriation of human burials, sacred objects and artifact collections as well as establishing artifact repositories. CRM companies can negotiate with the government concerning cultural heritage sites on First Nations lands and investigation of archaeological sites that contribute to an understanding of First Nations history. Conversely, Great Britain's archaeological heritage focus is to improve the management of historic sites and monuments with the objective of conservation. This stems from an emphasis on the preservation of material culture and the belief that cultural heritage belongs to the people. In Great Britain interest in the past has never been greater, where stone circles and other prehistoric monuments are often revered by members of the public as the focal point of lost wisdom (Thomas 2004:194). For example, some archaeological excavations in Britain attract public attention or controversy. The Seahenge site on the Norfolk coast became the subject of a very public debate that attracted national media attention. Local people objected to the excavation because they felt they had not been consulted about the fate of part of their local heritage and that it should be left alone. They complained that Seahenge would most likely be transported to London where it would be displayed in the British Museum, out of its local context. A great many people were attracted to the site to view it, or to protest, and the presence of such large numbers of people contributed further to the risk of damaging the site (Laverock 1999).

The Seahenge case illustrates several complex themes connected to CRM work on heritage management in Great Britain. The views of local people and other interested groups have to be balanced with the aims of government and academia. Archaeologists and government agencies associated with the Ancient Monuments Act need to tackle decisions that have to be made over what monuments to preserve and what to leave. Unlike Ontario and British Columbia, the authority of the state plays a significant role in archaeology in Great Britain because they have to select monuments that merit protection and funding. The final decisions on which monuments are of 'national importance' are made by the Secretary of State and it is difficult to appeal these decisions (Thomas 2004:192). The authority of the State has substantial power in the choice of monument preservation and by virtue of these choices can influence the perception of Great Britain's archaeological past.

Government policies also affect public awareness of archaeology in Canada. For example, the British Columbia Heritage Trust was dismantled in 2003 as a cost-cutting measure to streamline provincial core services (McLay 2007:2). Under the new guidelines archaeological research is not eligible for these particular funds, therefore creating a void of government funds devoted to improve the protection, understanding and public awareness of First Nations archaeological heritage. According to Eric McLay (2007), "if political commitment is reflected in financial support, provincial heritage conservation is a very low political priority," (McLay 2007:2). As a result of less funding, First Nations heritage sites and burial grounds are being destroyed by unregulated development, and the general public has no idea of the First Nations heritage located in their local neighbourhoods.

Limits of Public Access to CRM

Canada

Birch (2006) demonstrates clearly that CRM companies in Ontario have a positive attitude towards promoting archaeology to the public; however they are often unable to be involved in archaeological public awareness programs for a number of reasons. In Canada, it is difficult to run a public archaeology program utilizing CRM companies because consultants have to fulfil obligations to their clients as rapidly as possible (Birch 2006:124). There is a lack of time and funding on the part of CRM companies. This puts constraints on their ability to promote public archaeology. Birch states that there are currently no government grants available to fund public archaeology as the federal Access to Archaeology Programs ended in 1993 (Birch 2006:126). Another restriction is that there are few organized venues to allow CRM archaeologists to interact with the public, either through museums or educational institutions. CRM companies lack on-site outreach programs because there are legal concerns with the private property rights of the developers by which they are employed. Ultimately, there is an overall lack of government support in Canada for public awareness initiatives. This is illustrated by the absence of a policy mandating the Ministry of Culture to make information collected by CRM companies available to the public (Birch 2006:133). There is currently no recommendation that addresses how information from excavated sites is disseminated to the public and the question remains as to how we can ensure that the interests of the Canadian public are served.

Unlike Great Britain, Canada is politically fragmented, consisting of provinces, territories, pre-and post-contact periods, and languages that differ throughout Canada. This results in limited standardization of national polices associated with public archaeology. The multi-faceted definition of public archaeology in Canada has the potential to become divisive and exclusionary in the Canadian context (Lea 2007:7). There are two slightly different definitions of public archaeology that leads one to question which one is utilized by CRM archaeologists. Merriman (2004) states that in the literature, 'public archaeology' refers to the archaeology that is regulated by the state and only occasionally does it mean the archaeology of 'the public'. This results in two perceptions of 'the public'; the state and the people. The differing perceptions create tension between government authorities and the general publics' ability to be involved with the stewardship and interpretations of their heritage (Merriman 2004:2).

Lea's (2007) research reveals that public archaeology in Canada is defined and practiced by archaeologists on the basis of their academic training, licensing requirements or work mandate, but not by legislation or a mandated code of ethics. The absence of a unified national policy and a clear definition of public archaeology in Canada contribute to some archaeologist's lack of awareness of public archaeology programs in Canada, other than their own projects. Lea (2007) states that this is true not only for archaeological projects across Canada, but this lack of awareness can occur within the same province and in one case, within the same building (Lea 2007:7).

Great Britain

The Council for British Archaeology is a committee associated with the Department of Culture, Media and Sport, whose core mission is to involve people in archaeology and to promote appreciation and care of the historic environment. They realize that there is a "public appetite for taking part in and enjoying archaeological discoveries that continues to be keen," however there is limited capacity in the voluntary sector in archaeology to develop outreach projects and programmes (CBA 2009:4). According to the Council for British Archaeology there is a shortage of skilled archaeologists with training in delivering public outreach programs. This is the result of the decline in funding for English Heritage over the last five years that has impaired AMH archaeologists' ability to build the capacity and skills needed to engage with the public on a voluntary basis (CBA 2009:6).

In Great Britain, partial funding for archaeological conservation is through the Heritage Lottery Fund (HLF) and there is an important role for non-governmental and voluntary bodies to articulate the views and needs of the community wishing to enhance and protect their local heritage (CBA 2009:6). They encourage communities and individuals to take part in local decisions about the historic environment; however they realize the public needs access to the right information, understanding and skills. The British government has policies in place, but has not yet developed the proper programmes to engage the public and define their role in influencing the protection of their local heritage. Part of the difficulty in delivering sustainable community programmes is the combination of low wages received by archaeologists, which restricts recruitment efforts and imposes time constraints on practicing archaeologists. Local delivery of heritage protection reform requires an increase in the number of skilled archaeologists to educate volunteers to promote the conservation of historic monuments. According to the Council for British Archaeology increased funding is required for the implementation of a vocational programme that trains and develops archaeological skills for those who want to participate on a volunteer basis (CBA 2009:6).

Archaeology within Great Britain has to contend with the scrutiny of the British media that result in exaggerations and misrepresentations of archaeology and creates unwanted stereotypes. It is apparent that the mass media in Great Britain is still inclined to see the archaeologist as a desecrator and violator of archaeological materials (Ascherson 2004:147). The discovery of Seahenge is an example of how some media view the act of excavation as a crime or robbery. When the English Heritage intended to remove the timbers for conservation and display elsewhere, New Age protesters attempted to block the removal. *The Guardian* reported that 'an alliance of druids and eco-warriors won the first round in a seaside battle over Britain's Seahenge'. The protesters received public sympathy and wide coverage from the press and television. In contrast, the English Heritage committee's reasons for removing the timbers received only a single sentence (Ascherson 2004:147).

Museum Case Studies

Museums were examined to determine how outreach programs could be used to successfully transmit archaeological information to the general public. A comparative analysis of outreach programs from two museums in Ontario, one museum in British Columbia and one museum in Great Britain, illustrate variations and similarities between program types and target audience. The museums that were studied were the Museum of Ontario Archaeology in London, Ontario; the Royal Ontario Museum in Toronto, Ontario; the Museum of Anthropology in Vancouver, British Columbia; and the British Museum in London, England. As the sample museums are large institutions, data was collected from each museum's updated website during June of 2009. Outreach programming within each museum was categorized based on outreach program type and intended target audience (Table 1). Program types were grouped in broad categories to identify programs that were dependent upon: 1) the voluntary participation of interested individuals, 2) programs offered in association with curriculum-based learning in schools, and 3) programs offered through print or digital media. The target audience was categorized into child, teen and adult. Children were defined as less than fourteen years of age, teens were fourteen to eighteen years of age, and adults were over the age of eighteen.

Results

The dominant program types used by the museums were online resources and outreach programs associated with school curriculums. These two forms of outreach are represented within each museum case study, indicating these programs are successful with high levels of public interest. Though each museum used these methods of outreach, the representation of target audiences are not uniform between the case studies (Table 1). The variation in targeted audience may be linked to the size of the museum and the museum's associated institutions. For instance, the Royal Ontario Museum and the British Museum are the largest museums in Ontario and England respectively, thus receiving greater funding to run a variety of programs for different audiences. The Museum of Ontario Archaeology and the Museum of Anthropology are associated with post-secondary institutions. The Museum of Ontario Archaeology is linked with the University of Western Ontario while the Museum of Anthropology is associated with the University of British Columbia. These museums place emphasis on elementary and secondary school educational programs. Thus, the context of the museum institution influences the funding and the focus of outreach programs.

Online Resources

The growth and development of activities and resources offered by museums in digital format have increased the museum's visibility and permitted greater public access to information (Swain 2007:286-287). All the museums targeted a child audience for online resources through games and activities. In 50% of the museums surveyed, the Museum of Archaeology and the British Museum provided online resources targeted to adults, while no museum targeted teens. The absence of teen oriented online resources may have been the result of the inclusion of the teen demographic into the adult audience.

Educational Programs

Educational programs offered in association with school curriculums were also identified within all case studies. This form of programming predominantly targets children within the elementary school curriculum.

The Museum of Anthropology (British Columbia) and the British Museum were the only museums to offer curriculum-based programs to all target audience types. In 2009, the Museum of

Table 1. *Museum outreach programs by target audience type.*

		Ontario								British Columbia				Great Britain			
		Museum of Ontario Archaeology				**Royal Ontario Museum**				**Museum of Anthropology**				**British Museum**			
	Outreach Program Type	Adult	Teen	Child	Family	Adult	Teen	Child	Family	Adult	Teen	Child	Family	Adult	Teen	Child	Family
Open Access Programming	Lectures	X	X			X	X			X	X	X	X	X	X	X	
	Films													X	X		
	Workshops	X	X	X	X									X	X		
	Events	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
	Walking Tours					X	X	X	X								
	Day Trips					X											
	Travel Trips					X											
	Demonstrations	X	X	X	X					X	X	X	X	X	X		
	Children programs		X	X				X								X	
	Birthday Parties			X													
	Online resources	X												X			
Curriculum Based Programming	Courses					X	X										
	School programs at the museum		X	X				X		X	X	X		X	X	X	
	Internships									X					X		
	School program kits			X				X			X	X			X	X	
	Online activities			X				X				X				X	
	Teacher education	X				X				X				X			
Print	Publications	X				X				X				X			
	Newsletter	X				X				X				X			
Other	Partnership with descendent groups	X	X	X	X					X	X	X	X				
	Consulting services	X															
	TOTAL	**10**	**7**	**9**	**4**	**9**	**3**	**6**	**2**	**9**	**6**	**7**	**4**	**10**	**8**	**5**	**1**

Anthropology offered educational programs in association with elementary, secondary and post-secondary curriculums, while the British Museum offered programs for elementary, secondary and adult ESL curriculums. The programming offered through the adult ESL curriculum, provided new immigrants with the opportunity to learn British history through the British Museum (British Museum, 2009a). In Ontario, the Museum of Ontario Archaeology only offers elementary and secondary school programming, while the Royal Ontario Museum was limited to partnering with the elementary school curriculum.

Outreach in Ontario

We believe that online resources and curriculum-based programming can be used more frequently to increase public awareness of Ontario archaeology. This promotion could occur through the use of digital media, merging CRM firms and museums, and collaborating CRM firms and museums with the educational curriculum.

Digital Media

Digital media such as the internet and television programming have the potential to reach a large audience. The information distributed through these modes of media allow greater accessibility for the general public. Audiences composed of children, teens and adults may be easily addressed, as well as local, national and international audiences (Merriman 2004:91).

Websites provide a relatively greater return in the spread of information than other contemporary forms of communication (Meggs and Purvis

2006:505). The accessibility of information to both national and international audiences outweighs the relatively lower costs of creating and maintaining a website (Meggs and Purvis 2006:505). According to the Royal Ontario Museum's 2007/2008 Annual Report, the museum's website welcomed 3.1 million visitors during the year (Royal Ontario Museum 2008). This figure was an increase of 29% from the previous year (Royal Ontario Museum 2008). Similarly, the British Museum reported 6.5 million visitors on their website during 2009, in addition to another 6.5 million who accessed their resource pages (British Museum 2009b). These figures demonstrate the accessibility and visibility of web pages, and suggest that museums are embracing their ability to present information on such a scale.

The use of television programming as a mode of communications for museums and archaeologists has increased in Great Britain. The popular BBC show *Time Team* has increased the visibility of British archaeology within the UK (Caveille 2004). The show has also been broadcast to North American audiences through BBC America and the Discovery Channel, reaching beyond the borders of Great Britain (Discovery Channel 2010). The success of *Time Team* spurred the creation of other archaeology inspired programs such as *Bonekickers* (Caveille 2004). These new shows however, shift focus from educational to fictional entertainment, targeting a pop culture audience (Caveille 2004). Television and other forms of digital media have the potential to misrepresent artifacts, archaeologists and archaeology itself, as previously illustrated with the case of Seahenge.

Merging CRM and Museums

Ontario archaeology can be promoted on a local level through the collaboration of cultural resource management firms with local museums. Such a partnership would increase public awareness of local archaeological projects. An increase in public access to archaeological information would increase the visibility of local archaeology. The general public rarely associates archaeology with Ontario (Carter, Brown and Zagar 2009). This lack of association may be attributed to the invisibility of Ontario archaeology in media coverage and educational institutions. A collaborative effort would enable museums to function as a liaison between archaeologists and the general public and thus promote local archaeological projects.

Cultural resource management firms may establish a collection loan program with local museums. This program could display artifacts, photos and information of archaeological projects for public consumption and education. The smaller scale of local museums would also allow archaeologists to exercise greater curatorship over the interpretation and display of the collections. This control would reduce the possibility of misrepresentations of the material culture or project.

The Museum of Ontario Archaeology illustrates the potential of this cooperative merger. The museum is structured around the presentation of archaeological material from the Lawson Site (Museum of Archaeology 2009). The material culture excavated at the site is made accessible to the public through displays within the museum. The incorporation of the excavation site and reconstructed village at the museum, allows visitors to view the on-going archaeological work and obtain an understanding of the process.

CRM, Museums and the Curriculum

Cultural resource management firms and museums can further collaborate with educational curriculums to address audiences that do not voluntarily seek access to archaeological information through museums or online resources. As children are a frequently targeted audience, the collaboration of CRM and museums with the Ontario curriculum would be an effective program. The incorporation of archaeology into an educational environment would also increase the opportunity for discussions of Ontario archaeology within an academic environment.

Collaborations can occur within the education system at local and provincial levels. At a local level, partnerships with individual teachers and principals would establish opportunities for class and school trips to archaeological sites or museums. Class and school presentations with guest speakers, or the option of travelling education kits may also be arranged for interested teachers. By directly engaging teachers, there is a greater chance of establishing outreach opportunities.

The provincial government can also be approached with suggestions to incorporate current archaeological information and theories into the curriculum. The 2004 Ontario provincial curriculum confines the opportunity to discuss archaeology to history and social studies classes. The current curriculum emphasizes post-contact history with limited reference to the pre-contact period. The pre-contact period is restricted to the Grade five social studies subject of Early Civilizations, which may address prehistoric North American Aboriginal groups (Ministry of Education 2004:29). In contrast, the post-contact period is addressed in social studies' Grade three Early Settlements in Upper Canada and Grade six First Nation Peoples and European Explorers (Ministry of Education 2004:25). Even as post-contact history dominates the curriculum, emphasis is placed on historically significant figures and events (Ministry of Education 2004:25). Documented records and accounts are utilized as the main source of information for these studies, resulting in a biased perspective in the historical narrative of Canada.

Conclusions

The accessibility of archaeological information contributes to increasing the public's awareness of archaeological projects in Ontario. Outreach programming aids in establishing a bridge of communication for archaeologists to share and promote projects to the public. Collaborations between CRM firms, museums and the provincial educational curriculum provide an opportunity for archaeologists to address a range of audiences. The emergence of new communication technologies, such as websites and social networking sites, also increases public access to information with relatively low maintenance costs.

Ultimately, outreach programming offered through CRM firms and museums need to engage the public's curiosity, encourage government interest in funding archaeological projects, and provide instruction on how to preserve Ontario's heritage. If the creation and dissemination of knowledge is recognized as one of the fundamental purposes of museums and CRM firms, then it may be possible to reposition Ontario archaeology into a framework that can lead to the development of public responsibility for archaeology. Public involvement is important both to the general public and to the health of the discipline. For if the general public loses interest in our past and archaeology is viewed as irrelevant, we place our heritage at risk. In an era of shrinking budgets and increasing public scrutiny, archaeology must demonstrate that it serves the public's needs.

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Cette recherche tente d'illustrer le potentiel qui existe afin d'augmenter la visibilité de l'archéologie en Ontario. Par l'entremise de programmes de sensibilisation dans la gestion des ressources culturelles et des musées, un lien possible pourrait être établi entre les archéologues et le grand public. Avec des études de cas de l'Ontario, de la Colombie-Britannique et de la Grande-Bretagne, une analyse comparative est en cours afin d'identifier les ressemblances et les différences entre les structures gouvernementales et les types de programmes d'approche utilisés par divers musées sélectionnés. Afin de présenter les différences dans la façon dont l'archéologie est présentée au grand public, une vérification des dépenses et des restrictions gouvernementales imposées aux sociétés de ressources culturelles interdisant la facilité d'accès public aux sites archéologiques du Canada et de la Grande-Bretagne est présentement en cours. Par l'entremise de diverses formes de médias, nous discutons des moyens possibles afin de présenter l'archéologie au grand public. Une analyse des programmes de sensibilisation des musées identifie également le potentiel qui existe afin que les musées et les firmes de ressources culturelles puissent collaborer avec les institutions éducatives.

Lori D'Ortenzio
85 Central Drive,
Ancaster, Ontario, Canada L9G 2A1
loril@cogeco.ca

Christine Saly
747 Field Road
Lynden, Ontario, Canada L0R 1T0
christine.saly@gmail.com

Hi-Lo Lithic Toolkits: New Insights from the Double Take Site

Parker S. Dickson

The stone tool assemblage from the Double Take site (AgHb-240) near Brantford, Ontario, is described. The main component of this assemblage is attributed to Hi-Lo (ca. 10,000 years B.P.). I examine how these tools, particularly end scrapers, are similar to, or differ from, tools of earlier (Paleoindian) and later (Early Archaic) developments. Many characteristics of the Hi-Lo end scrapers (e.g., manufacturing technique, outline shape, and bit retouch intensity), serve to reinforce their affinity with conventional Paleoindian end scrapers, while others (e.g., overall size) reinforce ties to succeeding Archaic assemblages. After reviewing other aspects of the toolkit, including biface manufacture and expedient tool use, I suggest that tool production and use strategies appear to be intermediate between the two developments and that the shift from the Paleoindian to Archaic was a smoother and more gradual transition than previously thought.

Introduction

One of the most poorly known and understood early archaeological developments of the Great Lakes region is referred to as the Hi-Lo lithic industry (ca. 10,000 years B.P.). The dating of this development straddles the Paleoindian to Early Archaic transition. It has been variously classified as Late Paleoindian (Fitting 1963a), or Early Archaic (Wright 1995), or both (Ellis 2004a). This transition has often been seen as one of the major cultural transformations in North American archaeology and a prelude to the emergence of social inequality and domestication (Caldwell 1958; Hayden 1981). An examination of the emergence of these "cultural periods" or "traditions" or "stages" is fundamental to our comprehension of large scale culture change and the nature of this transition.

Mitigative excavations of the Double Take site (AgHb-240) revealed a large and easily identifiable Hi-Lo component (TMHC 2004). Using the assemblage obtained from this excavation, the entire Hi-Lo stone tool kit is more fully documented here. This work will enable us to recognize similarities and dissimilarities in whole tool assemblages from previous (Paleoindian) to succeeding (Archaic) times. Until now, reported Hi-Lo lithic collections have been very small, especially with respect to tools other than projectile points. What makes the Double Take site unique is that its assemblage includes more tools and tool performs than all other reported Hi-Lo sites combined. Attention is given to this site's end scrapers, which form a large collection that can be easily compared to earlier and later collections.

The Hi-Lo Lithic Complex

The Hi-Lo lithic industry derives its name from a surface collection discovered at the Hi-Lo Gun Club in southern Michigan by James Fitting (1963a, 1963b). Since its initial recognition, relatively few studies of Hi-Lo have been carried out, an exception being the research in southwestern Ontario reported by Ellis and Deller (1982; Ellis 2004a, 2004b). Based on a number of shared tool kit characteristics (alternate bevelling of projectile point fore-sections; projectile point hafting modifications; and tool recycling forms), Hi-Lo has been found to most closely resembles the Dalton Complex found in areas south of the Great Lakes (Ellis and Deller 1982). Based on a review of ^{14}C dates, Goodyear (1982) posits an age range of *ca.* 10,300 to 9,900 B.P. for Dalton. Given the similarities noted above, the same age range is suggested for Hi-Lo materials.

There are a number of differences between Hi-Lo and Dalton. For example, unlike Hi-Lo, many of the projectile points assigned to the Dalton Complex possess lateral edge serration. Dalton tool kits also incorporate large wood-working instruments such as hafted, flaked adzes, which are lacking in the Hi-Lo industry (Ellis and Deller 1990). As these Dalton characteristics are often seen as more "Archaic" traits, they have been used to argue that Dalton should be seen as Archaic rather than Paleoindian (Koldehoff and Walthall 2009).

Fitting (1963a) placed Hi-Lo in the Late Paleoindian tradition. Others, such as J.V. Wright (1995), regarded it as Early Archaic. More recently, Chris Ellis has partitioned the Hi-Lo lithic industry, assigning it to both Paleoindian and Early Archaic based on variation in projectile point morphology, including presumed earlier un-notched to later notched point varieties (Ellis 2004a; Ellis and Deller 1990; Ellis et al. 1990). Based on haft element morphology, Ellis (2004a, 2004b) recognizes three projectile point sub-types, which, he argues, are most likely to represent a temporal sequence (Figure 1).

The earliest potential sub-type is called either "Holcombe-like" (Ellis and Deller 1990) or "Hi-Ho" (Timmermans 1999; Deller and Ellis 2001). The temporal assignment of this sub-type as relatively early is based on similarities to Holcombe projectile points, a definitive Late Paleoindian point variety characteristic of the lower Great Lakes region (Fitting et al. 1966) that is presumed to immediately precede this sub-type. A lanceolate form and the absence of a distinct hafting element (i.e., a stem or notch) – characteristics shared with Holcombe points – contributes to the definition of this Hi-Lo point sub-type. On the other hand, points of the Hi-Ho sub-type lack "refined flaking and are much thicker than the finely-flaked and ultra-thin Holcombe forms" and are more like other forms of Hi-Lo points (Ellis 2004a:64).

The next sub-type is the "classic" form. In contrast to Hi-Ho forms, it is characterized by a narrower haft element and a wider fore-section, creating a slight – yet distinct – stem, often with concave lateral margins (Ellis 1981, 2004a, 2004b). In many cases, there is no remaining stem demarcation because of heavy lateral re-sharpening of the fore section (Ellis et al. 2009). According to Ellis (2004a), this classic form is the most commonly recovered Hi-Lo point sub-type.

The final sub-type is a side-notched variety. Rather than a slight stem, the hafting elements of these forms have distinct, albeit shallow, side-notches (Ellis 2004a, 2004b). Using the appearance of side-notched projectile point forms as the arbitrary initiation of the Early Archaic, Ellis (2004a, 2004b; Ellis and Deller 1990; Ellis et al.

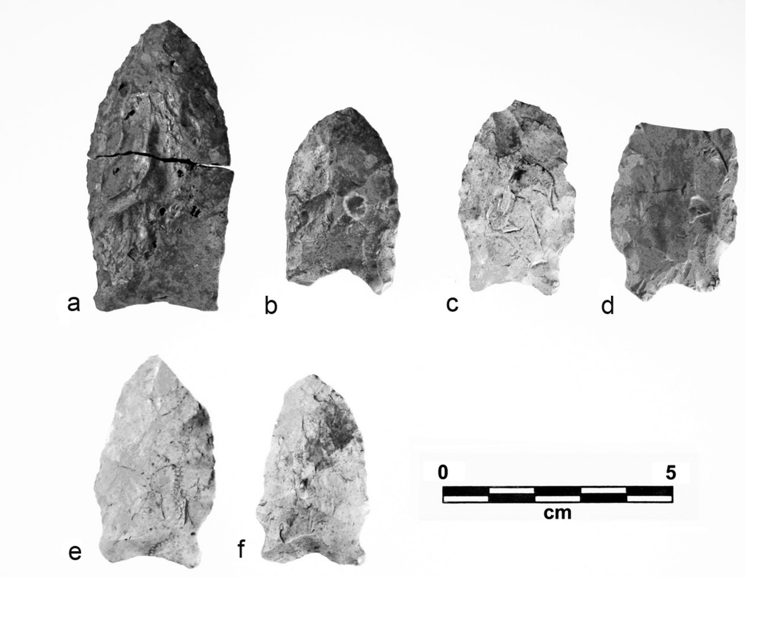

Figure 1. *Hi-Lo projectile point variations/sub-types. Holcombe-like Hi-Lo (a-b); "Classic" Stemmed Hi-Lo (c-d); and Side-Notched Hi-Lo (e-f).*

1990) considers this sub-type an Early Archaic manifestation. He suggests that side-notched varieties represent the earliest notched projectile points in the Great Lakes region and, hence, should be seen as Early Archaic, whereas the remaining two forms represent Late Paleoindian varieties. He further argues that the earlier point types (i.e., Hi-Ho) should be seen to represent stylistic continuity from earlier fluted and unfluted projectile point types (i.e., Holcombe).

Unfortunately, these suggested temporal distinctions represent no more than informed guesses and have yet to be widely employed in the literature. Nor have such distinctions become orthodoxy in the reporting of archaeological sites in the Ontario Ministry of Culture's archaeological sites database. As such, Hi-Lo shall be treated here as a single entity regardless of projectile point haft element variation.

In addition to their variation in haft element morphology, Hi-Lo points are well known for the large amount of variation in their fore-section morphology, something that contrasts with earlier Paleoindian point forms. Ellis and Deller (1982) attribute this variation to the fact all sub-types are heavily resharpened and recycled. Resharpening involved both tip resharpening, which results in variability in fore-section length, and lateral edge re-sharpening, often by alternate edge-bevelling of the fore-section, which greatly affects fore-section width and edge outline shape. Tip resharpening seems largely to rejuvenate tips broken during projectile use. Lateral edge resharpening seems to relate to non-projectile uses, such as cutting. Excessive re-sharpening sometimes produced concave lateral margins that formed a specialized side scraping edge (Ellis and Deller 1982; Ellis 2004a). Projectile point recycling is also common. Snapped point bases, fore-section fragments and exhausted specimens were reused to make end scrapers, straight to concave-edged side scrapers, spokeshaves, piercers or gravers and drills or perforators (Ellis 2004a).

Previous Research of Hi-Lo Occupations in Ontario

Finding Hi-Lo sites has been difficult. This can be attributed to the great age of materials and assumed highly mobile lifeways of aboriginal peoples of the time. With the exception of isolated surface finds, few sites have been located. Of these sites, only eight confirmed and reported Hi-Lo sites (Ellis 2004a, 2004b; Ellis and Deller 1982; Ellis et al. 2009; Timmins 1995; Woodley 1997) have been excavated in Ontario (Figure 2). The area excavated within these sites has often been minimal. Other Hi-Lo sites likely exist in the grey literature of archaeological consultant and government reports. Only three sites have been extensively excavated and published.

The Caradoc site, located 30 kilometers west of London, Ontario, consists mainly of a cache of purposely broken tools – largely biface cores/preforms – almost all of which are produced on a chert from Michigan, over 175 kilometres away (Deller and Ellis 2001; Ellis and Deller 2002). The only temporally diagnostic artifact – a Hi-Ho variant projectile point – suggests an early occupation of this site within the Hi-Lo complex. Furthermore, Ellis and Deller (2002) describe the recovery of large biface cores and side scrapers – characteristics commonly associated with earlier Paleoindian raw material procurement and tool production (Ellis and Deller 1990, 2002; Ellis 2004a). Thus, it could be argued that clear technological continuity exists between Paleoindian and the earliest Hi-Lo occupations.

The Welke-Tonkonoh site is a large, multi-area site located in ploughed fields just west of Mt. Brydges, Ontario (Ellis and Deller 1982). Excavations were carried out in three of the known Hi-Lo site areas in 1980, but only one area, Area C, appears to represent a pure Hi-Lo component and yielded a substantial tool assemblage other than points (Ellis 2004b). Surface collections and limited excavations in 1989, and continued surface examination throughout the following decade, yielded an assemblage of 32 tools over an area of some 400 m^2. Of these tools, the majority (n=27) are manufactured on Haldimand chert from bedrock outcrops, the nearest of which is some 175 kilometers southeast of the site (Ellis 2004b). The five diagnostic projectile points recovered during archaeological investigations all conform to the Hi-Lo side-notched variant (Ellis 2004b; Ellis et al. 2009). Given the temporal sequence suggested by Ellis

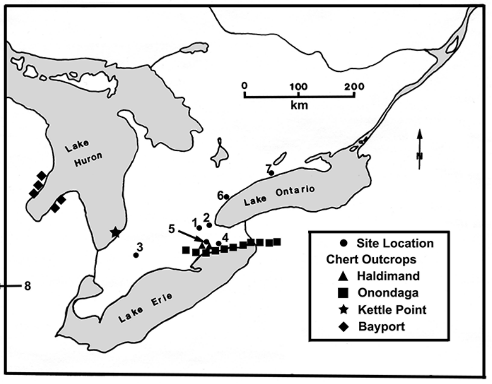

Figure 2. *Hi-Lo site and chert outcrop locations. 1) Double Take; 2) Witz and Koeppe II; 3) Welke-Tonkonoh, Stewart, Stephenson, Caradoc and Strathroy; 4) Stelco I; 5) Allan; 6) Ageing Maple; 7) ENL Hi-Lo; 8) Hi-Lo type site to east in western Michigan.*

(2004a; Ellis and Deller 1990; Ellis et al. 1990), the notched points suggest that Area C represents a later-dating Hi-Lo component, which could be classified as Early Archaic.

Flaking debris recovered at Welke-Tonkonoh Area C was restricted to a small excavated area of only 16 m^2) in the central portion of the location. In total, 17 pieces were recovered, representing three raw material sources: Haldimand (n=7); Onondaga (n=6); and Kettle Point (n=4; Ellis 2004b). With the exception of two larger (each about 3 g) Kettle Point flakes, perhaps resulting from the reduction of a single pebble from a secondary source, the remaining debitage is small – averaging under 0.3 grams, with no individual piece weighing more than 0.68 grams (Ellis 2004b; Ellis et al. 2009). Furthermore, the Haldimand debitage includes three flakes from the finishing or re-sharpening stages of biface production, a single uniface retouch flake and three small flake fragments (Ellis 2004b). With the exception of a single piece of shatter, the Onondaga debris includes one biface thinning flake and four flake fragments. In sum, the recovered flaking debris suggests that tool finishing and re-sharpening were the major lithic reduction activities at Area C and that primary core reduction was not a major activity. These characteristics – small debris size, an emphasis on tool finishing and re-sharpening, and a low debris-to-tool ratio – are consistent with other "traditional" Paleoindian sites in Ontario located some distance from the lithic sources employed (Deller and Ellis 1992a; Ellis and Deller 1990, 2000).

Finally, the Stelco I site – located near the mouth of the Grand River – produced a homogenous assemblage of 242 pieces of debitage and 38 tools, all of which are believed to be Hi-Lo in affiliation (Timmins 1995). Although small in excavation area (only 18 m^2), the surface scatter associated with the site was somewhat larger – close to 600 m^2 (Timmins 1995). Here, the use of Haldimand chert, which outcrops nearby, dominates the assemblage. In fact, with the exception of a single piece of flaking debris identified as Onondaga, which outcrops closer to the site, all other artifacts are produced on Haldimand chert from about 21 km away (Timmins 1995).

According to Timmins (1995), most of the tools recovered from Stelco I are simple expedient forms. This assemblage also includes a side-notched variant Hi-Lo projectile point, three finely flaked gravers and three small end scrapers. Morphologically and technologically, these seven, less expedient forms are identical to those recovered at Area C of Welke-Tonkonoh and, therefore, serve to establish a commonality in Hi-Lo lithic tool kits. Unlike Area C at Welke-Tonkonoh, evidence of core reduction is present at Stelco I. This evidence is in the form of several larger waste flakes and a single core (Timmins 1995). While such evidence may facilitate the examination of primary lithic reduction, the sample is too small to draw any reliable interpretations.

Other Hi-Lo sites in Ontario, such as the Allan site (Ellis 2004a), are multi-component, or are small, with little in the way of tools and debris, such as the Ageing Maple, Witz, and Koeppe II sites (Murray 1997; Woodley 1997). Still other sites (e.g., the Stewart and Strathroy sites) have only been briefly tested and have not been reported on (C. Ellis: personal communication).

To summarize, beyond surface collections and isolated finds (e.g., Bursey 1998; Timmermans 1999) only a handful of Ontario Hi-Lo sites have been excavated. With few exceptions, virtually all known Hi-Lo component locations are small and are believed to have been occupied for relatively short periods of time (Ellis 2004a). This interpretation is suggested by the low recovery of both tools and debris – similar to earlier fluted point occupations (Ellis and Deller 1990). Hi-Lo components (isolated finds or otherwise) appear to cluster in southern Ontario, in particular close to Lake Erie. As is often the case on earlier sites, Hi-Lo settlement locations seem to include well-drained elevated areas with southern exposure over-looking low-lying, marshy areas – a characteristic Deller (1976, 1979) notes among earlier fluted point encampments.

The projectile point is the most distinctive element of the Hi-Lo tool kit. Non-diagnostic bifaces have also been recovered but they vary enormously in size, shape and quality. It is difficult, therefore, to characterize them as a group. Some may have been knives, preforms for points and other tools, cores for producing tool blanks, or a combination of these purposes (Ellis 2004a).

The definitive Hi-Lo unifacial tool forms recovered to date have been restricted to a handful of examples. Many of these forms are said to mimic those seen on earlier fluted point or Holcombe sites (Deller and Ellis 1992a, 1992b). They include trianguloid end scrapers (some with spurs), simple well-made gravers, beaked or nosed/narrow end scrapers, simple side scrapers and multi-purpose tools with denticulated and notched edges (Ellis 2004a). Nonetheless, some differences are suggested, notably a Hi-Lo preference (not seen on earlier forms) for smaller end scrapers and inverse or underside flake removals on certain unifacial tool forms, such as side scrapers (Ellis 2004b:10; Ellis and Deller 1982:19).

The Double Take Site

The Double Take site (AgHb-240) was initially discovered during an archaeological assessment of subject lands in 1999 and 2000 by the London Museum of Archaeology (LMA 2000a, 2000b). At that time, the site was subjected to test excavations (LMA 2000b) and, later, partial salvage excavations (LMA 2001). Following a brief hiatus, Timmins Martelle Heritage Consultants concluded the salvage excavations during the summer and fall of 2003 (TMHC 2004). With the exception of initial reports mandated by the Ontario Ministry of Culture (LMA 2000a, 2000b, 20001; TMHC 2004), no detailed description or analysis of the recovered assemblage has been completed.

As is the case on several sites noted above, Haldimand chert, a material little used by earlier or later occupants of the region (Parker 1986a, 1986b), is the most commonly used material at the Double Take site (Dickson 2006). Primary Haldimand chert sources occur in a very restricted area west of the Grand River just inland from Lake Erie (Parker 1986a, 1986b; Figure 2). These outcrops are not only the nearest sources to the Double Take site (some 50 km away), they are the only ones known to date. The location of outcrops and the direction of glacial advances in the area means that secondary deposits of Haldimand chert would be located even farther south and west. Regardless, the flat, planar un-flaked original raw material surfaces still present on debris, tools, and cores show that the Haldimand chert reduced at the Double Take site is undoubtedly from a primary bedrock outcrop.

The 2003 mitigative excavations produced 24,159 artifacts, including diagnostic Hi-Lo projectile points. These artifacts are the focus of this analysis. For the most part, the 2003 excavations were conducted using quarter-inch mesh. However, to maximize artifact recovery, six units were excavated using eighth-inch mesh. The 2003 excavations also identified materials from the Middle Woodland period (TMHC 2004). This material included 4,082 lithic items (all Onondaga chert), 59 faunal fragments, one fire-cracked rock and one piece of non-chert detritus that clustered in one area of the site along with 26 diagnostic ceramic sherds. All of the Middle Woodland material, together, comprises 17.3 percent of the entire Double Take site collection. Thus, while the Double Take site can be considered multi-component, the great majority of the material recovered is assignable to a Hi-Lo occupation and can be isolated from the later Middle Woodland component (Dickson 2006). Analysis of diagnostic pieces, lithic debitage and sub-surface features and their distribution demonstrated that all lithic items manufactured from Haldimand chert (n=19,990, comprising 82.7 percent of the site assemblage) were Hi-Lo in origin (Dickson 2006). A few Onondaga lithic items may also be associated but as noted, most of that material clusters with the Middle Woodland diagnostics. The only definitive Hi-Lo item on Onondaga is a single Hi-Lo point.

Artifact Assemblage from Double Take

As noted, based upon spatial analysis and the recovery of diagnostic materials (Dickson 2006) it is suggested that the Hi-Lo component at the Double Take site is comprised of all artifacts manufactured from Haldimand chert plus the one definitive Hi-Lo point on Onondaga (Table 1). It includes 19,803 pieces of chipping debris, 183 tools/preforms, and four cores. These quantities exceed comparable values from other reported Hi-Lo sites and provide the basis for addressing the research questions. The focus here will be on documenting and describing the tool assemblage, with particular emphasis on end scraper morphology and how this tool class compares to earlier and later assemblages. Information on the flaking debris has been presented elsewhere (Dickson 2006).

Bifaces
A total of 92 bifaces were identified within the Double Take assemblage. These bifaces are unfinished and were discarded after breakage in manufacture or because of errors during production. For example, many specimens have irregular and asymmetrical outlines and cross-sections; prepared (e.g., ground, bevelled) platform remnants; frequent minimal and un-patterned flake scars; and edges that have not yet been flaked. In other words, the bifaces recovered from the Double Take site are extremely variable in terms of size, shape, and intensity of workmanship (Figure 3:a-j, n-p and Table 2).

To demonstrate this variability and to show that the entire reduction sequence of biface production is represented in these biface discards, the bifaces from Double Take were assigned to classes representing progressive stages of manufacture using the lithic reduction model presented by Callahan (1979). Stages of reduction include: obtaining the blank and initial edging of the objective piece (Stage 1 and 2); primary and secondary thinning as well as shaping of the biface (Stage 3 and 4); and commitment to the final outline of the biface, including hafting specializations (i.e., notching, stemming, etc.) and/or blade reconfigurations such as bevelling and serrating (Stage 5; Callahan 1979).

Table 1. *Double Take artifact totals.*

Artifact Category	**Non-Haldimand/Middle Woodland**		**Haldimand / Hi-Lo**	
	n	**%**	**n**	**%**
Bifaces	—	—	92	0.46
Ceramics	26	0.62	--	--
Cores	11	0.26	4	0.02
Debitage	4,044	97.00	19,803	99.04
Drills	1	0.02	—	—
Expedient Tools				
Notched Flakes	—	—	6	0.03
Retouched Flakes	4	0.10	30	0.15
Utilized Flakes	7	0.17	18	0.09
Faunal Remains	59	1.42	—	—
Fire-cracked Rock	1	0.02	—	—
Non-chert Detritus	1	0.02	—	—
Projectile Points	8	0.19	3*	0.02
Scrapers	5	0.12	27	0.14
Unifaces	2	0.05	5	0.05
Other Tools	—	—	2	0.01
Total	**4,169**	**100.00**	**19,990**	**100.00**

*One of these points is Onondaga chert

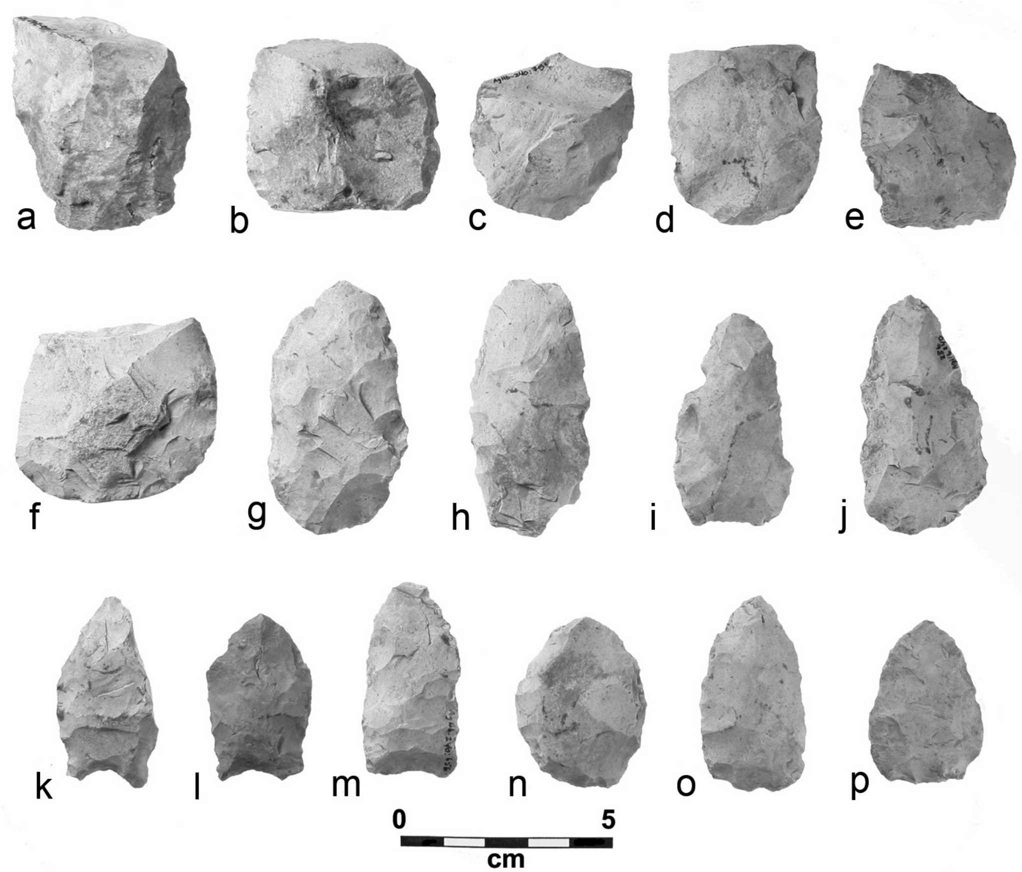

Figure 3. *Biface preform sample and diagnostic projectile points from Double Take. The three Hi-Lo points recovered from the site in 2003 are items k-m.*

Table 2. *Summarized metric data for all bifaces. All measurements are in mm.*

	Mean	SD	CV	Range	Minimum	Maximum
Max. Length	48.083	8.0829	16.810	31.1	33.9	65.0
Max. Width	34.240	8.1663	23.850	47.2	16.6	63.8
Max. Thickness	12.878	3.8596	29.970	19.4	3.9	23.3
Mid-Section Thickness	11.766	3.5332	30.029	16.5	6.8	23.3
Max. Width/Thickness	2.7939	.63627	22.774	2.91	1.43	4.34
Mid-Section Width/Thickness	3.0186	.64496	21.366	2.57	1.77	4.34
Edge Angle	50.94	11.529	22.633	50	29	79

As shown in Table 3, the majority of the bifaces (n=64, 87.7%) are classed in the earlier stages of reduction (e.g., Stages 1–2, as well as Stage 3). Very few late-stage (e.g., Stage 4) and even fewer finished bifaces (e.g., Stage 5) are represented. Unfortunately, due to their fragmentary nature, 19 specimens could not be classified. The above pattern suggests that biface finishing – that is, final edge sharpening and shaping – was likely not an important part of the manufacturing process at Double Take. Rather, bifaces appear to have been roughed out to about Stage 4 and then subsequently transported off site for final finishing and tool production as required. Such a strategy is consistent with what has been recovered at other Hi-Lo sites, particularly the

Table 3. *Biface reduction stages.*

Reduction Stage	Condition		Total	
	Complete	Incomplete	n	%
1 (Early)	2	1	3	4.10
2	6	19	25	34.20
3	16	20	36	49.30
4	3	5	8	10.90
5 (Late)	1	--	1	1.50

biface cache at the Caradoc site (Ellis and Deller 2002) and the three Haldimand chert biface preforms from the Welke-Tonkonoh site (Ellis 2004b; Ellis and Deller 1982:Figure 3:c, d, and e).

Projectile Points

Three classic stemmed Hi-Lo projectile points were recovered by TMHC from the Double Take site (Figure 3:k-m). The first (Figure 3:k) measures 44.6 mm in length, 25.4 mm in width, and 8.1 in maximum thickness. In transverse cross-section the piece is plano-convex with extensive lateral margin retouch on both edges producing an alternately left-bevelled appearance. The original plano-convex cross-section prior to bevelling suggests this tool may have been made on a thin flake rather than by serial biface reduction (Knudson 1973). Remnants of flat unflaked surfaces are present on one face, reinforcing the suggestion of production through direct thin flake manufacture (Knudson 1973). The basal element has shallow concave lateral stem margins, not so demarcated as to be considered notches.

The second projectile point (Figure 3:l) measures 39.9 mm in length, 24.9 mm in width, and 9.5 mm in maximum thickness and is the one on Onondaga chert. Extensive lateral modification to the biconvex transverse cross-section at the tip has produced an alternately right-bevelled, or twisted, appearance to the fore-section. Right bevelling tends to be much less common than left bevelling on Hi-Lo points (Ellis and Deller 1982:8), perhaps because bevelling is related to the handedness of the user. There is a slight concavity to the sides of the stem.

The final projectile point (Figure 3:m) measures 45.7 mm in length, 23.7 mm in width, and 9.9 mm in thickness. Although no intentional modification is evident, the fore-section appears to exhibit a natural body twist – a longitudinal curvature created as a result of a heavy percussive strike early in blank manufacture. This feature suggests manufacture on a thin flake, and results in a slight alternately left-bevelled configuration. An impact fracture, with no evidence of corrective rejuvenation, is also evident at the tip. The bevelling on this and the other projectile points suggests their use as knives or in other non-projectile contexts. However, the impact fracture on this particular specimen indicates its use as a projectile weapon after bevelling had occurred. Thus, the different uses of these tools were not restricted in time. That is, their use as knives did not always succeed their use as projectile points, and vice versa. These tools remained multifunctional until, presumably, any and all use-life was exhausted.

Drills

Only one definitive drill was recovered from the Double Take site – the tip of an extensively flaked bifacial bit end (Figure 4:a). Transverse and longitudinal cross-sections are biconvex and lenticular, respectively. Although fragmentary, maximum linear dimensions are 29.6 mm for length, 13.5 mm for width, and 6.1 mm for thickness. However, the extensive lateral margin retouch exhibited on the bit has produced a nearly, alternatively bevelled transverse cross-section. Hi-Lo projectile points are sometimes reworked into drills (e.g., Ellis and Deller 1982:9) but this item is not complete enough to determine if this is from a recycled point or made as is.

End Scrapers

The Double Take unifacial assemblage includes 18 end scrapers, recognized by the presence of a relatively narrow, steeply retouched, and typically convex working edge at the distal end of an elongated flake. This assemblage is by far the largest

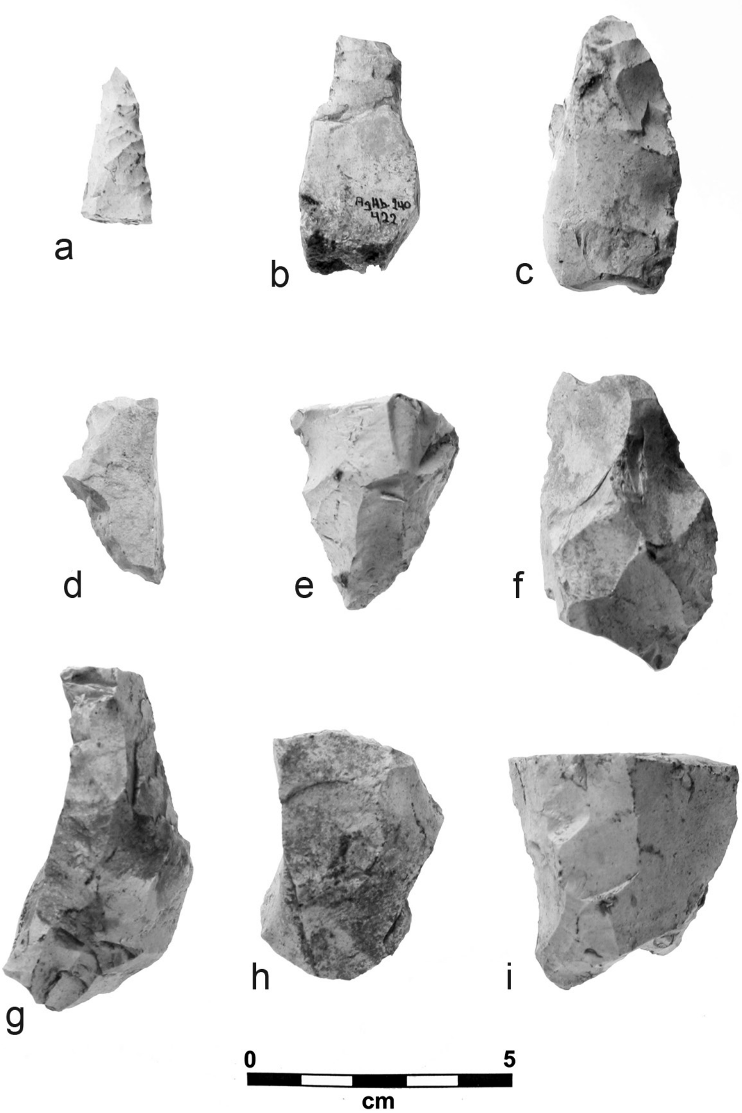

Figure 4. *Other tools and cores: drill tip (a); possible drill or drill preform fragment (b); scrapers (c-e), of which item c is made on a broken biface; and cores (f-i).*

one of this tool type that can be attributed to Hi-Lo, allowing generalizations and comparisons with occasional previously reported examples. The Double Take end scrapers are most certainly manufactured from large flake blanks and tend to taper towards their proximal ends. Some specimens display slight trianguloid outlines while others are parallel-sided except for tapering at the proximal end. Dorsal and/or ventral thinning of the proximal end is present on only 11.7 percent of end scrapers. Nevertheless, proximal end dimensions are consistent, demonstrated by low coefficient of variation values (Table 4). These values may be interpreted as indicating hafting standardization, facilitating insertion of the stone element into a handle or shaft (Daniel 1998; Keeley 1982).

Following the lead of others (e.g., MacMillan 2003), the Double Take end scraper assemblage was classified into three types based on the position and extent of retouch, and the presence or absence of hafting modifications. Variety-1 end

Table 4. *Select end scraper metrics by variety/sub-type.*

	N	R	X	S	CV
Length (mm)					
Variety 1	2	26.6 to 31.9	29.25	3.7477	12.8126
Variety 2	8	23.2 to 48.8	31.49	9.5625	30.3687
Variety 3	2	26.0 to 39.1	32.55	9.2631	28.4581
Width (mm)					
Variety 1	2	23.4 to 29.8	26.60	4.5255	17.0132
Variety 2	8	16.6 to 31.6	23.38	5.2448	22.4376
Variety 3	2	19.6 to 52.2	35.90	23.0517	64.2109
Thickness (mm)					
Variety 1	2	4.9 to 6.3	5.60	0.9899	17.6768
Variety 2	8	4.5 to 9.4	6.34	1.6911	26.6861
Variety 3	2	7.4 to 13.6	10.50	4.3841	41.7533
Proximal Thickness (mm)					
Variety 1	2	—	4.20	—	—
Variety 2	9	2.8 to 7.8	5.03	1.5330	30.4590
Variety 3	—	—	—	—	—
Proximal Width (mm)					
Variety 1	2	16.5 to 20.3	18.40	2.6870	14.6033
Variety 2	9	10.8 to 22.2	17.02	3.6646	21.5286
Variety 3	—	—	—	—	—
Bit Angle					
Variety 1	3	69 to 88	80.00	9.8490	12.3113
Variety 2	11	39 to 78	62.82	11.9320	18.9940
Variety 3	3	78 to 89	85.00	6.0830	7.1565
Bit Thickness (mm)					
Variety 1	3	3.4 to 6.5	4.97	1.5503	31.2120
Variety 2	11	2.2 to 9.5	4.64	2.1598	46.5876
Variety 3	3	3.1 to 7.0	5.10	1.9519	38.2725
Bit Width:Depth					
Variety 1	3	2.78 to 3.97	3.29	0.6116	18.5704
Variety 2	11	1.81 to 5.16	3.08	0.8534	27.6994
Variety 3	1	—	2.11	—	—

scrapers (Figure 5) exhibit well-executed, parallel flaking that originates from the lateral margins and completely covers all or most of the dorsal surface. Typically, this retouch results in a smooth surface and a consistent plano-convex transverse cross-section. Of the 18 end scrapers at the Double Take site, three specimens (17 percent), only two of which are relatively complete, are identified as Variety 1. While very common on some Early Archaic sites like Nettling (Ellis et al. 1991:13; MacMillan 2003), Variety-1 end scrapers are less common, though present, on Late Paleoindian sites (Dibb 1985; Julig 1994; Stewart 1984). They are almost non-existent on Early Paleoindian fluted point sites (MacMillan 2003). Thus, the low frequency of Variety-1 end scrapers at the Double Take site is more consistent with a Late Paleoindian affiliation than with an Early Archaic one.

A total of 12 end scrapers are recognized as Variety 2 (67 percent of all end scrapers). Variety-2 end scrapers exhibit “only marginal or no dorsal retouch” (Ellis et al. 1991:13). Although they share a similar outline shape to Variety 1, they are often more elongated, blade-like and narrower (Figure 5, Table 4). Although differences in mean measurements for various widths are not entirely statistically significant (Table 5), superficial morphological appearances tend to suggest an almost blade-like nature of some of the tools (Figure 5:f, h, and m).

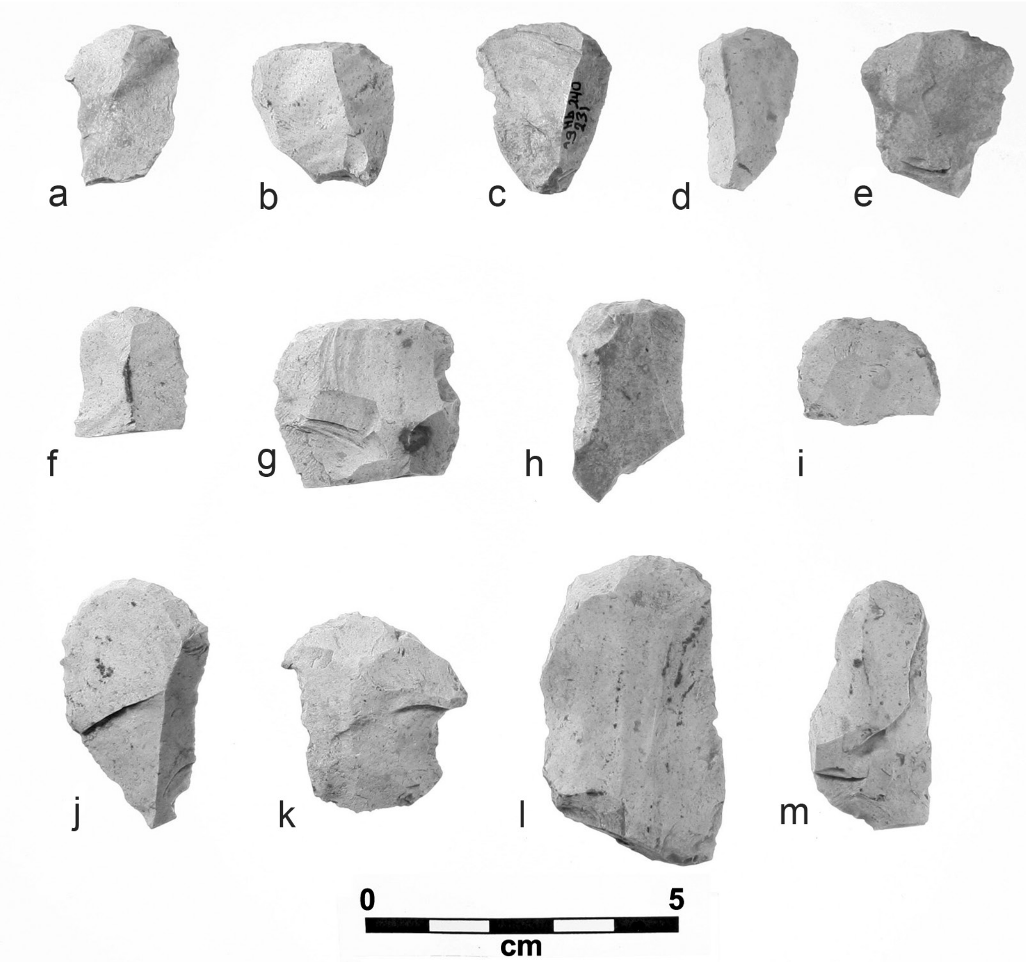

Figure 5. *Variety 1 (e, g, k) and Variety 2 (a-d, f, h-j, l, m) end scrapers.*

The difference between these two varieties may be related to blank selection and tool production preparation. The extensive "all over" flaking of Variety 1 is required to narrow and shape Variety-1 end scraper blanks, whereas those blanks selected for Variety 2 end scraper production were already narrow flakes to begin with, requiring less extensive retouch. Flaking is primarily restricted to the bit and proximal ends, with slight lateral margin retouch on only a handful of specimens.

Unlike both Variety-1 and Variety-2 end scrapers, Variety-3 end scrapers tend to be more variable in size and shape, and exhibit no evidence of hafting modifications (MacMillan 2003). Variety 3 specimens lack evidence for hafting and are, therefore, interpreted as hand-held tools. Like Variety 1 specimens, Variety 3 end scrapers are represented by only three specimens so that very little can be said about the category as a whole. High coefficients of variation (CVs), particularly for maximum tool width and thickness (Table 4), supports the idea that the Variety-3 assemblage includes tools that were perceived as different by their makers and users (Eerkens and Bettinger 2001). The sample is, however, small and not all attributes share equally high CVs. Variability may result, instead, from tool manufacture on opportunistically selected flake blanks. Given the intended use of such tools, standardization of size

Table 5. *Statistical testing for continuous variable differences between Variety 1 and Variety 2 end scrapers.*

Variable	*t*	*df*	Sig. (2-tailed)
Maximum Length	-0.178	9	0.862
Maximum Width	0.918	9	0.383
Maximum Thickness	-0.543	9	0.600
Proximal Width	0.619	10	0.550
Proximal Thickness	-0.658	10	0.525
Platform Length	-0.204	7	0.844
Platform Width	-0.573	8	0.583
Platform Angle	-1.190	8	0.268
Bit Angle	2.131	13	0.053
Bit Width	2.324	13	0.037
Bit Thickness	0.366	13	0.721
Bit Depth	0.956	13	0.356
Bit Width:Depth	-0.318	13	0.756

and form may not have been an important concern. Lack of standardization may further support the assertion that these tools were not hafted. High variability, especially for thickness, would not have facilitated the inter-changeability of stone tool elements into a limited supply of hafts.

It is useful to consider blank selection and scraper reduction/use characteristics for Variety 1 and the other end scrapers. Previous researchers have documented the use of flakes from both blocky tabular cores and biface cores, and their respective flake by-products, in early assemblages (e.g., MacDonald 1968; Wright and Roosa 1966). Traditionally, however, biface cores are often seen as more "typically" Paleoindian (e.g., Ellis and Deller 2000; Kelly and Todd 1988: Wilmsen 1970). Blanks derived from block cores tend to be more parallel-sided, long and narrow, and retain prepared or unprepared striking platforms matching those on the parent piece (Callahan 1979). Lothrop (1988:108) adds that blanks from block cores tend to exhibit higher striking platform angles (averaging 76.4 degrees at the Paleoindian Potts site). Similarly, Daniel (1998:139) notes that block-derived blanks possess large flat striking platforms with relatively obtuse angles (i.e., closer to 90 degrees). Furthermore, these blanks exhibit more triangular cross-sections as block corners or the more pronounced flake scar ridges from previous removals are used to guide subsequent flake removals (Lothrop 1988:108). Platform faceting, or pseudo-faceting, may be apparent on "later" stage removals reflecting core platform rejuvenation attempts (Daniel 1998:139). Daniel (1998) recognizes less complex dorsal scar patterns (with fewer dorsal flake scars), thicker cross-sections and more variable shapes for block-derived blanks compared to biface-derived blanks.

Biface-derived blanks are identified by the presence of striking platform angles closer to 70 degrees, reflecting the acute edge of a biface platform (Callahan 1979:117; Lothrop 1988:108). These platforms tend to be facetted with multiple flake scars and often display various preparation techniques, such as grinding (Callahan 1979:30). Grinding is often used to thicken and strengthen the weak, thin edge of the biface core prior to subsequent flake removal. Biface-derived flake blanks tend to exhibit more complex dorsal scar patterns as a result of prior multiple flake removals, sometimes convergent, originating from opposed margins. Unlike block-derived blanks, blanks from bifaces tend to exhibit varying degrees of longitudinal curvature. When longitudinal curvature is exhibited by block-derived blanks it is typically abrupt and distal – a result of the force of the flake rolling in towards the objective piece as it nears the end of the blocky core. In contrast, the apex of curvature on a biface-derived blank may be positioned anywhere along its length between proximal and distal end.

Of course, blanks from bifaces may not have been derived from true bifacial cores, a form of portable raw material for blank production (Deller and Ellis 1992; Knudson 1973; MacDonald 1968). Instead, Double Take site toolmakers may have been selecting appropriate flakes that were produced during the reduction of larger preforms into smaller bifacial tools (Kelly 1988) – a pattern recognized at the Potts site (Lothrop 1988). In other words, both larger bifacial cores and relatively smaller bifacial preforms can be used for producing blanks for certain tool types. Lothrop (1988) suggests that blanks from biface cores, which would have been fairly large, were produced intentionally, whereas smaller flakes derived from bifacial preforms (during biface manufacture) would have been selected opportunistically.

Variety-1 end scraper blank type identification is difficult for several reasons: the original dorsal scar pattern of the blank is no longer intact due to extensive dorsal-lateral retouch; this same extensive retouch continues towards the proximal end, altering or removing the original characteristics associated with the striking platform; and the specimens recovered from the Double Take site are either fragmentary (n=1) or, at best, only relatively complete (n=2). As a result, some of the identifying platform or proximal end characteristics are damaged or missing. As a result of these difficulties only one specimen could be classified – a biface-derived blank. All others were indeterminate. Given the small sample size of the Variety-1 end scrapers (n=3) and a lack of positive blank identifications, few conclusions can be drawn about blank selection.

As they are less reduced, Variety-2 end scraper blank type identification was more successful. Of 12 specimens, four are block-derived and five are biface-derived blanks, while three are indeterminate. These blank type preferences seem more similar to Paleoindian site than to Early Archaic site preferences. Paleoindian preferences for end scrapers, are for biface-derived blanks, or show a relatively equal distribution between the two types (Table 6). The exception is the Snary site, where the sample size is small (n=3; Table 6). In contrast, the limited Early Archaic data, available only for the Nettling site, has the lowest percentage of biface-derived blanks. Based on blank type preferences alone, selection of such blanks at Double Take seems to follow the preference trends of other Paleoindian sites.

Based on the extent of bit retouch and the variability in length exhibited by the Double Take end scrapers, repeated use and re-sharpening of these tools is supported. Juliet Morrow (1997) suggests that as hafted end scrapers are retouched through their use-lives, their bits will become steeper and flatter. In other words, as end scrapers become re-sharpened, they should exhibit a reduction in bit convexity and a corresponding increase in the steepness of bit angles (J. Morrow 1997:77). These characteristics will emerge as the tool is shortened during retouch: eventually, the additional flaking required to re-sharpen the edge near the sides/corners of the bit cannot proceed beyond the point where the tool makes contact with the haft. Stone tools utilizing socket hafts can have retouch applied only to the highest point of convexity (towards the centre of the bit), whereas slot-hafted tools – with bit corners exposed – can continue to be re-sharpened while maintaining a convex edge shape (Ellis and Deller 2000). In contrast, the bits

Cultural Complex/Site		**Blank Type**			
		Biface-Derived		**Block-Derived**	
		n	**%**	**n**	**%**
Early Paleoindian	Butler	6	75.0	2	25.0
	Dixon	3	60.0	2	40.0
	Fisher	4	57.1	3	42.9
	Thedford II	7	58.3	5	41.7
	Parkhill	10	43.5	13	56.5
	Gainey	6	50.0	6	50.0
	Snary	1	33.3	2	66.7
	Udora	7	70.0	3	30.0
Late Paleoindian	Deavitt	8	47.1	9	52.9
	Double Take	5	55.6	4	44.4
Early Archaic	Nettling	14	31.8	30	68.2

Table 6. *Comparing end scraper blank type preferences across cultural complexes.*

of socket-hafted tools become flatter as only the centrally located convex portion is re-sharpened.

Variety-1 end scrapers have a mean bit width to depth ratio of 3.29 (Table 4), indicating relatively flatter bits overall. Within this variety, bit angles are consistently steep, averaging 80 degrees. These measures of reduction suggest that the Variety-1 end scraper assemblage includes highly retouched, and perhaps more fully exhausted, tool specimens.

Variety 2 end scrapers show increased variability with a higher CV (27.69 versus 18.57 for Variety 1; Table 4). Typically, they also possess more convex bits, averaging a bit width to depth ratio of 3.08. Variety 2 bit angles are also more acute than their Variety 1 counterparts, averaging 62.8 degrees. Taken collectively, these measures of reduction suggest less intense re-sharpening and, perhaps, discard prior to tool exhaustion. The presence of so many non-exhausted discarded tools may indicate little concern for raw material and/or tool curation.

An attempt was made to further explore these ideas and see how the Hi-Lo end scrapers compare to those of earlier and later assemblages. The Double Take end scrapers were compared to items from other sites for which detailed data were available. These sites included Parkhill (Ellis and Deller 2000), representing the Early Paleoindian period, and Nettling (MacMillan 2003), representing the Early Archaic period (Table 7). The results of analysis of variance (ANOVA) show that there are significant differences among the three assemblages in all characteristics except in terms of bit depth and maximum tool length (Dickson 2006). Tukey post-hoc tests allow evaluation of which particular assemblages are different and contributing to these significant results (Dickson 2006).

In contrast to the Parkhill trianguloid end scrapers (a Paleoindian fluted point-associated assemblage), the Double Take end scrapers are significantly narrower and thinner. The Double Take end scrapers also possess significantly narrower and thinner bit ends. Maximum length and bit depth do not differ significantly between

Table 7. *Descriptive statistics for end scraper comparisons. All metrics are in mm.*

Site	Variable	N	Range	Minimum	Maximum	Mean	Std. Deviation
Nettling	Maximum Thickness	85	6.8	3.1	9.9	6.133	1.4912
	Bit Width	93	18.6	12.1	30.7	20.528	3.2573
	Bit Depth	93	9.1	3.6	12.7	7.427	2.1722
	Bit Thickness	97	5.7	1.6	7.3	4.529	1.2658
	Bit Width:Depth	91	3.6	1.5	5.1	2.943	.7048
	Maximum Length	72	29.2	20.1	49.3	33.960	7.1923
	Maximum Width	86	15.1	15.6	30.7	21.288	3.0234
	Bit Angle	99	50.0	32.5	82.5	59.8737	10.42694
Parkhill	Maximum Thickness	22	10.5	4.3	14.8	8.145	2.7976
	Bit Width	21	9.2	20.9	30.1	26.052	2.8294
	Bit Depth	22	11.8	3.0	14.8	6.673	2.5643
	Bit Thickness	22	9.7	3.5	13.2	7.227	2.8011
	Bit Width:Depth	21	5.0	2.0	7.0	4.263	1.2330
	Maximum Length	17	23.2	25.8	49.0	33.218	6.2838
	Maximum Width	21	9.4	20.7	30.1	26.576	2.7386
	Bit Angle	27	27.5	52.5	80.0	67.7273	7.43660
Double Take	Maximum Thickness	11	4.9	4.5	9.4	6.136	1.4895
	Bit Width	15	14.3	15.4	29.7	22.140	4.8344
	Bit Depth	15	10.9	1.5	12.4	7.173	2.8131
	Bit Thickness	15	7.3	2.2	9.5	4.580	1.9839
	Bit Width:Depth	15	9.6	1.8	11.4	3.678	2.2682
	Maximum Length	11	26.2	22.6	48.8	30.273	8.5259
	Maximum Width	11	15.0	16.6	31.6	23.691	4.9152
	Bit Angle	15	47.5	40	87.5	67.1667	12.67262

the Parkhill and Double Take assemblages. But since end scraper length and bit depth are altered, typically lessened, by re-sharpening efforts (J. Morrow 1997), they are not good indicators of original artifact size. While these results must be interpreted with caution, as only one fluted point Paleoindian assemblage (e.g., Parkhill) was used for comparison, the statistically significant differences in artifact width (both maximum and bit) and thickness (again, both maximum and bit) suggest that Hi-Lo end scrapers are smaller than earlier Paleoindian examples.

It is also worth noting that no difference is discernable between Parkhill and Double Take end scrapers in terms of bit width to bit depth ratios. Their respective ratios, 4.3 and 3.7, indicate that the bits are relatively wide versus their depths, or are, in other words, flat. These contrast with the more convex Nettling assemblage at 2.9 (Table 7). Furthermore, no significant difference is noted in bit angle between the Parkhill and Double Take end scrapers – in both assemblages, relatively steep, whereas the Nettling examples are more acute (Table 7). If flattening, or a reduction in bit convexity, and a corresponding increase in the steepness of bit angles are measures of re-sharpening intensity (Ellis and Deller 2000:102-107; J. Morrow 1997:77) the Double Take and Parkhill items are exhausted relative to the Nettling assemblage.

The Double Take end scrapers, as a whole, tend to be exhausted despite the fact that new raw material is locally and abundantly available, as indicated by the abundance of flaking debris and cores. Therefore, these end scrapers may represent discards from a tool kit that had been largely used up elsewhere and were being replaced through "gearing up" activities conducted at the Double Take site. The gearing up focus of the site occupation is suggested by the large number of earlier stage biface rejects described above as well as the earlier stages of manufacture represented amongst the flaking debris (Dickson 2006).

In their overall size (e.g., maximum width, maximum thickness, bit width, and bit thickness), the end scrapers from Double Take are more similar to the Early Archaic end scrapers from the Nettling site than they are to the Paleoindian end scrapers from Parkhill. In other words, the Nettling and Double Take end scrapers are both smaller than their earlier Paleoindian counterparts at Parkhill. As discussed above, the only statistically significant difference between the Nettling and Double Take end scraper samples concerns bit width to bit depth ratios, and the bit angle, suggesting that the Double Take end scrapers are much more exhausted, or re-sharpened, than their Early Archaic counterparts.

The end scrapers from Parkhill and Nettling share only two characteristics in common, namely, maximum length and bit depth. Such measures, however, are poor indicators of original artifact size due to their susceptibility to re-sharpening. Overall, these comparisons show that Hi-Lo end scrapers are significantly smaller than earlier Paleoindian forms and that, as Ellis (2004b:66) has argued in the past, they may be more Archaic-like in this regard. In fact, a closer examination of mean values (Table 7) shows that, despite the statistically significant differences noted above, the Double Take averages are almost always intermediate between the Parkhill (Early Paleoindian) and Nettling (Early Archaic) averages. This, in turn, suggests a relatively gradual and directional change over time, in which size decreases.

Unifacial "Preforms"

Five specimens have been identified as unifacial "preforms" – not necessarily because they are idealized blanks or templates for unifacial tool production, but because they do not fit into any formal tool category (Figure 6). Because they are unique and may serve as potential diagnostic Hi-Lo items, these "preforms" deserve further description. All of these specimens have extensive dorsal-lateral retouch on one face, averaging 7.0 flake scars. These flake scars are quite large and are no doubt intended to remove large surface portions of the face. They most certainly are not smaller retouch flakes of the kind seen on typical Paleoindian side scrapers. In 60% of these specimens, dorsal scar orientation is convergent with overlap; that is, flake scars from opposing margins undercut one another at the centre of the face, and the dorsal cortex has been removed (20%) or nearly removed (80%).

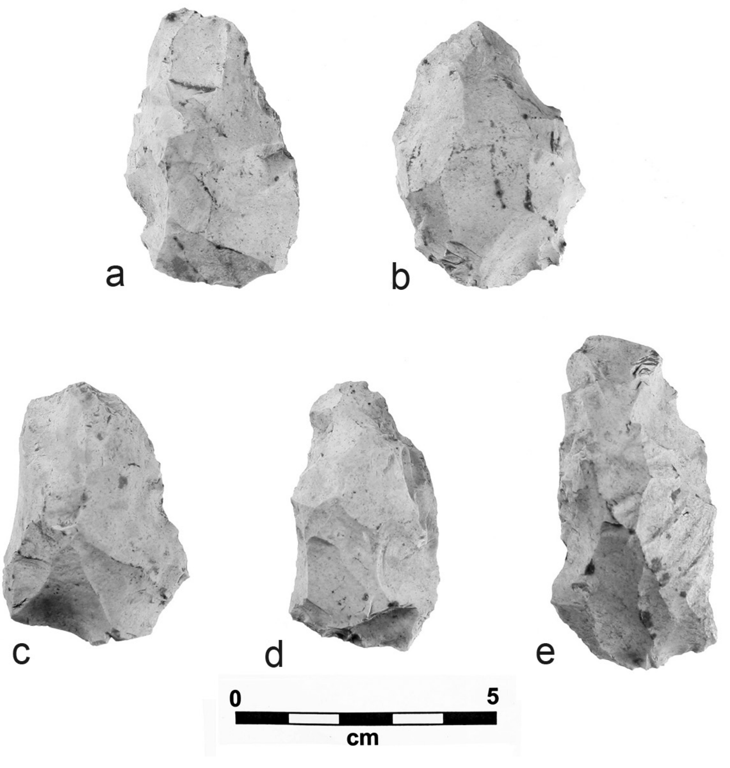

Figure 6. *"Unifacial preforms," Double Take site.*

The obverse face is always flat, producing overall transverse cross-sections that always exhibit one flat face, such as triangular or off-set triangular. Some ventral flaking occurs (3.8 flake scars on average), but the flake removals appear to have been intended to accentuate the flattened nature of the face, as opposed to creating a more biface-like cross-section. Furthermore, these ventrally removed flakes also seem to have been removed to decrease the amount of longitudinal curvature exhibited by the preform. They do not seem to create a more centred bifacially flaked margin in profile (as is desired in serial biface production). The differential, albeit intentional, modification on both faces produces plan outline shapes that are typically irregular.

Not only are plan shape and transverse and longitudinal cross-sections consistent among these specimens, so, too, are maximum linear dimensions. Length averages 53.2 mm, with a CV of 11.69. Similarly, thickness averages 15.58 mm, with a CV of 12.17. Width is slightly more standardized (CV = 6.26); it ranges from 31.9 mm to 37.2 mm, with an average of 34.7 mm. Edge angle is also highly standardized, averaging 54.1 degrees, with a CV of 5.9339.

The intended function and/or purpose of these pieces remain elusive. In comparison to the end scrapers previously described in the literature, these preforms are too large to have served as effective templates for end scraper production without additional and extensive flaking. Nor do they seem appropriate as templates for biface manufacture, because existing flaking seems intent on maintaining a primarily unifacial form. They could be used as sources of raw material (i.e., specialized unifacial cores) designed for producing thin flake blanks. After all, they are relatively standardized, at least in terms of overall size, shape, and form.

Alternatively, these objects may represent novice attempts at biface manufacture.

The fact that thick edge segments and step fracturing are consistently evident on all pieces suggests unsuccessful attempts, or practice attempts, at thinning/reduction flake removals.

Moreover, the typically irregular plan outlines, small overall size, and haphazard bifacial flaking also point to novice flintknapping (Chris Ellis: personal communication; see also Milne 2005).

A further, speculative explanation for these objects can also be advanced. As noted above, bifaces (including projectile points) can be made in one of two ways: through serial biface reduction or through direct thin flake manufacture (Knudson 1973). Finished bifaces produced as a result of the latter technique tend to have plano-convex transverse cross-sections and ventral surfaces retaining flat, unflaked original flake surfaces. Ellis and Spence (1997) argue that the utilization of the direct thin flake manufacturing process is more suitable, or easy to use, in cases where access to abundant raw materials is available and when immediate use of the finished product is required.

One of the projectile points from the Double Take site exhibits characteristics associated with direct thin flake manufacture (e.g., flat ventral surface, plano-convex cross-section). The fact that the "unifacial" objects in question also share these characteristics suggests they may be preforms for site-specific Hi-Lo points. Yet, direct thin flake manufacturing preforms and finished products are not the ideal forms to transport, because they are more prone to damage and do not have the flexibility to easily be made into very different bifacial tools or retouched to fit a variety of haft types and sizes, such as projectile points, knives, and drills (Ellis and Spence 1997). Nor do they provide additional raw material.

Thus, the two different manufacturing strategies described by Knudson (1973) could be in operation simultaneously at Double Take. First, direct thin flake manufacturing processes were employed to satisfy the immediate needs of the Double Take occupants. Second, serial biface reduction strategies were utilized to produce roughed-out bifacial preforms that could be transported off-site for future usage away from quarries. However, whether or not both manufacturing strategies were in operation at the Double Take site itself is difficult to ascertain.

One last explanation is also plausible. These items could be classified as large "bifacial" side scrapers or denticulates. Such items have been reported and indeed classified as such at other Hi-Lo sites, including Area C at Welke-Tonkonoh (Ellis 2004b), Stewart (Chris Ellis: personal communication), and Koeppe II (Woodley 1997). Regardless of the classification problems or discrepancies of these pieces, they most certainly are a recurrent and distinctive artifact form occurring on Hi-Lo sites.

Expedient Tools

Expedient tool forms are recognized by an absence of intense flaking. Often, they are simply waste flakes derived from stone tool reduction that exhibit some form of use-wear on a margin. Because they are largely derived from waste flakes, expedient tools tend to be highly variable in terms of linear dimensions, shape, and position of use-wear. A total of 54 expedient tools are recognized in the Double Take assemblage. Based on morphological characteristics observed at the macroscopic level, including use edge location and extent of wear, expedient tools were classified into three distinct types. Retouched flakes exhibit one or more margins with extensive, clearly identifiable, and more or less continuous retouch. This retouch, however, has not been applied to create the kinds of consistent forms seen in formal tool categories (i.e., scrapers, knives, and drills). Utilized flakes exhibit minor or minimal wear, or slight intentional retouch, on one or more margins. These use-wear edges may be continuous or discontinuous and tend not to form any predictable or repeated shape or form. Notched flakes describe a specific form of retouched margin whereby the extensive retouch has created a markedly concave, or notch-like, use edge. Within the Double Take assemblage, retouched flakes are most prominent (55.6%), followed by utilized (33.3%) and notched (11.1%) flakes.

With the exception of notched flakes, no preference for blank type is apparent among any of the expedient tool types (Table 8). However, given the small sample size of notched flakes (n=6), the apparent preference for blank type may be the result of sample skewing. Since flakes from all stages of reduction were utilized for

Table 8. *Expedient tool blank type preferences.*

Blank Type	Expedient Tool Type: Utilized Flake		Retouched Flake		Notched Flake	
Core Reduction/Trimming Flake	**n**	**%**	**n**	**%**	**n**	**%**
Large Biface Reduction Flake	5	27.8	8	26.7	4	66.7
Small Biface Reduction Flake	4	22.2	13	43.3	1	16.7
Flake Fragment	2	11.1	2	6.7		
Indeterminate	2	11.1	1	3.3	1	16.7
	5	27.8	6	20.0	—	—

expedient tool production (from core reduction to biface reduction, as well as for flake fragments), expedient tool blank selection appears to be random or, at best, opportunistic, with few criteria determining selection, other than a thin, sharp edge or being large enough to grip easily.

In order to examine the degree or intensity of retouch, retouch intensity values were tabulated for the expedient tools. The reduction index or value is calculated by dividing the use edge thickness by the maximum thickness of the flake (and is a method developed by Kuhn [1990:584]). This value provides a rough estimate of the degree of retouch or reduction that the use edge of an expedient tool has received. Heavily retouched edges should exhibit values closer to 1.0, whereas minimally reduced use edges should have values closer to zero. Retouch intensity indices for expedient tools (Table 9) are consistently moderate for all expedient tool types. In other words, because raw material availability was abundant – due to a short distance to source and the abundant debris produced during stone tool manufacture at the site – curation of these tool forms was not important. It seems reasonable to conclude that, given access to ample raw material, toolmakers would be less likely to invest time and energy in flake edge refinement, because it would be faster to produce a new expedient tool through additional flake removal or opportunistic debris selection (Nelson 1991; Parry and Kelly 1987).

Other Tools

This category is a residual one that includes four items. One is an unclassified tool fragment (Figure 4:b). The blocky piece is tapered towards one end where two scraping edges are present. These two edges provide the piece with an alternatively bevelled cross-section. Both use edges are incomplete due to a snap at the extreme end, suggesting a continuation of the working edge. This alternatively bevelled, tapered projection may represent a drill in manufacture. However, because flaking is limited to marginal retouch, this classification is merely speculative.

Another tool fragment (Figure 4:d) is represented by a blocky piece of Haldimand shatter. A small length (12.5 mm) of an indeterminate margin has been extensively flaked, forming an acute-angled (43-degree) edge. Although this piece is too fragmentary to be able to accurately discern the tool type, this piece may represent a broken section of a hand-held scraper.

A third tool fragment (Figure 4:e) is largely unifacial. It is snapped across the mid-section and has been extensively worked on the dorsal surface and only minimally worked on the ventral surface (restricted to the extreme edges). An examination of the dorsal surface shows a large area with numerous step fractures. On the opposite margin, intense flaking has created a thin, sharp, and acute-angled (48-degree) edge. The piece is triangular in transverse cross-section. Overall

Table 9. *Expedient tool reduction indices.*

Expedient Tool Type	Reduction Index Statistics: Mean	Standard Deviation	Coefficient of Variation	Minimum	Maximum
Utilized Flake	0.3499	0.1324	37.8350	0.1333	0.3000
Retouched Flake	0.5091	0.1326	26.0572	0.2500	0.8289
Notched Flake	0.5549	0.2109	38.0009	0.2500	0.7879

morphological characteristics suggest this may be a large fragment of a hand-held scraping tool.

A final tool of note is another hand held scraper (Figure 4:c) apparently made by recycling a biface preform edge/tip segment. The biface, which had a plano-convex cross-section, had snapped along one lateral edge (left edge in photo) as well as across the basal end. Subsequently, a series of continuous well-executed retouch flakes were removed all along the snapped edges on both the side and base originating from the plano face and resulting in a continuous, steep (80-85 degrees) scraper retouch.

Discussion

The description and analysis of the stone tool assemblage from the Double Take site provides a good basis for expanding our understanding of the Hi-Lo lithic industry and preferences. Specifically, it provides much needed documentation of the until now relatively undocumented Hi-Lo tool kit. Understanding the Hi-Lo industry and tool kit can assist us in monitoring the nature of change occurring in the tool kits of early southern Great Lakes groups during the Paleoindian to Early Archaic transition.

The Double Take site has a much larger tool assemblage than any previously investigated Hi-Lo site. The analysis reveals that most of the assemblage consists of items that were discarded in manufacture, such as biface performs, as well as simple expedient tools, such as utilized, notched, and retouched flakes. The assemblage of trianguloid end scrapers represents the largest collection of this Hi-Lo tool type reported to date. This analysis and analyses by other researchers have shown that parallels exist in the lithic reduction strategies of previous and succeeding developments; that expedient tool use was opportunistic at best; and that a second unique and perhaps diagnostic artifact class exists in addition to the Hi-Lo projectile point.

An examination of the biface discards has shown that few biface preforms reached late-stage reduction (e.g., small, thin, and finely retouched/flaked), whereas early-stage reduction is more prominent. This may suggest that biface preforms were being "roughed out" at the Double Take site and subsequently transported to other, non-quarry sites. This interpretation is supported by the fact that only finished or near-finished biface preforms (many of Haldimand chert) have been reported from other, non-quarry Hi-Lo sites (e.g., Welke-Tonkonoh, Caradoc). However, further detailed analysis of the bifaces and debitage from Double Take is required to more fully understand the lithic reduction and transportation strategies occurring at the site.

The recovered projectile points, all "Classic" stemmed Hi-Lo variants, display alternate bevelling to their fore-sections. This, in conjunction with an impact fracture located at the tip of one of the items, suggests that these projectile points were utilized as both knives and projectiles. Moreover, certain characteristics of these items, particularly plano-convex transverse cross-sections and remnant unflaked surfaces, suggest some production through direct thin flake manufacture.

More end scrapers were recovered from Double Take than from any Hi-Lo site to date. An analysis of these end scrapers revealed that, despite the fact that the producers of these tools had ready access to abundant raw material, most specimens appear to be exhausted or close to exhausted, as measured by relatively flat bits and steep bit angles. Bit retouch intensity measures (e.g., bit angle, bit width to depth) are similar to other Paleoindian end scrapers (e.g., Parkhill), but the scrapers are significantly more exhausted than Early Archaic ones (e.g., Nettling). However, despite the similarities in bit exhaustion, the Double Take end scrapers are, overall, significantly smaller in size than their Paleoindian counterparts and in this regard are more similar to Early Archaic end scrapers. Furthermore, based on the position and extent of retouch, and the presence or absence of hafting modifications (MacMillan 2003), many of these end scrapers are Variety 2 (67%), meaning that they have received only marginal or no dorsal surface retouch. In other words, little post-detachment modification of the blank is required to produce a consistently shaped form. That fact, and the fact that most are manufactured from biface-derived blanks, indicates they are original removals from standardized biface cores.

It seems plausible to suggest that the recovered end scrapers at Double Take represent discarded tools that largely had been used up elsewhere. The Double Take site, therefore, may represent a "gearing up" location at which biface preforms were manufactured for later – and distant – use and at which blanks for unifacial tools (e.g., end scrapers) were replenished and maybe even re-hafted. After all, Keeley (1982) notes that the context of hafted tool recovery at discard sites, such as the Double Take end scrapers (at least Varieties 1 and 2), may not be equivalent to the context (or site) of their use.

The examination of end scraper production via blank selection is also instructive. No statistically significant preference is discerned for block-derived versus biface-derived blank selection (five biface-derived versus four block-derived blanks). As such, it would seem that end scraper production proceeded opportunistically by selecting flakes that require minimal modification. As always though, the indifference for end scraper blank selection may be situational, because an ample supply of flakes was available at the Double Take site for opportunistic use. Such opportunistic flake selection is typically not available at other Hi-Lo or Paleoindian sites because flake quantities, particularly those of adequate size and form, are minimal. On the other hand, a comparable preference for biface-derived blanks is noted at many other, earlier fluted point Paleoindian sites (Table 6).

Biface-derived blanks were marginally more preferred than block-derived blanks at Double Take (55.6% versus 44.4%), whereas at the Early Archaic Nettling site, biface-derived blanks were much less preferred than block-derived blanks (31.8% versus 68.2%). In sum, the frequencies of blank type preference at Double Take are more similar to those on fluted point sites than those on Early Archaic sites (e.g., Nettling), where biface-derived blanks are much rarer. At face value, these proportions suggests Hi-Lo blank preferences may be more similar to those seen on Paleoindian sites, where more biface-derived blanks are used. And they may even suggest a greater preference for standardized blank production, often argued to be a Paleoindian, as opposed to Archaic, trait. A greater emphasis on standardized blank production, specifically biface core standardization, may suggest a more mobile lifeway and a need for a more portable tool kit in comparison with the subsequent Early Archaic. This interpretation must be approached with some caution, however, because only one Early Archaic assemblage was used in the comparison. The Nettling site is the only comparative site in which tool stone preference was directed more towards local than towards distant materials. As such, the lack of biface-derived blanks at Nettling may be the result of local raw material abundance rather than of a "cultural" difference.

The fact that very little post-detachment modification was made to the Double Take end scraper blanks may support this interpretation. Ellis (1984) notes that flakes from biface cores are ideal for end scraper blanks without modification because 1) their lateral edges naturally expand and can easily be fitted in a socketed handle; 2) they are naturally thin and this, too, facilitates socket hafting without modification; and 3) they are slightly curved, which is a desired end scraper blank trait. In sum, flakes from biface cores are well suited as blanks for end scraper production because very little post-detachment modification is required. The use of this strategy is further supported by the recovery of a significant number of Variety 2 end scrapers (n=12, 67%).

It is worth noting that Variety 1 end scrapers, typically more characteristic of Late Paleoindian sites and absent on fluted point sites, were also recovered at Double Take (n=3, 17%). Variety 1 end scrapers are much more common on Early Archaic sites, such as Nettling (37%) (MacMillan 2003:58). At face value, therefore, the Hi-Lo end scrapers are more like Late Paleoindian assemblages in their de-emphasis on Variety 1 end scraper use; at the very least they appear to be transitional between Early Paleoindian, where this variety does not occur, and Early Archaic, where this variety is much more common.

In contrast to end scrapers, expedient tools exhibit characteristics indicative of opportunistic manufacture utilizing flakes from the entire sequence of tool production, ranging from core reduction to biface reduction, including flake fragments. Nearly 41% of the expedient tools are produced on flakes derived from biface reduction (Table 8), and if indeterminate and fragmentary flakes are excluded from the total, the use of biface reduction flakes is amplified (56.4%). This preference mimics that which is seen for biface-derived blanks and end scraper production. However, the expedient tool blank preferences are likely devoid of any "cultural" meaning because the knapper just uses what simple flakes happen to be available. Expedient tool blank selection seems to be relatively random, focussing on flake edge characteristics and other simple criteria (e.g., ease of gripping) rather than actual blank form.

Moderate retouch intensity values (Table 9) compared with the low values calculated at Caradoc (<0.225; Ellis and Deller 2002: Tables 2.22 and 2.23) suggest that, while the Double Take items have been used (and indeed, more so than those in the Caradoc cache), enough raw material remained present that discard appears to have occurred before use edge exhaustion. Thus, these tools were manufactured for task-specific and immediate functions, with no emphasis placed on curation. Because these tools are not transported across the landscape, there is no need to invest time and energy in creating standardized blanks, especially since most of the time these tools consists of already-sharp edges, only minimally retouched. Such tools can be easily reproduced at other sites by removing flakes from a "roughed out" biface preform.

Some researchers have argued that Paleoindian groups produced heavily re-sharpened and retouched tools, while Archaic groups favoured more expedient tool forms. They usually attribute this to a reduced need for resharpening and, in turn, a reduced need for a more portable tool kit (Ellis 1984; Goodyear 1989). At face value, the dominance of the expedient tools (59.3%) in the Double Take tool kit (bifaces excluded) appears to be consistent with this characterization and seems to suggest that Double Take was more Archaic-like in this respect. Most Paleoindian sites have few expedient tools. However, the Paleoindian ones where expedient tools are dominant (Table 10), as is the case at Double Take, may not reflect a cultural preference. Notably, those Paleoindian sites

Table 10. *Percentage of informal tools in some Paleoindian tool kit assemblages (after Ellis [1984: Table 87] with additions).*

Site	Estimated % of Informal Tools
Dixon	0.0
Shoop	6.0
Holcombe	7.0
Crowfield	8.3
Barnes	9.0
Potts	10.0
Parkhill, Grid D	11.1
Parkhill, Grid C	15.0
Parkhill, Grid B	18.0
McLeod	22.2
Shawnee-Minisink	23.0
Thedford II	23.9
Debert	33.0
King's Road	53.0
West Athens Hill	56.0
Double Take	*59.3*

with large numbers of expedient tools just happen to be ones that also have evidence of the earlier stages of quarry block or biface reduction (e.g., King's Road, West Athens Hill, Double Take), so all sorts of large flakes are available for expedient use. This situation is not found at Paleoindian sites distant from lithic sources, where no core reduction or early-stage preform reduction occurred and so no or fewer larger flakes were available for expedient use.

Although enigmatic in terms of intended function and/or use, the bifacially edged "uniface preforms" described earlier are certainly important items in Hi-Lo tool kits. Whether they are classified as large side scrapers, denticulates, novice biface knapping attempts, or preforms for thin flake manufacture, these kinds of items are not seen on earlier Paleoindian sites or on Early Archaic or later sites. The fact that they occur at Double Take and other Hi-Lo sites, such as Welke-Tonkonoh, suggests they are a recurring artifact form in Hi-Lo assemblages and are perhaps diagnostic of that development.

Conclusions

Although there are exceptions (e.g. Gardner 1977), the traditional archaeological literature (e.g., Caldwell 1958; Hayden 1981) has often viewed the Paleoindian to Early Archaic shift as distinctly abrupt. An evaluation of the tool kit from the Double Take site, however, supports the idea that this shift was more gradual, and less abrupt, than previously thought and that it was characterized by tool production and use strategies that are neither entirely "Paleoindian" nor entirely "Archaic." The documentation and analyses presented here suggest that Hi-Lo is unique in some ways in comparison with earlier and later developments, but that it also shares, to varying degrees, traits and practices with each development and in this sense is transitional between the two. Because only a few sites from each development were available for comparison, particularly for Hi-Lo and the Early Archaic, it is difficult to determine whether these similarities and differences relate to cultural change over time or to other factors (e.g., specific site function).

The Hi-Lo development is unique in its projectile point manufacture and use in that nearly all items exhibit edge bevelling/recycling – a trait that is not typically associated with earlier Paleoindian or later Early Archaic developments. Moreover, Hi-Lo is also unique in the distinctive and characteristic development of "unifacial preforms." While the function of these items remains to be fully determined, there is no doubt that they are diagnostic of the Hi-Lo development, because they are found only on Hi-Lo sites and are absent in any earlier or later development.

Despite its distinctiveness, the Hi-Lo development does appear to be very similar to earlier Paleoindian assemblages. Earlier Paleoindian and Hi-Lo assemblages share a slight bias for the use of biface-derived blanks for unifacial tool production, particularly end scrapers but also expedient tools, and this *may* suggest a shared preference for bifacial core forms. End scraper comparisons demonstrated that, like earlier Paleoindian items, the Hi-Lo specimens have flat, steep bits, suggesting they are more exhausted or used up; at Double Take they likely represent discarded items, used up primarily elsewhere, that were discarded at the site during tool kit refurbishing. Hi-Lo primary tool production activities, like those of Paleoindian groups, seem to be largely restricted to areas nearer to quarry locations. However, at Double Take inhabitants may have extended the range of these activities farther away (e.g., more than 50 km) from quarries than did earlier, fluted point groups as is evident in the evidence of numerous early stage biface discards as well as the large amount of flaking debris and the presence of larger earlier stage flaking debris including some cores (Dickson 2006; Figure 4:f-i). This extended range, however, may be due to easy direct water access (e.g., the Grand River) to the raw material source, which facilitated transporting chert supplies to the site via watercraft.

Yet, in other respects, Hi-Lo does seem more Early Archaic-like. Despite their flatter bits (suggesting more intensive resharpening, similar to the earlier Paleoindian assemblages), the Double Take end scrapers are more like Early Archaic examples in overall size. There is also little evidence for standardized block core reduction at Double Take. And the fact that some Variety 1 end scrapers (those with "all-over" dorsal-lateral flaking) were identified also suggests less shaping of the core prior to flake removal. These particular forms of end scrapers are much more common on Early Archaic sites. However, these forms do occur on other Late Paleoindian, non–Hi-Lo lanceolate point sites and are thus not restricted to later notched point assemblages. In fact, Hi-Lo is more like the other Paleoindian sites than the Early Archaic sites, such as Nettling, in that Variety 1 end scrapers are rare compared with Variety 2 (i.e., those with minimal shaping retouch).

To summarize, Hi-Lo displays a mix of traits that have been traditionally regarded as Paleoindian-like or Early Archaic-like and, although it seems to share more traits with Paleoindian assemblages, is in many ways intermediate between the two. Regardless of how we classify the development, Hi-Lo most certainly exhibits evidence of gradual shifts, namely, 1) a decrease in end scraper size; 2) changing and increasing frequency of Variety 1 end scrapers; and 3) a decrease in preference for biface-derived blanks as uniface tool blanks. These gradual and directional changes imply a smooth *transition* from Paleoindian to Early Archaic lithic industries in southern Ontario. While the lithic tool production and use strategies described above can be used to characterize particular developments, we should exercise caution when attempting to expand these characterizations to broader defining units, such as Paleoindian and Early Archaic, and especially when attempting to draw an arbitrary, precise line between the two. It seems reasonable to suggest that such precise and definitive boundaries do not exist. Instead, the transition proceeds through a series of stages devoid of any discrete beginning or end, behaving much more like a continuum. Thus, the boundary between what it means to be "Paleoindian" and "Early Archaic" is much more fluid and dynamic than much of the traditional archaeological discourse would argue, and can be "moved" or "altered" by social groups depending on situational needs. As such, the terms Paleoindian and Early Archaic must be used to describe *general* archaeological lifestyles and adaptive behaviours, rather than as signposts signalling the termination points of various unrelated temporal divisions. With continued excavation, examination, and the human fascination with the unknown, a broader understanding of the Hi-Lo lithic industry, its people, and the choices they were faced with can be achieved.

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L'assemblage d'outils en pierre du site Double Take (AgHb-240), près de Brantford, en Ontario, est ici décrit. La principale composante de cet assemblage est attribuée au complexe Hi-Lo (environ 10 000 ans A.A.). J'ai examiné comment ces outils, particulièrement les grattoirs, sont similaires ou différents des outils des développements antérieurs (du Paléoindien) et des développements ultérieurs (de l'Archaïque). Plusieurs caractéristiques des grattoirs du complexe Hi-Lo, telles que la technique de fabrication, la silhouette et l'intensité de retouche des mèches, servent à renforcer leur affinité avec les grattoirs conventionnels de la période paléoindienne tandis que d'autres caractéristiques telles que la taille globale, renforcent les liens aux assemblages de la période archaïque. Après avoir examiné d'autres aspects du coffret à outils, y compris la fabrication bifaciale et l'utilisation opportune des outils, je suggère que la production d'outils et que les stratégies d'utilisation sont intermédiaires entre les deux évolutions et que la transition de la période paléoindienne à celle archaïque a été plus douce et plus progressive que préalablement cru.

Parker S. Dickson
37 Parkview Crescent
Strathroy, Ontario, Canada N7G 4B1
dickson908@rogers.com

Book Review

Modeling Archaeological Site Burial in Southern Michigan: A Geoarchaeologial Synthesis
(William Monaghan and William A. Lovis, with contributions by Michael J. Hambacher)

Reviewed by Andrew M. Stewart

Modeling Archaeological Site Burial in Southern Michigan: A Geoarchaeologial Synthesis by G. William Monaghan and William A. Lovis, with contributions by Michael J. Hambacher, 2005. Packaged with a CD-ROM that is viewable with ArcView 3.2 or higher geographic modeling software, 278 pp, 29 Figures; 11 Tables; Environmental Research Series, No. 1. David L. Ruggles, Series Editor. Paper, $35.95, ISBN 0-87013-738-7 978-0-87013-738-9.

Southern Ontario is now surrounded by the findings of research confirming the potential for deep burial of archaeological sites in the drainage systems of the Great Lakes and mid-Atlantic coast. An earlier volume (Cremeens and Hart 2003), reviewed in *Ontario Archaeology* 74, presents the case for geoarchaeology in the glaciated Northeast. The Michigan book reviewed here, by geomorphologist Bill Monaghan and archaeologist Bill Lovis, presents an even stronger and more unified theoretical and empirical argument for geoarchaeology. Their book is an inspiring call to action for us in Ontario. The rivers and lakes of southern Ontario, in particular, exist in dynamic relationship to the Great Lakes-St Lawrence River system, which defines this peninsular land mass. It's time we acknowledged this dynamic and its implications for archaeology.

The experience of Michigan archaeologists is that deep sites (sites that are buried at any depth below the plough zone, often with no surface cultural expression) are an important phenomenon in the basins draining into Lakes Huron and Michigan. Deep site testing in southern Michigan over the past 30 years has produced a body of evidence for burial by alluviation, demonstrating the opportunity for site preservation in floodplains.

Chapter 1 presents the state of deep testing in Michigan, showing how consensus has developed in compliance-related work around the need and protocol for deep testing. Gas transmission pipelines produced the incentive to develop these protocols. Of four prime movers for site burial (glacial-glaciolacustrine; lake transgression; shoreline erosion-deposition; and stream channel-floodplain activity), the last one (alluviation) is particularly susceptible to predictive modeling and significant for how it is affected by changes in late Holocene regional climate.

Chapter 2, "The Pre-Holocene Geological History of the Upper Great Lakes" (Superior, Michigan, Huron), is a useful synthesis of (sometimes differing) ideas on formation of these lakes since the retreat of the Laurentide Ice Sheet. It seems the Great Lakes region was a veritable funhouse following deglaciation: basins alternately filling and emptying as a result of outlets that opened and closed with ice movement; floors tipping as a result of isostatic rebound; water pooling behind barriers of sediment (moraines) that sometimes gave way, producing catastrophic floods.

Melting ice, isostatic rebound and sill erosion were the dominant early controls on water levels in the upper Great Lakes. Rapid fluctuations in the late-glacial/early Holocene period culminated in dramatic recessions in the Huron, Michigan and Superior basins (also in Erie and Ontario, though these are not the focus of the book). A gradual early/middle Holocene transgression—the result of more rapid uplift in the north—produced the Nipissing floods of 5000 years ago. The knock-on effects included: downcutting at the Port Huron outlet; high stages in Erie and Ontario over the next two millennia; and drowned lower valleys opening into these high-stage basins. As the fun slowed down during the late Holocene (it has not yet completely stopped), climate—specifically precipitation—became the more important control on lake levels.

According to research in the last 25 years by Curtis Larsen and others, water levels have fluctuated by as much as ± 2 m around "mean" levels, in cycles of 200-300 years. This is more obvious in the record of the past 2000 years as other effects (e.g., downcutting) stabilized. But climate fluctuations are likely superimposed on the record of change in lake levels resulting from isostatic rebound and downcutting throughout the Holocene. All of this makes for a complex pattern of changing lake levels in time and space, with specific implications for deposition and erosion of sediments in lower river valleys and lacustrine plains adjacent to the Great Lakes, and for the preservation and removal of archaeological sites in these places.

Chapter 3, "The Middle-to-Late Holocene Geological History," takes us through some of these changes, as recorded at archaeological sites in the Saginaw Bay area (Lake Huron) and in the lower Grand and Kalamazoo River valley area (Lake Michigan).

Chapter 4, "The Archaeological Perspective and Background," presents a chronological, cultural framework, with observations about site numbers, density, crowding, relationship to wetlands, and preservation of site stratigraphy for different periods—all possibly and ultimately related to changes in lake levels.

Chapter 5, "Location and Description of Buried Stratified Sites in Michigan," summarizes the information used for modeling site burial. It describes contexts and stratification at eleven sites. At three of them, cultural material pertaining to the Middle Archaic was buried by alluvial or shoreline deposits related to the Nipissing flood (which peaked at about 4800 rcybp). Five sites contain late Holocene (Late Archaic, Terminal Archaic and Woodland) components that were preserved by post-Algoma-stage floods (peaking at 1800 rcybp). Three sites have Late Woodland components—two buried by Little Ice Age flooding (300-500 years ago) and another by urban fill. Alluvial settings can be tied to the new information about cyclic lake level fluctuations from Larsen and others. Other less predictable Holocene contexts for burial include lake margins (littoral zones), lacustrine plains, eolian and colluvial settings. Predating these contexts, glaciers may have played a role in burying and preserving Palaeo-Indian sites in areas where sediment was mobilized by marginal re-advances of the ice sheet (the Greatlakean, 11,800-11,200 ka; and the Marquette, 9900-9500 ka).

Chapter 6, "Predicting Archaeological Site Burial in the Great Lakes Region," presents components of the model, articulating climate, alluviation, soil formation and site visibility for the middle-late Holocene. Palaeosols often represent long site occupations, during extended periods of surface exposure and weathering. When flooded, these palaeosols are rapidly buried by alluvial sediments. The site record (Chapter 5; Figure 6.1) shows that terminal dates for palaeosol occupations tend to coincide with clusters of dates of non-cultural detritus in floodplains marking episodes of alluviation. These form regional patterns, which, the authors argue, extend beyond the Great Lakes to the Mid-Atlantic and Mississippi Valley. The timing of these patterns suggests they reflect regionally significant climatic cooling events at 4000-3500, 2000-1500 and 600 rcybp, respectively (the most recent being the Little Ice Age). One complication is that the earliest of these cooling and alluvial events coincides with the later part of the Nipissing/Algoma transgression, which is essentially a geological event caused by isostatic rebound, not a climate event. To distinguish between the effects of geology and climate on the landscape, it's important to look at the inland (upstream) record, where the floodplain record of alluvial deposits and palaeosols more likely reflects climate.

The consequences of climate and alluvial cycles for site preservation and visibility are profound. In profile, sites range from being highly visible, midden-like deposits formed during stable, non-alluviating periods, on the one hand, to stringer-like or "sub-midden" deposits formed in rapidly alluviating environments during flood-prone periods. The midden-like sites are highly visible but subject to disturbance and mixing because the surfaces on which they formed were exposed for long times before being buried by flood sediments. The stringer-like, sub-midden sites are modest in profile but tend to be single-component and well-preserved, often yielding good settlement information, because they were rapidly buried.

Chapter 7, "A GIS Framework for Predicting Site Burial Potential in Southern Lower Michigan," shows how geographic information about the potential for site burial can be assessed against the geographic record of buried sites and deep test locations. A CD included with this book contains files that let the reader explore these relationships in ArcView 3.2 or higher format. Potential for burial is based on knowledge of Holocene floodplains, derived from GIS-based soils and recurrence interval data, as well as the extent of the Nipissing transgression. Buried palaeosols are more likely to be found in low-gradient, broad stream valleys with fine-textured sediment.

Chapter 8, "Recommendations and Procedures…" underlines the point that local and regional drainage basins and their development are key to understanding patterns of long-term sedimentation. This, in turn, is key to determining where buried sites occur. Involving an earth scientist early in the investigation of sites and areas with potential to yield deeply buried cultural deposits is critical. Early involvement (Stages 1, 2 and 3 in Ontario) leads to a better investigative approach, a better understanding of context and site taphonomy, and fewer costs down the road (Stage 4). Backhoe trenching is the most effective method for investigating areas with potential for deep burial, based on the experience of the authors. This is also the recommendation that emerges from extensive study of this question in the Minnesota Deep Test Protocol Project (Monaghan et al. 2006). Data collection, recording standards and reporting are all covered in this chapter. A summary and conclusions are contained in Chapter 9.

All of this experience and advice applies equally well to our situation in southern Ontario, which has a similar surface geology to southern Michigan. Admittedly, the Saginaw Basin is an extraordinary feature: many streams converge in a wide area above a constriction, low enough on the drainage system to have allowed burial of sites from at least the Middle Archaic period on. Sediment accretion on levees and across this floodplain has enabled deep burial to occur during cooler, wetter climatic episodes throughout the later Holocene.

Where is our equivalent to this sediment trap? One answer is the Delaware Flats of the Thames River, which is known to contain buried sites next to abandoned cut-offs. These flats are probably too far up the river to have been affected by the Nipissing transgression, so that alluvial and cultural deposits here might relate more directly to late Holocene climate change. The Thedford flats, or embayment, near the outlet of the Ausable River on Lake Huron give us another opportunity, one where Nipissing flooding was almost certainly a factor. Here we might expect middle Archaic components to be buried. Some remarkable Late and Terminal Archaic settlement features in a palaeosol are preserved in the floodplain of the Ausable River at the Davidson site, currently being investigated by Chris Ellis. The post-Algoma high-stage may have delivered the final floods responsible for site burial and abandonment—ongoing geomorphic work there will reveal more and serve to link these events into the regional environmental record.

Paul Karrow has consistently pointed out the potential for Nipissing floods to preserve organic deposits that would be of interest to archaeologists (e.g., Karrow et al. 2007). Despite his prompting, and discoveries in deeply buried settings in the lower Grand River (e.g., Walker et al. 1997), and elsewhere, we are only now beginning to acknowledge their importance.

Absorbed in full, this is an important book with exciting implications. The geomorphic and archaeological recording of deeply stratified sites over decades of careful work in Michigan is an accomplishment in itself. Relating this record of palaeosols and flood deposits to knowledge of Great Lakes flooding and climate now leads to the possibility of correlating site records regionally across drainage systems, at least for the later Holocene. This record, providing glimpses of past extreme events (suggested, for example, by sedimentation rates at the Schultz and Green Point sites), has contemporary relevance. Climate change is part of our reality today. Rivers and streams are increasingly vulnerable to flash flooding, accelerated by urban sprawl. Site burial is ongoing in our lifetimes.

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Andrew M. Stewart
Strata Consulting
528 Bathurst St, Suite 201,
Toronto, Ontario, Canada M5S 2P9
andrew@strata-geoarch.ca

Book Review

The Seneca Restoration 1715-1754: An Iroquois Local Political Economy (Kurt Jordan)

Reviewed by Gary Warrick

The Seneca Restoration 1715-1754: An Iroquois Local Political Economy, by Kurt A. Jordan. xiii+424 pp, 37 figures, 16 tables. 2008. University Press of Florida, Gainesville. ISBN 978-0-8130-3251-1.

In 1983, the excavation of two nineteenth-century cabins at Mohawk Village, in Brantford, Ontario focussed archaeological attention for the first time on the colonial period of Iroquoian history. Ian Kenyon and Neal Ferris (1983) reported the results of the excavation in *Arch Notes*, and Ian Kenyon published additional accounts of the archaeology of other nineteenth-century Six Nations sites in Ontario in the 1980s (e.g., Kenyon and Kenyon 1986). Neal Ferris, heavily influenced by his work with Kenyon, completed and published his Ph.D. on the colonial history of Aboriginal peoples of southwestern Ontario, from an archaeological perspective (Ferris 2009). In New York State, the work of Dean Snow and David Guldenzopf (1998) in the Mohawk Valley advanced the use of archaeology in the writing of the colonial history of the Six Nations Iroquois. The latest addition to the historical archaeology of Iroquoian peoples is Kurt Jordan's *The Seneca Restoration 1715-1754.* Jordan's book reinterprets eighteenth-century Seneca history from an archaeological point of view and it has unequivocally established the value of the archaeological study of Iroquoian people in colonial times.

Kurt Jordan's book is a revised version of his Ph.D. dissertation completed in 2002 and based on the 1996-2000 archaeological excavation of the Townley-Read site in western New York State. In short, the book is an excellent example of historical archaeology of Aboriginal people and is required reading by any archaeologist working with materials recovered from sites that were occupied by Indigenous peoples who were entangled in some way with Europeans.

The book is lengthy and organized into 12 chapters, plus a brief set of notes and extensive bibliography. Chapter 1 is an introduction and provides a clear statement of the book's purpose which is to demonstrate that prior claims of historians and archaeologists that the Seneca lost their culture and way of life by the eighteenth-century are not supported by archaeological evidence or reinterpretation of historical documents. Jordan makes clear in this chapter that archaeological interpretation of cultural loss and retention cannot be based just on certain artifact classes but must take into account the "contexts of social life" (p. 13), such as settlement patterns, land use, and diet. In Chapter 2, Jordan defines local political economy as organization of labour to encourage peaceful social relations and political power and he applies the term to the eighteenth-century Seneca. For Jordan, political economy of the Seneca can be revealed by examining regional relationships, community organization, exchange, and organization of gendered labour. A brief history of the Seneca from 1677-1754 appears in Chapter 3, highlighting population estimates, the fur trade, and episodes of war and famine, and how the Seneca handled political relations with Europeans and other Aboriginals during this time period. Chapter 4 provides the historical background to New Ganechstage, the settlement which incorporated the Townley-Read site, one of many clusters of houses. Jordan provides the physical, historical, and archaeological setting of the Townley-Read site, based on a thorough presentation and interpretation of historical maps and documents. He even offers a potential list of historical figures who may have lived there. The archaeology of the Townley-Read site is the topic of Chapter 5. Jordan summarizes the sequence of archaeological investigation and an overview of the settlement pattern and artifact and ecofact finds. Several pages in this chapter are devoted to an explanation for the age estimate for the site. Chapter 6 features the chronological sequence of Seneca settlement relocation from 1677-1779, reconstructed using a combination of archaeological and historical evidence, and assisted by a clear set of maps. In Chapter 7, the dispersed settlement pattern of the eighteenth-century Seneca, exemplified by Townley-Read, is interpreted as a beneficial adaptation carried out in a time of peace for political, economic, and ecological reasons. This new interpretation challenges previous interpretations of dispersed Seneca settlements which attribute dispersal to the sociopolitical collapse of Seneca culture. Chapter 8 and 9 continue the discussion of Seneca settlement patterns at the household level. The Townley-Read short house is interpreted as an "intercultural/creolized house" (p.233-235) which has a mix of European and Iroquoian architectural features, but is primarily an Iroquoian house form with precedents in pre-European settlements. A reconstruction of the local political economy of Townley-Read is presented in Chapter 10, based on interesting interpretations of faunal remains, red stone used for beads and pipes, and glass from alcohol bottles. Chapter 11 offers a concise re-evaluation of supposed turning points in Iroquoian history, emphasizing the resilience and adaptability of the Seneca people and culture from 1687-1783. Jordan maintains that the Seneca became truly colonized only after the land thefts of the 1790s and early 1800s, unlike the Mohawk who became colonized in the early 1700s. The book closes with Chapter 12, which offers a set of conclusions, dominated by the overall concept that the eighteenth-century Seneca were not a colonized people but were entangled culturally with Europeans and other Aboriginal groups, making changes to ensure political sovereignty, economic independence, and cultural values. Jordan points out that the major historical events in the Northeast affected each Iroquoian group differently and at different times dependent on geographical location and political situation. A brief set of notes and a comprehensive bibliography follow the final chapter.

The Seneca Restoration 1715-1754 provides the only book-length treatment of an eighteenth-century Iroquoian archaeological site. In light of the book's thesis, the archaeological information from the Townley-Read site is presented clearly, highlighting the house and surrounding activity areas and pit features, faunal remains, red stone artifacts, and bottle glass. The book is not an archaeological site report, so some readers may be disappointed to find little information about gun parts, tobacco pipes, and other artifact classes typically found on Aboriginal sites of the eighteenth-and nineteenth-century. The strength of the book lies in its contribution to an interdisciplinary approach to Aboriginal history. It weaves a compelling explanation for Seneca political and cultural resilience in the eighteenth-century, from the empirical evidence of historical maps and documents and archaeological data, using a theoretical framework which combines post-colonial theory, agency, and Marxism. Kurt Jordan's arguments are convincing mainly because he takes the time to methodically critique and eliminate alternative interpretations of the historical and archaeological evidence. This book is a superb example of good scholarship.

The Seneca Restoration 1715-1754 is very well written and a pleasure to read. Jordan's writing style engages the non-specialist reader. Despite the high quality of the writing, the book does have a couple of organizational issues. First of all, the placement of maps is slightly annoying. Description of the Townley-Read site location and layout are discussed in Chapter 4, 5, and 7. The maps of site location appear in Chapter 2, 4, 5, 6, and 7. This requires reading about the site location or settlement pattern with considerable flipping of pages back and forth. Perhaps the maps and discussion of site location and layout could have been concentrated in one or two chapters. Furthermore, more archaeological data in tables would assist the reader with the author's discussion of artifacts recovered and their provenience. Chapter 5 provides no summary table of artifacts according to provenience units (e.g. ploughzone, features, and buried midden) within each domestic refuse cluster. A complete artifact inventory for the site, even in three separate tables based on refuse cluster, would have helped.

Overall, Kurt Jordan's *The Seneca Restoration 1715-1754* is essential reading for any scholar interested in Iroquoian history and archaeology or Indigenous peoples and colonialism. It is a book that will become one of the classic reference works in the study of Iroquoian archaeology and history.

Gary Warrick
Contemporary Studies and Indigenous Studies
Brantford Campus,
Wilfrid Laurier University,
73 George Street,
Brantford, Ontario, Canada N3T 2Y3
gwarrick@wlu.ca

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