

**THE ZANDER SITE:  
PALEO-INDIAN OCCUPATION OF THE  
SOUTHERN HOLLAND MARSH REGION OF ONTARIO**

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*ABSTRACT*

The Zander site (BaGv-7) is a Paleo-Indian occupation of the main strandline of glacial Lake Algonquin at the south end of the former Schomberg embayment, south of modern Lake Simcoe. Fluted and lanceolate point fragments indicate the site was used during both the Early and Late Paleo-Indian periods. The artifact assemblage, which is diverse in raw materials and numbers of formal tool types, consists of about 200 tools and 2000 pieces of debitage which were recovered from the plough zone in two archaeological areas. A large proportion of basal point fragments in addition to bifaces and end scrapers suggest a hunting camp where the rearmament and maintenance of weapons and the processing of game were important activities throughout the period of Paleo-Indian occupation.

*INTRODUCTION*

History of Research in the Schomberg Region

The search for evidence of early man in the Lake Simcoe Lowlands began as part of a general strategy of survey by the Royal Ontario Museum and Trent University to locate Paleo-Indian sites along the main strandline of glacial Lake Algonquin in south central Ontario (Storck 1979a, 1982). During the 1970s survey efforts concentrated on two large embayments of Lake Algonquin which flooded, respectively, the Alliston and the Schomberg areas of the Simcoe Lowlands intermittently between about 12,000 BP and 10,400 BP (Deane 1950; Karrow et al 1975). Two small Paleo-Indian sites on the strandline of the Alliston embayment have since been excavated (Storck 1979a). Survey along the edges of the Schomberg embayment has yielded 12 sites with diagnostic Paleo-Indian artifacts and associated waste material (Fig. 1) plus findspots or localities of isolated, diagnostic artifacts or minor artifact clusters. An approximate total of 150 later or nondiagnostic sites were recorded within the survey area (Dibb 1979, 1982; Prideaux 1977, 1978; Stewart 1982; Storck 1979a).

Two clusters of Paleo-Indian sites were discovered on the eastern edge of the Schomberg embayment — the present Holland Marsh. The first of these groups is located east of Cook's Bay in the lower Holland River area (sites 1 to 7, Fig. 1). These include the Deavitt site — a large, Late Paleo-Indian site — and several, probably related sites which are currently under investigation (Dibb 1979, 1982, 1983).

The second group of sites was found in the southern or upper Holland River area near Schomberg (sites 8 to 12, Fig. 1). The initial fieldwork in this area by John Prideaux (1977) and his discovery of three sites with Paleo-Indian components (sites 9, 11 and 12, Fig. 1) led to test excavations at the largest of these, the Zander site, the following year (Prideaux 1978). Excavations were continued there by this author in 1982 and at the same time an intensive survey effort uncovered several new Paleo-Indian localities in the vicinity of the Zander site (Fig. 2a).

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1984

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

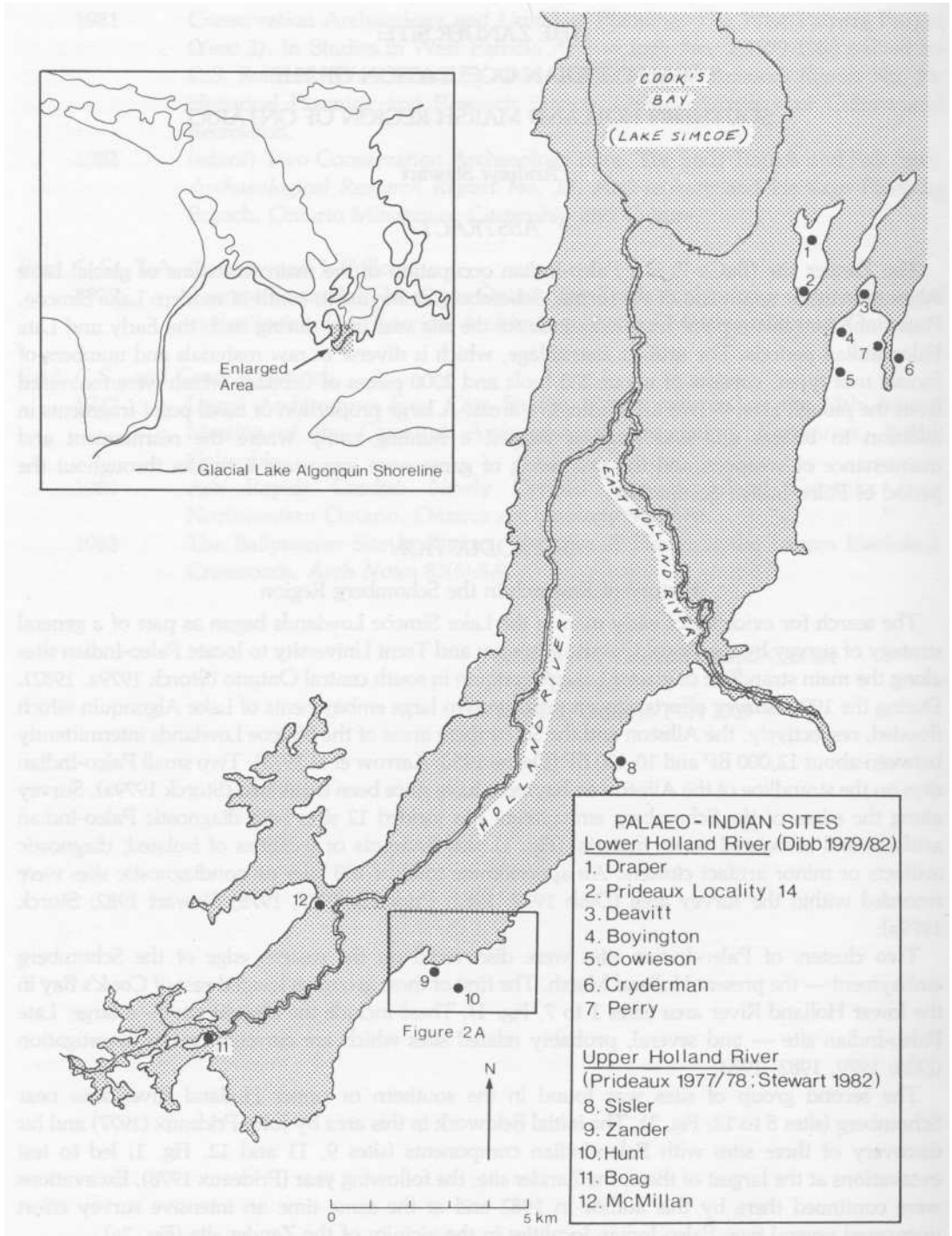


Fig. 1. Paleo-Indian sites in relation to the Schomberg embayment of glacial Lake Algonquin of southern Ontario.

### Surface Geology

Archaeological survey has been conducted along not only the main Algonquin strandline at an elevation of about 223 m above sea level in the area around the Zander site, but also along parts of an earlier and so far hypothetical strandline at about 244 m. Three localities were found at or just above this higher elevation during the 1982 survey (numbers 1, 2, and 4, Fig. 2a). Although Lake Algonquin shoreline features are still the only well-recorded and continuously mapped forms in this region (Gwyn and White 1973), there is some evidence for a higher strandline on the slopes west of Lake Simcoe (Chapman and Putnam 1973:100) and a delta at about 244 m (800 feet) near Pottageville (White 1975). Current fieldwork being conducted by the Ontario Ministry of Natural Resources in the Barrie area may reveal whether these features were the result of local pondings or a single proglacial lake (William Fitzgerald: personal communication). It has been suggested by Chapman and Putnam (1973:45) and White (1975:46) that Lake Schomberg, a poorly understood precursor of Lake Algonquin, may have been responsible for the formation of these features.

The Zander site is situated on the west side of a shallow recess in the southeast shore of the Schomberg embayment. A series of recesses or indentations creates a convoluted shoreline that extends northeast from the Zander site for about three km, each indentation representing the mouth of a ravine where it debouches into the Holland Marsh from the Oak Ridges moraine to the south. This convoluted section of strandline contains five of the eight Paleo-Indian sites and localities in the upper Holland River region (Fig. 1, 2a).

The visibility of the shoreline in this area — the degree to which it is developed — varies markedly. The outer edges of the recess on which the Zander site is situated stand out clearly in relation to the lakebed. On the west side a promontory of high land rising about eight m above the level of the site projects northward 300 m into the marsh. On the east side 500 m east of the site there is clearly development of a low bluff. However, between these two areas at the site itself the land grades almost imperceptibly into the Algonquin lakebed. The section of poorly developed strandline may be a result of a relative absence of wave action in the immediate vicinity of the site. If so, the site would have afforded protection from the prevailing weather off the lake to any inhabitants at the time of the Algonquin inundation of the Schomberg embayment.

### Excavations at the Zander Site

Test excavations were first carried out in one of two loose concentrations of material exposed on the surface of a ploughed field. Forty-two square metres and a possible subsoil feature were excavated in the westernmost concentration — known as Area 1 — which is estimated on the basis of scattered surface finds to extend to about 700 square metres.

The results of this excavation indicated that the site was occupied intermittently during both the Early and Late Paleo-Indian periods, as well as perhaps the Archaic period, based on the presence of eight fluted and eleven lanceolate points in addition to one side-notched specimen (Prideaux 1978). The scattered nature of the material within areas, the high proportion of projectile points to other artifact types, and the large number of finished projectile point bases in particular suggested to Prideaux that the site was seasonally or periodically visited by hunters for the processing of game and for the rearmament or maintenance of weapons.

Further excavations were scheduled in 1982 to investigate the nature and distribution of material in Area 2 and to locate features which might possibly yield information about the local environment as well as provide a radiocarbon date for a single Paleo-Indian occupation. Fifty-four square metres in an estimated 1000 square metre scatter of tools and flakes were excavated including a possible feature. Excavation was limited to an apparent concentration of material within Area 2 on the east side of a small swale that separates the two archaeological areas (see Fig. 2b, 3). The search for other similar concentrations of activity was hampered at the time by the wet condition of the newly seeded sod field where the Zander site is located, thus preventing a thorough resurvey of the site.

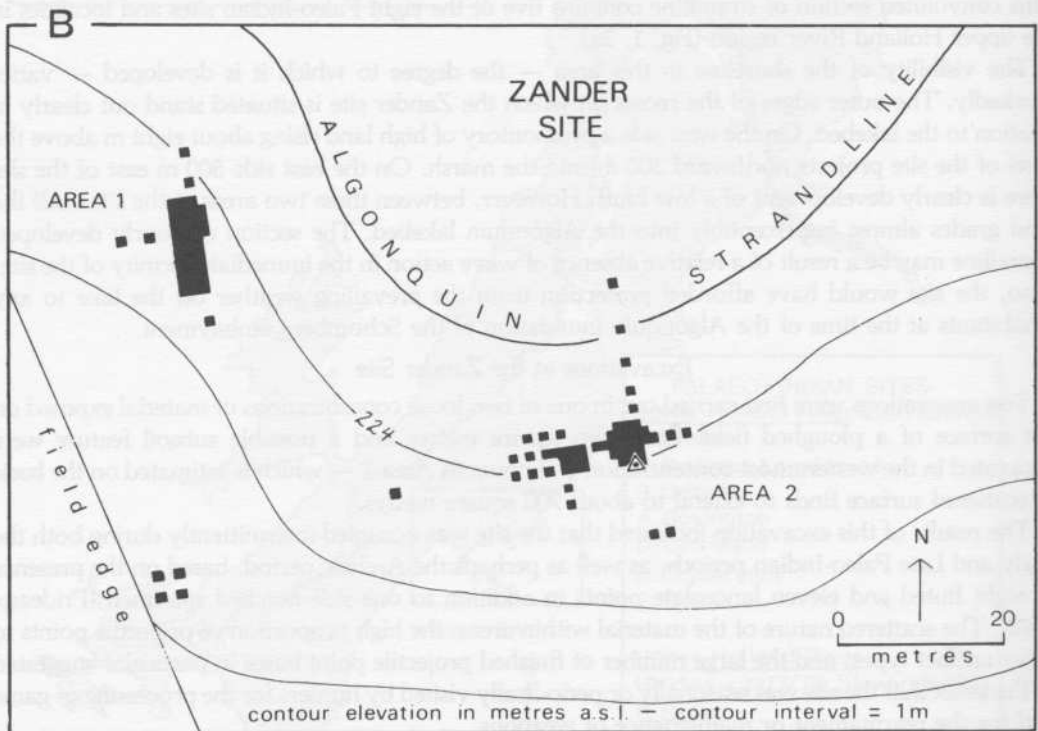
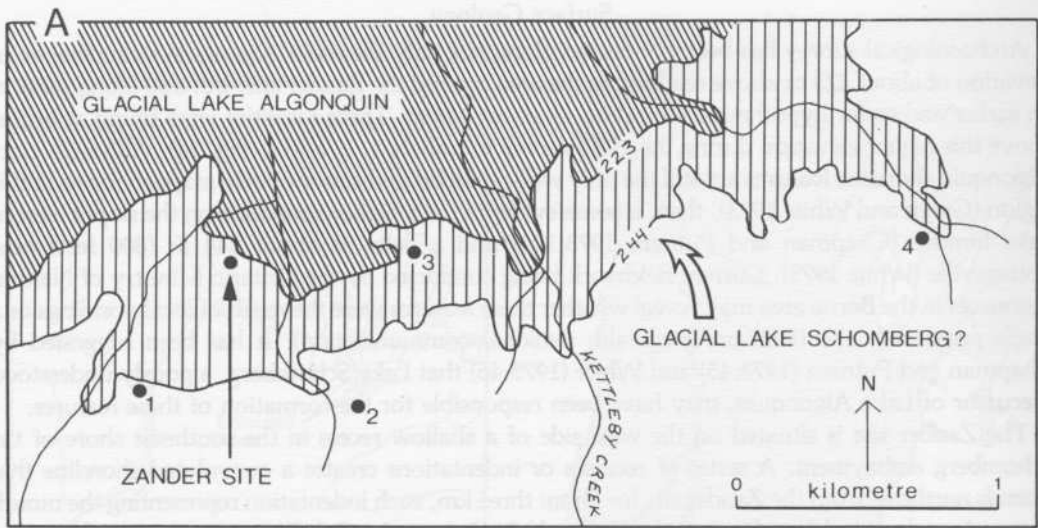


Fig. 2. a: The Zander site is shown in relation to the strandline of Lake Algonquin at approximately 223 m and to a possible strandline of Lake Schomberg at 244 m. Other Paleo-Indian localities are numbered: 1—BaGv-13 (1 channel flake, flakes); 2—BaGv-14 (1 Hunt, 2 combination beaked concave scrapers, flakes); 3—BaGv-7 (1 fluted point); 4—BaGv-27 (1 fluted point).

b: Excavations in relation to the Algonquin strandline as it was deduced from subsoil sediments on the site.



Fig. 3. View of the Zander site looking south. Excavations in Area 2 on the Algonquin strandline are indicated. Prominent east-west ridge behind the site may be a higher strandline at 244 m above sea level. The buildings in the foreground are on the former bed of Lake Algonquin.

#### *Method of Excavation*

Excavations in both 1978 and 1982 were established on a grid oriented to magnetic north and were related to permanent data on the edges of the field (Stewart 1982). Excavation units were 3 x 3 m square and were subdivided into nine 1 m square subunits for the collection of plough zone material. The large units were labelled by compass direction and numbered from a 0-0 datum in the centre of each grid. Subunits were labelled by letter starting with 'a' in the northwest corner and preceding by subunits in rows to 'i' in the southeast corner of the square.

The plough zone was excavated by shovel to the maximum depth at which material was found, approximately 20 cm below ground surface. The undisturbed subsoil surface normally occurred at about this depth but was in many places broken by deep or chisel ploughing to a depth of about 40 cm below ground surface. This deep plough zone did not contain archaeological material except in and around Feature 2. Plough zone material was recovered in quarter-inch mesh rocker type screens in Area 1, and in both quarter-inch and eighth-inch mesh screens in Area 2. A systematic sample of 20 out of the 54 subunits in Area 2 was processed through eighth-inch mesh as a means of testing the horizontal distribution of lithic material by size.

A single subsoil anomaly was found in each area, labelled Feature 1 in Area 1 and Feature 2 in Area 2. Although deep ploughing had clearly disturbed Feature 2 it was still possible to record its shape, defined primarily by colour but also by distribution of flakes, both in plan and cross section view. Feature soil was processed by water screening and SMAP barrel flotation to extract carbonised seeds, bones and wood.

The silty soil made screening under the best conditions a slow and arduous task. The further aggravation caused by the use of two sizes of screen was not compensated by significantly different results in terms of the proportion or pattern of distribution of materials recovered in the quarter-and eighth-inch screens. Ten channel flake fragments and two fluted point ears which might otherwise have been missed, in addition to three and one half times as many flakes on average, were recovered by the eighth-inch mesh. However the smaller screen size did not produce any more bifacial retouch flakes than the quarter-inch screen nor did it uniquely contribute to the discovery of clusters of material or features at the Zander site.

#### *Features*

Two subsoil anomalies were located, one in each area at the site. Feature 1 in N1W1-f of Area 1 (Fig. 16) consisted of a diffuse oval stain less than a metre in diameter. It contained ten flakes including two channel flakes. A single, very small sample of carbon was collected and submitted for radiocarbon dating in 1982 for which a date of  $3380 \pm 420$  BP (Beta 7308) was obtained. In 1978, Dr. J.H. McAndrews of the Department of Botany, Royal Ontario Museum, examined the pollen content of soil from the feature and found that the pollen assemblages was not directly comparable to any of the known lake core sequences for southern Ontario (Prideaux 1978). This feature may represent a hearth associated with a Paleo-Indian occupation which was naturally altered over a long period of time (Prideaux 1978). Alternatively, a more recent tree throw may have produced an apparent association between the artifacts and carbon.

Feature 2 was located in N2W1-i, N2E1-g, N1W1-c, and N1E1-a in Area 2 (Fig. 16). In plan view it appeared as a dark, mottled, ovoid area measuring 1.5 m east-west in contrast to the light coloured silty subsoil. In longitudinal section Feature 2 was irregular which can be attributed at least partly to the effects of deep ploughing. Flakes were recovered from a maximum depth of 30 cm below subsoil surface. Contents included fluted point ear number 982.91.34, part of the edge of fluted point 977.174.445/982.91.7/35 (Fig. 4), and 126 flakes including one channel flake. Ten channel flakes including three utilized channel flakes were found within a two-metre radius of the centre of the feature in the plough zone.

The remains of plants recovered by flotation were examined by Mr. Rudy Fecteau of the Department of Botany, Royal Ontario Museum. There were no carbonized seeds and only a small amount of carbonized coniferous wood which was insufficient for dating.

### *DESCRIPTION OF THE ARTIFACTS*

Individual categories of artifacts and debitage are described below and some representative specimens illustrated. The complete site assemblage is listed in Table 1.

#### *Raw Materials*

Chert comprises 95% of the lithic material recovered from the Zander site, the remainder being either basalt or quartz flakes or fragments. Nine categories of chert are described below in terms of such variables as colour, texture, lustre, presence or absence of quartz or fossil inclusions, fracturing and weathering characteristics. It should be emphasized that this "typing" of cherts is a descriptive procedure, not a geological identification of source. Nevertheless, bedrock sources are suggested for some of the categories listed here based on visual comparisons aided by a 10X hand lens. Chert categories are described beginning with the most common.

1. Mottled grey, blue-grey and tan chert with medium lustre, a relatively 'hard' or lustrous surface appearance. Flake scars exhibit conchoidal fracturing. Surface deposits of iron oxides are occasionally present. This category undoubtedly includes much Devonian chert from the Onondaga formation.

TABLE 1  
ZANDER SITE ARTIFACT AND DEBITAGE TOTAL

	<u>Area 1</u>	<u>Area 2</u>	<u>Total No.</u>	<u>%</u>
<u>Artifacts</u>				
fluted points	6	19	25	11.0
lanceolate points	11	3	14	6.1
notched points	1	1	2	.9
unidentified projectile point fragments	2	1	3	1.2
fluted bifaces	---	1	1	.4
gravers	4	---	4	1.8
end scrapers	6	11	17	7.5
beaked scrapers	1	---	1	.4
concave (spokeshave) scrapers	---	5	5	2.2
<u>pieces esquillees</u>	1	1	2	.9
bifaces	7	7	14	6.1
miscellaneous bifacial artifacts and fragments	15	28	43	18.9
unifacial scrapers	2	10	12	5.3
unidentified unifacial artifact fragments	16	8	24	10.5
worked and utilised flakes	21	40	61	26.8
			228	100.0
<u>Debitage</u>				
channel flakes	13	36	49	2.5
bifacial retouch flakes	14	31	45	2.3
platform flakes	68	185	253	12.8
distal flake fragments	443	1141	1584	80.1
blocky fragments	20	26	46	2.3
			1977	100.0
Artifact Total	93	135	228	10.3
Debitage Total	558	1419	1977	89.7
Specimen Total	651	1554	2205	100.0

2. A white, speckled, sometimes banded chert, 'hard' in appearance with good conchoidal fracturing. Iron oxides on the surface and quartz inclusions can be present. This is a Silurian chert from the Fossil Hill formation (Storck and von Bitter 1981) sometimes known as Collingwood chert. A Paleo-Indian workshop site has been found near an outcrop of Fossil Hill chert on the Niagara escarpment in the southern Georgian Bay region approximately 80 km northwest of the Zander site (Peter Storck: personal communication).

3. Very light grey or beige chert with a reddish or bluish cast. This chert is speckled and is 'soft' — lacking any lustre. The surface is often strongly coloured by iron oxides. Quartz inclusions are present. This category probably includes at least some examples of Silurian chert from the Lockport formation near Ancaster, 100 km south of the Zander site (William Fox: personal communication).

4. A black lustrous chert speckled with white. Comparison with samples collected from bedrock in the Bobcaygeon area suggests this chert belongs to the Ordovician Gull River formation which outcrops along a narrow east-west band located about 80 km north of the Zander site (Liberty 1969).

5. A yellowish-white, very 'soft' chert, lightly mottled grey and pure white. Pyrite banding and iron oxides are sometimes present. This chert may be a variety of Fossil Hill.

6. Light grey and white mottled chert. Surface texture is variable ranging from matte to slightly lustrous in appearance. Fracturing is subconchoidal. Iron oxides are sometimes present on the surface, as well as quartz and fossil inclusions. This category may be a variety of category 1 with more beige and more pronounced mottling and large inclusions of quartz.

7. A very small amount of the debitage at the site consisted of a 'hard' blue-grey pelloidal chert. This is Balsam Lake chert (Betty Eley: personal communication), an Ordovician chert from the Upper Bobcaygeon formation which has been collected for study from Balsam Lake, 80 km northeast of Zander (von Bitter and Eley 1983). Balsam Lake chert is the most common type found at the Late Paleo-Indian Deavitt site in the lower Holland River area (Gordon Dibb: personal communication) — see Fig. 1.

8. There is a single example of a mottled blue chert — lanceolate point base 977.174.339. It appears to have exceptional flaking qualities. It may be Onondaga chert, but also resembles Upper Mercer chert from the Ohio Valley (William Fox and Henry Wright: personal communication).

9. One of the side-notched points, specimen 977.174.341, is made from a bluish-white 'soft' chert, possibly a Devonian chert from the Bois Blanc formation (William Fox: personal communication). This specimen appears to be the only example of such chert at the site.

#### Diagnostic Artifacts

##### *Projectile Points and Point Preforms*

Projectile points comprise 44 of the 100 bifacial tools and fragments at the site. Most of the specimens are fragmentary including 21 bases, 8 midsections, 8 ears, 4 blades and 2 tips. Only 1 complete point was recovered (see Table 2 for a breakdown by area).

TABLE 2

#### PROJECTILE POINTS BY FORM AND AREA

	Complete	Bases	Mid-sections	Ears	Blades	Tips	Total
<hr/> <b>Area 1</b> <hr/>							
fluted	---	3	2	---	---	1	6
lanceolate	1	7	1	---	1	1	11
side-notched	---	1	---	---	---	---	1
unknown	---	1	---	---	1	---	2
<b>Total</b>	1	12	3	0	2	2	20
<hr/> <b>Area 2</b> <hr/>							
fluted	---	6	4	8	1	---	19
lanceolate	---	2	---	---	1	---	3
corner-notched	---	1	---	---	---	---	1
unknown	---	---	1	---	---	---	1
<b>Total</b>	U	9	5	8	2	0	24
<b>Site Total</b>	1	21	8	8	4	2	44



Tables 3 and 4 summarize the entire Paleo-Indian point collection in terms of a number of variables. It was not possible to measure or even estimate maximum dimensions for most specimens. However, a number of width/thickness ratios were calculated through the midsections of some of the larger fragments. "Stage of manufacture" is a qualitative judgement based on factors including the amount and placement of marginal retouch and edge grinding as well as on condition of the point, that is whether it appears to have been broken during or after manufacture. "Basal angle" is a measure of the convergence of the two lateral sides towards the base. A number of the more complete specimens are described below and illustrated.

TABLE 3

FLUTED POINT ATTRIBUTES

Catalogue No.	Condition	Stage of Manufacture	Chert Category	Pot-Lid Spalling	Grinding	Fluting	Mid-Section W/T Ratio
<u>Area 1</u>							
977.174.337	snapped base	finished	1	a	L	B	---
977.174.843	snapped base	finished	6	a	L,b	B	---
977.174.1012	mid-section	?	6	a	---	U?	---
977.174.1288/ 979.305.308	mid-sections	unfinished	1	a	L	U	5.8
979.305.310	tip	?	1	a	---	B	---
979.305.316	snapped base	finished	2	a	L	B	---
<u>Area 2</u>							
977.174.439	snapped blade	reworked?	2	a	L	B	5.0
977.174.440	base	unfinished	1	p	a	B	5.4
977.174.441	base	unfinished	1	p	a	B	5.7
977.174.444	base	unfinished	3	a	a	U	4.6
977.174.445/ 982.91.7/35	snapped base	Unfinished	3	a	L,b	U	6.4
977.174.446	mid-section	?	1	p	---	B	---
977.174.481	ear	finished?	1	a	L,b	U?	---
977.174.667	ear	finished?	2	a	L,b	B	---
979.305.383	mid-section	?	1	P	L	B	5.4
979.305.416	mid-section	finished?	2	a	L	R	---
979.305.552	ear	finished?	1	a	L	U?	---
979.305.553	ear	finished	3	a	L,b	B	---
979.305.555	snapped base	unfinished	1	p	a	U	---
982.91.4	ear	finished?	3	a	L	B	---
982.91.34	ear	Unfinished	1	a	a	B	---
982.91.73	ear	?	1	a	L	U	---
982.91.77	mid-section	unfinished	2	a	a	U	---
982.91.82	ear	finished	4	a	L,b	B	---
982.91.85	snapped base	finished	2	a	L	R	---

• - absent  
 b - basal  
 B - bifacial  
 L - lateral grinding  
 p - present  
 U - unifacial  
 W/T - width: thickness  
 --- - missing variable.

TABLE 4

## LANCEOLATE POINT ATTRIBUTES

Catalogue No.	condition	stage of Manufacture	chart Category	Pot-Lid Spalling	Grinding	Basal Treatment	Mid-section W/T Ratio	Basal Angle
Area 1								
977.174.338	snapped base	finished	5	a	L,b	th	---	30'
977.174.339	snapped base	finished	8	a	0,b	th	---	33'
977.174.340	complete	reworked	1	p	L	ur	3.5	13'
977.174.357	snapped base	unfinished	2	a	L	a	5.5	---
977.174.442	snapped blade	reworked	1	a	L	---	2.8	21'
977.174.832	snapped ear/base	finished	1	a	L,b	br?	---	--
977.174.1013	snapped base	finished	1	p	L,b	br	---	24'
977.174.1038	snapped base	finished	1	a	L,b	ur	---	parallel
977.174.1075	snapped blade	reworked	1	a	L	---	---	16'
977.174.1076	snapped base	?	1	a	L	ur	---	30'
977.174.1141	snapped base	finished	3	a	L	th	---	17'
Area 2								
977.174.447	mid-section	?	1	a	L	---	5.1	---
979.305.515	snapped base	finished	1	a	L,b	br	---	sub-parallel
979.305.516	snapped base	finished		p	L,b	br	---	20'
- absent		th - thinning						
b - basal		- unifacial						
retouch								
br - bifacial retouch		W/T - width: thickness						
L - lateral		--- - missing variable						
p - present								

## Fluted Points (Fig. 4)

One blade and 4 basal fragments (illustrated) are of sufficient size to estimate the extent of fluting at one-third to one-half the original length of the points.

Two of the basal specimens (977.174.444 and 977.174.445/982.91.7/35), both made of the same chert, are fluted on one face and bevelled along the base on the opposite face. In both instances the sides are excurvate and the bases straight. Specimen 977.174.444 has at least 3 flute scars on one face, 2 narrow scars on either side of a broad over-riding central channel flake. The point was broken and discarded when the final flute hinged down through the middle of the artifact.

The second specimen, also unfinished, is broken laterally and longitudinally into 3 pieces and represents the lower half of a snapped point. The single flute scar, 38 mm long, ends abruptly in a hinge fracture at a hump in the preform 7 mm short of the lateral snap. Both lateral edges are trimmed. The basal edge bears a deep negative bulb of percussion on the fluted (obverse) face and is steeply bevelled on the reverse.

A third unfinished point (977.174.440) has a straight, unground base and excurvate lateral edges that are not trimmed. The point was broken during fluting of the reverse face (not illustrated) by a hinge fracture after the successful removal of 2 channel flakes from the obverse face. One-half of the broken edge has been steeply reworked.

A finished point base (977.174.843) was fluted 3 times on both faces. The straight lateral edges, bifacially trimmed and ground, converge to a point below the base at an angle of 22 degrees. The basal edge, not ground, is slightly concave though this is not obvious on account of damage to both ears. The specimen was broken by a lateral snap across the flute scars below the distal limit of grinding.

Finally, specimen 977.174.439 is a long narrow blade of a bifacially fluted point. It is snapped across the midsection and damaged by impact to the tip from which longitudinal flake scars extend towards the base on both faces. There is evidence of reworking of the tip in the slight development of shoulders and marginal flaking between shoulders and tip. There are 5 narrow flute scars on the

illustrated face and 1 shorter scar on the opposite face. Both lateral edges are ground proximally from the "shoulders."

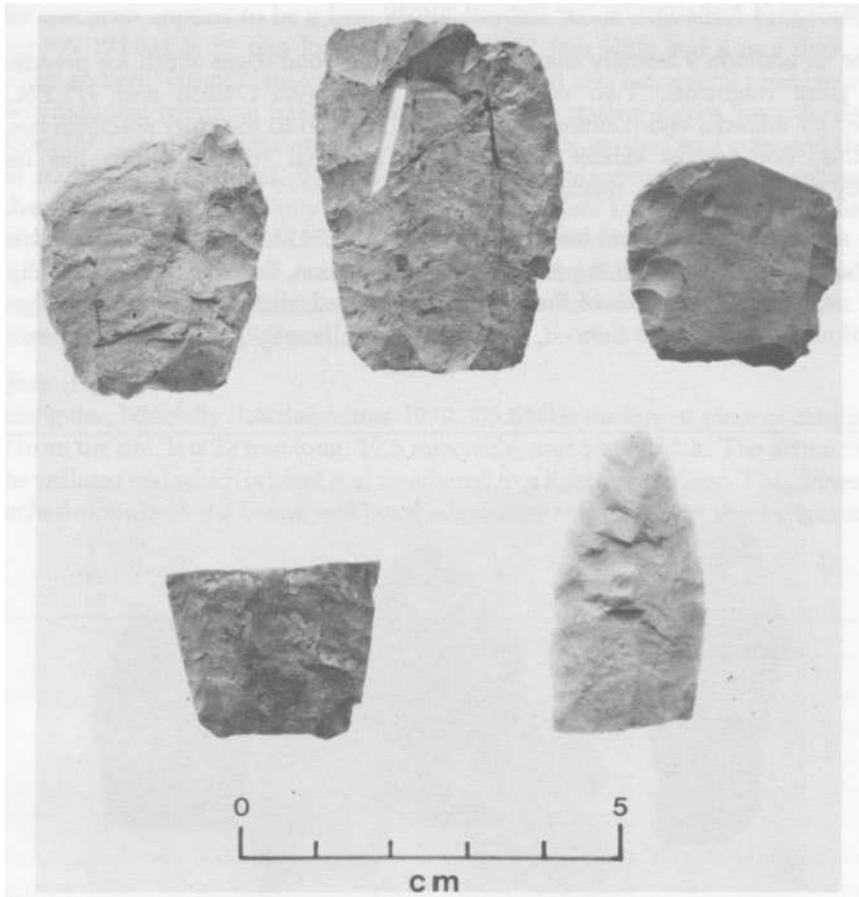


Fig. 4. Fluted points and preforms. Catalogue numbers, left to right, upper row: 977.174.444, 445, 440; lower row: 977.174.843, 439.

#### Lanceolate Points (Fig. 5)

Three specimens with contracting stems, developed shoulders, and resharpened blades were recovered (977.174.340, 442 and 1075).

Specimen 977.174.340, the only complete point from the Zander site, is 44 mm long, 21 mm wide at the shoulders and 6 mm thick. It is plano-convex in cross-section. The stem, measuring 19 mm between the base and shoulders, is heavily and continuously ground along both lateral edges. The basal edge has been broken and reworked by bevelling the piano face. Flaking on the stem is broad, full-facial, and perpendicular to the longitudinal axis, whereas the blade exhibits narrow marginal retouch. The other 2 shouldered specimens are more fragmentary but have the same outline and pattern of flaking. 977.174.442 has a strong plano-convex cross section. In longitudinal section it thins rapidly at the distal end between the shoulders and tip. 977.174.1075 is similarly made but with a more lenticular transverse cross-section. The tip is missing and a large flake scar resulting from tip breakage — possibly impact fracturing — extends from the broken edge down the length of the blade. The outline shape of all 3 points resembles that of Hell Gap on

the Great Plains. Part of this resemblance can be accounted for by resharpening, for which there is evidence in the flake scar patterning and longitudinal cross-sections. The strong, consistent development of shoulders suggest that the resemblance is also deliberate, however, and is not simply a function of resharpening (see Stewart 1983).

There are, in addition 9 laterally snapped bases with ground edges which are presumed to be lanceolate point fragments. Two of the larger pieces (977.174.338 and 977.174.339) are distinguished by unifacial end-thinning, though basal retouch to the latter specimen has partially obscured this. Both pieces exhibit discontinuous marginal retouch which has resulted in exceptionally thin and straight, regular edges.

A third, small but well-finished base was recovered (977.174.1013) having straight edges that contract at an angle of 24 degrees. It is biconvex in cross-section. Both faces are marginally flaked at an oblique angle to the main axis of the point. The rounded, slightly convex basal edge has been bifacially trimmed, rather than thinned, and all edges are heavily ground.

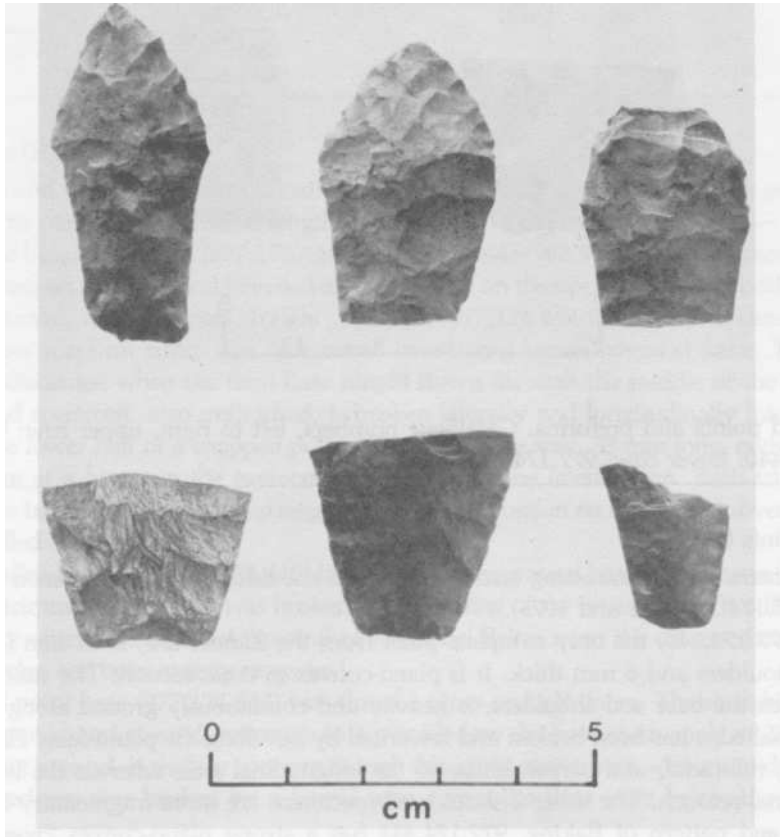


Fig. 5. Lanceolate points. Catalogue numbers, left to right, upper row: 977.174.340, 442, 1075; lower row: 977.174.338, 339, 1013.

### Side-notched Points

Two notched projectile point bases, both laterally snapped, were surface collected — one from each area of the site. The larger base, made from chert category 9, is probably Archaic in origin. The smaller specimen appears to be a Late Woodland dart made from chert category 1.

Specimen 977.174.341 is 35 mm long (incomplete), 22 mm wide and 8 mm thick and has a biconvex cross-section. The obverse face is irregularly flaked and has several prominent flake scar ridges which marginal trimming has failed to remove. The reverse face is smooth, having been trimmed from the lateral and basal edges. Grinding is present on the basal edge and the notches. The lateral edges are not ground. The lanceolate outline, placement of the notches, size, and grinding characteristics suggest affinity with Otter Creek in New York and Vermont (Ritchie 1971) and to Raddatz side-notched points in Wisconsin (Wittry 1959a,b).

Specimen 977.174.443 is a small, corner-notched projectile point base. Both lateral edges above the notches are snapped which suggests that prominent barbs were originally present. The basal edge is thinned on one face and ground.

### Fluted Biface (Fig. 6)

This rectangular, bifacially fluted specimen (979.305.554) is the largest piece of category 4 chert recovered from the site. It is 28 mm long, 19.5 mm wide, and 5 mm thick. The artifact is thickest through the unfluted end which is blunt and weathered to a light grey colour. The obverse face has been retouched along both the lateral and basal edges after fluting. All of these edges are slightly ground.

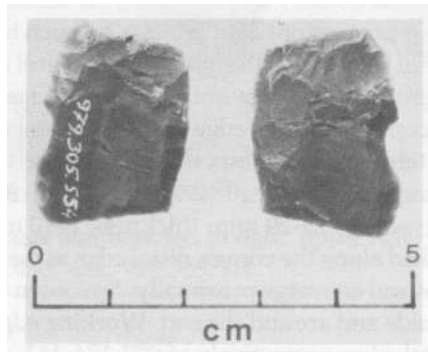


Fig. 6. Fluted biface, obverse face left. Catalogue number 979.305.554.

### Gravers (Fig. 7)

Four gravers were recovered — all from Area 1. Two have single spurs and are made from category 2 chert. One of these (977.174.1033) is formed by steep, unifacial flaking on either side of a ridge between 2 dorsal scars. The other (979.305.301) has a wider, more blunt spur which was created from an edge having no such flake ridges. The other 2 specimens (977.174.348 and .831— Fig. 7) appear to have 2 spurs, although in both instances the artifact fractured along the length of the second spur. They are made from flakes of category 1 chert. All 4 gravers were manufactured by steep, continuous retouch along 1 edge of the dorsal surface of a flake. The spurs project 2 to 3 mm from this edge.

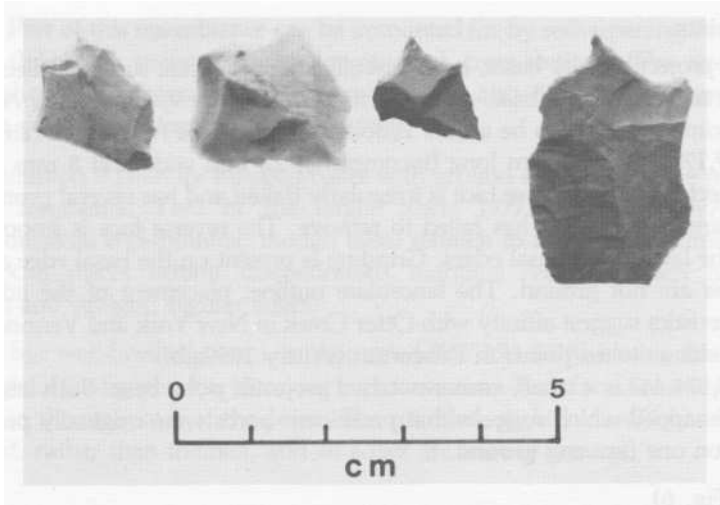


Fig. 7. Gravers. Catalogue numbers, left to right: 977.174.1033, 979.305.301, 977.174.348, 831.

#### *End Scrapers (Fig. 8)*

There are 17 end scrapers from the site, 6 complete examples from Area 1 and 11 from Area 2, (3 complete and 8 fragments). Four specimens from Area 1 are made from chert of category 1 and two of category 2. Two of the former specimens (979.305.296 and .297, Fig. 8) are almost identical in shape and size, each measuring between 35 and 37 mm in length, 26 mm width and 23-25 mm thickness. Specimen 979.305.296 is dorsally worked along the distal and 1 lateral edge of a flake. The proximal end (with bulb of percussion) also exhibits retouch in the form of step fracturing which is directed from the dorsal rather than the more usual ventral face. The distal working edge ranges between 65 and 85 degrees in steepness and the lateral edge between 40 and 45 degrees. 979.305.297 has only a single convex working edge along the distal edge of the flake. Heavy step fracturing along the right lateral edge suggests this part of the tool was also functional.

The 2 remaining grey end scrapers from Area 1 (977.174.342 and .808 — not illustrated) are both much thinner (length: 35 mm; width: 25-29 mm; thickness: 8-10 mm). The former specimen is symmetrical having been worked along the convex distal edge as well as continuously along both lateral edges which are straight and converge proximally. Specimen 977.174.808 is worked along the single, straight (left hand) side and around the end. Working edge angles range from 30 to 60 degrees on the lateral and distal edges respectively of 977.174.342, and from 45 to 55 degrees on 977.174.808.

One of the Fossil Hill end scrapers from Area 1 (977.174.343, illustrated) is unusually symmetrical and well made. It is 44 mm long, 35 mm wide and 9 mm thick. The lateral edges slope back 30 to 50 degrees from the ventral surface; the distal (convex) edge, 80 to 90 degrees. Not apparent in the photograph (Fig. 8, upper right) is damage to the unworked ventral flake surface along the distal edge of the tool: a single, deep scar extends in 12 mm from this edge, spanning almost its entire width. The steepness of the distal edge may be a result of retouch after an earlier break which removed the entire edge and part of the ventral surface.

The end scrapers from Area 2, with one exception of Fossil Hill chert (category 2), are made of category 1 chert. The 3 complete specimens (977.174.450, 452 and 979.305.544, Fig. 8, bottom row) are approximately the same size, the largest being 38 mm long, 27 mm wide and 11 mm thick. The remaining fragments (977.174.451, 453, 469, 979.305.382, 541, 982.91.53 and .58) are all convex working edges comparable in size to the complete specimens. 977.174.469 has an unusually shallow working edge angle (40 degrees) and has been partially worked on the ventral surface. The rest are

unifacially worked on the dorsal flake surface at angles ranging from 60 to 75 degrees. Out of the 11 specimens from this area, 3 are retouched or step fractured along both lateral edges in addition to the distal edge, 1 is worked only on the left lateral edge, 1 only on the distal edge and 6 are indeterminate.

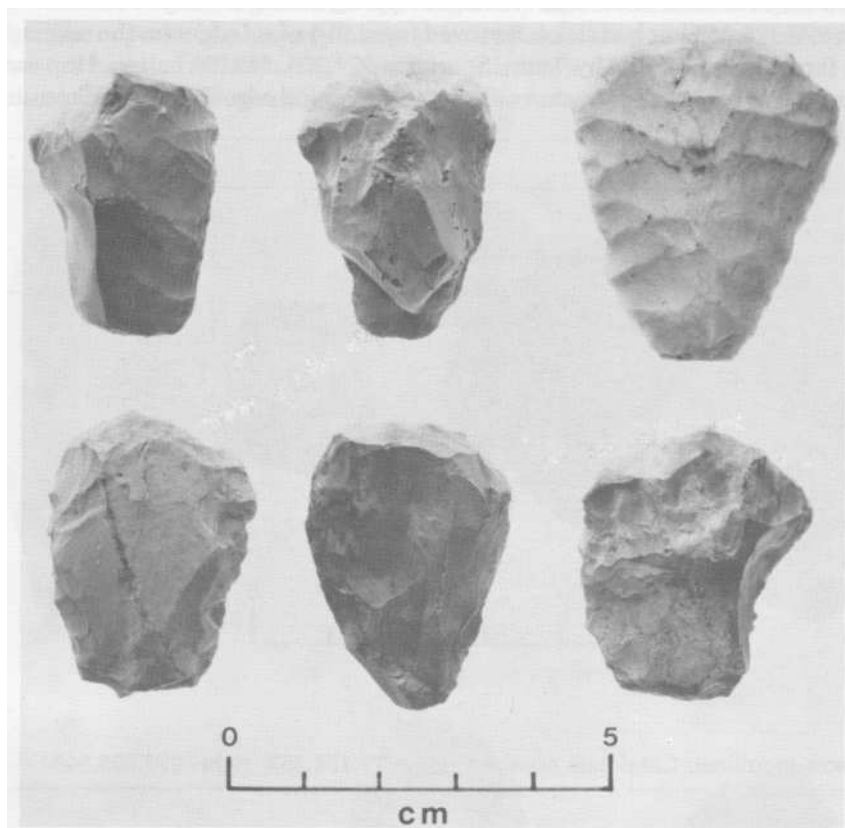


Fig. 8. End scrapers. Catalogue numbers, left to right, upper row: 979.305.296, 297, 977.174.343; lower row: 977.174.450, 452, 979.305.544.

#### *Beaked Scraper*

The blunt end of a narrow, high-backed unifacial tool (977.174.358) was recovered from Area 1. It is made from category 2 chert and measures 28 mm long between distal edge and proximal snap, 18 mm wide and 8 mm thick. The lateral sides slope at angles between 50 and 70 degrees. The distal edge angle is 30 degrees. The artifact is made from a flake whose striking platform forms the distal working edge — the lip of the striking platform remains attached to the unworked ventral face.

#### *Concave (Spokeshave) Scrapers*

A total of 5 of these artifacts was recovered from Area 2 (977.174.465, 491, 979.305.376, 982.91.128 and 129). They are made by steep, unifacial retouch to one or more edges of the dorsal face. Flake removal was directed from the ventral face leaving the ventral surface smooth and flat. The depth of the concavities ranges between 2 and 3 mm. The length of the working edge is between 16 and 23 mm and their slope between 45 and 70 degrees.

At least 3 specimens are also steeply worked along the opposite edge which is straight or slightly convex. Similar artifacts are illustrated from the Banting and Hussey sites (Storck 1979a: Plates 12g, 15a).

### *Pieces Esquillees* (Fig. 9)

Two specimens (977.174.353, Area 1; 979.305.548, Area 2) are identified as *pieces esquillees* or wedges on account of their having been bifacially worked from opposite edges (Gramly 1982:41, Plate 24; MacDonald 1968:85, Plate XI). Both specimens, which are made from chert category 1, exhibit broad irregular flake scars with concentric rippling ending in hinge fractures.

Specimen 977.174.353 has had flakes removed from all 4 of its edges on the reverse face (not illustrated). It measures 41 by 29 by 9 mm. Specimen 979.305.548 has battered top and crushed bottom edges as well as columnar fractures along the left vertical edge (Fig. 9). Its dimensions are 23 by 22 by 10 mm.

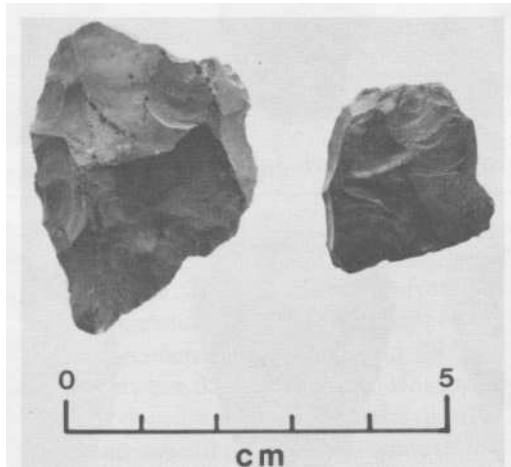


Fig. 9. Pieces esquillees. Catalogue numbers, left: 977.174.353; right: 979.305.548.

### Non-Diagnostic Artifacts

#### *Bifaces I* (Fig. 10)

There are 8 bifaces and biface fragments which are relatively thick and uneven in cross-section and have full-facial irregular flaking (see Table 5 for measurements and attributes). As a group they exhibit a minimum of surface preparation but discontinuous retouch is present in several instances.

Specimen 977.174.354 is a small but complete biface. One lateral edge, which is broadly S-shaped when viewed in longitudinal section, is thin and well-formed. Shallow flake scars extend from this edge to about the mid-line, perpendicular to the longitudinal axis. The opposite edge is angular having been broken or blunted in two places. One of these blunt surfaces is steeply and unifacially flaked; the other is an unretouched flat edge, 9 mm thick, which runs at right angles to either face.

977.174.356 is an ovoid biface, rounded at one end and pointed at the other. Like 977.174.354, one lateral edge is thin, though sinuous, while the other has been largely blunted and left as a series of 3 flat, unretouched surfaces. A small section of thin, bifacially worked edge intrudes between 2 of these blunt surfaces near the rounded end. Flake scars on this specimen are very large and deep. They generally extend from the thin edge to the blunt edge and from the rounded end to half way down the length of the biface.



977.174.355 is an ovoid biface with a flattened base 10 mm in thickness. The naturally weathered base, which is strongly coloured by iron-oxide, may have been the striking platform for removal of the original flake. The lateral edges are thin, though sinuous. One face (illustrated) has a series of longitudinal scars that extend from both ends towards the middle. Long, thin flakes, up to 20 mm in length, were removed from the blunt end diagonally across the artifact to the middle of one lateral edge. The opposite face has only 2 large primary flake scars extending across the entire width of the biface. A length of 27 mm along one edge of this face is flat (though not blunt) and straight (not sinuous). This edge shows signs of wear in the form of miniature step fracturing.

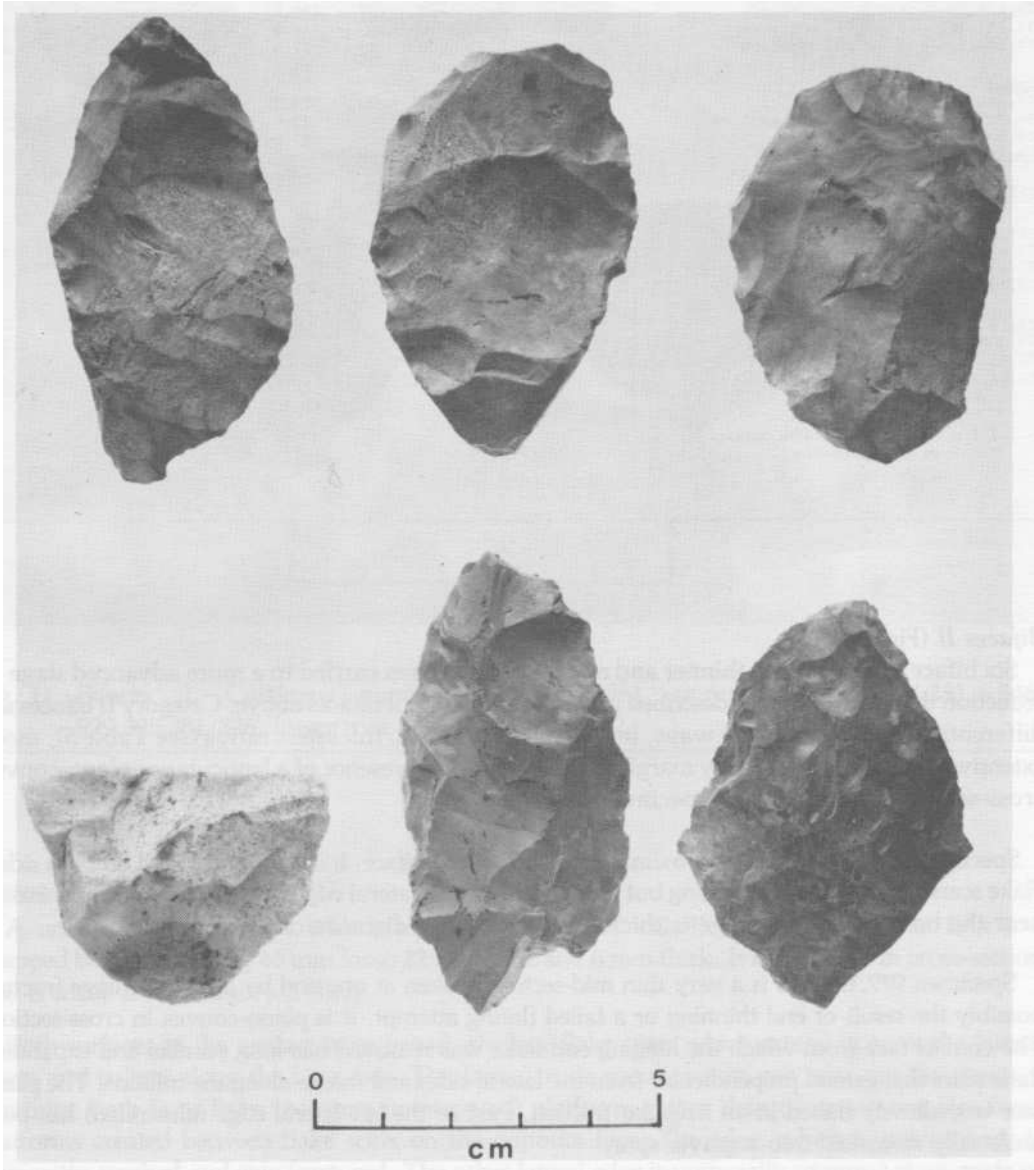


Fig. 10. Bifaces I. Catalogue numbers, left to right, upper row: 977.174.354, 356, 355; lower row: 979.305.514, 512, 977.174.330.

TABLE 5  
BIFACE ATTRIBUTES AND DIMENSIONS

Catalogue No.	Portion	Chert Category	Length (mm)	Width (mm)	Thick. (mm)	W/T Ratio
BIFACES - I						
Area 1						
977.174.330	tip	1	(60.0)	(43.0)	(12.0)	
977.174.354	complete	1	67.0	(35.5)	9.0	
977.174.355	complete	1	56.0	39.5	12.5	3.2:1
977.174.356	complete	1	60.0	37.5	10.0	3.8:1
Area 2						
977.174.480	tip	1	(41.0)	(34.0)	(10.0)	
979.305.513	mid-section	1	(47.0)	37.0	10.0	3.7:1
979.305.526	tip	1	(23.0)	(37.0)	(8.0)	
979.305.514	tip	2	(33.0)	(44.0)	(16.0)	
BIFACES - II						
Area 1						
977.174.331	base	6	(48.5)	41.0	9.0	4.6:1
977.174.346	mid-section	1	(27.5)	40.0	6.0	6.7:1
979.305.300	mid-section	1	(36.5)	(47.0)	(8.0)	
Area 2						
979.305.381	mid-section	1	(26.0)	44.0	7.0	6.3:1
982.91.78	tip	3	(43.0)	37.0	7.0	5.3:1
982.91.57/68/72	mid-section	1	(31.0)	30.0	5.0	6.0:1

( ) - incomplete measurement  
W/T - width:thickness

### *Bifaces II (Fig. 11)*

Six biface fragments are thinner and appear to have been carried to a more advanced stage of reduction than the specimens described in the first category of bifaces above. Category II bifaces are differentiated in a number of ways, including large width/thickness ratios (see Table 5), more extensive surface preparation by marginal flaking, and the presence of a lenticular or piano-convex cross-section. None of these specimens is ground.

Specimen 977.174.331 is the proximal half of an ovoid biface. It is basally thinned on both sides. Flake scars are large and expanding but very shallow. The lateral edges are thin and straight except near the base where one edge is thick and blunt for a distance of 29 mm.

Specimen 977.174.346 is a very thin mid-section broken at one end by a reverse hinge fracture possibly the result of end thinning or a failed fluting attempt. It is plano-convex in cross-section. The convex face from which the hinging end flake was removed has long parallel and expanding flake scars that extend perpendicular from the lateral sides and merge along the midline. The piano face is shallowly flaked in an irregular fashion. Part of the left lateral edge (illustrated) has been uniaxially reworked into a graver spur.

Specimen 979.305.381/526 is the lower half of a lenticular biface which has been damaged by pot-lid spalling. Large and shallow, irregularly-shaped flakes have been removed from both faces. Subsequent marginal flaking on the illustrated face has consistently raised the edge relative to this face.

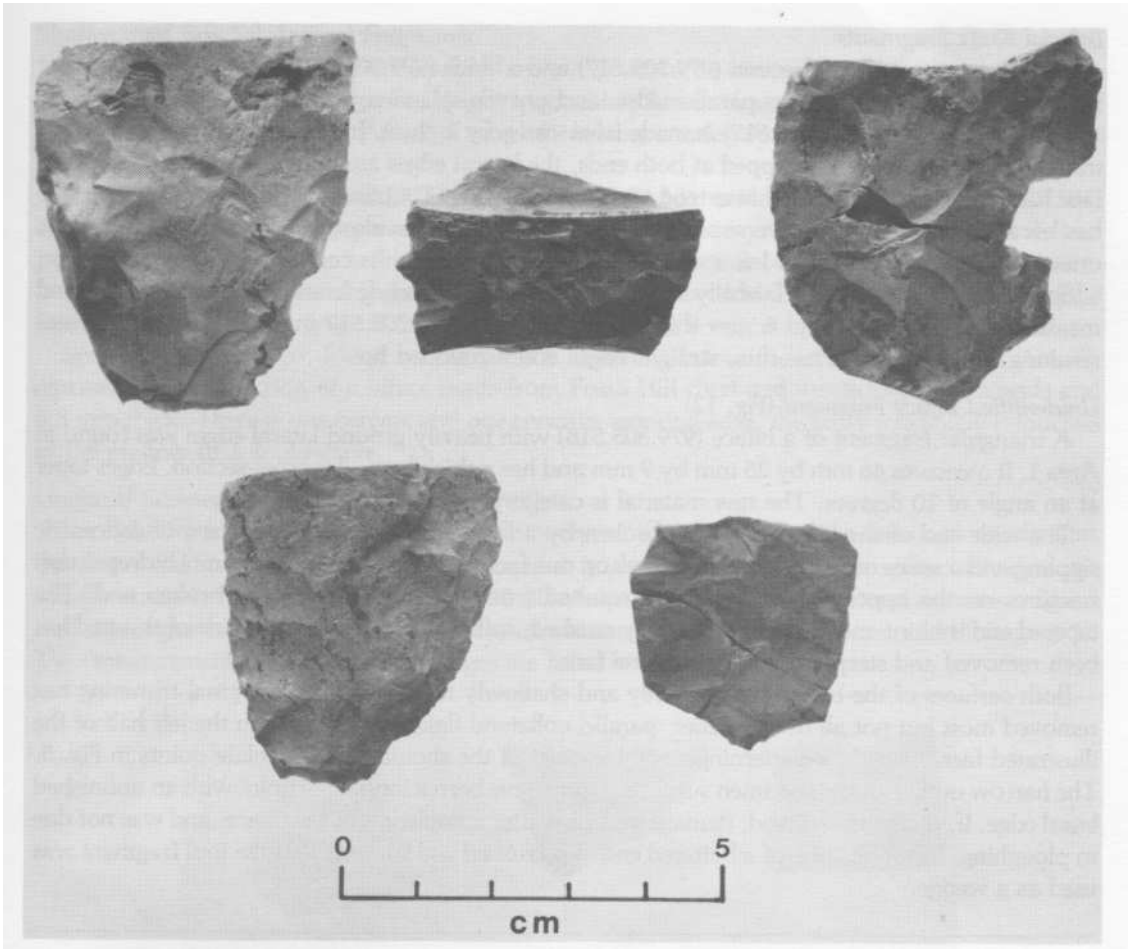


Fig. 11. Bifaces II. Catalogue numbers, left to right, upper row: 977.174.331, 346, 979.305.381/526; lower row: 982.91.78, 57/68/72.

#### *Serrated Knife Fragment (Fig. 12)*

A unique biface fragment with a serrated edge (977.174.1208) was found in Area 1. It is a snapped blade measuring 40 mm long, 22 mm wide and 6 mm thick. It is lenticular in cross-section and is made from category 5 chert.

Both surfaces of the artifact have broad, shallow flake scars which extend in from the lateral edges and collate along the long axis. The large, crude serrations on one edge are the result of trimming both faces from the same (unprepared) platforms rather than trimming one face from platforms created between flake scars on the opposite face. The edge, which is not ground, is frequently crushed and step fractured. The other lateral edge is unifacially trimmed at an angle of 70 degrees forming a concavity which is 18 mm long and 3 mm deep. The contrast in quality between the facial flaking on the one hand and the marginal flaking on the other suggest that this artifact is a re-worked fragment of a point or knife.

### *Bifacial Knife Fragments*

These 2 fragments, a midsection (979.305.517) and a blade (979.305.519), are described together because of their narrow shape, parallel sides, and uneven, piano-convex cross-section.

The first specimen (979.305.517) is made from category 1 chert. It is 21 mm wide and 6.5 mm thick. In addition to being snapped at both ends, the lateral edges are partially broken. The piano face has broad, shallow scars that extend across its width. By contrast, flaking of the opposite face has left a series of short, transverse scars that end in step fractures along the longitudinal axis. This uneven pattern of flaking has left a central ridge giving this face its convex appearance.

Specimen 979.305.519 is a laterally snapped blade fragment made from chert of category 3 and measuring 16 mm wide and 6 mm thick. It is similar to 979.305.517 in its flaking pattern and resulting cross-section. It has thin, straight edges and a rounded tip.

### *Unidentified Biface Fragment (Fig. 12)*

A triangular fragment of a biface (979.305.518) with heavily ground lateral edges was found in Area 1. It measures 46 mm by 25 mm by 9 mm and has a thick lenticular cross-section. Edges taper at an angle of 10 degrees. The raw material is category 1 chert.

The wide end of the biface has been broken by a lateral snap creating a pattern of concentric rippling and a series of shallow step fractures on one face (illustrated). A series of much deeper step fractures on the opposite face may have resulted from blows to the already broken end. The tapered end is blunt and consists of partially crushed, soft cortex material. One side of this end has been removed and steeply reworked on one face.

Both surfaces of the biface are smoothly and shallowly flaked. Bifacial marginal trimming has removed most but not all of the earlier, parallel collateral flake scars visible on the left half of the illustrated face. This flake patterning resembles that of the shouldered lanceolate points in Fig. 5. The narrow outline of the specimen suggests it may have been a lanceolate point with an unfinished basal edge. If, on the other hand, damage occurred after completion of the biface, and was not due to ploughing, the opposition of a battered end to a crushed end suggests that the tool fragment was used as a wedge.

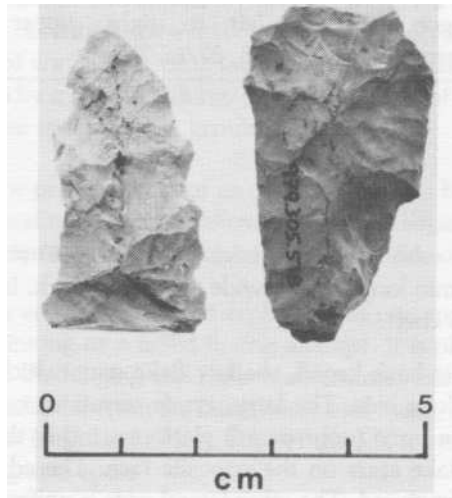


Fig. 12. Left: serrated knife fragment; right: unidentified biface fragment. Catalogue numbers: 977.174.1200, 979.305.518.

### *Unidentified Bifacial Artifact Fragments*

There are 39 of these fragments which are too small to be identified. Thirteen were found in Area 1 made from chert categories 1 (eight fragments), 2 (three fragments) and 5 (two fragments). Twenty-six pieces came from Area 2 of which 19 belong to category 1, four to 2, one to 3, one to 6 and one to 7.

Two specimens from Area 2 (977.174.527 and 982.91.131) and one from Area 1 (979.305.591) appear to be biface bases, representing perhaps the ends of knives or preforms. The former two pieces have thin bifacially worked edges which in each instance converge towards a blunt, unretouched surface measuring about 10 mm long and 5 mm wide. This surface may represent the striking platform of the original flake from which the biface was made.

Specimen 977.174.668, found on the surface at or just below the strandline north of Area 2, represents the midsection of a biface made from Fossil Hill chert and measuring 20 mm wide and 5.5 mm thick. There is one convex and one concave working edge, the latter unifacially retouched in the manner of a spokeshave.

### *Unifacial Scrapers — steeply worked (Fig. 13)*

Ten flakes or fragments from Area 2 exhibit steep, unifacial retouch along one or more edges on the dorsal flake surface. The flakes are irregular in shape and size, and the retouched edges are usually straight. One exception is 982.91.99 (illustrated) which is worked along a convex edge as well as along an adjacent straight edge. All specimens are made from mottled grey chert (category 1). Two measurements of the functional edges are listed in Table 6.

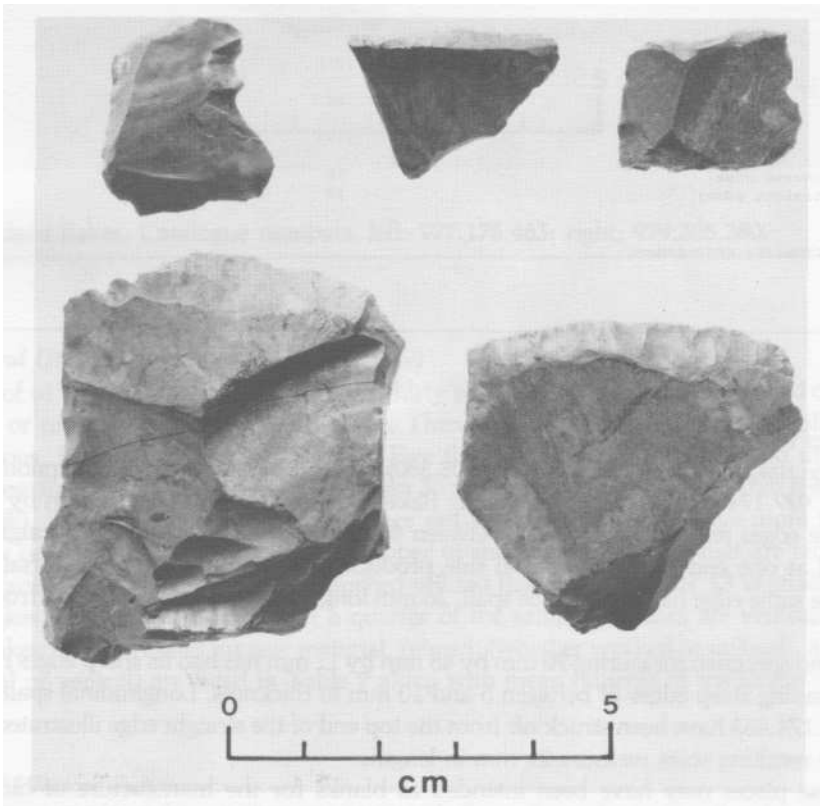


Fig. 13. Unifacial scrapers, upper row: steeply worked; lower row: shallowly worked. Catalogue numbers, left to right: 982.91.99, 979.305.540, 545, 977.174.359, 979.305.304.

*Unifacial Scrapers — shallowly worked* (Fig. 13)

Two large flake fragments from Area 1 (977.174.359 and 979.305.304) are each retouched continuously along one edge at angles between 30 and 40 degrees. Both working edges are broken and measure approximately 45 mm in length. The working edges were formed by the removal of rectangular and expanding flakes extending 5 to 7 mm in from the edge.

TABLE 6  
UNIFACIAL SCRAPERS (STEEPLY WORKED) DIMENSIONS

Catalogue Number	Length (mm)	Functional Edge(s)	Angle (°)
977.174.460	(17)		55-60
977.174.461	(13) 27		70-75 50-60
977.174.462	22 27		70-80 70-80
977.174.466	15		80-90
977.174.467	(20)		65-70
979.305.528	(16) 13		55-60 55-60
979.305.540	(27)		40-60
979.305.545	20		65-70
982.91.88	(19)		55-60
982.91.99	18 19	(concave edge) (straight edge)	60-65 50-60

( ) - incomplete measurement

*Edged Flakes* (Fig. 14)

Two large flakes (977.174.463 and 979.305.380) are roughly worked discontinuously around their edges. 977.174.463 is a long, expanding flake whose dimensions are 93 mm by 55 mm by 16 mm. The edges are naturally angled between 40 and 70 degrees. The single straight edge has been flaked at one end from the ventral side producing an edge angle on the dorsal face of 70 degrees. The same edge has had a single spall, 26 mm long, removed along its length from the same end.

The second specimen measuring 70 mm by 48 mm by 11 mm has had its sharp edges removed on two sides leaving steep edges of between 5 and 10 mm in thickness. Longitudinal spalls similar to that on 977.174.463 have been struck off from the top end of the straight edge illustrated in Fig. 14. Two of the resulting scars measure 21 mm in length.

Both these pieces may have been intended as blanks for the manufacture of bifacial tools. However, it would seem that initial efforts to produce a suitable edge for further thinning the tools were unsuccessful — the edges are blunt and appear excessively thick for the size of the flakes (Callahan 1979).

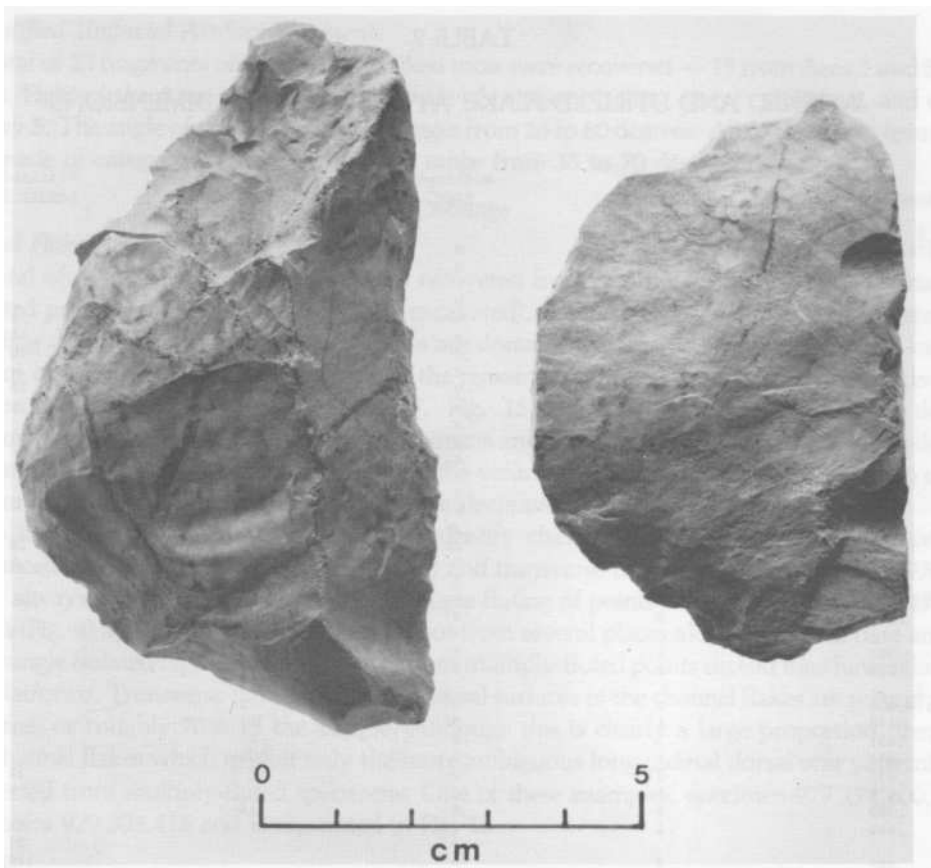


Fig. 14. Edged flakes. Catalogue numbers, left: 977.174.463; right: 979.305.380.

TABLE 7

## WORKED AND UTILIZED FLAKE ATTRIBUTES AND DIMENSIONS

Catalogue Number	Raw Material <sup>1</sup>	Modified Face <sup>2</sup>	Worked Edge Length (mm)	Utilised Edge Length (mm)
<u>Area 1</u>				
977.174.349	5	d	14	
.352	2	d	12	
.360	1	v	9	
.361	1	v	30	
.362	1	d	13	12
.363	2	d	18	15
.391	2	v	6	20
.392	2	v	13	
.786	1	d	10	
.824	2	d	26	
.833	2	v	13	
.1065	1	d	8	
.1068	1	v	7	
.1146	1	d	5	
.1147	5	d		18
.1243	1			3
.1249	1		8	
979.305.303	5	d	14	
.307	2	d	35	
.313	1	v		16
.314	2	d	10	
			24	
<u>Area 2</u>				
977.174.468	1	d	12	
.470	1	d	14	
.471	1	d	16	
.472	1	d	(20)	
.473	2?	v		21
.476	1	d		6
.482	1	d	14	
.484	1	d		21
.486	6	v		27
.487	1	d	11	(16)
.490	1	d		9
.492	2	d		9
.493	2	v		5
.511	1	v		14
.513	1	d	12	
.521	1	d		7
.591	2	d	5	
.598	2	v		8
979.305.378	1	v		9
.379	1	d	12	
.463	2	d	(8)	
.489	2	v	8	
.499	2	v		8
.506	1	d		6
.527	1	d	(9)	
.529	quartz	v	(16)	
.530	1	d		23
.532	2	d	(18)	11
.546	1	d		(10)
.549	1	d		16
.551	1	d	26	
982.91.31	1	d	10	
.42	1	v		20
.51	1	d	10	21
.54	1	d		8
.59	1	d		(7)
.70	1			5
.79	quartz	d		(9)
.94	1	v		12
		v		5
.119	1	d		(9)

1 - numbers refer to chert categories  
 2 - d - dorsal; v - ventral

( ) - incomplete measurement



*Unidentified Unifacial Artifact Fragments*

A total of 23 fragments of unifacially worked tools were recovered — 15 from Area 1 and 8 from Area 2. Eight of the Area 1 specimens are made of category 1 chert, six of category 2, and one of category 5. The angle of the worked edges ranges from 25 to 60 degrees. All of the pieces from Area 2 are made of category 1 chert. Edge angles range from 35 to 70 degrees.

## Debitage

*Channel Flakes (Fig. 15)*

A total of 49 possible channel flakes was recovered from the site, 13 from Area 1 (5 from the excavated portion) and 36 from Area 2 (23 excavated). All examples are thin and flat, sometimes expanding distally. Forty-one of the 49 flakes are dorsal fragments on which none of the original platform or bulb of percussion survives. Of the remaining 8 flakes, 1 has a well-defined, isolated and abraded striking platform (979.305.557, Fig. 15), and 7 have only moderately defined platforms. Various characteristics of these specimens are noted in Table 8. Platform angle is defined as the angle between the striking platform and the ventral surface of the flake. A ventral lip on the platform becomes more noticeable as this angle decreases.

Two attributes which have been used to identify channel flakes, namely the presence of a pronounced basal nipple (MacDonald 1968:73) and transverse dorsal flake scars (Storck 1979:34), are not always present at the Zander site. Multiple fluting of points such as specimens 977.174.440 and 444 (Fig. 4) appears to have been carried out from several places along a bevelled base and not from a single isolated nipple. Channel flakes from multiply-fluted points should thus have relatively small platforms. Transverse flake scars on the dorsal surfaces of the channel flakes are present on 33 specimens, or roughly 70% of the sample. Although this is clearly a large proportion, there are other channel flakes which exhibit only the more ambiguous longitudinal dorsal scar patterning to be expected from multiply-fluted specimens. One of these examples, specimen 977.174.600, joins fluted point 979.305.416 and is illustrated in Fig. 15.

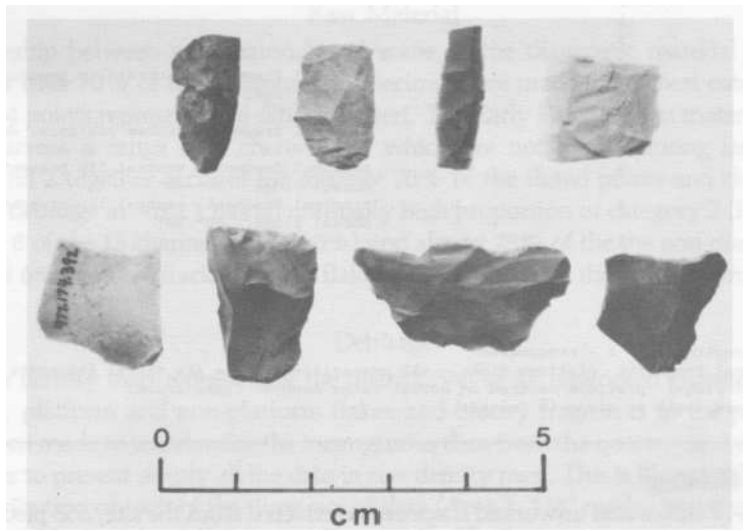


Fig. 15. Upper row: channel flakes. Catalogue numbers, left to right: 979.305.557, 982.91.64, 95, 977.174.600. Lower row: worked flakes. Catalogue numbers: 977.174.392, 482, 786, 979.305.313.

TABLE 8  
CHANNEL FLAKE ATTRIBUTES

Catalogue No.	Chert Category	Dorsal Flake Scars <sup>1</sup>	Comments <sup>2</sup>
<b>Area 1</b>			
977.174.802	3	t	
.910	3	t,L	
.918	3	t,L	
.1133	2	t	
.1233	1	t,L	
979.305.317	2	t	
.318	2	t	
.319	2	L	
.320	2	t	
.3 <sup>2</sup> 1	2	L	
.352	4	t	
.359	2	L	
.360	2	L	
<b>Area 2</b>			
977.174.449	2	t	
.600	2	t,L	
979.305.377	6?	t,L	
.493	3		
.498	1	t	
.557	1	L	proximal fragment, dorsal ridge. 90°
.558	1	L	
.559	2	t	
.560	1	t	
.561	3	t	
.562	6?	L	
.563	2	t,L	
982.91.6	4	t?	proximal fragment
.15	1	t,L	
.16	6	t	
.25	1	t,L	proximal fragment, crushed platform; dorsal ridge.
.26	1	t,L	
.27	1	t	
.29	4	t	
.30	1	t,L	
.36	4	t,L	
.37	4	t,L	proximal fragment, crushed platform; dorsal ridge.
.38	1	t	
.41	1	L	
.47	3	t	
.49	3	L	
.64	3	L	proximal fragment, ventral lip present; dorsal ridge. 70°
.69	2	t,L	
.74	2	t	proximal fragment, broken platform; dorsal ridge.
.83	4	t?L	
.90	4	L	proximal fragment, ventral lip present; dorsal ridge. 80°-90°
.9 <sup>2</sup>	4	L	proximal fragment, ventral lip present; dorsal ridge. 80°-90°
.95	1	t,L	
.106	1	t	
.124	4	t	
.127	6	t,L	

1 - L - longitudinal; t - transverse

2 - proximal fragment: platform flake - all unspecified flakes are distal fragments. dorsal ridge: platform centred on dorsal ridge between flake scars. Platform angle is given in degrees.

### Non-diagnostic Debitage

There were 1977 flakes and unworked fragments recovered from the site, 558 pieces from Area 1 and 1419 from Area 2. The proportions of the different categories of debitage found in each area are essentially similar to those listed for the entire site in Table 1. These include: channel flakes: 3%; bifacial retouch flakes with ground and faceted platforms: 2%; platform flakes: 13%; distal flake fragments: 80%; and blocky fragments: 2%. The proportions of artifacts to debitage by frequency and weight for the 6 most common categories of chert are given in Table 9.

TABLE 9  
ARTIFACT: DEBITAGE RATIOS BY  
FREQUENCY AND WEIGHT FOR CHERT  
CATEGORIES 1—6

		Raw Material						Total
		1	2	3	4	5	6	
Area 1	frequency	1:5	1:6	1:16		1:4	1:2	1:6
	weight	1:0.3	1:0.8	1:2		1:0.7	1:0.7	1:0.7
Area 2	frequency	1:7	1:5	1:5	1:23		1:9	1:11
	weight	1:0.7	1:0.7	1:0.3	1:2		1:0.8	1:1.4

#### DISTRIBUTION OF THE MATERIAL

Areas 1 and 2 can be distinguished primarily on the basis of different proportions of fluted and lanceolate points and raw material types. Neither of the excavated areas is large enough to reveal clear patterns of internal spatial distribution. The distribution of excavated artifacts is shown in Fig. 16.

#### Artifacts

Paleo-Indian projectile points comprise between 16 and 18% of the tool assemblage of each area. The overall proportion of fluted to lanceolate points at the site is roughly 2:1. In Area 1 this ratio is reversed at 1:2, and in Area 2 the proportion is approximately 9:1.

Diagnostic unifacial artifact types — graters, end scrapers, beaked scrapers, and concave scrapers — represent 12% of the artifacts in each area. Graters occur exclusively in Area 1. Area 2 contains all of the concave scrapers. Both areas produced roughly equal proportions of non-diagnostic tool types. Bifacial tools and fragments account for 45% of the artifacts in each area, for example, and spontaneously worked and utilized flakes between 20 and 30%.

#### Raw Material

The relationship between raw material and some of the diagnostic material is illustrated in Fig. 17. Ten or over 70% of the 14 lanceolate specimens are made from chert category 1, each of the remaining 4 points representing a different chert. The Early Paleo-Indian material is distributed more evenly across a range of 5 cherts, 2 of which are not found among lanceolate points. Categories 1 and 2 together account for roughly 70% of the fluted points and channel flakes. In particular, the debitage in Area 1 has an unusually high proportion of category 2 (Fossil Hill) chert. It accounts for 8 of the 13 channel flakes (60%) and almost 25% of the non-diagnostic debitage by weight, and 66% of the bifacial retouch flakes (see Table 10 for the breakdown of raw material by debitage).

#### Debitage

Fig. 18b is a density map representing the distribution of all unworked channel flakes, bifacial retouch flakes, platform and non-platform flakes and blocky fragments in the plough zone. An attempt has been made to standardize the incongruous data from the quarter- and eighth-inch mesh screens in order to present simply all the data in one density map. This is illustrated in Fig. 18a. The frequency distribution of each of the three sets of data (Area 1: 1/4" mesh; Area 2: 1/4" mesh; Area 2: 1/8" mesh) is shown along the top of Figure 18a. These same sets of data are presented as cumulative frequency graphs and horizontal lines are drawn from the Y-axis to establish density intervals at 68 and 95% of the subunits (representing 1 and 2 standard deviations from the mean, respectively, in each of the frequency distributions, assuming they all approximate the normal distribution).



The results of the distribution shown in Fig. 18b are inconclusive in Area 1 where low and medium density regions overlap. However, a high density of flakes is demonstrated around and to the south of Feature 1 where there also occurs the only fluted point and channel flakes in the excavated area as well as a large number of unifacial tools and fragments. The results in Area 2 show a similar concentration in the vicinity of Feature 2, plus a clearer fall-off in the distribution of flakes to the north and west.

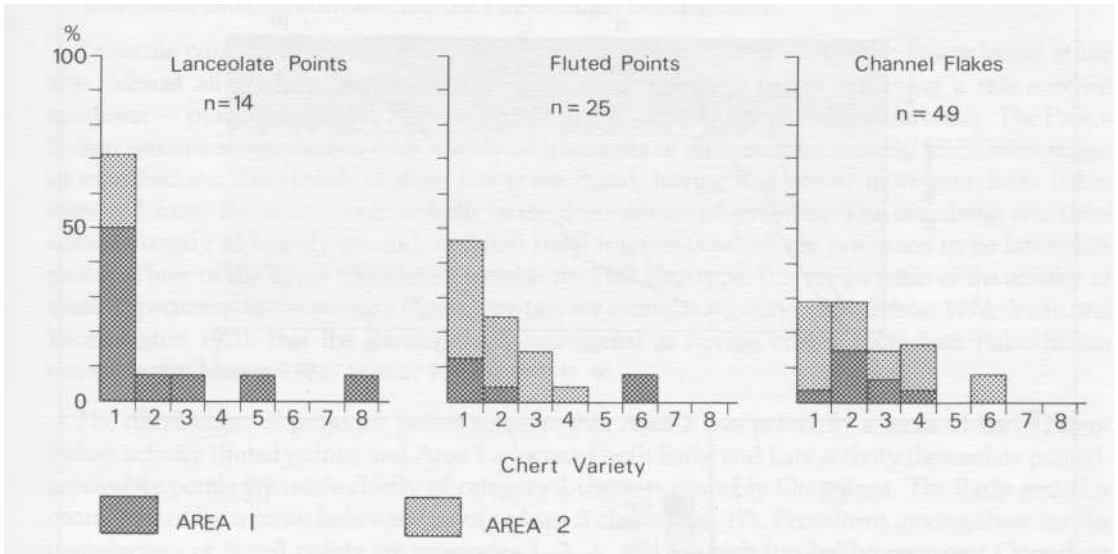


Fig. 17. Distribution of projectile points and channel flakes by raw material (categories of chert) for Areas 1 and 2 at the Zander site.

TABLE 10

MATERIAL OF NON-DIAGNOSTIC DEBITAGE BY WEIGHT

Raw Material	AREA 1										AREA 2										Site Total	
	Bifacial Retouch Flakes		Platform Flakes		Non-Platform Flakes		Blocky Fragments		Area 1 Total		Bifacial Retouch Flakes		Platform Flakes		Non-Platform Flakes		Blocky Fragments		Area 2 Total			
	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%	gms	%
1	.5	7.8	14.9	47.5	87.2	25.8	6.4	14.9	89.0	26.1	12.8	73.1	62.3	31.3	157.3	36.0	91.4	56.4	323.8	39.6	412.8	35.7
2	4.2	65.6	8.4	26.8	62.3	23.9	5.7	13.2	80.6	23.6	2.2	12.6	20.5	10.3	19.3	4.4	1.2	.7	43.2	5.3	123.8	10.7
3	0	0	1.4	4.5	1.6	.6	0	0	3.0	.9	.4	2.3	2.1	1.1	9.2	2.1	0	0	11.7	1.4	14.7	1.3
4	0	0	0	0	0	0	0	0	0	0	0	0	2.0	1.1	5.6	1.3	0	0	7.6	.9	7.6	.7
5	1.7	26.6	4.3	13.7	13.6	5.2	.3	.7	19.9	9.8	0	0	0	.8	.2	0	0	.8	.1	20.7	1.8	
6	0	0	0	0	4.0	1.5	0	0	4.0	1.2	1.4	8.0	1.5	.8	2.6	.6	0	0	5.5	.7	9.5	.8
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.4	.1	2.5	1.5	2.9	.4	2.9	.3
8	0	0	0	0	0	0	0	0	0	0	0	0	1.0	.5	0	0	0	0	1.0	.1	1.0	.1
Quartz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18.9	4.3	0	0	18.9	2.3	18.9	1.6
Metamorphic	0	0	0	0	111.5	42.9	30.0	69.6	141.5	41.5	.2	1.1	96.2	48.3	192.1	44.0	0	0	288.5	33.3	430.0	37.1
Unidentified	0	0	2.4	7.6	0	0	.7	1.6	3.1	.9	.5	2.9	13.6	6.8	31.7	7.3	67.0	41.3	112.8	13.8	115.9	10.1
TOTALS	6.4	100.0	31.4	100.1	260.2	99.9	43.1	100.0	341.1	100.0	17.5	100.0	199.2	100.2	437.9	100.3	162.1	99.9	816.7	99.9	1157.8	100.2

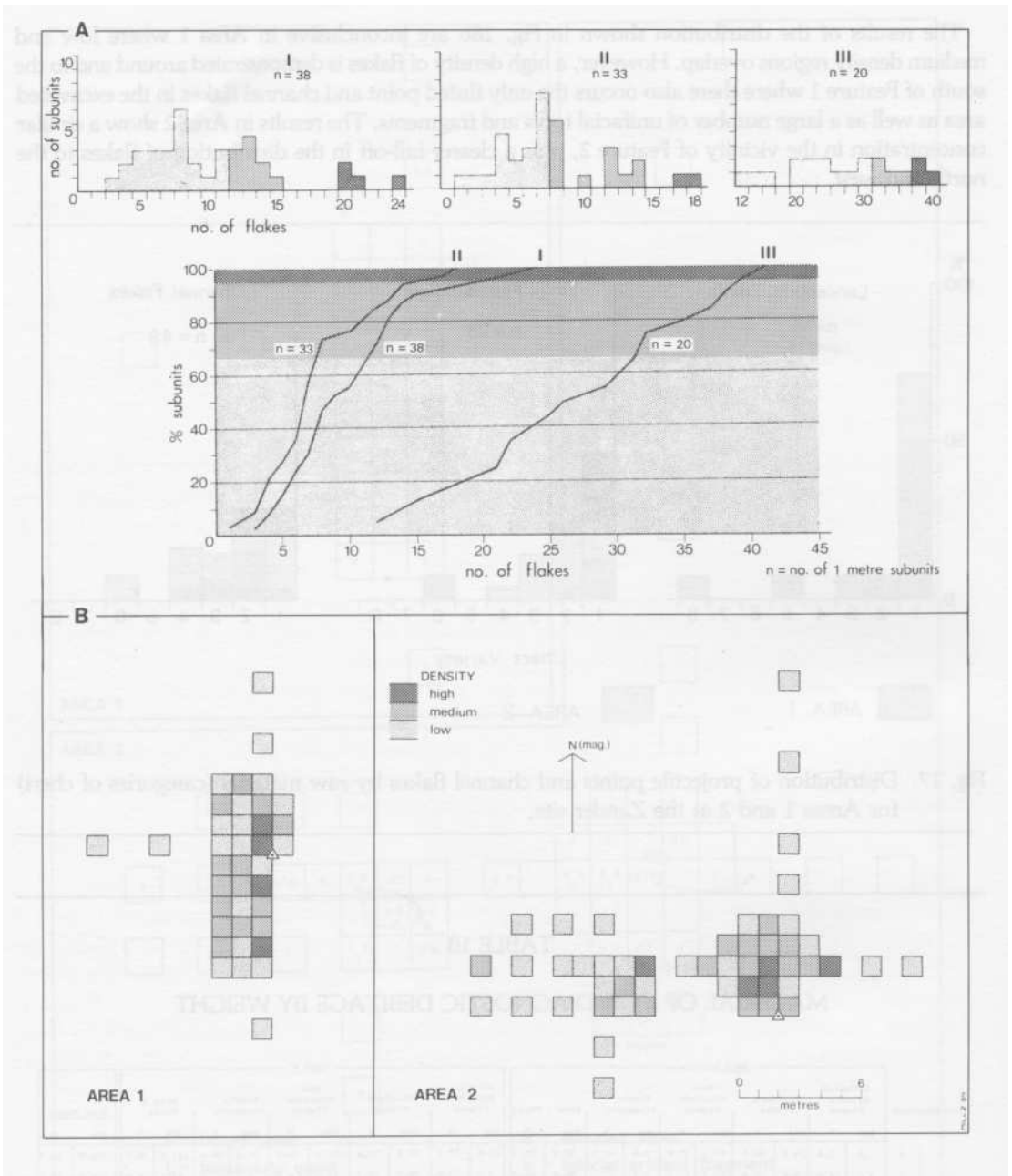


Fig. 18. Distribution of unworked flakes and fragments standardized for mesh size at the Zander site. a: distribution of (I) subunits in Area 1—1/4" mesh; (II) Area 2—1/4" mesh; (III) Area 2—1/8" mesh. b: density map of debitage. The three density intervals in b are derived from the cumulative graph in a and are defined for each area and mesh size by shading in the histograms.

## DISCUSSION

### The Nature of the Paleo-Indian Occupations

Two areas of habitation were recorded by excavation and survey at the Zander site. Test excavation of subconcentrations within these areas has yielded valuable diagnostic material. The evidence for activity areas pertaining to discrete components is poor, however, and the early cultural significance of the subsoil anomalies (Features 1 and 2) ambiguous. Feature 1 did not yield an acceptable radiocarbon date for the Paleo-Indian occupation(s).

Projectile points and preforms account for nearly 20% of the 228 worked artifacts found at the site. Almost all of these are diagnostic Paleo-Indian points, 2 exceptions being a side-notched specimen — possibly related to Archaic Otter Creek — and a Late Woodland dart base. The Paleo-Indian specimens constitute a wide variety of fragments of different raw material in different stages of manufacture. Two-thirds of these points are fluted, having had one or more prominent flakes removed from the end of one or both faces of an advanced preform. The remaining one-third consists largely of heavily ground, unfluted basal fragments which are presumed to be lanceolate points. Three of the larger specimens resemble the Hell Gap type. It is on the basis of the affinity of these 3 specimens to the western Plano type (see for example Agogino 1961; Frison 1974; Irwin and Wormington 1970) that the Zander site is interpreted as having one or more Late Paleo-Indian components (Mason 1981; Storck 1979b).

The distribution of projectile points suggests that Area 2 was primarily a locus of Early Paleo-Indian activity (fluted points) and Area 1 a locus of both Early and Late activity (lanceolate points). Lanceolate points are made chiefly of category 1 chert — probably Onondaga. The Early period is characterized by a more balanced use of at least 5 cherts (Fig. 17). Prominent among these for the manufacture of fluted points are categories 1, 2, 3, and 6 which (probably) represent Onondaga and Collingwood chert in the first two instances, and possibly Lockport chert in the third (see discussion of raw materials).

The artifact:debitage ratios for the different categories of chert (Table 9) show that there is a fairly consistent use of raw materials within areas. The smaller overall ratio in Area 2 is probably due to the partial use of finer mesh in the excavation of that area. It may be worth drawing attention to the unusually small ratios (by both weight and frequency) for category 3 in Area 1 (1:16 by frequency) and category 4 in Area 2 (1:23 by frequency). By contrast, the overall artifact:debitage ratio in each of these areas is 1:6 and 1:11 respectively. The smaller ratios may be an indication that these two raw materials were conserved less or worked more than the other cherts. However, as categories 3 and 4 together represent only 2% of the non-diagnostic debitage from the site by weight (Table 10), the importance of these differences should not be overly stressed.

The artifact assemblage as a whole suggests that an important though not exclusive orientation of the site during its time of occupation was hunting and the maintenance of weapons. Approximately 40% of the fluted points and 60% of the unfluted points are finished basal or ear fragments which were probably discarded after use during rearmament at the site. Eight or 30% of the fluted points and one or 7% of the lanceolate points can be identified as having broken before completion. Together with the channel flakes, and possibly the bifaces in category II, which may have served as projectile point preforms, these unfinished points are evidence of the manufacture and maintenance of weapons on the site. The large number of end scrapers seems to be consistent with a hunting orientation hypothesis. End scrapers, of which there are 17, represent the second most common diagnostic tool category after projectile points as they account for 7.5% of the entire artifact assemblage.

### External Comparisons and the Regional Context

Affinities of the Zander site with other sites in the Schomberg embayment and elsewhere are noted on the basis of similar diagnostic material and the nature of the occupation.

Fluted points from at least 3 sites in the Schomberg area have strong affinities with fluted points from the Crowfield and related sites in southwestern Ontario, approximately 200 km southwest of Zander (Deller and Ellis 1982: Fig. 29; Brian Deller: personal communication). There are several examples of thin, expanding points like those at Crowfield which are multiply-fluted from a bevelled, basal edge. The most notable are specimens 982.122.8 from the Sisler site (Stewart 1982: (Plate 2), 977.174.440, .444 and .843 from the Zander site (Fig. 4), and 977.174.162 from the McMillan site (Storck 1982: Fig. 7c). Ongoing work in southwestern Ontario by Brian Deller and also to the east of the Schomberg area around Udora (Storck 1982) will help to clarify the nature of this complex or style and its relationship to other projectile point complexes.

The Zander site is one of two known Paleo-Indian sites in south central Ontario with both Early and Late Paleo-Indian components. The Hussey site (Storck 1979a), located on the Alliston embayment of Lake Algonquin to the west, is a smaller site with a larger proportion of artifacts to unworked flakes and fragments. Projectile points at both sites account for about 20% of the artifacts and are similar in their apparent diversity at both sites. One of the fluted points from Hussey (974.168.26, Storck 1979a: Plate 16c) is very close in appearance to the Crowfield-like points from the Schomberg area. Both the Zander and Hussey sites were presumably occupied intermittently, perhaps seasonally, over a long period of time during which the local environments must have undergone considerable change as a result of glacial lake recession. It would be interesting to speculate on the reasons for continuity of occupation at these sites and to test various implications. A comparison between these and among other sites might be made based on, for instance, the degree of shelter provided by a site, or access from a site to a backwater or bog environment, or some other specific ecological habitat which might have survived the rapid transition at the end of the Pleistocene. The problem of chronological control is a major obstacle to this kind of research as the length of time over which sites like Zander and Hussey continued to be occupied, and the relative intensity of occupation by Early and Late Paleo-Indian peoples, remains unknown.

The Zander site is the largest of several Paleo-Indian sites located along the shoreline of the Schomberg embayment (Fig. 1, 2a). Some of the diagnostic material from these sites is shown in Stewart 1982. Extensive archaeological survey work along the Algonquin strandline has demonstrated that the southern and eastern margins of this embayment are especially productive (Fig. 1). Most of these sites are oriented to the main Algonquin strandline, which was formed between about 11,200 and 10,400 BP (Karrow et al 1975), and thus presumably date to no earlier than this period. Survey work in 1982 along a possible, though not yet confirmed, higher strandline led to the discovery of several sites in the vicinity of Zander (Fig. 2a shows the location and lists the finds from these sites). These higher sites are minor localities on the edges of ravines extending inland from the main strandline and may be associated with the main occupation at the Zander site itself. The question of whether or not Paleo-Indian sites were also located further inland on the Oak Ridges moraine is unanswered due to the fact that research over the last ten years in south central Ontario has focused on strandlines (Storck 1982). Nevertheless, individual fluted points have been found in this highland interior region (Garrad 1971; Jackson 1979, 1983), and the fieldwork reported here suggests that the edges of major ravines which lead south from Lake Algonquin into the moraine would be a useful focus for future research.



## ACKNOWLEDGEMENTS

Fieldwork at the Zander site and in the Holland River basin by both Mr. John Prideaux and myself was funded by the Ontario Heritage Foundation and supported by the Royal Ontario Museum. The artifact collections are housed at the Department of New World Archaeology, Royal Ontario Museum, Toronto. I wish to thank Mr. Fred Zander and Mr. Silvio Marra for their cooperation and permission to excavate on private property during the summer of 1982.

I have drawn extensively on the expertise of a large number of people during this project. Mr. William D. Fitzgerald, District Geologist for the Ontario Ministry of Natural Resources, Huronia District, ran levels between the Zander site and the nearest benchmark. I am thus grateful to him for the elevation of the site datum shown in Figure 2b, and also for establishing the position of the Lake Algonquin sediments to the north of Area 2. Mr. Laurie Jackson of Northeastern Archaeological Associates provided flotation facilities and supervised the processing of feature soil. Mr. Rudy Fecteau kindly analysed the organic contents of the features. Mr. Brian Deller, Mrs. Betty Eley, Mr. William Fox and Dr. Henry T. Wright all contributed substantially to my understanding of the cherts at the site—none of them is responsible for errors made in describing or identifying them.

I wish to thank Lori Kerr, John Moore, and Laura Peers for their professional field assistance, and Jane Edward in particular for her expertise in the field and in organizing and analysing finds. I am also grateful to the following volunteers who helped us survey and excavate during the summer of 1982: Pat Boyer, Gordon Dibb, Andrew Hinshelwood, Arthur Horn, Heather McKillop, Kathy Mills, Brian Molyneaux, Jennifer Peers, Tim Stewart, and Laurie Tolton.

I am most appreciative of the figures expertly drawn by Ms. Kathy Mills. Photographs of the artifacts were taken by Mr. William Robertson and tables typed by Ms. Peta Daniels, both courtesy of the Royal Ontario Museum. I would like to thank Ms. Jean Hudson and Dr. Michael Jochim of the University of California, Santa Barbara, for commenting on an earlier draft of this paper and Mr. Laurie Jackson for suggesting sundry derogatory appellations if this report was not done. In particular, I thank Dr. Peter Storck, Dept. of New World Archaeology, Royal Ontario Museum, for his advice and encouragement from the start of this research.

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