HI-LO MATERIALS FROM SOUTHWESTERN ONTARIO

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ABSTRACT

Recent research conducted on Hi-Lo sites in Southwestern Ontario provides support for Hi-Lo's placement as a Late Paleo-Indian/Early Archaic manifestation. The variation in Hi-Lo point morphology and the known tool forms associated with Hi-Lo are discussed. It is suggested that Hi-Lo can be conceived of as a Great Lakes area representative of Tuck's Dalton Horizon.

INTRODUCTION

In recent years, considerable attention has been directed towards the investigation of temporally early lithic industries in southern Ontario. However, the majority of this work has focused on fluted point materials (Ellis 1979; Jackson 1978; Roosa 1977a, 1977b; Storck 1978, 1979) and with few exceptions (Deller 1976a, 1976b, 1979; Storck 1979), little attention has been focused on later Paleo-Indian or Early Archaic manifestations. One such manifestation is Hi-Lo (Fitting 1963a, 1963b).

Hi-Lo points, which have been included with forms referred to as unfluted-fluted (Prufer and Baby 1963:22) and Aqua-Plano (Quimby 1961:34-36) and which are the best known diagnostic indicator of this lithic industry, are common in the Great Lakes area. Other than a few brief studies of Hi-Lo point typology and the geographical distribution of these points, Hi-Lo is both a poorly known and understood industry (Wright 1978:74).

This paper has two aims. First, data are presented supporting the placement of Hi-Lo as a Late Paleo-Indian/Early Archaic lithic industry. This is especially important given the recent recognition that several lanceolate point forms such as Fox Creek-Steubenville points (Mayer-Oakes 1955; Ritchie 1971) or the points associated with the "Satchell Complex" (Peske 1963) which were once presumed to be early are now known to be Late Archaic or Woodland in affiliation (Ritchie and Funk 1973; Kenyon 1980a, 1980b). Furthermore, Wright (1978:74) has recently expressed some doubts as to the early affinities of Hi-Lo materials and Noble (1975:102), while accepting an early temporal placement, has referred to Hi-Lo's position as "equivocal." Second, given that a Late Paleo-Indian/Early Archaic placement for Hi-Lo is accepted, the relationship of this material to relatively contemporaneous materials outside the Great Lakes area can be examined.

In order to accomplish these aims, it will be necessary to: (1) examine the nature of the variability exhibited by a series of Hi-Lo points; and (2) present currently available information on the tool forms associated with Hi-Lo points. In the following, after a brief discussion of the context of the available artifact samples, the Hi-Lo artifacts used in this study are briefly described. Emphasis is placed on describing those attributes bearing on the aims of the study outlined above. However, special attention is given to describing Hi-Lo tool forms other than points because only three tools other than points have been previously reported (Fitting 1963a).

Ellis, C. J., and D. Brian Deller
1982 Hi-Lo Materials From Southwestern Ontario. *Ontario Archaeology* 38:3-22.

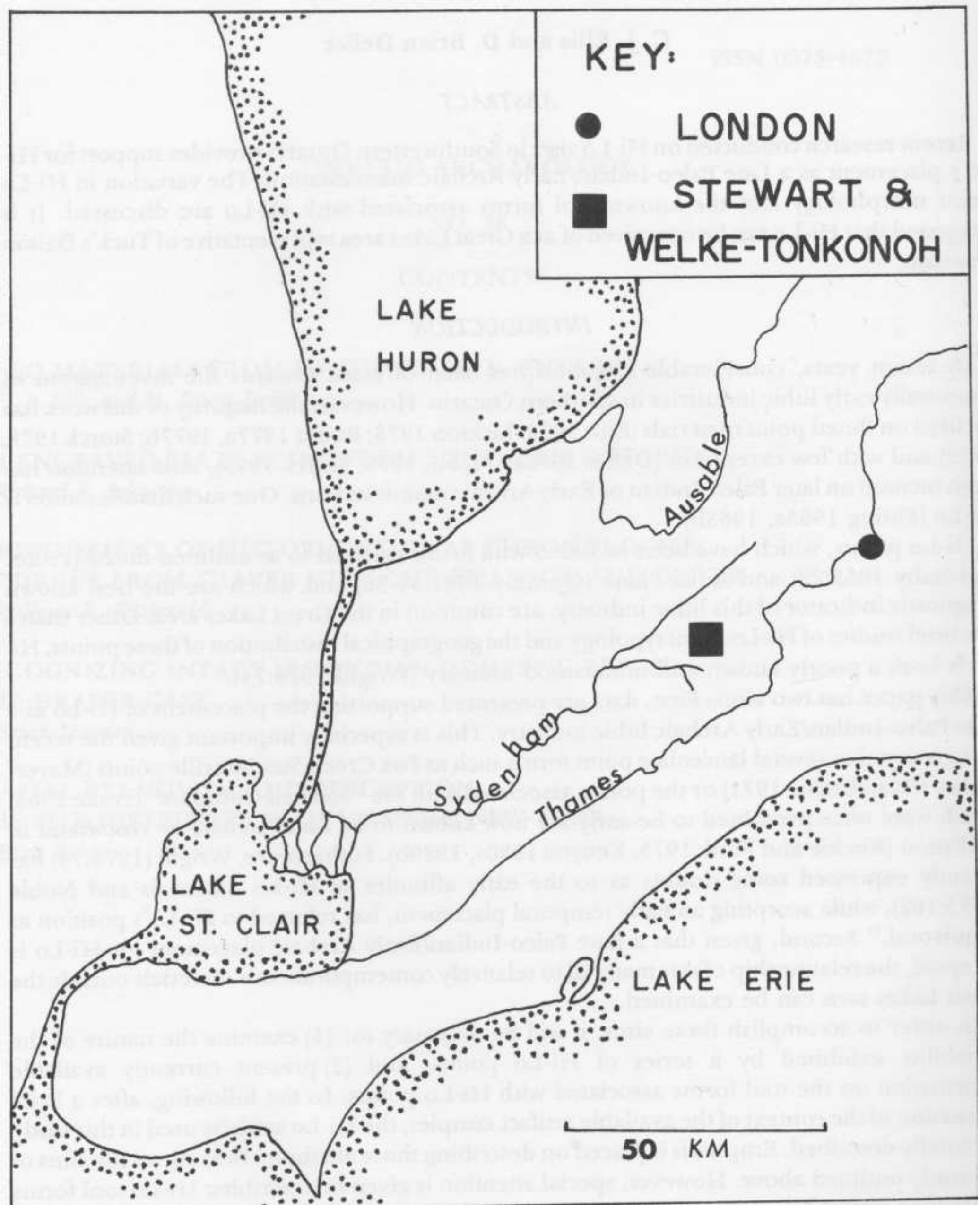

Fig. 1. Site locations in southwestern Ontario.

THE ARTIFACT SAMPLE

The artifact sample used in this study consists of 139 tools and is drawn from several sites in Middlesex County, Ontario, briefly reported by Deller (1976a, 1979). However, the vast majority of the tools are from two sites in Caradoc Township, just west of London, Ontario (Fig. 1): Welke-Tonkonoh (AfHj-5) and Stewart (AfHj-6). Both of these sites are within the confines of the Caradoc Sand Plain (Chapman and Putnam 1973:236-238) and within the Sydenham River drainage.

The Welke-Tonkonoh site is the most extensive Hi-Lo site yet reported and surface collection suggests several (5+) discrete concentrations or activity areas. Small areas of two of these concentrations (Grids A and C) were excavated during the summer of 1980. Most Hi-Lo artifacts from Grid A are from a surface-collected or an excavated plowzone context. However, two small areas of subsoil Hi-Lo materials were located and partially excavated. In addition to Hi-Lo materials, evidence of extensive Late Archaic to Middle Woodland occupations were noted in Grid A.

Excavations in Grid C were limited to test-pitting. All Hi-Lo artifacts were recovered in a surface or plowzone context. In contrast to Grid A though, Grid C is notable in that the only diagnostics recovered are Hi-Lo points and the recovered artifacts are almost totally of the diagnostic Hi-Lo lithic material type (see below).

TABLE 1
DISTRIBUTION OF ARTIFACTS BY SITES

Artifact Type	Welke-Tonkonoh			Stewart	Other	Isolated
	Grid A	Grid C	Other		Sites	Surface
Points	33	6	22	9	13	19
Thinning Stage Preforms	3	-	-	1	-	-
Completed Stage Preforms	-	-	-	1	2	-
Backed Biface	-	-	-	1	-	-
Small Thin Biface	-	-	-	1	-	-
"Bulbous" Biface	-	1	-	-	-	-
All Other Bifaces	5	-	-	-	-	-
Circular End Scrapers	-	2	-	-	1	-
End Scraper on Blade	1	-	-	-	-	-
End Scraper on Corner-Struck Flake	1	-	-	-	-	-
All Other End Scrapers	-	3	-	-	-	-
Side Scrapers	3	-	-	-	-	-
Beaked Scrapers	2	-	-	-	-	-
Scraper with Normal and Inverse Retouch on Distal End	1	-	-	-	-	-
All Other Unifacial Tools	-	8	-	-	-	-
Totals	49	20	22	13	16	19

TABLE 2
CONDITION OF POINT SAMPLE

Condition	N	%
Relatively Complete	84	82.35
Base	13	12.75
Blade Element	4	3.92
Lateral Edge Fragment	1	0.98
Total	102	100.00

TABLE 3
DESCRIPTIVE STATISTICS: POINTS

Variable	N[1]	X[2](mm)	SD[3]	R[4](mm)	CV[5]
Total Length	52	39.65	7.26	26.0-59.0	18.31
Blade Length	53	30.09	7.30	13.5-46.0	24.26
Maximum Blade Width	70	23.70	2.55	18.0-29.5	10.76
Maximum Blade Thickness	71	8.16	0.97	6.5-11.0	11.89
Shoulder Width[6]	73	23.35	2.52	18.0-29.5	10.79
Haft Length	72	10.08	1.62	7.0-13.0	16.07
Length of Lateral Grinding	121	9.76	1.58	5.5-13.0	16.19
Length of Basal Thinning7	83	10.72	2.73	5.0-19.5	25.42
Hafting Width[8]	73	20.23	2.82	13.0-25.0	13.94
Hafting Thickness[8]	75	6.13	0.77	5.0-8.0	12.56
Basal Width	54	20.51	2.55	12.5-24.5	12.43
Basal Concavity Depth	52	2.80	0.91	1.5-5.5	32.50

[1] Number of observations.
[2] Mean.
[3] Standard deviation
[4] Range.
[5] Coefficient of variation.
[6] Width across shoulders or just above lateral grinding.
7 Based on longest thinning flake scar on a face.
[8] Measured at juncture of shoulders and lateral basal edge or at top of grinding.

The Stewart site is located on the farm adjacent to Welke-Tonkonoh and might be considered simply an extension of the other site. Apparently, the site had at least two separate concentrations or activity areas but these have largely been destroyed by recent building activities. The site was test-excavated in the early 1970's by crews from the University of Waterloo. All recovered materials are from a plowzone or surface context. Archaic and Woodland components were also present on the site.

The distribution of the artifact sample by tool form and site is shown on Table 1.

THE TOOL INVENTORY

Hi-Lo Points

A total of 102 points were examined for this study. The condition of the sample is shown in Table 2 while summary statistics of a representative sample for various continuous variables are shown in Table 3. The frequency of the various material types represented in this collection are shown in Table 4. The largest percentage of the points are of a distinctive white chert. Although a positive material source identification is lacking for this chert, visually it resembles chert from outcrops in Haldimand County (William Fox: personal communication). Regardless of its exact origin, the white chert has proved useful in isolating surface and plowzone tool forms associated with Hi-Lo points since it does not occur among the Archaic and Woodland diagnostics found on the sites of the region examined. For example, at Welke-Tonkonoh none of the 136 notched, stemmed or triangular Archaic/Woodland points are of this material.

Within the available Hi-Lo point collection, there is considerable morphological variation and it is suggested here that this variation largely is a result of the differing life histories of individual points. Point blade elements are characterized by extensive lateral and longitudinal resharpening. "Lateral" resharpening refers to reworking which results in reduction of the original width of point blade elements and alteration of lateral blade edge configuration while "longitudinal" refers to instances in which blade length is reduced and tip shape is altered (see Goodyear 1979:11 for a similar concept). Evidence of the presence and degree of lateral resharpening is threefold. The first consists of the presence of a slight shoulder. Of the 92 specimens which are complete enough to examine this attribute, 80 or 86.96% provide good evidence of shouldering. Points with little lateral resharpening have the most pronounced shoulders (Fig. 2e, g,h) while more extensively resharpened specimens show only a "nubbin" remnant of this shoulder (Fig. 2a,b) or no shoulder (Fig. 2d). In short, it is quite clear that most if not all of these Hi-Lo points had a slight shoulder prior to resharpening. The second indication of lateral reworking concerns the form of the lateral edges. This edge ranges from excurvate to straight to incurvate depending on the degree and nature of the lateral reworking. On less resharpened forms, maximum point width occurs at the mid-point of the blade element.

A final measure of lateral resharpening is the presence and extent of edge beveling. In all but three instances, this beveling was achieved by a bifacial edge retouch rather than the pure unifacial retouch characteristic of some industries including beveled points such as Dalton

TABLE 4

LITHIC MATERIAL TYPES, POINTS

Material Type	N	%
Kettle Point	32	31.37
Onondaga	7	6.86
Bayport	8	7.84
White (Haldimand?)	39	38.24
Unknown	16	15.69
Total	102	100.00

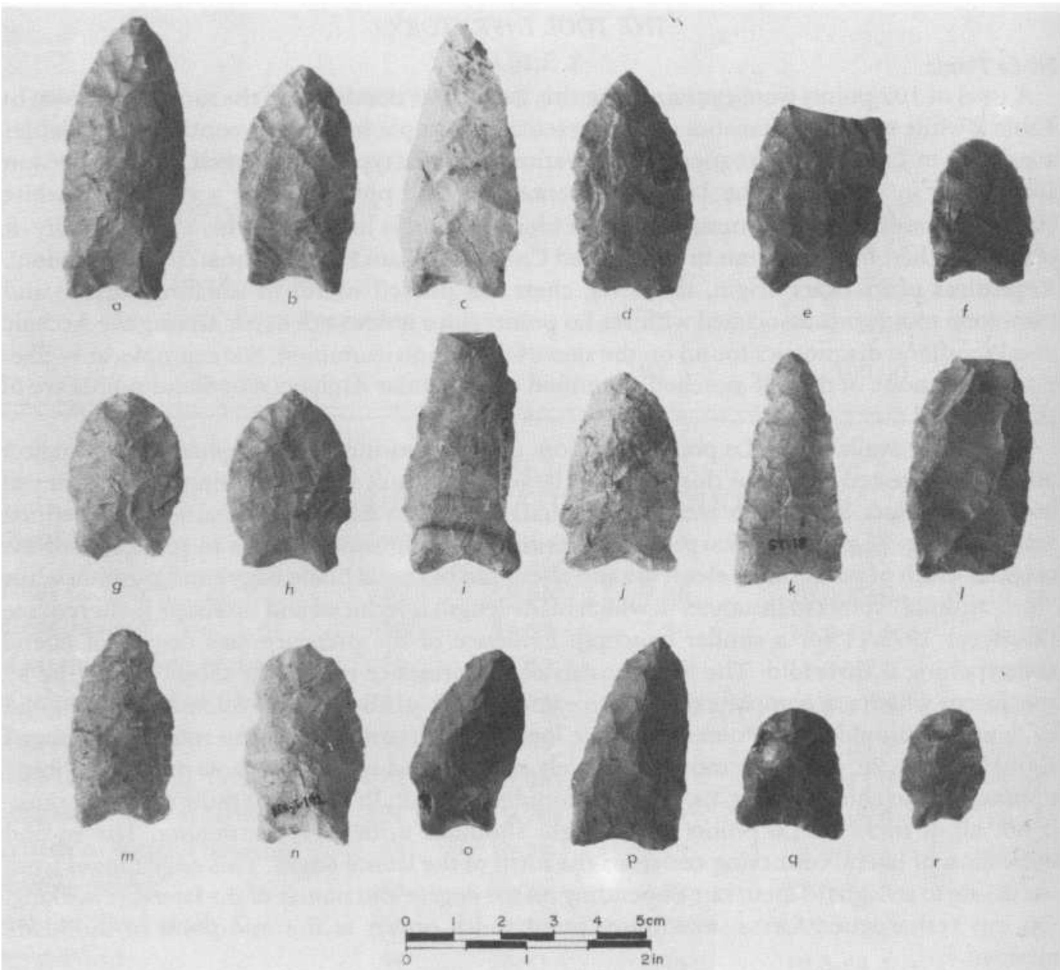

Fig. 2. Hi-Lo points.

(Goodyear 1974). Of the 89 points in a condition allowing examination of blade resharpening modes, fully 60 or 67.42% exhibit a bevel. When the point is viewed in plan with the base to the bottom, in 47 or 78.33% of the 60 cases, the bevel appears on the left edge. Five of these left-beveled points exhibit a bevel on only one lateral edge (Fig. 2e, o, p) while the remaining 42 have alternate edge beveling. Those points with a bevel on one left edge fall into two categories. One category, as represented by Figure 2e, includes two points with well-defined shoulders and a light bevel. These are interpreted to be intermediate between unbeveled and alternate beveled points. The second category includes three points (Fig. 2o, p) with very steep bevels and, as a consequence, exhibit only one incurvate edge and a blade element which runs off at an angle to a line drawn through the midline of the base. This assymetrical reworking is suggestive of a functional modification of point forms.

All of the right-beveled specimens (13) are alternately beveled and these and the left alternately beveled points exhibit a considerable twist in the point body relative to the base. Presumably, beveling and other indicators of extensive lateral reworking indicate the functional importance of Hi-Lo points in non-projectile usage.

Longitudinal resharpening is probably represented by the considerable variation in point length found in our sample (i.e. compare Fig. 2a with Fig. 2f; see also Fitting 1975:42). Definitive evidence of this form of resharpening occurs on 10 points (Fig. 2a) where tip impact fractures have been reworked. These specimens, as well as 11 with unreworked impact fractures (Fig. 2i, 1) are undoubtedly indicative or projectile usage. Finally, longitudinal resharpening is represented by two tools which have been partially reworked across a transverse blade break (Deller 1976a; Pl. 6g) and possibly by several specimens with rounded, blunt tips (Fig. 2f, g). These blunt tips might also suggest non-projectile usage (see Frison 1978:337-338).

In addition to the above reworking, some possible use modifications of blade elements can be noted. Two beveled tools have been subsequently worked into end scrapers (Fig. 2q,r) while two others were reworked into side scrapers (Fig. 21). An additional two points were recycled into "drills" (Fig. **3a,** b). Three other points exhibit a small notch flaked into one lateral edge (Fig. 2m,n). Also, one of these notched points has had two small notches retouched into the tip in order to isolate a pointed "perforator" (Fig. 2n). This perforator tip is broken, probably due to site plowing. Still another point has a large, broad, "spokeshave" notch carefully flaked into one edge. Finally, two points with largely rounded and blunted ends have possible small "perforators" in the centre of the tip (Fig. 2h).

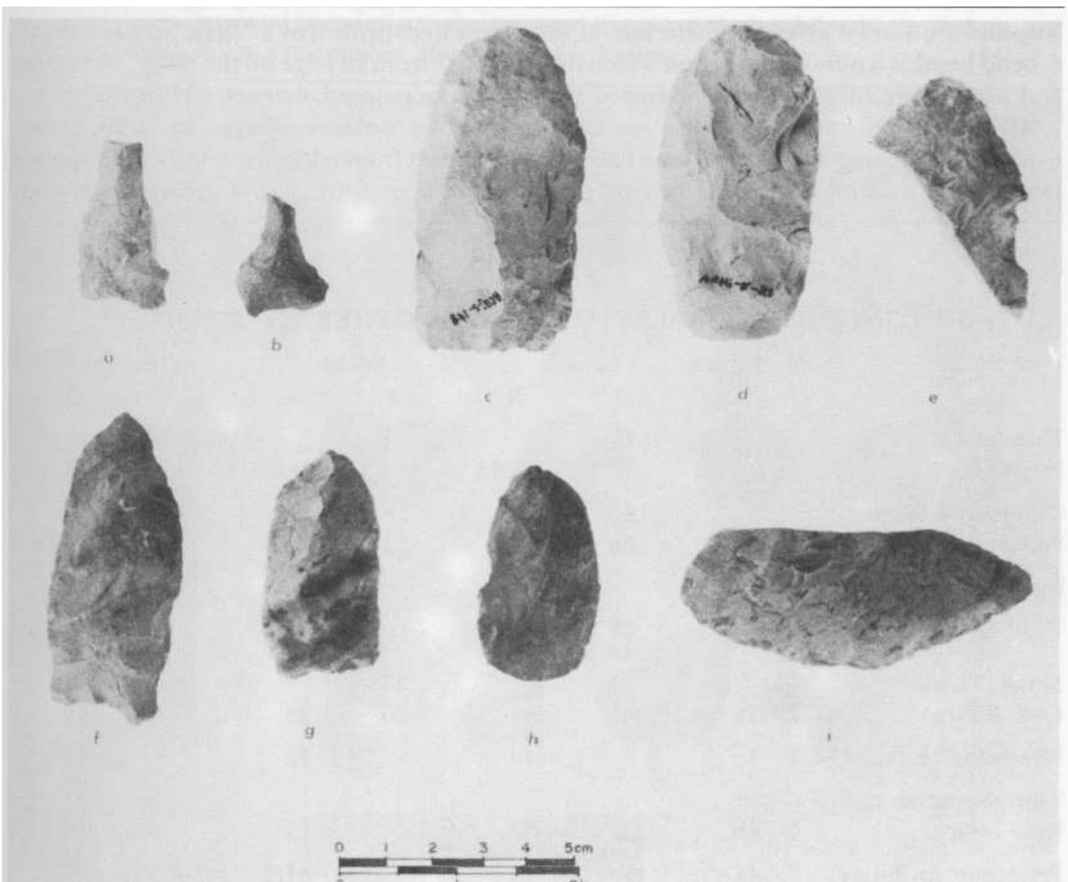

Fig. 3. Hi-Lo bifaces.

Basal or haft elements are characterized by several attribute states which have long been used to argue for an early temporal placement for Hi-Lo. Lateral and basal edges are always ground and basal thinning by the removal of single or several parallel-sided flakes is present. Occasionally, basal thinning is accomplished by the removal of a single, broad, expanding flake either alone or in conjunction with the short flute-like thinning. As well, thinning of the base just below the shoulders is often carried out by laterally directed parallel-sided removals from, usually, the right lateral basal edge. This lateral thinning often preceeds the basal thinning and usually occurs only on one face. The lateral basal edges range from straight to slightly concave to almost side-notched (i.e. Fig. 2j).

Ears are generally thick and pronounced and are often assymetrical in size and shape on the same point (Fig. 2f,h). It is suggested here that this assymetry results from reworking haft elements. Ears are often broken across their juncture with the base or by a pseudo-burin blow up the lateral edges. Interestingly, such breakage often accompanies tip impacts (i.e. Fig. 21) and thus may be associated with projectile usage. In 12 cases, these ear breaks have been partially reworked and ground over. Other evidence of reworking includes two point bases with battered ears from which a basal thinning flake has been removed.

Thinning Stage Preforms

Four preforms of the white chert were recovered (Fig. 3c,d,e). Two are complete while one is a tip and the other is a base. Both the incomplete items were broken by a "snap" or bend break. A bend break is a non-cone fracture which initiates back from an edge on the "face" of an item and usually produces thick, right-angled fracture surfaces (see Lawrence 1979:115).

All of the preforms in this type are characterized by surfaces covered by large, broad, expanding, thinning flake scars. These flakes were removed from edges previously continuously beveled and ground to prepare striking platforms. One preform with a squared base and

TABLE 5

CONTINUOUS VARIABLES FOR BIFACES OTHER THAN POINTS'

Tool Form	N	Figure	Length		Width		Thickness	
			r	X	r	X	r	X
Thinning Stage Preforms	2	3c.d.e	67-70.5	68.75	34-34.5	34.25	11-13	12
Completed Stage Preforms	3	3£g	49-66	59.8	24.5-32	28.2	10-11.5	10.66
Backed Biface	1	3i	-	76	-	29	-	9
Twist Drills	2	4c.d	28.5-46.5	37.5	-	10	5.5-6.0	5.75
Small. Thick. Oval Bifaces	2	3h	46-48	47	24-26	25	-	9
"Bulbous" Biface	1	4e	-	44	-	16	-	12
Thin. Squared Base Biface	1	4b	-	46	-	33	-	6.5
Perforator on Biface	1	4a	-	61	-	44.5	-	7

[1] All dimensions in mm; r: range; X:mean.

parallel lateral edges is notable (Fig. 3c). A similar preform in a further step of reduction has been illustrated by Quimby (1961:Fig. 14) as an Aqua-Plano point. Continuous variables for these and other reasonably complete non-point bifaces are shown on Table 5.

Completed Stage Preforms

Three preforms (Fig. 3f, g; Deller 1976 a: Pl. 8o) approximate the "completed preform stage" of Goodyear (1974:24-25). All lack basal and lateral grinding and possess a minimal amount of fine retouch. However, in size and shape, they approximate the finished points and are thought to be a further reduced stage of the thinning stage preforms. It should be noted that although these artifacts appear "unfinished," all appear to have been reworked and used. Two of these preforms are of Bayport chert while the third is of Kettle Point.

"Backed" Biface

One biface (Fig. 3i) of white chert was recovered which exhibits a flat backing along most of one lateral edge. This backing appears to have been formed by a snap or bend break. Subsequent to this break, a series of flakes were detached over both surfaces of the biface using the break as a striking platform.

Twist Drills

Two slight shouldered (or stemmed) Kettle Point chert twist drills with heavily worn blunt bits and ground basal and lateral edges were recoverd (Fig. 4c,d). Both exhibit the classic S-shaped bit end of such drills. Presumably the stem is for hafting.

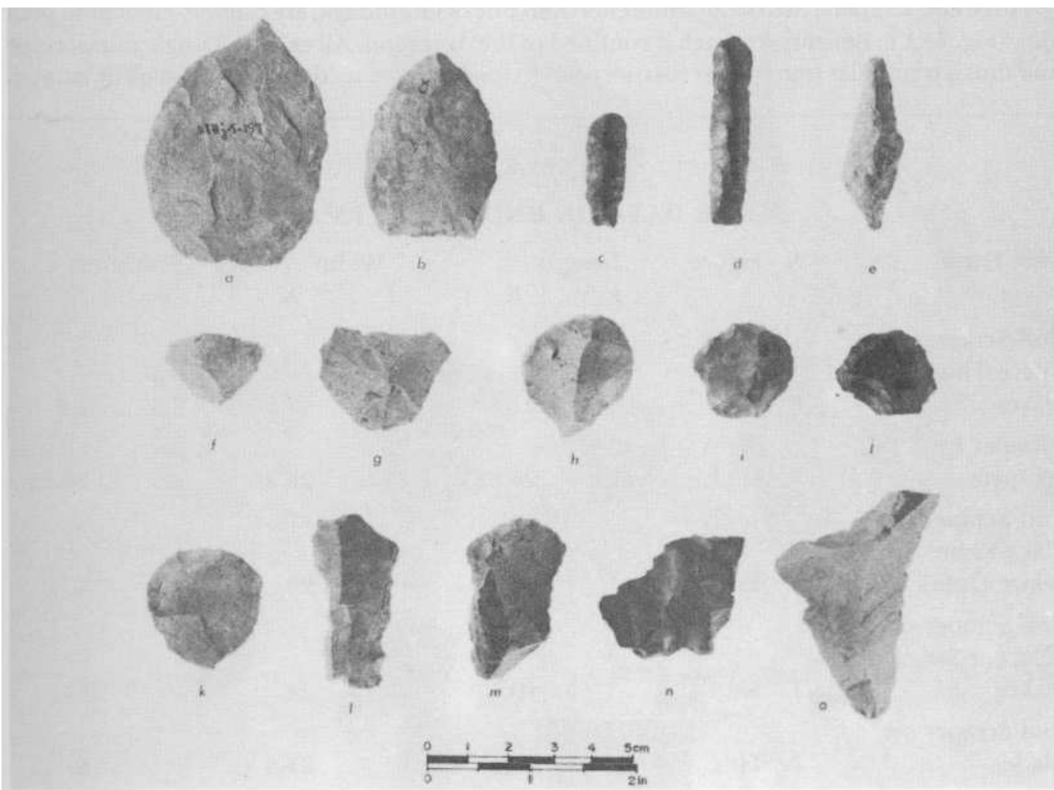

Fig. 4. Hi-Lo bifaces, end scrapers and pointed scrapers.

Other Bifaces

Five other bifaces were recovered. Two are small, thick oval forms (Fig. 3h) while a third is a thin well-made biface with a squared base (Fig. 4b). The fourth biface is thick and "bulbous" in the middle with rod-like projections at both ends (Fig. 4e). The tips of these projections are similar to those on the drills in that they are squared-off, blunt and heavily worn. However, they lack the "S" shape and undoubtedly, this tool was not hafted. This biface may have been made on a reworked point.

The final biface is large, oval, thin and well-made. It exhibits a large, partially broken "perforator" tip at one end (Fig. 4a). This tip has been formed by an alternate edge retouch. All of the above bifaces, with the exception of a small, thick oval form of Kettle Point chert, are made of the white chert.

End Scrapers on Biface Thinning Flakes

Two end scrapers of the white chert were made on biface thinning flakes (Fig. 4f, g). Both exhibit expanding lateral edges, pronounced curvature in longitudinal section, ground, faceted and acute-angled platforms and distal-dorsal scars indicating overlap of the flake removals with previous flake detachments from the opposite biface lateral edge. In shape, size and platform preparation, these flakes are identical to those which would be produced during the thinning of the thinning stage preforms. Continuous variables for these and other end scrapers are shown on Table 6.

Circular End Scrapers

Three end scrapers, two of the white chert and one of Onondaga, are roughly circular in plan view (Fig. 4h,i,j). Beveling retouch is confined to the distal end. All exhibit a single dorsal ridge and thus a triangular transverse cross-section. In longitudinal section, they are slightly curved.

TABLE 6

SIZE DATA ON END SCRAPERS'

Tool Form	N	Figure	Length		Width		Thickness	
			r	X	f	X	r	X
End Scrapers on Biface Thinning Flakes	2	4f.g	18-25	21.5	25-32	28.5	3.5-5.5	4.5
Circular End Scrapers	3	4i.j.k	22-32	26.33	26-27	26.33	5-27	26.33
End Scraper on Flake From Biface Core	1	4k	-	30	-	29	-	8
End Scraper on "Corner-Struck" Flake	1	4m	-	40	-	24	-	8
End Scraper on Blade	1	41	-	43.5	-	21.5	-	6

' All dimensions in mm; r: range; X: mean.

There is some evidence that these tools were hafted. One (Fig. 4h) has had the platform trimmed off while another (Fig. 4j) exhibits a bend break at the proximal end. In addition, this latter scraper has "incutting" at the corners of the retouched edge so that "spurs" are produced. Rather than being purposeful borers or gravers, we would suggest the incutting and hence spurs, are an attempt to maintain a convex working edge during resharpening. In sum, resharpening at the spurs was not possible due to enclosure in a haft.

Other End Scrapers

Three other white chert end scrapers are in the sample. The first of these is made on a flake derived from a large biface core (Fig. 4k). As such, it exhibits attributes similar to the end scrapers made on biface thinning flakes. However, it is much thicker and prior to extensive distal retouch would have been much longer.

The second artifact (Fig. 4m) is made on an elongated flake exhibiting a flat, right-angled platform and cortex along one lateral edge. The flake shows no curvature in longitudinal section while in transverse section it is wedge-shaped, the thick end of the wedge being the cortex surface. This cortex surface is at a 90° angle to the flaked portion of the dorsal surface. The tool blank in this case appears to have been struck off the corner of a tabular core (a blocky squarish core having 90° angles between adjacent surfaces) given its lack of curvature, 90° angle between the cortex edge and the remainder of the dorsal surface and its right-angled platform.

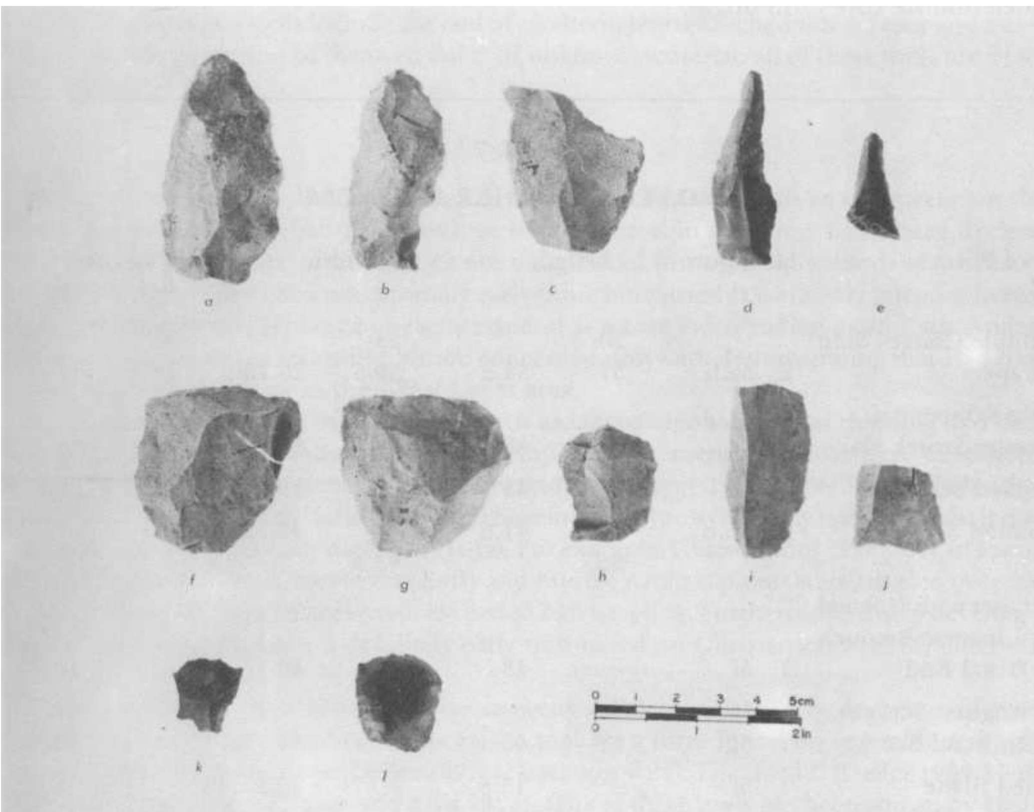

Fig. 5. Hi-Lo unifacial tools.

The final end scraper is made on a true blade (Fig. **4)** in terms of the definition offered by Bordes and Crabtree (1969:1); that is, it is twice as long as it is wide, probably exhibited roughly parallel lateral edges while the dorsal surface shows evidence of the removal of previous flakes of a similar size and configuration. In addition to two finely chipped graver spurs or borers, this specimen exhibits bilateral retouch and one lateral edge has a broad "spokeshave" notch.

Side Scrapers

Three side scrapers of white chert are included in the Hi-Lo sample. Two are double convex forms made on thick flakes (Fig. 5a,b). Both of these show some degree of bifacial modification. The third side scraper is a single convex form (Fig. 5c). It is made on a flake struck from the corner of a tabular core and thus, exhibits attributes identical to those of the end scraper noted earlier including: a flat right-angled platform, no longitudinal curvature, and a 90° angle between a cortex lateral edge and the dorsal flake surface. Size data on these side scrapers and other tools described below are given in Table 7.

Pointed Scrapers

Two scrapers (Fig. 4n,o) exhibit points at a corner of the distal end. In both cases, a portion of the distal flake end adjoining one lateral edge has been beveled, the juncture of this beveled edge and the lateral edge forming the "point." In addition, both exhibit possible evidence of use on the lateral edges. One of these tools, of white chert, is probably made on a large flake from a biface core (Fig. 4o) while the other (Fig. 4n), of Onondaga chert, is on a flake of indeterminate core-form origin.

TABLE 7

SIZE DATA ON OTHER UNIFACES'

Tool Form	N	Figure	Length		Width		Thickness	
			r	x	r	x	r	x
Double Convex Side Scrapers	2	5a.b	50-57	53.5	23-30.5	26.75	9-13	11
Side Scraper on Corner-Struck Flake	1	5c	-	40	-	35	-	8
Beaked Scrapers	1	5d	-	48.5	-	16.5	-	6.5
Pointed Scrapers	2	4n.o	30-35	41.5	34-43.5	43.75	-	7
Scraper with Normal and Inverse Retouch at Distal End	1	5f	-	43	-	40	-	10
Triangular Scraper With Bend Break	1	5g	-	46	-	44	-	10
Used Blade	1	5i	-	43.5	-	20.5	-	5

[1] All dimensions in mm: r: range; X:mean.

"Beaked" Scrapers

There are two scrapers in the sample which have thick projections at one end formed by steep retouch along both lateral edges. An incomplete form is made of Onondaga chert (Fig. 5c) while a complete tool is made of Kettle Point chert (Fig. 5d). This latter tool is made on a true blade and exhibits a small amount of ventral retouch along one lateral edge. Tools resembling these forms have been referred to by various terms in the literature. Here, after Storck (1979:40-44), we will refer to these tools as "beaked" scrapers.

Other Scrapers

Two other scrapers can be attributed to Hi-Lo. One (Fig. 5f) exhibits retouch on the dorsal surface for half of the distal end and on the ventral surface (i.e. inverse retouch) on the other half of this edge. Also, there is retouch along one convex lateral edge. The second scraper is of a rough triangular shape (Fig. 5g). Two of the margins exhibit continuous retouch while the third exhibits a bend break which has been subsequently retouched near one end. In addition, the unretouched part of the break shows signs of use. Both of the above scrapers are made of the white chert.

Other Unifacial Tools

There are five other unifacial tools. One tool (Fig. 5h) is a single borer or graver. The borer in this case is simply a polished projection rather than a carefully chipped spur. Another tool is a used blade (Fig. 5i). The distal end of what is apparently another used blade was also recovered (Fig. 5j). The final two tools include the end of an alternately retouched side scraper and a used flake. With the exception of the used flake, of unknown material, all of these tools are of the white chert.

COMMENTS

Although the available sample is small, it is entirely consistent with an interpretation that Hi-Lo is a Late Paleo-Indian/Early Archaic manifestation in the Great Lakes area. Indeed, there are a large number of similarities not only in tool form but in methods of tool blank production with other known temporally early lithic industries. It is not our purpose here to debate whether or not Hi-Lo can be conceived of as a Late Paleo-Indian or an Early Archaic industry. Instead, in the following, we are concerned only with demonstrating that Hi-Lo is a temporally early industry in the Great Lakes area.

As noted earlier, aspects of point form such as lanceolate shape, basal thinning and basal and lateral grinding suggestive of an early temporal placement for Hi-Lo have been noted before (Fitting 1963a). However, the present study also suggests that beveling of blade edges can be used to support this claim. Although beveling occurs on relatively late materials, it does not occur with the frequency noted for Hi-Lo. For example, Christenson (1978:284), in a study of materials from Illinois, found that Early and Middle Archaic points were beveled over 50% of the time whereas later bifaces never exceeded 25% beveling. Furthermore, heavy beveling of the type noted for Hi-Lo is a definitely early trait based on Christenson's (1978) and other studies.

The known Hi-Lo tool inventory also suggests a Paleo-Indian/Early Archaic affiliation. Backed bifaces virtually identical to the Hi-Lo tool are a form found on several fluted point sites in Ontario such as Dixon (Deller 1979:4, Location #25). Thedford II (Deller 1980:17-25) and Crowfield-Willaeys (Deller and Ellis 1982). One of these tools has been shown by Deller (1979: Fig. 6, #12a). Twist drills are definitely the preferred drill form on early sites (i.e. MacDonald 1968:81-85; Storck 1979: P1.10) and stemmed forms identical to the Hi-Lo drills were recovered from the fluted point site at Bull Brook (Byers 1954: Fig. 92). Large perforators made on unifacially worked blanks have been recovered from early sites (DeJarnette et al 1962:Fig. **41).** Specimens on bifaces such as the Hi-Lo example are not as common but are still reported in Paleo-Indian contexts (i.e. Kraft 1973:73). It should be noted that Roberts (1980: Pl. 5) has recently illustrated a large unifacial perforator from a possible Hi-Lo context.

The unifacial tool series is also notable. The beaked scrapers found in Hi-Lo have been reported from a large number of Paleo-Indian sites (see Storck 1979:40-44, for a summary of sites). Finely flaked graver spurs or borers such as those found on the Hi-Lo end scraper on blade are, of course, a common find on Paleo-Indian and Early Archaic sites (Roberts 1935:26; Goodyear **1974:46-47;** J. Chapman 1975:163, 1977:61, 84). In this regard, it is important to note that both multiple gravers and spurred end scrapers have been recovered from Hi-Lo sites through surface collection (Fig. 5k, 1) although it is not yet possible to assign these particular tools to Hi-Lo with any degree of confidence. Finally, alternately retouched side scrapers and bend break tools such as the Hi-Lo triangular scraper while perhaps not diagnostic of Paleo-Indian occupations are, at least, consistently found on fluted point sites in southwestern Ontario which we have examined.

The blanks used for Hi-Lo unifacial tools are also consistently recovered from Paleo-Indian sites. Scrapers made on flakes from biface cores are a predominant form on such sites (Dragoo 1973:10; Ellis 1979:122; MacDonald 1968:65-66; Wright and Roosa 1966:857). Retouched biface thinning **flakes** are known from southwestern Ontario fluted point sites such as Thedford II (Deller 1980:17-25), Parkhill (Roosa 1977a) and Crowfield-Willaeys (Deller and Ellis 1982). Similarly, side scrapers and end scrapers made on cortex backed "corner-struck" flakes from tabular cores are common on these same sites, especially Thedford II.

EXTERNAL RELATIONSHIPS

Given that the above indicates a Late Paleo-Indian or Early Archaic placement for Hi-Lo, it is possible to suggest some relationships to materials outside the Great Lakes area. Although several lanceolate point types can be placed into a Late Paleo-Indian/Early Archaic context in Eastern North America, only Dalton (C. Chapman 1948) and its variants exhibit a high incidence and degree of edge beveling. The idea that Hi-Lo is similar to Dalton is not new, having been suggested previously by Shay (1971:70), Roosa (personal communication) and indirectly by Wright (1978:66) who classifies a beveled Hi-Lo point as a Greenbriar Dalton. However, the present data base allows more explicit similarities to be drawn.

Hi-Lo and Dalton points share characteristics of lateral reworking other than beveling. For one, there is some suggestion that Dalton points exhibit a slight shoulder prior to resharpening. This is based on specific statements as well as illustrations in the literature (Coe **1964;** Goodyear 1974:Fig. 11; Morse 1971:Fig. 1, 1973:25, Fig. 3c,d, 1976:Fig. 2m; Redfield 1970: Fig. 6; Redfield and Moselage 1970:Fig. 9; Perino 1961:26). This shoulder is most noticeable on lightly resharpened or unresharpened Dalton points where serrations extend beyond the width of the haft element forming an abrupt break in outline. Even in some instances with reduced or broken serrations, a shoulder is noticeable (Michie 1973:Fig. 1: Milanich and Fairbanks 1980:Fig. 8c). Second, those points with an extensive left bevel on one edge and consequently, "off-angled" blade elements (Fig. 2o,p) are virtually identical to "Albany beveled scrapers", subtype II (Webb 1946:10-12) which occur on Dalton points (Michie 1973: Fig. ld; Morse 1975: 138) or Dalton-like variants (Webb 1946:10-12).

Another similarity occurs in extreme cases of lateral resharpening. In Dalton, this results in forms with incurvate edges referred to by Goodyear (1974:26) as "Advanced Stage Points."

Although rare, such forms do occur in Hi-Lo point collections (Fig. 2k; see also Stothers **1974).** We might suggest that some of the rare "Dalton" points of this form reported for the lower Great Lakes area are, in fact, Hi-Los. In addition, the present Hi-Lo sample includes both shouldered and unshouldered forms with rod-like blade elements (Fig. 3a, b) similar to those in the Dalton literature referred to as "Skewers," "Scrapers," "drills" or "Final Stage Daltons" (Morse 1971:10, 1975:138, 1976:162; Goodyear 1974:30).

Besides similarities in lateral resharpening, other aspects of reworking are also shared. Rounded, blunt point tips are common in Dalton (Morse 1971:10; Goodyear 1974:32) and blade elements are sometimes reworked into side scrapers (Morse 1971:12), spokeshaves (Morse 1973:35), end scrapers (Goodyear 1974:37; Michie 1973:27; Morse 1971:12) or perforators (Goodyear 1974:37-39). Indeed, with few exceptions, all use variants of the Dalton point are present in Hi-Lo. Finally, it can be noted that broken and reground ears are found on Dalton points (Goodyear 1974; Morse 1975:138) as is the reworking and use of "Completed Stage" preforms (Goodyear 1974:24-25; Morse 1973:23) and a tendency for some points to be almost side-notched (Lewis and Kneberg 1958:66; Mason 1962:241).

The tool forms associated with Hi-Lo points are also to be found with Dalton. Of course, some of these such as retouched biface thinning flakes (Goodyear **1974:47)** or scrapers made on flakes from large biface cores (Goodyear (1974:44) mentions a scraper made on a flake from a bifacially chipped adze) are common in many early industries. Also, we should note that outside of Dalton, the tool inventory associated with other "transitional" point forms such as Quad (Mason 1962) is poorly known. Nevertheless, it can be noted that as of this writing, certain specific tool forms appear to be restricted among eastern unfluted lanceolate point industries to Hi-Lo and Dalton. These include: rod-like, slight-shouldered bifaces which appear to be twist drills (Morse 1973:Fig. 3m; Duffield 1963: Fig. 14 a,b), very similar tools on "true" blades with gravers and "spokeshave" notches (Lewis and Kneberg 1958:78; Goodyear 1974: Fig. 18v) and circular end scrapers (C. Chapman 1975: Fig. 5-19; Morse 1973:27). Also, the large unifacial perforator illustrated by Roberts (1980: Pl. 5) is identical in outline and size to those reported for Dalton (DeJarnette et al 1962; Fig. 41; Lewis and Kneberg 1958:77). Last, and although it is perhaps premature to draw firm conclusions, the three and probably four blade tools in the small known Hi-Lo unifacial sample suggests a blade component as in Dalton (Goodyear 1974:56-58).

Accepting the above similarities to Dalton materials, an age for Hi-Lo of between ca. 10,500 and 10,000 years B.P. is suggested based on Goodyear's (1982:385-389) recent reevaluation of the context of radiocarbon dates reported for Dalton sites in the southeastern to midwestern United States.

CONCLUSIONS

In conclusion, then, it can be suggested that Hi-Lo is a Great Lakes area representative of what Tuck (1974) refers to as the Dalton horizon. Several regional variants of this horizon can be suggested based on variation in point form. Two of these have long been suggested and include "true" Dalton (C. Chapman 1948) in the upper to middle Mississippi River valley and adjacent areas and Meserve (Davis 1953) found on sites from Nebraska south and west to central Texas. However, we would agree with Goodyear (1982: 382-383) that the position of Meserve is, at the present time, somewhat equivocal. Another regional variant, as suggested by Morse (1971:30) and others includes San Patrice-hope (or goodwin) variety (Duffield 1963) points found in the lower Mississippi River valley to eastern Texas and Oklahoma (Webb et al 1971:44-46). Two other possible variants include Hardaway-Dalton (Coe 1964:64) found in states near the Atlantic coast and Hi-Lo. All of these variants include assemblages with point forms characterized by thick haft elements exhibiting ground lateral and basal edges, straight to concave lateral basal edges which sometimes approach side-notching, slight to deeply concave "eared" bases, some degree of basal thinning which can resemble fluting, heavy lateral and longitudinal resharpening including edge beveling and, excepting Meserve, perhaps a slight shoulder prior to resharpening.

The major differences between these point forms revolve around the frequency and exact nature of resharpening methods. For example, "true" Daltons and Meserves are beveled on the right while Hi-Lo, San Patrice-hope and some point forms from the Atlantic states (cf. Hemmings 1971:11) are beveled on the left. Also, Daltons are unifacially beveled while on San Patrice and Hi-Lo forms, the bevel is achieved by a bifacial flake removal. Finally, "true" Daltons have serrations but Hi-Los, Meserves and San Patrice points do not.

The significance of these variant resharpening methods in unknown. However, since they involve parts of the tools intended to be employed directly to the objective materials, it is possible that they indicate functional variation. Future use-related studies can help resolve this problem.

ACKNOWLEDGEMENTS

Excavations at the Stewart site were financed by grants from the Canada Council to Dr. W. B. Roosa. Excavations at Welke-Tonkonoh and surface collecting was supported by grants from the Ontario Heritage Foundation. The following individuals aided the research: E. Damkjar, W. Fox, R. Williamson and the Kelly crew, L. Weed, M. Heal, M. Austin, J. Croeze, D. McColl, S. Derbyshire, P. MacLean, B. Greco, J. Darbyshire, I. Krisch-Armstrong, and J. Pelly. Permission to excavate and surface collect on their properties was kindly granted by Mr. R. Welke, Mr. O. Welke, Green Giant of Canada Ltd. (Mr. S. Tultz and Mr. A. Brady) and Cuddy Farms of Strathroy, Ontario. The aid and support of all of the above individuals is gratefully acknowledged. Finally, gratitude is extended to Drs. W. B. Roosa and H. L. Alexander for their encouragement and support.

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