THE BOLTON SITE (AfHj-89): A CROWFIELD PHASE EARLY PALEO-INDIAN SITE IN SOUTHWESTERN ONTARIO

D. Brian Deller and Christopher Ellis

This *paper provides a* description *and analysis* of the information recovered *during the 1990 excavations* at the *Early Paleo-Indian* (fluted *point-related) Bolton* site *(AfHj-89) in* southwestern Ontario. *Bolton was excavated as part* of *a larger* project *designed* to *explore* the nature *and theoretical* significance *of small* sites *to our understanding of Paleo-Indian cultural* systems. The site *has yielded the* distinctive *Crowfield* style *fluted* points and preforms *and, hence,* is assignable to the *Crowfield* Phase. This phase is the presumed *terminal, Early Paleo-Indian* manifestation in *the eastern Great Lakes* area *and* is one of the poorest *known of all* suggested *Great Lakes area* Paleo-Indian *developments. Although several* other components were represented at the site, *detailed* analyses of the *spatial distribution of ploughzone* piece-plotted *artifact* types *and* of different lithic *raw materials allowed* the isolation *of the Paleo-Indian tool* and waste *flake* assemblage. The recovered site *sample* is *dominated by fluted* bifaces and *denticulated/retouched flakes* and is *interpreted as a small* hunting *camp* or a task *group activity* area. *Despite* the *fact* that *Crow*field bifaces *are* best *known* from *a ceremonial* feature *at the Crowfield* site, *the clearly non*ceremonial *nature* of the Bolton *site lends* credence to the *view that Crowfield* points *are utilitarian* tools *and not* some *special* ceremo*nial artifact.* The site *also* demonstrates some of the interpretative *advantages of small* sites, *particularly* with respect to *spatial patterning and delineating tool kits.*

INTRODUCTION

Although small sites dominate the Early Paleo-Indian archaeological record of southern Ontario, the majority of excavations have focussed on the much rarer large sites. Furthermore, most of the excavated sites are located on, or in the vicinity of, the inferred strandline of pro-glacial Main Lake Algonquin. As discussed elsewhere (Ellis 1994; Ellis and Deller 1980, 1991; Jackson 1990, 1994; Jackson and McKillop 1991; Storck 1982; Wortner and Ellis 1993), these biases have tended to provide a somewhat skewed view of many aspects of Paleo-Indian cultural systems. Also, this strategy has failed to take notice of some of the long-recognized theoretical advantages (e.g., Moseley and Mackey 1972:76) inherent in studying and interpreting small sites. For instance, there is a greater probability that small sites represent short-term occupations and a limited range of activities. Therefore, they provide a better opportunity to determine, or at least begin to recognize, co-occurrences of tool forms which may have been used together in the same tasks.

In an attempt to partially rectify the problems noted above, the authors initiated excavations at three small Early Paleo-Indian sites in southwestern Ontario in 1990. It is the goal of this paper to present a description and analysis of the archaeological information recovered from one of these sites: Bolton (AfHj-89). Although we discuss some of the theoretical advantages regarding small sites, our main goal in this paper is to place on record the substantive results of these excavations. In particular, we focus here on the implications of the site investigations to our knowledge of the poorly understood Early Paleo-Indian Crowfield Phase in the eastern Great Lakes region.

THE BOLTON SITE

The Bolton site is located southwest of Strathroy, Ontario. It is one of a series of Paleo-Indian sites in the general vicinity, the best known of which are probably Crowfield

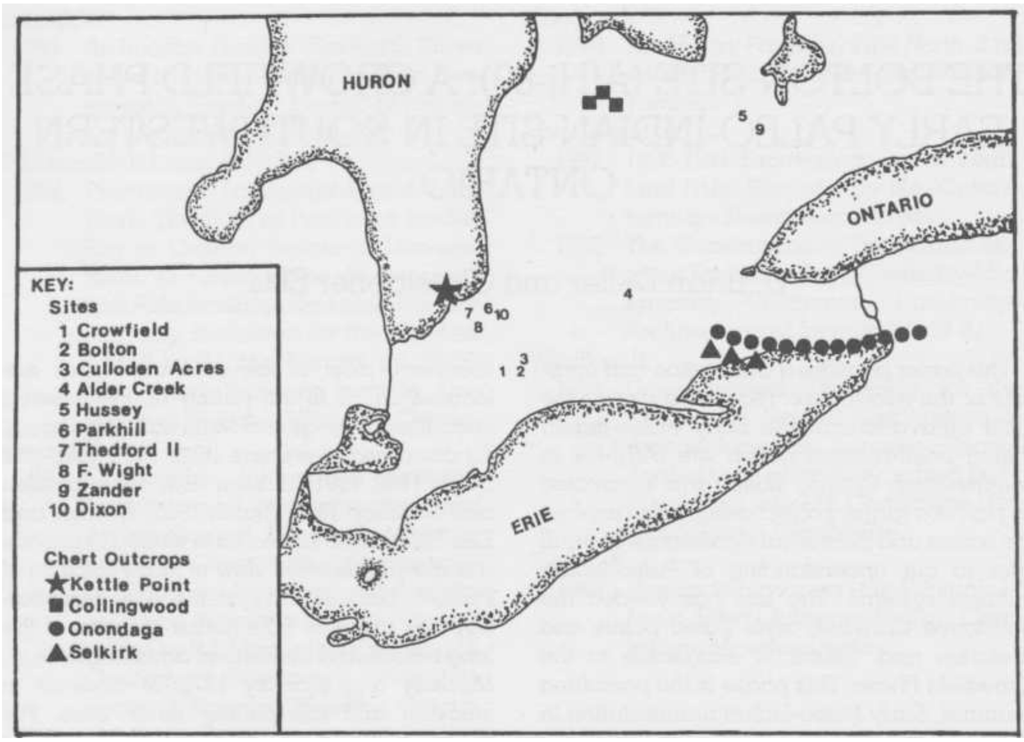

Figure 1. Map Showing Site Locations and Chert Bedrock Outcrops

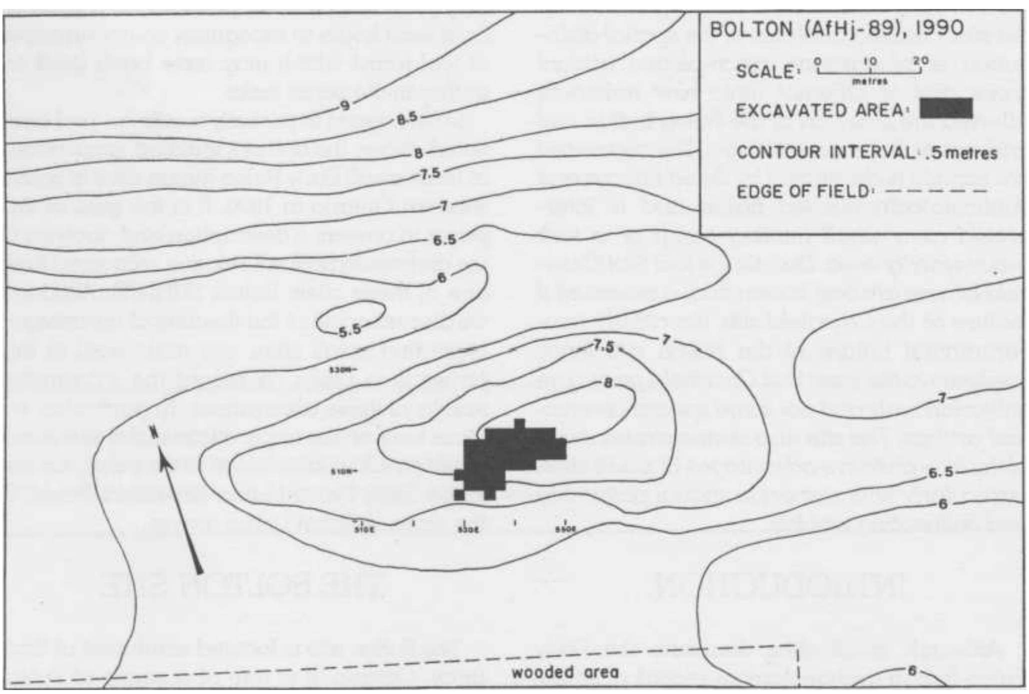

Figure 2. Topographic Map of Bolton Site

(Deller and Ellis 1984) located 6 km west of Bolton (Figure 1) and Culloden Acres (Ellis et al. 1992) located only .5 km to the north. Bolton is located just below a pro-glacial Lake Whittlesey strandline on a northwest to southeast trending knoll (Figure 2). This knoll appears to be a remnant of a sand dune, formed on a vegetation free expanse uncovered by the draining of Lake Whittlesey (Paul Karrow, personal communication, August 1990). Lake Whittlesey existed around 13,000 B.P. (Eschman and Karrow 1985:84), or some 2,000-3,000 radiocarbon years before the probable time of site occupation. The former lake bed of Whittlesey is today largely an extensive wetland/peatland in the site vicinity, or at least was so prior to extensive land alterations by Europeans. Hence, the site is in a location known to be typical of many Early Paleo-Indian sites (not only in Ontario but also in several other areas of the Northeast), namely, on an elevated area such as the dune, overlooking a lower poorly drained area of "muck" soils (e.g., Deller 1979:6; Nicholas 1988). The Bolton site was not cleared and ploughed until ten years prior to the present project. At that time, the southeast end of the dune was reduced by bulldozing to make it easier to farm. This alteration does not, however, seem to have had any effect on the Paleo-Indian component at the site.

The site was discovered by a local resident, James MacLeod, who immediately brought it to Deller's (1988) attention. The surface recoveries included complete and fragmentary fluted preforms for what we call Crowfield type fluted points (Deller and Ellis 1984). These points are diagnostic of what has been called the Crowfield Phase in the eastern Great Lakes region. This phase is believed to represent the latest-dating or terminal, Early Paleo-Indian occupation of the region (Deller 1988; Deller and Ellis 1984, 1988, 1992a; Ellis and Deller 1990).

Aside from the fact that the site was small, four characteristics suggested that it warranted further investigation although, as will become clear below, some of these suppositions proved unfounded. First, the site had yielded Crowfield fluted bifaces. Prior to 1990 when we began excavations, the phase was known only through a scattering of surface finds of the distinctive points, and excavations at the Crowfield site in Caradoc Township (Deller and Ellis 1984), the Zander site near Lake Simcoe (Stewart 1984), and Area A at the Hussey site, located near Alliston, Ontario (see Storck 1979: Plate 16c). More recently, however, a Crowfield component was excavated at the Alder Creek site near Kitchener, Ontario (Timmins 1994). Nevertheless, Crowfield Phase material remains the poorest known of all the recognized Paleo-Indian variants in the Great Lakes region.

Second, a fluted biface recovered from the Bolton site surface, along with some other tools, had been exposed to heating, exhibiting potlidding and some distinctive heat fractures. This heating was also characteristic of the Crowfield site where a pit was uncovered containing over 200 Paleo-Indian artifacts lacking any evidence of breakage in use and manufacture and which was clearly a ceremonial cache of some kind (Deller and Ellis 1984). Since the recovered fluted biface was also complete, it raised the possibility that the Bolton site would yield similar evidence which would provide the opportunity to explore the significance of such behaviour.

Third, except for some surface material to the east and southeast of where the majority of the Paleo-Indian artifacts were recovered, there was no evidence of later occupations at the site. This property would also simplify site interpretation as one would not have to try and separate out the non-Paleo-Indian material.

Finally, since the site was only placed under cultivation relatively recently, we reasoned it had a greater potential than many other sites to have more intact spatial patterning.

METHODS OF SITE INVESTIGATION

The Bolton site was excavated between July 5 and August 16, 1990 with a field crew ranging from two to eight individuals. With few exceptions, all of the artifacts surface collected prior to the project had been piece-plotted. These materials, along with the material found and piece-plotted during the 1990 project, allowed us to pinpoint the extent of the Paleo-Indian surface materials prior to excavation. The excavations were carried out in relation to a main grid of two-metre major excavation units. The east-west base-lines were laid out parallel to the direction of site ploughing. As a result, Grid North was established at an angle of 18 degrees east of magnetic north. The main north-south and east-west grid lines were laid out west and south of the site knoll and the intersection of these base-lines was arbitrarily designated 500N/500E. Squares were labelled in the field by the intersection coordinates at their southwest corners. This grid system was subsequently tied into two permanent, cement-encased, metal datum rods established in a wooded area south of the site (Figure 2).

Once a grid was established and prior to any excavation, David Nobes and Mike Brewster of the Department of Earth Sciences, University of Waterloo carried out magnetic and electromagnetic prospecting at the site. It was reasoned that if a feature similar to that at the Crowfield site was present, it should be detectable using these methods. These methods served to identify seven magnetic and/or electromagnetic anomalies in the gridded area (Brewster 1991; Nobes 1994:400-404). Six of these anomalies were peripheral to the area yielding Paleo-Indian material, and in fact, were in areas which were not excavated. The remaining anomaly was very well-defined, was located in the area of Square 512N/534E, and was in close vicinity to a number of artifact surface finds, notably a fluted preform from Square 512N/532E, a fluted preform fragment from Square 516N/536E, and a channel flake segment from Square 514N/538E. This close correspondence to the surface finds led us to suspect that the anomaly might represent a Paleo-Indian feature like that seen at the Crowfield site. This anomaly subsequently proved to be the location of two prehistoric cultural features (Features 1 and 2 in Figure 3). It seems certain that these features were not Paleo-Indian, since they were so well-preserved and corresponded to a ploughzone concentration of definitive non-Paleo-Indian material (Concentration "B" infra). In fact, the largest feature is probably "Smallpoint" Late Archaic (see Ellis et al. 1990), since a point diagnostic of that affiliation was recovered at the ploughzone-subsoil interface immediately on top of Feature 1. Another feature remnant (Feature 3) was located just to the west of Features 1 and 2 and also seems to be associated with a concentration of non-Paleo-Indian debris (Concentration "G" infra). Since no other prehistoric features were located at the site and there is no evidence the located ones are of Paleo-Indian affiliation, we will avoid further allusions to them in this paper.

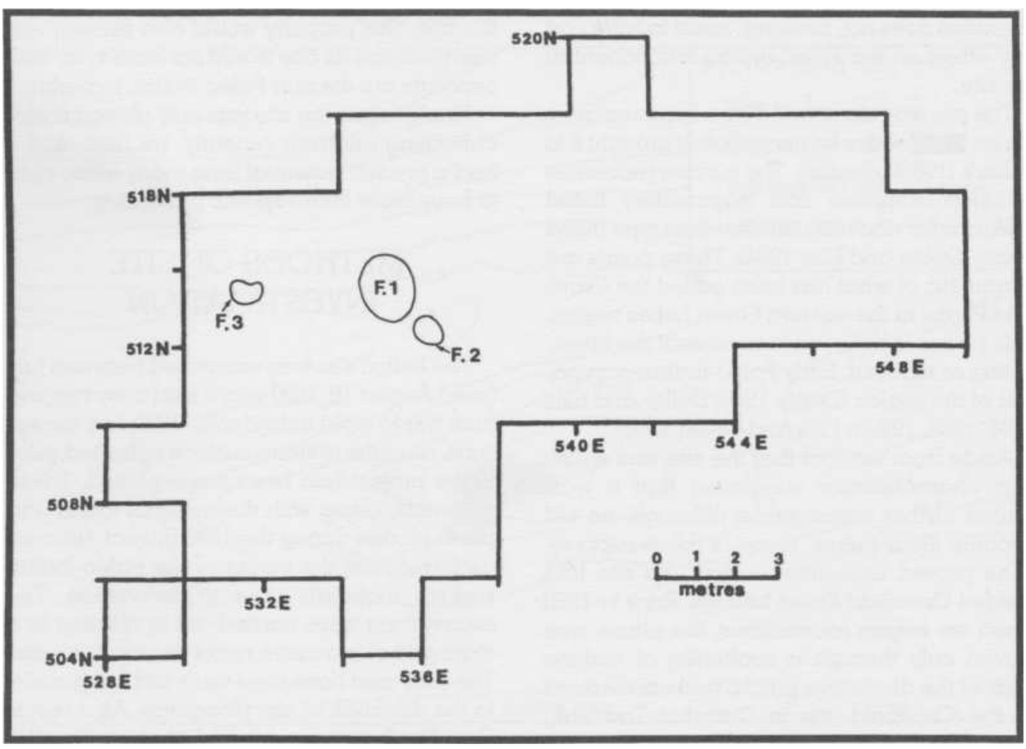

Figure 3. Feature Locations, Bolton Site

The excavation procedures used to investigate the Bolton site followed those we have successfully employed at other sites (e.g., Deller and Ellis 1992a). Within each two-metre unit, the matrix of three of the one-metre subunits was passed through 1/4 inch (6.5 mm) mesh hardware cloth. The matrix of the remaining one-metre subsquare (always the northeast subsquare of the two-metre unit) was passed through 1/8 inch (3.2mm) mesh. The ploughzone was removed with shovels. In general, only one shovel-load was screened at a time. All ploughzone tools and preforms, as well as some distinctive debris types such as channel flakes from point fluting, were piece-plotted. This plotting involved cross-tape triangulation to the centre of the location of the separately removed and screened shovel-load from which the artifact was recovered. Once the ploughzone was largely removed, the ploughzone-subsoil interface was cleaned with trowels and carefully examined for feature remnants and evidence of subsoil artifactual material. Whenever such features or subsoil cultural material were encountered, they were excavated with trowels and other fine scale excavation equipment and provenience information was carefully recorded. If no evidence of subsoil material was encountered, the subsoil was excavated with shovels and screened to a depth of at least 10 cm. If subsoil materials were encountered, excavations proceeded until a sterile 10 cm level was removed.

Excavation of the two-metre units proceeded as follows. A checkerboard pattern of two-metre squares was initiated beginning just east of the magnetic/electromagnetic anomaly, and this pattern was expanded until the general limits of the Paleo-Indian debris was determined. The intervening squares were subsequently excavated. In all, we estimate the Paleo-Indian activities at the site to have encompassed an area of some 200 m^2 of which 184 m^2 was excavated.

SPATIAL DISTRIBUTIONS AND LITHIC RAW MATERIALS

Although there was no evidence of non-Paleo-Indian cultural materials in the main area of the site prior to 1990, subsequent excavations recovered material diagnostic of later occupations of the site. These later diagnostics, recovered from the excavated or surrounding area (within six metres of the excavated area's perimeter), are summarized in Table 1 and illustrated in Figure 4. They include: two notched serrated points which could relate to either Early or Middle Archaic occupations of the site (see Ellis et al. 1991:23); the base and a complete example of side-notched, Late Archaic "Smallpoints"; three notched or stemmed points assignable to a Middle Woodland use of the area; and, a triangular point and two thick stemmed end scrapers resembling those reported from Early Ontario Iroquoian sites (see Williamson 1990: Figure 9.4j, k). In addition, a number of other items were recovered which, although not assignable to specific later occupations, are definitely not Paleo-Indian associated. These consist of two tips of small, relatively thick and narrow, projectile points; a notched point basal corner; two distinctive pieces of debris produced in making the notches seen on many Archaic and Woodland point forms; a fragment of a ground stone tool; and a large schist chopper. Fortunately, it was possible to isolate much, although by no means all, of the material associated with each occupation including the Paleo-Indian one.

The initial step in isolating these occupations was to construct density maps showing the distribution of definitive diagnostics from the site. Since these diagnostics were almost all piece-plotted, the density maps were constructed using the relatively objective "moving template" method (Whallon 1984:245). This method involves counting all the piece-plotted material within a specified radius of evenly spaced points on the established excavation grid. The few items which were not piece-plotted were assumed to have been recovered from the centre of the one-metre unit in which they were found. For purposes of the present study, the contours were based on the plotted totals of all the material within a two-metre radius of points spaced at one-metre intervals on the grid system. Next, density contours were constructed by linking points with comparable densities. Because of some distortion due to ploughing, and to avoid a great deal of "noise" on the resulting diagrams, only the densities of two or more items were plotted on the maps.

Two such density maps were initially produced: one for the combined non-Paleo-Indian material, and one for the definitive Paleo-

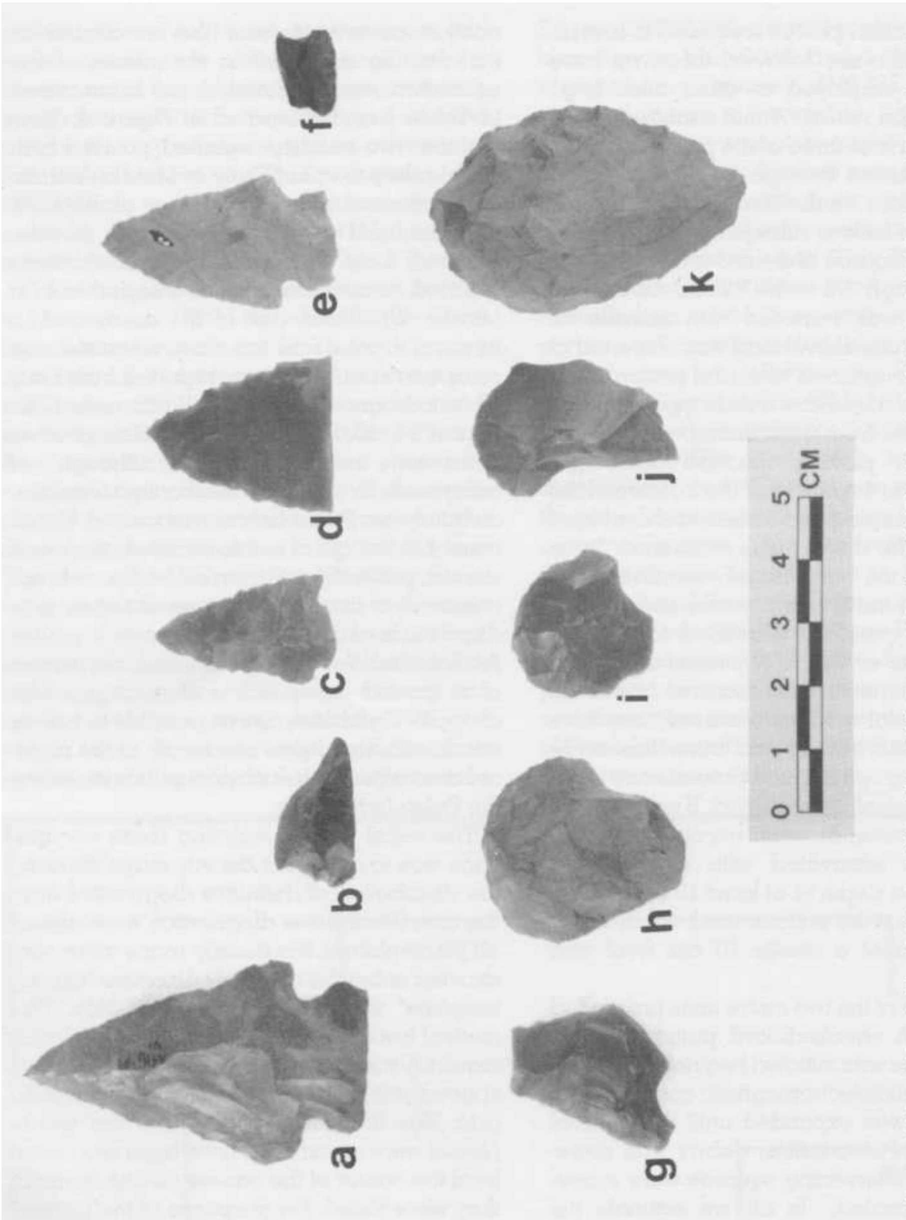

Figure 4. Non-Paleo-Indian Artifacts, Bolton Site. A-B: Corner-Notched Middle Woodland Points; C-D: Early or Middle Archaic Serrated Points; E-F: Late Archaic "Smallpoints"; G: Triangular Late Woodland Point; H-I: Stemmed End Scrapers; J-K: Other End Scrapers

Indian material. This Paleo-Indian material included several fluted bifaces or fragments, a number of channel flakes removed in point fluting, and a denticulate tool made on a channel flake segment. The density map for the non-Paleo-Indian occupation (using the two item density contour to isolate specific concentrations of debris) is shown in Figure 5. Three concentrations of non-Paleo-Indian tools are delineated which are labelled "A" to "C." The density map for the definitive Paleo-Indian material (Figure 6) reveals two major concentrations of debris (labelled "D" and "E") Neither of these Paleo-Indian concentrations corresponds to any of the concentrations of non-Paleo-Indian diagnostics.

Having initially established the main areas of definitive activity representing Paleo-Indian and non-Paleo-Indian site use, the next step was to try and isolate other non-diagnostic tools associated with each occupation. Variability in the stone raw materials used, and the

Table 1: Non-Paleo-Indian Diagnostics.

FC#*	Artifact Type	Assignment	Raw Material	Square Provenance
57	Serrated Point Tip	Early/Middle Archaic	Kettle Point	514N/544E
31	Corner-Notched Serrated Point	Early/Middle Archaic	Kettle Point	512N/544E
90	Notched Point Base	Late Archaic Small Point	Other Onondaga	512N/534E
26	Corner-Notched Point	Late Archaic Small Point	Kettle Point	522N/544E (surface)
41	Large Notched Point	Middle Woodland	High Quality Onondaga	500N/538E (surface)
99	Large Notched Point Base	Middle Woodland	High Quality Onondaga	512N/530E
155	Stemmed Point	Middle Woodland	Other Onondaga	510N/550E (surface)
57	Triangular Point	Late Woodland	Kettle Point	514N/544E
16	End Scraper	Late Woodland	Other Onondaga	504N/534E
120	End Scraper	Late Woodland	Kettle Point	514N/540E
64	Small Point Tip	Non-Paleo-Indian	Kettle Point	516N/542E
107	Small Point Tip	Non-Paleo-Indian	Other Onondaga	508N/530E
56	Notched Point Basal Corner	Non-Paleo-Indian	Kettle Point	514N/544E
	Notching Flake	Non-Paleo-Indian	Other Onondaga	512N/536E
	Notching Flake	Non-Paleo-Indian	Other Onondaga	504N/528E
131	Ground Stone Tool Fragment	Non-Paleo-Indian	Slate	504N/534E
102	Chopper	Non-Paleo-Indian	Schist	512N/530E

*FC# = Field Catalogue Number.

spatial distribution of these raw materials, was employed in this task. The stone raw materials employed at Bolton included: Kettle Point chert, Selkirk chert, Fossil Hill (Collingwood variant) chert, and Onondaga chert (Figure 1). In addition to these cherts, 12 waste flakes were recovered on a distinctive, fine-grained, high quality, red coloured material. This material may be jasper. Since nothing like it has ever been recovered by the authors from southern Ontario sites, this material is probably exotic to the area.

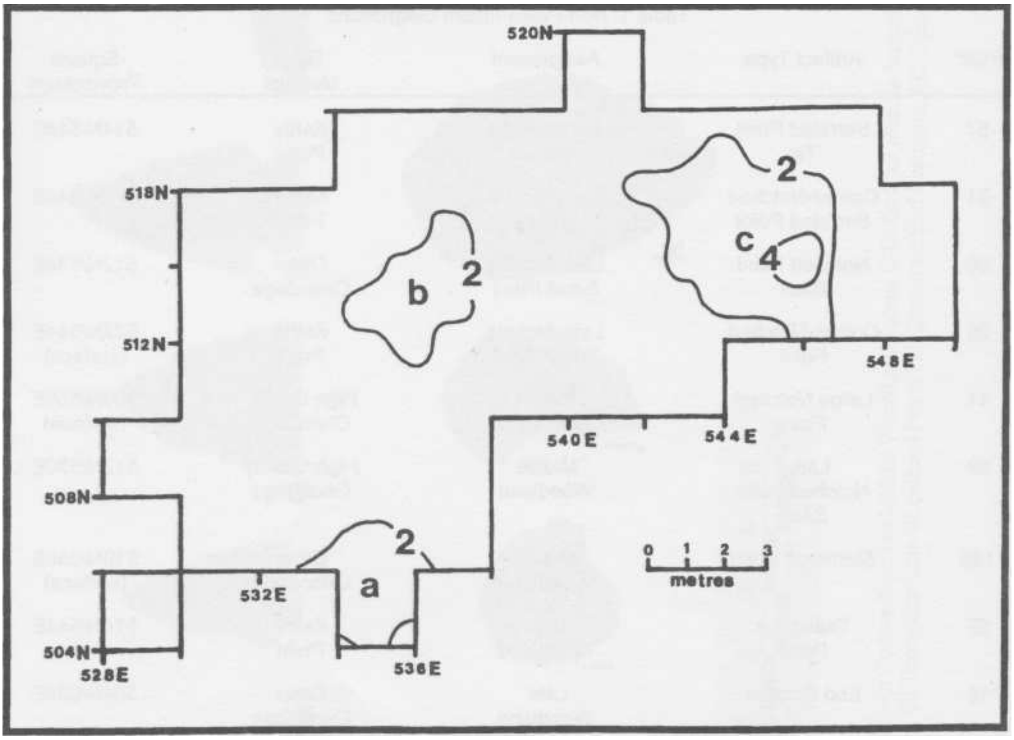

Figure 5. Density Map of Non-Paleo-Indian Artifacts

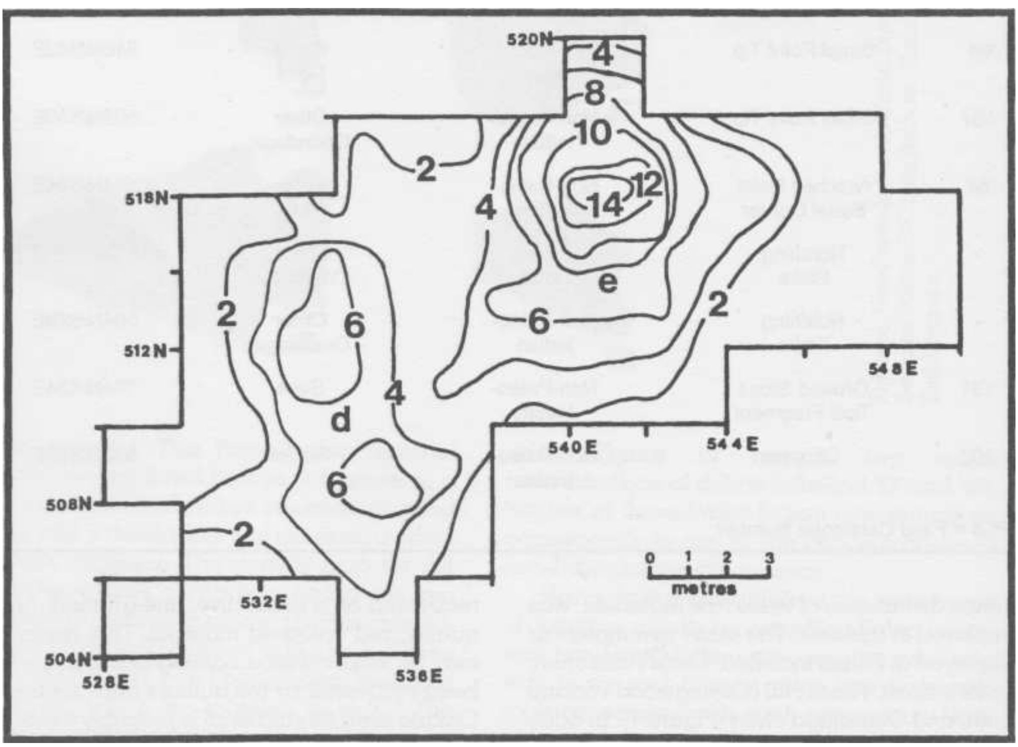

Figure 6. Density Map of Definitive Paleo-Indian Artifacts

In southwesternmost Ontario, Fossil Hill (Collingwood variant) chert usage is associated exclusively with Early Paleo-Indian assemblages (see Deller and Ellis 1992a, 1992b) and there seems little doubt it is associated with the Paleo-Indian component at Bolton. However, unlike many other Paleo-Indian sites in the area including nearby Culloden Acres, use of Fossil Hill at Bolton is minor. In fact, this material is represented by only a single biface finishing flake. As for the Onondaga chert at Bolton, this material ranges considerably in quality from a high grade, relatively flaw-free material at one extreme, to a low quality material which exhibits numerous flaws. Despite the fact there is some degree of gradation from the high to low quality end of the chert, it is possible to consistently recognize and sort out a high grade variety of this chert. This material is of a distinctive and relatively uniform blue-grey/grey to dark blue-grey/grey colour (10B5/1- 10YR5/1 to 10B3/1-10YR3/1 in the Munsell colour system). Aside from some browner areas with a higher limestone content from areas near original contacts of the chert with its surrounding matrix, there is little in the way of flaws in such material. Two artifacts retain original unflaked surfaces of the initial material from which they were made. In both cases, these surfaces are flat and planar and indicate this higher quality material was derived from bedrock outcrops. The nearest of these outcrops are located some 100 km southeast of Bolton. This bedrock source assignment can be contrasted with some of the lower grade material in the assemblage. That material is a lighter grey in colour, is generally more mottled, contains many more flaws, and (based on round and polished/pitted original unflaked surfaces) appears to be largely derived from secondary pebble deposits. These pebble deposits may occur as close as the Thames River Valley some 10 km to the east of Bolton.

Examination of the diagnostics in the collection suggests that certain stone materials are exclusively or largely associated with either the Paleo-Indian or non-Paleo-Indian components. Of the seven diagnostics made from Kettle Point chert, none are Paleo-Indian (see Table 1). These diagnostics include material representing the Early or Middle Archaic, Late Archaic and Late Woodland occupations of the site. On the other hand, the exotic red material is exclusively found in the forms of three Paleo-Indian channel flake segments. As for the Onondaga materials, there is no clear association with any one component. For example, there are at least eight Onondaga items which are non-Paleo-Indian. These include one stemmed Late Woodland end scraper, a complete and a fragmentary example of notched Middle Woodland points, a Late Archaic point base, a tip from a small projectile point, the two notching flakes, and a complete Middle Woodland stemmed point. There are, however, 37 Paleo-Indian artifacts made from this material. As was the case at the nearby Crowfield site (Deller and Ellis 1984:43), the definitive Paleo-Indian items are for the most part manufactured from easily isolated, higher quality, Onondaga pieces probably derived from bedrock outcrops. Indeed, 35 of 37 (94.6 percent) of the Paleo-Indian items are easily attributed to that Onondaga variety. In contrast, of the eight Onondaga items diagnostic of later occupations, only two (25 percent) are manufactured from high quality Onondaga chert. These two items are both large, notched, Middle Woodland points or fragments and one of these was recovered just to the south and outside the excavated area.

The associations of different raw materials with particular components can also be evaluated by examining spatial distributions. Figure 7 shows that there are three concentrations of Kettle Point chert artifacts. It is notable that two of these clusters correspond with concentrations of definitive non-Paleo-Indian materials (Figure 5) and, hence, concentrate in different areas than the Paleo-Indian materials. Moreover, the third concentration corresponds neither with a concentration of non-Paleo-Indian items, nor with the suggested areas of Paleo-Indian activity. For the sake of consistency, those Kettle Point chert concentrations that correspond to non-Paleo-Indian material concentrations have been assigned the same labels (e.g., Concentrations "B" and "C") The distribution of Kettle Point flaking debris is shown in Figure 8. Only one relatively dense concentration of this material occurs at the eastern end of the excavations. This concentration ("C") corresponds with the Kettle Point tool cluster/Non-Paleo-Indian tool cluster "C" (Figures 5 and 7). It is worth noting that there is a small cluster of Kettle Point debris in Square 516N/540E ("E" in Figure 8) corresponding to a Paleo-Indian tool/preform cluster ("E" in Figure

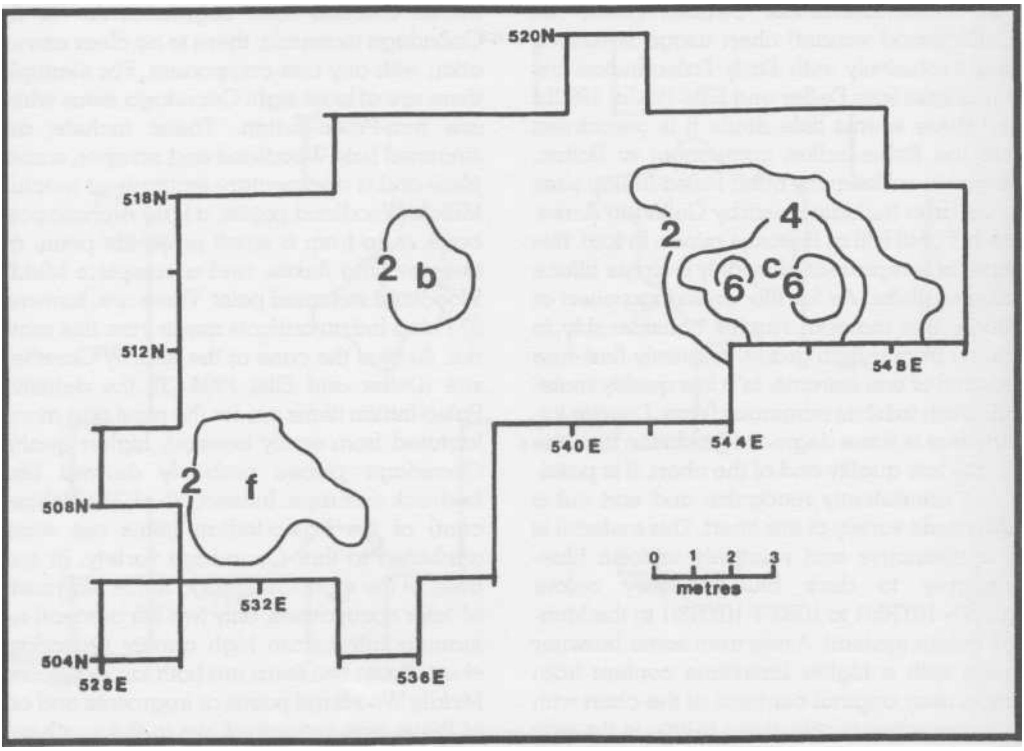

Figure 7. Density Map of Kettle Point Chert Tools/Preforms

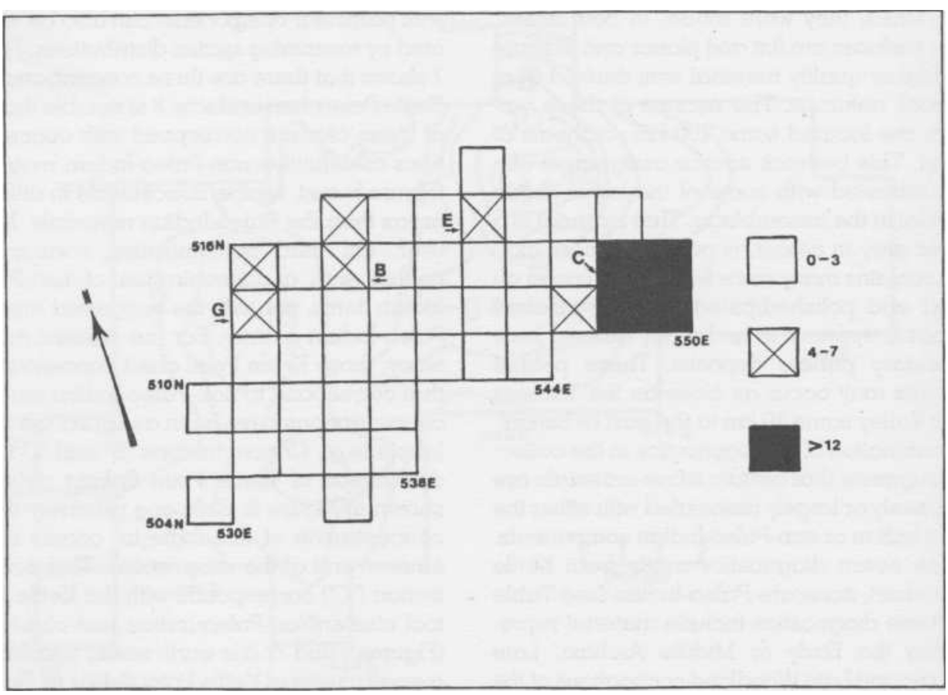

Figure 8. Kettle Point Chert Flaking Debris Densities

6). Other evidence not withstanding, this correspondence may suggest Paleo-Indian Kettle Point use. This use would not be surprising, since we have found evidence of minor use of this material at other Paleo-Indian sites such as Parkhill Area C (Deller and Ellis 1992b). However, it is notable that the tip of a small, non-Paleo-Indian point made from Kettle Point chert was recovered from the northwest subsquare of the two-metre square immediately adjacent to the concentration (Square 516N/542E), and an additional non-Paleo-Indian point of the same material attributed to the "Smallpoint" Late Archaic was recovered from the surface four metres to the north. It is possible, therefore, that this association is fortuitous. Overall, most of the available data suggest Kettle Point chert was only minimally used by the Paleo-Indian occupants of the site.

A density map was constructed plotting all Onondaga materials which can not be consistently sorted into the "high quality" Onondaga variety. This plotting reveals three concentrations of material (Figure 9). Two of these clusters correspond to non-Paleo-Indian concentrations ("B" and "C" in Figure 5) and, thus, are given the same labels in Figure 9. The third corresponds to Kettle Point concentration "F" which also suggests it is associated with post-Paleo-Indian occupations of the site (Figures 7 cf. Figure 9). A density map of comparable Onondaga flaking debris suggests this material concentrates in several areas (Figure 10). One of these is centered in Square 512N/534E and two other, less evident concentrations occur in Squares 514N/546E and 506N/530E. All three of these locations correspond to non-Paleo-Indian, Kettle Point tool/preform and low quality Onondaga tool/preform concentrations "B," "C" and "F" (Figures 5, 7, 9), once again suggesting this material is not Paleo-Indian.

Figure 11 plots the densities of tools and preforms made from the high quality Onondaga chert. The Paleo-Indian diagnostics were excluded because their number (35) would obscure patterns in the "non-diagnostics" of that same material. Figure 11 illustrates at least two very low density concentrations of these non-diagnostic artifacts made from high quality Onondaga chert. One of these concentrations corresponds to the Paleo-Indian diagnostic artifact cluster "E"; this result is not unexpected, given the dominance of this material among the definitive Paleo-Indian items. The other non-diagnostic, high quality Onondaga artifact cluster (consisting of a graver and a biface fragment) does not correspond with a concentration of definitive Paleo-Indian material and, in fact, corresponds generally with non-Paleo-Indian artifact concentration "B" (Figure 5 cf. Figure 11). Nevertheless, plotting the density of high quality Onondaga flaking debris reveals a close correspondence with the two suggested Paleo-Indian tool concentrations ("D" and "E" in Figure 12).

In summary, examining the frequency of different raw materials by items diagnostic of various time periods, as well as the spatial distributions of such items, suggests that the Paleo-Indian material from the site is manufactured primarily from a high quality, bedrock source of Onondaga chert, and is supplemented by a few pieces of a red exotic material. Fossil Hill chert is present but extremely rare. The Paleo-Indian material concentrates in two areas or forms two clusters. The non-Paleo-Indian materials, on the other hand, are made largely from Kettle Point and Onondaga cherts of lower quality, at least some of which are derived from secondary deposits. There is some evidence for the use of higher quality Onondaga but this use is relatively minor in comparison to Paleo-Indian use. The distributions of non-Paleo-Indian diagnostics and of the Kettle Point and lower quality Onondaga materials, as well as all these materials combined (Figure 13), suggest there are as many as six concentrations of post-Paleo-Indian materials. Although these are juxtaposed with the two concentrations of Paleo-Indian materials, they are located mainly in different spatial areas than the Paleo-Indian debris. In fact, only non-Paleo-Indian concentration "H" corresponds to the area of presumed Paleo-Indian activity concentration "E" (Figure 6 cf. Figure 13).

With the exception of concentration "F," all the suggested non-Paleo-Indian concentrations have yielded diagnostics which permit assignment to more specific post-Paleo-Indian occupations. Concentration "A" yielded a Late Woodland end scraper (Figure 4h) while concentration "B," which corresponds to Features 1 and 2, includes a "Smallpoint" Late Archaic point (Figure 4f). Concentration "C" represents the densest and most spatially extensive concentration and has both Early or Middle Ar-

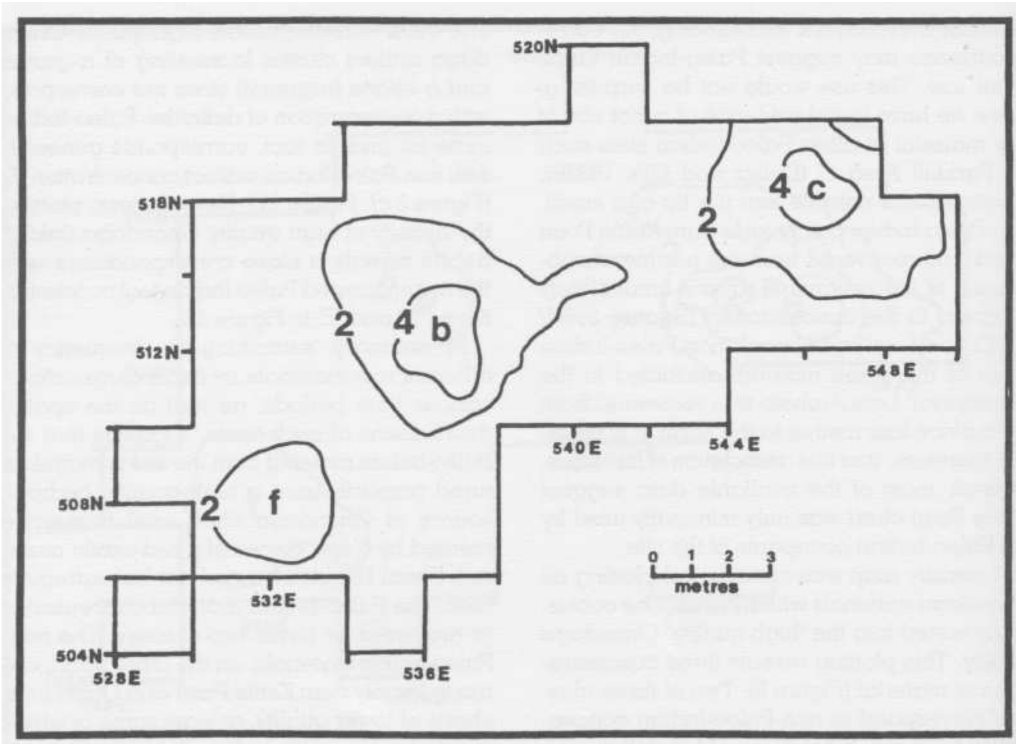

Figure 9. Density Map of Lower Quality Onondaga Chert Tools/Preforms

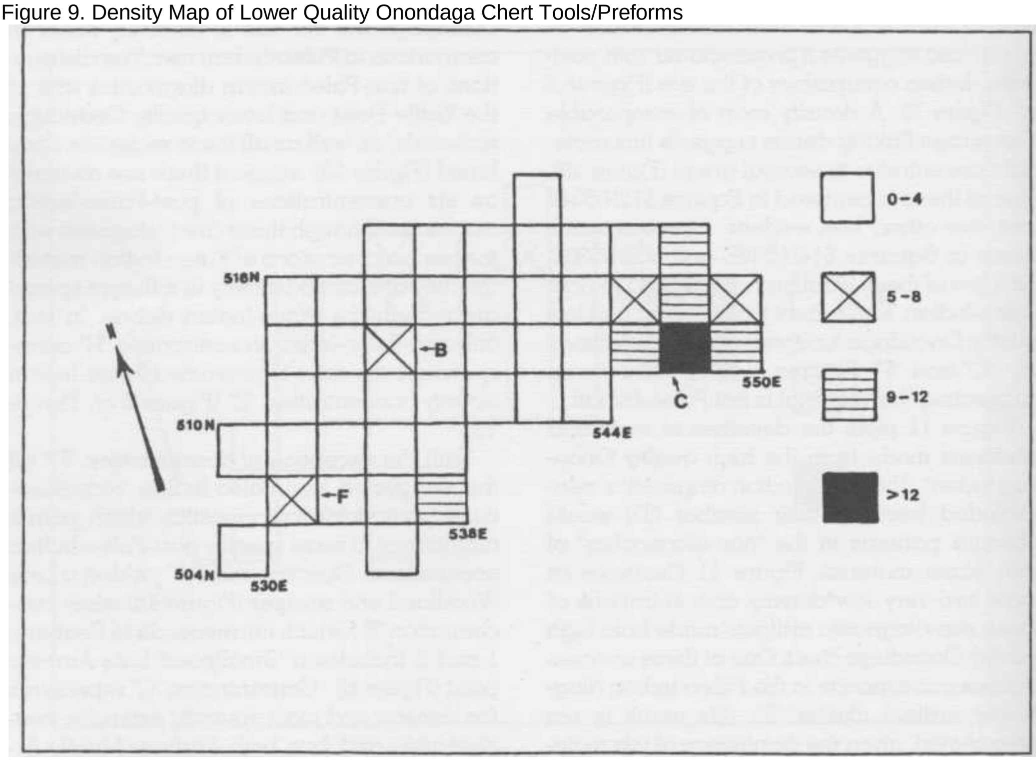

Figure 10. Lower Quality Onondaga Chert Flaking Debris Density

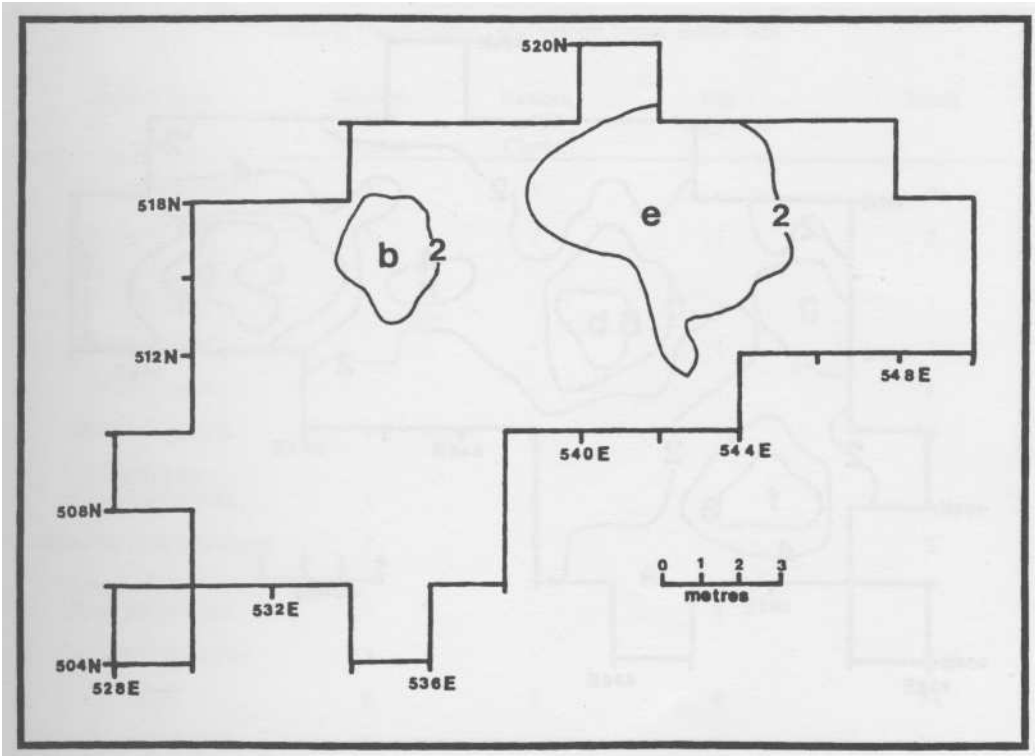

Figure 11. Density Map of High Quality Onondaga Chert Artifacts Excluding Paleo-Indian Diagnostics

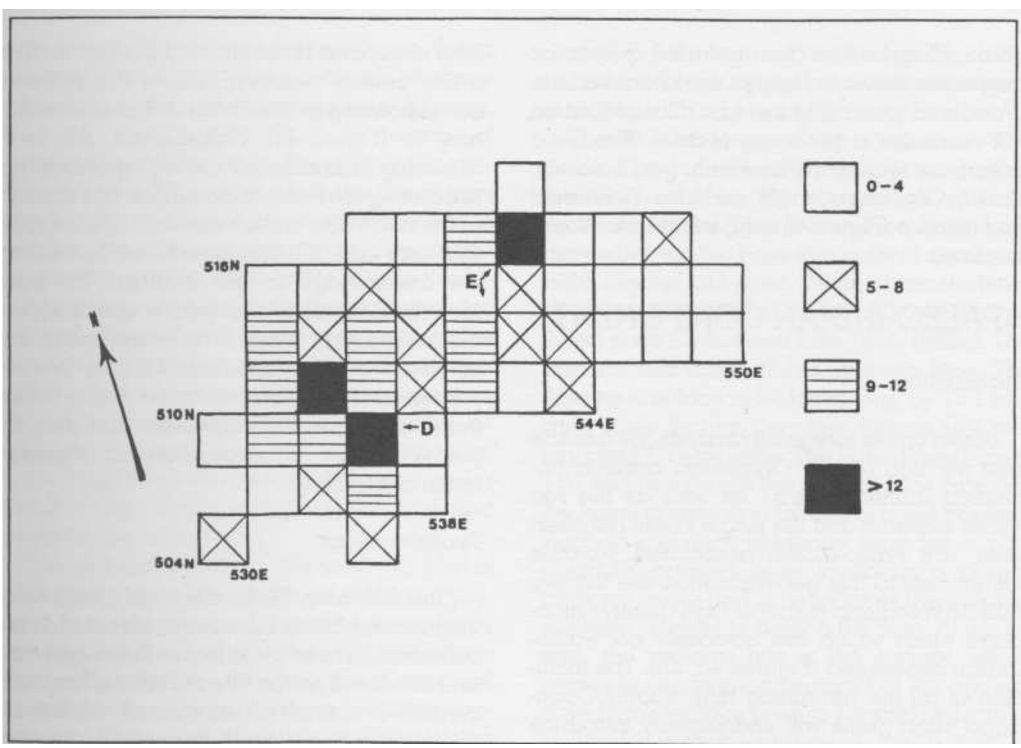

Figure 12. High Quality Onondaga Chert Flaking Debris Density

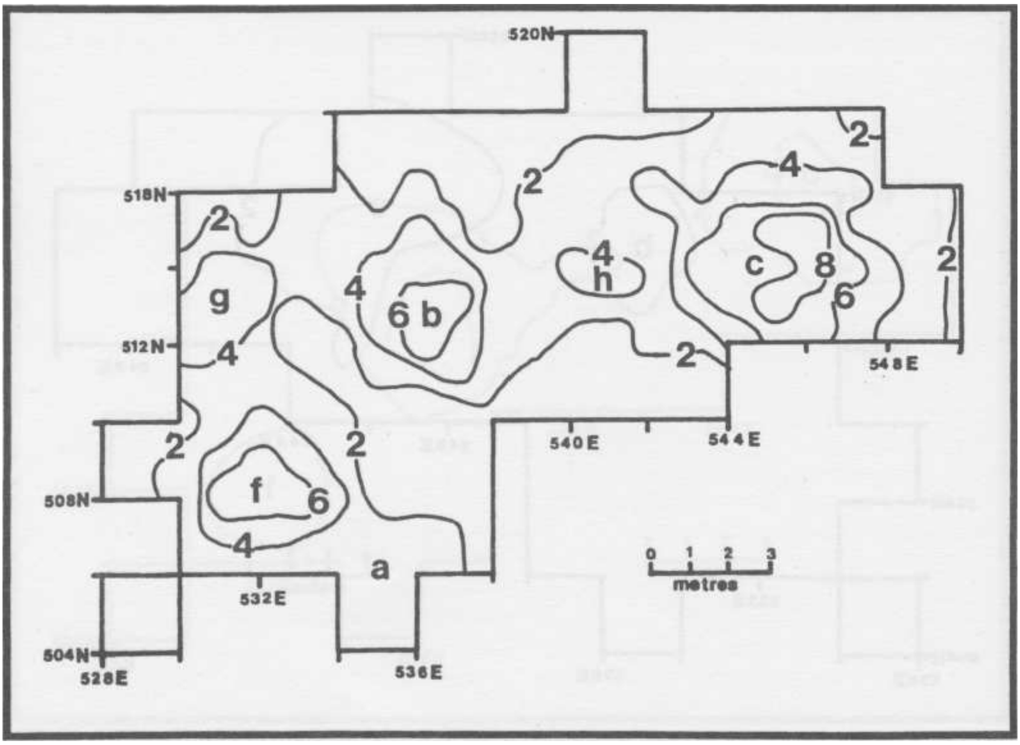

Figure 13. Density Map of All Presumed Post-Paleo-Indian Tools and Preforms

chaic diagnostics (two serrated points or fragments shown in Figures 4c, 4d) and a Late Woodland point (Figure 4g). Concentration "G" includes a probable Middle Woodland point base (Figure 4b) and includes Feature 3. Finally, Concentration "H" includes a stemmed end scraper (Figure 4i) suggesting Late Woodland use.

PALEO-INDIAN COMPONENT

Introduction

Based on the foregoing analysis, we assume that all high quality Onondaga artifacts (including flaking debris), as well as the red exotic material and the single Fossil Hill chert item, are Paleo-Indian associated. Notable exceptions to this generalization are the two Middle Woodland points of high quality Onondaga chert which are obviously not Paleo-Indian associated (Figures 4a, 4b). The inclusion of all the remaining high quality Onondaga chert items will undoubtedly introduce some biases, given the documented use by later occupants of the site and the fact there is a low density concentration of this material corresponding to non-Paleo-Indian concentration "B" (Figure 11). Nonetheless, the overwhelming dominance of the high quality material among the Paleo-Indian items and its rarity in the non-Paleo-Indian assemblage, suggest that little bias is being introduced by treating the assemblage in this manner. We have identified twenty-four separate specimens in the assemblage (Table 2) as Paleo-Indian, five of which are surface-finds lacking precise provenance. Several of these Paleo-Indian items are very tiny fragments and may be pieces of larger, incomplete artifact segments in the assemblage.

Tools/Preforms

Fluted Bifaces. There are eight complete or fragmented fluted bifaces represented in the collection. These include two fluted preforms and five fluted points. The remaining fragment consists of a small edge segment which is too incomplete to assign to the point or preform

Table 2: Paleo-Indian Tool/Preform Totals, Bolton Site.

Artifact Type	Western or "D" Cluster	Eastern or "E" Cluster	Not Assignable	Totals
Fluted Preforms	1	1	-	2
Fluted Points	1	3	1	5
Other Fluted Biface	-	-	1	1
Backed Biface	-	-	1	1
Side Scraper	-	-	1	1
Biface Fragments	1	2	-	3
Denticulate/ Retouched Flakes	1	2	1	4
Micro-Piercers or Gravers	2	1	-	3
Combination Notch/ Borer/Denticulate	-	-	1	1
Uniface Fragments	3	-	-	3
Totals	9	9	6	24
Channel Flakes	12	19	-	31

category. With the exception of one fluted preform and one fluted point, all of these materials have been exposed to heating. However, there is also a high percentage of heating among the waste flakes from the site. For example, 56 percent of all the Onondaga chert waste at the site has been subjected to heating. Moreover, several of the diagnostics of later occupations such as the Middle Woodland point and a Late Archaic small point are heated. Overall, this heating seems to be fortuitous and in the main is probably a product of a forest or grass fire (perhaps between the Middle Woodland and Late Woodland, as all Late Woodland diagnostics, including an Onondaga chert stemmed endscraper and a Kettle Point chert projectile point and end scraper, are unheated).

The unheated preform (Figures 14b, 15a) is essentially complete, although broken transversely in two places. A break near the base was likely due to Paleo-Indian activities, since the break surface is weathered; it is a typical manufacturing break, called a perverse fracture (see Frison and Bradley 1980:43), involving the preform splitting during a failed attempt to remove a flake from a lateral edge. The other transverse break appears to be due to recent activities such as ploughing.

This 79.2-mm-long preform is extremely well made. It is very wide (40.08 mm), yet incredibly thin (5.02 mm), having a very high width to thickness ratio of 8.1 to 1. In outline, it expands markedly from the base to a point of maximum width beyond mid-point. These characteristics all indicate it is a preform for a Crowfield type fluted point (Deller and Ellis 1984, 1992a). The preform has single flutes on each face. The flute on one face is 54.1 mm long by 16.1 mm wide while that on the other face is 50.4 mm long by 17.9 mm wide. The latter flute (Figure 14b, left) represents the second face fluted as the basal preparation for fluting is still present. Such preparation evidence includes a purposefully beveled base to obtain a proper platform angle and a remnant of the isolated platform created to detach the flute. At the tip end, the preform has a flat surface which seems to represent a segment of the original flake blank surface prior to bifacial reduction, and which probably represents the "bottom" of

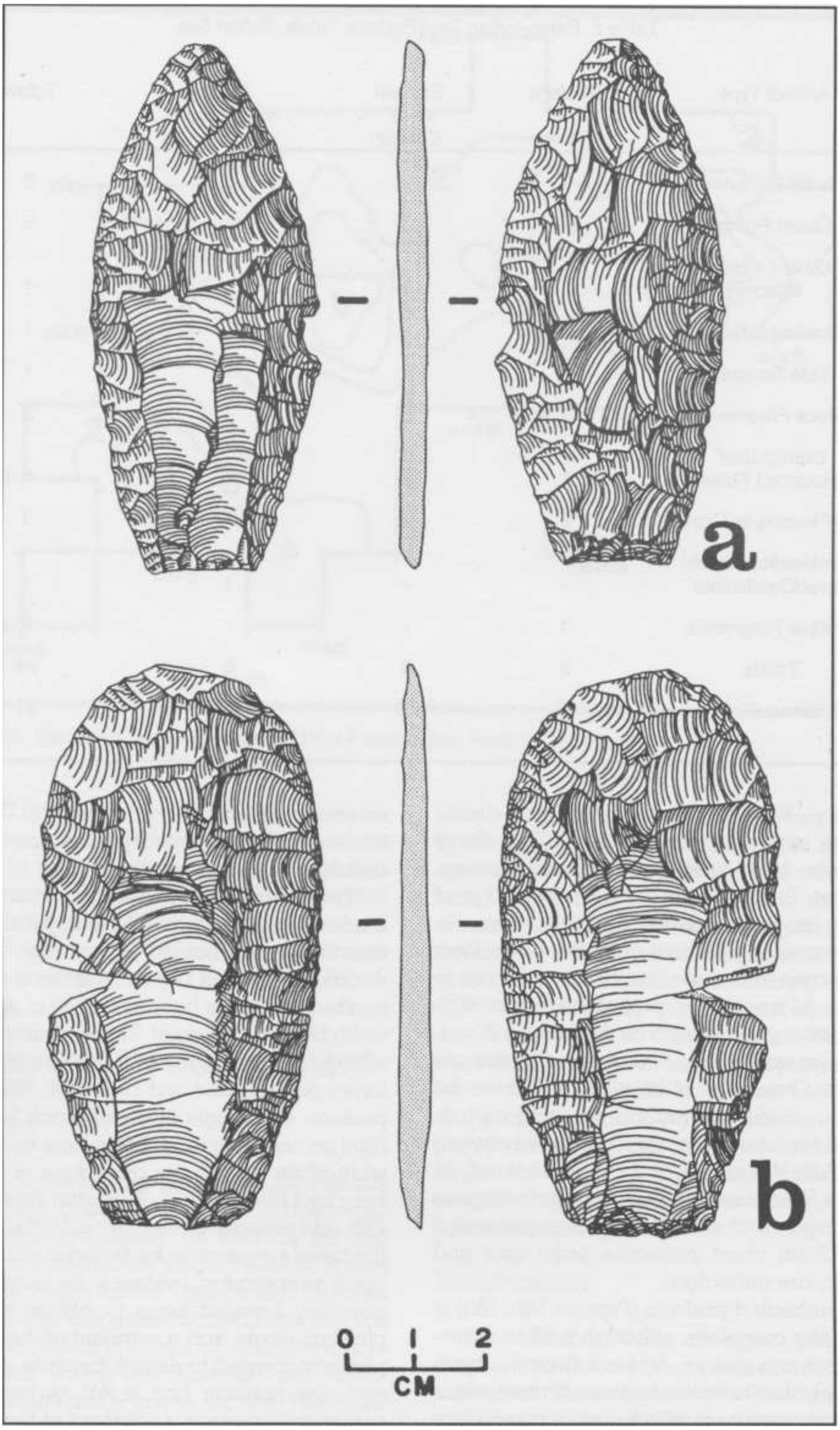

Figure 14. Fluted Preforms, Bolton Site

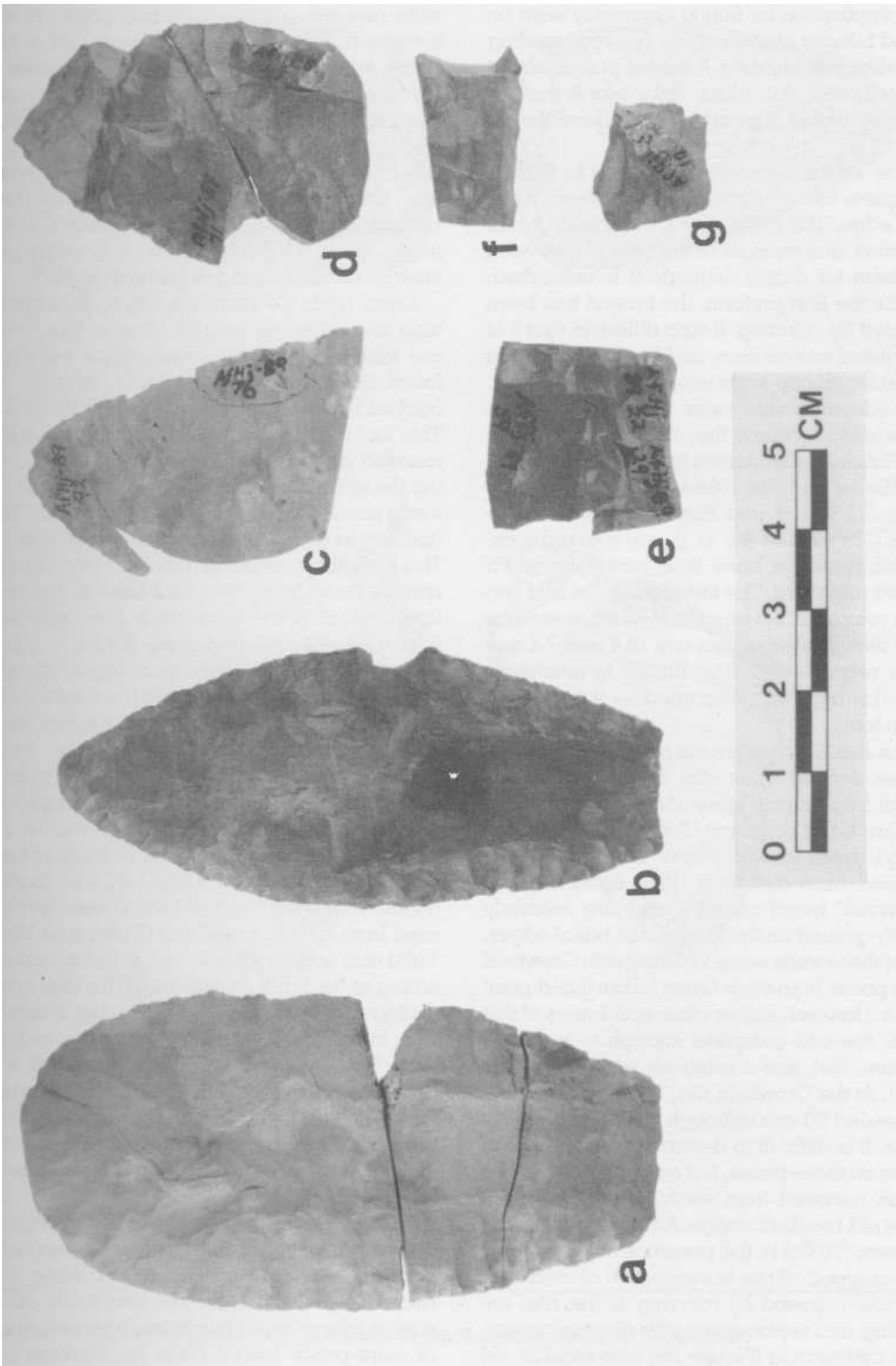

Figure 15. Fluted Bifaces, Bolton Site. A-B: Preforms; C-G: Finished Points

the core from which this flake blank was struck. It is notable that this tip exhibits none of the preparation for fluting commonly seen on fluted bifaces of other types such as beveling or deliberate blunting. It seems probable that the retained, flat, blunt, flake blank surface was a suitable support for the biface during fluting.

The second preform (Figure 14a,15b) is complete except for a slight heat break near one edge. The blunt tip, lack of lateral basal grinding, and remnant at the base of a beveled platform for fluting, indicate it is unfinished. Unlike the first preform, the tip end has been blunted by grinding. It also differs in that it is only fluted on one face, and has evidence of a shoulder on one edge around the heat break. Shouldered points were also found at the Crowfield site where they were interpreted as specialized hafted knives rather than projectile tips (Deller and Ellis 1984:44-45). The preform is wide (33.3 mm) and thin (4.3 mm; width to thickness ratio of 8.1 to 1) and markedly expands from the base to a maximum width above mid-point. The fluted face has had two flute removals, the longest of which measures 42.7 mm. The two flutes are 16.4 and 7.4 mm wide respectively. It is difficult to determine why this item was discarded — it may have been lost.

The five fluted points are represented by two bases, two tip ends and a midsection. The basal fragments (Figure 15e,g) both exhibit a shallow basal concavity (.6 and 1.5 mm respectively), have lateral edges which markedly expand from the base, lack fishtails, have "rounded" basal corners, and are relatively lightly ground on the lateral and basal edges. All of these traits serve to distinguish Crowfield type points from other Great Lakes fluted point types. However, unlike other specimens of this type, the one complete enough to measure (Figure 15e), has a relatively wide base (21.1 mm). At the Crowfield site, these bases rarely exceeded 20 mm although there were exceptions. It is difficult to determine the number of flutes on these bases, but one had at least two flutes removed from each face. Both bases have old breaks/damage. As first suggested by Roberts (1935:21), the presence of bases lacking snapped off tips is suggestive of breakage off site, followed by carrying to the site, unhafting, and replacement with new specimens. The mid-section (Figure 15f) also exhibits old snaps suggestive of breakage in use.

The two tip ends (Figure 15c,d) are both from wide and thin points. Both have been heat fractured. However, one (Figure 15c) was clearly snapped off prior to heating. Moreover, the other has a tip impact indicative of use as a projectile prior to heat damage. One retains the tip of a flute scar on one face, while the other has remnants of two flute scars on one face and at least one flute removal on the second. Such tips, or points with tip impacts, might represent items retrieved in activities such as the butchering of game animals.

Other Tools. Of the remaining tools assignable to a relatively specific class or type, two are technically bifacial, while eight are unifacial items. One of the bifacial items is a backed biface (Ellis and Deller 1988:114-115). This tool (Figure 16a, 17a) has a narrow and rounded tip, and a wider blunt base still retaining the striking platform of the flake on which it was made. One lateral edge is thick and flat and served as a "back" to hold or haft the tool. This back also served as a striking platform to remove flakes from the dorsal flake surface to thin the tool in the back area. The opposite lateral edge is thin and finely flaked. It is bifacially retouched. However, this retouch tends to be discontinuous along both the dorsal and ventral faces, perhaps indicating the tool was not employed for an extended period of time and resharpened prior to discard. Much of the ventral surface away from the lateral edges is unmodified by secondary flaking and, as a result, this surface retains the features of the flake blank upon which the tool was made (Figure 16a, right). Backed bifaces were recovered from the Crowfield site (Deller and Ellis 1984) and these tools also have flaking originating at the back on one face. This seems to distinguish Crowfield Phase backed bifaces from their Parkhill Phase counterparts, as the latter have flaking originating at the back on both faces (Ellis and Deller 1988:121). Also, the Parkhill Phase tools have one or two notches at the base although, as is the case at Bolton, these notches are lacking on the Crowfield site specimens.

The second bifacial tool is a side scraper with a convex, continuously retouched working edge on one margin (Figure 17b). While the retouch is unifacial, the tool was made on a narrow biface. Since this biface has a remnant of outre-passé lateral flake terminations on

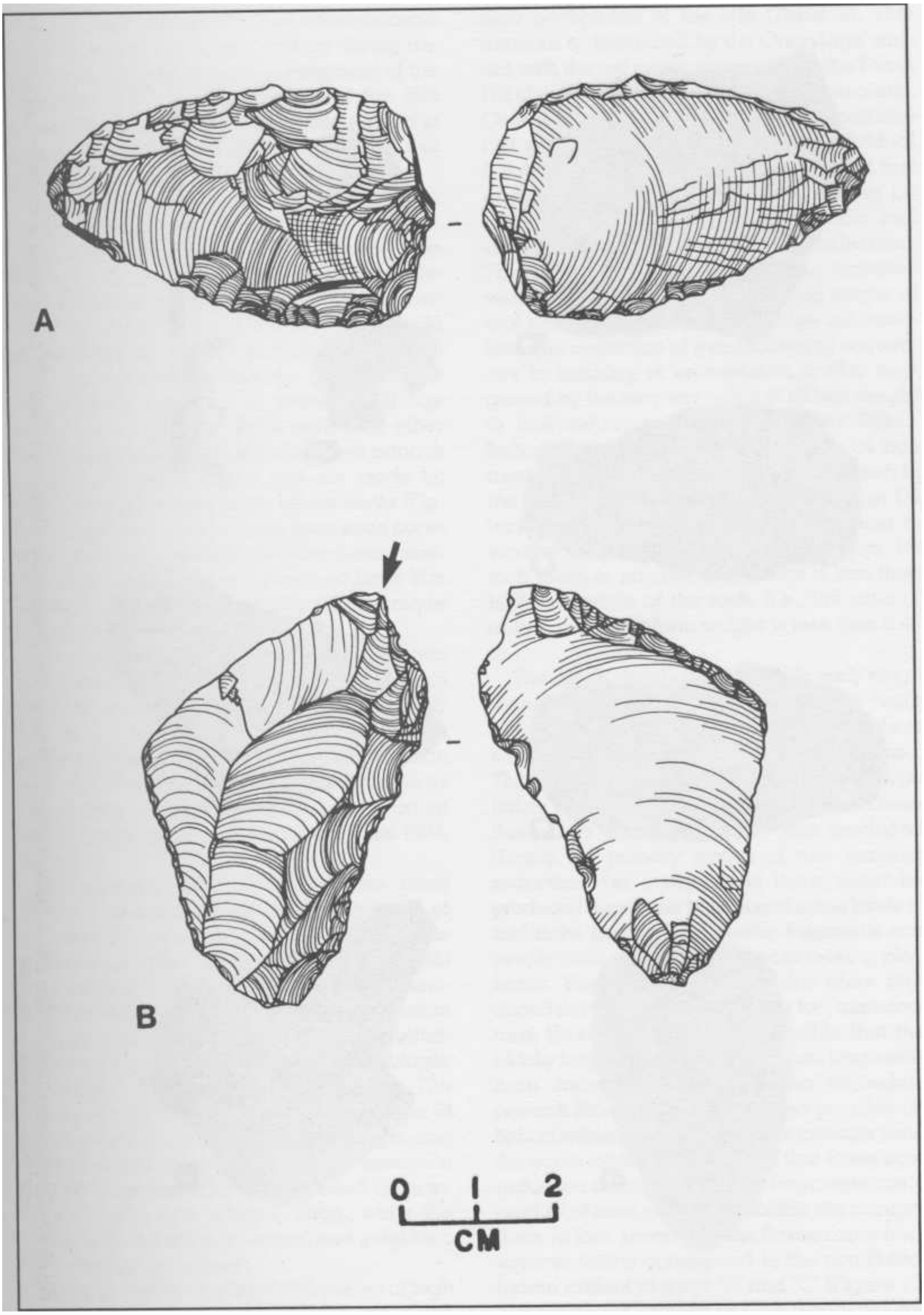

Figure 16. Backed Biface (A) and Combination Notch/Borer/Denticulate (B), Bolton Site

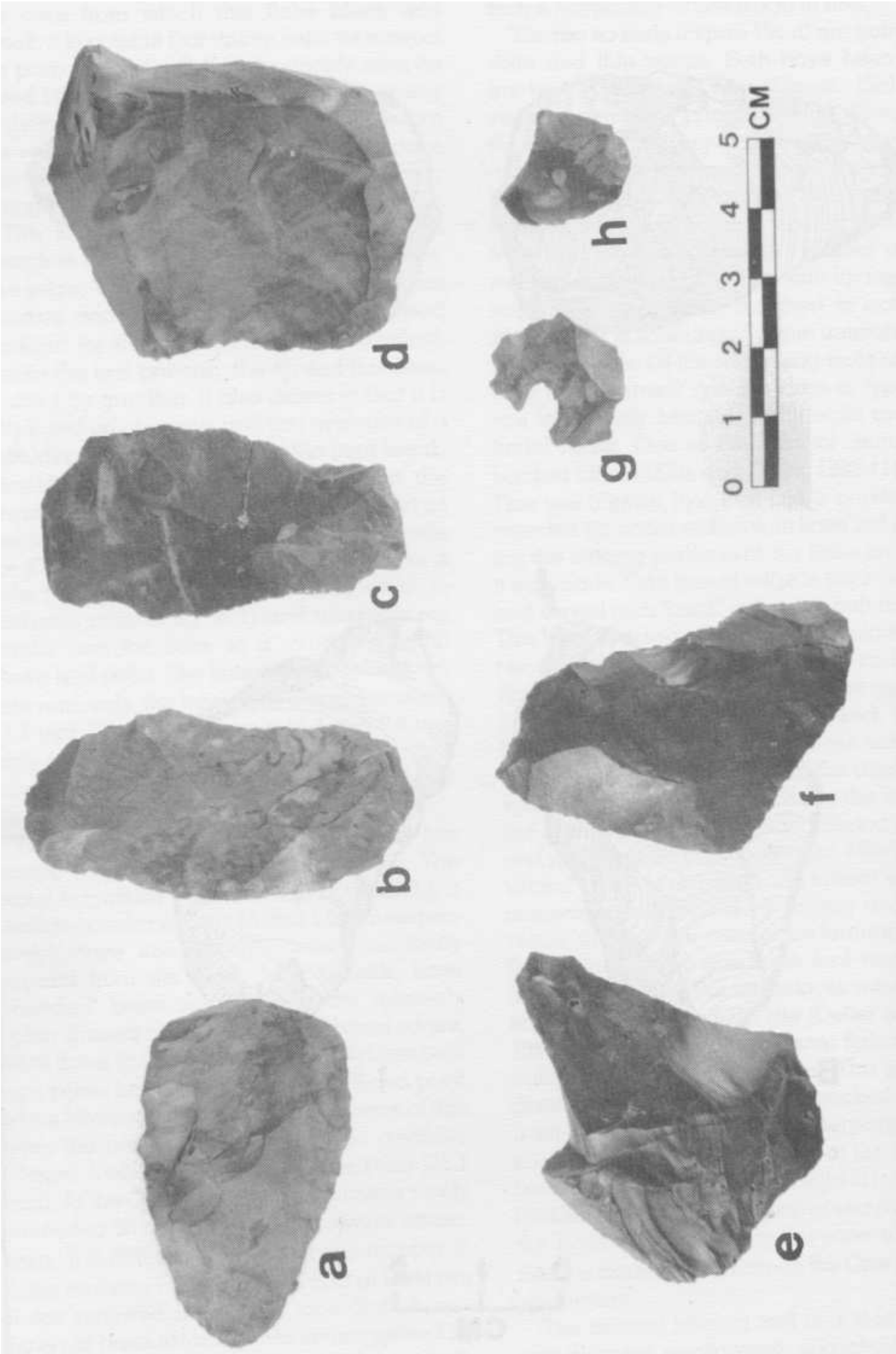

Figure 17. Miscellaneous Tools, Bolton Site. A: Backed Biface; B: Bifacial Side Scraper; C-E: Retouched Flakes; F: Combination Notch/Borer/Denticulate; G-H: Micro-piercers or Gravers

both faces (i.e., biface thinning flake removals carried across the biface surface during detachment, thereby removing a segment of the opposite edge), it is possible that the tool represents the recycling of a biface rejected in manufacture into a completely different tool form.

Among the remaining unifacial tools are four flakes with minimally retouched, often denticulated, use edges (Figure 17c-e). One of these (Figure 17d) is made from a large flake detached during the initial reduction of an Onondaga chert block; therefore, it has a right-angle platform and retains unflaked original surfaces of the quarry block on both the dorsal surface and platform. Retouch is found along one lateral edge and the distal end. Two other denticulates or retouched flakes have retouch along both lateral edges and are made on flakes detached from large biface cores (Figure 17c,e). Use of tool blanks from such cores is a common occurrence on Paleo-Indian sites. The final denticulate or retouched flake has retouch along one lateral edge and is made from a channel flake segment.

Three well-made "gravers" or micro-piercers are in the collection (Figure l7g,h). One had at least two spurs, while the others retained only one spur. Two of these micro-piercers are made on biface thinning flakes from preform reduction and again, the use of these flakes as tool blanks for such tools is very common on Paleo-Indian sites (e.g., Deller and Ellis 1984, 1992a).

The remaining tools include three small biface fragments, three small fragments of scrapers or retouched flakes, and a single example of what Deller and Ellis (1992a:68) have called combination notch/borer/denticulates (Figure 16b, 17f). These combination tools are quite distinctive and are characteristically found in many Paleo-Indian assemblages in Ontario (Deller and Ellis 1992b:46). The Bolton example exhibits a thick spur or borer at the distal end, a denticulated right margin, and a notch on the right margin near the borer. On the left edge towards the distal end is an inversely retouched scraper edge, while the same edge near the proximal end exhibits a fine, continuous retouch.

Flaking Debris. A total of 320 pieces of high quality Onondaga, Fossil Hill and red exotic chert were recovered during the Bolton site investigations and assigned to the Paleo-Indian occupation of the site (Table 3). This material is dominated by the Onondaga variant, with the red exotic material and the Fossil Hill chert being present only in trace amounts. Overall, the debris is notable for its small size (.18 gm average weight; only five individual flakes weigh over 1 gm each) and the fact that almost all relatively complete flakes can be assigned to the reduction of specific tool classes (e.g., biface or uniface reduction). These characteristics suggest that activities were largely confined to the finishing stages of tool manufacture and to tool edge rejuvenation. The restriction of manufacturing sequences to finishing or rejuvenation is also suggested by the very low ratios of debris weight to tool/preform weight. Since many Paleo-Indian sites were excavated using only 1/4 inch mesh, all debris recovered in 1/8 inch mesh in the field was rescreened in the lab through 1/4 inch mesh (Table 4). As shown on Table 6, whether one includes the material from 1/8 inch mesh or not, the total debris is less than half the weight of the tools (i.e., the ratio of debris to tool/preform weight is less than 0.43 to 1).

The only suggestions of possible early stage manufacturing at Bolton are the six "core reduction flakes" and two blocky fragments or shatter pieces on the high quality Onondaga. The core reduction flakes are relatively large flakes with right-angled platforms. These flakes are usually or more often produced during the primary stages of raw material reduction. Yet, comparable items could be produced during the trimming of some kinds of tool flake blanks. The blocky fragments are simply thick pieces or fragments lacking platforms. Such fragments are also often produced during the early stages of tool manufacture. However, it is just as possible that the blocky fragments are unifacial tool fragments from areas of the tools lacking secondary retouch flake removals. It is even possible (in light of evidence that later site occupants used the same material on the site) that these core reduction flakes and blocky fragments are a product of later, post-Paleo-Indian site occupations. In fact, seven of these flakes came from squares which correspond to the non-Paleo-Indian artifact clusters "B" and "C" (Figure 13) attributable to Archaic or Late Woodland site use (the other flake was from square 510N/534E). Even if Paleo-Indian, the presence of

Table 3: Totals for All Presumed Paleo-Indian Flaking Debris.*

Debris Type	High Quality Onondaga	Collingwood	Red Exotic	Totals
Channel Flakes	28 (11.21)	0	3 (0.77)	31 (11.98)
Biface Thinning Flakes	15 (9.64)	0	0	15 (9.64)
Biface Finishing Flakes	111 (11.51)	1 (0.07)	4 (0.21)	116 (11.79)
Biface Reduction Error Flakes	4 (2.56)	0	0	4 (2.56)
Uniface Retouch Flakes	9 (2.09)	0	0	9 (2.09)
Flake Fragments	131 (12.85)	0	6 (0.56)	137 (13.41)
Core Reduction Flakes	6 (6.25)	0	0	6 (6.25)
Blocky Fragments	2 (2.19)	0	0	2 (2.19)
Totals	306 (58.30)	1 (0.07)	13 (1.54)	320 (59.91)

*numbers in brackets indicate weight in grams.

only eight relatively small pieces of such debris (all weigh under 1.75 gms each) suggest primary reduction was quite unimportant. As noted earlier, there is also a "concentration" of five Kettle Point flakes in Square 516N/540E which corresponds to Paleo-Indian tool cluster "E" (Figure 6). These five flakes are all derived from the primary reduction of Kettle Point pebbles and include four core reduction flakes and a blocky fragment ("shatter"). Once again, the association of this material with the Paleo-Indian occupation is uncertain and the amount of material involved is so small that its exclusion does not introduce any serious biases in interpretation.

Uniface reduction debris is rare and accounts for only 5.1 percent of the debris assignable to biface or uniface reduction. The uniface reduction flakes are undoubtedly under represented in the collection because of their smaller size in relation to biface reduction flakes, and hence, difficulties in recovering them in standard 1/4 inch mesh. As well, uniface retouch produces much less debris than biface retouch. Nonetheless, the rarity of such uniface debris (nine specimens) is striking, and suggests uniface-related activities were relatively unimportant at Bolton. This conclusion is in accord with the low percentage of unifaces in the collection when compared with other sites, and the fact that such unifaces are dominated by forms with minimal retouch and little evidence of resharpening such as denticulates or retouched flakes and micro-piercers. Indeed, the retouch scars on the existing unifaces are so small that it is doubtful flakes matching this scar size would be recovered even in 1/8 inch mesh screen. The Bolton uniface retouch flakes include eight "normal" removals from the dorsal surfaces of flake blanks. The remaining flake is a 'Ventral" uniface retouch flake (Frison 1968; Deller and Ellis 1992a:87), removed from the underside of a uniface edge.

Table 4: Totals for Presumed Paleo-Indian Flaking Debris Excluding 1/8 inch.*

Debris Type	High Quality Onondaga	Collingwood	Red Exotic	Totals
Channel Flakes	26 (10.95)	0	3 (0.77)	29 (11.72)
Biface Thinning Flakes	15 (9.64)	0	0	15 (9.64)
Biface Finishing Flakes	79 (10.28)	1 (0.07)	3 (0.16)	83 (10.51)
Biface Reduction Error Flakes	4 (2.56)	0	0	**4** (2.56)
Uniface Retouch Flakes	5 (1.77)	0	0	5 (1.77)
Flake Fragments	96 (11.81)	0	5 (0.52)	101 (12.33)
Core Reduction Flakes	6 (6.25)	0	0	6 (6.25)
Blocky Fragments	2 (2.19)	0	0	2 (2.19)
Totals	233 (55.45)	1 (0.07)	11 (1.45)	245 (56.97)

*numbers in brackets indicate weight in grams.

Table 5: Comparisons of Channel Flake Widths.*

Site	N	Range	Mean	S	C.V.
Parkhill	87	4.8-16.7	10.97	1.94	17.69
Thedford II	23	8.0-16.0	11.80	2.34	19.83
Alder Creek	9	7.4-11.8	9.00	1.50	16.67
Bolton	24	5.2-18.7	10.79	3.06	28.33

*in mm; N=number of observations; S=Standard Deviation; C.V.=Coefficient of Variation; widths are only included if it is certain the measurement reflects the maximum width of the channel flake (e.g., incomplete expanding segments are excluded).

The biface reduction flakes include relatively few larger, biface thinning flakes derived from the earlier stages of biface preform reduction. This rarity, especially in relation to the number of channel flakes recovered, suggests that these preforms were brought to the site already roughed out, so that finishing them involved retouching the preforms into points. The channel flakes from the site (Figure 18) include, after refitting of some fragments, thirty-one items. Eleven of these were basal ends with slightly isolated and ground plat-

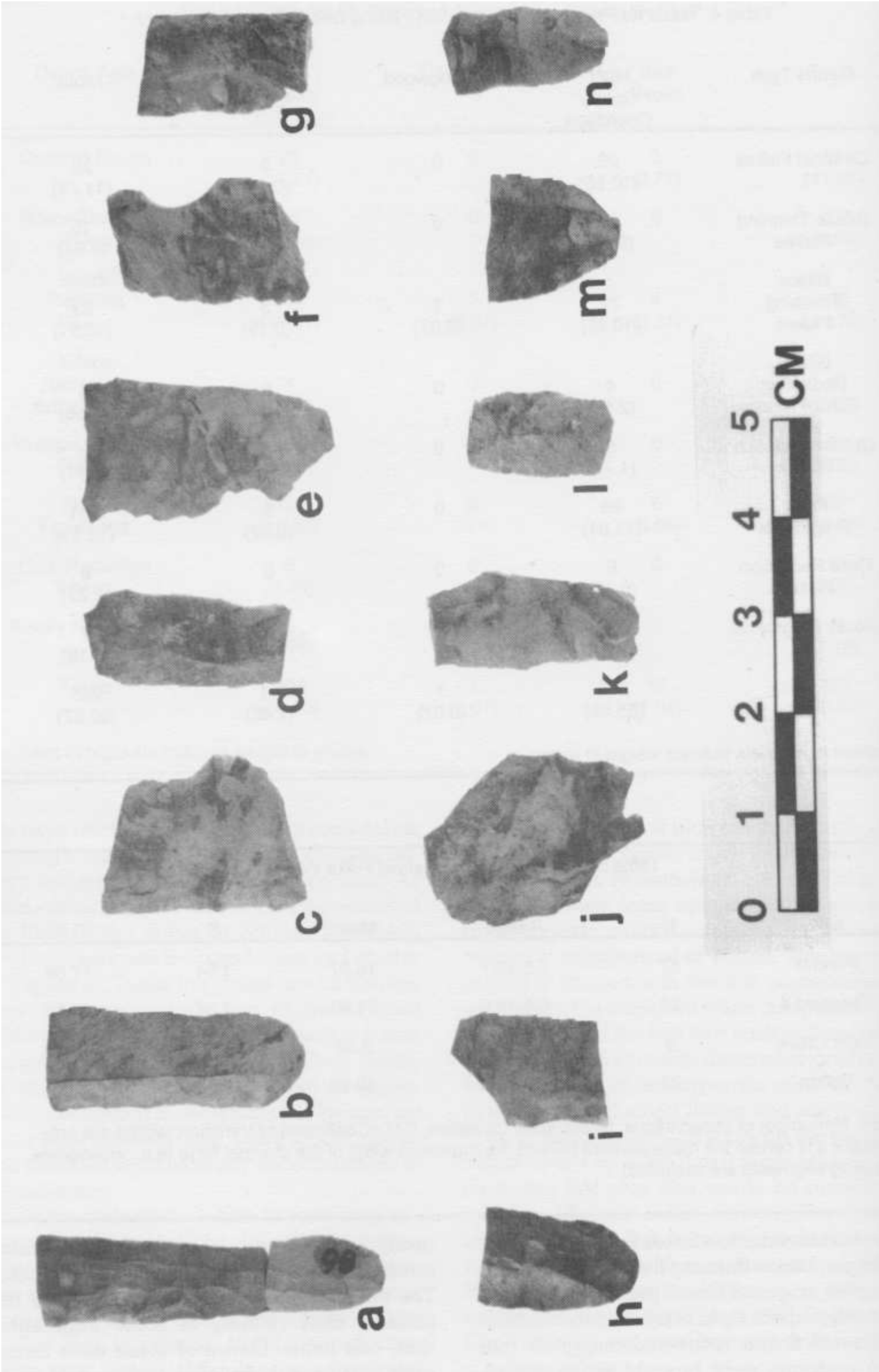

Figure 18. Channel Flakes, Bolton Site

forms while the remainder were medial/distal sections. The longest fragment was, after refitting of two segments, 35.9 mm.

Overall, the channel flakes from Bolton are notable in two respects. First, many are derived from multiple fluted points with longitudinal scars representing as many as three previous flute removals. In fact, 22 (71 percent) of the Bolton channel flakes exhibit evidence of previous flute removals. This high percentage is seen at other Crowfield Phase sites (Stewart 1984:69; Timmins 1994:179) and is in marked contrast to other sites yielding different kinds of fluted bifaces. For example, at the Parkhill Phase type site (where we find the very different, usually single-fluted, Barnes type points) only three (1.5 percent) of the 203 channel flakes recovered are from multiple fluted points. For this reason, one can use the high percentage of channel flakes from multiple fluted points in order to recognize Crowfield Phase sites even in the absence of actual fluted bifaces.

Second, the width of channel flakes may also be useful to distinguish channel flake assemblages related to the Crowfield Phase. Detailed statistical comparisons of the width of the Bolton site channel flakes with available data from other sites with large samples (such as Parkhill and Thedford II) failed to reveal any significant differences. Yet, while width per se may not be useful to distinguish Crowfield channel flakes, the degree of variation in this width does seem to have some potential. As indicated above, Crowfield points are often multiply-fluted, while single fluting is characteristic of Great Lakes Gainey and Barnes points. Both Gainey and Barnes points are relatively thick, with marked biconvex cross-sections and a medial ridge down the centre of the face formed by lateral flake terminations (Deller and Ellis 1992a; Storck 1983). Hence, the tendency is to remove single flutes down the centre of the point faces, guided by this medial ridge. In contrast, Crowfield points have very flat cross-sections without such a medial ridge to guide removals and keep them well-centered. The result is that several flute removals are often required to obtain the desired flute surface. The removal of multiple flutes without guiding ridges tends to produce channel flakes with considerable variation in width. As shown in Table 5, and as measured by the coefficient of variation, the channel flakes from Bolton are much more variable in width than those from Barnes point's sites like Parkhill and Thedford II. It is notable, however, that the channel flakes from the Crowfield Phase Alder Creek site exhibit less variation than those from sites like Parkhill, Thedford II and Bolton (Timmins 1994: Table 4). This contradictory result may be a product of a very small sample size (only nine channel flakes) at Alder Creek.

Table 6 presents the debris to tool ratios by frequency at the Bolton site. As discussed elsewhere (Deller and Ellis 1992a:88-89), these ratios have been widely used for interpreting activity variability, and especially variation in stone tool manufacturing activity, between Paleo-Indian sites. In essence, sites with lower ratios of debris to tools are inferred to be locations where manufacturing was relatively unimportant. However, extreme caution should be used in such comparisons because they are affected by several other variables.

One complicating factor is the size of the mesh used to screen the soil. This variable can be controlled by employing site assemblages excavated in comparable manners. Therefore, and as noted earlier, since 1/4 inch mesh has been used at most other Paleo-Indian sites, we have provided calculations of the ratios for Bolton, excluding material which would only be recovered in 1/8 inch mesh (Table 6). Another factor influencing these ratios is the degree of emphasis on biface versus uniface-related activities at a site. The production of a single biface can produce much more debris than the manufacture and resharpening of a single uniface tool (Collins 1975:32). We have suggested that, all else being equal, one can generally predict a high ratio if sites have numerous bifaces and a low ratio if collections are dominated by unifaces (Deller and Ellis 1992a:89). Since Bolton has a very high percentage (52.9) of bifaces (9 of 17 excluding very fragmentary items), one should expect a relatively high debris to tool ratio. As shown in Table 7, the Bolton ratio of 10.2 to 1 is larger than the ratios at the other reported sites such as Vail. The Bolton ratio does appear low when compared to sites having comparable percentages of bifaces such as Parkhill Area C. This relatively low ratio requires explanation.

First, it may be that Crowfield Phase sites with abundant biface manufacture evidence, and especially evidence for fluted biface production, will always have lower ratios than

Table 6: Debris to Tool Ratios by Frequency and Weight.

Measure	Including 1/8 inch Material	Excluding 1/8 inch Material
Frequency including tool fragments	13.3 to 1	10.21 to 1
Frequency excluding tool fragments	18.8 to 1	14.4 to 1
Weight including tool fragments	0.41 to 1	0.39 to 1
Weight excluding tool fragments	0.43 to 1	0.41 to 1

Table 7: Biface Percentages and Debris to Tool Frequency Ratios at Northeastern Paleo-Indian Sites Excavated Using 1/4 inch Mesh.'

Site or Site Area	Biface Percentage[2]	Debris to Tool Ratio[3]
Vail A	6.5	2.2 to1
Vail B	5.6	1.5 to 1
Vail C	11.5	1.6 to 1
Vail D	4.2	1.2 to 1
Vail E	3.6	1.9 to 1
Vail F	7.6	3.0 to 1
Vail G	1.2	1.2 to 1
Vail H	5.0	1.6 to 1
Vail Total	4.7	1.5 to 1
Potts A	1.0	3.1 to 1
Potts B	0.9	8.1 to 1
Twin Fields	4.1	8.6 to 1
Bolton	52.9	10.2 to 1
Holcombe	82.3	17.0 to 1
Parkhill B'	79.0	22.0 to 1
Parkhill C'	51.1	23.5 to 1
Parkhill D'	24.6	9.1 to 1
Barnes	70.0	48.0 to 1

1: tool/preform fragments are included in calculations of ratios. Data is derived from Eisenberg 1978; Fitting et al 1966; Gramly 1982; Gramly and Lothrop 1984; Voss 1977.
2: includes *pieces esquilées* as unifaces.
3: excludes non-flaking debris such as "potlids."
4: excludes surface-collected materials from outside the excavated areas.

sites with comparable biface percentages representative of other Early Paleo-Indian phases. It must have been more difficult to successfully manufacture the wide and thin Crowfield points than the Parkhill or Gainey varieties. Hence, one might expect a higher percentage of preforms rejected in manufacture on Crowfield Phase sites. This factor would lead to higher percentages of bifaces in assemblages and, in turn, to lower debris to tool/preform ratios. This rationale might explain, for example, why some 28.6 percent of the Bolton fluted bifaces are preforms, whereas at sites such as Parkhill Area C, only 13 percent of the bifaces are preforms despite abundant evidence for point manufacture (Ellis and Payne 1995).

A second possible reason for the relatively low ratio may be linked to the fact that the assemblage includes a high percentage of complete fluted points or fore-sections. As is discussed more fully below, such items are often characteristic of kill sites or sites with butchering activities in which used points are recovered from carcasses during processing. What this means is that one can recover a number of bifaces which were not flaked at the site — they were simply left there as exhausted and broken tools. In this instance, the number of fluted bifaces will be increased but there will be relatively little flaking debris produced. The result is lower debris to tool ratios on sites where animal kill and butchering were important.

Spatial Distributions

As indicated earlier, the density maps for definitive Paleo-Indian materials, including both diagnostic tools and channel flakes, suggests that there are two relatively discrete concentrations associated with site occupation (Figure 6). Figure 19 shows the distribution of all tools and preforms from high quality Onondaga chert, while Figures 20 and 21 illustrate the density of these items and channel flakes. Figures 20 and 21 also show that there are two major clusters of Paleo-Indian materials (labelled "D" and "E"). The fact that the channel flakes and tool/ preforms overlap suggests that areas of point manufacture and tool/preform discard coincided at this site. It is notable that the refitted fragments (Figure 19) are separated in a roughly west to east direction or parallel to the manner in which the site has been ploughed. The same trend has been noted by the authors at other ploughed Paleo-Indian sites such as Crowfield (Deller and Ellis 1984) and Thedford II (Deller and Ellis 1992a). These "refits" suggest that the greatest amount of distortion has been in an east to west direction and we surmise that the one artifact link between the two areas is simply a product of plough drag.

The density map of the channel flakes does suggest that there may be at least two "sub-clusters" in each of the major concentrations. However, given the nature of the method used to isolate such clusters, this sub-clustering may be of little significance. Overall, it seems warranted to conclude only that the major concentrations may be of behavioural significance.

The two major concentrations are remarkably similar. They are comparable in spatial extent, each covering approximately 75m^2. The effects of ploughing have been uniform in both areas and, hence, the original sizes of the clusters were probably also similar. Data from the Crowfield site (Deller and Ellis 1984), which had been ploughed for a time period comparable to Bolton, provides some clues as to original cluster size. Crowfield yielded a plough-truncated feature containing a large number of heat fractured lithic items. Numerous "refits" were possible between items from the feature and the surrounding ploughzone, suggesting ploughing had spread material over an area two to three times the original spatial extent. Assuming a comparable effect at Bolton, the concentrations may have been originally on the order of 25 to 50m^2.

Both Bolton concentrations have similar numbers of tools/tool fragments (Figure 19; Table 2). Channel flakes of the red exotic material are also found in both concentrations. The tools or preforms assignable to each major concentration are also relatively similar (Table 2). Both concentrations included single examples of fluted preforms and one or two gravers or denticulates. The only major differences are (1) that "D" has three unifacial tool fragments while none are to be found in "E"; and (2) "D" has fewer channel flakes than does "E". However, as fragile and/or highly fragmentary items, the numbers of both these types are subject to distortion. Overall, the activities conducted in each area seem very similar.

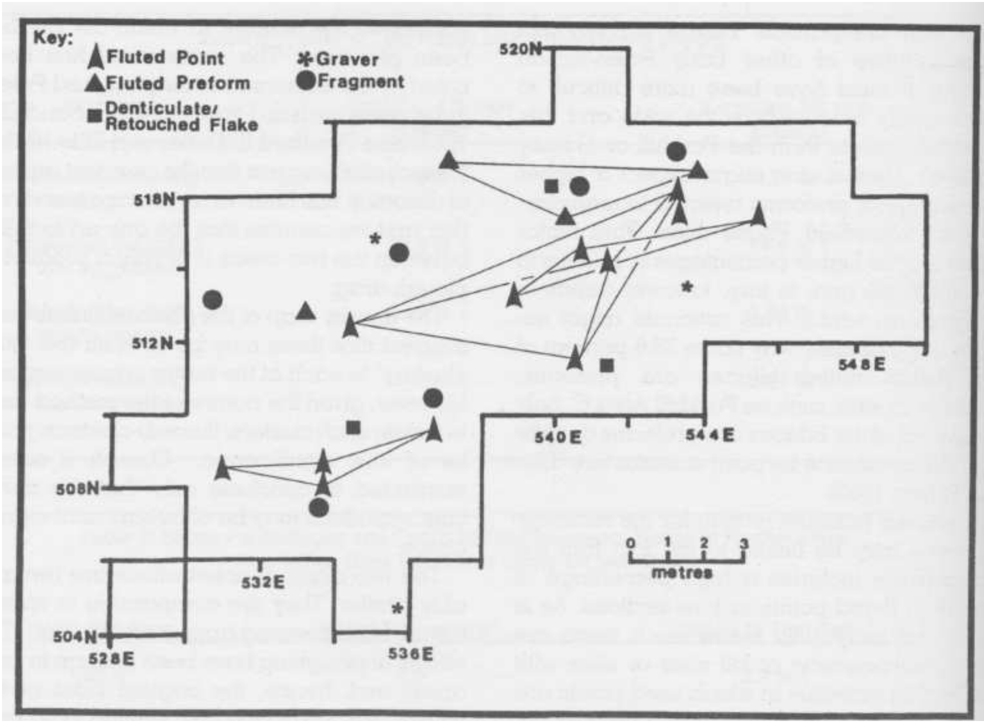

Figure 19. Distribution of All Presumed Paleo-Indian Tools and Preforms, Bolton Site

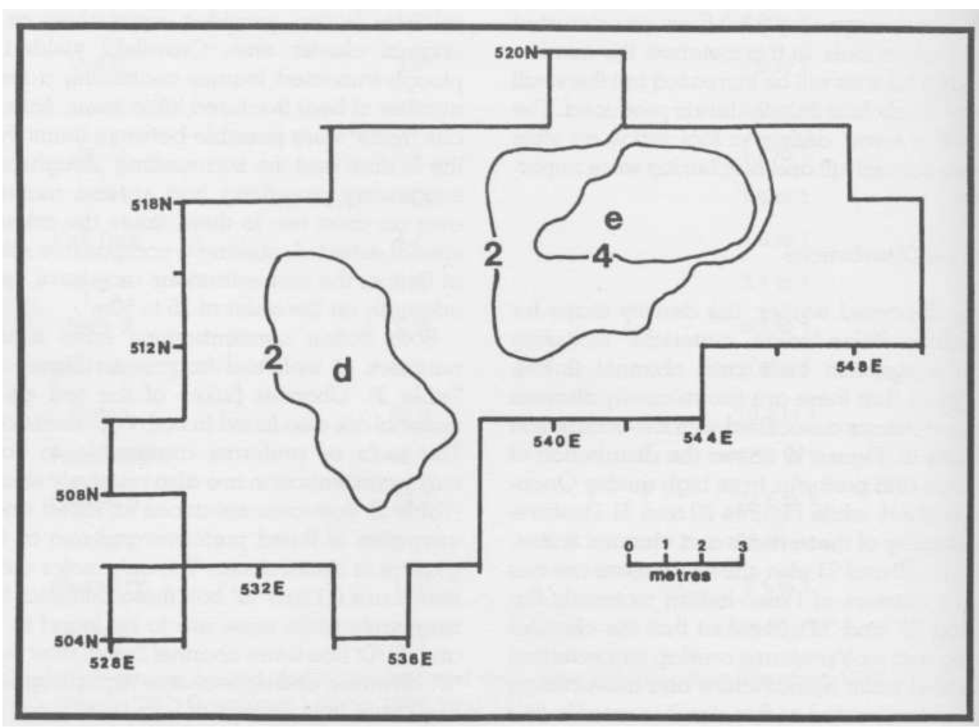

Figure 20. Density of All Presumed Paleo-Indian Tools and Preforms, Bolton Site

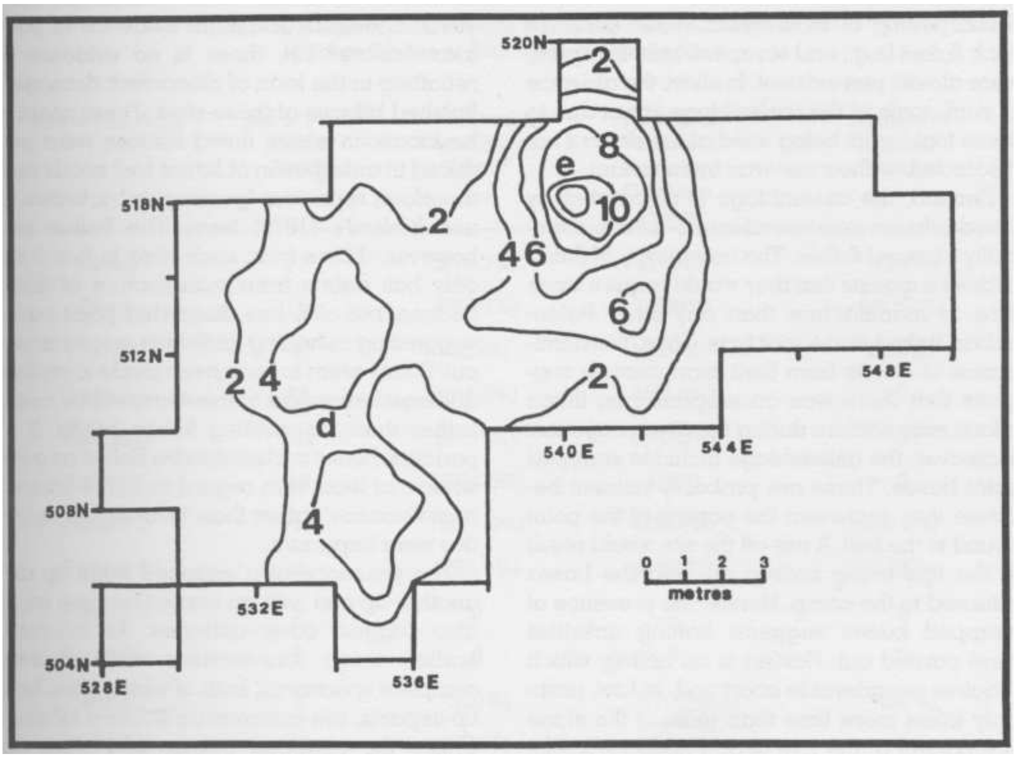

Figure 21. Density of Channel Flakes, Bolton Site

Whether the two concentrations were contemporaneous is difficult to determine. However, the presence of the red exotic chert in both concentrations, a material not seen by these authors in any other Paleo-Indian assemblage from southwestern Ontario, suggests that they were contemporary. The rarity of Fossil Hill chert in both concentrations, a material we have recovered in much larger quantities from other Crowfield Phase sites (e.g., Deller and Ellis 1984), is also suggestive of occupation at the same time. In any event, estimates of a very small original spatial extent suggest that a limited number of individuals (perhaps only one or two) were responsible for each concentration.

Site Activities

The Bolton Paleo-Indian assemblage contains a limited range of tool types and classes suggesting a relatively specialized occupation. The limited number of tool categories is undoubtedly related to the small sample size available. As some investigators have discussed (e.g., Shott 1989a, 1989b), at short-term occupied sites activities using certain tool forms may be carried out but will not be represented in the discarded tools because tool use-life can exceed occupation span. In essence, differences in the tool types present in an assemblage do not necessarily represent differences in activities. Rather, at longer occupied sites one is more apt to get all the tool forms used actually discarded as opposed to shorter occupations where some types may be used and not discarded. Twenty-six distinct Paleo-Indian tool types and/or classes are routinely recognized by the authors. This total exceeds the number of different types and/or classes (17) in the whole Bolton assemblage. Thus, a limited range of tool types at Bolton in comparison to some other sites is not unexpected. However, this limited range cannot be explained simply as a function of sample size, since there is evidence to suggest the activities were specialized.

First, there is a paucity of uniface retouch flakes in the flaking debris assemblage which suggests that activities involving the use and resharpening of tools which would produce such flakes (e.g., end scrapers, side scrapers) were almost non-existent. In short, the absence of such tools in the assemblage is not due to these tool forms being used at the site but not discarded — their use *was* unimportant.

Second, the assemblage is dominated by fluted bifaces and manufacture debris, especially channel flakes. The complexity of fluted bifaces suggests that they would require more time to manufacture than any other Paleo-Indian flaked stone tool type. Thus, the dominance of debris from their manufacture suggests that there was an emphasis on fluted biface manufacture during the site occupation. Moreover, the assemblage includes snapped point bases. These are probably present because they represent the portion of the point bound in the haft. A use off the site would result in the tips being broken off, and the bases returned to the camp. Hence, the presence of snapped bases suggests hafting activities were carried out. Hafting is an activity which requires considerable effort and, in fact, probably takes more time than making the stone component of the tool (e.g., Frison 1978:262). When one considers that none of the unifaces in the assemblage were apparently hafted, fluted biface related activities are again emphasized. As well, virtually all the unifaces are simple forms with minimal retouch such as denticulates or retouched flakes and micro-piercers or gravers. These are tools which probably had much shorter use-lives than fluted bifaces. Therefore, the dominance of fluted biface related activities is again emphasized.

In summary, the Bolton assemblage is not only spatially limited, which suggests few individuals occupied the site, but is also characterized by a small artifact inventory, which suggests a relatively short-term occupation. The site also seems to have been relatively specialized with fluted biface related activities predominating. These activities included discard of bases suggesting rehafting activities, as well as the manufacture of new points to replace broken specimens (as is indicated by the presence of preforms, channel flakes, and biface retouch flakes). At other small sites or site areas where fluted biface related activities were predominant, such as Culloden Acres Area B or the West Knoll Area at the Murphy site (Ellis and Deller 1991; Jackson 1991), one finds abundant evidence of point manufacture. Yet, there is no evidence of rehafting in the form of discarded, damaged, finished bifaces at those sites. These seem to be locations where fluted bifaces were produced in anticipation of future tool needs and, therefore, represent "gearing-up" activities, to use Binford's (1979) term. The Bolton site, however, differs from such sites in that it not only has debris from manufacture of fluted bifaces, but also has discarded point bases suggesting rehafting activities were carried out. Points seem to have been made to replace damaged examples to meet immediate needs rather than for meeting future needs. It is, perhaps, better to characterize Bolton as a site where, at least with regard to fluted bifaces, "maintenance" rather than "gearing-up" activities were important.

The presence of a snapped point tip and another tip end with an impact fracture might also suggest other activities. As indicated earlier, these fore-sections and relatively complete specimens, both of which often have tip-impacts, are common on western kill sites. Unlike the snapped bases, they were not retrieved to occupation sites still bound in their hafts. It is doubtful that Bolton represents a kill site; however, the presence of two such specimens could suggest butchering activities were carried out during which the items could be retrieved from carcasses.

It was noted earlier that one advantage to studying small sites was the greater probability that these sites represent short-term occupations; there is also a greater probability that the discarded tool forms were related in use during the carrying out of the same tasks. Sites or site areas where fore-sections or relatively complete, often tip-impacted, specimens make up a relatively large percentage of the fluted point totals are common among reported assemblages from southwestern Ontario (Table 8). It is noteworthy that there are at least three other sites in southwestern Ontario which are small spatially (or are small in terms of very low artifact densities), have a high percentage of these fore-sections or damaged points, and have yielded backed biface tools. These include Dixon and F. Wight (Deller 1988; Deller and Ellis 1992b:31) as well as Area A-West at the Thedford II site (Deller and Ellis 1992a:109-112). Backed bifaces are *very* rare to non-existent in most assemblages and are

Table 8: Frequency of Complete Points and Fore-Sections and Backed Bifaces at Southwestern Ontario Sites.

Site or Site Area	Site or Area Artifact Total'	Finished Fluted Biface Totals[2]	Number of Point Fore-Sections & Complete Points[3]	Number of Backed Bifaces[4]
Bolton	31	5(16.3%)	2(40%)	1(3.2%)
Dixon	15	2(13.3%)	2(100%)	1(6.67%)
F. Wight	**4**	1(25%)	1(100%)[5]	2(50%)
Parkhill A	13	8(61.5%)	3(37.5%)	0
Parkhill B	100	57(57%)	6(10.5%)	0
Parkhill C	58	20(34.5%)	1(5%)	0
Parkhill D	112	13(11.6%)	4(30.8%)	1(0.9%)
Parkhill E	9	3(33.3%)	3(100%)	0
Parkhill G	5	0	0	0
Parkhill H	6	0	0	0
Parkhill I	5	1(20%)	1(100%)	1(20%)
Parkhill K	11	1(9.09)	1(100%)	0
Thedford II, A-East	21	0	0	0
Thedford II, A-Northeast'	29	5(21.7%)	0	0
Thedford II, A-Centre	45	0	0	0
Thedford II, A-West	23	3(13%)	1(33.3%)	**1(4.4%)**
Snary	13	1(7.7%)	0	0
McLeod A	18	0	0	0
McLeod B	5	0	0	0
McLeod C	9	0	0	0

1: includes tools, preforms and fragments; 2: numbers in brackets represent percentage of site or area total; : numbers in brackets indicate percentage of total finished points at site or site area; 4: numbers in brackets indicate percentage of site or site area total; 5: a second fore-section was recovered from the same field as his site; 6: totals exclude points and preforms from a probable artifact cache.

totally lacking from sites with few fore-sections or complete points (Table 8). Hence, it seems unlikely that these two kinds of tools would occur consistently together by chance. It is also notable that similar backed bifaces have been reported from an apparent butchery site in Maine (coincidently also named the Wight Site) where they are associated with a probable kill site (Gramly and Funk 1990:16,18). The Maine site assemblage also included retouched/ denticulated flakes which could be used in butchering tasks. In fact, backed bifaces are also reported in southwestern Ontario from one larger site or site area with high percentages of fore-sections and complete points (Parkhill Area D) and from one incompletely known site or site area the extent of which is difficult to determine (Parkhill Area I in Table 8). This highlights the utility of small sites, particularly since it would be extremely difficult to initially pinpoint this association in the context of the larger diverse assemblages. Overall, while our available site samples are perhaps too limited to allow firm conclusions, we suggest that the backed bifaces are butchering tools. We also suggest that researchers look for an association between the presence of these backed bifaces and high percentages of fore-sections and complete points in future analyses.

SUMMARY AND CONCLUSIONS

The investigations at the Bolton site uncovered an approximately 200 m^2 Paleo-Indian occupation as well as evidence of subsequent prehistoric occupations during the Early or Middle Archaic (Serrated Points), Late Archaic ("smallpoint"), Middle Woodland, and Late Woodland (probably Glen Meyer). Despite the number of components represented, it was possible to isolate material associated with each occupation through analyses of spatial distributions and raw material source preferences as evidenced in diagnostic tools. The isolation of such components was only possible because, even though the site was ploughed, the artifacts had been piece-plotted. This result leads us to recommend that such plotting be carried out in the future on similar sites.

The Paleo-Indian component at Bolton is assignable to the Crowfield Phase and is important for several reasons. The Crowfield Phase is the poorest known of all such eastern Great Lakes Early Paleo-Indian phases. In fact, since the phase is known mainly from a "ceremonial cache" at the Crowfield site, one could argue that Crowfield points were a specially made ceremonial form, perhaps attributable to previously recognized phases such as Gainey or Parkhill, rather than a distinct Paleo-Indian manifestation. However, no such argument can be made for the Bolton assemblage or, for that matter, for comparable assemblages at other Ontario sites such as Hussey (Storck 1979). Bolton clearly is a Crowfield occupation site, and whatever the meaning of Crowfield points to their makers, they clearly were employed as utilitarian tools — an argument supported by the fact that the points from the Crowfield site *per se* were resharpened and recycled (Deller and Ellis 1984:50).

The Bolton assemblage includes a shouldered, fluted biface suggesting that the similar items at the Crowfield site are of functional significance and were not a fortuitous occurrence. Moreover, the Bolton assemblage includes a backed biface which only has flaking from the back surface on one face and lacks basal notches. This tool resembles those found at the Crowfield site and differs from those associated with earlier Parkhill Phase components. Hence, this form of backed biface seems to be diagnostic of the Crowfield Phase. In addition, the Bolton assemblage has generated new insights into Crowfield Phase lithic assemblages. For instance, the excavations yielded an unprecedented sample of channel flakes from fluted Crowfield points. When compared to channel flakes from other Early Paleo-Indian phase components (such as those of the Parkhill Phase), the Bolton sample has a high incidence of specimens from multiple fluted points and exhibits considerable variability in width. These differences suggest that we can recognize Crowfield components in the future solely from the characteristics of the channel flake assemblages, and in the absence of other diagnostic artifacts such as fluted bifaces.

Chert preferences at the Bolton site are significantly different from other Paleo-Indian sites in the region (e.g., the area west of London). Whereas Fossil Hill chert dominates known Gainey and Parkhill Phase sites in the region, only one waste flake of that material was recovered from Bolton. The Paleo-Indian lithics at Bolton are manufactured primarily from a high quality Onondaga chert originating in bedrock outcrops located some 100 km southeast of the site. In this regard the site is similar to the nearby Crowfield site. These similarities and differences raise the possibility that we will be able to recognize Early Paleo-Indian sites of the Crowfield Phase in southwesternmost Ontario in the absence of the highly diagnostic points. They might be assigned to the Crowfield Phase because of the dominance of Onondaga. More importantly, the contrasts between Crowfield and the earlier phases in terms of the lithic sources used (and the directions to those sources) suggest differences in the directions of seasonal movements over the landscape. In short, people of the Crowfield Phase seem to have included both the Bolton site area and the Onondaga outcrop area to the east-southeast in their seasonal patterns of movement (Figure 1). In contrast, earlier Parkhill Phase users of the same area as Bolton seem to have included the Collingwood chert source area to the northeast within their seasonal ranges, but not the Onondaga chert outcrop areas. Given that all the sites regardless of phase occur over the same geographic area, these contrasts in movement patterns supports the notion that the suggested phases represent a time series rather than contemporaneous variation.

The Bolton Paleo-Indian assemblage is small and relatively specialized, being dominated by fluted biface associated activities. The high frequency of fluted bifaces suggest it was a hunting camp. If one assumes by analogical reasoning from the ethnographic record that projectiles were largely used by males, and that the lithic assemblage is representative of all activities carried out at the site, then it is probable Bolton was occupied by a male task group. The small assemblage also includes a backed biface and a high percentage of complete points and fore-sections. The co-occurrence of these two, rare artifact forms is repeated at other sites and raises the possibility that the backed bifaces were butchering tools used to process game during which the snapped fore-sections and complete points were retrieved from (or brought to the site in) animal carcasses. Clearly we need additional data from other sites in order to properly evaluate this suggestion.

Acknowledgements. Excavations at the Belton site were supported by a grant from the Social Sciences and Humanities Research Council of Canada (Grant #410-90-1642) awarded to the authors and Dr. Barry Warner, University of Waterloo. We thank Barry, Dr. Paul Karrow, Dr. David Nobes and Mike Brewster for their help on geological and paleoenvironmental matters. We also gratefully acknowledge Jim McLeod who brought the site to our attention and assisted in the excavations, and to the field crew: Brian Kelman, Holly Martelle, Donna Morrison, Anne Moulton, Shawn Thompson and especially, Juliet Garfit. A special vote of thanks is extended to Mr. and Mrs. Charles Bolton for permission to excavate on their property and also, for the many kindnesses they extended to the field crew which made the work at the site such a pleasant task. The artifact drawings are by Janie Ravenhurst and were funded by a grant from the Dean of Social Science, University of Western Ontario. Stephen Harding assisted with developing the photographs. We are grateful to Dr. Alexander von Gernet and the two reviewers who forced us to put the paper into passable English. Finally, we respectfully dedicate this paper to the memory of our very good friend, mentor, and pioneer Great Lakes Paleo-Indian archaeologist, the late Dr. William Burton Roosa.

REFERENCES CITED

Binford, L.R.
1979 Organization and Formation Processes: Looking at Curated Technologies. *Journal of Anthropological* Research 35:255-273.

Brewster, M.L.
1991 *Application of Magnetic* and Electromagnetic Geophysical *Methods to North* American Prehistoric Archaeology. Unpublished BSc Thesis, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario.

Collins, M.B.
1975 Lithic Technology as a Means of Processual Inference. In *Lithic* Technol*ogy: Making and Using* Stone Tools, edited by E. Swanson, pp. 15-34. The Hague, Mouton.

Deller, D.B.
1979 Paleo-Indian Reconnaissance in the Counties of Lambton and Middlesex. *Ontario* Archaeology 32:3-20.
1988 The Paleo-Indian *Occupation of* Southwestern Ontario: *Distribution,* Technology *and* Social Organization. Unpublished PhD Dissertation, Dept. of Anthropology, McGill University, Montreal, P.Q.

Deller, D.B. and C.J. Ellis
1984 Crowfield: A Preliminary Report on a Probable Paleo-Indian Cremation in Southwestern Ontario. Archaeology of Eastern *North* America 12:41-71.

1988 Early Paleo-Indian Complexes in Southwestern Ontario. In *Late Pleistocene and Early* Holocene Paleoecology *and* Archaeology of the Eastern *Great Lakes* Region, edited by R. Laub, N. Miller and D. Steadman, pp. 251-263. Bulletin of the Buffalo Society of Natural Sciences 33.

1992a *Thedford II:* A Paleo-Indian Site in the Ausable River *Watershed* of Southwestern Ontario. Memoirs of the Museum of Anthropology, University of Michigan 24.

1992b The Early Paleo-Indian Parkhill Phase in Southwestern Ontario. *Man in* the *Northeast* 44:15-54.

Eisenberg, L.

1978 *Paleo-Indian* Settlement *Patterns in* the *Hudson and Delaware* River rainages. Occasional Publications in Northeastern Anthropology 4.

Ellis, C.J.

1994 Some Unanswered Questions Concerning Early Paleo-Indian Subsistence and Settlement Systems in Southern Ontario. In *Great* Lakes *Archaeology and Paleoecology: Exploring Interdisciplinary Initiatives for* the Nineties, edited by R.I. MacDonald, pp. 413-429. Quaternary Sciences Institute, University of Waterloo, Publication 10.

Ellis, C.J. and D.B. Deller

1980 Test Excavations on Two Small Fluted Point Sites in Ontario. In An Archaeo*logical* Survey in the Counties of *Lambton and Middlesex Including* Test *Excavations* at *Two Paleo-Indian* Sites, by D.B. Deller, pp. 92-156. Ms. on File, Ontario Heritage Foundation and Ontario Ministry of Culture and Communications, Toronto, Ontario.

1988 Some Distinctive Paleo-Indian Tool Types from the Lower Great Lakes Region. Midcontinental *Journal of* Archaeology 13:111-158.

1990 Paleo-Indians. In *The Archaeology of* Southern Ontario to A.D. 1650, edited by C.J. Ellis and N. Ferris, pp. 37-63. Occasional Publication of the London Chapter, Ontario Archaeological Society 5. London, Ontario.

1991 *Investigations at Small Early Paleo-Indian* Sites in Southwestern *Ontario,* 1990: Culloden *Acres, Bolton and Murphy.* Ms. on File, Ontario Ministry of Culture, Tourism and Recreation, Toronto, Ontario.

Ellis, C.J., D.B. Deller and L.J. Jackson

1992 Investigations at Small, Interior, Early Paleo-Indian Sites in Southwestern Ontario. *Annual Archaeological* Report *for Ontario for 1991, New* Series 2:92-96.

Ellis, C.J., I. Kenyon and M. Spence

1990 The Archaic. In The Archaeology of Southern Ontario *to A.D. 1650,* edited by C. Ellis and N. Ferris, pp. 65-124. Occasional Publication of the London Chapter, Ontario Archaeological Society 5. London, Ontario.

Ellis, C.J. and J.H. Payne

1995 Estimating Failure Rates in Fluting Based on Archaeological Data: Examples from NE North America. Jour*nal* of *Field Archaeology* 22(4):459-474.

Ellis, C.J., S. Wortner, and W. Fox

1991 Nettling: An Overview of an Early Archaic "Kirk Corner-Notched Cluster" Site in Southwestern Ontario. Canadian Journal *of Archaeology* 15:1-34.

Eschman, D. F., and P. F. Karrow

1985 Huron Basin Glacial Lakes: A Review. In *Quaternary Evolution* of the Great Lakes, edited by P. F. Karrow and P. E. Calkin, pp. 79-93. Geological Association of Canada Special Paper 30.

Fitting, J. E., E. Wahla, and J. DeVisscher

1966 *The Paleo-Indian* Occupation of the Holcombe *Beach.* Museum of Anthropology, University of Michigan, Anthropological Papers 27.

Frison, G.C.

1968 A Functional Analysis of Certain Chipped Stone Tools. American An*tiquity* 33:149-155.

1978 Prehistoric Hunters of the *High* Plains. Academic Press, New York.

Frison, G.C., and B. Bradley

1980 Folsom Tools and Technology at the *Hanson* Site, Wyoming. University of New Mexico Press, Albuquerque.

Gramly, R.M.
1982 *The Vail Site: A Palaeo-Indian* Encampment *in Maine.* Bulletin of the Buffalo Society of Natural Sciences 33.
Gramly, R.M., and R.E. Funk
1990 What is Known and Not Known About the Human Occupation of the Northeastern United States Until 10,000 B.P. Archaeology of Eastern *North* America 18:5-31.
Gramly, R.M., and J.C. Lothrop
1984 Archaeological Investigations at the Potts Site, Oswego County, New York, 1982 and 1983. Archaeology *of Eastern North* America 12:122-158.
Jackson, L.J.
1990 Interior Paleoindian Settlement Strategies: A First Approximation for the Lower Great Lakes. In *Early* Paleo-*indian Economics* of Eastern North America, edited by K. Tankersley and B. Isaac, pp. 95-142. Research in Economic Anthropology, Supplement 5.
1991 The Murphy Site (AeHk-1), 1990 Excavations. In Investigations at *Small Early Paleo-Indian* Sites in Southwestern *Ontario,* 1990: *Culloden* Acres, Bolton *and Murphy,* by C. J. Ellis and D.B. Deller, pp. 107-124. Ms. on File, Ontario Ministry of Culture, Tourism and Recreation, Toronto, Ontario.
1994 *Gainey Phase* Occupation in the Southern Rice *Lake* Region, Canada. PhD. Dissertation, Department of Anthropology, Southern Methodist University, Dallas, Texas. University Microfilms, Ann Arbor, Michigan.
Jackson, L.J., and H. McKillop
1991 Approaches to Paleo-Indian Economy: An Ontario and Great Lakes Perspective. Midcontinental *Journal of* Archaeology 16:34-68.
Mosley, M.E., and C.J. Mackey
1972 Peruvian Settlement Pattern Studies and Small Site Methodology. American Antiquity 37:67-81.
Nicholas, G.P.
1988 Ecological Leveling: The Archaeology and Environmental Dynamics of Early Post-Glacial Land Use. In Holocene *Human Ecology* in Northeastern *North* America, edited by G.P. Nicholas, pp. 257-296. Plenum Press, New York.
Nobes, D.C.
1994 Geophysics and Archaeology: Non-Destructive Survey Techniques. In Great *Lakes* Archaeology *and Paleoecology:* Exploring Interdisciplinary Initiatives for *the Nineties,* edited by R.I. MacDonald, pp. 367-411. Quaternary Sciences Institute, University of Waterloo, Publication 10.
Roberts, F.H.H. Jr.
1935 A Folsom Complex: Preliminary Report on Investigations at the Lindenmeier Site in Northern Colorado. Smithsonian *Miscellaneous Collections* 94(4).
Shott, M.J.
1989a Diversity, Organization and Behaviour in the Material Record: Ethnographic and Archaeological Examples. *Current* Anthropology 30:283-315.
1989b On Tool Class Use-Lives and the Formation of Archaeological Assemblages. American *Antiquity* 54:9-30.
Stewart, A.
1984 The Zander Site: Paleo-Indian Occupation of the Southern Holland Marsh Region of Ontario. Ontario *Archaeology* 42:45-79.
Storck, P.L.
1979 A Report on *the Banting and Hussey* Sites: *Two Palaeo-Indian* Campsites in Simcoe County, Southern Ontario. National Museum of Man, Archaeological Survey of Canada, Mercury Series Paper 93.
1982 Palaeo-Indian Settlement Patterns Associated with the Strandline of Glacial Lake Algonquin in Southcentral Ontario. Canadian *Journal of Archaeology* 6:1-31.
1983 The Fisher Site, Fluting Techniques and Early Paleo-Indian Cultural Relationships. Archaeology of Eastern *North* America 11:80-97.

Timmins, P.
1994 Alder Creek: A Paleo-Indian Crow-field Phase Manifestation in the Region of Waterloo, Ontario. *Midcontinental Journal* of Archaeology 19(2):170-197.

Voss, J.
1977 The Barnes Site: Functional and Stylistic Variability in a Small Paleo-Indian Assemblage. *Midcontinental Journal of Archaeology* 2:283-305.

Whallon, R.
1984 Unconstrained Clustering for the Analysis of Spatial Distributions in Archaeology. In Intrasite *Spatial Analysis in* Archaeology, edited by H. Hietala, pp. 242-277. Cambridge University Press, Cambridge.

Williamson, R.F.
1990 The Early Iroquoian Period of Southern Ontario. In *The Archaeology of* Southern Ontario *to A.D.* 1650, edited by C. Ellis and N. Ferris, pp. 291-320. Occasional Publication of the London Chapter, Ontario Archaeological Society 5. London, Ontario.

Wortner, S., and C.J. Ellis
1993 The Snary Early Paleo-Indian Site. *Kewa* 93(2):3-15.

D. Brian Deller, R.R. #4, Glencoe, Ontario NOL 1M0
Christopher Ellis, Department of Anthropology, University of Western Ontario, London, Ontario N6A 5C2

Comment on Deller and Ellis' "The Bolton Site: A Crowfield Phase Early Paleo-Indian Site in South-western Ontario"

Peter A. Timmins

The Deller and Ellis paper on the Bolton site is not only a useful addition to the regional Paleo-Indian literature, but also contains methodological and analytical contributions related to excavation techniques and the advantages of "small site" archaeology.

The Bolton site excavations have provided additional evidence that Crowfield fluted bifaces are not merely ceremonial artifacts, despite the fact that they are best known from a ceremonial feature at the Crowfield site. However, Crowfield points have been discovered in utilitarian contexts at other sites, including Zander (Stewart 1984) and Alder Creek (Timmins 1994), so their discovery at Bolton is not really a surprise.

Perhaps of greater interest is the demonstration that the occupants of the Bolton site had a clear preference for high quality Onondaga chert probably obtained from quarry sources located on or near the northeastern shore of Lake Erie. This chert preference pattern documents a radical shift from a focus on the more northerly Fossil Hill chert heavily used by people of the preceding Parkhill Phase. The shift in procurement patterns implies a change from north-south seasonal movements predicated on chert acquisition and possibly caribou hunting (Deller and Ellis 1992) to a predominantly east-west movement focused on the Onondaga chert source. It is likely that such a shift was imbedded in a substantially modified subsistence strategy involving the exploitation of more southerly species. Hence, the Crowfield site may be related to significant changes in Paleo-Indian subsistence systems that occurred toward the end of the Early Paleo-Indian period. We must await the discovery and investigation of more sites and concur-rent paleoenvironmental research before the complexities of this change will be fully understood.

Deller and Ellis employ the "moving template" method of constructing density plans to maximize the spatial information gained by piece-plotting artifacts from the ploughzone. They maintain that the technique helped them isolate the main concentrations of Paleo-Indian tools and debris when coupled with the analysis of raw material types. This application should be of interest to all of us who try to reconstruct site structure from ploughzone deposits, but it is not a panacea for mixed assemblage problems. The success of the technique is at least partially dependant upon patterns of chert preference, which became quite clear in the Bolton case. One wonders what the outcome would be if the technique was applied to a multi-component Archaic site occupied by six different groups — all with a penchant for low quality Onondaga chert.

There is also some risk, which Deller and Ellis acknowledge, in assuming that all of the high quality Onondaga material at Bolton can be assigned to the Crowfield Phase. We know that later post-Paleo-Indian groups also used high quality Onondaga chert, and some Middle Woodland diagnostics of this material were found at Bolton, thus introducing an unknown error factor into the data.

The Bolton site report is perhaps most useful as a demonstration of the advantages offered by the analysis of small sites in a Paleo-Indian context. The Bolton tool assemblage involves a limited range of tool types including fluted points, preforms, bifaces, denticulated and retouched flakes, and gravers. This type of tool assemblage may represent the debris from a limited number of hunt-related activities including butchering, projectile point manufacture and rehafting. A very similar tool assemblage was found at the Alder Creek site, another small inland Crowfield Phase component located near Kitchener, Ontario (Timmins 1994). Small sites like Alder Creek and Bolton are important because they are the building blocks for our understanding of more complex larger sites and the overall settlement-subsistence systems of prehistoric hunter-gatherers.

REFERENCES CITED

Deller, D.B., and C. Ellis
1992 The Early Paleo-Indian Parkhill Phase in Southwestern Ontario. *Man in* the Northeast 44:15-54.

Stewart, A.
1984 The Zander Site: Paleo-Indian Occupation of the Southern Holland Marsh Region of Ontario. Ontario *Archaeology* 41:45-79.

Timmins, P.
1994 Alder Creek: A Paleo-Indian Crowfield Phase Manifestation in the Region of Waterloo, Ontario. *Midcontinental Journal of Archaeology* 19(2):170-197.

Peter A. Timmins, Ontario Ministry of Transportation, Southwest Region, Environmental Unit, 55 Centre St., London, Ontario N6J 1T4

Reply to Timmins' Comment

D. Brian Deller and Christopher Ellis

We thank Peter Timmins for taking the time to comment on our paper and for his positive comments. We agree that the differences in use of raw materials on sites of different Early Paleo-Indian phases west of London suggest range shifts over time. These may be related to changes in hunting patterns and, in fact, we (and others) have used different lines of evidence to suggest such changes did occur between presumed earlier Gainey and Parkhill Phase occupations and the later Crowfield Phase occupations (Deller and Ellis 1988, 1992b; Ellis and Deller 1997). Whether these suggested changes relate to shifts in the prey species taken (as suggested by Peter Timmins), instead of to changes over time in the distribution of the same species such as caribou, remains to be determined. Our knowledge of what species were present during the late Pleistocene - Early Holocene is sadly inadequate.

We also agree that the methods employed at Bolton to isolate the various components may not work at other sites and that, to some extent, it is desirable to find sites with a diversity of material used during the various occupations. We were lucky at Bolton in this regard and, in fact, have been similarly lucky at other Paleo-Indian sites such as Thedford II (Deller and Ellis 1992a) and Culloden Acres (Ellis and Deller 1991; 1996), at least when it comes to separating out most of the Paleo-Indian material from other components. This, however, is largely because the Paleo-Indian knappers (and also Early Archaic ones) tended to be more selective in their raw material preferences. Separating out later components from one another is much more problematical (witness Concentration "C" at Bolton which has both Archaic and Woodland diagnostics), so we advocate such methods in early site contexts, or contexts where there is some prior indication that suggests it is worth the trouble to piece-plot the material.

One should not regard the method of using moving templates as a panacea because the technique does have its own inherent limitations. For example, it tends to artificially de-emphasize clustering near the margins of excavated areas; unless one excavates a relatively large area, its usefulness is limited. One can also change the clustering somewhat by changing the radius one uses about grid points to calculate the density at those points (at Bolton we received comparable results plotting at several radii so, for the sake of brevity, we only presented the results for a two metre radius around grid points). We would also like to stress that the patterns seen at Bolton were present despite disturbances caused by ploughing. Some authors, based on experiments in ploughed fields, have argued that this clustering may be spurious and a product of ploughing rather than cultural behaviour (e.g., Odell and Cowan 1987). In fact, they have raised this possibility in an otherwise positive review of our work (Odell 1994). We believe that we are dealing with clustering at such a general level that the robust methods employed are yielding significant results. It is difficult to believe that ploughing at some of these sites would separate out Bayport from Fossil Hill chert, Kettle Point from Onondaga chert, or, as seen at some sites, different artifact types from one another (e.g., Deller and Ellis 1992a; Ellis 1994). Nonetheless, much more experimentation in ploughed fields is required, as is the use of several different methods to check for consistency in results. The only check we had involved studying density by two metre unit of flaking debris and this in itself can be distorted by "playing with" density intervals.

Finally, we obviously agree that small sites have much unexplored and unused potential in finding out about the prehistoric past. Many theoretical advantages have been noted since the early 1970s (e.g., Shiner 1970) and have been discussed in the Ontario literature (Finlayson 1977:266-227). It seems our practice is slow in catching up with our theory in this case. We have only touched on some of these advantages in our Bolton paper. Many more advantages in terms of dealing with the Paleo-

Indian archaeological record have either been discussed and illustrated elsewhere (Wortner and Ellis 1993) or will be discussed in a monograph-length report on the Culloden Acres site which is currently nearing completion.

REFERENCES CITED

Deller, D. B., and C. J. Ellis

1988 Early Paleo-Indian Complexes in Southwestern Ontario. In Late *Pleistocene and Early* Holocene Paleoecology *and* Archaeology of the East-*ern Great Lakes* Region, edited by R. Laub, N. Miller and D. Steadman, pp. 251-263. Bulletin of the Buffalo Society of Natural Sciences 33.

1992a *Medford II: A Paleo-Indian* Site in the Ausable *River Watershed* of Southwestern Ontario. Memoirs of the Museum of Anthropology, University of Michigan, 24.

1992b The Early Paleo-Indian Parkhill Phase in Southwestern Ontario. Man in the Northeast 44:15-54.

Ellis, C. J.

1994 Miniature Early Paleo-Indian Stone Artifacts from the Parkhill Site, Ontario. *North* American Archaeologist 15:253-267.

Ellis, C. J., and D. B. Deller

1991 A Small (But Informative) Early Archaic Component at the Culloden Acres Site, Area B. Kewa 91(8):2-17.

1996 Variability in the Archaeological Record of Northeastern Early Paleo-Indians: A View from Southern Ontario. *Archaeology of Eastern* North America 25: in press.

Finlayson, W. A.

1977 The Saugeen Culture: *A Middle Woodland Manifestation in* South-*western* Ontario. National Museum of Man, Archaeological Survey of Canada, Mercury Series Paper 61.

Odell, G. H.

1994 Review of 'Thedford II: A Paleo-Indian Site in the Ausable River Watershed of Southwestern Ontario" by D. B. Deller and C. J. Ellis, Memoirs of the Museum of Anthropology, University of Michigan, 24. *North* American Archaeologist 15:87-89.

Odell, G. H., and F. Cowan

1987 Estimating Tillage Effects on Artifact Distributions. American *Antiquity* 52:456-484.

Shiner, J.

1970 Activity Analysis of a Prehistoric Site. *Bulletin* of the Texas Archaeological Society 41:25-36.

Wortner, S., and C.J. Ellis

1993 The Snary Early Paleo-Indian Site. *Kewa* 93(2):3-15.

D. Brian Deller, R.R. #4, Glencoe, Ontario NOL 1M0
Christopher Ellis, Department of Anthropology, University of Western Ontario, London, Ontario N6A 5C2