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ANALYSIS OF LITHIC DEBITAGE FROM FLUTED POINT SITES

ANALYSIS OF LITHIC DEBITAGE FROM FLUTED POINT SITES IN ONTARIO

By

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ABSTRACT

This thesis is concerned with the interpretation of lithic debitage from two fluted point sites in Ontario: the Parkhill and McLeod sites. Given the extremely homogenous nature of the debitage collections, a typological analysis was undertaken. Explanation of the variability between debitage attribute clusters (i.e. debitage types) is based on two factors, namely, the types of tools being altered and the stages and steps in the manufacture of lithic tools from which the debitage was derived.

As a result of the above endeavours: (1) hypotheses about the nature of site activities suggested by the lithic tools from a site or site area are tested with information on site activities derived from an examination of the debitage collections; (2) the lithic reduction sequence on the sites examined is partially constructed; (3) the breakdown of this sequence into segments practiced at different loci of activity is documented and discussed; (4) conclusions are presented as to the relative length of occupation, temporal ordering and association of discrete loci of lithic activities from an examination of the channel flake collection; and (5), the possible significance of some inconsistencies between the relative frequency of certain lithic material types among the debitage and the lithic tool categories is discussed.

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I am also grateful and acknowledge my debt to: Brian Deller for information and discussions regarding the Paleo-Indian occupation of the province; to Peter Sheppard and Bill Parkins for information and discussions regarding lithic material types; to the Department of Anthropology at McMaster and especially, Dr. William C. Noble for providing laboratory space and equipment for analysis; to the Dean of Graduate Studies at McMaster and Dr. Richard Preston for providing travel funds to examine archaeological collections at the University of Waterloo; to Zelda Cohen who drew the maps used in the study; to David Christianson for taking the photographs found in the study; and to G. D. Ellis for proof-reading the manuscript.

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INTRODUCTION

Prior to the late 1960's, the investigation of early cultures in southern Ontario was confined largely to (a) simply denoting the presence of fluted points in this region and (b) a concern with delineating, at a very general level, the geographical distribution of these distinctive lithic tools. The earliest study of this nature, and consequently the first mention of the presence and significance of fluted points in southern Ontario, was that of Figgins (1934). This particular study was primarily concerned with the distribution of fluted points throughout North America and followed closely on the heels of the discovery of fluted points in association with extinct megafauna at Folsom, New Mexico in the late 1920's. However, studies of this nature subsequently appeared which were focused solely on Ontario (Kidd 1951). These culminated in the work of Garrad (1971).

In 1966, Mr. D. B. Deller of Mt. Brydges, Ontario, with some encouragement from Dr. William B. Roosa of the University of Waterloo, initiated the first systematic attempts to locate actual fluted point sites in southern Ontario. Based on the fact that known fluted point sites in the Great Lakes region were associated with glacial strand-lines, Deller began to survey these glacial features in areas west and north of London, Ontario. His work has been highly successful in locating sites in this portion of the province (see Deller 1976a, 1976b, n.d.). Furthermore, his studies have provided preliminary statements about the association of sites, and thus choice of site location by fluted point peoples, with reference to specific physiographic features.

Dr. Peter Storck of the Royal Ontario Museum began surveys to locate Paleo-Indian sites in southern Ontario in the early 1970's. His earlier work was concerned with locating fluted point sites near gaps in the Niagara escarpment which he believed might be linked to possible caribou migration routes (cf. Storck 1971). However, in more recent years, as with Deller, his work has focused on glacial strandlines; in this case, south of Collingwood, Ontario. These more recent studies have succeeded in locating several sites in the region (Storck 1978).

The publications and encouragement of Deller, Roosa and Storck have stimulated more recent surveys for fluted point sites in southern Ontario. Largely with funding from the Ontario Heritage Foundation, Laurie Jackson (Klein 1977), John Prideaux (personal communication), Peter Sheppard (personal communication) and this author have carried out surveys in various portions of the province. Prideaux's studies have located several Paleo-Indian localities, among them the Zander and Macmillan sites, on glacial Lake Algonquin shorelines north of the Holland Marsh south of Alliston, Ontario. Sheppard's studies have concentrated on locating sources of lithic raw materials exploited by fluted point makers west of Collingwood, Ontario. However, he has located at least one definite site, the Mullin site, in this area. My own surveys have denoted several possible and one definite fluted point site, the

Ward site, in the Niagara peninsula region of Ontario. The Ward site was originally brought to my attention by Mr. Bill Parkins of the University of Ottawa.

In addition to the above studies, mention must be made of the work of non-professionals in the province. For example, Mr. William Marshall (personal communication) has located several fluted point sites, including the Van Sickle #4 and the Hunt sites, in the upper Grand River area near Brantford, Ontario.

Beginning in 1971, several of the fluted point sites located by the above surveys were test-pitted or more fully excavated. The Stewart site, McLeod site and Parkhill site located by Deller were dug between 1971 and 1975 by Dr. William B. Roosa (1977a, 1977b, 1977c). In addition, in 1976, Roosa tested the Baker site southeast of London, Ontario. This site was reported by Mr. Jim Keron of London. In 1974, and continuing up to the present time, Storck (1978) has conducted excavations at the Hussey, Banting and Fisher sites.

While the recent excavation of several sites has not brought solutions to such basic archaeological problems as the temporal placement of the localities, they do provide the opportunity to ask questions for which the previous data base was not suitable. For one, we can begin to explore the significance of inter and intra-site variability in tool inventories. Also, the manufacturing sequences involved in the production of lithic tools can be more fully explored. It is towards the investigation of these two aspects of the Paleo-Indian occupation of the province that the present study is directed.

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GOALS OF THE STUDY

In recent years, lithic debitage has come to play a larger role in archaeological interpretation. In historical perspective, the impetus for this occurence can be seen to have its roots in at least two major developments. First, it is a natural outcome of the increasing emphasis on the experimental replication of archaeologically recoverable lithic materials by investigators such as François Bordes and Donald Crabtree (cf. Purdy 1978:34). Second, it reflects a change in orientation by archaeologists towards the nature of the archaeological record. Instead of assuming *a priori* the limitations of this record with regard to providing information about past cultures, there has been a shift towards the exploration of the limitations of the same (see Binford 1972 :94-96). Given this consideration, it was understandable that previously neglected archaeologically recoverable materials such as debitage, would be submitted to scrutiny.

This study is concerned with the description and analysis of lithic debitage from two fluted point sites in Ontario: the Parkhill site and the McLeod site. The study is organized into ten chapters. In this second chapter, the term "debitage" is defined and the major goals of the analysis are given. In chapter three, the sites examined in the study are described with reference to their location, the archaeological recovery techniques employed, etc. Chapter four provides the attributes and terminology employed in the description of the debitage and in the creation of "debitage types" while chapter five provides a comprehensive description of these types. The next four chapters encompass the description and analysis of the debitage from the two sites. The final chapter provides the general conclusions and a summary of the study.

DEBITAGE

From an examination of the literature, it is obvious that the term "debitage" has been employed in various ways. For example, to Judge (1973:111), this rubric would include modified and used lithic pieces, as well as non-employed specimens while to Funk (1973:30), used pieces, and presumably modified ones, would be excluded. In some cases, the use of the term is not clear (Wilmsen 1970).

In the present study, "debitage" will be used to refer to all of the by-products of the manufacture and rejuvenation of lithic tools recovered from a given locus - and which are presumably the result of flint-knapping activities carried out at that locus. Obviously, this definition encompasses all of the lithic material from a site showing no evidence of post-detachment use or modification. However, a number of specimens which do exhibit use also are included because they can be regarded as the by-products of flint-knapping activities on a site. These specimens are the result of what White (1963:9) refers to as the retouching stage of tool manufacture and consequently, are inferred not to have been detached to serve as tools or tool blanks. Rather, their use was probably spontaneous and highly dependent upon the immediate task at hand.

GOALS OF THE ANALYSIS

The goals of this analysis are given below. Each of these is discussed in turn with reference to the theoretical justification for pursuing that particular line of inquiry. It should be made clear from the following discussion that I do not intend to concentrate on the debitage to the exclusion of the other artifact categories. Rather, this study is concerned with ways in which the debitage collection from a given site can be useful in deriving relevant cultural information whether in isolation from other artifact categories or in conjunction with the same.

The first goal of this analysis is to delineate the steps involved in the reduction of the lithic raw material to useable forms. Perhaps the term "step" can best be defined and understood by contrasting it with another analytical unit referred to herein as a stage. Both of these units are segments of the lithic reduction sequence; however, they differ in scope and application.

A stage is the most abstract and thus the most inclusive unit of the lithic reduction sequence. Each stage, and the sequence of stages defined by an investigator is, in effect, a model which it is hypothesized can be applied to any and all of the lithic industries under examination; in this case, eastern Paleo-Indian industries. Therefore, a stage is a valid unit within which inter-cultural comparisons can be made. In this study, the particular stage model employed is a variant of that presented by White (1963:5-9). White's(1963) model includes three stages: primary flaking, secondary flaking and retouching. We will retain her first stage as she presents it:

"primary flaking refers to the shaping of a block or nodule of flint into a core" (White 1963:5). Secondary flaking was defined as "the processes of knapping flakes from a core". We will modify this stage and define it as that in which the flint-knapper is detaching flakes or blades from a core, his goal being the production of blanks upon which tools can be made (Binford and Papworth 1963:83). It should be mentioned that in order to accept this definition as applying to all eastern Paleo-Indian industries, we must assume that all eastern Paleo-Indian lithic tools were made on flakes or blades rather than core blanks. A survey of the literature reveals this is generally the case. However, two exceptions should be noted.

First, at the Holcombe site, Fitting (Fitting et al 1966:61) believed that projectiles were made on core blanks, largely as a result of the form of the lithic raw material (i.e. small nodules). However, given the extreme thinness of Holcombe points, as well as their plano-convex transverse cross-section, the use of core blanks seems unlikely (Roosa 1968:334). Instead, the general use of flake blanks appears to be more reasonable.

Second, at the Debert site (MacDonald 1968:65-66), bifaces and other tools were made on flakes derived from bifacially chipped cores which were lenticular in cross-section. The "exhausted" nuclei of these cores was in fact, a biface which could serve as a preform for a bifacial tool. The use of lenticular cores is common on sites in the northeast and elsewhere, and we would expect this use of "exhausted" cores as tool preforms to be the case at these other sites. However, the ratio of tools made on flakes to those made on these cores is probably quite high. In sum, these are essentially flake industries, the use of core preforms being simply the by-product (albeit an intentional by-product) of the working of a particular core form. Nevertheless, we should be aware that core preforms were occasionally used.

White's retouching stage is seen here to be composed of three stages. The first two of these stages apply only to bifaces and not to simple retouched tools such as unifacial scrapers. An examination of the available literature on the experimental replication of bifaces, whether of such varied forms as Paleolithic hand-axes (Newcomer 1971) or Clovis points (Henry et al 1976), might allow us to generalize the reduction of tool blanks to finished bifaces into three main stages. Following Bradley (1974:192), the first two of these stages are defined by the goals of the flint-knapper and are referred to herein as margin production and thinning-shaping. The final stage, applicable to simple retouched tools as well as bifaces, will be called the retouching stage.

The existence of these last three stages in Paleo-Indian biface manufacture is essentially an hypothesis worthy of further testing and elaboration. However, there are data from other Paleo-Indian sites in eastern North America to suggest the reality of at least the thinning-shaping and retouching stage. These data will be presented when a specific debitage form (biface thinning flakes) associated with the thinning-shaping stage is described in chapter four of this thesis.

The goal of the stage of margin production is simply the creation of a bifacially chipped margin or edge on the tool. We will call a biface in this stage of manufacture a Type I preform. Bradley's (1974) next stage of thinning-shaping applies to bifaces in a state of manufacture in which the emphasis is on a thinning of the tool and secondarily, a rough shaping of the tool outline. Thinning here is meant to imply a thinning of the central face of the tool as opposed to those areas immediately adjacent to the tool edge. Thinning of these latter areas can be seen to be a goal of the retouching stage. A biface in the stage of thinning-shaping will be called a Type II preform.

In the retouching stage, in contrast to the thinning-shaping stage, the flint-knapper's main concern is with the form of the tool edges rather than the central areas of the tool face. This has two aspects. First, he is concerned with the tool outline, the tool's finished shape. This form is related to various stylistic and functional factors. Second, he is concerned with the sharpening of the tool edge; that is, with purely functional goals. In the case of bifaces, the goal is a sharp edge suitable for cutting and piercing functions. With unifaces such as end scrapers, he may be concerned with the angle of the bevelled edge, the steepness of which may be related to various functional tasks (see Wilmsen 1970). A biface in this stage of manufacture will be referred to as a Type III preform.

In summary, the five stages of the sequence are: primary flaking, secondary flaking, margin production, thinning-shaping and retouching.

There can be any number of steps within each of the above stages. A step is the most specialized, concrete and least inclusive unit of the manufacturing sequence and unlike a stage, it is not found in every eastern Paleo-Indian industry. Hence, the presence or absence of a step in this sequence may be of value in cultural assignment. It is for this reason that I wish to delineate the steps involved in the manufacture of lithic tools. An example of this utility is Witthoft's (in Byers 1954) contention that there was little or no bevelling of the base prior to fluting on points from the Shoop site. Witthoft believed that the absence of this step had considerable utility in making finer cultural distinctions within eastern fluted point industries. Thus, while stages define the operations necessary in the production of a lithic tool, the definition of steps is an expression of the various ways in which any given stage may be executed.

The next goal of this analysis has been implied in the above. It consists of uniting the steps and stages involved in the manufacture of lithic tools into one uniform framework which is referred to as the lithic reduction sequence. The lithic reduction sequence is the particular combination of stages and steps characteristic of a particular lithic industry. One advantage of delineating these sequences is that it allows one to view the lithic component of an archaeological site as a subsystem of the culture involved. It integrates all of the lithic tool categories into one holistic framework in which the relationships of the various lithic categories can be explicated. It is proposed that within this framework, one is in a better position to explain the changes (i.e. changes in finished artifact form and so on) occuring in that system (Sheets 1975).

Second, it can be noted that the delineation of the lithic reduction sequence links the finished artifact forms to their methods of production and therefore, has a bearing on the temporal, spatial and cultural placement of artifact assemblages. For example, Bonnichsen (1977:3) has noted that most artifact classification systems designed to elucidate cultural relationships have generally focused on the morphology of the finished or thought to be finished artifacts. One problem with this practice is that artifacts which are virtually identical in morphology can be the output of sequences involving different steps and methods, and therefore can be the product of different cultural groups. Thus, the elucidation of the sequence of manufacture for recovered artifacts may allow us to derive better interpretations of artifactual data. One illustration of the utility of this approach is Judge's (1970) study of the relationship between Folsom and Midland points. Judge demonstrates that a possible resolution of the debate over whether these point types are the product of one or two cultural entities probably can be obtained by linking these types to their sequence of manufacture - particularly with regard to the constraints governing the nature of the flake blanks upon which these points were made.

It should be noted that regardless of the theoretical justification for delineating these sequences, in the present study the goal is largely descriptive. The absence of good comparative data and the lack of a temporal sequence for Paleo-Indian industries in the northeast, precludes the attainment of these theoretical ends. However, the presentation of descriptive data on these sequences should allow further research to proceed when these data become available for other sites.

The third goal of this analysis is to determine the initial form(s) of the lithic raw material as it was brought to the sites. As implied above, an attempt will be made to reconstruct as fully as possible the lithic reduction sequence. However, only in rare instances does one find the total sequence practiced at any one locale or site. Rather, this sequence is broken up into portions carried out at different loci. The ways in which this sequence is broken up are, of course, one reflection of the treatment accorded lithic material as a cultural resource, and thus provide important information on the adaptive patterns of the culture involved (Binford and Quimby 1972: 346-347).

The final major goal of this analysis is concerned with delimiting the nature of the activities carried out at a given site. The reasons for pursuing this goal should be self-evident and will not be related in detail at this point. However, it is necessary to expound upon the role of debitage in determining site activities. First, we can note that debitage is usually the most abundant category of material recovered from archaeological sites. In some cases, the paucity of other artifact categories makes the debitage the only material from which good and valid data on site activities can be derived. Frison's (1968) study is one excellent example of this utility (see also Voss 1977).

Second, in cases where the other tool categories are better represented, one can employ the debitage to test hypotheses on site activities suggested by an examination of these other tool categories.

As noted at the beginning of this chapter, archaeologists have begun to explore the limitations of the archaeological record. Specifically, they have become concerned with the relationships between artifacts in their recovered context (i.e. archaeological context) and their position in the context of a functioning cultural system (Schiffer 1972,1976). Binford (1973,1976) has distinguished between curated and expedient lithic technologies. Briefly, curated assemblages are characteristic of cultures which use, maintain and recycle tools over an extended length of time. While one can expect that on any archaeological site some of the activities carried out there will not be represented in terms of artifacts or features, Binford's (1976:347) implication is that under conditions of a curated technology, those artifacts recovered may have no relationship to the relative importance of certain activities carried out at a given site. However, the debitage, as the by-product of the manufacture and rejuvenation of lithic tools at a particular locus (and which, in terms of use-life, has little value) should be of greater reliability in determining site activities (Collins 1975:19).

It should be noted that although the debitage can be used from the above perspectives, it does have some disadvantages in determining the nature of site activities. For example, employing the debitage, we may be able to determine the relative importance of biface versus scraper associated activities but we may not be able to determine activities at a finer level such as the relative importance of fluted versus non-fluted biface manufacture or end versus side scraper alteration.

In summary, four general goals of the analysis have been presented. Attention was given to the theoretical justification for pursuing those goals. In the process of doing so, two concepts relevant to the analysis called stage and step were defined. Also, a simple stage model of lithic reduction sequences was presented and three types of preforms were delimited. The four goals are: (1) to determine the <u>steps</u> involved in the manufacture of lithic tools; (2) to unite the stages and steps into a lithic reduction sequence; (3) to see how the reduction sequence is broken down into segments practiced at different loci; and (4), to explore the nature of site activities.

3

SITE DESCRIPTIONS

PARKHILL SITE

The Parkhill Site was excavated over a three year period beginning in 1973. As previously noted, these excavations were under the direction of Dr. William B. Roosa of the University of Waterloo. Funding for these excavations was provided by the Canada Council. Two published reports on the site are available (Roosa 1977a,1977b). The following description is based on these reports as well as on my own observations at the site.

The site is located near a major bend in the glacial Lake Algonquin shoreline, a few miles west of Parkhill, Ontario (Figs. 1, 2). It consists of a number of widely spaced concentrations of cultural material on rolling land surrounding what is today a small swampy area. A grid of five foot excavation units was laid out over the entire site. Those artifact concentrations which were test-pitted or more fully excavated were termed <u>Grids</u> and assigned sequential letters of identification. In all, excavation units were dug in seven of these grids, labelled A through G. In this study, debitage material from only three of the Grids, referred to as B, C and D1, was examined. These three areas yielded the vast majority of the debitage from the site, almost 6,000 pieces. For the purposes of this study, these Grids will be treated as if they were three separate sites.

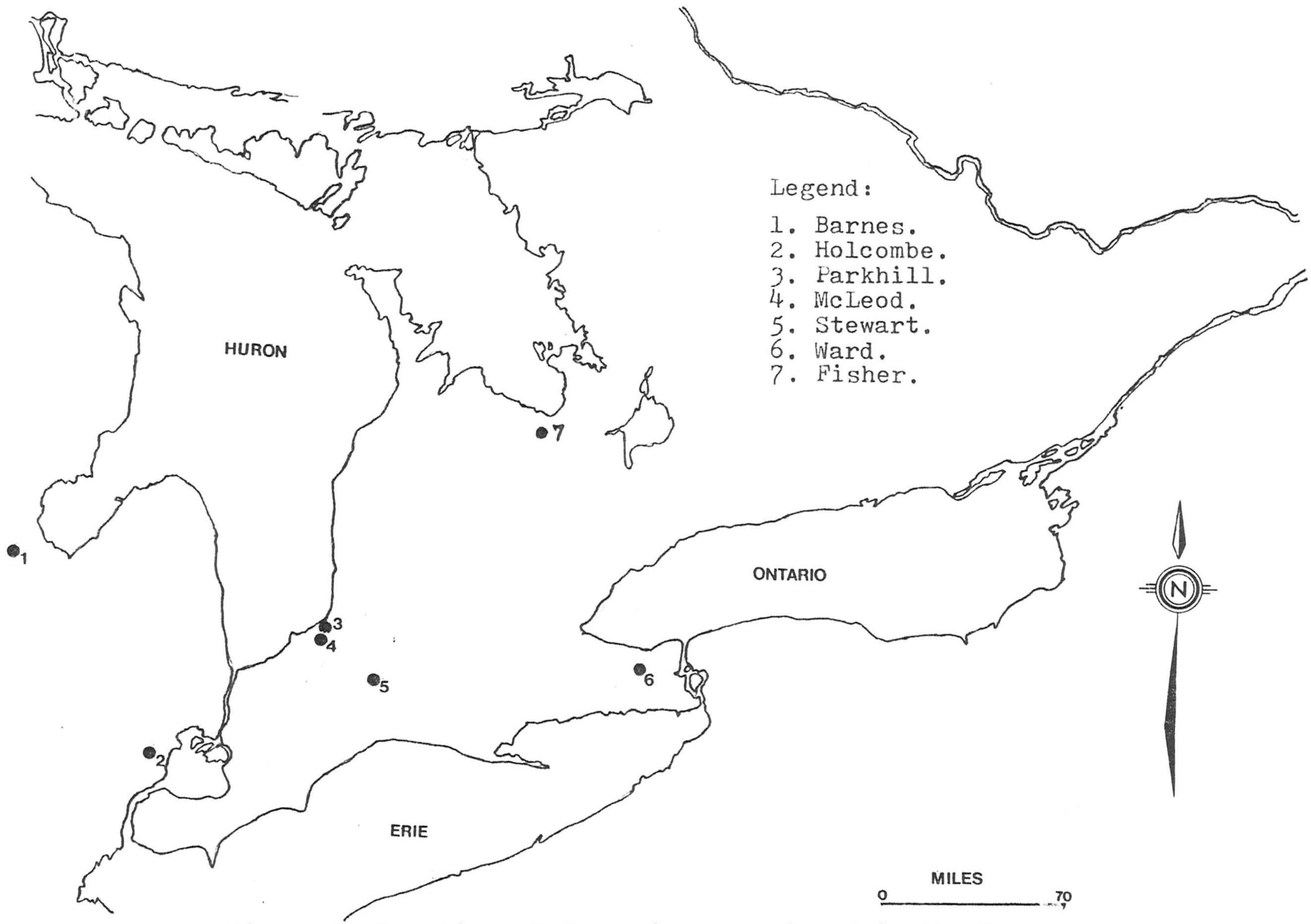


Figure 1. Location of Some Sites Mentioned in the Text.

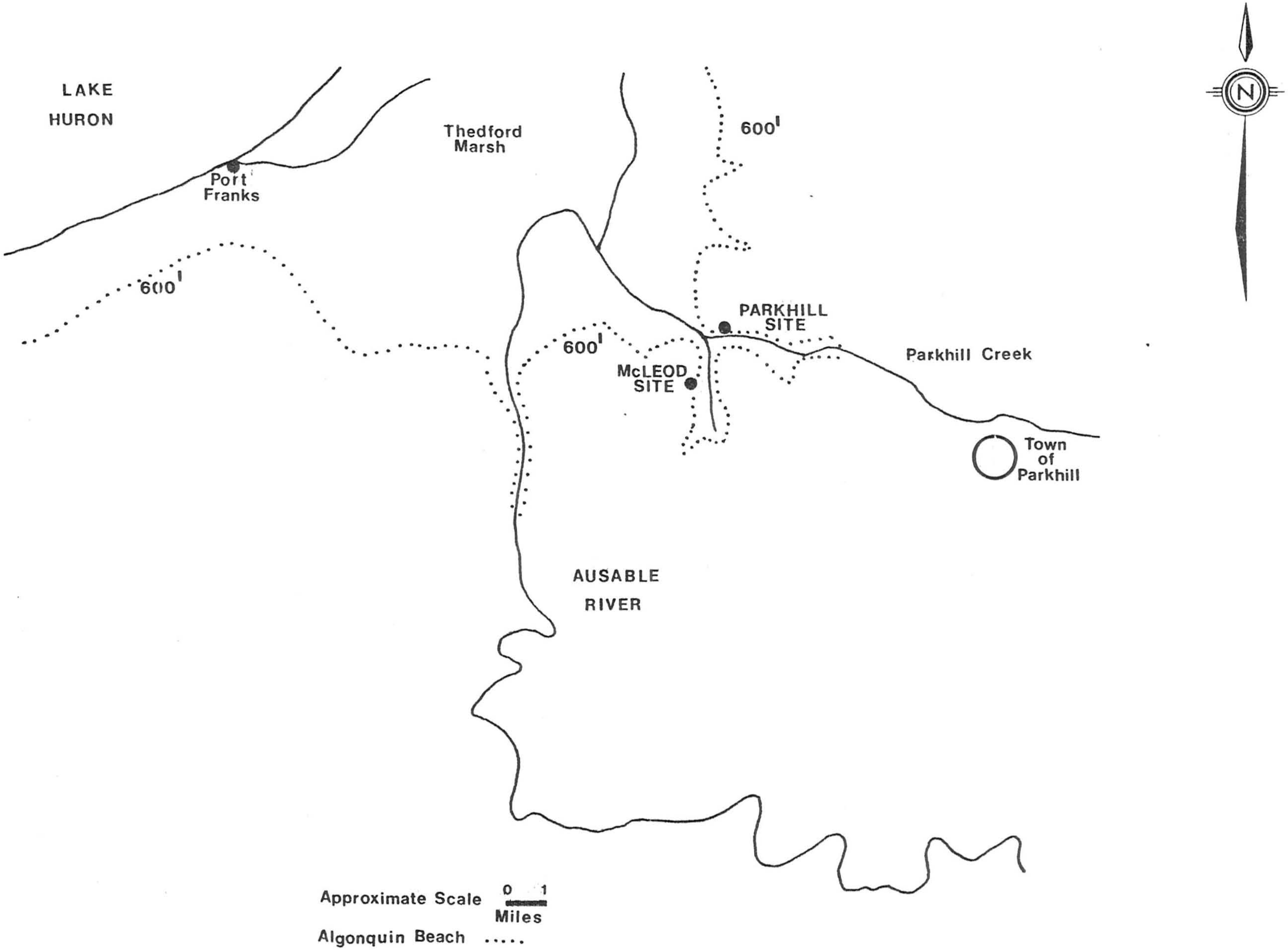


Fig. 2 Location of Sites Examined in Study

Each of these is examined in turn, below.

The Parkhill site has yielded a large number of fluted points, as well as other Paleo-Indian artifacts such as multiple gravers, spurred end scrapers and so on. The fluted points have been assigned by Roosa to the Barnes type (1977a:351; see also Roosa 1965:96-97). In terms of both outline shape and technology, these points closely resemble those from the Barnes site in Michigan (Wright and Roosa 1966; Voss 1977). Roosa (1977b:119) has designated "the cultural complex found at the Barnes and Parkhill sites as the Parkhill complex". Other sites in this complex include the Dobblaar site in Michigan (Roosa 1977a:353), the Hussey and Fisher sites in Ontario (Storck 1978) and the Mcleod site which will be described below. A pollen sample from the Parkhill site suggests an antiquity between 9,750 and 10,750 B.P. This rough dating is supported by numerous technological and artifactual similarities to the Folsom complex of the plains which dates roughly to this period (Roosa 1977a:352).

Three types of <u>identifiable</u> lithic material occur in the Parkhill site assemblage. By far, the dominant chert type is one which has been variously referred to as Amabel (Roosa 1977b:93) or Collingwood (Deller n.d.; William Fox:personal communication) chert. The latter name will be used herein. Mr. Peter Sheppard (personal communication) has recently located extensive sources of this material in the area of the Niagara escarpment, southwest of Collingwood, Ontario. This location is approximately 100-125 miles northeast of the Parkhill site. Mr. Sheppard had samples of this material identified by Dr. B. A. Liberty of Brock University. He identified this material as coming from the Silurian deposits of the Niagara escarpment, specifically from the Fossil Hill formation although some may have come from the lower member of the overlying Amabel formation.

This Collingwood chert was used into historic times by the Petun of the escarpment region. However, in the Parkhill site area, its use was confined to Paleo-Indian cultures, later peoples preferring the Port Franks (Fig. 2) and other cherts which occur in abundance in the immediate area. On the basis of the lithic material distribution, Roosa (1977a:353) has postulated the existence of a social unit which he refers to as a "band", moving back and forth from the Parkhill area to the Collingwood area, perhaps on a seasonal basis. The preference for one lithic material source many miles from the Parkhill site, might suggest that this resource was scheduled for exploitation on a seasonal basis.

The two remaining identifiable lithic materials from the Parkhill site occur in limited amounts and are: (1) Bayport chert from Michigan (see Ozker 1976) and (2) Onondaga chert. The latter originates in the Middle Devonian Clarence member of the Onondaga formation which extends along the north shore of Lake Erie in Ontario, and eastward into New York state (Bill Parkins:personal communication).

All cherts which could not be placed into the above three types were placed into a fourth category of unidentifiable specimens. It is probable that many of these are exotics (i.e they are from sources other than those noted above). However, some of these specimens may be from the first three sources although they are not easily recognized as such.

Grid B

Grid B is located 1000 feet north of the small swampy area between two shallow east-west ridges. Over 2000 square feet was excavated in this area. Peripheral test-pits around the main excavated area were largely sterile and suggest that almost all of the area of Paleo-Indian lithic activity was uncovered. Therefore, we have for study a sample of tools and debitage which should be fully representative of lithic activities at this locus.

Post-depositional disturbance at Grid B was limited to plowing. The majority of the artifacts were recovered from the plowzone but several were in situ in the subsoil. Both 1/4" and 1/8" mesh were employed in screening the soil during excavation. An estimated 10 to 20% of the soil screened was passed through 1/8" mesh. This consisted of the top two-tenths of a foot in the plowzone and a small amount of subsoil. The remainder of the soil screened was passed through 1/4" mesh.

A large sample of fluted bifaces was recovered from Grid B, the majority of which were point bases. Scrapers and other tools are, by contrast, poorly represented. Roosa (1977b:96) has suggested that this is an armament area similar to those located by Judge (1973) in New Mexico Folsom. In order to compare site activities as suggested by the lithic tool collection with those suggested by the debitage, it is necessary to characterize these two artifact categories in similar terms. For our purposes, we can present the tool data simply as the ratio of bifaces to scrapers. At Grid B, this ratio is 9.6 to 1. The distribution of the tools by the lithic material types (excluding debitage) is shown in Table 1.

Table 1. Material Types Among Tool Categories, Grid B.

Category	N	Collingwood N	Collingwood %	Onondaga N	Onondaga %	Bayport N	Bayport %	Unidentifiable N	Unidentifiable %
Bifaces	77	68	88.31	1	1.30	3	3.90	5	6.49
Scrapers	8	8	100.00	-	-	-	-	-	-
Other	1	1	100.00	-	-	-	-	-	-
Totals	86	77	89.53	1	1.16	3	3.49	5	5.80

Grid C

This area is located approximately 750 feet north of the swampy area, separated from it by a shallow east to west ridge. In this area, 1250 square feet was uncovered. Again, peripheral excavation units suggest that almost the total area of Paleo-Indian lithic activities was uncovered. However, it may have extended further on the southwest. The artifact sample should be fully representative of activities carried out at this locus.

As at Grid B, the majority of the artifacts were recovered from the plowzone with only a small number having subsoil provenance. The majority of the soil was screened through 1/4" mesh. 1/8" mesh was used in the top two-tenths of a foot in the plowzone in approximately 66% of the five foot excavation units. Obviously, in relation to Grid B, this will introduce a bias into the size of the individual debitage pieces recovered since 1/8" was used in every square at Grid B.

Besides fluted bifaces and scrapers, gravers (which are absent from Grid B) were recovered from Grid C. The ratio of bifaces to scrapers is 1.9 to 1. The distribution of these tools by the lithic material types is shown in Table 2.

Table 2. Material Types Among Tool Categories, Grid C.

Category	N	Collingwood N	Collingwood %	Onondaga N	Onondaga %	Bayport N	Bayport %	Unidentifiable N	Unidentifiable %
Bifaces	28	23	82.14	1	3.57	2	7.14	2	7.14
Scrapers	15	10	66.67	2	13.33	1	6.67	2	13.33
Other	3	1	33.33	1	33.33	-	-	1	33.33
Totals	46	34	73.91	4	8.70	3	6.52	5	10.87

Grid D

This artifact concentration is located approximately 150 feet east and southeast of the swampy area on a low hill. This area was briefly investigated in 1974 and again, in 1975. The material analyzed herein came from the 1974 excavations and is referred to as D1.

Surface collection indicates that Grid D as a whole was quite extensive. This factor, in conjunction with the large number of artifact classes represented, the artifact variability within those classes and the relative percentage of each class has led Roosa (1977b: 118) to refer to Grid D as a base camp, again following Judge (1973). The ratio of bifaces to scrapers at Grid D is 1 to 1.6.

As previously mentioned, the debitage sample analyzed herein came from Grid D1. Excavation in Grid D1 was limited to only 375 square feet and so, it can not be taken as fully representative of activities at all of Grid D. However, obviously, it can be used to support inferences on activities in the Grid D1 area. Excluding debitage and some "bits and pieces" of Paleo-Indian artifacts, 15 tools were recovered from Grid D1. Almost all of the tools were of Collingwood chert (Table 3) although it should be noted that a small number of Onondaga and Bayport Paleo-Indian scrapers were recovered through surface collection. The ratio of bifaces to scrapers at Grid D1 is 1 to 3.

The largest percentage of the excavated materials came from the subsoil where they were found to underlie Late Archaic materials. However, it appears that the original surface upon which the artifacts were deposited was somewhat irregular so that in some areas, there has been a mixing of Archaic and Paleo-Indian materials by plowing. This is problematical in that some of the Archaic artifacts and presumably the Archaic debitage was of Onondaga chert. Also, the status (i.e cultural affiliation) of the unidentifiable materials is unknown. As a result, I have had to exclude the Onondaga and unidentifiable chert debitage from the analysis. In doing so, it seems that some Paleo-Indian debitage has been excluded from the analysis. This is confirmed by the recovery of one Onondaga channel flake, a diagnostic piece of Paleo-Indian debitage (see Chapter 5 below), from Grid D1. However, this low incidence, as well as the low incidence of Paleo-Indian tools of Onondaga and unidentifiable cherts suggests that very little bias is being introduced into our sample by excluding these lithic materials.

As at Grid B, 1/8" mesh was employed in screening the top two-tenths of a foot in the plowzone, the remainder of the soil generally being passed through 1/4" mesh. However, one complete excavation unit (25 square feet) was excavated completely using 1/8" mesh. This last factor would have an effect on the debitage sample recovered and may partially account for the dense concentration of debitage at this locus. Lastly, we can note that some of the subsoil material appears to have been disturbed by erosional processes (Roosa 1977b:116).

Table 3. Material Types Among Tool Categories, Grid D1.

Category	N	Collingwood		Onondaga		Bayport		Unidentifiable	
		N	%	N	%	N	%	N	%
Bifaces	3	3	100.00	-	-	-	-	-	-
Scrapers	9	8	88.80	-	-	-	-	1	11.20
Other	3	3	100.00	-	-	-	-	-	-
Totals	15	14	93.3	-	-	-	-	1	6.70

McLEOD SITE

The following description is based on Ross (n.d.) and Woodside and Roosa (1976). This site is located approximately one kilometre SSW of the Parkhill site (Figs. 1,2). As such, it is in close proximity to the glacial Lake Algonquin shoreline. It is situated on flat ground, just west of a small creek. This site was test excavated in the summer of 1975 under the direction of Dr. W. B. Roosa.

The excavation procedure followed that at Grid B at the Parkhill site. Five foot square test-pits were dug, all of the soil from the top two-tenths of a foot in the plowzone being passed through 1/8" mesh, the remainder through 1/4" mesh. The majority of the artifacts came from the plowzone.

The test-pits were dug in areas which had yielded surface concentrations of artifacts. In all, 625 square feet was excavated. While this surface area is in excess of that at Grid D1 at the Parkhill site, a much smaller amount of debitage was recovered. To a certain extent, the small size of the debitage sample may reflect sampling error (i.e. concentrations of debitage were missed in the test-pitting). However, in general, the small amount of debitage probably reflects the nature of the activities in the areas tested.

The ratio of bifaces to scrapers at the McLeod site is 1 to 19. The only biface fragment recovered may be a preform fragment. All of the lithic tools recovered, with the exception of a single <u>piece escaillee</u> of Onondaga chert, are of Collingwood chert. Indeed, it was material type which first suggested that the site was Paleo-Indian.

4

DEBITAGE ATTRIBUTES

In order to provide solutions to the goals of the study outlined in chapter two, the debitage collections were sorted into analytically meaningful units referred to as debitage types. The series of debitage specimens within a type exhibit a cluster of attributes which allow placement of those particular specimens into the steps and stages of the lithic reduction sequence. In addition, these types attempt to take into account the class of tool (i.e. biface, uniface) from which a particular specimen was derived. This has a bearing on the nature of the activities carried out at a given locus.

It should be noted that no attempt was made to deduce the techniques used to produce a given piece of debitage and to employ the same in the creation of debitage types as Fitting (1967) does. Examples of techniques are motor habits such as free flaking, flat flaking and resolved flaking (Witthoft 1958:17-19), impactor types such as hard or soft hammer, the way the object is held during flaking and so on. The reason for this is that there is considerable difficulty in defining techniques from the attributes on the debitage (Henry et al 1976; Jelinek 1976:24; Mewhinney 1964). For example, there is some disagreement as to whether Clovis peoples used pressure flaking (compare Jelinek 1971:16, with Bonnichsen 1977:193).

The debitage attributes used to delineate debitage types in this study are of two kinds. First, there are those attributes which previous experimental work has demonstrated are significant in terms of the conclusions I draw from the same. For example, Bordes (1961: 6) has outlined the attributes indicative of a flake's derivation during biface manufacture. Attributes of this type are generally associated with the proximal end of the debitage piece. Second, there are those attributes which I impute to have significance simply because it appears logical within the context of the stage sequence model outlined earlier. For instance, as will be stated more fully below, I find flake size, especially breadth, to be of importance in separating out the products of the thinning-shaping stage from those of the retouching stage. These attributes are generally not associated with the proximal end of the flake.

The particular flake landmarks are shown in Figure 3. The particular attribute states associated with each of these landmarks are discussed below. The attributes associated with particular areas of the debitage specimen are discussed together.

Proximal End

1. Striking Platform.

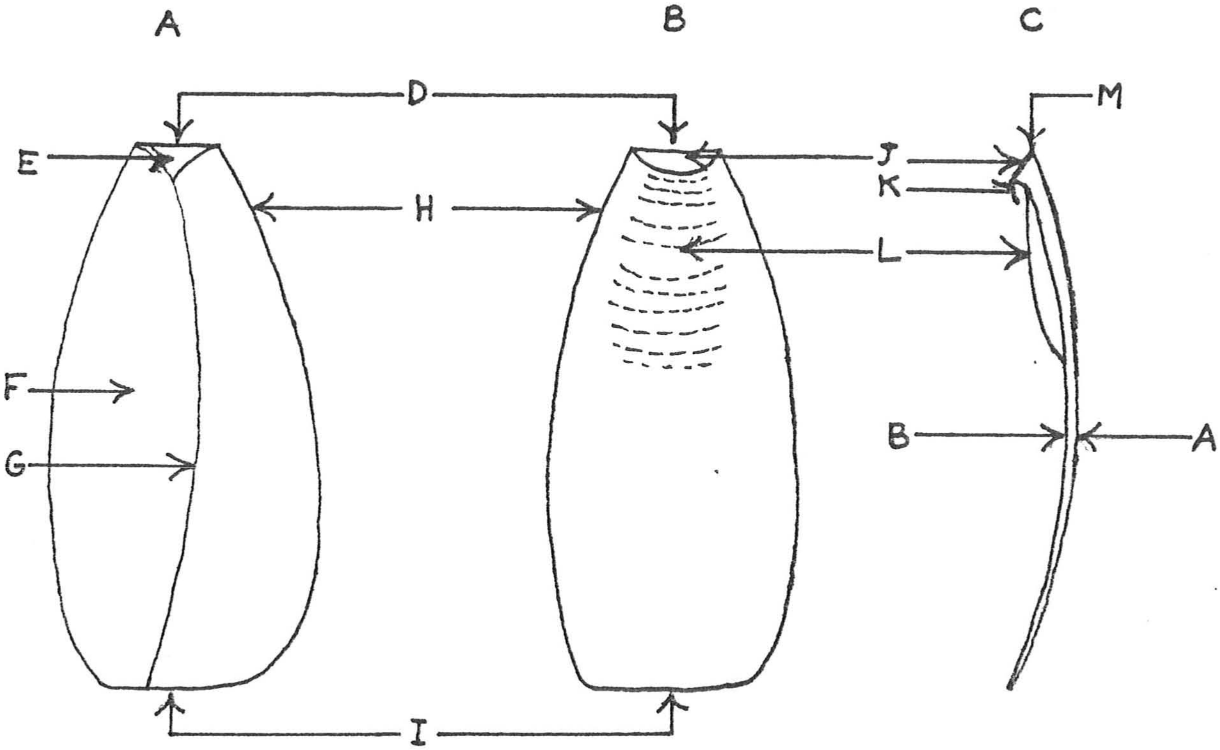
   (i) present.

   (ii) absent.

2. Platform Surface.

The particular attributes of the platform surface were determined by macroscopic and microscopic (up to 20X) examination.

(i) sparse faceting: A small number of facets or portions of flake scars, and the ridges between the same, are visible on the platform surface.



LEGEND:

A. Dorsal Surface
B. Ventral Surface
C. Longitudinal Section
D. Proximal End
E. Delta
F. Dorsal Scar
G. Dorsal Ridge
H. Lateral Edge
I. Distal End
J. Striking Platform Surface
K. Lip
L. Bulb of Force
M. Juncture of Striking Platform and Dorsal Surface

Figure 3. Debitage Landmarks.

(ii) cluttered faceting: A large number of facets are present on the platform surface.

(iii) cortical: The platform surface is the cortex of the lithic raw material.

(iv) plain and flat: The striking platform exhibits no flake scars or cortex and is completely flat.

(v) abraded: The juncture of the platform surface and the dorsal surface of the flake has been abraded. This abrading may be a result of: a) purposeful roughing of the platform surface in order to provide a better 'bite' for the flaking tool (Fitting et al 1966:61); b) purposeful dulling and thus thickening and strengthening of the core/preform edge prior to the flake detachment so that the edge of the core/preform will not collapse during the flake removal (Crabtree 1966:14; Sheets 1973); c) the use of the tool prior to the detachment of the flake (Frison 1968:149-150). This platform surface can occur in conjunction with any of the above attribute states except cortical.

3. Platform Angle.

This angle is that between the platform surface and the dorsal surface of the flake as measured in Figure 5. This angle is somewhat difficult to measure and in most cases was recorded only to within the nearest 5^{o}.

4. Lip (Figure 3).

The presence of a lip formed by the overhang of the striking platform above the bulb of force was noted. This attribute has been widely cited as evidence of soft hammer percussion (Fitting 1967;

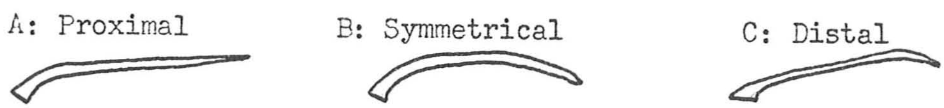


Figure 4. Curvature Placement.

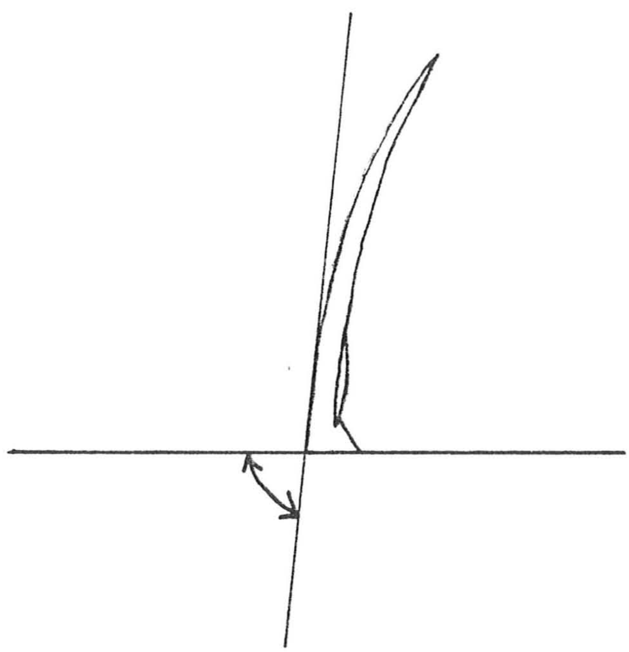


Figure 5. Measurement of Platform Angle.

Jelinek 1966:403; Morlan 1973:17) although a lip can result from hard hammer and soft hammer techniques (Crabtree 1972:74; Henry *et al* 1976). Furthermore, recent experiments by Bonnichsen (1977:165-166) have shown a correlation between lips and the impact angle of the hammer. Thus, it can be noted that the presence of a lip can be related in a general way to the platform angle as outlined above.

(i) present.

(ii) absent.

Dorsal Surface

1. Cortex.

(i) present.

(ii) absent.

2. Dorsal Flake Scar Orientation.

This attribute expresses the orientation of dorsal flake scars as indicative of the direction of previous flake removals.

(i) transverse: The previous flake removals, as evidenced by the scars were at right angles to the longitudinal axis of the flake under examination.

(ii) parallel: The previous flake detachments were roughly parallel to the direction of removal of the flake under examination.

(iii) complex: Specimens which exhibit a complex scar pattern and which could not be forced into the parallel-transverse dichotomy were said to exhibit this attribute state.

3. Dorsal Ridges.

(i) pronounced: The ridges between scars are over 1 mm above the surface of the deepest portion of the flake scar.

(ii) diffuse. The ridges between scars do not project over 1 mm above the flake scar surface.

Ventral Surface

1. Bulb of force.

As Johnson (1977:218) has noted, metric measurements of the projections of the bulbs of force from the ventral surface are difficult to accomplish. Therefore, a subjective measurement was used here.

(i) pronounced: The bulb of force projects markedly above the ventral surface.

(ii) diffuse: The bulb projects inconspicuously above the ventral surface.

(iii) undetectable or flat: The bulb does not project and therefore can not be detected.

2. Other.

(i) undulations.

(ii) errailures or bulbar scars.

(iii) smooth: None of the above two states are present.

Longitudinal Section

1. Curvature.

(i) pronounced.

(ii) moderate.

(iii) little or absent.

2. Curvature Placement.

(i) proximal: There is greater curvature near the proximal end of the flake (Fig. 4a).

(ii) distal: There is greater curvature near the distal end of the flake (Fig. 4c).

(iii) symmetrical: Curvature placement is neither (i) nor (ii), the curvature being gradual and symmetrical (Fig 4b).

Other

1. Flake Size.

Flake size was measured largely by weight in grams. However, in order to provide a visual approximation of flake size, the maximum and minimum length, width and thickness is provided wherever this is possible.

2. Lateral Edge Orientation.

Following White (1963:9), the orientation of the lateral edges to the platform is given. The four attribute states are:

(i) contracting.

(ii) parallel.

(iii) expanding.

(iv) rapidly expanding-parallel (Fig. 9:1-2; 10:1).

3. Outline Form.

(i) symmetrical.

(ii) assymetrical or angular.

4. Twist in the Flake Body.

Any twist in the flake body in relation to the plane of the striking platform was noted (see Geier 1973:12).

(i) present.

(ii) absent.

5

DEBITAGE TYPES

In all, nine debitage types were delineated. These types are described below with reference to their attribute composition. In addition, the significance of each type with regard to the lithic reduction sequence and the type of tool being altered is discussed. This discussion is presented within the context of three general categories of debitage: flakes derived from bifacially worked objects, flakes derived from scrapers (scraper retouch flakes) and debitage derived from other sources.

FLAKES DERIVED FROM BIFACES

Four types of flakes derived during the alteration of bifaces were recognized in the debitage collections: biface thinning flakes, bifacial retouch flakes, channel flakes and biface trimming flakes.

Biface Thinning Flakes

As the term "thinning" implies, these flakes are inferred to have been detached during the thinning-shaping stage of biface manufacture. At the outset, it should be emphasized that they are not the product of the thinning of all bifaces but of a specific "category" of biface which will be referred to herein as "small" bifaces. This designation includes all of the fluted bifaces from the sites and by extension, unfluted bifaces of a similar size and configuration. The distinction between these "small" bifaces and what can be termed "large" bifaces will become clear during the description of this flake type and the biface <u>trimming</u> flake type.

These flakes are quite large in relation to two of the other types derived from bifaces. They range in size from .25 to 1.74 gms with a mean of .65 gms. However, it should be noted that the majority of these flakes exhibit thick abrupt distal ends. In most cases, the specimens with this termination are simply the proximal ends of flakes which collapsed during removal or were broken by subsequent plowing of the site. In a few cases, this termination may be the result of the flake hinging out from the surface of the biface. Presumably, this hinging was unintentional on the part of the flint-knapper. In any event, the massiveness of the striking platform, flake thickness and so on indicate that these fragmentary flakes were originally much larger. Flakes exhibiting abrupt termination weighed as much as .93 grams. However, relatively complete flakes (i.e. with feathered termination) weighed as little as .59 grams.

The incompleteness of some specimens makes it difficult in these cases to document all of the attributes associated with biface thinning flakes, particularly the orientation of the flake scars at the distal end of the flake. Nevertheless, visible attributes of these fragmentary flakes such as the orientation of the lateral edges to the striking platform, and what can be determined about flake curvature, platform preparation, platform angle and flake thickness conform to those complete specimens deemed biface thinning flakes.

Two other aspects of biface thinning flake size should be noted. First, despite the large overall size of these flakes in relation to some of the other debitage types, these flakes are quite thin (1 to 3 mm; mean of 2.4) in relation to their own length and width. Second, the large size of these flakes suggests that they are recovered easily using 1/4" mesh. Thus, we should have virtually every one of these flakes from the excavated portions of the sites.

The biface thinning flakes, as with all flakes derived from bifaces, exhibit an acute angle between the platform surface and the dorsal surface of the flake. This angle ranges from 40 to 55°. The platform surface itself exhibits cluttered facets; that is, flake scars or portions thereof appear on the platform surface. These scars are the result of the removal of previous flakes from that face of the biface opposite that from which the flake under examination was detached. This faceting appears to be the result of true intentional platform preparation. The large number of scars or facets on the platform is incongruous with the general paucity of flake scars on the dorsal surface of the flakes. Presumably, this faceting is a result of the flint-knapper attempting to provide a striking angle or a thicker preform edge, suitable for the detachment of the flake. Additional evidence of intentional platform preparation may be present in the form of abrading on 89.74% of the specimens of this type.

All biface thinning flakes exhibit a lip formed by the overhang of the striking platform above the bulb of force. The outline shape of these flakes is quite symmetrical. In a few instances, these flakes can be characterized as having parallel or perhaps slightly expanding lateral edges. However, in over 93% of the cases, the flake body is quite broad in relation to the striking platform and therefore, they can be easily characterized as expanding. None of these flakes exhibit a twist in the flake body.

Less than 3% of the biface thinning flakes exhibit pronounced dorsal ridges, the vast majority being diffuse. A similar small percentage exhibit cortex. At least six specimens (7.8%) exhibit on part of the dorsal surface what is apparently a portion of the original surface of the flake blank from which the flake was removed (i.e. Fig. 7:2). In passing, we can note that the presence of these last three attributes on a few specimens suggests that a goal of the detachment of the same may have been to remove any remaining bumps or cortex on the surface of the preform.

An examination of the dorsal ridges and the flake scars they encompass, reveals that only 18.18% exhibit a complex scar pattern while the remainder show that previous flake detachments roughly paralleled the direction of removal of the flake under examination. Furthermore, in these latter cases, I would suggest that the previous removals were mostly of flakes exhibiting expanding lateral edges although this is difficult to determine.

On the dorsal surface at the distal end, the distal tips of flake scars which are the product of the removal of previous flakes from the opposite lateral edge of the tool are usually visible (Fig. 7). Near the proximal end, 15.58% of the specimens exhibit hinge fractures on the dorsal surface. These hinge fractures could be the outcome of a failure to detach the flake under examination by earlier "blows" (see Johnson 1977:218-219).

The ventral surface of these flakes all exhibit a diffuse bulb of force. The remainder of the surface is usually smooth but many specimens exhibit diffuse undulations. In longitudinal section, these flakes exhibit moderate to pronounced curvature (Fig. 8) which is symmetrical or slightly distal. Also, in longitudinal section, a ridge at right-angles to the proximal-distal axis is sometimes visible (Fig. 8). This ridge reflects the juncture of flake scars and consequently, previous flake removals, driven off from opposite lateral edges of the preform towards the main longitudinal axis of the same.

There are three attributes of the biface thinning flakes which lead me to believe that they were detached during the thinning-shaping stage. These are: flake size, flake curvature and the presence of dorsal-distal scars showing flake removals from the opposite preform edge.

As noted in the second chapter, the goal of the thinning-shaping stage was to thin the central area of the tool face with only secondary consideration given to outline shape (i.e. the tool edge). I would submit that the large size of these flakes, especially their breadth, indicates that a goal of their detachment was to remove a large portion of the surface area of the tool. The implication here is that the primary concern is with the tool surface rather than the tool edge, and thus, thinning of the tool.

The length of these flakes would suggest also a concern with the thinning of the preform. Specifically, there is evidence to suggest that the flake removal travelled a considerable distance across the preform face. First, we have the presence of dorsal-distal scars. These scars show that there was considerable overlap with thinning flake removals from the opposite lateral edge of the preform. Second, we have the evidence of flake curvature.

As noted above, these flakes exhibit a moderate to pronounced curvature. This curvature is extreme in relation to all of the other flake types derived from bifaces. At least three factors are contributing to this curvature. For one, this curvature is a result of the thickness of the preform in the thinning-shaping stage. The bifacial retouch flakes exhibit little or no curvature (see below) because they were removed from a thinner preform with more acute edge angles. Next, it is a result of the fact that the thinning flake removal "skimmed" the preform surface and thus, more closely approximates the outline of the tool in transverse cross-section. This "skimming" is indicated not only by curvature but also, by the thinness of the flakes and their lack of pronounced dorsal ridges. In effect, these attributes suggest a concerted effort to create and maintain the cross-section (in this case lenticular) of the preform.

Finally, I would submit that the extreme curvature of the biface thinning flakes is also a product of the distance the flake removal travelled across the preform surface. As Figure 6 indicates, there is an increase in flake curvature the greater the distance the

Figure 6. Relationship of flake curvature to length of flake removal.

flake removal travelled over the biface surface. Indeed, on some biface thinning flakes, the flake detachment ran so far over this surface that from the longitudinal curvature and the angle of the striking platform (and assuming a roughly symmetrical transverse cross-section), an estimate of the width of the preform from which the flake was removed is possible. These specimens indicate a width ranging from 25 to 40 mm.

As noted at the beginning of this flake type description, these flakes are inferred to have been produced during the thinning of "small" bifaces, a designation which includes all of the fluted bifaces from the sites examined. The reasons behind this inference are twofold. First, our estimates of the width of the preform from which the flakes were derived (25 to 40 mm) is certainly within the size range we would expect for fluted preforms since the completed points are ca. 20-25 mm in width. Second, the skimming nature of these flakes is noteworthy. This indicates considerable care in maintaining the cross-section (both transverse and longitudinal) and thickness of the tool. As Judge (1973:166) has noted for Folsom, the cross-section of the tool is important in assuring "the success of the flute removal". It is probable that the careful attention to cross-section shown by the thinning flakes in our study is also related to the subsequent fluting of the points.

The removal of a series of broad thinning flakes (i.e. the existence of a thinning-shaping stage) prior to the finishing of the fluted biface is supported by an examination of preforms from a number of fluted point sites in eastern North America. These include:

the Barnes site (Wright and Roosa 1966; Voss 1977), the West Athens Hill site (Funk 1973), the Wells Creek Crater site (Dragoo 1973), the Williamson site (Painter 1974), the Reagan site (Ritchie 1953) and perhaps, the Holcombe site (Fitting et al 1966).

Bifacial Retouch Flakes

The term "bifacial retouch flake" is derived from Bordes (1961:6). However, I am using it in a more restricted sense than Bordes. Presumably, Bordes typology would include those flakes I have placed in the biface thinning, channel flake and biface trimming types.

Bifacial retouch flakes are quite small (.11 gm average) and, in part, this is due to the fragmentary nature of some specimens. However, given the thickness, width and so on of these flakes, they could not have been much larger. Over 88% of these flakes weigh under .2 grams although specimens weighing as much as .39 grams were recovered. Thus, excluding for the moment the fragmentary biface thinning flakes, there is a considerable gap in size on the order of .2 grams between the two flake types. It should be noted that flakes weighing under .2 grams tend to pass through 1/4" mesh and thus, we have only a sample of the bifacial retouch flakes, recovered largely when 1/8" mesh was employed.

The bifacial retouch flakes exhibit a sparsely faceted striking platform. I will avoid referring to this faceting as platform preparation since the facets may be the simple outcome of the knapping of a biface which by definition, is worked on both faces; that is, the facets were not intentionally created on the platform as was the case with biface thinning flakes. In this sense, perhaps the term "pseudo-faceted" (adapted from Honea 1965:28) is more apt.

These flakes exhibit an acute angle between the platform surface and the dorsal surface of the flake. From a subjective visual examination, I suspect that the average angle for these flakes is less than that for the biface thinning flakes as a result of the detachment of the latter from a thicker preform with larger edge angles. However, since the small size of the bifacial retouch flakes makes it difficult to measure this angle exactly, I can neither confirm nor deny this proposition except at a subjective level.

77.8% of these flakes exhibit abraded platforms. 59.4% exhibit a lip formed by the overhang of the striking platform above the bulb of force. None of these flakes exhibit cortex, pronounced dorsal ridges or a twist in the flake body. In outline shape, all are quite symmetrical. It can be noted that there does not seem to be any significant association between the presence of a lip, an abraded platform, lateral edge orientation, etc.

The ventral surface of these flakes is smooth, the bulb of force being diffuse or undetectable. These flakes are quite thin and in logitudinal section exhibit little or no curvature. In some of the cases exhibiting a small amount of curvature, the curvature is distal. This curvature placement suggests that the flake removal went over the longitudinal mid-line of the tool face. Furthermore, it suggests that the biface from which the flake was removed was not entirely lenticular in cross-section. This curvature will deserve more discussion below.

An examination of the dorsal flake scars indicates that previous flake removals paralleled the direction of the flake under examination. In terms of lateral edge orientation, fully 91.1% of these flakes can be characterized as parallel or rapidly expanding-parallel while the remainder are expanding.

I would like to suggest that the largely parallel edge orientation is the result of patterned parallel flaking such as that seen on the finished and unfinished bifaces. 32.28% of the largely parallel-sided flakes can be definitely attributed to this flaking pattern. These flakes exhibit on the dorsal surface one or rarely, two ridges exactly paralleling the long axis of the flake. This suggests that previous flake detachments were of flakes with parallel lateral edges. A number of pairs of overlapping bifacial retouch flakes of this nature which are clearly the product of patterned parallel flaking were recovered (Fig. 9). In cases where one or both of the adjoining flakes were of the rapidly expanding-parallel variety, the effect is to leave a small "delta" (Roosa 1968:131) on the surface of the tool or on the surface of subsequent flake removals from the same area of the tool face (Fig. 3). It can be noted that the presence of one or two well centered parallel ridges on the dorsal surface of these flakes suggests that the flake detachments were designed to encompass the ridge(s). This ridge(s) would serve as a spine to guide the flake removal.

The remaining 67.72% of the parallel-sided flakes, despite the fact that the dorsal ridges do not exactly parallel the long axis, also could be the result of patterned parallel flaking. We would expect an absence of exactly parallel ridges on flakes which represent the transition from non-parallel (but not necessarily non-patterned) to parallel patterned flake removals; on flakes from areas of the tool such as the tip where adjoining flakes can not be detached exactly parallel to each other; on flakes derived from resharpening; and as a result of the ability of the flint-knapper to control flake removals and spacing. However, given the nature of these data, it is difficult to test these hypotheses.

If we accept all of these parallel-sided flakes or the majority thereof as a product of parallel flaking, then given that parallel-sided flakes constitute the vast majority of the bifacial retouch flakes, we must conclude that almost all of the retouching stage was accomplished by this method.

The bifacial retouch flakes with expanding edges may be also a result of patterned flaking. They could also represent the transition from thinning-shaping to the retouch stage or they could be flakes of tool rejuvenation. However, I have no proof or tests for these hypotheses.

Finally, with regard to the flake description, it must be noted that 9.8% of all the bifacial retouch flakes exhibit flake scars at the distal end indicating that there was overlap in the central face of the tool with flake removals from the opposite lateral edge of the same. However, these scars are short (ca. 1 to 2 mm) indicating that there was little overlap. 82.9% of the flakes with distal scars exhibit parallel or rapidly expanding-parallel lateral edges. All of the flakes exhibiting the distal curvature noted earlier also show the scars. However, the reverse (i.e. those exhibiting scars also exhibit distal curvature) does not hold.

The assignment of these flakes to the bifacial retouch type and as a product of the retouching stage is based mainly on flake size. I am impressed with the small size of these flakes, especially width, which is always less than 12 mm. This small size suggests a minor concern with removing surface areas of the tool and emphasizes a major concern with a fine shaping of the tool edge. The thinning of the central face is viewed here as being of secondary consideration. In many cases, a major concern with a fine shaping of the biface edge is demonstrated by attributes suggesting patterned parallel flaking.

Finally, with reference to the bifacial retouch flakes, some mention must be made of the presence of flakes of rejuvenation within this type. These flakes are not easy to separate out from those derived from the context of manufacture. Frison (1968:149-150) notes what he refers to as a dulled edge on biface resharpening flakes which he interprets to be a result of use although he cautions:

> One of the major problems...appears to be a means of distinguishing between wear produced deliberately and that resulting from use.

It can be noted that in Frison's (1968) study, his interpretation of these flakes as a product of rejuvenation was greatly aided by the context of the recovered material (i.e. a kill and butchering site as opposed to a manufacturing site).

On the sites examined in the present study, a number of biface flakes exhibit a dulled or as it is phrased here, abraded edge. However, even after careful examination, I can not decide whether this dulled edge is a result of use or of intentional platform preparation such as grinding. Furthermore, the context of the material with which I deal (i.e. lithic manufacturing as well as rejuvenation) provides no aid to interpretation.

I would submit that in some cases, even if we accept certain attributes such as an abraded edge as evidence of use, those flakes exhibiting this use may not be rejuvenation flakes. For example, Judge (1973:191) found that Folsom preforms were used as knives before being modified to use as projectiles. A preform from the Ward site (Fig. 23; Ellis 1979), extends this practice into the northeast (see also Funk 1973:16-19). The debitage produced by modifying these preform knives into projectile points may exhibit evidence of use and still be the result of manufacture.

The reverse can also exist; that is, flakes exhibiting no evidence of use can be the result of tool rejuvenation. For example, if a certain biface is used as a projectile, the tip is snapped off and a new tip chipped into place, the bifacial retouch flakes from this rejuvenation would not differ from those of manufacture. In sum, given the above considerations, it is extremely difficult to distinguish flakes of rejuvenation from flakes of manufacture and so, no concerted effort was made to do so.

Channel Flakes

Channel flakes are a specialized form of flake removed during the fluting of bifaces. They can be characterized as long thin flakes with rapidly expanding-parallel edges (Fig. 10). However, some slightly expanding specimens were recovered (Fig. 10:4). They are plano-convex in transverse cross-section and show almost no curvature in longitudinal section. In the cases where curvature is present, it is restricted to the proximal end of the flake, immediately adjacent to the bulb of force. In respect to this curvature placement, they differ from the other flake types derived from bifaces. This is a result of their being removed from the thicker base of the biface rather than the thin lateral edges as is the case with the other flakes. During flute removal, the channel flake usually breaks (collapses) at this point of curvature; a point where the fluting "blow" is directed away from the main axis of the point. As a result, the proximal ends of channel flakes are almost all under 10 to 15 mm in length. This feature makes the proximal ends difficult to recover using 1/4" mesh.

A defining characteristic of channel flakes is a dorsal surface exhibiting flake scars at right-angles (i.e. transverse) to the proximal-distal axis. Of course, this criterion is violated in the case of guide flake removals (see below) and in instances of multiple flutings. The ventral surface is smooth, having a diffuse or undetectable bulb of force. All channel flake proximal ends exhibit a lip and platform preparation in the form of abrading and intentional (as opposed to pseudo) faceting. The abrading is apparently a method for thickening and thus strengthening the edge which is to receive the detaching "blow" although it may have been also a method for shaping the basal nipple or striking platform. The faceting is the result of the bevelling of the base of the preform to provide a striking platform of an angle suitable for fluting. A sample of 22 channel flakes with platforms exhibited an angle between 45 and 65°.

Two other aspects of channel flakes relative to the proximal end can be mentioned. First, a large number of specimens were placed in the channel flake type which lack platforms (i.e. they are medial and distal fragments). This contrasts with the flakes placed in the other types derived from bifaces which include only specimens which possess platforms. Second, the use of a basal nipple as a striking platform results in a rounded or pointed outline to the juncture of the dorsal surface and the platform surface. This contrasts with the flat outline seen on the other flakes derived from bifaces.

None of the channel flakes exhibit cortex, pronounced dorsal ridges or a twist in the flake body.

A very few guide flakes (Wright and Roosa 1966:854) were recognized in the debitage collections and they were included in the channel flake type. They are identical to channel flakes but they are quite small and lack the elaborate platform preparation. In fact, their removal is related to preparing the preform base for the channel flake removal. Their detachment probably served a dual function. First, they helped to isolate a basal nipple which served as a striking platform for the channel flake removal. Second, the exterior lateral edges (in relation to the closest lateral preform edge) of the guide flake scar may have served to guide the channel flake removal by determining its width and isolating it from the lateral edges of the preform (Roosa 1968:13).

The guide flake removal should not be confused with guide flutes or primary fluting. These flakes are very small, being under 5 mm in width, 10 mm in length and 1 mm in thickness.

Evidence that the guide flake removal was a commonly used technique is found when the dorsal surface of the proximal end of the channel flakes is examined. Almost all of these flakes exhibit parts of two small guide flake scars paralleling the longitudinal axis (Fig. 10:1). The guide flake removal leads to the familiar rapidly expanding-parallel shape of channel flake lateral edges.

An attempt was made to match channel flakes to the flutes on the bifaces. The benefits of this matching process include: information on technological aspects of Paleo-Indian lithics, especially by the matching of fluted preforms and channel flakes; information on historical variables such as the length of occupation and the temporal ordering of sites; and the elucidation of data on other cultural variables such as "band structure, site utilization and activity loci" (Judge 1973:208).

Mention must be made of the placement of the channel flake removal in the lithic reduction sequence. An examination of preforms indicates that fluting occured after patterned parallel flake removals had begun. The finished points indicate that this pattern continued after fluting. In other words, fluting occured somewhere in the middle of the retouching stage. The exact function of fluting has been much debated. However, the general concensus is that it is related to hafting of the point. Since the function of fluting can be generally taken as thinning of the tool for hafting purposes, this concern with thinning in the retouching stage does not readily fit into the stage sequence model.

Biface Trimming Flakes

The final type of flake derived during the alteration of bifacial objects is referred to herein as biface trimming flakes. These flakes appear similar to those deemed biface thinning flakes, notably in size, platform surface, platform angle and lateral edge orientation. However, despite these general similarities, they are easily distinguishable.

In overall size, these flakes are quite large, ranging from .3 grams to 1.56 grams with a mean of .90 grams. The smallest complete specimen weighs 1.09 gms. Given the large size of these flakes, we should have recovered virtually every specimen of the type from the excavated portions of the sites. It can be noted that these flakes are, on the average, thicker than biface thinning flakes, ranging from 2.5 to 4 mm with a mean of 3 mm.

The striking platform exhibits sparse, probably "pseudo" faceting and heavy abrading. In a few cases, battering is shown as well. The platforms are quite massive, especially with respect to width. 45.5% of the available specimens provide evidence that the edge of the object from which the flake was detached was quite sinuous (Fig. 12). A lip is present on over 90% of the specimens. The platform forms an angle ranging from 50 to 65° with the dorsal surface of the flake.

The dorsal surface exhibits flake scars which indicate that previous flake removals paralleled the direction of removal of the flake under examination. At least one pronounced dorsal ridge is found on 81.8% of the specimens. No cortex was noted. Only one (9.1%) of these flakes exhibited dorsal-distal scars showing flake removals from the opposite lateral edge of the tool. The overlap in this case was only 2.5 mm.

The ventral surface is free of undulations or bulbar scars. The bulb of force is diffuse to pronounced. These flakes are quite symmetrical in outline, 81.8% exhibiting expanding lateral edges, the remainder being of the rapidly expanding-parallel variety. 27.3% exhibit a twist in the flake body (Fig. 12). In longitudinal section, these flakes show little or no curvature (Fig. 13).

The origin of these flakes is not totally clear and their interpretation is dependent upon the context of their recovery (i.e. their association with other artifactual materials). Four possible sources for these flakes are discussed below.

First, as previously stated, a number of Paleo-Indian sites provide evidence of the use of bifacially worked lenticular cores exhibiting ground edges. These include: the Debert site (MacDonald 1968:65), the Barnes site (Wright and Roosa 1966), perhaps the Shoop, Bull Brook and Holcombe sites (all Roosa 1968) and the Folsom complex (Roosa 1968). Scrapers with faceted ground platforms are found in the Parkhill site collections, and therefore we have evidence for the use of this core form in our own study. It is possible that the biface trimming flakes are simply flakes derived during the trimming of this type of core. However, the dorsal scars are not nearly as pronounced as one would expect from the working of such a core.

Second, some of the fragmentary flakes in our collection may be the snapped off proximal ends of tools such as the scrapers mentioned above. However, most of the fragmentary specimens lack the very pronounced scars found on the scrapers and appear to have been made from much smaller flakes than those on which the scrapers were made.

The third possible explanation for the origin of these flakes is related to the thinning-shaping stage of "small" biface manufacture. As noted earlier, the biface thinning flakes are thin, lack pronounced dorsal scars and show a relatively pronounced curvature. These attributes suggest that their removal "skimmed" the surface of the preform, probably in an attempt to maintain the lenticular transverse cross-section of the biface being worked. In contrast, the biface trimming flakes are somewhat thicker, exhibit more pronounced dorsal ridges and show little curvature, suggesting that their removal did not "skim" the surface of the biface to the extent of the biface thinning flakes (i.e. the trimming flakes left deeper scars). Given this consideration, we can suggest that the biface trimming flakes represent an earlier <u>step</u> in the thinning-shaping stage of biface manufacture in which the fine concern with the cross-section is not yet important. However, it should be noted that two of the biface <u>thinning</u> flakes exhibit dorsal cortex and an additional six specimens show what is apparently a portion of the original surfaces of the flake blank upon which the biface was made. If the trimming flakes were earlier in the sequence of manufacture, we would expect some of them to exhibit these attributes but this is not the case.

Finally, rather than representing two sequential steps in the manufacture of a "small" bifacial tool form, the biface trimming and biface thinning flakes may stem from the alteration of two different "types" of bifacial tools. Presumably, if this is the case, the creation and maintenance of the cross-sections of the tool is not important to the manufacture and employment of the tools from which the trimming flakes were derived.

I find this last alternative to be the most satisfying explanation. For one, it would explain the lack of cortex, etc. found on these flakes. Second, as just noted, the lack of curvature on the trimming flakes is probably partially a result of their thickness. On the other hand, I would submit that this lack of curvature is largely the product of the short distance the flake removal travelled across the tool face. The general lack of dorsal-distal scars on the trimming flakes indicating removals from the opposite lateral edge of the tool would support this contention.

Granting that the trimming flake removals travelled a relatively short distance over the biface surface, it becomes increasingly clear that they were removed from extremely wide thick tools as can be readily envisioned from the longitudinal section of two such flakes shown in Figure 13. It is difficult to estimate the size of the bifaces from which these flakes were removed. None of the flakes apparently crossed very far over the longitudinal mid-line of the biface surface during their detachment. However, one specimen from Grid D1 (Fig. 13:lower) is from a biface estimated to have been in excess of 60 mm wide. I would like to suggest that the biface trimming flakes may be the product of the alteration of "large" bifacial tools such as those that are sometimes recovered from Paleo-Indian sites (Dragoo 1973:16-20; Kraft 1977:265; MacDonald 1968:175; Storck 1978:6). It can be mentioned that most of these tools are probably made on an "exhausted" bifacial core of the type noted above.

If this fourth alternative is accepted, it remains to determine whether these flakes are a product of the thinning-shaping or retouching stage of "large" bifacial tool manufacture. This is difficult to accomplish. The large striking platforms, the presence of pronounced dorsal scars, the evidence of a sinuous tool edge and the frequent twist in the flake body might suggest a rough shaping of the tool and thus, the thinning-shaping stage. However, it should be realized that large tools of this type might not exhibit the fine retouching such as that evidenced on the small bifaces. Therefore, we might expect that the flakes from the retouching of such tools would exhibit a fairly "rough" morphology. On the other hand, the large bifaces from other sites do exhibit some fine retouch scars. In sum, the resolution of this problem requires a good sample of bifaces of this type or a good series of debitage which can be definitely attributed to this type of tool. Until this sample is available, this must remain an open question.

FLAKES DERIVED FROM SCRAPERS

Flakes derived during the rejuvenation and perhaps manufacture of unifacial scraping tools were first recognized in North American lithic industries by Witthoft (1952:474). In ensuing years, a number of studies of these materials have appeared in the North American literature (i.e. Frison 1968, 1974; Jelinek 1966; Shafer 1970). These studies have noted three methods of altering scraper edges in order to produce a working edge suitable for the use of the tool.

The first method consists of the direction of essentially burin blows to the side of the working edge of the tool (Shafer 1970: 481-484), resulting in a flake removal across this edge. An examination of the scrapers and the debitage from the sites in this study has not yielded evidence of this method. However, it can be noted that this method occurs on the Bull Brook site (Jordan 1960:100-102, cited in Roosa 1968:135). This may indicate a significant difference between the lithic industries at the Bull Brook site and the sites examined in this study.

The second method is the direction of blows straight on the working face of the tool (Frison 1968:150; Shafer 1970), the ensuing debitage specimens having a dorsal surface approximating the flat underside of the tool while the platform of the flake is a fragment of the old working edge of the tool. Frison hypothesizes that this method is intended to maintain the cross-section of the tool in a form suitable for its efficient use. Only three flakes which are possibly the result of this method were recovered from the sites examined herein. Given the questionable nature of their origin, and the fact that only three specimens were noted, these particular flakes were placed into the "other" flake type which is simply a residual category of problematical specimens. They are discussed in that context.

The final method of altering scraper edges consists of the removal of flakes by force directed against the flat ventral face and up across the intended or actual working face of the tool. With the three possible exceptions noted above, all of the debitage derived during the alteration of scrapers in the present study is a product of this method.

In dealing with materials from a late prehistoric site in Wyoming, clear-cut distinctions between the working edge morphology of end and side scrapers allowed Frison (1968) to make a distinction between flakes derived from end scrapers and those derived from side scrapers. However, in our study, there is in many cases no clear distinction between the working edges of some side scrapers and those of some end scrapers. As a result, no attempt was made to delimit the by-products of each and all the scraper retouch flakes produced by the third method noted above, were placed into one type.

Scraper Retouch Flakes

The flakes in this type weighed an average of .15 grams although specimens weighing as much as .80 grams were encountered. The small size of the majority of these flakes suggests that they would pass through 1/4" mesh and so, we have only a sample.

The striking platform, with the exception of one cortical specimen, is plain and flat and approximates the flat unmodified ventral face of the tool against which the "blows" of detachment were directed. The platform surface forms an angle with the dorsal surface ranging from 25 to 90°. Only 16.3% of the specimens exhibit a lip and these are largely those flakes exhibiting the more acute platform angles. The platform surface is generally small. However, this is violated in the case of specimens exhibiting a lip because the platform is extended above the bulb of force.

The dorsal surface of these flakes exhibit flake scars which indicate that previous flake removals paralleled the direction of the flake under examination. The ridges between scars are always diffuse. The dorsal surface of these flakes, adjacent to the proximal end, is a portion of the old working surface or bevelled edge of the tool. 85.6% of these flakes exhibit what can be termed a scalar or "demi-quina" effect on this area (Figs. 14,15) while 8.45% show an abraded or dulled or rounded juncture of the dorsal surface and the platform edge in addition to this scalar retouch. These two attributes probably reflect the use of the tool prior to the detachment of the flake. The remaining 5.95% of these flakes exhibit neither the scalar retouch nor the abraded edge-scalar retouch combination.

The presence of a small number of specimens exhibiting no possible evidence of pre-detachment use could indicate scraper manufacture (i.e. the initial bevelling of flake blanks). We might also suggest that some of these flakes were removed from marginal sections (i.e. sections bevelled but not directly employed) of the working edge of the tool. In this case, their detachment may have been an attempt to maintain an efficient outline shape for the working edge. Such alteration would be necessary in the face of edge breakage and differential wear.

The bulb of force varies from undetectable to pronounced, and bulbar scars are sometimes visible. The remainder of the surface is smooth. These flakes are symmetrical in outline and in a very few cases, exhibit a slight twist in the flake body. Less than 1% of the these flakes possess cortex (excluding the cortical platform) and this is confined to what can be termed the "back" of the tool (see below).

On the basis of the distal attributes of these flakes, three varieties are distinguishable within the type. The first variety includes that 59.15% of the specimens which exhibit a distal morphology indicating the flake detachment feathered out through the back of the scraping tool. A "ridge" at right-angles to the longitudinal axis of the flake is visible on the dorsal surface near the distal end. This ridge approximates the juncture of the bevelled face and the dorsal surface (or back) of the flake blank upon which the uniface was made. In longitudinal section, those specimens exhibiting a right-angled platform (i.e. from steeply retouched tools) show these two surfaces meeting at almost right-angles, reflecting the steep nature of the retouched tool edge (Fig. 17). As the platform angle becomes more acute, the juncture of these two surfaces becomes less distinct.

These flakes are generally quite thick with the exception of some of those with acute edge angles. All of the flakes in this variety exhibit a moderate to pronounced curvature which is symmetrical or slightly distal.

The second variety encompasses that 26.76% of the flakes which feathered out through the working face or bevelled edge of the tool. In effect, the distal ridge found on the first variety is absent. These flakes are smaller than the first variety (.12 grams as opposed to .18 grams average), being generally thinner and shorter than the same. Flakes in this second variety exhibit a small to moderate amount of symmetrical curvature.

The remaining 14.09% of this type includes specimens with abrupt distal ends. Apparently, these flakes hinged rather than feathered out although the possibility of collapse during removal or by post-detachment factors exists. It should be also noted that some of the flakes in this variety, especially the smaller specimens, may not have been detached by purposeful "blows" but may have hinged out through use of the tool from which they were derived.

Finally, with regard to this type as a whole, we can mention that several overlapping sets of flakes derived during the alteration of scraper edges were recovered (Figs. 14, 15). In addition, some were found which fit onto the scars on scrapers (Figs. 19, 20).

DEBITAGE DERIVED FROM OTHER SOURCES

Core Trimming Flakes

These flakes are relatively large, ranging from .25 grams for an incomplete specimen, to 1.81 grams with a mean of .63 grams. The large size suggests that they are easily recovered using 1/4" mesh. The angle between the platform surface and the dorsal surface of the flake ranges from 60 to 95^{o}. The platform surface is usually plain and flat (93.75%) but one cortical specimen was noted. None of the specimens show abraded platforms and only three show a lip (18.75%).

The vast majority of these flakes (81.25%) exhibit pronounced dorsal ridges. One specimen (6.25%) had a partially cortical dorsal surface. The orientation of the dorsal scars is split evenly between the parallel and complex varieties. The bulb of force is moderate to pronounced and often exhibits a bulbar scar. In longitudinal section, 81.25% show little or no curvature while the remainder possess moderate curvature. 50% exhibit parallel lateral edges while 43.75% are expanding and 6.25% contracting. 31.25% exhibit a twist in the flake body.

These flakes are certainly not from bifacially worked objects given their right-angled and flat platforms. Neither are they scraper retouch flakes because of their size and generally, their pronounced dorsal ridges, lack of curvature and complex dorsal scar patterns. I would suggest that these attributes indicate an origin in the stages of primary and secondary flaking. Their exact placement in one or the other of these two stages can not be easily determined. Since core alteration is a component of both these stages, I have adopted the term core trimming flake.

Flat Flakes

The term "flat flake" is derived from DeVissher et al (1970: 20). This type includes a large number of specimens which vary considerably in terms of size, lateral edge orientation, dorsal flake scars, curvature, etc. The main unifying features of these flakes are: the absence of striking platforms due to collapse during removal or by subsequent post-detachment disturbances; and their general thinness in relation to overall flake size. In all probability, these are the distal and medial portions of the previously defined types (with the exception of channel flakes whose distal portions were included along with the other flakes of the type).

The materials in the flat flake type were divided into three arbitrary weight categories: those under .2 gms, those between .2 and .4 gms and those weighing over .4 gms. The reasons for creating these divisions was simply to give some idea of the size of these flakes in relation to the other types recovered from the sites under examination.

Shatter

This type includes thick, angular specimens lacking striking platforms and developed bulbs of percussion. They are too thick to be the distal portions of any of the preceeding types, and their angular or assymmetrical outline is unique to this type. Apparently the lack of platforms on this type is not the result of post-detachment collapse or breakage of the specimens. The term "shatter" is derived from Binford and Quimby (1972:347,364). They postulated that these materials resulted from the "heavy percussion techniques" employed in the early stages of the lithic material reduction.

Other

This "type" is, in fact, a residual category designed to encompass those materials which do not easily fit into any of the above types. The number of specimens in this type is very small and so, individual pieces can be discussed in detail.

SUMMARY

In sum, the nine debitage types have been defined. In order that the contrasts between the types can be easily assessed, the data on each type is presented in Table 4. It must be noted that this table glosses over some of the nuances of the type classification, such as the distinction between "pseudo" and intentional faceting or the presence of dorsal-distal scars. In addition, the variability in some attribute states is ignored in favour of a more concise presentation. Nevertheless, despite these shortcomings, this table clearly points out the major contrasts between the various types.

With the type descriptions completed, we can proceed to examine the debitage materials from each of the sites.

Table 4. Debitage type attributes.

Debitage Type	Striking Platform	Platform Surface	Platform Angle	Lip	Dorsal Ridges
Biface Thinning	Present	Cluttered Faceted & Abraded	40 to 55°	Present	Diffuse*
Bifacial Retouch	Present	Sparse Faceted & Abraded*	Acute	Present*	Diffuse
Channel Flakes	Absent*	Sparse Faceted & Abraded	45 to 65°	Present	Diffuse
Biface Trimming	Present	Sparse Faceted & Abraded*	50 to 65°	Present*	Pronounced*
Scraper Retouch	Present	Plain & Flat	25 to 90°	Absent*	Diffuse
Core Trimming	Present	Plain & Flat	60 to 95°	Absent*	Pronounced*
Flat Flakes	Absent	N/A	N/A	N/A	Diffuse*
Shatter	Absent	N/A	N/A	N/A	Pronounced?*

*indicates stated attribute state is dominant but not absolute.

N/A: not applicable.

Table 4. (continued)

Debitage Type	Dorsal Scar Orientation	Cortex	Outline	Lateral Edge Orientation
Biface Thinning	Parallel & Complex	Rare	Symmetrical	Expanding*
Bifacial Retouch	Parallel	Absent	Symmetrical	Roughly Parallel***
Channel Flakes	Transverse	Absent	Symmetrical	Roughly Parallel**
Biface Trimming	Parallel	Absent	Symmetrical	Expanding*
Scraper Retouch	Parallel	Rare	Symmetrical	N/A
Core Trimming	Parallel & Complex	Rare	Symmetrical	Varies
Flat Flakes	Varies	Rare	Symmetrical	N/A
Shatter	N/A	Absent	Angular	N/A

*indicates stated attribute is dominant but not absolute.
**combines parallel & rapidly expanding-parallel attribute states.
***combines parallel & rapidly expanding-parallel attribute states and indicates stated attribute state is dominant but not absolute.
N/A: not applicable.

Table 4. (continued)

Debitage Type	Bulb of Force	Other: Ventral Surface	Curvature	Curvature Placement
Biface Thinning	Diffuse or Undetectable	Smooth or Undulations	Moderate to Pronounced	Symmetrical
Bifacial Retouch	Diffuse or Undetectable	Smooth	Little or None	Distal*
Channel Flakes	Diffuse	Smooth	Little or None	Proximal*
Biface Trimming	Diffuse to Moderate	Smooth	Little or None	N/A
Scraper Retouch	Diffuse to Pronounced	Smooth	Small to Pronounced	Symmetrical*
Core Trimming	Moderate to Pronounced	Smooth* & Bulbar Scars**	Small to Moderate	N/A
Flat Flakes	N/A	Smooth*	Varies	N/A
Shatter	N/A	N/A	Varies	N/A

*indicates stated attribute state is dominant but not absolute.
**indicates stated attribute is present but rare.
N/A: not applicable.

Table 4. (continued)

Debitage Type	Twist in Flake Body	Mean Weight (gms)	Thickness	Size (mm) Length	Width
Biface Thinning	Absent	.65	1 - 3	18 - 39	15 - 27
Bifacial Retouch	Absent	.11	.5 - 2	? - 16	3 - 12
Channel Flakes	Absent	.30	1 - 3.5	5 - 39	7 - 18
Biface Trimming	Present*	.90	2.5 - 4	24 - 34	16 - 25
Scraper Retouch	Rare	.15	1 - 5	5 - 15	5 - 13
Core Trimming	Present*	.63	-	-	-
Flat Flakes	N/A	.08	-	-	-
Shatter	N/A	.66	-	-	-

*stated attribute is not dominant but makes up a significant percentage.

N/A: not applicable.

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PARKHILL SITE: GRID B

The 3011 pieces of Paleo-Indian debitage recovered from Grid B at the Parkhill site were sorted into the previously defined flake types. The number of specimens in each type, as well as their size as measured by weight, is given in Table 5. The distribution of the flat flake type by arbitrary weight categories is shown in Table 6.

One noteworthy aspect of the debitage collection from Grid B is the uniformly small size of individual specimens. Indeed, 86.5% of those flakes recovered weighed under .2 grams each. Furthermore, we can note that if 1/8" mesh had been used at all depths, this percentage would have been even larger.

The uniformly small size of the debitage pieces at Grid B could be taken as general evidence for the dominance of tool maintenance, as opposed to manufacture, at this locus. However, the fact that there is a debitage to tool ratio of 35 to 1, and the presence of a large number of flakes which must be the product of manufacture (i.e. channel flakes) makes this assumption tenuous. As will be argued later in this chapter, the small size of the debitage specimens can be more profitably explained as a product of the restricted nature of the lithic reduction sequence at Grid B.

Table 7 gives the relative percentages of the various material types among the debitage. These percentages generally correspond to the totals derived from an examination of the other artifact categories

Table 5. Debitage types and frequencies, Grid B.

Type	N	% of N	Wt.(Gms)	% of Wt.	Mean Wt.
Biface Thinning	45	1.49	27.90	8.57	.62
Bifacial Retouch	1285	42.61	135.96	41.77	.11
Channel Flakes	136	4.52	38.10	11.71	.28
Biface Trimming	-	-	-	-	-
Scraper Retouch	31	1.03	7.02	2.16	.23
Core Trimming	6	0.20	3.70	1.14	.62
Flat Flakes	1504	49.95	108.81	33.43	.07
Shatter	5	0.17	3.06	.94	.61
Other	1	0.03	.93	.29	.93
Totals	3011	100.01	325.48	100.01	.11

Table 6. Distribution of Flat Flakes by arbitrary weight categories, Grid B.

Weight Division	N	% of N*	Weight	% of Wt.*	Mean Wt.
0 to .2 grams	1432	47.56	84.43	25.94	.06
.2 to .4 grams	58	1.93	16.35	5.02	.28
over .4 grams	14	.46	8.03	2.47	.57

*refers to percentage of total from all debitage types.

Table 7. Distribution of debitage types by lithic material types, Grid B.

Type	N	Collingwood		Onondaga		Bayport		Unidentifiable	
		N	%	N	%	N	%	N	%
Biface Thinning	45	41	91.11	-	-	2	4.44	2	4.44
Bifacial Retouch	1283	1207	91.30	25	1.95	37	2.88	14	1.09
Channel Flakes	136	133	97.79	-	-	3	2.21	-	-
Scraper Retouch	31	28	90.32	-	-	3	9.68	-	-
Core Trimming	6	6	100.00	-	-	-	-	-	-
Flat	1504	1438	95.61	10	0.66	32	2.13	24	1.60
Shatter	5	5	100.00	-	-	-	-	-	-
Other	1	1	100.00	-	-	-	-	-	-
Totals	3011	2859	94.95	35	1.16	77	2.56	40	1.33

at the Grid. However, unidentifiable materials are much more common among the tools than the debitage. This may be due to the "grab-bag" nature of this material category.

FLAKES DERIVED FROM BIFACES

The large number of flakes derived from bifaces (48.62% of the debitage) suggests that actvities associated with the alteration of these tools were important at Grid B. The relative importance of biface versus scraper alteration will be assessed during the discussion of the scraper retouch flakes.

Only three of the four flake types derived from bifaces are represented at Grid B, the biface trimming flakes being absent. Of those biface flake types represented, the smallest number of specimens are assignable to the biface thinning flake type. Five or 10.9% of these flakes exhibit evidence of post-detachment use in the form of flaking or polishing on the distal or rarely, lateral edges. All of the biface thinning flakes, with the exception of two unassignable specimens and two unused flakes of Bayport chert are of Collingwood chert. Four of the Collingwood specimens exhibit on part of their dorsal surface what is apparently a portion of the original surface of the flake blank from which they were detached (i.e. Fig. 7:2), while two others exhibit cortex.

The vast majority of the flakes derived from bifaces were placed into the bifacial retouch flake type. Furthermore, we should note that due to their small size, it is possible that many more were present but were not recovered due to the mesh size employed. Although no concerted effort was made to find overlapping flakes of this type derived from the same biface, three pairs were found when sorting the debitage into types (Fig. 9:1). All of the lithic material types are represented but with the exception of Collingwood chert, they appear in negligible amounts.

As already mentioned, it is difficult, if not impossible to sort out those bifacial retouch flakes resulting from rejuvenation from those of manufacture. There is sparse evidence from three sources which suggest that some of the bifacial retouch flakes are a result of rejuvenation. First, four fluted point "blades" (resharpened mid-sections of fluted points; see Roosa 1977b:105) were recovered from Grid B. The use of these bifaces as evidence of rejuvenation is questionable. In effect, one must assume that these four bifaces which exhibit evidence of resharpening were, in fact, resharpened at Grid B. Second, we can note that there are bifacial retouch flakes of Onandaga chert but no channel flakes of the same material. This could indicate that these particular flakes are ones of rejuvenation. On the other hand, they could be the result of the manufacture of unfluted bifaces. Also, the absence of channel flakes of this material could reflect the sampling techniques (i.e. the screen size) employed. Finally, and this constitutes the only good evidence for biface rejuvenation, the bases and tips of two points were recovered from Grid B. When the bases and tips are compared, it is evident that the former have been resharpened, an event which probably occurred after breakage at Grid B.

In sum, the evidence for biface rejuvenation is slim and, to a certain extent, questionable. I would speculate that it was not very important vis a vis manufacture at Grid B.

In all, 146 channel flake fragments were recovered from Grid B. This total includes two guide flakes and excludes portions of four small points made from channel flakes. This total of 146 was reduced to 136 when a number of fragments were found to fit together with others in the collection. It is probable that many of the remaining fragments are portions of the same channel flakes even though they do not fit together.

Several of the channel flakes exhibit fractures similar to those pictured by Crabtree (1966:30) and these specimens probably collapsed during removal. However, many appear to have been broken by post-depositional disturbances such as plowing. This hypothesis receives added support when the Grid B sample is compared to that of Grid D1. The former collection is largely from the plowzone while the latter was recovered mainly from the subsoil. The Grid D specimens have an average weight of .41 grams as opposed to the .28 gram average at Grid B.

The Grid B channel flakes (excluding guide flakes) ranged in width from 7 to 15 mm (mean of 9.9); in thickness from 1.5 to 3.5 mm (mean of 2); and in length from 6 to 35 mm (in two pieces) with a mean of 13.5 mm. The longest single fragment was 29 mm. Only 27 of the fragments are basal sections (proximal ends). All 27 show a ground and faceted striking platform and 22 show evidence of guide flake removal. Two of the bases show a dorsal scar indicating that they were the second flute removed from that face of the tool. Only one of the medial or distal sections shows evidence of previous flute removals.

Three of the channel flakes are of Bayport chert while the remainder are of Collingwood chert. Twelve or 8.8% of the channel flakes show signs of post-detachment use. Use flake scars are found on both the ventral and dorsal surface of one lateral edge. These appear to have been used as knives.

Only one of the channel flakes fits onto a fluted biface from Grid B. One of the Bayport specimens noted above fits onto the only fluted preform base from Grid B (Figs. 21:1, 22:1). This channel flake exhibits a thick distal end, an attribute restricted on the Parkhill site to this one specimen. It is evident that the channel flake hinged through the point during fluting. The fact that none of the other channel flakes from Grid B fits finished fluted points recovered from the same suggests these points are discards made elsewhere. It can be also taken to indicate that Grid B was not occupied for a length of time in which points manufactured there could be used and later discarded at the same locus; that is, it suggests that Grid B was not a "home base" from which hunting activities were carried out. Given the specialized nature of the Grid B occupation (i.e. its overwhelming orientation to biface associated activities; see below) this conclusion is not unexpected. We must note that two of the Grid B channel flakes fit onto two fluted bifaces, a blade and a base, recovered from Grid D indicating these two site areas are related.

It is possible to provide estimates of the number of bifaces manufactured (or, at least, fluted) at Grid B by examining the channel flake collections. As Crabtree (1966:8) has noted, estimates of the number of bifaces fluted should be tempered with caution given the tendency of these flakes to collapse during removal. In our case, the added factor of breakage by plowing should be also noted. Despite these limitations on determining the exact number fluted, I believe we can provide a minimum estimate of the number treated in this manner at Grid B. This will have a bearing on our estimates of the initial form of the lithic material brought to Grid B.

The 27 basal sections and an assumption that an average of two channel flakes were removed per point (except in those two cases where there is evidence of multiple fluting and excluding the channel flake which hinged through the point during fluting) indicates that at least twelve points were successfully fluted at Grid B. In all probability, this estimate is low. For one, as we have stated, the channel flakes tend to collapse during removal very close to the proximal end which makes them difficult to identify or recover. Second, large channel flake basal sections were used as blanks for channel flake points, the basal end serving as the tip of the point. The presence of these points at Grid B raises the possibility that some of the larger bases may have been removed from this site area to serve this purpose. Finally, the number of discarded points at Grid B would suggest that this estimate is low. Again, we can note that none of these channel flakes fit the finished points, suggesting the latter are discards made elsewhere. The majority of these point fragments are bases or parts of bases, the mid-sections and tips of which were not recovered. It is possible that the bases are present because they represent that portion of the point which was bound or became wedged in the shaft or foreshaft (see Roberts 1935:21; Fitting et al 1966:84). The bases were removed from the shafts and discarded at Grid B. It does not seem unreasonable to conclude that points were rehafted to replace these discarded specimens. If we also assume that the replacement points were manufactured at Grid B, then an estimate of 45 to 50 is obtained. Undoubtedly, this estimate is high since it assumes that finished unhafted points were not a component of an individual's tool kit. However, it does suggest that our estimate of 12 is low.

It should be noted that our minimum estimate, when coupled with the knowledge that only one biface broke during fluting indicates that there was a failure rate of less than 7.5% (one in thirteen) in fluting bifaces. This will deserve additional discussion when the other site and site areas have been described.

The above does not mean to imply that only fluted bifaces were manufactured at Grid B. As already stated, the presence of Onondaga bifacial retouch flakes but a lack of channel flakes of this material could indicate the manufacture of unfluted bifaces. The presence of two biface thinning flakes of an unidentifiable black chert, and yet the absence of channel flakes of this material might also indicate unfluted biface manufacture.

FLAKES DERIVED FROM SCRAPERS

Only 31 flakes derived from this source were recovered from Grid B. It must be noted that this total disagrees with that presented by Roosa (1977b:96) for this site area. The total presented by Roosa considered only those scraper retouch flakes which were recognized as such in the field. This new revised total includes those specimens which were subsequently recognized during the intensive analysis of the debitage collection from the Grid.

The small number of scraper retouch flakes, in contrast to the large number of flakes derived from bifaces, would suggest that the alteration of the latter was of primary importance at Grid B. Of course, one must mention that a judgement on this basis of the relative importance of scraper versus biface alteration should be tempered with caution. For one, we would expect that the modification necessary to alter a single scraper would not result in the production of nearly as large an amount of debitage as would the extensive modification necessary to alter a single biface (Collins 1975:32). Second, there is good evidence to suggest that a large number of bifaces were manufactured at Grid B. On the other hand, the scraper retouch flakes are largely the product of rejuvenation. Since manufacture will produce a greater amount of debitage than tool rejuvenation, we again have a bias in favour of biface debitage.

Fortunately, these limitations can be circumvented because we have comparative data from the other site and site areas. It is pertinent to note that the scraper retouch flakes make up a smaller percentage of the debitage at B than they do at Grids C, D1 and the McLeod site. Indeed, the ratio of biface flakes to scraper retouch flakes is 47.2 to 1 at B compared to 3.3 to 1 at C, 2.8 to 1 at D1 and 1 to 2.1 at the McLeod site. In general therefore, we may conclude that scraper associated activities were relatively unimportant at Grid B. This conclusion is in line with the high ratio of bifaces to scrapers at Grid B (9.6 to 1) when compared to the other Parkhill site areas and the McLeod site.

None of the scraper retouch flakes from Grid B exhibit cortex. Surprisingly, two specimens were found which exhibit evidence of post-detachment use at the distal end. The flakes in this type are quite large in relation to those specimens recovered from Grids C (.16), D1 (.13) and the McLeod site (.08), having an average weight of .23 grams. At least in relation to the McLeod site and Grid C, these differences can not be attributed to recovery techniques. Although difficult to determine, we can speculate that perhaps these size differences reflect the use of larger thicker tools at Grid B.

An attempt was made to place scraper retouch flakes onto the scars on the scrapers recovered from Grid B. In addition, an effort was made to find overlapping "sets" of scraper retouch flakes removed during the alteration of the same tool edge. The goal of these efforts was to investigate changes in tool form and perhaps function through time. Furthermore, in conjunction with lithic material types, texture and colour, this matching might allow estimates of the number of tools altered but not discarded at Grid B.

Two factors precluded the attainment of these ends. First, none of the retouch flakes fit onto the scrapers recovered from Grid B and only one "set" of three overlapping flakes was noted (Fig. 14:1). Second, material colour within the Collingwood chert type has been substantially altered due to minerals in the soil, etc. This is indicated by matching fragments of the same tool which differ considerably in appearance. However, we should note that although no scrapers of Bayport chert were recovered, three flakes of this material were found. This suggests that at least one scraping tool of this material was employed but not discarded at Grid B.

DEBITAGE FROM OTHER SOURCES

Given the "catch-all" nature of the type, it is not surprising that this category is dominated by flat flakes. As Table 6 indicates, most of the specimens in this type are quite small and this conforms to the generally small size of the majority of the debitage from Grid B. Only two of these flakes were used and both fall in the range over .4 grams.

Only one specimen was placed into the "other" flake type. This consists of a large specimen of an expanding nature, with no curvature and a faceted platform. These attributes might suggest that it is a biface trimming flake. However, it differs from the trimming flakes in two respects. First, the striking platform is at right-angles to the body of the flake and second, the juncture of the striking platform and the dorsal surface is concave rather than flat. The second attribute gives the flake a notched appearance when it is viewed from either face. I have no suggestions as to the origin of this flake.

The remaining flakes in this category consist of 11 specimens which can be assigned to the core trimming and shatter debitage types. Two of the core trimming flakes exhibit cortex. All specimens in both types are of Collingwood chert.

The small number of core trimming and shatter specimens can be employed as evidence of the unimportance of core working and consequently, the stages of primary and secondary flaking, at Grid B.

LITHIC REDUCTION SEQUENCE

At this point, attention will be directed towards briefly outlining the stages of the lithic reduction sequence represented at Grid B and to determining the initial form of the lithic raw material. A more complete description of the lithic reduction sequence will be offered after all the sites and site areas examined herein have been described.

As previously noted, the uniformly small size of the debitage specimens, in combination with the high debitage to tool ratio, would suggest a restricted lithic reduction sequence. Further support for this interpretation is found when the distribution of the debitage by types is considered. Possible evidence of the stages of primary and secondary flaking at Grid B in the form of core trimming flakes, shatter and perhaps biface trimming flakes, is sparse or absent. These above factors would suggest that the vast majority of the lithic material was brought to Grid B as flake blanks or a more advanced state of manufacture.

It can not be readily determined if the scrapers were brought to Grid B as flake blanks or if the working edges (i.e. bevels) were already present. Given that only minor modification is necessary to transform a flake blank into a simple retouched tool such as a scraper, perhaps the answer to this question is unimportant. However, in dealing with complex tools such as bifaces, the initial form as flake blanks or preforms is of significance, as will be demonstrated in later chapters.

It would appear, from a consideration of three factors, that the stage of margin production is not represented at Grid B and consequently, the initial form of the lithic material intended to be employed as biface tools was not that of flake blanks. First, we would expect the initial modification of the ventral face of the flake blank would produce flakes with flat or partially flat dorsal surfaces. In essence, the dorsal surface of the detached flake would approximate the flat unmodified surface of the flake blank. Despite concerted ef efforts, no flakes exhibiting this attribute were located at Grid B. Second, and similarly, we might expect that if margin production was represented, the recovery of a number of flakes exhibiting on the dorsal surface what could be construed as a portion of the original dorsal surface of the flake blank. Except for the four biface thinning flakes, the dorsal surfaces of which are partially of this nature, no flakes exhibiting this attribute were recovered from Grid B. Finally, I would posit that the succeeding stage of thinning-shaping is poorly represented.

Only 45 biface thinning flakes, as compared to 1283 bifacial retouch flakes were recovered. It can be noted that due to their small size, those flakes in the latter type are under-represented given the archaeological recovery techniques involved. However, one should be cognizant of the fact that fewer debitage pieces would be produced in the thinning-shaping stage than in the retouching stage. Therefore, some other measure of the extent of biface thinning at Grid B is necessary. Our minimum estimate of the number of bifaces altered at Grid B provides an alternative.

The 45 thinning flakes, in relation to our estimate of 13 bifaces manufactured (12 successfully and one broken in fluting), provides a maximum ratio of 3.5 thinning flakes detached per fluted biface. In actuality, this ratio is probably smaller since this is a minimum estimate of points manufactured. Material type provides some support for this contention.

Three Bayport channel flakes were recovered from Grid B. These flakes would infer that at least two bifaces of this material were worked at this locus. One of these was successfully fluted while the other, represented by the unifacially fluted preform base, broke in fluting. Since only two Bayport thinning flakes were recovered, the ratio of these flakes to the bifaces is only 1 to 1.

An estimate of the number of thinning flakes detached per biface during thinning-shaping can be obtained by an examination of the preforms from other fluted point sites in eastern North America. Drawings and photographs of preforms which still retain evidence of this stage of manufacture, from the Barnes site (Wright and Roosa 1966:854, Figs. 1*e*-*f*, 2*e*-*f*, 4*a*; Voss 1977:278, Fig. 5*a*), the West Athens Hill site (Funk 1973:17, Plates 7:21,24,28, 9:13), the Wells Creek Crater site (Dragoo 1973:13, Fig. 6g-h), the Williamson site (Painter 1974:25) and perhaps the Holcombe site (Fitting et al 1966:37, Fig. 5f-i, k-m), suggest 4 to 16 large, broad flake removals per face of the preform. Given this consideration, our estimate of 3.5 per preform seems very low.

A second estimate can be obtained by examining the thinning flakes from the Parkhill site in conjunction with the complete, finished, discarded bifaces from the same. The biface thinning flakes (based on the total available sample from all the sites and site areas) ranged in width from 15 to 27 mm with a mean of 20 mm. The finished complete bifaces from the site ranged in length from 50 to 77 mm. Therefore, at least three to four flake removals from one lateral edge of the tool would be necessary to thin any of the complete specimens. Assuming a tool was thinned on both faces and from opposite lateral edges, 12 to 16 flakes would be produced. This estimate is probably low since it assumes that the completed points were as long as the preforms on which they were made and also, that the thinning flake removals from one edge of the tool were not of overlapping flakes.

In sum, I would hypothesize that the thinning-shaping stage of biface manufacture is poorly represented at Grid B. Manufacture seems to have been confined largely to the retouching stage. I would postulate that those biface thinning flakes present at Grid B represent isolated minor alterations to the initial preform shape which individual flint-knappers decided were necessary on specific preforms prior to retouching. This hypothesis of isolated flake removals receives some support from the fact that none of the thinning flakes fit together to form overlapping "sets" removed from the same biface. In some cases, the removal of cortex, pronounced dorsal ridges and remnants of the original flake blank surfaces, may have been a goal of the isolated thinning flake detachment.

The above considerations lead me to believe that if preforms representing the initial form of the material at Grid B had been recovered, from an examination of the flake scars, they would be classified as Type II preforms.

SUMMARY

Examination of the debitage collections from Grid B at the Parkhill site indicates that the predominant lithic activity was one involving the alteration of bifaces as opposed to unifaces such as scrapers. It is suggested that fluted biface manufacture was very important at this locus. It is hypothesized that Type II preforms were brought to the site and retouched (including fluting) into finished products. At least 12 bifaces and probably many more, were successfully manufactured at Grid B in this manner.

The channel flakes would suggest that few bifaces were double fluted. Fluting of bifaces was apparently quite successful, only one breakage in fluting being noted. None of the channel flakes fits onto the finished points and it was suggested that Grid B was not a hunting "base camp". Two channel flakes from Grid B fit onto fluted bifaces recovered from Grid D indicating that these two site areas are somehow related. There is some suggestion (although weak) that "small" unfluted bifaces were manufactured at Grid B. Rejuvenation of bifaces and scrapers was apparently not of importance at Grid B.

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PARKHILL SITE: GRID C

A total of 1437 pieces of Paleo-Indian debitage was recovered from Grid C at the Parkhill site. The distribution of these materials by debitage types is shown in Table 8. The distribution of the flat flake type by arbitrary weight categories is shown in Table 9.

As at Grid B, the uniformly small size of the debitage specimens is noteworthy. A large percentage (79.75%) of the individual pieces weighed under .2 grams despite the fact that 1/8" mesh was not used to screen the soil in several excavation units. The use of different recovery techniques between Grids B and C is probably reflected in the larger average debitage size (.14 gms) in the latter area. The debitage to tool ratio is 31 to 1 at Grid C and in combination with the number of channel flakes recovered, suggests tool manufacture was important at this locus.

The distribution of the lithic material types among the Grid C debitage is shown in Table 10. The relative percentage of Bayport and unidentifiable cherts among the debitage generally corresponds to their representation among the tools. However, Onondaga chert is better represented among the debitage (16.56%) than among the tools (8.7%) and consequently, Collingwood cherts are better represented among the tools (73.91%) than among the debitage (64.51%). This inconsistency between the distribution of Onondaga materials among the debitage and

Table 8. Debitage types and frequencies, Grid C.

Type	N	% of N	Wt. (Gms)	% of Wt.	Mean Weight
Biface Thinning	23	1.60	14.16	7.10	.62
Bifacial Retouch	431	29.99	43.42	21.77	.10
Channel Flakes	43	2.99	13.15	6.59	.31
Biface Trimming	7	.49	6.48	3.25	.93
Scraper Retouch	155	10.78	25.15	12.61	.16
Core Trimming	3	.21	1.70	.85	.57
Flat Flakes	770	53.58	90.26	45.26	.12
Shatter	2	.14	1.44	.72	.36
Other	3	.21	3.65	1.83	1.22
Totals	1437	99.99	199.41	99.98	.14

Table 9. Distribution of Flat Flakes by arbitrary weight categories, Grid C.

Weight Division	N	% of N*	Weight	% of Wt.*	Mean Weight
0 to .2 grams	678	47.18	52.02	26.09	.08
.2 to .4 grams	60	4.18	16.34	8.19	.27
over .4 grams	32	2.23	21.90	10.98	.68

*refers to percentage of total from all debitage types.

Table 10. Distribution of debitage types by lithic material types, Grid C.

Type	N	Collingwood		Onondaga		Bayport		Unidentifiable	
		N	%	N	%	N	%	N	%
Biface Thinning	23	11	47.83	11	47.83	-	-	1	4.35
Bifacial Retouch	431	244	56.61	99	22.97	44	10.21	44	10.21
Channel Flakes	43	25	58.14	8	18.60	6	13.95	4	9.30
Biface Trimming	7	-	-	7	100.00	-	-	-	-
Scraper Retouch	155	61	39.35	14	9.03	48	30.97	32	20.65
Core Trimming	3	3	100.00	-	-	-	-	-	-
Flat	770	578	75.06	99	12.86	21	2.73	72	9.35
Shatter	2	2	100.00	-	-	-	-	-	-
Other	3	3	100.00	-	-	-	-	-	-
Totals	1437	927	64.51	238	16.56	119	8.28	153	10.65

its distribution among the tools could reflect the time which has passed since access to sources of this material. It may be that while a certain percentage of tools are being made of this material, not enough time has elapsed for the tools to be used and discarded in a percentage equal to their manufacture. This inconsistency could also reflect a preference for the use of Onondaga chert in the manufacture of a tool category such as bifaces, which produces a greater amount of debitage than other tool categories.

FLAKES DERIVED FROM BIFACES

The large number of biface flakes from Grid C leads to the conclusion that the alteration of these tools was important at this locus. However, they were not as numerous at Grid C as at Grid B, comprising 35.07% of the debitage in the former area compared to 48.62% in the latter. All of the biface flake types are represented. Not surprisingly, the vast majority of these flakes are of the bifacial retouch flake type. Again, it is pertinentto note that they are undoubtedly under-represented due to the recovery techniques employed. However, it can be mentioned that the Grid C specimens are smaller on the average (.10 gms) than those at Grid B (.11 gms) despite the employment of 1/8" mesh in more excavation units in the latter area.

All of the material types are represented among the bifacial retouch flakes, Collingwood chert predominating (56.81%). Onondaga chert is also well represented (22.86%). Indeed, it is apparent that the greater importance of Onondaga chert among the debitage than among the tools is due to the large number of bifacial retouch flakes and, of course, flat flakes of this material (Table 10). As just noted, the large amount of Onondaga debitage, as opposed to tools, could reflect a preference for the use of this material type in the manufacture of tools such as bifaces, which would produce a large amount of debitage. One overlapping pair of Onondaga bifacial retouch flakes (Fig. 9:2) and one pair of Collingwood specimens, was noted.

Again, it is difficult to determine the extent of biface rejuvenation at Grid C. The presence of four fluted point "blades" might suggest that some of the bifacial retouch flakes are ones of rejuvenation.

After bifacial retouch flakes, channel flakes are the best represented biface flake type. 48 channel flake fragments were recovered. This total was reduced to 43 when several fragments were found to fit together. None of the Grid C specimens are guide flakes.

The channel flakes are smaller (.31 gms average) than those at Grid D1 (.41 grams), probably reflecting the effects of breakage due to plowing at the former locus. The Grid C channel flakes ranged in thickness from 1 to 2.5 mm (mean of 1.8), in width from 9 to 14 mm (mean of 11.2) and in length from 5 to 36 mm (in two pieces) with a mean of 13.7 mm. The longest single fragment was 22 mm. Eleven of the fragments are basal ends possessing platforms. Nine or 81.8% of these show evidence of guide flake removals. One base of Collingwood chert and one distal (medial?) section of Onondaga chert show evidence of a previous flute removal (i.e. they are from double fluted points). Eight or 18.6% of the channel flakes show evidence of post-detachment use. The same comments applicable to similar used specimens at Grid B are applicable here.

Of the 25 channel flakes of Collingwood chert, 6 are basal sections. Given that one of these is from a double fluted point, and assuming the preforms were fluted on both faces, at least three bifaces of this material were treated in this manner at Grid C. None of these Collingwood channel flakes fit onto fluted bifaces from the Parkhill site.

The eight Onondaga channel flake fragments include three proximal ends. One of these matches exactly on material and inclusions with the flute on one face of a bifacially fluted preform base from Grid C (Figs. 21:1, 22:2). Its ventral surface does not fit exactly with this flute, apparently because the preform base has been thinned since the flute removal from this area. The reasons for the breakage of this preform are unclear although it may have broken in fluting the face opposite that from which the above channel flake was detached. The Onondaga channel flake bases indicate that at least one biface of this material was successfully fluted while another may have broken in fluting.

The six Bayport channel flakes include two bases. None of these channel flakes fits onto the fluted bifaces from the Parkhill site. At least one preform of this material was fluted at Grid C. The channel flakes of unidentifiable cherts do not include proximal ends. Neither do any of these flakes fit onto fluted bifaces from the Parkhill site.

In sum, the above evidence indicates that a minimum of six bifaces were fluted at Grid B. If we accept that the Onandaga preform broke in fluting, there was a failure rate of less than 16.7% in fluting bifaces. As at Grid B, the non-matching of channel flakes and finished bifaces suggests the discarded bifaces were made at another locality and also, that Grid C was not occupied for a length of time in which bifaces fluted there could be discarded.

For the same reasons given at Grid B, it should be emphasized that the estimate of bifaces fluted given above, is a minimum estimate. These include, first, the difficulty in identifying or recovering the small channel flake bases, a difficulty emphasized at Grid C given the more extensive employment of a larger mesh size. Second, there is the possibility that the larger bases were used as "blanks" for channel flake points and thus, were removed from the Grid. However, it should be noted that none of these points were recovered from Grid C. Finally, the number of discarded bifaces at Grid C can be noted. Complete bases or basal fragments of 14 fluted points were recovered, suggesting that at least this many were removed from their shafts or foreshafts and the same number rehafted and perhaps manufactured at Grid C.

Data specific to Grid C would also indicate our estimate is low. For example, the presence of channel flakes of unidentifiable cherts but the absence of bases of these materials in the collection is of note. In addition, the recovery of a medial or distal section of Onandaga chert from a double fluted point but the lack of a basal section from the same can be mentioned.

Biface thinning flakes are represented at Grid C by 23 specimens. None of these exhibit evidence of post-detachment use. One Collingwood specimen exhibiting on part of its dorsal surface what is probably a portion of the original flake blank surface was recovered. At this point we can note that equal numbers of Onondaga and Collingwood specimens (11 of each) were located. This is somewhat inconsistent with the larger number of channel flakes and bifacial retouch flakes of Collingwood chert and will deserve more attention later in this chapter.

The last biface flake type is the biface trimming flakes. Seven specimens of this type are represented at Grid C, all of which are of Onondaga chert. Four possible origins for these flakes have been outlined above. For reasons outlined in chapter four, I would rule out the first two of these sources for the Grid C specimens. First, they do not appear to be from biface core trimming given the lack of very pronounced dorsal scars. Second, none of these seven specimens appear to be large enough to be the proximal ends of unifacial scraping tools. The final two possibilities will be discussed when the lithic reduction sequence at Grid C is examined.

FLAKES DERIVED FROM SCRAPERS

Over 150 scraper retouch flakes, making up 10.78% of the debitage total, were located in the Grid C debitage collection. It is probable that this type is numerically under-represented given their small size (.16 gm average) and the recovery techniques employed. Nevertheless, scraper retouch flakes make up a larger percentage of the debitage total at Grid C than they do at Grid B. The ratio of biface flakes to scraper retouch flakes is only 3.3 to 1 at Grid C which is considerably different from the 47.2 to 1 ratio at Grid B. The greater importance of scraper associated activities at Grid C, as reflected in the debitage, is mirrored in the smaller biface to scraper ratio (1.9 to 1) found at this locus when compared to Grid B (9.6 to 1). It should be mentioned that our total of 155 scraper retouch flakes disagrees with that presented by Roosa (1977b:116), indicating the more intensive analysis of the debitage available in this study and excavations in the area since the writing of Dr. Roosa's report.

None of the Grid C scraper retouch flakes were found to fit onto Grid C scrapers. However, seven sets of overlapping flakes of this type, removed during the alteration of a scraper edge were noted. These consist of six sets of two flakes and one containing three specimens. Some of these are pictured in Figures 14 and 15. One of the pairs is of note because it appears that its two members are the result of two separate resharpening episodes (Fig. 14:4). This is implied by the fact that the old working edge on one specimen overlays that on the other (Fig. 17). It is noteworthy that the two members of this set exhibit the largest horizontal separation of all the sets when they are plotted on a map of the Grid (5.0 metres). All of the other sets had a spatial separation of less than 1.85 metres with a mean of .89 metres.

All of the material types are represented among the scraper retouch flakes. There are a number of inconsistencies between the distribution of material types among the total debitage collection and their distribution among the scraper retouch flakes. As Table 10 indicates, Collingwood and Onondaga cherts are seemingly under-represented while correspondingly, Bayport and unidentifiable cherts are over-represented when the scraper retouch flakes are compared to the distribution of the total debitage collection. This might be an indication of a preference for Bayport chert in the manufacture of scrapers. There is one other inconsistency which can be noted. Although Bayport chert is weakly represented among the scrapers recovered (6.67%), this is not the case with the scraper retouch flakes where this material is well represented (30.97%). There are a number of possible explanations for this incongruity. For example, it may be a product of the time that has elapsed since access to this source of material. Bayport scrapers might not have been in use for a long enough time in order to be discarded in large amounts; that is, there is a tendency to resharpen rather than discard these tools.

DEBITAGE FROM OTHER SOURCES

Only three core trimming flakes and two pieces of shatter were noted. As at Grid B, I would interpret this small number of specimens to be indicative of the general absence of core working at Grid C.

Flat flakes have the largest numerical representation of any of the flake types. As Table 9 indicates, the vast majority of these flakes are quite small. None of these flakes exhibit evidence of use.

Three specimens were placed into the "other" flake type. The first of these is the second largest piece of lithic material lacking evidence of post-detachment modification, recovered from the Parkhill site (3.41 gm). This specimen exhibits a large flat platform and a thick abrupt distal end. I suspect that it is the proximal end of a unifacial tool such as a scraper but I can not conclusively demonstrate this.

The two remaining specimens in this type are small (.14 gm average) flakes of Collingwood chert. Only one possesses a striking platform which is faceted. Both specimens have a completely flat dorsal surface devoid of flake scars indicating previous flake removals. Two possible origins can be suggested for these flakes. First, they could be the output from margin production, their flat dorsal surfaces approximating the original flat interior surface of the flake blank. Second, they could be the product of the resharpening of scrapers by the second method outlined in chapter four above; that is, the blows of detachment were directed against the old bevelled edge of the tool, resulting in a flake removal from the flat interior surface of the flake blank. This second interpretation receives support from the presence of a scalar retouch on the platform surface of the one specimen which possesses a platform.

LITHIC REDUCTION SEQUENCE

The generally small size of the Grid C debitage specimens, in conjunction with the high debitage to tool ratio would suggest the lithic reduction sequence was highly restricted at Grid C. This interpretation is supported by the general paucity of debitage types indicative of core working such as core trimming flakes, shatter and perhaps biface trimming flakes. Therefore, I would hypothesize that the majority of the lithic material was brought to this site area as flake blanks or a more advanced state of manufacture.

The initial modification of the ventral surface of flake blanks intended to be made into biface tools, should produce flakes with flat or partially flat dorsal surfaces. Only two flakes, placed into the "other" debitage type exhibit this attribute state. Given that these flakes may be from scraper rejuvenation, and also, that they appear in small frequencies in relation to our estimates of six bifaces fluted, I would infer the absence of margin production at Grid C. As well, this contention is supported by (1) the presence of only one flake (a biface thinning flake) exhibiting a dorsal surface partially covered by what is inferred to be the original dorsal surface of the flake blank and (2), the paucity of evidence for the succeeding stage of thinning-shaping.

The channel flakes indicate that bifaces of Bayport, Collingwood and Onondaga cherts were fluted at Grid C. With regard to the Bayport material, no biface thinning flakes were located suggesting the absence of the thinning-shaping stage among "small" bifaces of this material. The Collingwood channel flakes provide evidence that a minimum of three bifaces of this material were fluted at Grid C. This provides a ratio of 3.7 Collingwood biface thinning flakes per biface. The estimated numbers of thinning flakes detached per biface given above at Grid B would infer that the thinning-shaping stage is poorly represented among the bifaces of Collingwood chert. As at Grid B, I would suggest that the Collingwood thinning flakes recovered from Grid C represent isolated minor alterations prior to retouching. This hypothesis receives added support from the fact that none of the Collingwood thinning flakes fit together to form overlapping sets and therefore, can be definitely determined to have been detached from the same biface.

The ratio of Onondaga biface thinning flakes to our minimum estimate of Onondaga bifaces manufactured is 5.5 to 1. Again, I would indicate that this ratio is too low for the thinning-shaping stage to be fully represented and that those thinning flakes recovered indicate isolated flake removals, a last "gasp" so to speak of the thinning of "small" Onondaga bifaces. Of course, this assumes that the biface trimming flakes, all of which are of Onondaga chert, are not a product of the thinning-shaping stage. This deserves some discussion.

As previously mentioned, there are equal numbers of biface thinning flakes of Onondaga and Collingwood chert despite the weaker representation among the former material type of channel flakes and bifacial retouch flakes. This would indicate that the thinning-shaping stage is more fully represented among the Collingwood specimens. If the Onondaga biface trimming flakes are representative of an earlier step in the thinning-shping stage, then we might expect, as is the case, that the step of thinning-shaping represented by the biface thinning flakes would be better represented. This line of evidence would infer that the biface trimming flakes do, in fact, represent an earlier step in the thinning of small bifaces. However, there are other lines of evidence which lead me to believe that this is not the case.

It is difficult to provide estimates of the size of bifaces from which the biface trimming flakes were derived. As noted earlier, one specimen from Grid D1 suggests a width of approximately 60 mm but we have no idea how representative this particular specimen is of the biface size from which the trimming flakes were removed. In general, we may only suggest that these flakes were derived from very large bifaces. I would hypothesize that the Onondaga trimming flakes are too few in number to have reduced these large bifaces to the size of 25-40 mm suggested by the thinning flakes. Even if we were to accept that the trimming flakes are present in sufficient numbers to suggest conclusively continuity between two sequential steps of the thinning-shaping stage, we must assume that they were all derived from the same biface. Two lines of evidence infer that this is not the case. First, none of the biface trimming flakes fit together and thus, they can not be positively assigned to the reduction of the same tool. Second, based on material colour, texture and inclusions, at least two varieties of Onondaga chert are represented among the trimming flakes. Of course, in this latter case, one must be aware of the possible effects of minerals in the soil and other post-depositional factors on material colour and texture.

Finally, it can be mentioned that none of the Onondaga trimming flakes fit together with the biface thinning flakes, suggesting that these two flake types are not the product of two sequential steps in the thinnning-shaping stage.

In sum, I believe the above evidence suggests that the biface trimming flakes are the product of the manufacture of a different "type" of biface tool than are those deemed biface thinning flakes.

The segment of the lithic reduction sequence practiced at Grid C was apparently similar to that at Grid B. The stages or primary and secondary flaking are poorly represented. Some thinning of bifaces was carried out but the emphasis appears to have been on the retouching of tools at Grid C. The initial form of the biface materials brought to the site was probably Type II preforms. As at Grid B, it can not be determined if the scrapers were brought to the Grid with retouched edges or as simply flake blanks.

SUMMARY

The debitage indicated that biface alteration was important at Grid C. However, it was of less importance _vis a vis_ scraper associated activities than it was at Grid B. This conclusion supports the interpretation of the importance of scraper versus biface alteration derived from an examination of the artifact categories other than debitage.

The extent of biface rejuvenation at Grid C is debateable. However, scraper retouch flakes and presumably scraper rejuvenation was more important at Grid C than at B.

The lithic reduction sequence was similar to that at Grid B, the stages of primary flaking, secondary flaking, margin production and thinning-shaping being poorly represented. The inferred initial form of material intended to be finished into small bifaces was Type II preforms. At least 6 of these preforms were retouched (including fluting). One of these might have broken in fluting. There is little evidence of multiple fluting among the channel flakes.

Data from Grid C support the interpretation that the biface trimming flakes are a product of the alteration of a different "type" (i.e. large biface) of biface tool than the biface thinning flakes.

A number of incongruities between the relative percentages of the various lithic material types among the debitage types and their representation among the total debitage collection and the other tool categories were noted. Some possible explanations of the significance of these inconsistencies were presented.

PARKHILL SITE: GRID D1

In all, 1445 specimens of Paleo-Indian lithic debitage were recognized at Grid D1. The distribution of this collection by the debitage types is shown in Table 11. The distribution of the flat flake type by arbitrary weight categories is given in Table 12.

As at the other Parkhill site areas examined, the Grid D1 debitage specimens are of a uniformly small size. Indeed, 88.20% of the specimens weighed under .2 gm each. The debitage to tool ratio at Grid D1 is an extremely high 96.33 to 1. This high ratio suggests that tool manufacture was important at Grid D1. It can be mentioned that the Grid D1 ratio is higher than that on the other areas of the Parkhill site, perhaps as a result of the more extensive employment of a finer mesh size.

The distribution of the Grid D1 debitage by the material types is shown in Table 13. As noted earlier, mixing with Archaic materials has led to the exclusion of "non-diagnostic" Onondaga and unidentifiable chert debitage from the analysis. With the exception of one Onondaga channel flake and nine Bayport flakes, all of the debitage is of Collingwood chert.

FLAKES DERIVED FROM BIFACES

Debitage produced during the alteration of bifaces is well represented at Grid D1. However, these flakes account for less of the debitage total (27.72%) than they did at the other Parkhill site areas.

Table 11. Debitage types and frequencies, Grid D1.

Type	N	% of N	Wt. (Gms)	% of Wt.	Mean Weight
Biface Thinning	8	0.55	7.38	5.39	.92
Bifacial Retouch	367	25.40	42.59	31.12	.12
Channel Flakes	15	1.04	6.22	4.55	.42
Biface Trimming	3	0.21	2.85	2.08	.95
Scraper Retouch	140	9.69	18.13	13.25	.13
Core Trimming	7	0.48	4.69	3.43	.67
Flat Flakes	895	61.93	44.70	32.67	.05
Shatter	8	0.55	6.43	4.70	.80
Other	2	0.14	3.85	2.81	1.93
Totals	1445	99.99	136.84	100.00	.10

Table 12. Distribution of Flat Flakes by arbitrary weight categories, Grid D1.

Weight Division	N	% of N*	Weight	% of Wt.*	Mean Weight
0 to .2 grams	867	60.00	34.33	25.08	.04
.2 to .4 grams	20	1.38	5.88	4.30	.29
over .4 grams	8	0.55	4.49	3.28	.56

*refers to percentage of total from all debitage types.

Table 13. Distribution of debitage types by lithic material types, Grid D1.

Type	N	Collingwood		Onondaga		Bayport		Unidentifiable	
		N	%	N	%	N	%	N	%
Biface Thinning	38	8	100.00	-	-	-	-	-	-
Bifacial Retouch	367	361	98.30	-	-	6	1.70	-	-
Channel Flakes	15	14	93.33	1	6.66	-	-	-	-
Biface Trimming	3	3	100.00	-	-	-	-	-	-
Scraper Retouch	140	140	100.00	-	-	-	-	-	-
Core Trimming	7	7	100.00	-	-	-	-	-	-
Flat	895	892	99.68	-	-	3	0.32	-	-
Shatter	8	8	100.00	-	-	-	-	-	-
Other	2	2	100.00	-	-	-	-	-	-
Totals	1445	1435	99.30	1	0.07	9	0.63	-	-

Seventeen channel flake fragments were located in the debitage collection. This total does not include one almost complete small point made from a channel flake. This total of 17 was reduced to 15 when two of them were found to fit together with others in the collection. Six or 40% of the fifteen fragments show evidence of post-detachment use.

The channel flakes are larger at Grid D1 than they are at the other Parkhill site areas. This could reflect the fact that they are mostly from a subsoil provenance and thus, have not been exposed to the effects of breakage by plowing. The Grid D1 channel flakes ranged in thickness from 1 to 2.5 mm (mean of 1.8), in width from 8.5 to 18 mm (mean of 11.5) and in length from 8 to 39 mm (in two pieces) with a mean of 16.2 mm. The longest single fragment was 26 mm.

None of the channel flakes exhibit evidence of previous flute removals. Four are proximal ends, and three of these exhibit guide flake scars. Three of the channel flake bases are of Collingwood chert, the last being an Onondaga specimen. Assuming two channel flake removals per point, at least three preforms were fluted at Grid D1; two of Collingwood chert and one of Onondaga chert.

One of the medial sections of a channel flake fit onto a finished point base from Grid D1 (Figs. 21:3, 22:3), indicating this point was made and discarded at the same locus. Assuming this point was used as a projectile (and lost its tip through hunting activities), this matchup suggests that Grid D was a base camp in the true sense of the word. Also, it would imply a longer occupation at Grid D than at the other Parkhill site Grids.

None of the remaining channel flakes matches the flutes on the bifaces from the Parkhill site. However, as noted earlier, two channel flakes from Grid B fit onto a blade and a base from Grid D. In the case of the blade, the channel flake dorsal scars along one lateral edge do not match up with those on the point, probably as a result of resharpening along this edge since the fluting of the biface.

As was to be expected, the largest number of biface flakes were assigned to the bifacial retouch flake type. There are no resharpened bifaces in the Grid D1 collection which would suggest that some of the bifacial retouch flakes are ones of rejuvenation. However, three fluted point blades were recovered in surface collection so it is possible that flakes of biface rejuvenation are present. Certainly, the ratio of bifacial retouch flakes to channel flakes at Grid D1 (24.5 to 1) is much higher than that at Grid C (10 to 1) or B (9.4 to 1). This higher ratio could indicate a greater emphasis on rejuvenation at Grid D1. In addition, it might suggest the manufacture of unfluted points at Grid D, an interpretation supported by the recovery of a "plano" point base through surface collection (Roosa 1977b:116). However, it is probable that the higher ratio reflects the more extensive employment of 1/8" mesh and also, less breakage of channel flakes due to plowing at Grid D1.

Only 8 biface thinning flakes were recovered from Grid D1 and all of these are of Collingwood chert. None of these fit together to form overlapping sets. Part of the dorsal surface of one of the thinning flakes exhibits what is probably a portion of the original flake blank surface.

The remaining three biface flakes were placed into the biface trimming flake type. All of these are of Collingwood chert. None of them fit together to form overlapping sets either with themselves or with the biface thinning flakes. This last factor suggests that the trimming and thinning flakes are not the result of two sequential steps in the manufacture of a biface. In addition, as previously noted, the thinning flakes are inferred to have been removed from small bifaces on the order of 25 to 40 mm wide while the trimming flakes are from much larger tools. One of the Grid D1 trimming flakes (Fig. 13: lower) was apparently from a biface in excess of 60 mm wide. As at Grid C, the trimming and thinning flakes do not seem to be present in sufficient amounts to reduce a "large" biface to the size of the smaller specimens. I must conclude, using these data, that the trimming and thinning flakes are the output from the manufacture of two different "types" of bifacial tools.

FLAKES DERIVED FROM SCRAPERS

These flakes are well represented at Grid D1, 140 specimens or 9.69% of the debitage being placed in the type. The ratio of biface flakes to the scraper retouch flakes at Grid D1 is 2.8 to 1, a much smaller ratio than that at Grid B (47.2 to 1) and one slightly smaller than that at Grid C (3.3 to 1). This ratio indicates the greater importance of scraper associated activities at Grid D1, an interpretation in line with the differing biface to scraper ratios between these areas (9.6 to 1 at B; 1.9 to 1 at C; 1 to 3 at D1).

Although the debitage to tool ratio from the Grid suggests that tool manufacture was important in the occupation, the large number of scraper retouch flakes and their inferred origin as a product of rejuvenation, would suggest that tool rejuvenation was also important.

Two sets of overlapping scraper retouch flakes, one of three specimens (Fig 14:3) and one including two flakes, were noted in the Grid D1 collection. In addition, three flakes were found which fit onto end scrapers in the collection. Two of these are shown in Figures 19 and 20. In these three cases, there is a space ranging from .5 to 1 mm between the ventral surface of the flake near the proximal end and the working edge of the scraper. This space represents the amount the edge has been worn back by use since the scraper retouch flake removal.

DEBITAGE FROM OTHER SOURCES

As at the other Parkhill site areas, flat flakes account for the greatest percentage of the debitage total (61.93%). The distribution of these flakes by the arbitrary weight categories shown in Table 12, indicates they generally correspond to the small size of the debitage pieces from the Grid.

Fifteen specimens (1.03%) were placed into the core trimming and shatter flake types. Although these two types are slightly better represented at Grid D1 than at B (0.37%) and C (0.35%), the small number of specimens argues for a sparse representation of core working at Grid D1.

Two specimens were placed into the "other" flake type. One of these is the largest piece of lithic material, lacking evidence of post-detachment modification, recovered from the Parkhill site. This flake weighs 3.71 grams. It is similar to the specimen from Grid C which was placed in this type. Given the context of the specimen within the Grid D1 collection, I would suggest that it is the snapped off proximal end of a unifacial tool.

The remaining specimen weighs .14 grams, exhibits a completely flat dorsal surface (Fig. 16) and a faceted platform showing a scalar retouch. As with two similar specimens from Grid C, I would posit that it is a scraper retouch flake removed by the second method outlined in chapter five above.

LITHIC REDUCTION SEQUENCE

As was the case at the other Parkhill site Grids, the paucity of core trimming and shatter debitage and the small size of the majority of the debitage pieces infers the absence of the primary and secondary flaking stages. Furthermore, in line with interpretations presented above, the lack of specimens (with the exception of one biface thinning flake and perhaps one specimen in the "other" type) exhibiting on their dorsal surfaces a portion of the original flake blank surface, as well as the low ratio of Collingwood biface thinning flakes to our estimates of bifaces manufactured of the same material (4 to 1), suggests the general absence of the stages of margin-production and thinning-shaping. I would postulate that the few biface thinning flakes recovered represent isolated minor alterations prior to retouching, a position partially supported by the fact that none of these flakes fit together to form overlapping sets. From these facts, it is inferred that the biface material was brought to Grid D1 as Type II preforms which were retouched and fluted into finished forms.

ASSOCIATION OF GRIDS B AND D

As mentioned earlier, two channel flakes from Grid B fit onto a fluted point blade and base recovered from Grid D. The possible significance of the association of these two areas is briefly discussed here. Underlying this discussion is one important assumption which should be noted. I assume that both Grids represent one occupation at each locality rather than several occupations by Paleo-Indian peoples. Roosa (1977a:351) has stated that: "Grid B was probably the locus of small camps of advanced scouting parties of men and boys", implying multiple occuaptions. However, I would postulate that the highly specialized nature of this area, with its overwhelming orientation to fluted point manufacture, argues for a single occupation.

At Grid D, the multiple activity nature of the area and its spatial extent could suggest multiple occupations. However, I would not hesitate to point out that the finished point-channel flake matchup for this area argues for a long occupation. This long occupation may be supported by the greater concentration of debitage at Grid D1 in relation to the other Parkhill site areas but it could also reflect the more intensive employment of 1/8" mesh in screening the soil. We might expect more variability in site activities as length of occupation increases and this would be consistent with the nature of the Grid D tool assemblage. A longer occupation might also be congruent with an occupation by a larger social unit and perhaps with the greater spatial extent of the Grid D occupation.

Given the above assumption, two hypotheses about the temporal relationship of these two site areas can be presented. First, it is possible that the Grid B and Grid D occupations were contemporaneous, the former being simply a specialized activity area (presumably occupied by males given the emphasis on fluted biface manufacture) within one occupation of the site. Second, it is possible that the two areas were not occupied simultaneously but instead, represent two sequential occupations, some of the same individuals (i.e. males) being present at both loci. In either case, it appears that Grid B involves pre-hunt preparations and suggests that Grid D may be somehow related to the processing of the results of the hunting activity.

SUMMARY

Lithic manufacturing, specifically of bifaces was important at Grid D1 although it was apparently less important than at the other Parkhill site areas. Type II preforms were brought to the site and retouched into finished forms. The presence of a few biface trimming flakes indicates the alteration of "large" bifacial tools at Grid D1.

An emphasis on scraper alteration, as inferred by the ratio of bifaces to scrapers from the Grid, is mirrored in the large number of scraper retouch flakes recovered. These scraper retouch flakes also suggest that tool rejuvenation was important in the occupation of the area.

A channel flake-finished biface matchup from the Grid suggests it was occupied longer than the other Parkhill site areas and may be a base camp from which hunting activities were carried out. The longer occupation of this area might suggest Grid D represents one occupation. Two of the channel flakes from Grid B fit onto two bifaces from Grid D indicating the two areas are related. The nature of this association was briefly discussed.

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McLEOD SITE

As noted earlier, the McLeod site sample is small, consisting of only 72 specimens. However, it is hypothesized that this low yield reflects the nature of activities in the areas test-pitted. The distribution of these debitage pieces by the debitage types is shown in Table 14. The distribution of the flat flake type by the arbitrary weight categories is given in Table 15.

90.27% of the McLeod site sample weighs under .2 grams each. The debitage to tool ratio (including surface collected tools) is a low ratio of 3.4 to 1. If the surface collected material is excluded, the ratio is less than 10 to 1. Neither of these figures approaches the high ratios found on the Parkhill site. The above factors could suggest the dominance of tool maintenance on the test-pitted areas of the McLeod site, and will deserve additional discussion below.

Table 16 provides the distribution of the McLeod site debitage by the lithic material types. Outside of Collingwood chert, only Onondaga materials were noted. The percentage of this latter material (6.54%) generally corresponds to its representation among the tools (4.8%).

FLAKES DERIVED FROM BIFACES

These flakes are poorly represented (19.45% of the debitage collection), in comparison to their counterparts at the Parkhill site.

Table 14. Debitage types and frequencies, McLeod Site.

Type	N	% of N	Wt. (Gm)	% of Weight	Mean Weight
Biface Thinning	1	1.39	0.47	4.13	.47
Bifacial Retouch	10	13.89	1.00	8.79	.10
Channel Flakes	2	2.78	0.67	5.89	.34
Biface Trimming	1	1.39	0.58	5.10	.58
Scraper Retouch	29	40.28	2.56	22.49	.09
Flat Flakes	26	36.11	4.32	37.96	.17
Shatter	2	2.78	0.24	2.11	.12
Other	1	1.39	1.54	13.53	1.54
Totals	72	100.01	11.38	100.00	.16

Table 15. Distribution of Flat Flakes by arbitrary weight categories, McLeod site.

Weight Division	N	% of N*	Weight	% of Wt.*	Mean Weight
0 to .2 grams	21	29.17	1.48	13.01	.07
.2 to .4 grams	2	2.78	0.68	5.98	.34
over .4 grams	3	4.17	2.16	18.98	.72

*refers to percentage of total from all debitage types.

Table 16. Distribution of debitage types by lithic material types, McLeod site.

Type	N	Collingwood N	Collingwood %	Onondaga N	Onondaga %	Bayport N	Bayport %	Unidentifiable N	Unidentifiable %
Biface Thinning	1	1	100.00	-	-	-	-	-	-
Bifacial Retouch	10	8	80.00	2	20.00	-	-	-	-
Channel Flakes	2	2	100.00	-	-	-	-	-	-
Biface Trimming	1	1	100.00	-	-	-	-	-	-
Scraper Retouch	28	27	93.10	2	6.90	-	-	-	-
Flat Flakes	26	25	96.15	1	3.85	-	-	-	-
Shatter	2	2	100.00	-	-	-	-	-	-
Other	1	1	100.00	-	-	-	-	-	-
Totals	72	67	93.06	5	6.94	-	-	-	-

This weak representation might suggest biface rejuvenation. Of course, the presence of two channel flakes and one biface thinning flake is definite evidence of tool manufacture. It must be noted that all three of these flakes did not come from the test-pits but were surface collected from areas just to the west. I include them here for two reasons. First, this positive evidence of biface manufacture might suggest that those biface flakes recovered from the test-pits are ones of manufacture. In other words, the flakes produced during the alteration of bifaces may be sparsely represented as a result of test-pitting peripheral to areas of biface manufacture. Second, I include the two channel flakes because they provide positive proof that the occupants of the site produced fluted points. The spurred end scrapers in the surface collection can only suggest a Paleo-Indian occupation which does not necessarily entail fluted point cultures.

The two channel flake fragments include one basal end exhibiting a ground faceted platform and 2 guide flake removals. This specimen is 14 mm long by 11 mm wide by 1 mm thick. The remaining distal or medial fragment is 23 mm long by 10 mm wide by 1.5 mm thick. Neither of these two fragments shows evidence of post-detachment use.

It should be mentioned that one biface trimming flake was recovered from the McLeod site. In line with evidence presented earlier, this suggests the manufacture or perhaps rejuvenation of at least one large biface tool at the McLeod site.

FLAKES DERIVED FROM SCRAPERS

These flakes are well represented at the McLeod site, comprising

40.28% of the debitage total. This percentage is far in excess of that for the same flake type on all areas of the Parkhill site and conforms to the very low ratio of bifaces to scrapers (1 to 19) in comparison to the Parkhill site loci. It should be noted that this ratio was calculated for the McLeod site, including surface collected artifacts. However, only scrapers were recovered from the test pits, bifaces being absent.

Given that the scraper retouch flakes are a product of tool rejuvenation, and their dominance among the flake types and categories recovered, we may conclude that those areas test-pitted on the McLeod site were largely ones of tool rejuvenation, regardless of the status of the bifacial retouch flakes. None of the scraper retouch flakes were found to fit together to form overlapping sets. One scraper retouch flake was found to fit onto an end scraper. Unfortunately, this scraper retouch flake is fragmentary and so, the amount the edge has been worn back by use since rejuvenation can not be given.

Two of the scraper retouch flakes are of Onondaga chert indicating the rejuvenation and use of at least one scraper of this material although none were recovered.

DEBITAGE FROM OTHER SOURCES

As at the Parkhill site, this category is dominated by flat flakes. However, they are present in small amounts on the McLeod site in relation to the debitage collection as a whole and are outnumbered by scraper retouch flakes. At the Parkhill site, none of the other types were better represented numerically than the flat flakes.

The flat flake size, as shown in Table 15, conforms to the generally small size of the debitage from the McLeod site.

Only three other specimens (4.2% of the debitage total) were placed into this debitage category. Two of these are of the shatter type, suggesting, albeit on a limited scale, core working. The remaining specimen is a large flake (1.54 grams) possessing a large flat right-angled platform and an abrupt distal end. As with similar specimens from the Parkhill site, I suspect that this is the proximal end of a unifacial tool such as a scraper.

LITHIC REDUCTION SEQUENCE

Given the limited nature ofthe debitage sample, especially its apparent production as a result of rejuvenation, little can be said about the lithic reduction sequence at the McLeod site. However, the paucity of evidence of core working would suggest the general absence of primary and secondary flaking at least in those areas test-pitted and perhaps for the site as a whole. Certainly, there is no evidence of core working in the surface collections.

SUMMARY

The small sample of debitage from the McLeod site supports the apparent emphasis on scraper associated activities in those areas test-pitted. The dominance of scraper retouch flakes, in association with the small size of the debitage pieces and a low debitage to tool ratio, indicates the prevalence of tool rejuvenation in the sample examined herein.

The presence of two channel flakes in the surface collection provides positive proof that the McLeod site was occupied by fluted point makers. The stages of primary and secondary flaking are apparently not represented on the site.

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SUMMARY AND CONCLUSIONS

In this chapter, conclusions relevant to the four major goals of the analysis outlined in chapter two are presented.

The first two goals of this analysis were: (1) to delineate the steps involved in the production of lithic tools and (2) to unite these steps into stages within a lithic reduction sequence. The stages and steps are discussed below.

Primary Flaking

As a result of the restricted nature of the lithic reduction sequence on the sites and site areas examined, the debitage collections from these sites provide little information on the early stages of the lithic material reduction and the steps of which they are composed. Any information on the primary (and secondary) flaking stages must be derived from an examination of the other artifact categories and it might be advantageous to summarize this information at this point.

Given that they have had little modification since being output from the primary and secondary flaking stages, the scrapers provide some information on these early stages. Two types of platforms can be noted on the scraper "blanks". First, there are those specimens exhibiting plain flat platforms at right-angles to the flake body, suggesting they were removed from cores which were tabular in cross-section.

Second, there are scrapers exhibiting abraded platforms with generally cluttered faceting. The platforms are at acute angles to the dorsal surface of the flake body. Apparently, these were derived from cores which were lenticular in cross-section and which were worked bifacially.

Wright (Wright and Roosa 1966:857) has noted similar platforms on flake tools from the Barnes site. He has postulated that these two platform types represent two sequential phases in the reduction of the lithic material; that the "repeated removal of flakes from a tabular core produced a lenticular core". Assuming the goal of the flint-knapper was the production of a biface lenticular core, then the flakes with right-angled platforms upon which some of the scrapers were made could be the by-products of the stage of primary flaking. Besides a step of flake detachments in this stage, we can also postulate a previous step of platform preparation. The flat platforms on these flakes is certainly not natural but must have been intentionally created by the direction of "blows" to the edge of the intended platform.

Secondary Flaking

The first step of this stage is suggested by examining the scrapers made on flakes with acute, right-angled platforms. These platforms show generally cluttered faceting. The number of facets is incongruent with the paucity of scars on the dorsal surface of the flake, indicating intentional platform preparation. This faceting may have been to create a platform angle suitable for the flake detachment. It could also have been a method of thickening the core edge to prevent its collapse under the detaching blow. Finally, the facets and ridges between the same might have served to provide a better "bite" for the hammer.

The second step of this stage included the abrasion of the platform edge. As with the intentional faceting on the platforms, the goal of abrasion was to thicken and strengthen the core edge for the detaching blow. In conjunction with the faceting, it suggests considerable care was taken to ensure the successful flake removal. I should mention that abrading seems to have followed rather than preceded the faceting since the ridges between the facets have been dulled near the juncture with the abraded edge.

The final step of the secondary flaking stage was, of course, the detachment of the flakes from the lenticular core. It has been hypothesized that it was flakes from lenticular cores rather than the earlier tabular forms that were preferred as blanks for biface tools at the Barnes site (Wright and Roosa 1966:857). Roosa (1968:133) has postulated the same for Folsom. There is some suggestion that this was also the case on the sites studied here. A preform tip from the Parkhill site and a similar specimen of Collingwood chert from the Stewart site in the University of Waterloo collections possess a remnant of the striking platform of the original flake blank. In both cases, this platform surface is at acute angles to what would have been the original flake body, indicating probable detachment from a lenticular core.

Margin Production

This stage, and the steps which make it up, have not been documented on the sites examined, and so, can not be discussed.

Thinning-Shaping

Before proceeding, I should note that the following description is meant to apply to only "small" bifaces. For reasons outlined in chapter five, the thinning of large bifaces can not be discussed.

The stage of thinning-shaping for small bifaces is inferred from the biface thinning flakes. It must be mentioned that this stage is imputed to be poorly represented on the sites examined and that the biface thinning flakes are seen to be the product of the final flake detachments of this stage. Thus, it is possible that better debitage and preform collections may allow the recognition of additional steps in the thinning-shaping stage than those that are recognized here.

The first step of platform faceting was probably undertaken for the same reasons outlined under the secondary flaking stage, namely, the thickening and strengthening of the platform edge, the creation of a suitable platform angle and perhaps, the roughening of the platform.

The second step of platform abrasion was apparently undertaken, as was the preceeding step, to thicken and strengthen the biface edge. This step, and the previous one, suggest considerable care in the flake removals. As noted earlier, there appears to have been an attempt to detach flakes which skimmed the surface of the biface, probably in an attempt to create and maintain a lens-shaped transverse cross-section on the tool. Also, this would suggest an attempt to create and maintain a uniformly thin longitudinal cross-section (i.e. to remove any longitudinal curvature of the preform). Both of these goals would have to be attained in order to ensure the success of the succeeding flute removal. Furthermore, it should be noted that the large broad nature of the detached thinning flakes suggests that an error in their removal would seriously impair the successful completion of the tool.

The final step of the thinning-shaping stage was the detachment of large thin flakes across almost the whole surface of the tool.

It is hypothesized that the output of this stage was a Type II preform, a biface covered with remnants of large, broad, shallow flake removals. These were probably lens-shaped in cross-section and ranged in width from 25 to 40 mm. The curvature of the thinning flakes would also suggest that the preforms were fairly thick.

Retouching

This stage is the best documented on the sites examined herein. The retouching of unifaces apparently involved only a step of flake detachments. In other words, this step was co-extensive with the stage. However, the retouching of bifaces, especially fluted bifaces, was much more complex and it is these tools that will be dealt with at this point. Again, for reasons outlined in chapter five, the retouching of large bifaces will not be considered.

The first step in the retouching of fluted bifaces was probably the abrading (intentional platform preparation) of the edges of the Type II preforms since 77.8% of the bifacial retouch flakes exhibit abraded platforms. On the other hand, it must be remembered that the extent to which this abrasion is a product of biface use can not be estimated. If the retouching of the Parkhill and McLeod site bifaces did involve intentional platform abrasion, then this differs from the retouching of Holcombe points, where apparently this step was omitted (Fitting et al 1966:61).

Following platform preparation, the second step involved in this stage was obviously flake detachments from the biface edges. The bifacial retouch flakes infer that this involved largely parallel-sided flake detachments. The initial series of removals probably served to straighten the margins of the tool and to remove the thinning flake scars from the preform surface. In some cases, as indicated by the distal curvature on a few of the larger bifacial retouch flakes, the lens-shaped cross-section of the preforms was modified into a slight diamond shape (i.e. slight medial ridges on each face of the preform).

The above step ended with the fluting of the point. It is difficult to envision the form of the preform just prior to fluting. We can note that it was apparently about twice the width of the intended flute removal (Fig 21:1; 22:1; see also Storck 1978:11). In some cases, at least the basal lateral edges may have been in the form of the finished tool (but lacking grinding). This is inferred from the matching of flake scars on the edge of the tool with the channel flakes on biface-channel flake matchups (i.e. Fig. 22:3). It is also suggested by the small narrow tips of flake scars on the dorsal surfaces of many of the channel flakes. If the lateral edges were finished or almost finished on the majority of the bifaces fluted, then the fluting took place quite late in the manufacture of the tool. This might suggest a difference between the placement of fluting in the retouch stage on the sites examined here and Folsom, where apparently, fluting was comparatively early in this stage (cf. Irwin 1973:133-134). However, I suspect that there was considerable variabilty in the placement of fluting on Barnes points. Only future work can clarify this issue.

As noted in chapter three, Roosa (1977a:351) has called the Parkhill site bifaces Barnes points as a result of the similarity in fluting techniques (i.e. the steps involved in fluting) between the Parkhill and Barnes sites. He has presented evidence for these steps at the Barnes site (Wright and Roosa 1966). The steps at Parkhill appear virtually identical to those at Barnes. My main goal in presenting them again here is to provide added documentation of these steps derived primarily from an examination of the large channel flake collection on the sites examined. For purposes of simplification, the following discussion will consider only points fluted once on each face. Multiple fluted points will be discussed briefly later.

The first step in fluting, as indicated by the unifacially fluted preform base from Grid B, involved the bevelling of the base opposite the face to be fluted. The faceted platforms and the relatively acute platform angles on the channel flakes are a result of this step. Presumably, this bevelling was done to provide a platform angle suitable for fluting. As the channel flakes attest, the angle ranged between 45 and 65°. It can be mentioned that this bevelling was probably at what was the distal end of the original flake blank given the presence of a remnant of the blank's striking platform on the two preform tips. Fluting from the distal end towards the proximal end has been noted at the Debert site (MacDonald 1968:108) and on Folsom points (Judge 1973:167).

The second step in fluting usually involved the removal of guide flakes from the base of the face to be fluted. An examination of channel flake basal ends suggests this occured in at least 83.3% of the flute removals. This step may have been more prevalent than the channel flakes indicate. A few of the channel flakes show a remnant of the guide flake scars on only one lateral edge. Rather than indicating that there was no guide flake removal from the opposite side, I would suggest that these cases showing only one guide flake scar are a result of the fact that the channel flake did not expand enough on one lateral edge to encompass part of this scar. Therefore, it is possible that on those specimens exhibiting no evidence of guide flake removals the channel flake did not expand enough on either lateral edge to encompass a portion of these scars.

As noted earlier, these guide flake detachments served to guide the flute removal and also helped to isolate a basal nipple or striking platform in the centre of the bevelled base. The basal nipple is seen on the pointed proximal ends on most of the channel flakes, as well as on the channel flake-preform matchup from Grid B on the Parkhill site (Fig. 22:1).

The second last step in fluting involved, as indicated by all of the channel flake bases, the abrading of the striking platform. As mentioned in chapter five, this abrading might have aided in shaping the basal nipple but its major function was probably to dull and thus thicken and strengthen the edge which was to receive the detaching blow.

The final step in the fluting process was the flake detachment. The blow in this case seems to have been directed slightly away from the main axis or face of the point. This is suggested by the platform angle and the tendency of channel flakes to collapse near the proximal end.

Fluting of the second face involved the same steps as outlined above for the first face, including the bevelling of the base and the creation of a basal nipple. These steps are inferred on both faces from the acute-angled, pointed, faceted platforms on the majority of the channel flakes.

Roosa (1977b:92) has postulated that the double fluting found on the faces of some points "utilized a simple convex bevelled base" rather than a striking platform having a basal nipple. The three channel flake proximal ends from multiple fluting located on the Parkhill site possess a pointed striking platform suggesting the use of a basal nipple instead of this convex base. These data do not necessarily negate Roosa's hypothesis. It is possible that a simple convex base was used on bifaces intended to have short double fluting such as fluted knives (Roosa 1977b:96-98). The three channel flake bases found herein may be from bifaces where double fluting was <u>not</u>

intended; that is, they were removed in order to correct errors where the original flute was not wide or alternatively, long enough.

In any event, it is evident that a great deal of attention was given to preparing the base for fluting, a prerequisite for ensuring a successful flute removal. At the Parkhill site, two broken preforms (assuming the specimen from Grid C broke in fluting) out of a minimum of 22 fluted, suggests that a maximum of only 9.09% broke in fluting. This is considerably less than the total offered by Judge (1973:17) of 25% for Folsom, or upwards of 35% in Flenniken's (1978) experiments in making Folsom points. It is possible that the differences noted here reflect differences in the morphology of the bifaces between these two industries such as length, width and thickness of flute removals, and the thickness of the preform prior to fluting. For example, since the flutes are longer on Folsom points, there would be a greater opportunity for the flute to hinge through the point.

Differences such as those just noted, would not explain the apparent low failure rate in fluting at the Parkhill site in relation to the Barnes site, where biface morphology was virtually identical. The 26 channel flake bases from this site (Wright & Roosa 1966:854; Voss 1977:293) suggest that at least 13 bifaces were fluted at this site. At least four points (30.7%) were broken in fluting at the Barnes site (Wright & Roosa 1966:854, Fig. 2<u>c</u>-<u>e</u>; Voss 1977:258). Of course, one must be aware of the fact that different recovery techniques were used on most areas of the Parkhill site than was the case at the Barnes site. 1/8" mesh was not employed at the latter. As previously noted, it is suspected that the small channel flake bases tend to pass through the 1/4" mesh employed at the Barnes site. As a result, we have a bias in favour of a smaller estimate of bifaces fluted at this site. On the other hand, there is a high discard rate on the Barnes site during fluting (not breakage in fluting per se but for various reasons related to control of flute removal, see Wright and Roosa 1966:854), something absent on the Parkhill site.

I would like to suggest that the differences in discard rate during fluting are real and that this is related to the use of a poorer quality lithic material on the Barnes site (see Roosa 1968:323). The Barnes site material is largely Bayport chert (Voss 1977). As Fitting (Fitting et al 1966:18) has noted, "quartz inclusions and fossils are frequent" in this material. This may have led to less control over fluting on the Barnes site points than is possible using Collingwood chert. It is perhaps significant that of the two bases from the Parkhill site which broke in fluting, one is of Bayport chert (the other is Onondaga). I might add that the data from Grid C at the Parkhill site suggested a possible preference for the use of Bayport chert in the manufacture of scrapers.

It may be that the low discard rate of bifaces during fluting at Parkhill as compared to Barnes is also related to distance to material source. The Barnes site is closer to the Bayport chert source than is the Parkhill site to the Collingwood source. This could suggest that there is a tendency at the Parkhill site to keep and use preforms which would normally be discarded in fluting for purposes other than their intended usage. However, if this were the case, we might expect some preform fragments which show use in this manner, at the Parkhill or McLeod sites. This is not the case, no preform tools being recovered.

The next step or series of steps in the manufacture of fluted bifaces involved the finishing of the base. Finishing of the base included the careful chipping of the ears, a step which may have been preceeded by abrading (platform preparation) of the platform. The base of the point could also be thinned by the removal of basal finishing flakes (Roosa 1977b:92; i.e. the Barnes finishing technique, see Roosa 1965:96), a step which largely obliterated the remnants of basal preparation for fluting. In a very few cases, a series of small chips could be removed from the base as a finishing technique (cf. Storck 1978:11, middle row, Fig. 5d).

The next series of steps may have involved the finishing of the tip. I assume this finishing took place after fluting in all cases because of the presence of a few snapped preform tips exhibiting the distal end of the flute scar. The first step in the finishing of the tip was probably the snapping off of this tip, a trait found in Folsom. Presumably, this step was undertaken to give the point a fully fluted appearance. This step does not appear to occur with as great a frequency on Barnes points as it does on Folsom (Roosa 1977b:112) probably because fewer Barnes points are fully fluted. However, I should mention that some of the tips from the Parkhill site show no evidence of flute removals. Therefore, it is possible that the snapping of the tip was designed to serve other purposes such as removing striking platform remnants.

The final two steps in the finishing of the tip were probably intentional platform preparation (abrasion) and then, the flake detachments to sharpen and shape the tip.

The final step in the finishing of the point might have been the grinding of the lateral basal edges. It is generally agreed that this grinding is related to hafting although its specific function is debated.

In summary, approximately 25 steps in the reduction of the lithic raw material have been suggested. This listing is by no means complete, especially due to the lack of data on the early stages. A complete description will have to await the accumulation of more data.

The third goal of this analysis was to see how the lithic reduction sequence was broken down into segments practiced at different loci. Based on the postulated initial form of the lithic raw material brought to the Parkhill and McLeod sites, especially the initial form of the material intended to be manufactured and employed as biface tools, at least two spatially discrete segments are suggested. The first of these involved all those operations not represented on the sites and site areas examined herein and therefore, are inferred to have taken place at different loci. This segment included all those operations placed into the stages of primary and secondary flaking. As well, in the case of bifaces, it included the stages of margin production and thinning-shaping and, in the case of scrapers, perhaps the retouching stage.

As an aside, we should note that this first portion of the reduction sequence may have been carried out at several rather than one loci. However, since none of these operations are documented on the sites examined herein, proof of this is not forthcoming.

The second spatially discrete segment involved the reduction of the output from the first segment (or series of segments) into finished forms. It is this second segment that is represented on the Parkhill and perhaps, McLeod sites. In the case of bifaces, it included the reduction (retouching) of Type II preforms into finished forms while in the case of scrapers, it may have involved simply the retouching of flake blanks.

The initial form of the "small" bifaces as preforms at the Parkhill and McLeod sites was based on the general absence of flakes exhibiting dorsal surfaces representing the original surface of the flake blank and the paucity of flakes representing the thinning-shaping stage. It should be mentioned that the initial form as preforms (but not necessarily Type II preforms) is supported by three other lines of evidence from Parkhill complex sites. First, there is a paucity of preforms from the Parkhill site, especially at Grid B, a fact which is incongruent with the evidence of a large number of bifaces manufactured. In other words, if the initial form of the material was as flake blanks, the extensive modification necessary to reduce these blanks to finished forms should result in more discarded preform rejects. Second, all of the preforms from the Parkhill site are in an advanced state of manufacture. In fact, with the exception of some snapped tips, all have been fluted. If the reduction of flake blanks to finished tool was being carried out, I would expect some rejects from pre-fluting steps. Finally. at the Parkhill complex Fisher site near Stayner, Ontario (Storck 1978; Klein 1977:646), the spatial separation of the early stages of the preform reduction from the retouching stage has been noted. This will require further elaboration below.

As noted in chapter two, the means by which the lithic reduction sequence is broken up is one expression of the treatment accorded lithic material as a cultural resource and therefore, should provide information on the adaptive patterns of the culture involved. It remains to discuss, or rather, speculate, on the significance of the break down noted here. Specifically, I wish to examine the possible significance of the separation into two segments of the alteration of preforms. This boils down to a discussion of why the material was not brought to the sites and site areas examined as cores, or alternatively, finished tools.

I would postulate that the lack of core working on the Parkhill and McLeod sites is a reflection of distance to material source and the day to day mobility of the inhabitants of the sites examined. As already mentioned, the Parkhill and McLeod sites are over 100 miles from the sources of the Collingwood material. We may speculate that the further the material is reduced towards the finished product, the more efficient use will be made of the transported material. For one, an individual will not be transporting excessive "dead" material that will be trimmed off and discarded as waste. Also, the initial altering of blanks will give the flint-knapper insights into any inclusions and so on in a particular piece of material which might impair its being successfully made into a completed tool.

The above begs one important question. If it was more efficient to transport material that most closely approximated the finished form, indeed, why is it that all bifaces were not brought to the site as finished products rather than, in some cases, as preforms? I believe there are several possible answers to this question. First, it is possible that the more massive preform ensured that small nicks and breaks occuring in transport would not impair the functioning of the tool. Second, the channel flakes derived in fluting the preforms could serve as blanks for the manufacture of channel flake points. Also, in some cases, gravers were made on them as indicated by one specimen from surface collection at the Parkhill site (see also Storck 1978:11). Finally, the channel flakes could be used as knives. Approximately 13.5% of the channel flakes show evidence of use as knives. This is somewhat lower than the 80% reported for Folsom (Judge 1973:101), presumably because the Barnes channel flakes are less massive. However, it could be related to differences in site activities. There was variation between the Parkhill site areas in degree of channel flake usage, ranging from 8.8% at Grid B to 40% at Grid D1. This suggests functional differences between the two areas. It is interesting to note that the greatest percentage exhibiting use is at Grid D1 where the widest range of activities took place.

Next, I would postulate that the preforms were used as knives. In effect, this derives twice the amount of use out of the material since they could be used first as knives and second, after additional modification, as projectiles; certainly an efficient use of material (cf.Judge 1973:177-178).

The use of preforms as knives has not been specifically noted on the sites examined here. However, it appears to be widespread in fluted point industries. In eastern North America, preforms exhibiting use have been noted at the West Athens Hill site in New York state (Funk 1973:16), perhaps the Wells Creek Crater site in Tennessee (Dragoo 1973:13) and the Ward site in Ontario (Ellis 1979). The use of preforms might have occurred in Clovis given the mis-identification of Clovis preforms as knives (Muto 1971; see also Hemmings 1970) and is definitely found in Folsom (Judge 1973). In Folsom, this use generally followed fluting, perhaps indicating the preforms were hafted. On the sites examined here, granted that little modification followed fluting, it is possible that they were used prior to fluting as unhafted knives. Certainly, the preform "knife" from the Ward site (Fig. 23) is not fluted. I believe that the clarification of the use or non-use of Barnes points is an essential hypothesis worthy of testing since it will be important in understanding the practice of preform transportation.

Finally, the transportation of preforms might have ensured that fluted bifaces of several "types" could be made in quantities to suit the day to day needs of the individual. It has been noted by Roosa (1977b:98-99) that there was a special class of unifacially double fluted bifaces from the Parkhill site which were probably intended to be used as hafted knives rather than projectiles. Presumably, these artifacts were made on preforms of the same type as those upon which the projectiles were made.

In sum, the above suggested significance of the spatial breakdown of the lithic reduction sequence is suggestive of an efficient use of lithic material, one which might be related to the day to day mobility of the inhabitants (general life-ways) and to distance and therefore access to lithic material sources. This suggested efficiency of lithic material use is reflected in various other aspects of the Parkhill site occupations. In the first place, the use of lenticular cores results in a minimum waste of lithic material (MacDonald 1968:66). Also, there is extensive re-use of projectile point fragments, especially on the Parkhill site. The snapped blades were re-used as knives as were large bases missing tips. The snapped blades were also re-worked into gravers and scrapers (Roosa 1977b:105-106). The snapped bases were used as burins (W.C. Noble, personal communication to W.B. Roosa). Other points were apparently re-worked into drills (Roosa 1977b:108).

Underlying the above discussion was the assumption that evidence of extensive core working will <u>not</u> be found on Parkhill complex sites in the Parkhill site area, where the dominant lithic material type is Collingwood chert. Certainly, there appears to be little evidence of core working on the extensive Parkhill site which is probably the largest Paleo-Indian site in the Parkhill area (Brian Deller: personal communication). Given this consideration, one would expect that if evidence of core working was to be found, it would be on the Parkhill site. Also, it can be mentioned that the initial form of some of the bifaces as preforms rather than as flake blanks or an earlier stage of manufacture has been suggested on other Paleo-Indian sites in eastern North America and elsewhere. In these cases, the sites are a considerable distance from the sources of the most commonly used lithic raw material. In the northeast, they include the Holcombe site in Michigan (Fitting et al 1966:61), the Shoop site in Pennsylvania (Witthoft 1952:471) and sites in the Shenandoah Valley of Virginia examined by Gardner (1977:258-259). The same relationship has been noted for Clovis in Arizona by Hemmings (1970) and in Idaho by Irwin (1971:48).

In the case of the Shoop site, Witthoft (1952:471) was of the opinion that "the chert was carried here from Western New York predominantly as finished tools but partially as blank forms" (i.e. leaf-shaped blanks or rather, preforms). The emphasis on finished forms rather than preforms by Witthoft was suggested mainly by a low debitage to tool ratio of 3 to 1 and also, the low number of channel flakes. However, we should note that this is a surface collected rather than excavated site. As at the Parkhill site, we might expect the recovery of small pieces of debitage from the retouching of bifaces to be extremely difficult in the absence of screening of the soil. Also, the

Shoop site consists of a number of widely spaced concentrations of artifacts similar to the Parkhill site Grids. There may be variability in the debitage to tool ratio between these site areas at Shoop. In effect, some areas might have had higher debitage to tool ratios but they were effectively removed from the analysis by calculating the ratio for the site as a whole. Finally, with regard to the low number of channel flakes from this site, I would suggest that this may be related to the fact that the Shoop site points are poorly fluted and thus, the resulting channel flakes are hard to identify.

One final aspect of the postulated preform transport should be noted. Specifically, this included the transport of exotic cherts (i.e. Bayport and Onondaga) as preforms. Granted that the major Collingwood chert distribution of Barnes points coincides with the range of one social unit, it indicates the probable "trickle trade" of some materials as preforms rather than as finished products. It is probable also that the presence of exotic materials in the Parkhill site assemblage is related to the movement of individuals (presumably males) between different social units.

The final major goal of this analysis was to examine the nature of site activities outside of the lithic material reduction. Basically, this involved a determination of the relative importance of biface versus scraper associated activities at a locus of activity from the debitage and an attempt to see how this interpretation fit with the tool assemblage from an area. The biface to scraper ratio from each of the site ares and sites examined allowed us to order these loci in terms of decreasing importance of biface associated activities as Grid B, Grid C, Grid D1 and the McLeod site. The ordering of sites based on biface versus scraper debitage was identical to that noted from the tools and generally supports interpretations derived from the same. It can be also noted that the debitage suggests that certain tool types were modified at various localities even though none were recovered from the same. These include the manufacture of small unfluted bifaces at Grids B and D1, the manufacture of fluted bifaces at the McLeod site and the alteration of "large" bifacial tools at Grids C, D1 and the McLeod site.

The results of this study have been suggestive rather than conclusive. In part, this is due to two factors. In the first place, there is an absence of unfinished tools (especially bifaces) on the sites examined. This absence precludes the derivation of an interpretative framework to which the debitage types can be related. For example, Fitting (Fitting et al 1966:61-62) was able to derive a series of preform types with which specific debitage attributes could be equated; that is, an interpretative framework was provided simply by examining the unfinished bifaces in the assemblage. Second, the suggestive nature of the study is due to the restricted nature of the lithic reduction sequence. It can be noted that this restricted sequence has had some benefits. For instance, it has allowed the easy identification and classification of virtually every debitage specimen from the sites. This is due to the fact that more care is taken by the flint-knapper to ensure successful flake detachments in these stages. Also, the tools are beginning to take on their finished form in these stages and the debitage from the same is fairly diagnostic.

The lack of a good series of unfinished tools and the restricted nature of the lithic reduction sequence led me to derive a framework to guide interpretation from the literature which I call the stage sequence model. Many of the conclusions presented here are based on the assumed applicability of this model. The stages in the sequence are presented as being applicable to all eastern Paleo-Indian industries. However, for the interpretations presented above, we need only assume that these stages are applicable to Parkhill complex sites.

It would appear that the data to test this applicability to the Parkhill complex is already available. At the Fisher site excavated by Dr. Peter Storck, it is noted:

> The first seasons work at the Fisher site resulted in the discovery of five distinct areas of artifact concentrations. Three of these areas have produced large numbers of channel flakes, *fluted* points in various stages of manufacture and a wide variety of other tools. The two remaining areas have produced *no* fluted points and *few* channel flakes but large numbers of cores, *preform* fragments and abundant debitage (Klein 1977:646; italics mine).

The first three areas sound very much like those found on the sites examined here while the latter are not represented. Incidentally, as noted above, this description indicates a spatial separation of the early steps of preform reduction from the latter steps and lends support to my interpretation of the bifaces on the sites and site areas examined in this study.

If the stage sequence model is applicable to the Parkhill complex, then we can offer a number of predictions for testing with the material from those latter two areas of primary manufacture on the Fisher site. Some of the more important ones are: (1) these areas will yield large numbers of biface thinning flakes as defined earlier; (2) these areas will yield large numbers of flakes exhibiting on their dorsal surface portions of the original flake blanks; (3) bifacial retouch flakes will be rare or absent on these areas; (4) the preforms will provide (from flake scars) evidence of the detachment of a large number of broad shallow biface thinning flakes per specimen or alternatively, incomplete bifacially chipped margins; (5) the preforms will provide evidence that they were made on flake blanks, perhaps derived from large bifacially chipped lenticular cores.

Finally, in addition to the major conclusions noted above, we can note that the matching of channel flakes to points on the Parkhill site has provided other information about the occupation of this site. It has been suggested that Grids B and D were roughly contemporaneous in their occupation and that some of the same individuals were present at both loci. In addition, it has been suggested that Grids B and C were occupied for a shorter period of time than Grid D. Furthermore, it seems possible that Grid D was a base camp in the true sense of the word; that is, it served as a base from which hunting activities were carried out.

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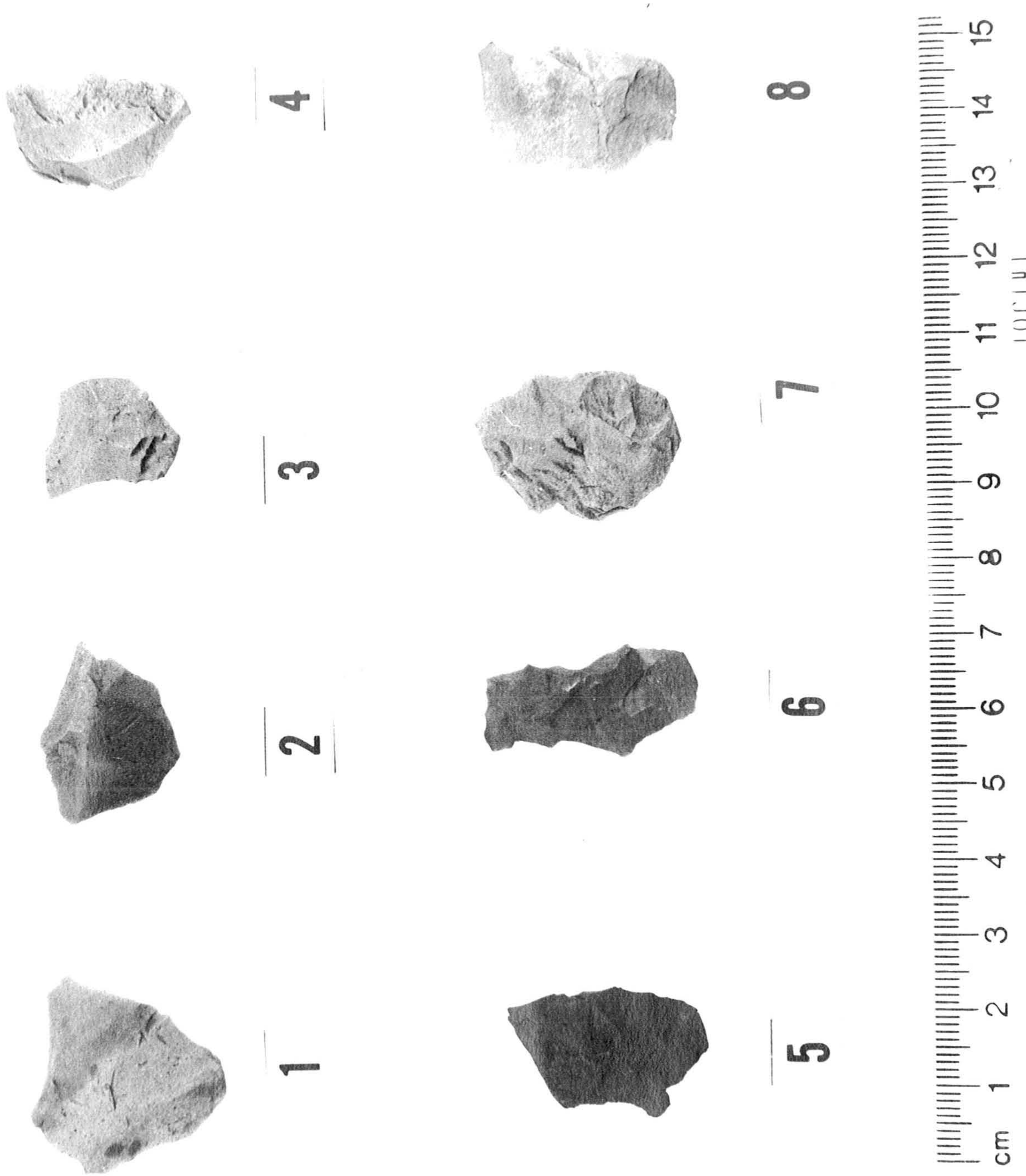

Fig. 7. Biface thinning flakes.

Fig. 8. Longitudinal view of biface thinning flakes.

Fig. 9. Overlapping pairs of bifacial retouch flakes.

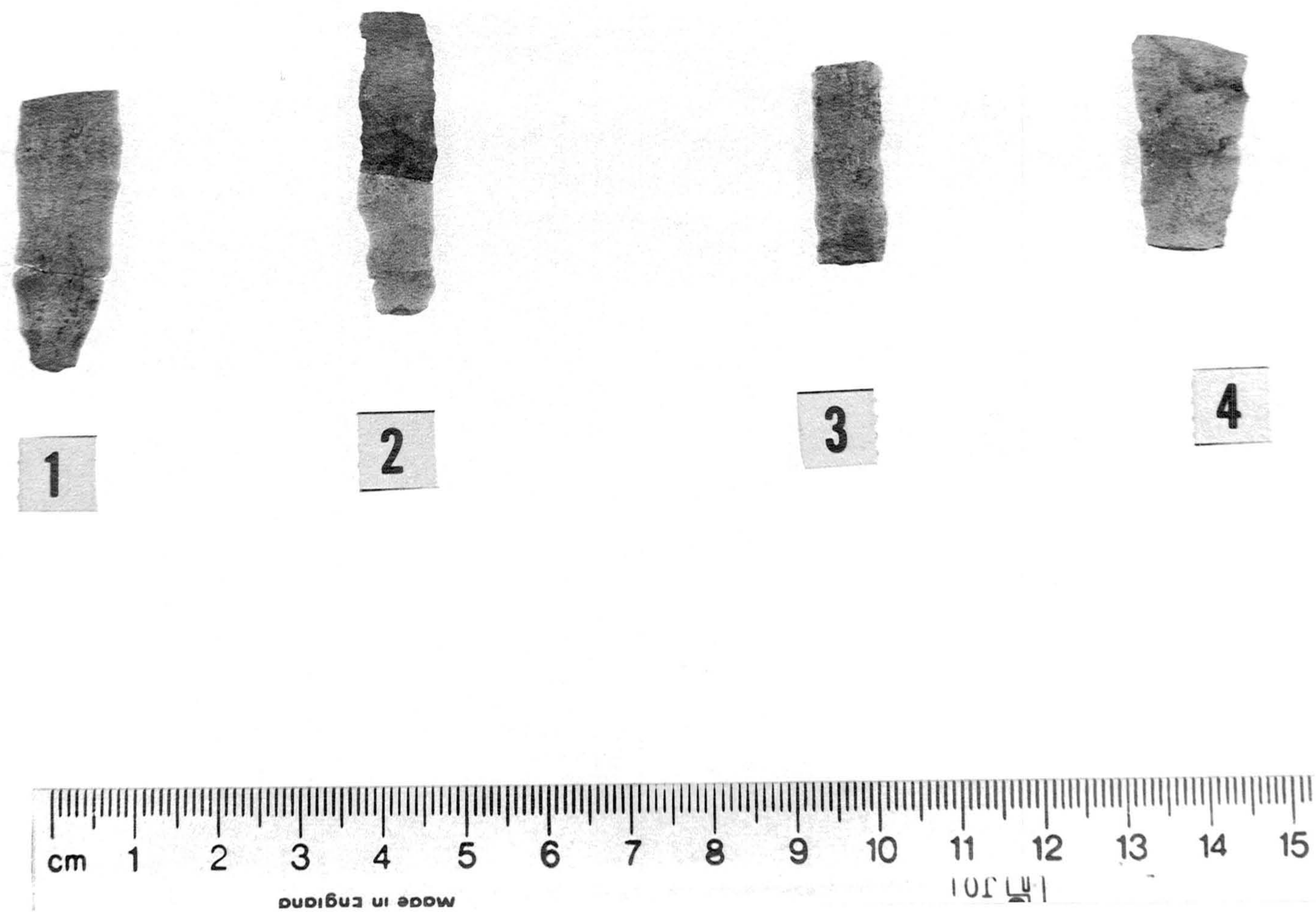

Fig. 10. Channel flakes.

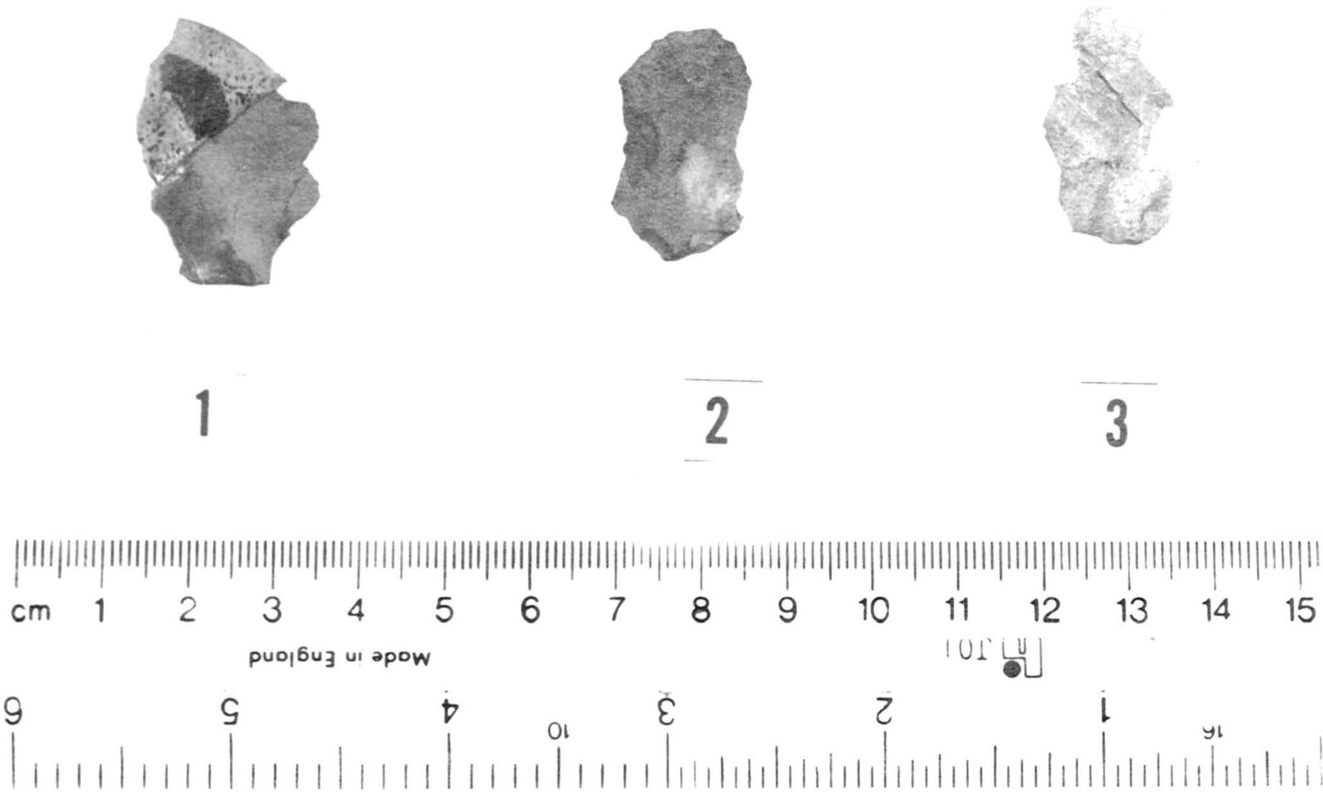

Fig. 11. Biface trimming flakes.

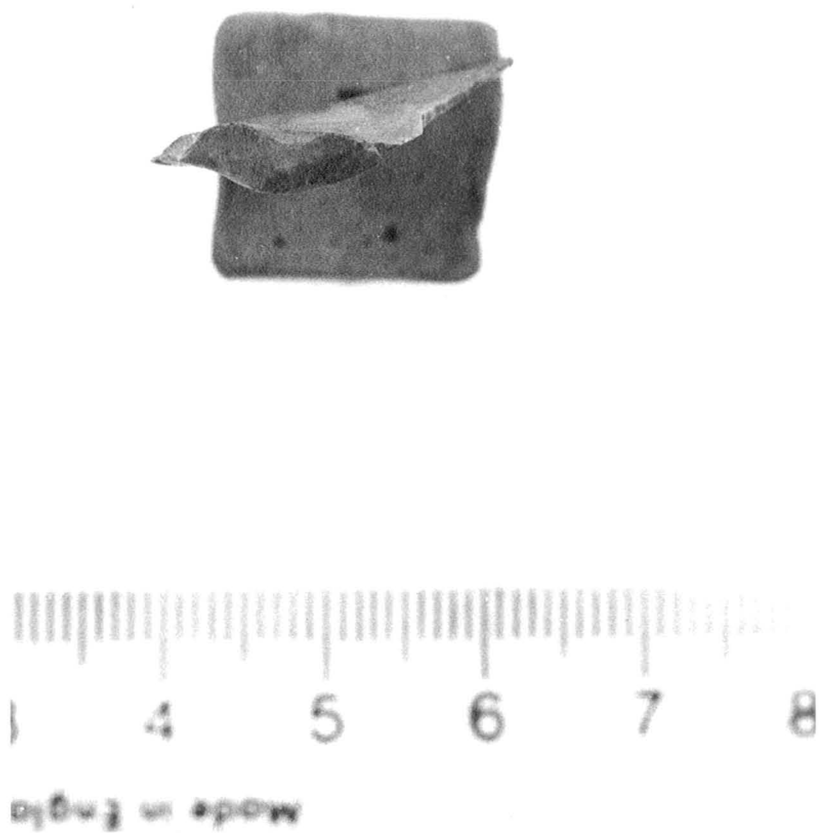

Fig. 12. View of proximal end of biface trimming flake.

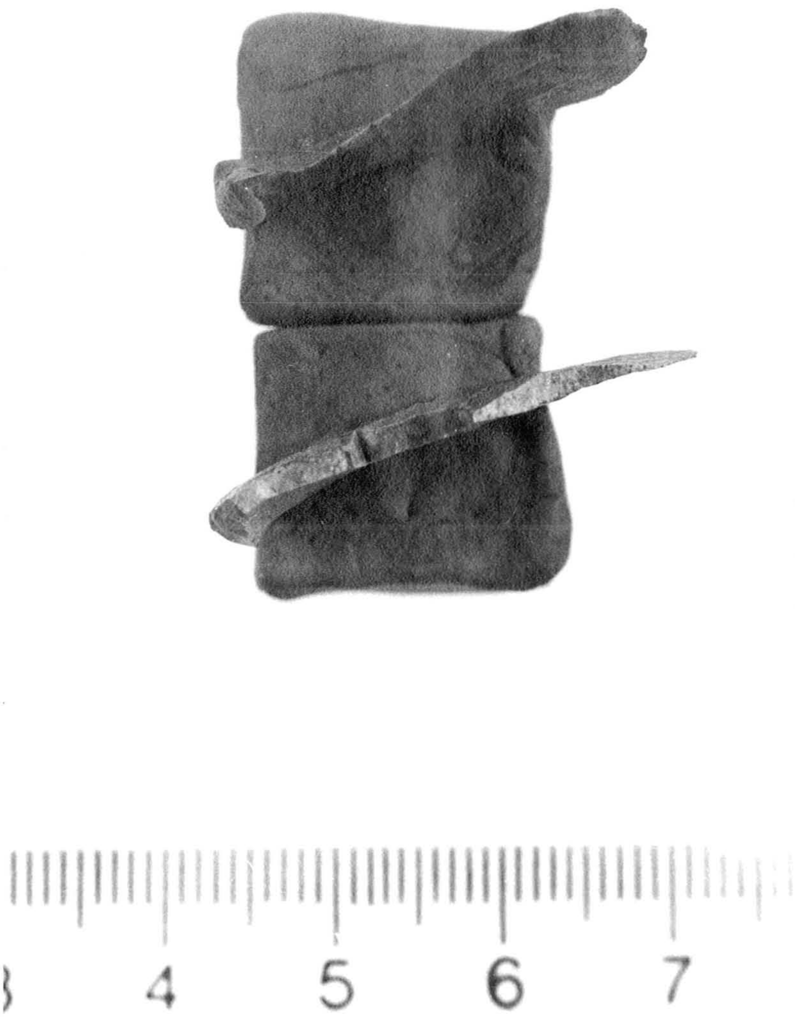

Fig. 13. Longitudinal view of biface trimming flakes.

Fig. 14. Scraper retouch flakes.

Fig. 15. Scraper retouch flake sets.
(scale in mm)

Fig. 16. Flat dorsal surface of possible scraper retouch flake.
(scale in mm)

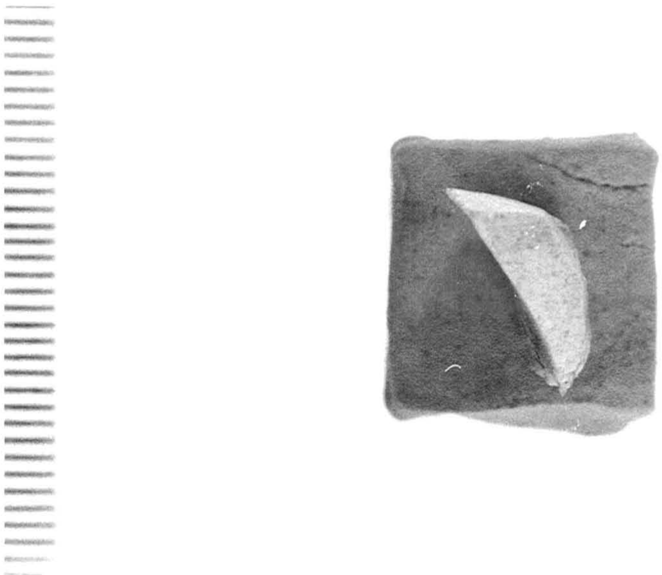

Fig. 17. Longitudinal view of scraper
retouch flake.
(scale in mm)

Fig. 18. Proximal view of scraper retouch
flake set. (scale in cm)

Fig. 19. Scraper retouch flake in place on end scraper. (scale in mm)

Fig. 20. Scraper retouch flake in place on end scraper. (scale in mm)


1
2
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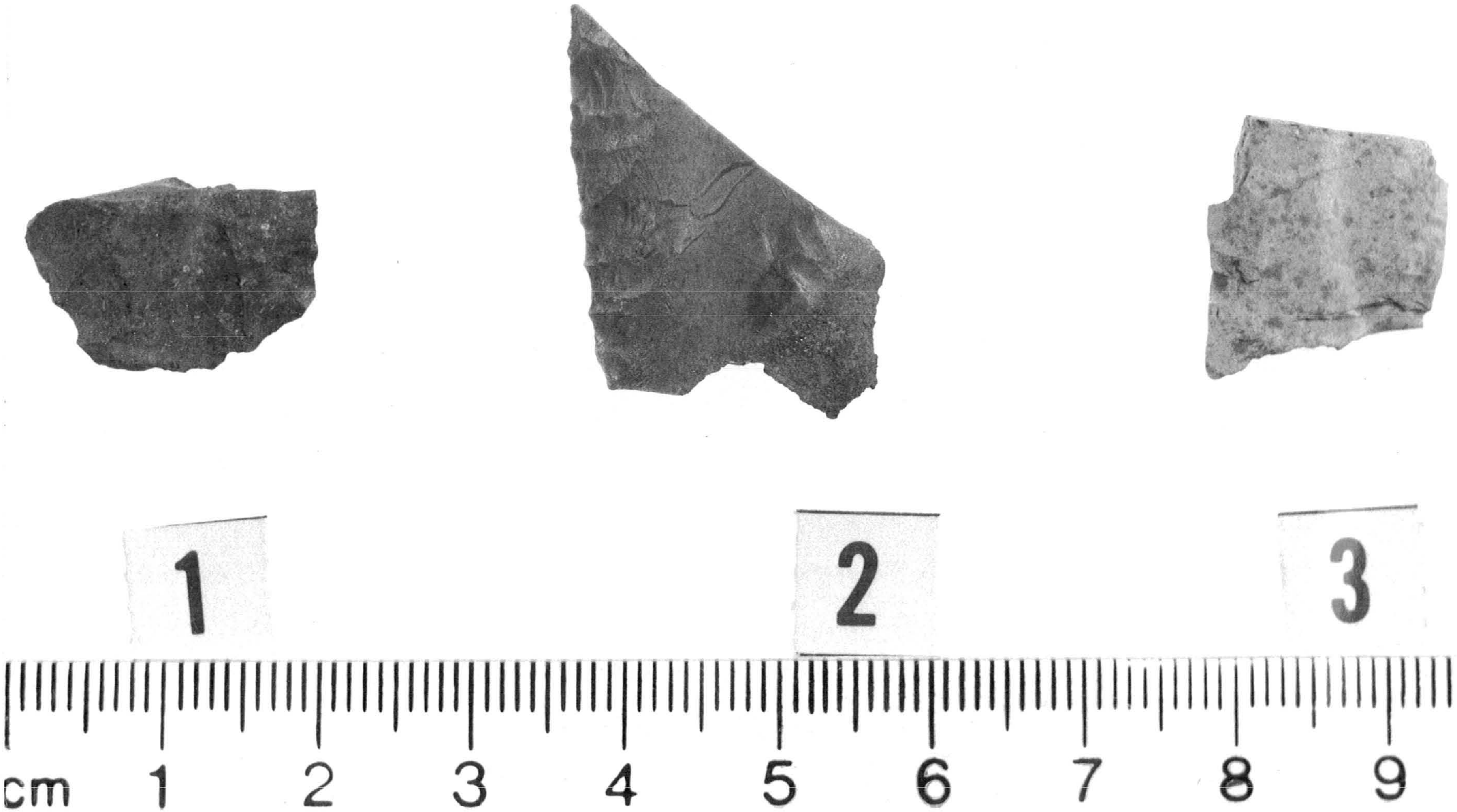

Fig.21. Fluted point bases.

Fig. 23. Preform "knife" from the Ward Site.