# The Canada Century site: A Lamoka Component located on the Niagara Peninsula, Ontario

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***Plough-disturbed** archaic lithic scatters, until recently **ignored** as **potential sources** of **knowledge,** or simply stripped away in the search for **subsoil features, have received much attention in the past decade, particularly from contract archaeologists. Recently, some researchers have studied the effects of ploughing on cultural deposits and sought to design excavation strategies to recover what the plough has disturbed. Different archaeologists have used various approaches and have contributed to our growing knowledge of the information potential of** such sites. This paper reports the results of excavations at **the** Canada **Century** site, a **plough-disturbed lithic scatter on the Niagara Peninsula. The occupation is attributed to the ca.** 2000-3000 B.C. Lamoka **phase.** Analysis of a sizeable **assemblage of debitage and cores yielded conflicting interpretations. Current research on Lake Erie water levels suggests that a large inland lake influenced accessibility to the nearest source** of **the** raw material. The small **assemblage** of tools is **dominated** by pieces esquillées or **wedges and** a **sequence** of bifaces and points **suggesting** that **hunting** was an important activity **here.** In addition to **providing** an **example** of a **small Lamoka Phase occupation, the Canada Century site reproduces an interesting pattern** of **ploughzone** artifact **recoveries,** which is **nearly** identical to that **found** at **another** late archaic **component, Innes,** excavated in the same fashion. This **pattern** is **interpreted** as **evidence** for **the presence and configuration** of a structure **and these considerations** of **artifact density and distribution are also examined here.***

## Introduction

The Canada Century site (AgGt-10) was first identified in 1981 during an archaeological survey of the proposed Highway 406 near the City of Welland, Ontario (Ambrose 1981). Following its initial recognition during a shovel-test excavation, Ambrose ploughed the estimated site area and conducted controlled surface collections several times during that season. The surface distribution of one hundred and eighty-nine pieces of cultural material, most of which was debitage, defined one large concentration of artifacts surrounded by several minor concentrations or by general scatter. As a result Ambrose recommended that the site be further ploughed, disked, surface collected and finally stripped to allow identification and excavation of subsoil features.

Having just completed salvage excavations at the Late Archaic limes site (AgHc-5) on the highway between Brantford and Woodstock (Lennox 1986a) and a field crew being still in place, Ambrose asked if I would conduct salvage excavations on the Canada Century site during the fall season of 1982. This report documents those excavations.

## Site location

The Canada Century site is located on the eastern outskirts of the City of Welland on the south bank of the Welland River, on land owned by the Saint Lawrence Seaway Authority due to its proximity to the Welland Canal. In fact, the site name was derived from a passing ship visible during initial investigations. The site is approximately fifteen km upstream from the mouth of the Welland River at its confluence with the Niagara River below Grand Island, and seventeen km north of the Lake Erie shore at Port Colborne (Fig. 1). Onondaga chert outcrops occur along the Lake Erie shore in this vicinity and these were assumed to be the chert sources throughout the excavation and analysis phase of the project. However, as discussed in the concluding sections of this report, these primary sources were likely not accessible at the time of site occupation.

The site is situated on a small knoll bordered on the north by the Welland River, on the east by a CN Railway track and to the south and west by gently rolling abandoned farmland. The soils are a heavy clay known as Haldimand or Welland Clay. Regardless of the preferred name, they are extremely difficult to work.

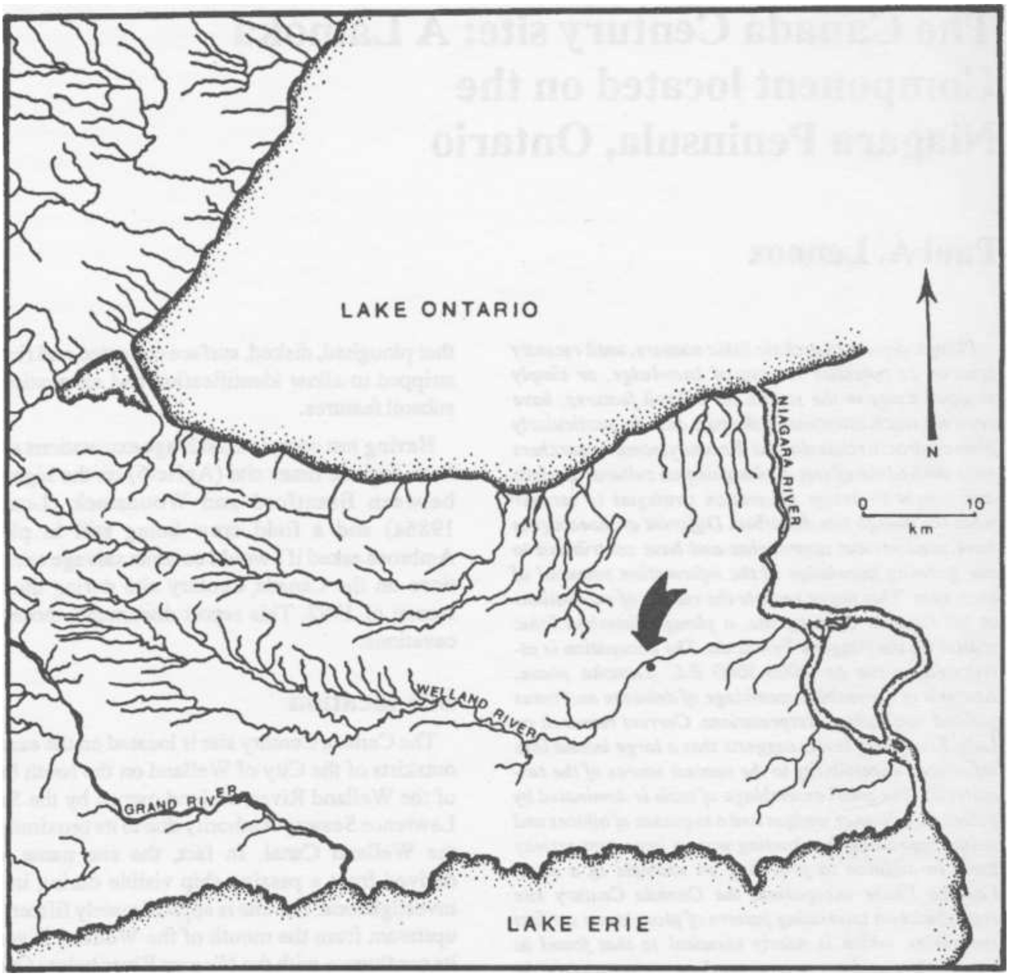


FIGURE 1

Location of the Canada Century site.

## The 1982 excavations

The 1982 excavations were focussed within Ambrose's ploughed area and within the artifact concentration identified by her controlled surface pickup (Fig. 2). The excavation strategy followed that used in 1981 at the Ines site (Lennox 1986a). With the establishment of a grid, one-metre squares of ploughzone were shovelled through 6 mm mesh screens, beginning towards the centre of the artifact concentration where the debitage density was greatest (a maximum of 99 flakes per square metre), and proceeded outward to an arbitrary limit defined by densities of less than fifteen flakes per square metre. These excavations identified a single artifact concentration, one hundred and ninety-three square metres in area and measuring a maximum of twenty-one metres north-south by fourteen metres east-west. In addition, some of the peripheral artifact concentrations were tested through the excavation of nineteen one-metre square excavation units, but these produced low artifact densities (Fig. 3). During the one-metre square excavations the ploughzone-subsoil interface was shovel-shined in search of subsoil features, several being identified. Following the completion of excavations, a Gradall was contracted to strip a wider area, but this resulted in no additional feature identifications.

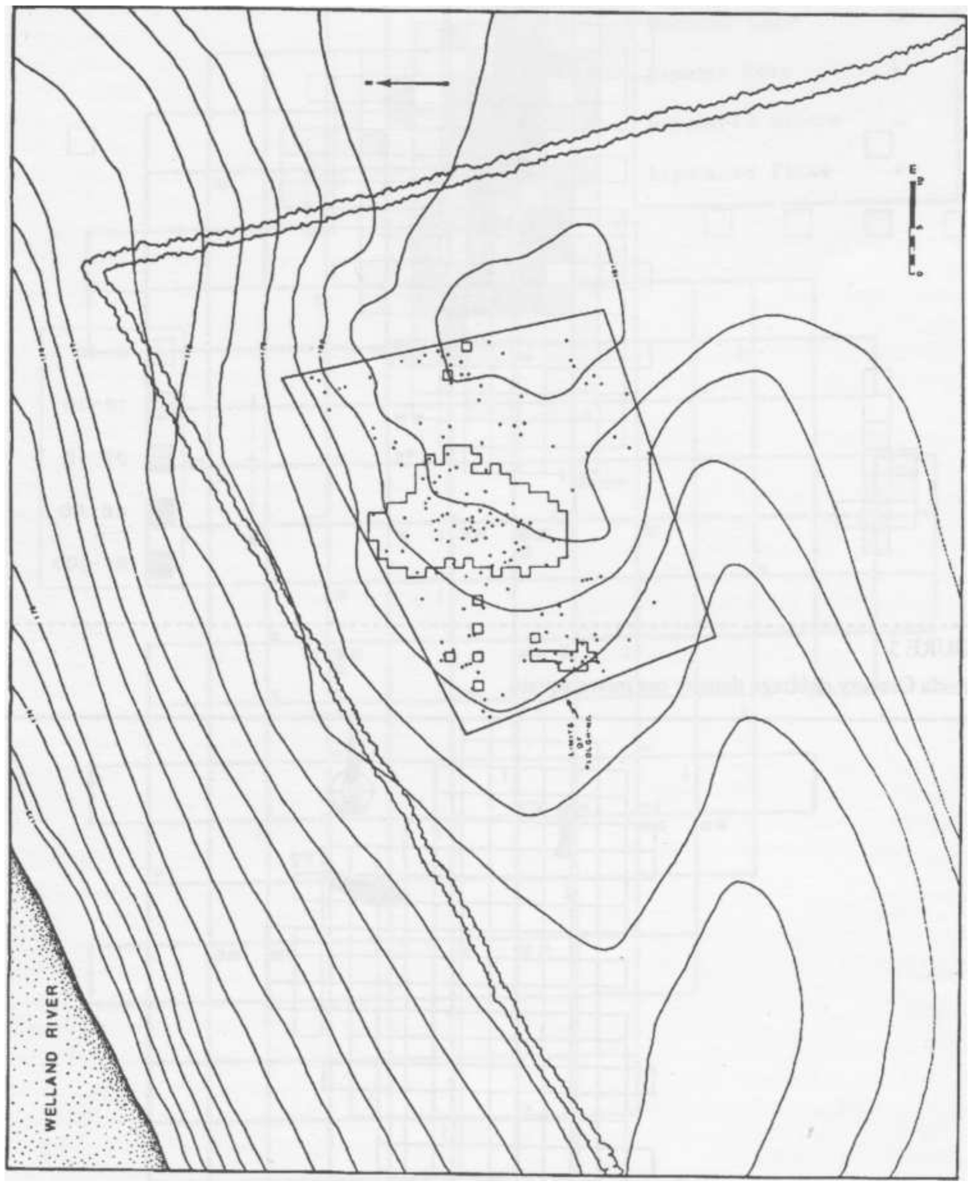


FIGURE 2

Canada Century topography, distribution of surface collected artifacts and limits of excavations.

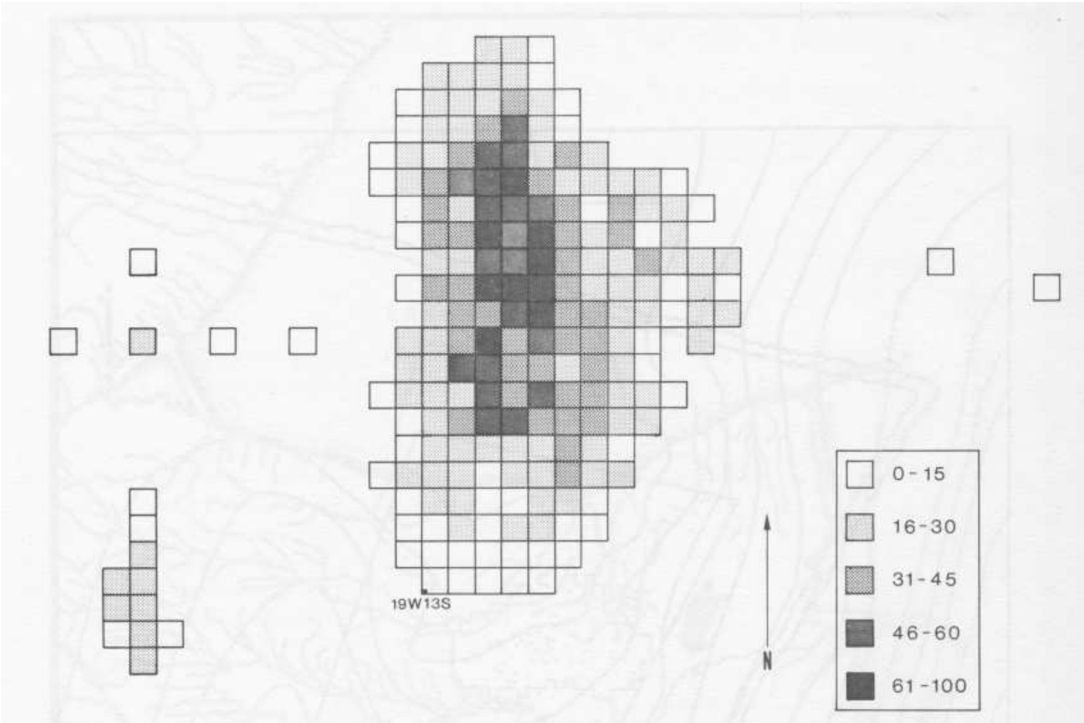


FIGURE 3
Canada Century debitage density per metre square.

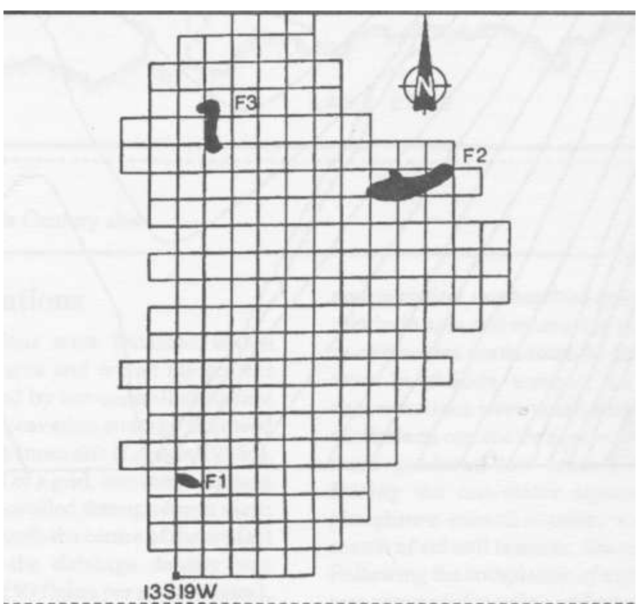


**FIGURE 4**
**Features**

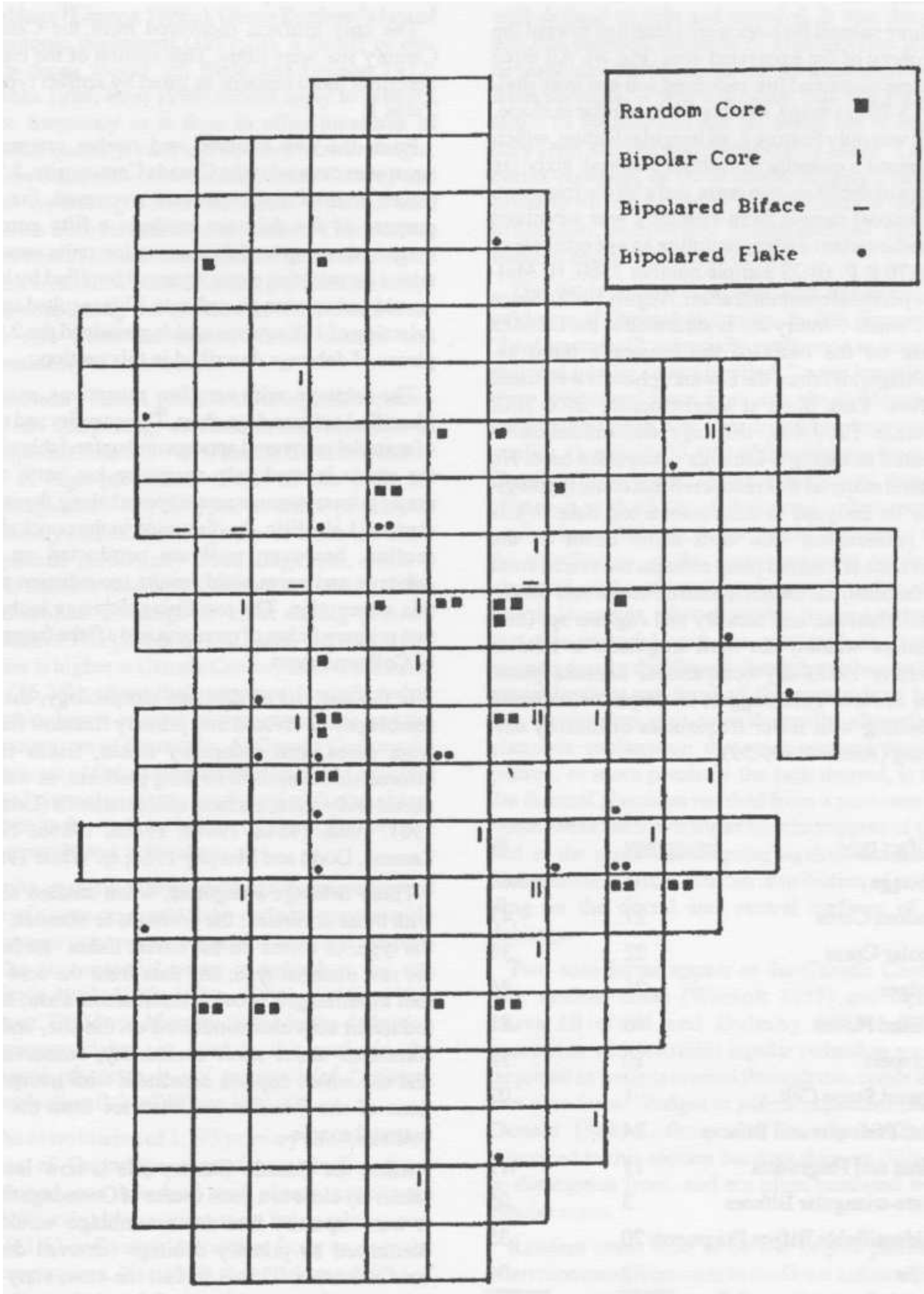


**FIGURE 5**

Distribution of cores and bipolared specimens.

## Features

Three subsoil features were identified toward the periphery of the excavated area (Fig. 4). All three features contained fire-reddened soil and were shallow (5-20 cm deep). Feature 1 was regular in shape, but it was only Feature 2, an irregular feature, which contained a quantity of cultural material: sixty-six pieces of debitage, two cores and a biface fragment. A charcoal sample from Feature 2 was submitted for radiocarbon dating, returning an age estimate of 980±70 B.P. (BGS sample number 1360. H. Melville personal communication, August 1989). Since the Canada Century site is attributed to the Lamoka phase on the basis of the projectile point assemblage, and since the Lamoka phase is well dated in New York State at approximately 2500 B.C. (Ritchie 1969:43), this **age** determination is rejected as dating **a** Lamoka occupation here. No cultural material was recovered that could typologically be assigned to this radiocarbon date. While the radiocarbon date casts some doubt on the relevance of charred plant remains recovered from the features, the identification of maple and beechwood charcoal, and hickory and *Juglans* sp. (butternut or walnut) nut shell fragments is notable (Murphy 1982). By comparison, Lamoka phase sites in New York suggest an emphasis on acorn collecting with fewer frequencies of hickory collecting (Ritchie 1969:59).

| Artifact type | Frequency | % |
|---|---|---|
| Debitage | 5,504 | 96.63 |
| Random Cores | 27 | .47 |
| Bipolar Cores | 22 | 39 |
| Wedges | 26 | .46 |
| Utilized Flakes | 46 | .81 |
| "Scrapers" | 10 | .18 |
| Ground Stone Celt | 1 | .02 |
| Point Preforms and Bifaces | 24 | .42 |
| Points and Fragments | 11 | .19 |
| Ovate-triangular Bifaces | 3 | .05 |
| Unidentifiable Biface Fragments | 20 | 35 |
| Drills | 2 | .04 |
| Total | 5,696 | 100.01 |

TABLE 1
Artifact type and frequency

## Artifact analysis

The only artifacts recovered from the Canada Century site were lithic. This section of the report describes those remains as listed by artifact type in Table 1.

From the two hundred and twelve one-metre squares excavated at the Canada Century site, 5,504 pieces of lithic debitage were recovered. For the purpose of the debitage analysis a fifty percent systematic sample of the excavation units was obtained by selecting those squares identified by both an odd and an even co-ordinate. This resulted in the selection of 108 squares which contained the 2,632 pieces of debitage described in this section.

The debitage, with very few exceptions, may be identified as Onondaga chert. The quantity and type of material recovered appears understandable since the site is located only seventeen km north of a major primary source now exposed along the north shore of Lake Erie. As discussed in the concluding section, however, analyses conducted on the debitage and cores yield results inconsistent with this assumption. The remaining debitage includes two primary flakes of quartzite and a flake fragment of Colborne chert.

In the analysis of debitage morphology, the assemblage was divided into primary flakes or flakes from cores, and secondary flakes, flakes from bifaces, on the basis of striking platform, as well as dorsal and ventral surface, characteristics (Lennox 1981, 1982, 1984a, 1984b, 1986a, 1986b, 1987; Lennox, Dodd and Murphy 1986; *cf.* White 1963).

These debitage categories, when studied along with other attributes: the presence or absence, and the type, of cortex on the dorsal flakes' surfaces; the raw material type; and data from the core and tool assemblages, provide information about lithic reduction activities conducted on the site, and information about chert availability, conservation and use which appears consistent with interpretations of site function and distance from the raw material source.

Since the Canada Century site is now located relatively close to a good source of Onondaga chert, it was expected that the assemblage would be dominated by primary debitage removed during core reduction. This is in fact the case, sixty-one percent of the analyzable flakes being primary flakes. This frequency is only slightly higher, however, than that found at another Late Archaic component located twice the distance from its nearest source. Primary flakes from the limes site constitute fifty-four per cent of the identifiable flake assemblage (Lennox 1986a). Given Renfrew's law of monotonic decrement (1977:72), **a** falloff or distance-decay model *(cf.* Earle and Ericson 1977; Janusas 1984; Reid 1986) should apply to primary flake frequency as it does to other measures of material quantity, such as frequency, size or weight. But the difference between the Canada Century and Inns assemblages does not appear to reflect their distance from the nearest chert source. This was one of the first of several anomalies in the lithic analysis which demanded a closer look at my initial assumptions concerning the distance of the Canada Century site from the nearest chert source and accessibility of that source.

Secondary flakes, generated during biface reduction and sharpening, account for the remainder of identifiable flakes (39%) from the Canada Century site. A high proportion (54%) of the flake assemblage could not be typed as either primary or secondary flakes. The majority of these are flake fragments, particularly distal fragments, while a small fraction consists of shatter, attributed to the uncontrolled breakage of chert during primary reduction. The percentage of flake fragments and shatter is higher at Canada Century than at the Inns site (36.7%) where their presence is attributed to the ploughzone context of the assemblage and the coarse texture of the matrix. At Canada Century the higher rate of flake fragmentation may be a function of the heavy clay matrix combined with ploughing. Certainly the high incidence of thermal alteration also contributed to breakage.

In the analysis of lithic debitage the presence and type of cortex on dorsal flake surfaces may provide inferences concerning material source and the state of the raw material when it arrived at the site (Lennox 1981, 1982, 1984a, 1984b, 1986b, 1987; Lennox, Dodd and Murphy 1986). In the definition of primary flakes, as used in this analysis, the presence of cortex is not assumed *(cf.* "primary decortication flakes" White 1961:5).

The examination of 1,195 primary and secondary flakes of Onondaga chert for cortical surfaces produced one hundred and ninety specimens (15.9%) exhibiting cortex, most being tabular cortex (81%) indicating extraction from or near the outcrop source. Notable is the incidence (19%) of nodular cortex suggesting that secondary sources were also exploited.

During the analysis of cortical surfaces on cores it was noted that the contact face between a chert bed and its limestone matrix can, at times, resemble nodular cortex, especially when this interface is well defined or thin and rounded. It was thought that this potential problem of identification might be particularly manifest during the analysis of small flake surfaces. It was suspected that this statistic might be inflated and that the actual use of secondary chert sources was considerably lower. Yet the cortex observed on cores would suggest a similar breakdown of primary and secondary source utilization, supporting interpretations derived through analysis of the debitage.

The lithic assemblage was also examined for evidence of thermal alteration. In this discussion, "heat treatment", intentially performed to improve material quality, is not implied. To my knowledge there is little evidence from any site in Ontario to suggest that chert was heat treated to improve its quality. One third (33.4%) of the debitage from the Canada Century site shows evidence of thermal alteration in the form of darkening, often accompanied by potlidding. It was initially thought that the distribution of this waste material might be clustered and indicate the former location of a hearth. However, when plotted, it became apparent that this material was not clustered; in fact, it seemed evenly distributed throughout the site (i.e. approximately one-third of the assemblage from any excavation unit was thermally altered). A plausible explanation that may account for this pattern, or more precisely the lack thereof, is that the thermal alteration resulted from a post-occupational event such as a forest fire. In support of this, and at the same time arguing against intentional heat treatment, is the random distribution of potlidding on the dorsal and ventral surfaces of the debitage.

Two core forms appear at the Canada Century site, random cores (Witthoft 1957) and bipolar cores (Binford and Quimby 1963). Some specimens which exhibit bipolar reduction are interpreted as wedges created through use, rather than as a core form. Wedges or *pieces esquilées (Mac*-Donald 1968; Lothrop and Gramly 1982) are described in this section because they are difficult to distinguish from, and are often confused with, bipolar cores.

Random cores tend to be the largest pieces of chert recovered from sites in the Great Lakes region and, along with primary flakes, are regarded as the end byproduct of the initial stages of reduction. Where chert is common (i.e. close to a primary source), large random cores are often discarded, but where materials are scarce, these cores are more

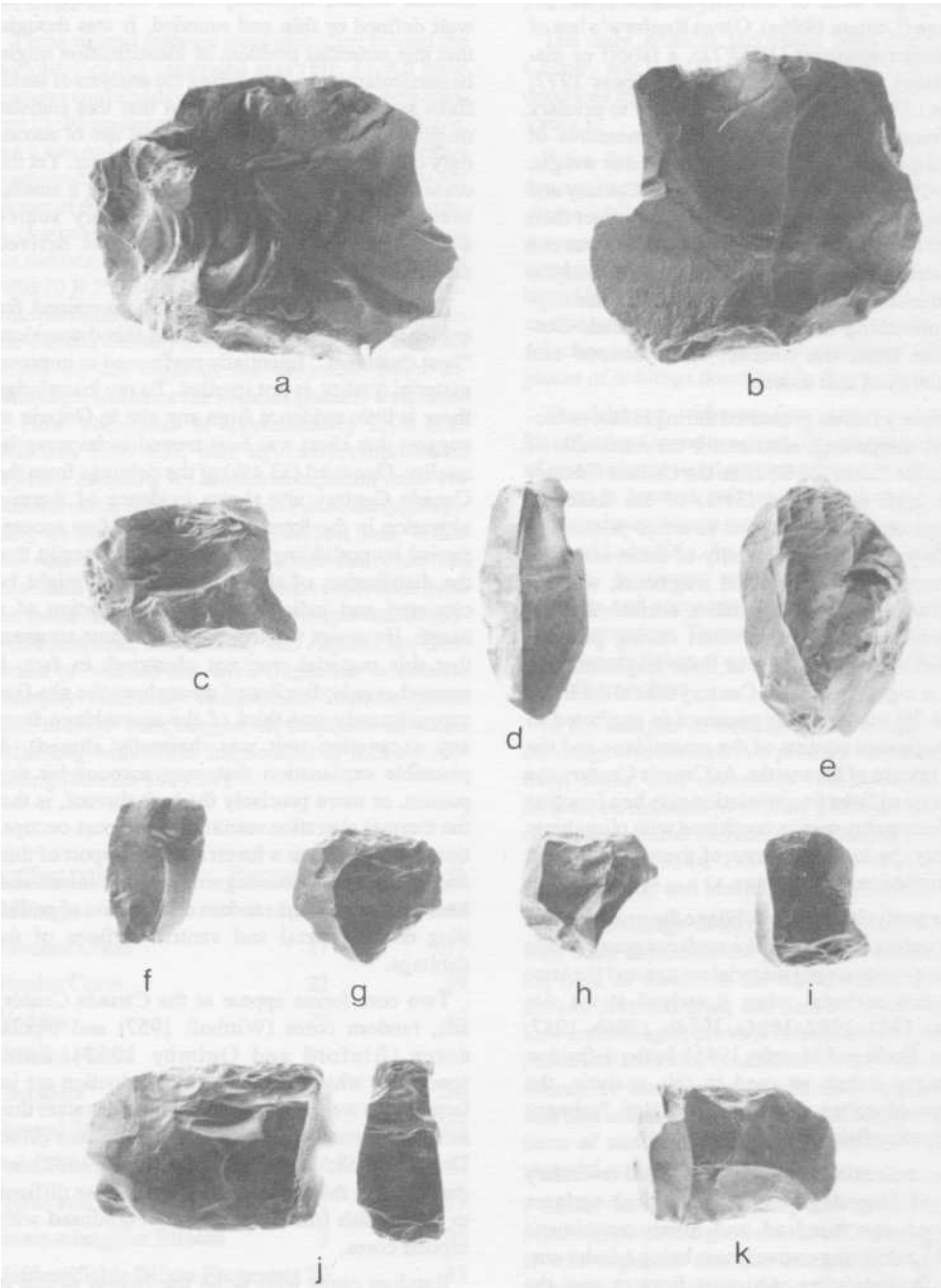


FIGURE 6

Cores and bipolared specimens: a, b — random cores (F-2, 8S19W); c-e — bipolar cores (3S14W, 1S19W, 6S16W); f-i — bipolared flakes (1S10W, 6N14W, 5S17W, 1N16W); j, k — bipolared bifaces (1N20W-1N20W, 2S4E).

likely to be reduced to tools or to small core nuclei. The bipolar technique is thought to provide a way of further reducing an exhausted random core or a small chert pebble. Bipolar cores are particularly common where raw materials are scarce or on scarce raw materials. For example, the bipolar core technique is more likely to be utilized as the distance from a primary outcrop source to the site increases. This may coincide with the utilization of secondary source materials or pebble cherts which are widely distributed in the tills of Southern Ontario. The use of the technique is also more common on exotic cherts that are rare in the particular assemblage under study (Lennox 1984a:62,134).

The twenty-seven random cores include eighteen complete specimens and nine fragments (Fig. 6:a,b). The presence of cortex on random cores is common, occurring on sixteen specimens. As noted in the analysis of debitage, in some instances there was a problem distinguishing nodular from tabular cortex. Nodular cortex, the result of chert weathering in, or during natural transport to, a secondary deposit, may be confused in this sample with the rounded interface between the chert bed and its limestone matrix. This interface may be distinguished in the core sample because of core size, but it was suspected that in the case of small flakes this surface was identified as nodular cortex from secondary deposits, thus inflating interpretations concerning the extent of secondary source utilization. Of the nine random cores initially identified as having nodular cortex, only three possess this attribute while six specimens actually possess the interfacial surface more appropriately attributed to primary source derivation. As such, thirteen of the sixteen random cores with cortex exhibit tabular cortex (81%), in close agreement with the debitage sample.

Forty-eight specimens that exhibit bipolar reduction are recognized as either cores or wedges. Twenty-two large columnar specimens appear to be true bipolar cores and were large enough to have produced flake blanks for further reduction or use (Fig. 6:c-e). Wedges or *pieces esquilées* also exhibit bipolar reduction but are smaller and thinner than bipolar cores, seemingly too small to have produced usable flakes. Their "ridge" edges often appear crushed or retouched through use. The most common variant, with twenty-two examples, may best be described as "bipolared flakes", consisting of flakes with bipolar edge damage. They are often lenticular or wedge-shaped in cross section and may be flakes removed by the bipolar technique (i.e. bipolar flakes) but show further bipolar reduction after removal from the core (Fig. 6:f-i). A second variant may be described morphologically as "bipolared bifaces". These appear to be bifaces that have been used as wedges. The reuse of bifaces and other tool forms as wedges or *pièces esquilées* is noted elsewhere, ranging from Palaeo-Indian (Lothrop and Gramly 1982) to Late Woodland assemblages (Poulton 1985). In both instances cited, the raw material was scarce and the reforming and reuse of tools was common. At Canada Century bipolared bifaces are represented only by four specimens, two of which are reconstructed from two fragments, likely broken during use. While three of the specimens appear to be bipolared bifaces, the reconstruction of the remaining specimen indicates that the biface-like form is a result of bipolar reduction rather than the principal design of the tool. One fragment of this specimen shows a "v"-shaped or ridge-area (Binford and Quimby 1963 cross section while the remaining fragment, through further use or intentional reduction, became shorter and lenticular in cross section or biface-like (opposing ridge) in form (Fig. 6:j).

Few of the bipolar cores and wedges exhibit cortex, and this is consistent with their interpreted function or position within the reduction sequence. Yet there is some suggestion from the higher incidence of nodular cortex on bipolar cores that the bipolar technique was preferred for the reduction of small waterworn chert pebbles. Of the twenty-two bipolar cores, five possess nodular cortex and one exhibits tabular cortex. Two of the twenty-two bipolared flakes possess nodular cortex and one has a remnant tabular cortical surface. No cortex was observed on the bipolared bifaces.

With regard to the distribution of the cores (Fig. 5) it is interesting to note that random cores appear widely scattered with some tendency to occur within the high flake density areas toward the centre of excavations. Bipolar cores and wedges however appear to concentrate toward the southwest of this central area with gaps in their frequency and distribution toward the northeast and southern limits of the excavations. Three of the four bipolared bifaces appear in close proximity, being recovered from squares 1N20W-1N20W, 1N19W, ON18WON14W, and 254E (metre square provenience is designated by the northwest grid coordinate and a hyphen between the square references indicates a mend.)

Table 2 provides measurement summaries for random cores, bipolar cores and the two variants of *pieces esquillées,* "bipolared flakes" and

| Core Type | Length | Width | Thickness |
|---|---|---|---|
| Random Cores (f = 27) | | | |
| Range | 29-66 | 23-46 | 13-29 |
| Mean | 49.0 | 33.5 | 21.3 |
| St.. | 10.5 | 6.8 | 4.2 |
| Bipolar Cores (f= 22) | | | |
| Range | 19-37 | 8-30 | 3-21 |
| Mean | 28.2 | 18.9 | 10.9 |
| St.. | 5.6 | 5.6 | 3.9 |
| Pieces esquilées | | | |
| Bipolared Flakes (f = 22) | | | |
| Range | 18-30 | 11-28 | 3-9 |
| Mean | 22.0 | 17.4 | 6.3 |
| St.D. | 3.6 | 4.3 | 1.9 |
| Bipolared Bifaces (f = 4) | | | |
| Range | 15-27 | 12-35 | 6-13 |
| Mean | 21.7 | 25.0 | 8.8 |
| St.D. | 5.5 | 7.6 | 2.4 |

TABLE 2
Core metrics (mm)

"bipolared bifaces". Their spatial distribution is shown in Figure 5 and examples are illustrated in Figure 6.

The core data from Canada Century yield conflicting interpretations. On the one hand, large random cores appear rejected before exhaustion, as if there had been no shortage of raw material; on the other hand, bipolar cores also occur, in fact they are almost as common as random cores. They occur on small chert pebbles and on small chert pieces, perhaps the remnants of random cores, following the suggestion that this reduction technique is especially useful on small pieces of chert. Why would the occupants of the site have resorted to the use of the bipolar technique at all? Elsewhere this technique is associated with material conservation, in an attempt to derive a few more utilizable flakes from an otherwise exhausted piece of material (Lennox 1984:62, 1986a227; Lennox, Dodd and Murphy 1986:82). Possible solutions to this problem *are* discussed in the concluding sections.

A total of forty-six utilized flakes exhibiting fifty-three utilized edges were recovered from Canada Century and these appear widely distributed throughout the excavations. Common to all specimens is use-retouch resulting in the removal of small (less than 2 mm long) flakes along one or more edges. Rarely is use-retouch extensive enough to create a marked change in the shape of the flake-edge used. Use-retouch does tend to dull, or make more obtuse, the utilized edge angle.

Of the forty-six utilized flakes recovered, only thirty-two are identifiable as to flake type. The larger, thicker primary flakes were preferred for utilization. There are twenty-eight of these while the remaining four are on secondary flakes. Utilized flakes range in length between 16 and 55 mm (mean =29.0mm), 11 and 42 mm in width (mean = 24.0 mm) and 2 and 13 mm in thickness (mean = 6.2 mm). The lateral edges of flakes are generally the longest employable edges and these are preferred on thirty-three edges while fourteen utilized edges are distal flake edges and the remainder are unidentifiable. Utilized edge length ranges from 8 to 35 mm (mean = 16.3 mm) on the forty-four measurable edges but these are likely biased toward shorter specimens. Unifacial use-retouch, suggesting unidirectional scraping, appears predominantly on dorsal surfaces, as indicated by thirty-four of the utilized edges, while seven show bifacial use-retouch on their ventral surface. Nine edges exhibit biracial use-retouch, often resulting in an irregular edge form. Such retouch may be attributed to bidirectional scraping or whittling. Due to the small size of some utilized flake fragments, three utilized edges were impossible to orient to their original flake. The shape of utilized edges is widely variable, fifteen being straight, twelve being concave, ten convex and sixteen irregular. As noted above, irregular edges are often associated with bifacial use-retouch, perhaps produced through bidirectional scraping or whittling. Concave edges are always represented by unifacial use-retouch and could have functioned as spokeshaves. Very few utilized flakes show signs of extensive edge rounding.

Concerning his work in New York State, Ritchie states (1969:62): "It is important to note the virtual lack in the Lamoka phase of any kind of chipped-flint scraper." This is also the case at Canada Century where no formal scraper types, such as end, side or thumbnail scrapers, were recovered. Despite the absence of formal scrapers, a number of utilized flakes, described above, exhibit unifacial use-retouch suggestive of scraping activities. Yet their irregular, concave and short straight and convex edges would seem ill-adapted for hide-scraping and were likely used on other materials such as bone or wood. While these utilized flakes show little edge rounding, a trait which often accompanies formal scraping tools in other assemblages, several additional specimens, described below, may be fragments of formal scraping tools or hide scrapers.

This small assemblage of seven specimens includes four pieces best described as scraper retouch flakes, driven from the worn, rounded or dulled working edge of steeply retouched unifaces. Of the three remaining specimens, one is a primary flake with steep lateral dorsal retouch creating a short (14 mm long) convex edge which is rounded through use (Fig. 7:e); another may be described as a crude biface also possessing a worn convex edge 26 mm long; and the last specimen may be a fragment of a "true" endscraper, but only a few millimetres of the bit remain, making this identification tentative (Fig. 7:d).

It is notable that these "scrapers" appear in two fairly tight clusters; 1N18W, 1N17W, 2N19W, 4N16W and 7S18W, 8S17W, 9S18W within the northwest and southwest portions of the area excavated. Figure 8 shows the distribution of these specimens along with those tentatively identified scrapers described below, and the small cell which was perhaps also used in scraping.

Another tool category which may also be subsumed under the broadest definition of the term "scraper" includes three primary flakes that are "naturals" for endscrapers but only exhibit minor

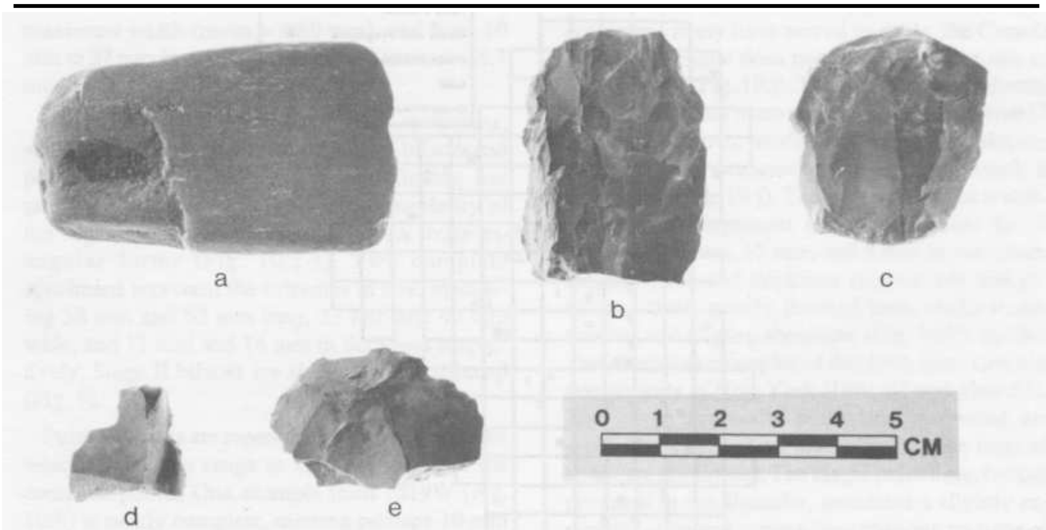


FIGURE 7

Celt and scrapers: a — ground stone celt (3N15W); b, c — utilized flake endscrapers (OS 16W, 1S 16W); d — endscraper fragment (2N19W); e — flake scraper, upper (lateral) and upper left (distal) edges exhibit extensive edge rounding (1N18W).

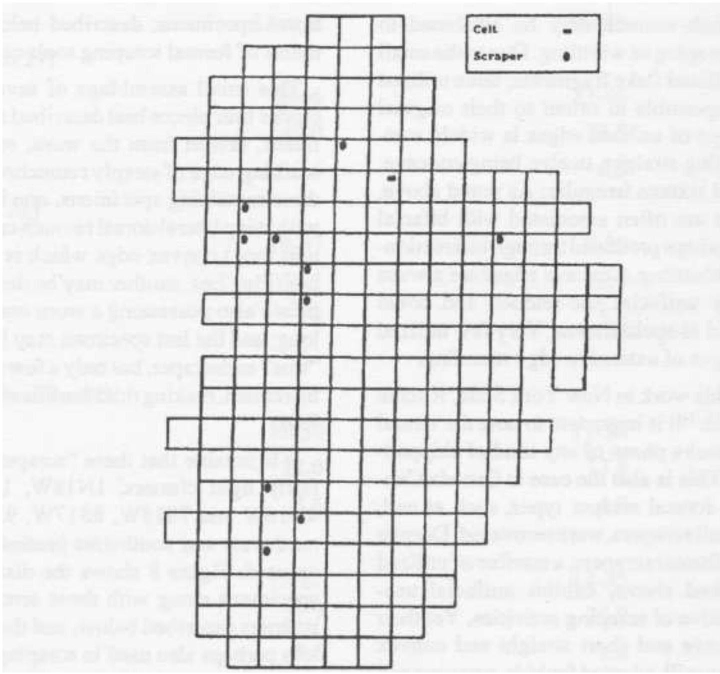


FIGURE **8**
Distribution of scrapers and celt.

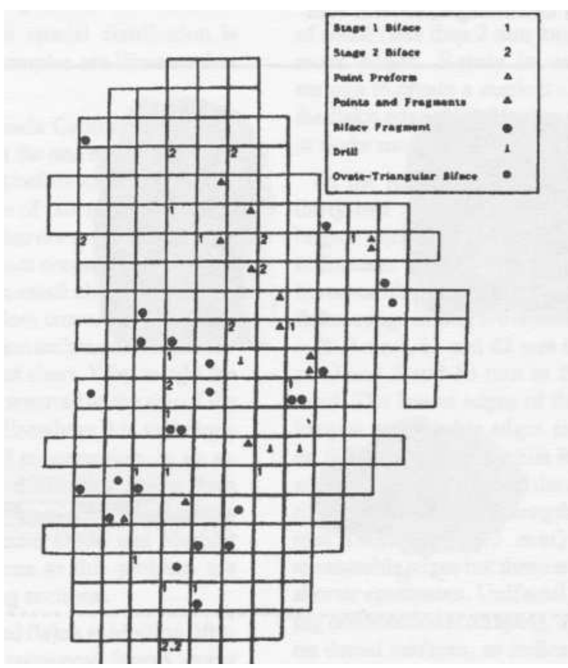


**FIGURE 9**
**Canada Century bifaces and points.**

distal dorsal use retouch (Fig. 7;b,c). These pieces, which measure 45 mm, 41 mm, and 40 mm long, 32 mm, 27 mm, and 34 mm in maximum width and 14 mm, 12 mm, and 9 mm in maximum thickness respectively, were recovered from OS16W, 1N11W, and 1S16W.

Twenty-four bifaces appear to represent the reduction of core remnants and flake blanks to point preforms. This continuum may be rather arbitrarily divided into several stages: stage I bifaces, stage II bifaces and point preforms, to reflect the extent of reduction on any one specimen prior to breakage or rejection. The number of examples within any one stage decreases throughout the reduction sequence such that stage I bifaces are represented by fourteen specimens, stage H by eight specimens and point preforms by two specimens. This suggests that biface and preform failure is most likely to occur earlier, rather than later, in the reduction sequence. Projectile points are represented by three complete specimens and eight fragments.

Stage I bifaces are represented by fourteen specimens distributed widely throughout the excavations (Fig. 9). They exhibit a range of forms from amorphous to ovate or ovate-triangular; they are generally large and thick, with coarse bifacial flaking leaving sinuous edges and often remnants of cortical surfaces. The eight complete specimens range from 41 mm to 71 mm in maximum length (mean = 52.7 mm), from 26 mm to 51 mm in maximum width (mean = 40.0 mm), and from 10 mm to 27 mm in maximum thickness (mean = 18.7 mm) (Fig. 10:a,b).

Stage II bifaces, represented by eight specimens, are intermediate in form between stage I bifaces and point preforms. Complete bifacial flaking has produced thinning of the biface and regularity of the edges, usually resulting in elongate, ovate-triangular forms (Fig. 10:c-f). Two complete specimens represent the extremes in size, measuring 38 mm and 62 mm long, 23 mm and 42 mm wide, and 11 mm and 16 mm in thickness respectively. Stage II bifaces are also widely distributed (Fig. 9).

Point preforms are represented by two specimens which reflect the range in size and shape of the complete points. One example from 7S19W (Fig. 10:h) is nearly complete, missing perhaps 10 mm from one end. It is long and narrow, like the finished points, and was likely rejected due to a thick irregularity on one edge. It measures 54 mm long, 21 mm wide and 10 mm in maximum thickness. The second example, from 2S 13W (Fig. 10:g), is complete but small, measuring 44 mm long, 19 mm wide and 7 mm in maximum thickness. If in fact this represents a preform, it is not clear why it was rejected before completion.

The projectile point assemblage includes three complete specimens, seven point tips, and a point base. It is of interest to note that most of these specimens were recovered from the north and east portions of the excavations (Fig. 9).

Lamoka points are described by Ritchie (1961:29) as "small, narrow, thick points with weak to moderately pronounced side notches, or straight-stemmed with slight usually sloping shoulders ... both the side-notched and stemmed forms occur together in the same Lamoka components at the same levels." It may be noted from illustrated examples (Ritchie 1944:299, 1961:85, 1969:51) that in addition to straight stems, expanding stems are also common. The three complete specimens from Canada Century fall well within this range yet, at the same time, demonstrate the full range of point forms within this small assemblage. The largest of the complete specimens may be described as long (59 mm), narrow (19 mm), and thick (9 mm), with sloped shoulders and an expanding stem. The base is also thick and poorly finished with a slightly ground, convex basal edge. A peculiar narrowing of the tip of this specimen is paralleled often in Ritchie's illustrated examples but is not commented upon in his text. While some of these specimens many have served as drills, the Canada Century example does not show extensive use of this "nipple" (Fig. 10:i). The second point is shorter (40 mm), slightly narrower (16 mm), and thinner (7 mm), with broad, shallow side-notches, sloping shoulders, and possesses a thinned base which is not ground (Fig. 10:j). The remaining point is stubby and may represent a reworked point tip. It measures 24 mm, 15 mm, and 6 mm in maximum length, width and thickness respectively and exhibits a thick, poorly finished base, shallow side notches and sloping shoulders (Fig. 10:k). Ritchie also illustrates examples of this form from Lamoka components in New York (1961:63 and 1969:51). The seven projectile point tips recovered are generally thick and narrow following the form of complete specimens. The single point base, broken proximal to the shoulder, possesses a slightly expanding stem and convex base showing no signs of grinding.

In addition to the bifaces which appear to portray the point reduction sequence, there are three other, apparently completed, thin and well finished

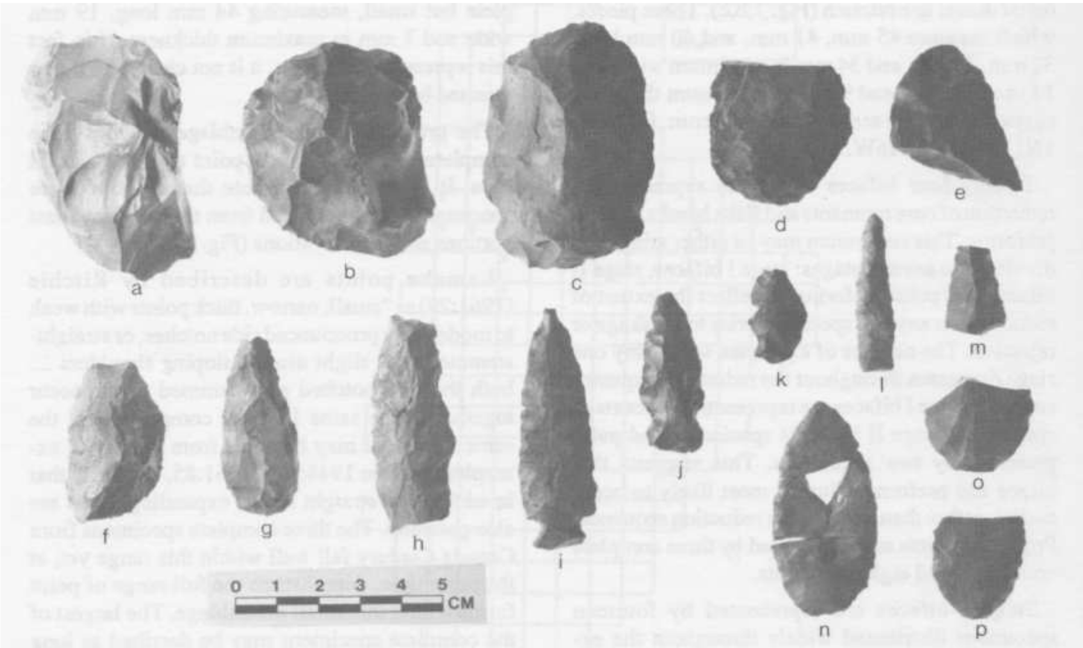


FIGURE 10

Canada Century bifaces: a, b — Stage I bifaces (9S18W, Surface #61); c-e — Stage II bifaces (5N15W, 2N20W, Surface #28); f-h — point preforms (12S 17W, 2S13W, 7S 19W); 1-k — Lamoka points (2S13W, 3N15W, 1S14W); 1, m —drills (5S13W-5S14W, 2S15W);n-p—ovate-triangular bifaces (2S16W-3S16W-3S20W-6S19W-7S15W, ON10W, Surface #49).

bifaces which do not appear to have been intended as points or preforms. One relatively complete biface, mended from five fragments, and two bases from similarly shaped specimens, appear small and especially thin for point preforms and may have served as completed tools, perhaps "knives". Ritchie describes a similar Lamoka tool as an ovate lanceolate biface, also suggesting their function as knives (1969:82). The most complete specimen from Canada Century (Fig. 10:h) may be described as ovate-triangular in form and measures 53 mm long, 26 mm wide and 4 mm in maximum thickness. The striking platforms used to produce the original blank are still evident on the basal edge of all three specimens although all other edges of the tools appear "finished". Edge rounding, perhaps resulting from use, is present, but is slight in its development midway along the lateral edge of the complete specimen.

Twenty biface fragments too small to provide useful data on reduction stages or finished tools are referred to as unidentifiable biface fragments in Table 1. It may be noted in Figure 9 that these tend to occur in the south and west of the area excavated, along with most other bifaces except points and point fragments, which tend to occur in the north and east portion of the excavations.

One drill reconstructed from two fragments (5S13W-5S14W) is either missing its base or the base remained "unfinished" (Fig. 10:1). This specimen measures 40 mm in maximum length, 10 mm in maximum width and 5 mm in thickness but shows little sign of use. Another narrow biface midsection from 2S 15W may also represent a drill fragment (Fig. 10:m).

While considering the scarcity of scrapers in Lamoka assemblages and reflecting on this otherwise ubiquitous tool form, mention must be made of a small ground stone celt from the Canada Century site (Fig.7:a). This specimen, made from hornblende chlorite schist, was recovered from 3N15W. It is 63 mm long, 37 mm in maximum width next to the slightly convex blade edge, and

10 mm thick. It possesses piano-convex longitudinal and transverse cross sections, the latter resulting from small ground facets located along the lateral dorsal extremities creating a slightly beveled edge. The blade itself is finely honed and is symmetrically biconvex. Nearly identical celts are noted from Lamoka sites in New York where they are referred to by Ritchie as thin adze-like scrapers which may have been used on hides or wood (1969:62). The beveled adze, a larger and heavier variant of the celt described above, with much more extensive dorsal beveling, is "the most diagnostic single trait of the Lamoka culture" (ibid:67) but is absent from the small Canada Century assemblage.

## Settlement pattern

In the absence of structural features, it is difficult to discuss settlement pattern at this level, unless structures can be inferred from other data. In this regard it is of interest to note some remarkable similarities between the distribution of materials recovered at Canada Century and those from the Innes site (Lennox 1986a).

Inns was excavated in the same manner as Canada Century. One-metre squares of ploughzone were shovelled through 6 mm mesh screens beginning at the centre of the artifact concentration, as defined by the distribution of surface materials, out to one-metre squares producing less than fifteen flakes per square. In this manner four hundred and forty-six one-metre squares produced 10,405 pieces of chipping debitage and a full complement of about one hundred and fifty tools, distributed in two loci. The two Innes loci are similar to the single locus at Canada Century in size, area and debitage density (Table 3), though the assemblages are represented by differing emphases on particular tool forms.

| Attribute | Innes | | Canada Century |
|---|---|---|---|
| | North | South | |
| size sq. m | 192 | 254 | 193 |
| dimensions | 18 X 13 | 18 X 17 | 21 X 14 |

Table 3

Canada Century and limes loth comparisons

Through the use of a simple model (Lennox 1986a:236-7) the limes loci were interpreted as house structures. Debitage density transects revealed secondary peaks on either side of the main debitage concentrations. It was suggested that these had formed as a result of debitage accumulation against house walls. The squares producing the secondary peaks in debitage density were then plotted to exhibit house form.

Debitage density transects were also plotted for Canada Century (Fig. 11). It was surprising to see a similar pattern of secondary peaks appearing in these transects too, especially to the northeast, east and southeast. For the west and south there are two possible interpretations. To the west, secondary peaks are either poorly developed or absent. If they are absent the shape of the projected house walls (Fig. 12) may suggest that our excavations did not continue far enough toward the west to intercept the secondary peaks, if in fact they exist there. Alternatively, a poorly developed series of secondary peaks exist a few metres to the west of the primary peak, being absent only from the 0 North transect (Fig. 11). If the "missing"west wall interpretation is preferred, the south end of the extrapolated structure appears narrow and elongate. This elongation of the south end is accentuated if the poorly developed secondary peaks are preferred and in this case the dual peaks seen on the 6 South transect (Fig. 11) may represent the south end of the structure.

Given that the secondary peaks do portray house walls, the size estimates for the Canada Century structure vary depending on which of the above interpretations is preferred. These estimates range from a maximum of approximately 9 X 16 metres to a minimum of about 7 X 13 metres. While preference here is for the smaller structure size, either estimate is close to those for the extrapolated Innes houses which measure 9 X 11 and 10 X 13 metres. These are about three times the size of Lamoka Lake structures extrapolated from post moulds (Ritchie 1969) and similarly larger than the suggested house sizes reported for the Thistle Hill site (Woodley 1988, 1989). While the interpreted Innes and Canada Century structures appear large, the other components cited have been interpreted as summer occupations. As such they would likely have demanded less indoor space for daily activities. A similarly large (5 X 7 metre) post and frame structure was recently reported from *the ca.* 3000 B.C. Woodland I Period Hockessin Valley site in Delaware where a cold-weather occupation is also inferred (Custer and Hodny (1989:31,59).

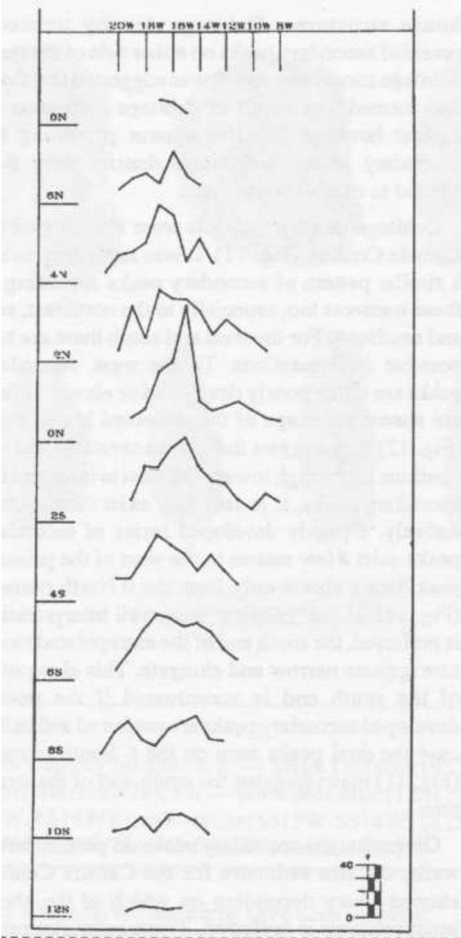


FIGURE 11
Debitage density transects.

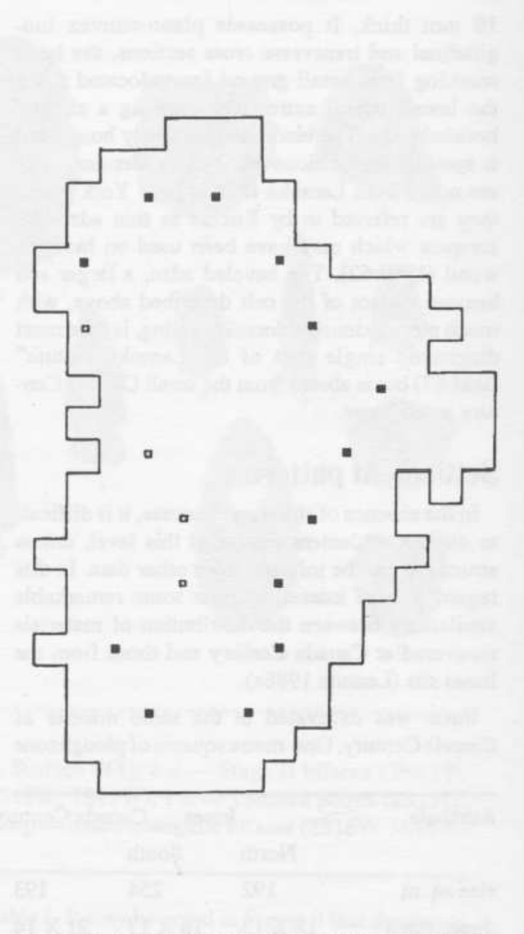

FIGURE 12
Secondary peaks and extrapolated house walls.

## Discussion and conclusions

The Canada Century site is a small Archaic component attributed to the Lamoka culture on the basis of its distinctive point style. As such, the occupation likely dates to about 2500 B.C., a mean date provided by Lamoka components in New York State (Ritchie 1969:43; Ritchie and Funk 1973:41). The site consists of **a** large, dense, lithic scatter, most of which was excavated. Several smaller scatters were also apparent from the initial surface collections. These were tested but low artifact density and adverse soil conditions precluded their complete excavation. Three subsoil features, located towards the periphery of the main concentration, were investigated, but were irregular in outline, contained little cultural material, and yielded a radiocarbon date far too late to be considered contemporary with an occupation by Lamoka people.

Debitage density transects repeat the pattern of primary and secondary peaks observed at the Innes site (Lennox 1986a) and are here interpreted as representing a structure of similar size. Both of the Inns structures and the single example from Canada Century are considerably larger than those from either the Lamoka Lake (Ritchie 1969:74) or Thistle Hill (Woodley 1989:62) sites. This difference may be an expression of seasonality, larger structures perhaps being required for cold season occupations. In this regard the larger structures are comparable in size to a similarly-dated post and frame structure from Delaware also interpreted as a cold-weather occupation (Custer and Hodny 1989). Inferred structure size, the lack of well-pronounced activity areas beyond the main concentration, an assemblage of tools dominated by hunting equipment (points), the absence of fishing equipment (netsinkers) and a concern for chert conservation, may all be considered arguments in favour of a cold season occupation.

Within the main area of excavations, most artifact types were randomly distributed, but several types appear to be more restricted or clustered in their distribution. Most notable is the distribution of points and point fragments in the northeast portion of the excavations while the remainder of the biface reduction sequence is scattered especially to the southwest of the points. The area to the northeast may be an area where points are refitted to shafts or alternatively an area where point fragments, especially point tips, were removed from animal carcasses and discarded during butchering.

The scarcity of lithic scrapers in this assemblage is also noted for Lamoka sites in New York State. Perhaps this is also a seasonal indicator, with Lamoka scrapers being common on site types which have not yet been investigated. Alternatively, another tool form, such as the small adze-like scraper, may have been used for hide processing. If Ritchie is correct in his suggestion that these tools were scrapers, their long use-life might account for the scarcity of other scraper forms in Lamoka assemblages. The few tools from Canada Century that do resemble "scrapers", in the broadest definition of the term, appear in two small concentrations, perhaps representing specialized activity areas.

The remaining tool category that deserves special mention are the wedges or *pieces esquilées.* There has been considerable discussion concerning the presence and interpretation of these tools in the Northeast since MacDonald's first recognition of their presence in North America at the Debert site in Nova Scotia (1968). This discussion has been concerned with the difference between bipolar cores and wedges, particularly where tools have been reduced in a bipolar fashion *(cf.* Lothrop and Gramly 1982, Poulton 1985) but has merged with discussions concerning the use of bipolar cores (Binford and Quimby 1963) as a means of chert acquisition. Some analysts interpret bipolared tools as having been intentionally reduced through the bipolar technique to acquire usable flakes, especially where materials are scarce. Others emphasize the secondary or terminal use of tools as wedges. At Canada Century there appears to be a fairly clear division between bipolar cores and wedges or *pieces esquilées,* bipolar cores being larger, thicker and more blocky in cross section, capable of producing usable flakes, while wedges are smaller, thinner and more lenticular in cross section, incapable of producing flakes of a size suitable for use. Despite the more frequent recognition of *pieces esquilées,* few insights concerning their use have emerged beyond the suggestion that they were wedges used for extracting splinters of bone, antler or wood (MacDonald 1968:88-90).

Lithic debitage accounts for the largest proportion of the assemblage and all but a few specimens are of Onondaga chert. Sixty-one per cent of the identifiable flakes (primary and secondary flakes combined) are primary flakes (flakes removed from cores) suggesting that raw material was abundant close by (a primary source of Onondaga chert is currently accessible seventeen km from the site) and that at least some of the material was transported to the site where it saw the early stages of reduction performed. In agreement are the sixteen per cent of identifiable flakes exhibiting cortex, eighty-one per cent of this being tabular cortex, confirming use of a primary chert source and again suggesting that the material had not undergone extensive reduction prior to its arrival at the site.

Examination of the cores, however, yields a different interpretation from that suggested by the analysis of the flakes. Random cores (Witthoft 1957) are larger pieces of chert which have had flakes removed from several striking platforms with no directional preference or pattern. On sites close to chert sources they appear to have been rejected after the most easily obtained flakes had been detached, or when the core became small and perhaps difficult to hold during reduction. Bipolar cores (Binford and Quimby 1963) are smaller pieces of chert which have had flakes removed from opposing ends, presumably produced between an anvil and anvilstone. They tend to be more common where raw materials are scarce or on scarce raw materials following the suggestion that the bipolar core technique provides a method of further reducing an otherwise exhausted, handheld, random core. At the Canada Century site the twenty-seven random cores only slightly outnumber the twenty-two bipolar cores (excluding the twenty-five wedges, etc.). So the high frequency of primary flakes and the large number of random cores suggest there was an abundance of raw material. Yet, on the other hand, the strong representation of bipolar cores suggests that material was scarce.

There is some suggestion in the Canada Century assemblage that pebble cherts derived from secon-

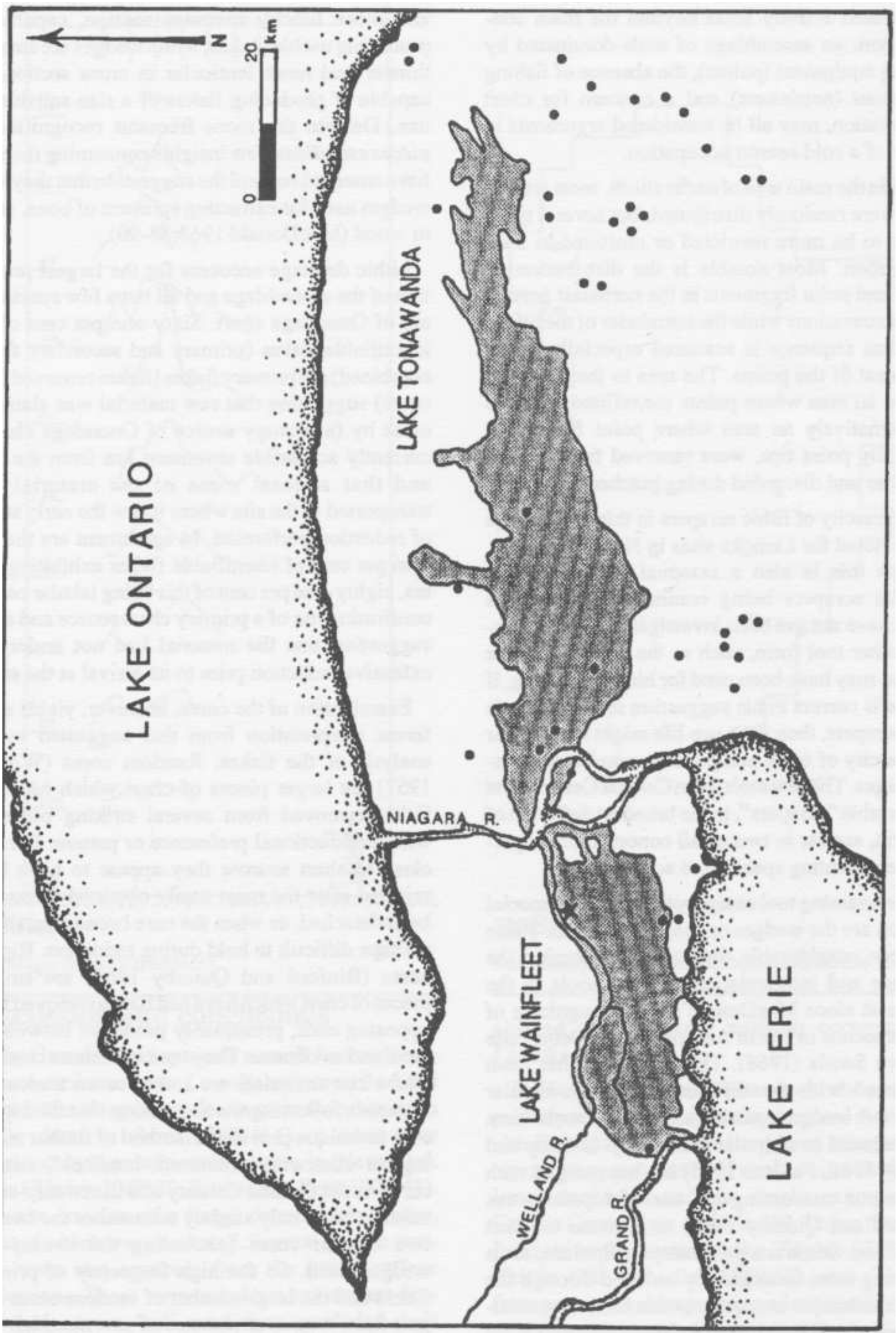


**FIGURE 13**

**Lakes Wainfleet and Tonawanda (after Pengelly 1986) and the distribution of Lamoka beveled adzes (after Ritchie 1969).**

dary sources, those that exhibit nodular cortex, were preferred for reduction using the bipolar technique or alternatively that the bipolar technique was preferred for small nodular pieces of chert obtained from secondary sources. Although cortex is rare on bipolar cores, five of the twenty-two bipolar cores exhibit nodular cortex and one possesses tabular cortex, while, of the twenty-seven random cores, thirteen exhibit tabular cortex and only three possess nodular cortex. In the case of secondary source materials such as chert pebbles, the use of the bipolar technique is likely a function of their small size. The question remains, however, why use the smaller chert pebbles from secondary sources when larger pieces of raw material seem readily available nearby? Also, assuming that an abundance of material is available from a nearby primary source, why resort to the use of the bipolar technique at all?

These questions may be answered if we consider more closely the problem of the accessibility of the primary Onondaga source located due south of the site on the Lake Erie shore. At first, when trying to reconcile the apparent concern with chert conservation and the short distance from the site to the chert source, it was thought that the peat bog, located between the site and the lakeshore, may have provided an obstacle. However, recent and ongoing research suggests that a sizeable lake, of which the bog is only a small remnant, may have existed during the period of site occupation.

Recent geological and palynological evidence suggests that the present land-water relationships on the Niagara Peninsula took their form following the Nipissing high-water levels between 4000 and 5000 B.P. As such, this relationship is pertinent to the present study and to our understanding of Archaic assemblages throughout this region. In fact, archaeological evidence may eventually be used to support, refine or refute the timing of these geomorpological events. This area of research is currently being pursued by J. Pengelly (1986, 1990).

It is believed that for several thousand years before approximately 4000 B.P. the level of Lake Erie was maintained at the 176-178 metre level by the Johnsons/Lyell Ridge rather than by the 168-meter Fort Erie Sill (Pengelly 1990:67; Tinkler nd.). Pengelly suggests at that time the discharge of Lake Erie occurred through other outlets such as that at Lowbanks, east of Morgan's Point (Fenstra 1981) and that at the mouth of the Grand River, creating flow across the Niagara Peninsula through a shallow, slow moving "Lake Wainfleet" located between the Onondaga Escarpment and the Fontill Kame and discharging where the present Welland River meets the Niagara River (Pengelly 1986, 1990). From this point eastwards there was a well defined lake called Lake Tonawanda which existed between the Niagara and Onondaga Escarpments in New York State. Kindle and Taylor (1913), when mapping Lake Tonawanda, suggested a fifteen-mile long western extension into Ontario (Fig. 13). Pengelly (1986, 1990) suggests that much of the southern Niagara Peninsula between the Onondaga Escarpment and the Fonthill Kame was covered by Lake Wainfleet and that the Onondaga Escarpment formed a series of islands along the shore of Lake Erie. The distribution of the Lamoka beveled adzes in western New York and Ontario (Ritchie 1969:44-45) in comparison with the shores of Lake Tonawanda and Lake Wainfleet (Pengelly 1986) appears to lend some support to their coexistence (Fig. 13) especially since both data sources were constructed independently and were not portrayed with detailed comparison in mind. For more detailed mapping of Lake Wainfleet at various levels, see Pengelly 1990:74-75.

The Onondaga chert source, now barely exposed along the present Lake Erie shore on the eastern Niagara Peninsula, would have been submerged during these high water stages but chert would have been available farther west where it outcrops at higher elevations. This might explain why Onondaga chert recovered from an Archaic site on the Welland River near Chippawa was identified as deriving from a source west of the Grand River (Parkins 1974, 1977; Pengelly 1986, 1990). Why, queries Parkins, would Indians on the Welland River take a long round-about trip to the mouth of the Grand River to obtain their chert when an abundant supply at Erie Beach and Point Abino was closer at hand and easier to reach (1974:29)?

Bearing these data in mind, ten thin sections of chert from Canada Century were provided to Parkins for source identification. Basing his conclusion on the percentage, distribution and form (anhedral or euhedral) of calcite and its replacement in the chert sample by cryptocrystalline quartz, Parkins indicated that three samples were definitely from west of the Grand River, five samples could easily have come from either east or west of the Grand River but were not from the far eastern end of the Niagara Peninsula, and the remaining two samples were not interpretable due to the unknown effects of thermal alternation on the specimens. These results provide support to the pattern of chert source utlization observed by Parkins (1974, 1977) on other sites along the Welland River and lend additional substance to Pengelly's hypothesis concerning the presence of Lake Wainfleet on the Niagara Peninsula until Late Archaic times. If chert was accessible from currently available sources seventeen km south of the Canada Century site, these sources would have undoubtedly been preferred over sources west of the Grand which are at least twice the distance away.

The transport of Onondaga chert from sources west of the Grand River to the Canada Century site may partly explain its conservation or exhaustion there using the bipolar core technique. Yet there are still outstanding questions concerning the transport and use of pebble cherts over similar distances since chert pebbles do not occur naturally on the Welland River (Parkins, personal communication 1990). Assuming that the pebble cherts were obtained from the same source west of the Grand River, why transport small pieces of chert when larger blocks are available from the same source? There also appears to be a discrepancy between the discard of larger random cores and waste flakes and the exhaustion of some materials using the bipolar core technique. Is this a result of a change in attitude toward raw materials on the site during its occupation? Perhaps during the site occupation, for example over the winter months, the supply of material became depleted and a change in reduction strategy was required to compensate for material scarcity.

The few extensively investigated Lamoka sites in New York State tend to be large, occupied repeatedly or for long periods of time, allowing for the accumulation of substantial amounts of refuse. Lamoka Lake, for example, is noted for being three acres in extent and possessing refuse deposits up to five feet thick. A wide variety of activities are represented with emphasis being on deer hunting, fishing and acorn processing. Most Lamoka sites, however, are small temporary camps, found on small streams, lakes, and marshes (Ritchie and Funk 1973:41-44, 338-9).

Perhaps, as Ritchie suggests, "the close harmony involving habitat, economy and technology is evident within the limited ecosystem of the Lamoka people in the locations and contents of the major sites, which yield such inferences more readily than the camp components where only a small fraction of the material culture survives"(1969:39). Yet, we must agree that these small camps, by their very nature or simply because of their presence, must offer a different perspective on the Lamoka culture whether they are small, short term, special purpose extractive camps or more substantial, seasonal home base occupations. The Canada Century site, now located on the bank of **a** major river, may once have been on the shore of **a** large lake. Yet, from the assemblage of tools recovered, it appears to ignore the bounties of these resources. Clearly the study of these smaller camps will offer a more complete and rounded picture of the Lamoka culture in the Great Lakes region.

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