THE PALEO-INDIAN OCCUPATION OF SOUTHWESTERN ONTARIO: DISTRIBUTION, TECHNOLOGY, AND SOCIAL ORGANIZATION

by

(c) D. Brian Deller

Department of Anthropology
McGill University, Montreal

February 1988

A thesis submitted to the
Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for
the degree of Doctor of Philosophy

THE PALEO-INDIAN OCCUPATION OF SOUTHWESTERN ONTARIO

ABSTRACT

This study concerns Paleo-Indian behaviour and culture history in the central Great Lakes region. More than 15 sites and numerous loci associated with Late Pleistocene and Early Holocene societies in southwestern Ontario are reported. These are organized into archaeological complexes and their interpretation is synthesized into a broader understanding of early occupations in the Northeast.

Complexes are defined by projectile point typology and substantiated by other technological traits and patterns of lithic raw material utilization. Early (fluted point associated) Paleo-Indian complexes are, in suggested chronological order, Gainey, Parkhill, and Crowfield. Late Paleo-Indian complexes are Holcombe and Madina. All date between 11 000 and 10 000 B.P. according to geological considerations, pollen dating, and comparisons to dated materials elsewhere.

Seasonal rounds of resource exploitation within broad territorial ranges are suggested for Gainey and Parkhill populations. Commodity exchange involving particular implement categories provides evidence of band interaction. Mortuary practices and religious beliefs are suggested by possible cremation burials at the Crowfield site. Other significant behavioural patterns are revealed through inter- and intra-site analyses.

RÉSUMÉ

Cette étude de l'histoire de la culture et du comportement des populations paléo-indiennes de la région centrale des Grands Lacs porte sur plus de quinze sites et sur plusieurs lieux associés à des sociétés du Pléistocène supérieur et de l'Holocène inférieur dans le sud-ouest de l'Ontario. Ces sites forment des complexes archéologiques qui sont interprétés d'une façon plus générale en fonction d'une occupation ancienne du Nord-Est.

Les différents complexes se définissent par le type de pointes de projectiles qu'on y trouve et leur appartenance à un groupe donné est confirmée par d'autres caractéristiques technologiques ainsi que par la façon d'utiliser la matière première lithique. Les complexes paléo-indiens inférieurs (associés à des pointes cannelées) sont apparemment les suivants, dans l'ordre chronologique, Gainey, Parkhill et Crowfield. Les sites de Holcombe et de Madina sont des complexes paléo-indiens supérieurs. Les considérations géologiques, la datation par analyse des pollens et la comparaison avec des matériaux datés trouvés ailleurs suggèrent que tous ces sites remontent à 11 000 et 10 000 ans avant notre ère.

Il semble que les populations de Gainey et de Parkhill exploitaient les ressources d'un vaste territoire en rondes saisonnières. L'échange de certains produits et de certains types d'outils témoigne d'une interaction entre les bandes. Le fait qu'on ait peut-être inhumé des dépouilles incinérées au site de Crowfield suggère l'existence de rites funéraires et de croyances religieuses. L'analyse de chaque site et la comparaison des sites entre eux révèlent d'autres modèles de comportement significatifs.

ACKNOWLEDGEMENTS

During the course of more than thirty years of fieldwork and academic involvement which provided the foundation for this study, I have received significant encouragement, assistance, and guidance from numerous individuals, groups, and institutions to whom I am indebted and grateful. I have derived great satisfaction as well as benefit from my experiences with these people and the institutions they represent.

This thesis was written during graduate studies at McGill University. I am especially indebted to three faculty members who supervised my work and enriched my understanding: Michael S. Bisson, from whom I learned much about lithic technology, Fumiko Ikawa-Smith, who directed my research on Paleo-Indian cultures, and Bruce G. Trigger, who was my thesis supervisor. While at McGill I benefitted also from sharing ideas with Moira McCaffrey, Bruce Jamieson, Alexander Von Gernet, and Peter Timmins, and received laboratory assistance from Sharon Baillie, Katherine Brodeur, Arnold Feast, Mary-Ann Levine, Susan McNabb, and Katharine Timmins.

I am grateful to W.V.V. Pardy, M.D. and Wilfrid Jury for initiating and guiding my first steps towards archaeology by encouraging me as a youth to search ploughed fields for prehistoric artifacts, to wonder about their significance, and to respect the ingenuity and culture of the people that made them.

Over the years a large number of people became involved in my search for Paleo-Indian sites. Collectively, I thank several hundred landowners and tenants who permitted access to their property, which was often planted in crops. Invaluable assistance in the field, about half the time under sunny skies, was provided by Michael Austin, George Connoy, Darcy and Barbara Fallon, Juliet Garfit, Michael Heal, Scott Oliver, Joe Pelly, Mark Webster, and Reynold Walke. Information on prehistoric sites and the loan of artifacts, often for extended periods of time, were provided by William Baxter, Raymond Baxter, Robert Calvert, Florence Calvert, George Connoy, Sid Earl, Gary Laye, Randy Laye, James MacLeod, Edward McLeod, Jack Redmond, Glenn Stott, Glen Tedball, Ronald Watts, Leroy Weed, John Welton, and Frank Wight.

Financial assistance was provided in the form of three grants from the Ontario Heritage Foundation and a research stipend from McGill University. Laboratory and storage space and photocopying services were provided by 418218 Ontario Limited.

I express my appreciation to William A. Fox and Ian Kenyon of the Ministry of Citizenship and Culture, who assisted the later stages of my research in many ways, especially through the preparation of plates and loan of archaeological hardware. Similarly, Peter L. Storck and William Robertson of the Royal Ontario Museum generously provided technical and photographic services. Brenda Dennis is thanked for typing initial drafts of this manuscript, and Katharine Timmins for typing the final version. Juliet Garfit prepared the final maps and diagrams.

The contributions to my research of many scholars who freely shared their views and data through correspondence and conversations are sincerely appreciated. I am particularly indebted to Robson Bonnichsen, Aleksis Dreimanis, John Elson, James Fitting, Charles Garrad, Michael Gramly, James B. Griffin, Ronald Mason, George MacDonald, James Payne, Donald Simons, Peter L. Storck, Stanley Wortner, James V. Wright, and Henry Wright.

Two scholars and colleagues played significant roles in my research. William B. Roosa guided me through part-time undergraduate studies, encouraged my interests in Paleo-Indians, provided a devil's advocate for my ideas, and expanded and brought to maturity some of my seedling

archaeological projects: the Welke-Tonkonoh, Parkhill, and McLeod sites. Christopher J. Ellis shared the burden of other projects, including the excavation, analyses, and reporting of the Thedford II and Crowfield sites, the analysis of several hundred Ontario fluted points, research concerning early sites that were inundated by Lake Nipissing, and the analyses of Hi-Lo assemblages from southwestern Ontario. Through his tireless efforts and dedication a mountainous backlog of unpublished data has diminished significantly. Certainly he deserves much more credit than is given here and in the text of this study.

Finally, I express appreciation to my parents for their encouragement, tolerance, and provision of material support for my many archaeological endeavours over the years.

TABLE OF CONTENTS

Page

Page

Page

LIST OF FIGURES

Page

Page

Page

LIST OF TABLES

Page

THE PALEO-INDIAN OCCUPATION OF SOUTHWESTERN ONTARIO: DISTRIBUTION, TECHNOLOGY, AND SOCIAL ORGANIZATION

CHAPTER I

INTRODUCTION

Significant advances in the study of early North American human populations have recently been made in southwestern Ontario. Archaeological reconnaissance in this region has succeeded in locating a comparatively large number and variety of Paleo-Indian sites that allow cultural changes to be traced through the Paleo-Indian period. Data recovered during reconnaissance and excavations on these sites provide opportunities that currently are rare in eastern North America to address problems concerning the cultural history of Paleo-Indian societies and their systems of settlement, technology, and social organization.

Southwestern Ontario, at present, encompasses the most agriculturally developed region of the province and one of the most heavily populated and industrialized regions of Canada. For the purposes of this study it is defined as that portion of

Ontario bounded on the south by Lake Erie, on the west by Lake Huron and the St. Clair-Detroit river system, on the north by Georgian Bay, and on the east by the Niagara escarpment (see Figure 1). Political units referred to in this thesis and selected physiographic features are shown in Figures 2, 3, 4, and 5.

Goals of the Thesis

A problem of major archaeological concern in the Northeast is the lack of clear understanding of Paleo-Indian societies, including their temporal and social contexts and their adaptations to the late glacial and early post-glacial environments. Factors contributing to this problem include the paucity of data concerning Paleo-Indian remains in the published archaeological record and the dearth of analyses of intra-site and inter-site variation. The present study will address these issues using data from a number of Paleo-Indian locations in southwestern Ontario, including eight previously unpublished sites and more than 50 unpublished find spots where isolated Paleo-Indian artifacts have been recovered. It will be demonstrated, where possible, how technological and social systems articulated human populations with their natural and cultural environments.

Specifically, the goals of this thesis are to:

1) report several Paleo-Indian sites for which there are no previous scientific or published records. Data recorded will

include site location, history of investigation, descriptions of artifacts and cultural features, and their interpretation;

2) classify the known Paleo-Indian assemblages in southwestern Ontario, and by extension, in the central Great Lakes region. This will involve refinement of criteria for defining several complexes, as well as the definition of previously undefined complexes;

3) determine the chronology of the sites and the complexes they represent. Determination of the temporal placement of Great Lakes Paleo-Indian sites is one of the fundamental archaeological issues to be resolved in the region. It is essential for placing the sites and complexes within their proper geological and paleoecological contexts. This in turn is a prerequisite for the understanding of Paleo-Indian cultural adaptation;

4) reveal, where possible, significant lifeways of particular Paleo-Indian societies, with reference to technology, settlement and subsistence systems, seasonal resource exploitation, camp organization, ritual practices, and interaction between neighbouring social groups.

History of Research

Much archaeological work is, of necessity, collaborative and this is true of Paleo-Indian research in southwestern Ontario. The following summarizes the history of the research underlying this thesis and identifies my own contributions to the understanding of Paleo-Indian lifeways and cultural history. In all possible instances, I have provided references in the text for significant ideas and data that originated with other researchers, or jointly with myself and others.

When I undertook my first survey work aimed specifically at locating evidence of Ontario's initial human inhabitants, there were no Early (fluted point associated) Paleo-Indian sites reported in the province, and the few fluted points that were known generally were considered to be anomalies. My survey work changed this as it brought to scientific attention more than thirty Paleo-Indian sites, including the first to be discovered in the province, and in excess of one hundred and fifty locations yielding isolated finds of Paleo-Indian projectile points or other early diagnostic artifacts. With one exception, I determined the cultural affiliation of the sites and isolated locations, and made the initial interpretations concerning the potential scientific value of each site and the nature of its occupation.

The Initial Fieldwork, 1955-1963

I first began searching for prehistoric sites and plotting their locations on topographic maps in 1955. During the early 1960s, I initiated a program of archaeological research that concentrated on two activities: 1) intensive surface reconnaissance on the Caradoc sand plain and Ekfrid clay plain in Middlesex county, Ontario; and 2) the study of collections of prehistoric artifacts gathered for the most part by farmers and collectors of Indian relics throughout southwestern Ontario. Several leads on sites were obtained by showing rural people a small (strategic) collection of artifacts and a mastodon tooth, and inquiring if similar materials had been found in the neighbourhood.

This research provided valuable experience that was of significant benefit to later survey work. It was learned what prehistoric cultural evidence and peculiarities of its distribution to expect in the area as a whole, as well as in specific physiographic settings. Of particular significance, it was observed what lithic raw materials occurred in the area naturally and/or in archaeological contexts, and that assemblages associated with certain types of projectile points frequently were characterized by distinctive patterns of raw material association. These observations benefitted subsequent survey efforts by permitting the location of some types of sites to be predicted from topographic and soil survey maps, and by facilitating identification of the cultural affiliation of some sites that lacked commonly recognized diagnostic artifacts.

The Search for Paleo-Indian Sites, 1963-1972

Beginning in 1963, I directed my reconnaissance efforts specifically towards locating Paleo-Indian sites. The first systematic attempt to locate early sites was based on the possibility that Paleo-Indians might have been hunting proboscidians. Several areas where mastodon remains had been reported were searched for evidence of early hunters who might have camped near a kill site. A few previously unreported locations yielding remains of mastodon were discovered, but no Paleo-Indian sites were located. It became evident that the major concentrations of mastodon remains were south of the Thames River, whereas the major concentrations of fluted points seemed to occur north of it. These data, however, do not preclude the possibility that at least some Paleo-Indians might have been hunting mastodon in southwestern Ontario.

By 1965, several isolated finds of Paleo-Indian artifacts had been recorded. When the locations of these artifacts were plotted on topographic maps, it became apparent that several locations were situated on or near water divides. This pattern seemed to contrast with those from other areas in the Northeast where "The Paleo-Indian also shared with a majority of his successors a decided choice for main waterways" (Ritchie 1965:7). Based on the presumed southwestern Ontario pattern, survey efforts were concentrated on water divides and a few additional Paleo-Indian artifacts were recovered.

One of the most significant outcomes of this research was the observation that Paleo-Indian artifacts also frequently occurred at certain elevations above sea level. These elevations marked the water planes of a series of Late Pleistocene proglacial lakes that had inundated large areas of the Great Lakes basin (Hough 1958). Beginning in 1968, survey efforts were concentrated on shoreline areas of Lake Maumee, Lake Arkona, Lake Whittlesey, and Lake Warren. Surveys based on this strategy proved to be productive, as several find spots of Paleo-Indian artifacts were discovered and a few small Paleo-Indian sites including Strathroy, Stewart, White, and Glen Oak were recorded. The dates when these lakes were active, circa 16 000 B.P. to 12 000 B.P. (Hough 1958; Prest 1970), are earlier than the time range generally accepted for Paleo-Indian cultures, and thus, the possibility that the Paleo-Indians were camping next to the water's edge is precluded. Rather, it is probable that they were attracted to the relict shoreline localities because they offered a favourable micro-environment. For example, it is possible that the surrounding environment might have consisted of boreal-type forest that had a low carrying capacity in terms of supporting human populations. The low-lying areas flanking the relict shorelines may have offered a richer environment, perhaps consisting of vegetation such as sedges, grasses, or lichens, that attracted game animals, and thus bands of Paleo-Indian hunters. Furthermore, it was noted

(Deller 1976a, 1979) that most of the sites in these areas were associated with sections of the fossil shoreline that had a "zigzag" configuration. More recently, Storck refers to similar localities in southcentral Ontario as indented shorelines. He proposes (1982:23) that sites along indented shorelines would have provided access to larger areas of shoreline habitat within a short radius of the site than would locations on straight shorelines.

During these surveys it was noted that Collingwood (Fossil Hill) chert was diagnostic of early Paleo-Indian sites throughout most of southwestern Ontario. This observation made significant contributions to the identification and location of Paleo-Indian components. Several Paleo-Indian sites were initially recognized in the field on the basis of this raw material.

Turning Points in the Survey Program: The Discovery of the Parkhill Site and Development of a Settlement-Subsistence Model

The discovery of the Parkhill site in 1973 (Deller 1980b) marked a turning point in the search for early sites in southwestern Ontario. Interpretations of data from the site led to the formation of a settlement-subsistence model proposing a seasonal round of resource exploitation that could be used to explain site location and population movements through the region. This model was successfully used to predict localities and loci where sites most likely would be situated.

Reconnaissance in these areas proved to be very productive. Many sites were discovered where predicted, some precisely so and others within a few hundred metres of the predicted location. The model proposed that:

1) Caribou played a major role in the subsistence economy of the Parkhill population.

2) A major caribou migration corridor skirted the Thedford embayment of proglacial Lake Algonquin. Caribou migrating northward from a large area south of the lake would be deflected northeastward as they encountered the shoreline area (see Figure 17). Ultimately the animals passed around the southeastern corner of the bay. The convergence of migration routes at this location made it a favourable place to intercept the migrating herds.

3) The Parkhill population moved on an annual cycle within their territory in accordance with the seasonal ranges and migratory behaviour of caribou. In anticipation of the caribou migration in the spring, the Parkhill population moved to sites that were in a favourable position for intercepting the northward movement of the animals. One such locality was the migration corridor that skirted the Thedford embayment of Lake Algonquin. Springtime camps possibly represented macroband gatherings of the population. Large sites, such as Parkhill, probably were reoccupied several times over a number of years, not necessarily in succession.

4) During the summer, the Parkhill population, or at least part of it, moved to the northern range of their territory, in the Georgian Bay area south of the ice front, in order to keep within or near the summer range of caribou. While they were in their summer (northern) range, the Paleo-Indians obtained their annual supply of chert. From the summer camps the movements of caribou could be monitored to facilitate prediction of the most likely migration routes in the fall.

5) The Parkhill population dispersed during the winter to small microband camps in the southern range of their territory. These camps were located in the sheltered, inland areas near boggy terrain that caribou were known to frequent.

Surveys for Paleo-Indian Sites, 1973-1982

Following the development of this model in 1973, another series of surveys for Paleo-Indian sites was inaugurated. Whereas the former survey strategies had been based on an analysis of site locations relative to physiographic features, the new survey strategies were based on an understanding of Paleo-Indian behaviour as suggested in the model. Working under the assumptions that Paleo-Indians had a settlement-subsistence system that was structured and repetitious and that site location could be predicted according to the settlement-subsistence model, a number of locations were selected for survey where it was anticipated that spring or winter occupied sites might be found. Surveys of these locations proved to be productive. Several sites were found, including McLeod (AhHk-52), Dixon (AhHk-73), Schofield, Haunted Hill (AhHk-86), Heaman (AhHk-51), Thedford II (AgHk-6), and Wight. In addition to these base camps, more than 25 locations that yielded at least one diagnostic Paleo-Indian artifact, such as a fluted point or a channel flake, were recorded.

Analyses of the physiographic attributes of these southwestern Ontario sites and find spots suggested further patterns involving site locations relative to soil types. It was noted that Paleo-Indian sites were frequently situated on Berrien sandy loam (consisting of approximately a metre of sandy loam overlying a clay base) in proximity to areas of muck soils. As these soil types often occur in proximity to each other, especially along proglacial lake strandlines, it is difficult to determine which factor might have been more significant to Paleo-Indian settlement systems. Elsewhere (Deller 1979) it has been suggested that the areas of muck soils might have offered the Paleo-Indians a favourable, but as yet unidentified type of environment, either directly through the vegetative covering or indirectly through the animals that were attracted to such micro-environments. In modern times, farmers note that cattle prefer to browse in these low areas rather than on the surrounding terrain. Whatever the explanation, these soil configurations are easy to identify on soil survey maps, and beginning in 1978, reconnaissance was directed to some of these areas in the counties of Lambton and Middlesex. This reconnaissance resulted in the discovery of several sites, including McColl-Davelaar, Lambert, Rommele, and Crowfield, as well as several locations yielding one or two diagnostic Paleo-Indian artifacts.

Research in Collaboration with William B. Roosa

From 1971 to 1976, William B. Roosa of the University of Waterloo began, in collaboration with the author, a program of excavations on some of the sites found during the survey work. These sites included Strathroy, Welke-Tonkonoh, Stewart, Parkhill, and McLeod. They are discussed briefly here and in greater detail in subsequent chapters.

Apart from the initial recognition of the sites' importance, my contributions included obtaining permission to excavate (often in planted cropland), the negotiation of agreements with a native group that opposed excavation of the sites, the provision of housing and some transportation for field crews, and, as the project developed, ideas concerning the seasonal exploitation of a fairly well defined territory by the Parkhill society, the location and function interpretation of areas G, H, I, J, K, and L on the Parkhill site (see Chapter V), and the significance of some types of artifacts, such as backed bifaces and alternately bevelled bifaces that previously had not been recognized in Northeastern or Great Lakes Paleo-Indian contexts.

The Strathroy site (see Chapter VII) was the focus of limited test pitting and excavations in 1971 and 1972. Although the surface of the site had yielded several basally thinned projectile points similar to those from the Holcombe site in Michigan (Fitting et al. 1966), no artifacts diagnostic of Paleo-Indian occupation were recovered in situ in the excavations. The work, however, taught a valuable lesson that was to be repeated on several early sites in Ontario: that Paleo-Indian encampments frequently are characterized by two or more areas of artifact concentration. Whereas the spaces between these areas might have been the loci of considerable human activity, surviving evidence in these areas generally is quite sparse.

The Welke-Tonkonoh and Stewart sites were the focus of excavations by Roosa in 1972 and 1973. These sites are among the few known base camps associated with the Hi-Lo point type, which has a widespread distribution throughout southern Ontario, Ohio, and Michigan. In 1980, C.J. Ellis continued excavations on Welke-Tonkonoh. The excavated assemblages and a large surface collection from these sites provided the basis for the first major synthesis of data concerning Hi-Lo points and associated implements (Ellis and Deller 1982).

The Parkhill site serves as the "type-site" for the Parkhill complex in the central Great Lakes region. Surface investigations at Parkhill (Deller 1980b) revealed that the site was characterized by discrete concentrations of artifacts and debitage that have been interpreted as workshop and/or habitation areas. Excavations directed by Roosa on the site during 1973 to 1975 recovered substantial amounts of data, which, combined with the surface collected materials, provided the basis for publications generally focusing on analyses of fluted points (Roosa 1977a, 1977b; Roosa and Deller 1982) and lithic debitage (Ellis 1979).

The McLeod site is situated on the proglacial Lake Algonquin shoreline about 1.5 km south of the Parkhill site. Surface investigations (Deller 1979, 1980a) and limited excavations directed by Roosa revealed two areas of artifact concentration separated by about 100 m. It is probable that the site is attributable to the Parkhill complex and to the same Paleo-Indian population that occupied the Parkhill site. Publications concerning McLeod include brief descriptions of the site's location and artifacts (Deller 1979, 1980a; Deller and Ellis 1982) and a detailed analysis of the lithic debris (Ellis 1979).

Research in Collaboration With C.J. Ellis

From 1978 to the present, I have worked in collaboration with C.J. Ellis on several projects. These include investigations of the Weed, Ferguson, Thedford II, and Crowfield sites, for which I have overall responsibility, especially in terms of financing, reporting, and accountability. Ellis, for the most part, directed excavations and initially analyzed the findings as part of his graduate studies at Simon Fraser University. Since we freely shared ideas and the data base, neither Ellis nor I can claim full credit for most ideas resulting from these projects. Nevertheless, his interests and contributions mainly were in the realm of lithic technology and mine were concerned primarily with cultural history and the distribution of cultural traits.

In the study of early assemblages that were altered when Lake Nipissing reoccupied the former Algonquin shoreline (Ellis and Deller 1986), I was responsible for the collection of data in the field and initial interpretations, while Ellis reanalysed the data, refined the interpretations, and prepared the work for publication.

ORGANIZATION AND SCOPE OF THE THESIS

The rest of Chapter I summarizes the previous Paleo-Indian research on which this thesis will build. A combined geographical and historical approach will be used. Generally, the summary will proceed from west to east, becoming more detailed and problem orientated as it approaches southwestern Ontario. For the west, Paleo-Indian complexes will be summarized in a general chronological sequence. For the east and particularly the Northeast, where the understanding of

Paleo-Indian chronology is hampered by the paucity of chronometric dates and stratified sites, the summary will trace the development of Paleo-Indian research with a concentration on significant sites that have been discovered and their interpretation in light of the western paradigm.

Chapter II will summarize the Late Wisconsin deglaciation and the paleoenvironmental record of the Great Lakes region. This is essential for examining the Paleo-Indian occupations within their proper geological and ecological contexts, which in turn is necessary for the study of Paleo-Indian adaptive strategies. The chapter will conclude with short descriptions of the lithic raw materials frequently utilized by Paleo-Indian societies in southwestern Ontario.

Chapter III will present data on the known fluted point types in southwestern Ontario. This will include discussions concerning their definitive criteria, diagnostic value in identifying Paleo-Indian complexes, age and cultural affiliation, and distribution in the Great Lakes region.

Chapters IV to VI will describe in chronological order the southwestern Ontario Paleo-Indian complexes that are associated with fluted projectile points. These include the Gainey, Parkhill, and Crowfield complexes. Reports on several sites will be included.

Chapter VII will present data on Late Paleo-Indian sites and the complexes that they represent. These consist of Holcombe and Madina manifestations.

Chapter VIII will provide a summary of the study and general conclusions.

AN OVERVIEW OF PALEO-INDIAN RESEARCH IN NORTH AMERICA

Paleo-Indian: What's in a Name?

The term "Paleo-Indian" first appeared in the published record in the title of a 1940 synthesis of early man studies by Frank Roberts. Although the term was not defined in the text of this synthesis, it was clear that it referred to early American societies that hunted species of animals that became extinct at the close of the Pleistocene epoch (Wilsen 1974:10). The term was adopted by other researchers but generally there was a lack of agreement concerning its definition. Witthoft (1952:364) notes:

> The term Paleo-Indian was originally used by Roberts for American cultural assemblages which appeared to be chronologically early, on the basis of geologic, faunal, or typological evidence, and I believe he used the term in a cautious non-classificatory sense, since he was obliged to handle many complexes of controversial status under this term (Frank H.H. Roberts, Development in the problem of the North American Paleo-Indian, Smith. Misc. Coll. 100:51-116. 1940). Griffin used the term in contrast to Neo-Indian, and extended Robert's usage to include typical complexes of what I call the Early and Late Archaic Periods, as well as various basketmaker complexes. In Griffin's usage, the term is a convenient label for complexes which are formally not Neolithic, particularly in economic pattern, and is offered in objection to widespread use of the term Archaic Pattern (James B. Griffin, Cultural change and continuity in Eastern United States archaeology, Man In Northeastern North

> America, Papers Robert S. Peabody Foundation for Arch. 3:37-95, 1946, pp. 40-43). I have used the term for a technological stage, presumed to equate with a time horizon, with the absence of pecking and grinding as a tool-shaping method as the major criteria; this usage is a refinement of Robert's usage, probably of limited value, but permitting precise and convenient classification of industries.

Another definition was offered by Wormington (1957:3) in her classic synthesis of data concerning ancient man in North America.

> The term "Paleo-Indian" (Paleo=Old) is often used to refer to the earliest inhabitants of North America in order to differentiate them from the later peoples...It will be used here to refer to people who hunted animals which are now extinct, to people who occupied the western United States prior to about 6,000 years ago, and to the makers of the fluted points found in the eastern United States.

The terms "Paleo-Indian stage", "Paleo-Indian tradition", and "Paleo-Indian period" frequently appear in the literature but there is some question as to what they are referring. For example, in a synthesis of archaeological data from New York state, Ritchie uses the terms "Paleo-Indian period" (e.g. 1957:3, 19) and "Paleo-Indian stage" (ibid:17, 22) interchangeably. Mason (1962:227) refers to a Paleo-Indian tradition, but also notes there is confusion in terminology. He comments (ibid:229):

> Clearly, a single life-way is represented, one homogeneous in its big-game hunting orientation, although the particular species hunted change in time and space. There is little or no indication of increased population density or of a shift to a more sedentary settlement pattern. Everything

> points to a single culture type whose unity and cohesiveness through time can be documented by reference to artifact typology, subsistence basis, and shared traits, both positive and negative. This continuum, tradition, culture stage, or culture type - however it may be viewed - is what American archaeologists usually call Paleo-Indian.

Prufer and Baby (1963:2, 3) remark:

> It has never been determined satisfactorily whether "Paleo-Indian" and "Archaic" should be viewed as culture stages, culture traditions, or both...No matter which of the numerous definitions for Paleo-Indian and Archaic are used, any of them is relatively satisfactory as long as it applies to the classic archaeological complexes in terms of which the definitions were set up. The difficulties begin when one considers tool assemblages which do not appear to fit either tradition and which essentially - because they were poorly known at the time - were not part of the original tradition definitions, but which chronologically (though not necessarily culturally) appear to be transitional between Paleo-Indian and the Archaic.

In this study, the term Paleo-Indian will refer to Late Pleistocene and/or Early Holocene hunters and gatherers in the New World that made lanceolate projectile points. At present, the most easily recognized diagnostic traits of Paleo-Indian societies are found in the lithic artifacts. Diagnostic artifacts include several varieties of fluted and unfluted lanceolate projectile points that have grinding on their lower lateral edges. Most, if not all, Paleo-Indian societies manufactured gravers, end scrapers, and side scrapers, but it is often difficult to distinguish the latter two types of tools from those of later cultures (see Irwin and Wormington (1970) for definitions of most implement types referred to in this study). Other artifacts that are regionally diagnostic of Paleo-Indian cultures will be discussed later in this study. The chipped stone industry predominantly is manufactured from high quality cryptocrystalline lithic raw materials, often of exotic (non-local) origin. Ceramic materials are not found in Paleo-Indian assemblages.

Point Typology and the Identification of Paleo-Indian Complexes

There are several reasons why the study of projectile points has been a central focus of Paleo-Indian studies. Generally, lithics constitute most of the evidence that remains for archaeological analysis on Paleo-Indian sites. Of the lithic artifacts, projectile points exceed the other classes of tools in diagnostic value. For example, assemblages of fluted points tend to show more significant variation between sites of different complexes than do assemblages of gravers, sidescrapers, or endscrapers. Perhaps this is due to the fact that fluted points are more complex and involve more decisions in their manufacture than do the other tools.

The diagnostic value of Paleo-Indian projectile points was first recognized on the western plains where archaeologists distinguished two types of fluted points: Clovis and Folsom. Clovis points were found in association with the remains of mammoth on several sites and Folsom points consistently were recovered in association with bison remains. These point types were considered to be manufactured by discrete Late Pleistocene societies. This was verified by Cotter's 1934 excavations at Blackwater Draw near Clovis, New Mexico, where the two types were recovered in separate stratigraphic units. Clovis fluted points were found in association with mammoth remains underlying Folsom points associated with bison bones. Elsewhere on the western plains, Agate Basin points, Scottsbluff points, and other types (see Wormington 1957) were similarly isolated on the basis of typological variation and stratigraphic separation. Later, radiometric dating of these point types provided yet another means by which they could be shown to be discrete.

Paleo-Indian Complexes and Chronologies on the Western Plains

Several Paleo-Indian complexes have been identified on the western plains of North America. Not only are these complexes of culture historical significance, since they provided the basis for the first Paleo-Indian studies, but also they have furnished significant data concerning Late Pleistocene cultures and their environmental and temporal contexts. The following are brief summaries of the western complexes that provide a framework of reference for the southwestern Ontario data described later in this study.

The Clovis or Llano Complex (11 500 B.P.-11 000 B.P.)

This is the oldest well-documented complex in North America (see Table 1 for radiometric dates for some Clovis components). The precise definition of this complex has not been achieved and, as is the case with many Paleo-Indian complexes, agreement has not been reached concerning its full range of variation. Whereas there is a general concensus about what constitutes "classic" Clovis on western sites such as Naco and Lehner in Arizona (Haury 1953; Haury et al. 1959), there is considerable controversy when the term is extended to include assemblages such as those from the Colby site in Wyoming (Frison 1978) or several sites in the east whose fluted points frequently were identified as Clovis, e.g, the Shawnee-Minisink and the Slippery Rock sites in Pennsylvania (McNett et al. 1977; McConaughy et al. 1977). Probably some of the controversy concerning the definition of the complex can be attributed to the fact that most Clovis sites that have been investigated represent only a very limited range of behaviour. The complex is known primarily from kill sites and associated processing and workshop areas where Clovis fluted points and a few other utilitarian implements have been found consistently associated with the remains of mammoth, and occasionally with those of sloth, camel, horse, dire-wolf, giant armadillo, and four-horned antelope (Hester 1975). Few base camps attributable to the complex have been investigated. When base camps representative of a broader range of Clovis lifeways are found and investigated in detail, archaeologists no doubt will gain a better understanding of the complex and the society it represents. Until this is accomplished, I concur with Roosa (1965) that the term Clovis should be restricted to assemblages of a particular population in the West whose economic orientation included the hunting of mammoth and whose tool kits included "classic" Clovis points.

Another fundamental problem yet to be resolved concerns the origin of the Clovis culture. Ikawa-Smith (1982) summarizes lithic assemblages and early subsistence practices in East Asia as an aid for understanding possible ancestral forms of early adaptive strategies in the New World. Yet direct relationships have still to be discovered. Frison (1983:111) notes: "The origins of Clovis seem as dim as ever. There is still no acceptable stratigraphic evidence that offers any reasonable cultural complex out of which Clovis could have evolved". Generally, opinion is divided as to whether Clovis represents an adaptation to the New World conditions of a population who moved across Beringia late in the Pleistocene, or whether it developed out of a culture or cultures which reached south of the ice sheet earlier. Haynes (1982:383-384) comments:

> An Old World origin for Clovis seems probable on the basis of comparisons of their bone and stone technology with that of Europe and Siberia during the late Paleolithic. In eastern Siberia before 11,000 BP, there appear to have been two distinct lithic traditions, one dominated by microblades

> (Dyuktai) and one without microblades (Mal'ta-Afontova). Clovis may have been a descendant of the latter people, who crossed Beringia in pursuit of big game between 20,000 and 15,000 years ago when steppe-tundra united the two northern continents. Subsequent decline of steppe-tundra and Pleistocene megafauna after 15,000 BP may have led the hunting cultures farther south-eastward until they passed from the habitats of M. primigenius to those of M. columbi and M. jeffersoni about 13,000 to 12,000 years ago. The nearly explosive increase and spread of the Clovis culture thereafter may have been the direct result of this contact with game resources not previously exploited by man, or at least not with the intensity brought to bear by the Clovis big game specialists... The main alternate hypothesis for Clovis origin is that the culture developed within the Americas from a population present in the New World before late Wisconsin glaciation began 30,000 to 50,000 BP (Bryan, 1969; Bonnichsen, 1978; Stanford, 1978).

Again, when variability within the Clovis complex is more clearly understood, researchers will be in a better position to determine its history. Perhaps some of the Clovis forms that are presently considered to be aberrant will prove to be intermediate between Clovis and its predecessor.

Sites that are generally accepted as having Clovis components include Blackwater Draw, Mockingbird Gap, and 13JB5 in New Mexico (Cotter 1937; Weber et al. 1968; Judge 1973); Naco, Le[illegible] and Murray Springs in Arizona (Haury 1953; Haury et al. 1959; Haynes 1968); Domebo in Oklahoma (Leonhardy 1966); and Dent in Colorado (Figgins 1933). The Anzick site in Montana (Lahren and Bonnichsen 1974) yielded possible evidence of Clovis burials in the form of red ochre-covered subadults accompanied by stone and bone artifacts.

Haynes (1982:393) summarizes Clovis technology and subsistence:

> Clovis people appear in general to have been foragers, mainly hunting mammoths and bison as both food and material resources. A typical tool kit that might be found among a band of Clovis people would contain, in addition to the diagnostic projectile points, knives on bifacial thinning flakes (some with graver or borer tips); end scrapers (some with spurs) on both flakes and blades; side scrapers on large flakes and blades; notched blades; well-made bifacial preforms of various sizes that could serve as choppers; and a variety of bone and ivory tools of which only two forms, bevel-based cylindrical objects and a shaft straightener have been preserved in Clovis sites. Their big-game take was commonly a single mammoth which was only partially butchered and utilized, or a small group of bison which were dismembered and apparently more efficiently utilized than mammoth kills.
>
> The small amount of available data indicates that the basic Clovis tool kit was the same, except for minor local components, whether in the eastern or western parts of the continent and regardless of environment. This and the wide-ranging flint source confirm a high degree of mobility and lack of dependence on the resources of a restricted environment. Clovis people appear to have wandered over extensive areas looking for lithic sources and exploiting the megafauna, usually at watering places. The degree to which vegetation was utilized in their economy is unknown due to lack of preservation, but presumably it was great.

The Folsom Complex (circa 10 800 B.P.-10 400 B.P.)

The Folsom complex post-dates the Clovis complex on the western plains. This has been demonstrated stratigraphically at the Blackwater Draw site in New Mexico and by radiometric dating at several other sites. Dates for several Folsom components are given in Table 1. Diagnostic of the complex are Folsom fluted points that generally are smaller, thinner, more fully fluted, and more carefully flaked than Clovis points. They have been found at several kill sites in association with the remains of extinct bison, and also at pre-hunt armament sites, post-hunt processing sites, and base camps. Other faunal remains associated with Folsom components include pronghorn deer, hare, wolf, coyote, fox, and turtle (Wilmsen and Roberts 1984). The faunal remains and the numerous projectile points found on Folsom sites provide evidence that hunting played a significant role in Folsom subsistence. The distribution of the Folsom complex seems to concentrate in the area known as the High Plains, which extends along the eastern slope of the Rocky Mountains. Elsewhere finds have been much less frequent. Sites with Folsom components include Folsom in New Mexico (Figgins 1927); Lubbock, Bonfire Shelter, Adair-Steadman, and Scharbauer in Texas (Sellards 1952; Dibble and Lorrain 1968; Tunnell 1975; Wendorf and Kreiger 1959); Lindenmeier and Johnson in Colorado (Roberts 1935; Wormington 1957:40); Hell Gap, Brewster, and Hanson in Wyoming (Irwin-Williams <u>et al</u>. 1973; Agogino 1972; Frison and Bradley 1980); and MacHaffie in Montana (Forbis and Sperry 1952).

The Midland Complex

This complex first was identified on the Scharbauer site near Midland, Texas. Here, seven Folsom points were recovered as well as 21 points that are similar to Folsom in most respects except they are not fluted. These unfluted specimens were named Midland Points. Whether or not they are diagnostic of a separate complex, however, has been questioned by several researchers (see Agogino 1969; Mason 1962; Frison 1983). Judge (1970:44) notes:

> There has been considerable debate among archaeologists as to whether the Midland specimens constitute a separate type, or whether they are simply unfluted Folsom points. A frequently encountered explanation of this phenomenon is that the Midland points are in reality Folsom points which were too thin to flute.

Regardless of whether the Midland complex differs from Folsom, Midland points are of interest to this study because they are similar to Holcombe points in the Great Lakes region (Fitting et al. 1966:132; Roosa and Deller 1982:4). This is not meant to imply that there is a close historical affinity between Midland and Holcombe. Instead, they might represent parallel developments in different regions.

In a proposed succession of Paleo-Indian complexes, Irwin (1971:48) suggests that the Midland complex dates between Folsom and Agate Basin: Plainview or Goshen (9000-8800 B.C.), Folsom (8800-8550 B.C.), Midland (8650-8350 B.C.), Agate Basin (8450-7950 B.C.) and Hell Gap (7950-7450 B.C.).

The Plainview Complex (circa 10 000 B.P.)

The Plainview complex that concentrates on the southern High Plains is not as controversial as the Midland complex. Its principal diagnostic artifacts are Plainview points that are often described as "unfluted" Folsoms. Concerning the complex, Johnson and Holliday (1980:90) note:

> The Plainview type site (Sellards <u>et al</u>. 1947) is located on the Llano Estacado in Running Water Draw on the outskirts of the city of Plainview, Texas...Few Plainview period sites have been excavated and there is some debate as to the culture's geographic extent and range in time (Dibble 1968; Irwin 1971; Wheat 1972). Even less is known about lifeway patterns of these peoples, their economic system, tool assemblages, and environment in which they interacted.

The Plainview complex overlies Folsom components on several sites including the Lubbock Lake site (ibid.) and the Bonfire Shelter site (Dibble and Lorraine 1968) in Texas. Other sites having Plainview components are the Plainview type site (Sellards <u>et al</u>. 1947), the Lone Wolfe Creek site (Cook 1927; Wormington 1957), and the Lake Theo site (Harrison and Killen 1978) in Texas; and the Nall site (Baker <u>et al</u>. 1957) and Pumpkin Creek site (Wyckoff and Taylor 1971) in Oklahoma. On the Northern Plains, Plainview points are reported from the Red Smoke and Lime Creek sites (Davis 1962).

The Agate Basin Complex

The Agate Basin complex generally post-dates the Folsom complex on the western Plains. Frison (1983:114) comments on its development:

> The ultimate fate of the Folsom cultural complex, with its distinctively fluted points, remains unsolved. On the Northwestern Plains, the next known cultural complex is Agate Basin; further south, it is Plainview. The writer feels much more comfortable claiming a possible direct relationship between Plainview and Folsom than Agate Basin and Folsom based on technology alone. On the other hand, the Agate Basin site has dated, stratigraphic evidence of Agate Basin immediately above Folsom with no apparent change in site activities and no significant changes in tool assemblages. The fluted Folsom points may have simply been replaced by the Agate Basin...Agate Basin has been a problem in Paleoindian studies because of the use of the term "Agate Basin-like: used to describe projectile points that resemble the Agate Basin type in outline form but that are usually several thousand years later in date.

Diagnostic of the complex are long, slender, finely-flaked, lanceolate projectile points that generally have grinding on their lower lateral edges and base. This point type frequently has been found in association with bison remains (Frison 1978), but it is assumed that the subsistence base included a variety of animal species as well as plant products. Radiometric dates from a number of Agate Basin sites range between 10 500 B.P. and 10 000 B.P. (Frison ibid.; Irwin-Williams et al. 1973).

The Hell Gap Complex

Closely related to Agate Basin points are Hell Gap points that date between 10 000 B.P. and 9 500 B.P. In many respects these two point types are similar except that Hell Gap points generally are characterized by more markedly contracting stems.

It is probable that they were hafted in sockets and used for hunting bison, deer, and antelope (Frison 1978). The Hell Gap complex is found on several sites, including the Hell Gap and Casper sites in Wyoming (Irwin-Williams et al. 1973; Frison 1974) and the Jones-Miller site in Colorado (Frison 1978).

The Development of Paleo-Indian Research and Understanding in the Northeast

In comparison to most other areas in the New World, relatively large numbers of Paleo-Indian artifacts have been recovered in the Northeast. For example, Ohio alone has produced more than 1000 fluted points (Seeman and Prufer 1982) and hundreds have been recovered in adjacent areas of southern Ontario, Michigan, and Indiana. Studies based on these artifacts and the large number and variety of sites that have been found in the Northeast have made substantial contributions to the understanding of Early Man in North America, yet fundamental problems remain to be resolved. One of the major issues that needs to be addressed is the classification of known Paleo-Indian assemblages into units representing discrete Paleo-Indian populations. This will make it possible to analyze data from groups of related sites in such a way as to facilitate an understanding of lifeways attributable to specific Paleo-Indian groups. This type of classification generally developed more slowly in the Northeast than on the western plains because of several factors:

1) In the Northeast there is a paucity of stratified Paleo-Indian components, reliable radiometric dates, and faunal and floral associations with early cultural materials;

2) The Northeast is characterized by a great variety of Paleo-Indian projectile points. Since these represent continuous change through time, there are many transitional examples among samples from various sites. This makes classification difficult;

3) The western Paleo-Indian complexes for the most part were defined at a time when American archaeological research interests were especially concerned with the reconstruction of culture histories. This has not been the case in the Northeast, where much of the research has been accomplished more recently.

Initial Studies of Northeastern Paleo-Indians

The following section summarizes the development of Paleo-Indian research in the Northeast in arbitrary periods, each spanning approximately a decade. Some data concerning fieldwork in southern Ontario are included at the end of the section.

The initial Paleo-Indian research in the Northeast generally concerned the age and distribution of fluted points. Studies by Figgins (1934), Howard (1934), Shetrone (1936), Crozier (1939), Roberts (1939), Robertson (1947), McCary (1947, 1948, 1949), Kidd (1951), and Ritzenthaler and Scholz (1951) demonstrated that the Paleo-Indian occupation had been widespread and was represented by a great variety of projectile point types. Also, these studies raised controversial issues concerning the nature of the relationship between eastern and western Paleo-Indian societies. Some scholars maintained that the close similarities between eastern and western assemblages indicated contemporaneity. Others suggested that some eastern assemblages were older, based on the erroneous assumption that there is a necessary correlation between the distribution of a type and its age, namely the larger the area covered, the older the form. Roberts (1939) commented on these issues in a 1939 summary:

> The significance of the fluted points occurring east of the Mississippi River is open to question. There is still no evidence suggesting their possible age or place in the main archaeological picture. The vast majority are surface finds and although there seem to be several centers, as mentioned previously, where they are picked up in comparatively large numbers, nothing has come to light that would indicate their relationship to the cultural remains present in those areas. The fact that the eastern examples bear a striking resemblance to those in the West does not make them of equal antiquity. They may represent a survival of a highly specialized implement in later horizons. Some students take a different view and regard the individuality of the form together with its apparent absence from the recognized complexes in the East as a manifestation of its greater age. On the basis of the distribution concept as an index to age - a theory substantiated in some respect by evidence that tends to indicate that there is a correlation between type and distribution, so that the larger the area covered the older the form - the eastern examples would indicate more antiquity than the western. But until specimens are found in association with fauna comparable to that in the West and

accompanied by other implements not known to belong to the Folsom complex, conclusions must be withheld.

Studies of Northeastern Paleo-Indians During the 1950s

During the 1950s, understanding of Paleo-Indian societies in the Northeast was advanced by the publication of several sites: the Parrish site in Kentucky (Webb 1951), the Williamson site in Virginia (McCary 1951), the Shoop site in Pennsylvania (Witthoft 1952), the Reagan site in Vermont (Ritchie 1953), and the Bull Brook site in Massachusetts (Byers 1954). Studies of these sites generally focused on lithic technology, particularly descriptions of utilitarian implements and analyses of waste products in order to determine how lithic assemblages were made and used.

Several regional studies published during the 1950s attempted to date fluted points by interpretation of their distribution in relation to geologically dated features, such as moraines and proglacial lakes. In Michigan, Mason (1958) noted the frequent association of Paleo-Indian projectile points with the strandlines of Late Pleistocene proglacial lakes. Based on the then available data, he proposed that the Valders ice corresponded with the northern boundary of the distribution of fluted points. Quimby (1958, 1960) noted the correlated distribution of fluted points, spruce-fir forests, and mastodons in the Upper Great Lakes, and proposed that the makers of Clovis points were hunting mastodon in this area despite the lack of known kill sites. In New York state, Ritchie (1957) noted that the principal concentration of fluted points occurred on the bed of proglacial Lake Iroquois, which meant they must have been left there after the recession of the water.

Developments in Northeastern Paleo-Indian Research During the 1960s

During the 1960s, studies of Paleo-Indian demography and technology in the Northeast continued, while environmental reconstructions and socio-archaeological problems received increasing attention. Survey work included that of Prufer (1960), Hyde (1960), and Prufer and Baby (1963) in Ohio; Peru (1965) in Michigan; Funk and Schamback (1964) and Ritchie (1965) in New York; and McCary (1968) in Virginia.

Early in the decade, Mason (1962) published a major synthesis of Paleo-Indian research, the central theme of which was culture history. The study also reflected growing interests in inter-disciplinary studies and cultural ecology. It touched on several key issues, including the definition of Paleo-Indian, the distribution of Paleo-Indian materials across the continent, and the chronological relationship of eastern and western assemblages. It served to focus attention on eastern Paleo-Indian materials by raising provocative ideas, such as that Paleo-Indian culture might have originated in the southeast rather than in the west as was the consensus at the time. Although Mason noted that the concept of a big game hunting orientation preceding a generalized hunting and collecting stage was coming under attack as being an outdated model, he felt that the hunting of Late Pleistocene (herd) animals played a significant role in Paleo-Indian subsistence:

> It seems more than coincidental that the end of the Paleo-Indian cultural dominance, as measured by radio-carbon and other dating techniques, agrees closely with the demise of the fossil Pleistocene big-game animals; or to put it another way, that it was during the period characterized archaeologically by such artifact types as Folsom and Clovis that the great Pleistocene extinctions were taking place. It would push the limits of credibility to view as likewise coincidental the fact of the emergence of the generalized subsistence basis of the Archaic cultures during the disappearance of the Pleistocene fauna and fluted points. In other words, there is expressed a functional relationship between these culture types and the total ecology of which they were parts...We might wonder how it was possible that such a restricted set of cultural paraphernalia, best exemplified by the Clovis point, came to be distributed at an early period across almost all of the ice-free North American continent, and that such artifacts are frequently identical though separated by thousands of miles and significant boundaries. Why did not the material culture change as man adapted himself to the different habitats he quite evidently occupied? A contribution to the answer suggests itself: probably the most singularly potent factor to which man had to adapt was the great reservoir of large herbivores on which we know the food-quest relied and which must have answered the needs for clothing as well. With the tapping of this vast energy pool man fastened himself to a vehicle for cultural specialization that cut across other ecological barriers. Once that primary adaptation was achieved, he was not only capable of making but did in fact make those lesser adaptations required to follow and exploit the Pleistocene mammalian fauna (Mason 1962:242-243).

Tribute to this study was paid by Cotter more than 20 years later (1983:15):

> In the necessary re-reading of Mason's 1962 article on the Paleo-Indian in Eastern North America and the comments, together with his response, I was impressed with how much we knew then about the subject. I was equally impressed by how little we have really added to the hard site data on fluted and parallel-flaked blades since then. Mason's conclusion, "Tomorrow we will know a lot more" finds, 20 years later, that we do know more, but not a great deal more.

Another significant contribution to Paleo-Indian studies in the Northeast during the 1960s was Roosa's (1965) definition of some Great Lakes fluted point types. He suggested that fluted points in the east not be called Clovis points, reserving this term for a specific point type on the western Plains that exhibited characteristics discrete from those in the east and which was associated with the hunting of mammoth. Instead, he advocated the classification of fluted points in the Great Lakes area into typological groups such as Enterline, Bull Brook, Barnes, Cumberland, and Ross County. These types were established primarily on the basis of fluting techniques. Size and outline shape were relegated to secondary sorting criteria because they frequently are altered by resharpening.

The decade spanning the 1960s also was marked by the publication of several sites: Renier (Mason and Irwin, 1960), Hi-lo (Fitting 1963), Holcombe (Fitting et al. 1966), and Barnes

(Wright and Roosa 1966) in Michigan; Dutchess Quarry Cave (Funk et al. 1969) in New York; and Debert (MacDonald 1968) in Nova Scotia.

The Renier site revealed evidence of Late Paleo-Indian cremation burial practices. The heat shattered remains of several Scottsbluff and Eden points, typical of the Cody complex, were recovered from the site, along with a side notched point that Mason and Irwin (1960) interpreted as possible evidence of interaction between Paleo-Indian and Archaic societies.

The Hi-Lo site provided a surface-collected assemblage that appeared to be early on the basis of several technological traits. One of the central problems concerning the site and the widely distributed complex named after it in the Great Lakes region concerns its chronological placement. Fitting (1963) initially attributed the site to a Late Paleo-Indian occupation based on the projectile points. They shared a number of characteristics typical of Late Paleo-Indian materials: lanceolate outline, basal concavity, heavy lateral grinding, and basal modification ranging from thinning to fluting. Later, he suggested that Hi-Lo points represented an Early Paleo-Indian manifestation, but he puzzled over geological considerations which suggested that they post-dated proglacial Lake Algonquin (Fitting 1975:xiii).

The Holcombe site provided significant data concerning lithic technology, settlement patterns, and subsistence. Fitting (Fitting et al. 1966) attributed the site to a Late Paleo-Indian population on the basis of technological aspects, especially the presence of basally thinned lanceolate points that were similar to Midland points. Yet Griffin disagrees that the site should be classified as a Paleo-Indian manifestation. He notes (1977:10):

> I cannot view the material from Holcombe as a fluted point site but instead would regard its recurrent occupations to have by been groups of hunters at a period corresponding to Plainsview-Portales and Milnesand in the west and to a decline in the fluting technique to a simple basal thinning. While some commentators do refer to 8000 to 7000 B.C. complexes as Paleo-Indian because the term "paleo" rolls easily off the tongue and bestows glamor, I prefer the appellation Early Archaic.

A Barren Ground caribou bone from the site supported the proposal that the occupants of Holcombe might have had a subsistence economy comparable to more recent caribou hunters in the Arctic and sub-Arctic (Fitting et al. 1966).

The Debert site in Nova Scotia (MacDonald 1968) is the most northeasterly occurring Paleo-Indian site on record. Yet, despite its peripheral location relative to the main concentrations of Paleo-Indian sites across the continent, its artifact assemblage shares basic traits that are is the hallmark of Paleo-Indian materials relative to those of later occupations. The site was the first associated with fluted points in the Northeast to yield a reliable series of radiometric dates. These average around 10 600 B.P. and, in combination with paleo-environmental studies, help to place the occupation in a periglacial environment with active ice caps less than 100 km away, and a mean annual temperature below 0°C. The large artifact assemblage from Debert includes a distinctive type of fluted point with a deep basal concavity. Probably these are closely related to Bull Brook points. Like several other Paleo-Indian sites in the Northeast, Debert appears to have been reoccupied on several occasions, probably on a seasonal basis. MacDonald (1968:147) concludes:

> The material culture of the occupants of the site, judging from the lithic remains, was remarkably well developed and was capable of sustaining a sizeable population in a seasonally harsh environment. Suggestions of territorialism are to be found in the lithic materials used and in the distinctive point style at the site. Co-operative hunting practices are indicated by the community pattern of the occupation and argue for a social and economic pattern similar to modern northern hunting bands. Faunal evidence is indirect, but zoogeographical and paleo-environmental studies appear to favour woodland caribou.

Contributions to the Understanding of Northeastern Paleo-Indians since 1970

During the period of research spanning the 1970s to the present, steady progress continued to be made in understanding northeastern Paleo-Indian occupations. In particular, advances were achieved in seven main areas:

1) Expansion of the data base: A variety of sites were recorded which considerably expanded the data base. These include a series of Plano sites in Quebec (Benmouyal 1978); the Vail site in Maine (Gramly 1982); the Whipple site in New Hampshire (Curran 1984); the Twin Fields (Eisenberg 1978) and Corditaipe sites (Funk and Wellman 1984) in New York; the 6LF21 site in Connecticut (Moeller 1980); the Plenge (Kraft 1973) and Turkey Swamp sites (Cavallo 1981) in New Jersey; the Kellogg Farm (McConaughy et al. 1977) and Shawnee-Minisink sites (McNett et al. 1977) in Pennsylvania; the Thunderbird (Gardner 1974) and Fifty sites (Carr 1975) in Virginia; the Welling (Prufer and Wright 1970) and Dewitt sites (Payne 1982) in Ohio; the Gainey (Simons et al. 1984) and Leavitt sites (Henry Wright: personal communication) in Michigan; and several sites in southern Ontario that will be discussed in subsequent portions of this thesis.

2) Settlement and distribution: Significant research focusing on the distribution of Paleo-Indian materials were published during this period. Farrand (1977), Jackson (1978), and Loring (1980) plotted the location of sites and find spots of Paleo-Indian artifacts against geologically dated features in order to establish general time ranges of the related occupations. Point types, however, were not distinguished which indicates that there continued to be a problem in recognizing specific northeastern projectile point types. This is

particularly evident in the survey instigated by Brennan (1982), which demonstrates that further classificatory work needs to be accomplished before meaningful comparisons can be made.

Other studies focused on types of settlement and the distribution of Paleo-Indian materials in relation to physiographic features and resources. Gardner (1977) proposed that there are five functionally distinct types of sites associated with the Flint Run complex in Virginia: 1) quarry sites, 2) quarry reduction stations, 3) quarry-related base camps centred around outcrops of jasper, 4) periodically visited hunting sites, and 5) sporadically visited hunting sites related to (unspecified) food procurement. Seeman and Prufer (1982) suggest that proximity to flint quarries and river confluences are important factors affecting the distribution of fluted points in Ohio. Storck (1982) notes that Paleo-Indian sites in southcentral Ontario are frequently located on the strandline of proglacial Lake Algonquin, especially at relict features such as lagoons, islands, peninsulas, and embayments, and where there are unobstructed views of the strandline.

3) Chronology: During this period significant advances were made in understanding the temporal contexts of northeastern Paleo-Indian societies. In addition to the geological dating mentioned earlier, the Vail site yielded radiometric dates of 11 120 B.P. and 10 300 B.P. (Gramly 1982:60); the Whipple site yielded dates averaging 9950 B.P., and 11 050 B.P. (Curran 1984;

Haynes et al. 1984); the Shawnee-Minisink site produced a date of 10 590 ± 300 B.P. (McNett et al. 1977:284); and the 6LF21 site yielded a date of 10 190 ± 300 B.P. (Moeller 1980:31). The Thunderbird site (Gardner 1974) in Virginia provided stratigraphically separated assemblages ranging from Paleo-Indian to Early Archaic. Based primarily on the Thunderbird site data, three sub-phases within the fluted point phase were proposed (Gardner 1974; Gardner and Verry 1979): 1) the Clovis sub-phase, characterized by the Clovis point, comparable in most respects to its western counterpart; 2) the Middle Paleo sub-phase, distinguished by projectile points that are smaller and thinner than the preceding Clovis types and have more marked fluting and deeper basal concavities; and 3) the Dalton-Hardaway sub-phase, which is characterized by still smaller fluted points that tend to be trianguloid.

Understanding of regional chronologies and classification of Paleo-Indian assemblages also was advanced significantly in the Great Lakes region. Based primarily on the seriation of point types, geological clues from a number of sites in southwestern Ontario and Michigan, and comparison with chronologies established on the western Plains, a sequence of Paleo-Indian complexes was suggested (Roosa and Deller 1982; Deller 1983). From earliest to latest, this consisted of the Enterline, Gainey, Parkhill, undifferentiated Plano, Crowfield, Holcombe, and Hi-Lo complexes. These will be discussed in subsequent chapters.

4) Subsistence: Another major issue during this period continued to be the subsistence economy of northeastern Paleo-Indian societies. For years following the initial discoveries of Paleo-Indian artifacts in association with megafauna on the western Plains, it was observed that Paleo-Indian tool kits from the east were remarkably similar to those from the west. These similarities were accounted for by postulating shared economic strategies based on the hunting of gregarious megafauna. The frequent use of exotic lithic raw materials was seen as evidence of the mobility required to sustain this way of life. Yet in recent years there has been growing opposition to the stereotyping of Paleo-Indians as big game hunters. Griffin (1964:224) comments that the restriction of the diets of early hunters to big game animals has been made in the minds of certain archaeologists, not by the people who lived 12 000 to 11 000 years ago. Dincauze and Curran (1983) observe that the specialized hunting strategies thought to be associated with Paleo-Indians are incompatible with the ecological diversity in the paleoenvironmental record. Other researchers (e.g. Meltzer 1983) caution against trying to fit all eastern Paleo-Indian data into the western Paleo-Indian model. Instead, they recommend a closer examination of the eastern paleoenvironmental record and models of foraging theory.

Meltzer and Smith (1986) propose that some Paleo-Indian societies maintained specialized (focal) subsistence economies, while others were characterized by generalized (diffuse) subsistence strategies, depending on the diversity of the ecological resources provided by the environment. They conclude that specialization occurred on the western Plains and in the northeastern periglacial environments: regions characterized by monotypic, low diversity, species-poor environments, where there was an abundance of individuals of a single taxa. Generalized economies existed in the Late Pleistocene forested regions of the East, well to the south of the glacial margins:

> Paleoindian groups are known to have occupied the tundra and tundra-forest ecotone by 10,500 B.P. (Haynes et al. 1984), and it is likely these groups were specialized caribou hunters. There is ample ethnographic evidence from, for example, the caribou-eater Chipewyan and Caribou Eskimo...that specialized caribou hunting is quite viable, although it requires high mobility and fluidity in the social system to reduce search and handling costs. Importantly, it appears that these ethnographic groups ate little else.
>
> By contrast, Paleoindian groups further south were situated in the species-rich eastern forests. There, the structure of habitats was one of great diversity and species richness, which mitigates against high numbers of individuals per species. This environment would lead to selection favoring a generalized foraging strategy. Such a strategy likely included the exploitation of a variety of subsistence resources: seeds and nuts, small mammals, and perhaps an occasional large mammal (Meltzer and Smith 1986:12-13).

Direct evidence of food resources that some Paleo-Indians exploited were recovered at the Shawnee-Minisink site, where hawthorn pits and fragments of fish bone were recovered in a hearth (McNett et al. 1977:284); at the Whipple site where caribou remains were recovered (Curran 1984); and at the Silver Lake site in Ohio where a broken fluted point was found embedded in a rib of an elk (Mason 1981:99).

5) Lithic technology: During this period, the understanding of Paleo-Indian lithic technology and use of various lithic raw material sources in the Northeast was advanced by the publication of numerous studies (e.g. Cox 1972; Kraft 1973; Gardner 1974; Painter 1974; Voss 1977; Roosa 1977a, 1977b; Eisenberg 1978; Callahan 1979; Ellis 1979, 1984; Storck 1979, 1983; Wright 1981; Storck and Von Bitter 1981; Ellis and Deller 1982; and Gramly 1982).

Wilmsen (1973, 1974) was one of the first researchers to focus attention on the significant role that lithic raw material source identification can play in determining social phenomena, such as group interaction and spacing behaviour. He proposes that band territories can be demarcated by the distribution patterns of lithic raw materials in combination with homogeneous zones of socially linked patterns of artifact variation such as stylistic differentiation (Wilmsen 1973:23-25). The presence of exotic raw materials on sites can be interpreted as evidence of interaction between bands that exchanged goods to reinforce social bonds and obligations.

The work of Painter (1974) describing the lithic reduction sequence at the Williamson site prompted experimental research by Callahan. This resulted in the publication of a detailed model explaining principles of biface knapping and fluted point manufacture (Callahan 1979). It was proposed that differences in biface reduction systems might correspond to differences in time, space, or lithic traditions.

Ellis (1979, 1984) describes and explains tool production sequences and their products associated with Parkhill and Crowfield complex sites in southwestern Ontario. This work clearly demonstrates that Parkhill and Crowfield populations had highly structured strategies for the procurement of lithic raw materials and their systematic reduction into utilitarian implements. It is proposed that: a) many tool forms are frequently associated with specific blank types. For example, Parkhill complex fluted points that are manufactured from Collingwood chert consistently are made on blanks that have horizontal banding, indicating that they were removed from the side of a tabular block of raw material using the top as a striking platform. Backed bifaces consistently are manufactured on blanks struck down the corner of a tabular block in such a manner that they retain a flat natural surface along one edge that served as the backing on the finished artifact; b) several tool forms are diagnostic of particular Paleo-Indian industries. For example, leaf-shaped bifaces with the remains of thick bulbs at one end (Deller and Ellis 1984) are diagnostic of the Crowfield complex; c) at least some Paleo-Indian raw material exploitation patterns in the Great Lakes region differ from those of other areas by relying predominantly on one lithic material source; and d) the reliance on certain lithic raw materials might result from discrete Paleo-Indian groups using specific raw materials to signal group identity. This would be particularly useful among groups that relied heavily on risk pooling.

Analysis of the Barnes site assemblage (Voss 1977) demonstrates that excavations on plow-disturbed sites can produce significant data. The site is interpreted as a small camp with a limited range of activities related to hunting. It consists of two major concentrations of lithic materials that are interpreted as representing activity differences. This is based on two highly correlated artifact associations: waste flakes-channel flakes and shatter-endscrapers.

6) Social organization: Contributions to the understanding of Paleo-Indian organization and ecological adaptations were made by Wilmsen (1973, 1974) and Fitting (1977). Wilmsen (1973:8, 9) noted that major economic dependence upon migratory herding species should be accompanied by population concentration in one or a few large residence units. Gregarious ungulates, such as bison or caribou, are most effectively hunted by groups of men who are temporarily assembled in band aggregates. Aggregation increases the chances of hunting

success for all the hunters by facilitating co-operative search procedures for mobile resources that will be contacted in quantity at an unknown point in the environment. Using the Lindenmeier site in Colorado as a model, he proposed (1974) that individual bands that shared a single cultural system needed to schedule their movements in such a way that they met on a regular basis. They did this to co-operate in hunts and to execute a series of necessary social transactions, such as mate exchanges, religious ceremonies, and group reaffirmation rituals. Fitting (1977) remarks that Paleo-Indian adaptation, which seems to have been relatively stable and quite uniform over broad geographic areas, concerns a wide spectrum of human behaviour, including organizational modes and the ideologies that support them. He cautions (ibid:370) that living hunting and gathering societies might not furnish adequate models for adaptive patterns of prehistoric hunters and in particular that the band model, largely based on Service's concept of the band as an evolutionary adaptive type, might not apply to the Paleo-Indian situation. He goes so far as to suggest (ibid:371) that:

> ...we should at least consider the implications of Paleo-Indians with a tribal level of integration...The tribal mode that I find most intriguing is that of the segmentary lineage which has been characterized as a unit of "predatory expansion"...The most salient characteristics of this expansion are an internal ethic demanding new territories and a massing effect, where the entire tribal group, if necessary will stand behind and support the efforts of a fissioned segment moving

> into a new territory...Paleo-Indian peoples...were clearly expansionistic and most probably expanded by the fissioning of small groups who settled new territories. The uniformity of certain artifact types over a wide area has been used to argue for a rapid expansion. It could also indicate a widespread ethic of group identification, or belonging to a single-expanding lineage.

7) Transition to Early Archaic: Although the origins of northeastern Paleo-Indian cultures remained in doubt during this period, considerable progress was made towards a clearer understanding of terminal Paleo-Indian societies and their gradual transition to Archaic lifeways. In Virginia, particularly at the Thunderbird site, Gardner (1974) recovered assemblages from stratigraphically separated levels that appear to represent a gradual transition from Paleo-Indian to Archaic cultures. He notes (Gardner 1977:258):

> The Flint Run Paleo-Indian complex represents a continuously evolving cultural tradition covering between 3,000 and 2,500 years. Seven phases have been isolated. With the exception of minor changes in site choice, intrasite patterning, and reduction in size of certain tool classes, the only apparently major change is in projectile points, with a shift from un-notched to notched points around 10,000 B.P. This may be simply a stylistic innovation, but it more likely represents the introduction of the spear thrower. Other than that, the Paleo-Indian and Early Archaic periods represent a cultural continuum. This continuum is stratigraphically and archaeologically replicated at two spatially and functionally different sites, Thunderbird and Fifty, and at three different areas within the Thunderbird site.

In the Great Lakes region no stratified sites clearly demonstrating the transition from Paleo-Indian to Archaic had been reported as of 1984, but several assemblages were published that probably represent various phases of this transition. One such manifestation is the Hi-Lo complex. Ellis and Deller (1982) note that the Hi-Lo lithic industry is typical of Paleo-Indian assemblages in respect to tool blank production and implements such as basally thinned lanceolate projectile points, spurred end scrapers, gravers, beaks, and backed bifaces. Yet the settlement patterns associated with the complex and the lithic raw material preferences of Hi-Lo populations appear to be closely related to those of Archaic societies (Deller 1976a, 1979).

Paleo-Indian Research in Southern Ontario

Initial studies of Paleo-Indian materials: The first published reference to Paleo-Indian materials in Ontario, and indeed one of the first on the continent, concerns a fluted point that was illustrated and described by David Boyle (1906) almost a quarter of a century before the significance of fluted points was realized. The artifact was found around the turn of the century near Strathroy, Ontario by Andrew Stewart, a teacher and nursery stock salesman whose intellectual pursuits included a study of local archaeology and geology. An acquaintance of Stewart, W.V.V. Pardy, M.D., late of Mount Brydges, Ontario, informed the author (personal communication) that Stewart found the artifact on a sandy ridge which he believed to be a shoreline of an Ice Age lake. Stewart noted a similarity between this artifact and another in a farmer's collection in West Williams township. This specimen, presumably a fluted point, also had been found on a fossil shoreline. Stewart observed that the artifact had been heavily worn and polished as a result of having been rolled on the beach by the action of the surf. This led Stewart to deduce that it had been left on the beach either before or during the time that the Ice Age lake was active. The present location of these fluted points is unknown, although it is possible that at least one of them might be in the collections of the Royal Ontario Museum (see Garrad 1971:15).

It was during efforts to locate the find spots of these artifacts that I first became interested in fluted points and their provenance relative to physiographic features. During a 1963 survey in West Williams township, Pardy and I located a fossil shoreline ridge that yielded several lithic artifacts and considerable debitage. This material matched Stewart's descriptions of water rolled specimens from this area (i.e. smoothed appearance, rounded edges, polished, glossy brown patina). We concluded that we had located the ridge that Stewart had investigated at the turn of the century. This shoreline ridge is attributable to proglacial Lake Algonquin (Chapman and Putnam 1966; Cooper 1979). It should be noted, however, that the ridge was subsequently reoccupied by the waters of Lake Nipissing (Karrow et al. 1975; Cooper 1979).

Most, if not all, of the materials that show evidence of water rolling probably were left on the former Algonquin beach during the low water interval between Lake Algonquin and Lake Nipissing (see Figure 7). Their water rolled characteristics are a product of the Lake Nipissing transgression rather than that of an earlier "ice age" lake, as suspected by Stewart. Nevertheless, Stewart's deduction that the water rolled artifacts were earlier than most artifacts commonly found in the area was correct, even if his temporal assignment of fluted points to the Pleistocene epoch was based on data which currently are thought to be erroneous. On the other hand, Pardy believed that Stewart might have had another reason to associate fluted points with the Pleistocene epoch: knowledge of fluted points in association with the remains of mastodon, possibly those publicized by Kock (1839) or first hand experience. Whatever the reasons for Stewart's deductions, be they based on fortuitous observations or firm scientific reasoning, the work is significant in several respects: 1) it resulted in one of the first publications of a fluted point; 2) it represents one of the first successful examples of the relative dating of cultural materials through their association with beach ridges; and 3) it provided a substantial foundation of data, and to a lesser extent, research design, upon which my initial research was based over 75 years later.

In 1934, a short time after the significance of fluted points was recognized on the western Plains, Figgins (1934:Plates 1 and 2) illustrated several examples found at locations near London, in southwestern Ontario. These, he remarked (ibid:5) "appear to represent a mile post on the back trail of Folsom man from northeastern Asia". This statement promoted the idea of Paleo-Indians bringing fluted points across the Bering Strait, and subsequently migrating southward through Canada. It also suggested to many researchers that Canadian fluted points might represent earlier forms than those found farther south. While these ideas are highly debatable, they do not detract from the significance of the study, which was one of the first to note the similarities among widespread Paleo-Indian materials.

In 1951, Kenneth Kidd published references to several fluted points from southern Ontario that were in the collections of the Royal Ontario Museum in Toronto. He noted that the centre of distribution seemed to be in the southwestern counties (Kidd 1951:260). Twenty years later, Charles Garrad made the first province-wide attempt to collect and organize data on fluted points. He searched the literature for published references and appealed to the membership of the Ontario Archaeological Society for data. The result was a publication summarizing the distribution, size, and material of manufacture of 50 early projectile points (Garrad 1971). This study clearly demonstrated that the Paleo-Indian occupation of southern Ontario had been widespread and was represented by a variety of projectile point types. Yet sites of concentrated Paleo-Indian activities remained unknown. This was the state of understanding that prevailed when I initiated my fieldwork described at the beginning of this chapter.

Fieldwork directed by P.L. Storck: In 1970, Peter L. Storck from the Royal Ontario Museum initiated surveys for early sites, first on the rugged terrain north of Georgian Bay (Storck 1971) and later in gaps along the Niagara escarpment, where he speculated that Paleo-Indian hunters might have intercepted migrating caribou. A few Paleo-Indian artifacts, including a fluted point, were located (Storck 1973:2). In 1973, following a lead provided by Charles Garrad, Storck identified a Paleo-Indian component on the Banting site in southcentral Ontario (Storck 1979). The discovery of this site on a former island in proglacial Lake Algonquin led to a program of field work along the Algonquin strandline. Storck (1982:3) notes:

> Between 1974 and 1980, six seasons of survey work resulted in the discovery of a relatively large number of both Early and Late Paleo-Indian sites: the Hussey site in 1974, the Coates Creek and the Fisher site complex in 1975, a cluster of 21 Paleo-Indian collecting localities including the Udora site in 1979, and the McCarl site in 1980. Excavations were conducted at the previously mentioned Banting site between 1973 and 1975 (Storck 1979a), at the Coates Creek and Hussey sites in 1975 (Storck 1978b, 1978c, 1979), at the Fisher site complex in 1976, 1978, and 1980 (Storck 1978c), and at the Udora site and two other sites in the vicinity in 1980.

Other significant fieldwork: In 1977 and 1978, John Prideaux surveyed the shoreline of proglacial Lake Algonquin in the Holland Marsh area of southcentral Ontario. This survey resulted in the discovery of three sites yielding Early and/or Late Paleo-Indian materials: the McMillan site (BaGv-8), the Boag site (BaGv-9), and the Zander site (BaGv-7) (Prideaux 1977, 1978). In 1978, Gordon Dibb conducted reconnaissance on shoreline areas of proglacial Lake Algonquin in the vicinity of the Holland River Valley in southcentral Ontario (Dibb 1979). At least one Late Paleo-Indian site, the Deavitt site, was discovered. This site consists of a number of Paleo-Indian activity loci scattered over a small peninsula. Diagnostic artifacts include Plano points similar to those from the Heaman site in southwestern Ontario (Deller 1976b). Excavations were conducted on the Deavitt site in the summer of 1980 (Dibb 1985).

Other surveys and fieldwork were conducted by Christopher Ellis, Laurie Jackson, Peter Sheppard, Arthur Roberts, James Keron, and Peter Reid. Ellis located several possible fluted point sites and one definite one, the Ward site, in the Niagara Peninsula (Ellis 1979). Sheppard located secondary deposits of Collingwood chert in glacial till south of Georgian Bay, and a Holcombe point from Huron county. Roberts (1980, 1984) recorded a small number of find spots of Early and Late Paleo-Indian materials along the shoreline of proglacial Lake Iroquois east of Toronto. In Middlesex county, Keron located the Baker site, a small Early Paleo-Indian site of unknown cultural affiliation, and the Grieve IV site, attributable to the Crowfield complex.

Summary

By the end of the Pleistocene epoch, widely separated parts of North America were occupied by groups of hunters and gatherers known to modern researchers as Paleo-Indians. These were the earliest inhabitants of the continent for which the evidence is clearly established. Assemblages of their lithic artifacts show remarkable similarities across the continent.

On the western Plains, artifactual remains of these populations have been organized into a number of archaeological complexes. These include, in chronological order, fairly well established by radiometric dating and stratigraphic separation, the Clovis, Folsom, Midland, Agate Basin, Plainview, and Hell Gap complexes. For the most part, they are better understood than their eastern counterparts in terms of their chronological placement and technical adaptations to the resource base and environment.

Paleo-Indian sites in the Northeast generally are characterized by a paucity of organic remains and a lack of stratigraphic separation of early components. With few exceptions, they appear to be isolated in terms of their spatial distribution and their cultural affiliations remain to be worked out. It is not known how representative of Paleo-Indian lifeways are isolated sites that at best represent short term occupations during a single season. Yet these sites have provided significant data about Paleo-Indian technology, especially how lithic tools were made and used. The main exceptions to the general condition of Paleo-Indian site isolation in the Northeast include a large number and variety of Paleo-Indian sites recently located in southwestern Ontario.

Data recovered during surface reconnaissance and excavations on the southwestern Ontario sites provide opportunities that currently are rare in the Northeast to increase the understanding of the early human occupation of the region. In order to achieve a clearer understanding of this occupation, this thesis will address the following significant issues: 1) the classification of known Paleo-Indian assemblages into complexes representing discrete Paleo-Indian populations, 2) the placement of these complexes into their chronological contexts, and 3) the determination of particular lifeways associated with some of the complexes. This will require synthesizing data from several unpublished sites and find spots of Paleo-Indian artifacts into the archaeological record.

In order to understand more clearly the early human occupation of these sites, they will be analyzed, where possible, within the context of their paleoecological setting.

The next chapter will summarize this setting, first by describing the stages of glacial retreat, and then by describing the succession of plant, animal, and lithic resources available to, or frequently utilized by, the Paleo-Indian populations.

CHAPTER II

THE PALEO-ENVIRONMENTAL SETTING IN SOUTHWESTERN ONTARIO

Introduction

It is generally accepted that the first human penetration into the Great Lakes region and southwestern Ontario occurred at the close of the Late Wisconsin stage of the Pleistocene epoch. This chapter summarizes glacial environments and events that set the stage for human occupation of the area. It begins by providing general background information concerning the late history of the Wisconsin glaciation in the Northeast, particularly the withdrawal of glacial ice from southwestern Ontario, and the succession of proglacial lakes that formed in its wake. This is followed by data concerning the succession of floral and faunal communities that colonized the region and short descriptions of chert types and sources most frequently utilized by Paleo-Indians in the area.

The Late Wisconsin Glaciation

The Late Wisconsin was the last of three substages of the Pleistocene epoch. It was characterized by a period of glacial advance around 23 000 B.P., followed by the complete withdrawal of the Laurentide ice sheet (Dreimanis and Goldthwait 1973). By the time of the maximum advance, southern margins of the Laurentide and Cordilleran ice sheets formed a semi-continuous front, over 10 000 km long, extending from the Atlantic to the Pacific Ocean (Evenson and Dreimanis 1976:217-218). The most southerly protrusion of the ice occurred in the Great Lakes region. Dreimanis (1977:70) notes:

> The Great Lakes region stands out as the most central, most southward protruding part of the Laurentide ice sheet, extending almost to the 39th parallel into the Mississippi-Ohio basin during the Late Wisconsin maximum. The ice sheet advanced so far south because of a combination of factors, particularly a) the funnelling of the glacial flow southward along topographically low areas, and b) abundant nourishment of this ice marginal area by storm tracks from the south and west. Therefore, the Great Lakes region of the Laurentide ice sheet was maintained dynamic and active even during the general late-glacial recession, when many others became stagnant along wide marginal zones or in isolated areas.

The maximum extent of the ice front south of the Great Lakes was reached between 21 500 and 18 000 B.P. This is based on radiocarbon dates of spruce wood and other organic debris incorporated in tills at the terminal position of the ice front in Illinois, Indiana, and Ohio (Kempton and Gross 1971; Goldthwait 1958). Burns (1958) notes that in some places the advancing ice bent logs in the direction of ice flow, and they are still covered by bark, which suggests the overriding of live trees by the advancing ice. Gruger (1972a, 1972b) proposes that climatic conditions about 50 to 150 km south of the maximum (Late Wisconsin) glacial advance in Illinois were not extremely cold and that spruce, pine, and oak dominated open woodland. Meltzer and Smith (1986:9) suggest that the temperatures of the unglaciated regions might not have been significantly different from what they are today as a result of the general impounding of the arctic air mass in the polar regions by the Laurentide ice sheet. Glacial climates, although averaging 7°C to 12°C cooler, may have been more equable than at present with relatively cooler summers and winters less severe.

Late Wisconsin Glacial Retreat in the Great Lakes Region

Around 17 000 B.P., the glacial ice fronts in Indiana and Ohio began to retreat (Dreimanis and Goldthwait 1973; Dreimanis 1977). During the Erie Interstadial, the Huron ice lobe retreated as far as Goderich, Ontario, while the Erie ice lobe achieved a maximum retreat of about 600 km to the Niagara peninsula of Ontario. The Erie Interstadial was followed by a glacial re-advance, the Port Bruce stadial, culminating about 14 800 to 14 000 B.P. (Dreimanis 1977:78). This re-advance established the border of the maximum ice penetration for the Des Moines lobe, and returned the ice front to within 20 to 150 km of the maximum penetration in most other areas south of the Great Lakes.

A short time after it reached the Cary or Port Bruce maximum, ice fronts in the Great Lakes region again began to recede. This recession occurred during the Mackinaw Interstadial, which commenced about 14 000 B.P. and ended about 13 100 B.P.

The Mackinaw Interstadial was followed by a period of glacial re-advance during the Port Huron stadial. This re-advance, which involved two oscillations, is responsible for twin moraines in the basins of Lakes Michigan, Huron, and Erie. In the Michigan basin this moraine is known as the Port Huron moraine (see Figure 3). It continues into southwestern Ontario where it is known as the Wyoming moraine (circa 13 000 B.P.). South of Georgian Bay, the Port Huron advance built the Singhampton moraine (Chapman and Putnam 1966). West of Lake Ontario, the advance first left the Paris moraine (ibid.) and then receded and built the Galt moraine. The southern continuation of the Paris moraine is submerged under the present waters of Lake Erie where it is called the Norfolk moraine (Sly and Lewis 1972). Southwest of Lake Erie, the advance can be traced through Leverett's (1902) Lake Escarpment morainic system. Farther east, opinions differ as to whether the Valley Heads (Muller 1965) or the Hamburg-Waterloo-Auburn moraines (Connally and Sirkin 1973) were built by the Port Huron advance (Evenson and Dreimanis 1976).

The Port Huron re-advance was followed by a period of glacial retreat during the Two Creeks Interstade (also called the Two Creeks interval, interstadial, substage, or the Two Creekan substage). This interstade derives its name from a forest bed covered by Two Rivers till at Two Creeks, Wisconsin. The large number of spruce and other conifer logs in this forest bed suggests rapid spread of spruce forest into the Green Bay area around 11 850 B.P. (Dreimanis 1977:80). The general retreat of the glacial ice was interrupted by a 125 km post-Two Creeks re-advance, culminating about 11 850 B.P. in the Michigan basin, but not clearly understood elsewhere. Dreimanis (1977:85) notes:

> Some problems exist with the terminology of this re-advance, commonly called Valderan or Valders: it apparently had deposited the Two Rivers Till, rather than the type Valders till. Therefore a new name, Greatlakean, has been proposed to replace the Valderan.

Another slowdown in the recession of the glacial ice occurred during the Algonquin Stadial from about 11 000 B.P. to 10 500 B.P. (ibid:85).

The Proglacial Lakes

When the Late Wisconsin glacial ice retreated into the Great Lakes basins, large amounts of glacial meltwater and regular surface drainage were impounded between the glacial ice margin and the land rebounding to the south. Thus a series of proglacial lakes was formed. The levels of these proglacial lakes varied as the oscillating glacial margins opened and closed various outlet channels. Generally, the highest and oldest lakes drained through western outlets towards the Mississippi drainage system; the next lowest and oldest lakes drained through southern outlets down the Hudson River system; and finally, the lowest and latest lakes drained to the east through the St. Lawrence River system.

Data published on these proglacial lakes include those of Leverett and Taylor (1915); Hough (1958); Chapman and Putnam (1966); Prest (1970); Sly and Lewis (1972); Karrow, Anderson, Clarke, Delorme, and Sreenivasa (1975); Farrand (1977); Fullerton (1980); Anderson and Lewis (1985); Calkin and Feenstra (1985); and Eschmann and Karrow (1985).

Although the sequence of the lakes is fairly well established, there are at least two problems still to be worked out that are fundamental to archaeological studies of Paleo-Indian societies:

1) The absolute dating of the lakes. Determination of the precise age of the lakes would help to clarify an understanding of the relationship between the numerous Paleo-Indian sites that are located on or near shoreline features and their paleo-environments. At present it is not always clear whether Paleo-Indian settlement-subsistence systems were adapted to

lacustrine environments or to ecological phenomena that existed after the recession of the waters.

2) The identification of shorelines. In some cases shoreline features have been recognized but they have not been attributed to specific proglacial lakes. Identification can be complicated by the discontinuous nature of the shorelines and/or by differential rates of isostatic rebound.

The following section will summarize data on proglacial and early post-glacial lakes in southwestern Ontario. In chronological order from earliest to latest these lakes include Maumee, Arkona, Whittlesey, Warren, Grassmere, Lundy, Algonquin, and Nipissing.

Lake Maumee: This was the first of the proglacial lakes in southwestern Ontario. It formed in the western Lake Erie basin around 14 000 B.P. Later, it expanded into the Huron basin as the Huron ice lobe receded (Prest 1970:726). Successive water levels stood at elevations of 244 m, 232 m, and 238 m a.s.l., resulting from use of different outlets as the ice margin fluctuated. During the high phase, Lake Maumee drained to the south by way of the Wabash river. The lower phases discharged to the west by way of the Grand River into Lake Chicago which in turn drained into the Mississippi River system.

Lake Arkona: After Lake Maumee, the glacial ice held a position of retreat before its re-advance to the Port

Huron-Wyoming moraine (Chapman and Putnam 1966:88). During this retreat the Grand River outlet was modified and the water levels lowered to those of Lake Arkona at 216 m, 213 m, and 212 m a.s.l.

The Arkona strandlines in southwestern Ontario have not been mapped in full. They are indistinct in many areas because they were scattered by wave action when they were submerged under the higher waters of Lake Whittlesey. Cooper (1979:26, 28) notes:

> The major problem with the Arkona beach in Ontario is that it has not been and, to a large extent, cannot be traced continuously. There has been considerable confusion in discussion by Spencer, Leverett and Taylor, and Chapman and Putnam concerning which beaches they were referring to...Both Lake Arkona and Lake Whittlesey are present at Arkona; the Lake Arkona shoreline is at approximately 229 m (750 feet) and can be traced through the centre of the town of Arkona; the Lake Whittlesey shoreline is parallel to it at approximately 238 m (780 feet) and is found on the eastern edge of the town.

The author has traced the 229 m contour of elevation (the Lake Arkona level) from Alvinston south of Strathroy onto the Caradoc sand plain. Here it becomes a fairly prominent ridge along which several Paleo-Indian sites are located. This ridge crosses the Thames River into Delaware township where it is identified as a Lake Warren shoreline by Dreimanis (personal communication). However, this elevation seems too high for Lake Warren. Chapman and Putnam (1966) have identified Warren beaches at an elevation of 213 m above sea level about 20 km west of the ridges in question. I propose that the 229 m contour of elevation that crosses Caradoc township approximates the former location of the Lake Arkona strandline before it was reworked by Lake Whittlesey waters and further obscured by Lake Whittlesey deltaic deposits.

Dreimanis (1977:79) notes that Lake Arkona ended around 13 600 ± 500 B.P., according to dates obtained on wood from the Arkona-Whittlesey transition beach near Cleveland, Ohio.

Lake Whittlesey: Lake Whittlesey, which stood about 9 m higher than Lake Arkona, was contemporaneous with the Port Huron-Wyoming moraine around 13 000 B.P. at the end of the Mackinaw Interstade. This lake discharged to the northwest by way of the Ubly River channel into the Saginaw basin and thence to Lake Chicago and the Mississippi River (Prest 1970:726). In southwestern Ontario, Lake Whittlesey is notable for its deltas, including the Caradoc sand plain.

Lake Warren: As a result of down-cutting of the outlet across the "thumb" of Michigan, water levels dropped to those of Lake Warren (Prest 1970:726). In southwestern Ontario, the highest waters of Lake Warren (209 m) were about 18 m below the level of Lake Whittlesey. Three Lake Warren water planes have been postulated by Hough (1958). Locations of Lake Warren beaches in southeastern Ontario are described by Chapman and Putnam (1966:88-95). Often, twin Lake Warren beaches occur, the first being 3 to 5 m above the second and seldom more than a kilometre away.

Lake Grassmere and Lake Lundy: Continued recession of the Lake Huron and Ontario ice lobes resulted in still lower lake levels known as Grassmere at 195 m a.s.l. and Lundy at 189 m a.s.l. (Prest 1970:726). Prest (ibid.) notes that discharge was believed to have been eastward, for the first time, along the south side of the Lake Ontario basin into the Mohawk and Hudson River systems. When the ice sheet receded from the southern part of the Lake Ontario basin, a lower outlet was uncovered near Rome, New York, and the Lundy water levels lowered rapidly.

Lake Algonquin: As the ice front retreated northward in the Huron basin, Early Lake Algonquin formed at an elevation of about 184 m a.s.l. (Karrow <u>et al</u>. 1975). Prest (1970:728) suggests that this lake drained southward, possibly first by way of Chicago, and later by way of the Port Huron outlet into Lake Erie. Eventually the receding ice uncovered the Kirkfield or Trent valley outlet and the water level dropped an estimated 15 to 30 m (Karrow <u>et al</u>. 1975:51). This drop in water level probably took place during the Two Creeks interval which, as previously noted, dates to circa 11 850 in the Green Bay area.

After the Two Creeks interval, the water levels again rose to 184 m above sea level, forming (main) Lake Algonquin. The reason for this rise is open to debate. Karrow <u>et al</u>. (1975:51) note:

> Whether the Kirkfield outlet was closed by isostatic uplift as the ice continued its northward retreat, or whether ice re-advance

> closed the outlet, is a matter of controversy...In any case, Lake Algonquin was reestablished (Main Lake Algonquin) with its outlet at 605 ft. (184 m) above sea level at Port Huron.

Karrow et al. (1975:79) suggest that Lake Algonquin drained shortly after 10 600 B.P. and uplift probably caused the draining of the Alliston district at about 10 400 B.P.

Late Wisconsin Floral Succession in Southwestern Ontario

The Paleo-environmental record of southwestern Ontario gives some idea of the ecological context of the Paleo-Indian occupation. This has significant implications for interpreting settlement and subsistence strategies. The following summarizes the succession of floral communities that colonized the area after the glacial ice retreated, and some of the limitations imposed by the nature of the data for interpreting Paleo-Indian lifeways.

There is a substantial amount of data available for the reconstruction of floral communities that occupied southwestern Ontario during Late Pleistocene and Early Holocene times. They are reconstructed primarily on the basis of pollen analysis, plant macrofossils, and fossil insects, whose sensitivity to climate and habitat made them excellent indicators of particular environmental conditions.

Reconstructions based on these techniques are complicated by several factors. Terasmae and Matthews (1980:1087) note:

> Although the palynological interpretations have improved through the use of pollen influx data and correlation of fossil assemblages with modern pollen deposition in surface samples, some problems still remain to be resolved. For example, most pollen types are commonly identified only to the generic level, many plants produce too little pollen to be represented in the fossil assemblages, especially with respect to statistically significant numbers, and most tree pollen is transported by air over considerable distances. This last problem is particularly troublesome in studies of late-glacial vegetation because the predominantly herbaceous plants that comprised the pioneer flora were mostly characterized by relatively low pollen production, and a significant proportion of late-glacial pollen assemblages is made up of tree pollen, especially spruce and pine, derived by atmospheric transport from more or less distant source areas. It is difficult, therefore, to determine from palynological data when tree species became established in any specific area after deglaciation.

Also, it should be noted that within the broad macro-environments hereafter summarized there existed a number of regionally differentiated micro-environments which resulted from peculiarities of physiography and glacial history (see Davis et al. 1975:459). For example, biotic communities occupying areas adjacent to glacial ice margins would be affected by factors such as katabatic winds flowing off the ice mass and increased moisture due to meltwater, fog, and regional storms caused by the collision of air masses of differing temperatures. Similarly, marginal areas flanking large glacial lakes must have been conditioned by air masses originating over the lakes. This interpretation is supported by data from the Eighteen Mile River site (Ashworth 1977) near the shoreline of Lake Algonquin in southwestern Ontario. Paleoentomological analyses suggest a biotic community circa 10 600 B.P. which indicates the presence of a micro-environment cooler than what might have been expected for the rest of the region. Ashworth (ibid.) suggests that the fossil fauna of the valley in which the site is located reflects a cool microclimate conditioned by winds that blew from glacial Lake Algonquin into the valley. Some of the Coleoptera from the site have modern ranges that correspond to mean July temperatures of 12°C to 13°C. They indicate a tree-line type of environment, possibly an open spruce forest at the site, whereas the upland areas were characterized by floral communities generally associated with warmer climates (i.e. spruce forests with significant pine and deciduous elements constituting of up to 20% of pollen counts).

Despite these and other problems in interpretation (e.g. almost all pollen samples have been taken from boggy areas, which introduces a bias toward certain types of terrain), the general vegetative succession in southwestern Ontario is fairly well understood. The following descriptions are based largely on a model proposed by McAndrews (1981), with supplementary data from Anderson (1971), Karrow <u>et al</u>. (1975), Miller and Morgan (1982), Morgan <u>et al</u>. (1982), Mott and Farley-Gill (1978), and

Schwert et al. (1985). The general trend involved a succession from tundra, through spruce forests with a small deciduous element, to pine dominated forests with increasing deciduous content. This succession coincided with a general amelioration of climate. Although it is fairly well dated, two factors complicate its use in archaeological interpretations of Paleo-Indian data: 1) the succession would not have occurred at a uniform rate through the region due to differences in temperature and moisture, particularly in areas adjacent to glacial ice and/or proglacial lakes, and 2) since the Paleo-Indian occupations have not been precisely dated, cross references can only be inferred.

The Tundra Period (circa Deglaciation - 13 000 B.P.)

The nature of the first vegetation to colonize the recently deglaciated areas of the Great Lakes region has been the subject of considerable study by paleoecologists. Yet definitive data to determine the precise character of the colonization are still elusive. Most researchers agree that tundra, or a tundra-like vegetation, developed shortly after deglaciation. Morgan et al. (1982) suggest the presence of a permafrost regime south of the glacial ice. Fossil insect assemblages and the presence of ice wedge polygons in the ground indicate a periglacial environment with a mean average temperature below freezing. Winn (1977) records evidence for a short-lived early tundra, as well as a forest tundra vegetation, in a bog near Simcoe, Ontario. Similarly, Mott and Farley-Gill (1978) present data indicating that the recently deglaciated landscape was colonized by a short-lived treeless, or almost treeless, tundra prior to 13 000 B.P. Some of the best data in support of Late Wisconsin tundra vegetation in the Great Lakes area comes from the Cheboygan Bryophyte bed in Michigan (Miller and Benninghoff 1969). This interstadial deposit dates sometime between 13 300 B.P. and 12 500 B.P.

Regional differences in composition of the early vegetation can be inferred from the work of other researchers who report slightly different floral communities. Terasmae (1973:219) proposes that southern Ontario was initially colonized by tundra and taiga vegetation. Sreenivasa (1968) proposes that the earliest vegetation in the Erbsville bog after the Port Bruce retreat is comparable to taiga. Terasmae and Matthews (1980:1093) note:

> In pollen diagrams from southern Ontario (those that cover the Late Wisconsin time) a herb pollen zone commonly precedes the spruce pollen zone. The herb pollen zone is characterized by a significantly higher percentage of nonarboreal pollen, especially Cyperaceae, Gramineae, Artemisia, and other herbaceous species that are ecological indicators of a more or less treeless vegetation. However, spruce pollen still comprises a considerable proportion (30-40%) of pollen assemblages in the herb pollen zone.

The Spruce Period (circa 13 000 B.P. - 10 600 B.P.)

Pollen profiles and fossil insect assemblages suggest that southwestern Ontario experienced a period of rapid climatic amelioration around 13 000 B.P. As this occurred, the landscape was invaded by arboreal species, mostly spruce, and to a lesser extent, willow, alder, birch, and larch (Cleland 1966). Pollen assemblages from this period, known as the spruce pollen zone (Terasmae and Matthews 1980; McAndrews 1981) is one of the frequently used Late Wisconsin palynostratigraphic units in studies of vegetative succession in southern Ontario.

The timing and route of the spruce forest migration into the area remains to be adequately delineated. It was, presumably, the culmination of a general spruce migration from a Late Wisconsin refugium south of the Great Lakes in the central United States. Initially the colonization would have occurred in low areas, and gradually spread to better drained upland areas that were still dominated by non-arboreal species (Cleland 1966). Pollen from this zone has been interpreted as representing spruce forest tundra (McAndrews 1972:225), and open spruce parkland (Winn 1977:127-132). It included considerable pine, as well as substantial amounts of sedges and other herbs. Anderson (1971:93) notes:

> A spruce-parkland flora might perhaps be defined as a semi-boreal vegetation characterized by Artemesia-dominated tundra or prairie-like opening with normal spruce succession. Key words in the suggested definition are "semi-boreal", "tundra",

> and "prairie". The vegetation seems to have had a boreal affinity, yet open sterile soils characteristic of tundra landscapes may have been a common feature throughout. Furthermore, the climate may have been moderate and dry.

Schwert et al. (1985) interpret the sedge and herb pollen content as indicating that the floral assemblage of 13 000 B.P. - 12 500 B.P. in southwestern Ontario was similar to that of modern tree-line/tundra environments in northern Canada. Based on analyses of organic remains from a Kettle Lake in Waterloo county (the Gage Street site), they conclude that the transition from spruce parkland to closed spruce forest represents a progressive floral succession within a moderate (mean July temperatures of 15°C - 17°C) and stable or gradually warming climate. Morgan et al. (1982) suggest that fossil beetle assemblages from 11 000 to 10 000 B.P. in southwestern Ontario are analogous to modern communities near the southern portion of the boreal forest in Canada. However, it should be noted that these early floral communities were not totally similar to modern counterparts. This is evident in the occurrence of deciduous tree pollen, such as oak, in the fossil remains which does not occur in the pollen rain of modern forest/tundra transition zones. Some interpret this as indicating that deciduous trees such as oak were present in small quantities in well-drained upland localities (Karrow et al. 1975:57), while others (McAndrews 1981:329) suggest that the deciduous pollen was carried in from more southerly regions by the wind.

The Pine Period (circa 10 600 B.P. - 10 000 B.P.)

Pollen assemblages from across the region indicate that around 10 600 B.P. the preceding spruce forest was invaded by pine, fir, and some deciduous species, such as birch, oak, elm, and maple. It is likely that jackpine initiated the invasion on drier upland sites, and continued to migrate down the slopes as soil conditions became progressively drier. White pine and red pine dominated as time progressed, while pockets of spruce probably remained in moist areas.

The transition between the spruce and pine dominated regimes is securely dated. Morgan <u>et al.</u> (1982) note:

> The decline of spruce and the rapid increase in pine pollen has been reported in many pollen profiles. This transition occurred about 10 600 to 10 500 radiocarbon years B.P., based upon an average of eleven dates in southwestern Ontario (Karrow <u>et al.</u> 1975).

Opinions differ as to the cause of the pine invasion. Winn (1977:32) suggests that rapid changes in climate around 11 000 B.P. resulted in the regional vegetational transition from open spruce parkland to closed boreal pine forest. Edwards <u>et al.</u> (1985) suggest that the spruce/pine transition coincided with a general warming of temperatures:

> Insect faunas that have been analyzed from a number of sites still remain unpublished; however, they do indicate a steady increase in July temperatures throughout the time frame discussed in this paper. By 11 000 years B.P. the July average was probably close to 18°C in areas away from the influence of the glacially fed lakes. Localized lake-marginal settings were somewhat

> cooler, with July averages 4-5°C lower. July averages by 10 000 years B.P. were approaching present July means (19-20°C).

Morgan, et al. (1982:383) attribute the transition to natural ecological succession rather than dramatic changes in climate:

> The absence of any clear changes in the beetle faunas from all the sites in southern Ontario tends to substantiate the hypothesis that the transition from spruce to pine dominated forests was purely one of ecological succession - possibly hastened by lowering water level of Lake Algonquin, but in no way related to any major climatic amelioration at that time. There could have been a gradual warming between 11 000 and 10 000 years ago. Such a warming is difficult to access with the current knowledge of distributional ranges and ecology, but probably it remains within our postulated July temperature range of 16°C to 18°C.

Coincidental with the transition from spruce to pine dominated floral regimes, Lake Algonquin drained with the opening of the North Bay outlet. This drastic lowering of lake levels not only widened the interlake land areas, making them available to the expansion of terrestrial flora and fauna, but also increased the drainage capacity of streams entering the lakes (Dreimanis 1977:83). The newly exposed lakebeds probably supported early succession vegetation, such as sedges, grasses, willows, and alders, before giving way to the broader, regional patterns. Initially, drainage was probably poor on the former lakebeds, especially before water runs began to mature, and so spruce probably was more frequent than in the upland areas.

Late Wisconsin Fauna in Southwestern Ontario

The first colonization by animal species in southwestern Ontario probably commenced soon after the retreat of the glacial ice and the re-establishment of suitable floral habitats. The history and nature of this colonization are not yet clearly understood. This is due in part to the paucity of animal remains that have been discovered and reported. Most are isolated finds in a poor state of preservation and few are associated with reliable radiometric dating. Furthermore, the fossil record more often includes the bones of larger mammals, such as mastodon, while smaller animals, such as birds, reptiles, and fish, are seldom recovered (Jackson 1978:249).

Table 2 shows the circa Late Wisconsin animal species that have been found in southern Ontario. Jackson (1978:252) notes that these include 70 mastodon, 20 mammoth, six unspecified proboscidians, seven elk, two caribou, two deer, two musk oxen, two bison, two unidentified cervids, and single finds of eastern chipmunk, beaver, grizzly bear, unspecified bear, marten, and giant moose-elk. Of the marine mammals, nine are white whales, five are unspecified seals, and the remainder are single finds of humpback whale, bowhead whale, bearded seal, and harp seal.

Cleland (1966:18 20) proposes that the initial faunal colonization of the Great Lakes region was characterized by the influx of open country grazing species, such as mammoth, barren-ground caribou, and musk ox, and predators, such as wolf and grizzly bear. These species occupied the higher, more open parkland areas. Later, as the climate ameliorated and the conifer forests began to dominate the better drained uplands, mastodon, moose, and woodland caribou probably largely replaced the pioneer grazing species. By the time of the subclimax boreal (spruce) forest period, a few animal species associated with deciduous forests might have been present. Cleland (1966:20) notes:

> It is probable that a few mammals found in deciduous forest situations also inhabited the Great Lakes area of this time. In addition to mastodon, which have been dated to the Boreal Forest period, we would expect that these forests were inhabited by the black bear, marten, fisher, wolverine, lynx, snowshoe hare, beaver, muskrat, porcupine, woodland caribou, and moose.

Caribou as a Paleo-Indian Resource in Southwestern Ontario

As of the writing of this study, no faunal remains have been recovered in direct association with Paleo-Indian material in Ontario. This is due, in part, to the acidic soil conditions that generally prevail throughout the region. As Savage (1981:4) notes, bone preservation in Ontario rarely exceeds 6000 years, unless there are especially favourable circumstances. This prevents the direct study of Paleo-Indian subsistence in the region. Nevertheless, several studies of Ontario Paleo-Indians have proposed that caribou were included in the resource base of at least some Paleo-Indian societies (Deller

1976a, 1980; Jackson 1978; Peers 1985; Roosa 1977a; Storck 1971, 1984). This conclusion is based largely on two lines of reasoning: 1) the utilization of caribou resources has been demonstrated elsewhere in the Northeast at the Holcombe and Whipple sites; and 2) theoretical considerations best explain the nature of Paleo-Indian assemblages and site locations in the formerly glaciated parts of the Northeast, and particularly in southwestern Ontario, in terms of caribou exploitation. Cleland (1966) notes that the restricted nature of Paleo-Indian tool kits in the Great Lakes region is best explained by a subsistence adaptation that relies heavily on the exploitation of a limited range of resources, such as that provided by caribou herds. Meltzer and Smith (1986) note that models suggesting specialized subsistence strategies in areas close to the ice margins are compatible with current foraging theory and data on Late Pleistocene environments. They conclude (ibid:12):

> While the paleontological record is silent on the subject of faunal abundance, it can be inferred that caribou was the only gregarious herd animal in that environment that would yield sufficient economic return (body size, food value) to allow humans to survive.

Other researchers (Storck 1971, 1982, 1984; Speiss 1979; Gramly 1982; Deller 1979, 1980a) have explained the situation of Paleo-Indian sites as being at favourable locations for watching for caribou herds and intercepting them at natural barriers.

In previous studies (Deller 1980a, 1980b), I used a model of caribou ranging behaviour in southern Ontario to explain the distribution of the Parkhill complex. The model suggested that the particular configuration of the Simcoe-Kawartha ice lobe in conjunction with proglacial Lake Algonquin was a controlling factor of caribou ranging behaviour in the area. Displaced from their natural high latitude environments by the southerly position of the glacial ice front, caribou might have been using the dissected uplands in the southern Georgian Bay area close to the ice front for calving grounds and summer range. Kelsall (1968:179) notes that calving grounds are typically characterized by inhospitable terrain:

> They are at high latitudes and altitudes; they retain ice and snow longer than lower adjacent areas; they receive the full force of late storms and blizzards; they have an impoverished and late-developing flora; and they also have an impoverished fauna.

The position of the ice front near the rugged dissected uplands in the Georgian Bay area, and in particular the rugged valleys along the Niagara escarpment that would be exposed to storms blowing inland off Lake Algonquin, probably offered the most favourable environment available at that time for calving grounds. The southern extent of the caribou range was perhaps not as distant from their summer grounds as that of many modern caribou, whose migrations can cover up to 700 miles (Kelsall 1968:106). In the lower-lying latitudes of southern Ontario, the transition between forest and tundra, if indeed tundra existed at all in the area fringing the ice front, would be quite abrupt, thus reducing the necessity of caribou migrating long distances to experience appreciable changes in vegetation.

Chert Resources Frequently Utilized by Paleo-Indians in Southwestern Ontario

A variety of cherts was utilized in southwestern Ontario throughout the Paleo-Indian occupation. Identification of these lithic materials in archaeological contexts has made significant contributions to the understanding of Paleo-Indian lifeways, as will be demonstrated in subsequent chapters. The following section will summarize the physical appearance and geological sources of the five cherts most frequently utilized in the manufacture of Paleo-Indian artifacts in the region: Collingwood (Fossil Hill), Onondaga, Kettle Point, Bayport, and Upper Mercer. The approximate locations of the bedrock sources of these cherts are shown in Figure 6.

These cherts can be identified by visual inspection with a high level of confidence. All have distinctive physical properties that enable them to be distinguished easily from each other and from other cherts occurring in the Great Lakes region. All identifications in this thesis have been confirmed by at least one other researcher who is experienced in identification of cherts in the region. In very few cases has it been necessary to obtain thin sections for detailed microscopic examination. Cases involving questionable identification are noted in the text.

i) Collingwood (Fossil Hill) chert. Collingwood chert is a Middle Silurian age material that was used extensively throughout Paleo-Indian times in southwestern Ontario and was rarely utilized by Archaic and Woodland populations in this region. Thus it has considerable diagnostic value for identifying early components (Deller 1979; Deller and Ellis 1984). This opaque to slightly translucent chert generally is fine grained in texture, ranges from dull to mildly vitreous in lustre, and contains few macro-fossils. It ranges in colour from a pale yellow (10YR 8/3) through beige (10YR 8/2) to a white/light grey (N8;N7) in the Munsell system (Ellis 1984:45-46). It appears in archaeological contexts most frequently as a white or pale yellow chert with black dots that occur in speckled bands. Its appearance is described by Roosa (1977b:93):

> It varies in colour from solid white to creamy yellow and occasionally pinkish orange. It often has gray, pink, orange, yellow or brown bands. Much of it has tiny black dots that show up as pits under 20x magnification. Texture varies from chalky to slick and glassy when seen with the unaided eye.

Collingwood chert occurs in bedded, primary context in the Middle Silurian Fossil Hill formation at locations in the southern Georgian Bay area (Storck and Von Bitter 1981). At the bedrock source, the chert outcrops in up to three overlying bands, together ranging up to 30 cm thick (Ellis 1984:45). Blocks of ~~the~~ chert often exhibit a dolomite cortex where it joins the surrounding matrix. This juncture is well defined and forms straight, regular margins on both archaeological and lithic source specimens. In addition, blocks of Collingwood chert often are characterized by what has been referred to as angular weathered fracture planes (Deller and Ellis 1982:16) that appear to be randomly oriented with respect to the original bed orientation. Collingwood (Fossil Hill) chert also occurs in glacial till in the Collingwood-Owen Sound area, not far from the bedrock outcrops (Sheppard 1977; William Fox: personal communication), but it has been noted (Deller and Ellis 1984) that most Paleo-Indian groups obtained their chert supplies mainly from bedrock sources rather than from secondary deposits.

2) Onondaga chert. Onondaga chert is a Middle Devonian age material that was used extensively in the central Great Lakes region by Paleo-Indian, Archaic, and Woodland populations. The chert is mottled in appearance with combinations of several shades of bluish grey and brown occurring in splotches i.e. light bluish grey (10YR 4/1), dark grey (10YR 7/1), light brown, and dark brown. Brown limestone inclusions frequently occur in the material and these are often eroded away by acidic soils, leaving irregularly shaped cavities in archaeological specimens. Onondaga chert originates in the Middle Devonian Clarence member of the Onondaga formation. This formation constitutes the bedrock surface parallel to the modern Lake Erie shore from near Nanticoke, Ontario east into New York State (Parkins 1977). Tabular shaped cobbles of Onondaga chert occur in fairly dense concentrations at locations along the shore, and outcrops are exposed in creek beds at locations farther inland

(William A. Fox: personal communication). At the time of the Paleo-Indian occupation, additional primary sources of Onondaga chert probably would have been exposed as a result of lower lake levels in the Erie basin.

3) Kettle Point chert. Kettle Point chert is a Middle Devonian age material that gained widespread use by Late Paleo-Indian, Archaic, and Woodland populations in the central Great Lakes region. The material is described in detail by Janusas (1984). It ranges in colour from a dark blue-grey with occasional darker banding, through a medium grey with darker mottles, to a pinkish mauve. Frequently, small, circular inclusions that possibly represent fossil sponge spicules are present. When present, these are highly diagnostic of the material. Kettle Point chert is found the Middle Devonian Ipperwash formation in the vicinity of Kettle Point, Ontario. At the present time the known bedrock sources of Kettle Point chert are submerged under shallow water just off the shoreline of Lake Huron. The availability of these sources in the past was determined by water levels in the Huron basin. These water levels fluctuated considerably above and below the outcrops due to glacial and post-glacial phenomena. This made the outcrops alternately available and inaccessible to prehistoric societies for periods lasting up to several thousand years (see Figure 7). These fluctuations are fairly well understood in terms of their sequence and chronology (Hough 1958; Chapman and Putnam

1966; Prest 1970). This can provide significant assistance in the relative dating of archaeological assemblages. For example, the frequent utilization of Kettle Point chert in Late Paleo-Indian complexes, such as Holcombe and Hi-Lo (see Chapter VII), probably dates to one of the intervals when the bedrock source was accessible. This assumes that the Paleo-Indians were obtaining their supplies of chert from bedrock sources rather than from till sources (see Deller and Ellis 1984).

4) Bayport chert. This lithic material is exotic to southwestern Ontario. It originates in nodular form in the Upper Mississippian Bayport formation in the Saginaw Bay area of Michigan. Bayport chert recovered on Paleo-Indian sites in southern Ontario generally ranges in colour from a light brown (10NR 6/2) through a light grey (10YR 7/2) to a dark grey (N6/N4). Ellis (1984:48) notes that it is somewhat coarse to medium in texture and has a dull to medium lustre. One of the most distinctive features of the chert is the presence of concentric banding which originates at the centre of the nodule. Other notable characteristics include a high fossil content and the presence of small grains of quartz crystal that sparkle when the chert is rotated under a light source (ibid.).

5) Upper Mercer chert. Upper Mercer chert is a high quality material of Lower Pennsylvanian age that originates in the Upper Mercer formation in Ohio. This formation frequently caps hills and ridges in the counties of Coshocton, Muskingum,

Licking, Perry, and Hocking, where numerous aboriginal quarries and chipping stations have been found (Luedtke 1976:285). The chert occurs in nodular form and in beds up to 15 cm thick. Samples of Upper Mercer chert from two localities are described by Luedtke (ibid:288).

> Material at both localities is homogeneous to mottled and streaked, with color ranging from dark black, N2/ through bluish grey, N3/, N4/, N5/, N6/, to light bluish grey N7, and N8/. The texture is medium to fine, luster is medium to shiny, and the chert is opaque. Veins of white and blue chalcedony are common inclusions, and fossils also occur... This material is available in very large quantities and in pieces of large size. Furthermore, it is very high quality chert, and visually distinctive and attractive. These factors combine to make Upper Mercer chert important to the entire region.

Summary.

The Paleo-Indian occupation of southwestern Ontario occurred during a period of the Late Wisconsin when the area was experiencing a complex series of geological events and a succession of biotic communities dominated by the glacial ice that was slowly withdrawing from the region. The understanding of these environmental conditions contributes significantly to the interpretation of several aspects of the human occupation. Although the precise chronology of this occupation remains to be established, presumably it occurred during the existence of proglacial Lake Algonquin (circa 11 000 B.P. - 10 500 B.P.), as the area was undergoing its final stages of deglaciation.

During the several millennia preceding this, southwestern Ontario had been covered periodically by large masses of glacial ice. Then, coinciding with a gradual warming trend in the climate, the last deglaciation of the area began about 15 000 years ago. As the ice front retreated northward, a sequence of proglacial Lakes formed between the glacier and the rebounding land surface to the south. Water levels of these lakes varied as the receding ice opened new outlets, each slightly lower than its predecessor. Meanwhile, the available land mass was colonized by a succession of biotic communities similar, but not identical, to modern communities associated with zones of tundra and northern boreal forests in the Canadian Arctic and sub-Arctic.

The oldest proglacial lakes, Maumee circa 14 000 B.P. and Arkona circa 13 600 B.P., existed during permafrost régimes that supported a tundra-like vegetation. Arboreal elements, consisting mainly of spruce, increased as the climate ameliorated. By the time of Lake Whittlesey, during the Port Huron re-advance, circa 13 000 B.P., spruce forests similar to the modern boreal zone near the treeline were becoming the dominant vegetation across the region. Yet tundra-like vegetation continued to persist in micro-environments flanking the glacial ice and proglacial lakes.

As the climate continued to ameliorate and the receding ice front opened new outlets, the water levels of Lake Whittlesey dropped to successively lower lakes: Warren, Grassmere, Lundy, and Early Algonquin. Gradually, there occurred a transition in floral communities across the region from spruce parkland to an increasingly closed spruce forest. Whether there was a small deciduous element has not been clearly established.

After Early Lake Algonquin, water levels lowered during the Two Creek interval circa 11 800 B.P., and then rose to establish (main) Lake Algonquin. By the terminal phase of Lake Algonquin circa 10 600 B.P., floral communities on the drier upland areas were experiencing a transition from spruce to pine, with some fir and deciduous species such as birch and oak. Spruce continued to dominate on poorly drained terrain. July temperatures averaged around 17°C in inland areas, and possibly around 14°C near Lake Algonquin, based on the interpretation of fossil pollen and insect assemblages.

Although the fossil record is sparse, it is probable that by the time of the first human occupation, the area was occupied by several animal species, including mastodon, caribou, black bear, marten, fisher, lynx, and snowshoe hare. At the present time there is no direct evidence concerning what floral and faunal resources the Paleo-Indians included in their subsistence economy. Lithic material resources that they utilized in the manufacture of their stone tools included Collingwood (Fossil Hill) chert, Onondaga chert, and Kettle Point chert from Ontario; Bayport chert from Michigan; and Upper Mercer chert from Ohio.

CHAPTER III

PALEO-INDIAN POINT TYPES IN SOUTHWESTERN ONTARIO

Introduction and Assumptions

Southwestern Ontario has yielded a large number of Paleo-Indian projectile points that represent a variety of early complexes. These are classified into two general categories: fluted points attributed to Early Paleo-Indian populations, and Plano points that include several varieties of non-fluted lanceolate points associated with Late Paleo-Indian populations.

Data will be presented in this chapter to define several Early and Late Paleo-Indian projectile point types in southwestern Ontario, and, by extension, in the Great Lakes region. The point types are defined on the basis of morphological traits. Following chapters will demonstrate that differing patterns of distribution, settlement strategies, lithic raw material association, and technological traits (other than those represented by projectile points) are associated with each type. This indicates that the point types are meaningful in terms of differing patterns of behaviour. Also, data will follow to show that most of the point types are non-contemporaneous. Rather, they represent sequential developments which appear to be regional manifestations of broader Paleo-Indian trends across the continent.

To enhance understanding of the Paleo-Indian projectile point types in southwestern Ontario, three significant factors should be kept in mind:

1) The point types are polythetic (see Clarke 1968:37-38). In other words, not all defining traits have to be present in each artifact assigned to the set. Furthermore, the diagnostic value of given traits can vary from point type to point type. Deller and Ellis (1987:50) note:

> In sum, as we perceive them, no single characteristic, be it an aspect of fluting, a particular measurement of outline shape, or a basal finishing technique, is sufficient to assign a particular point to a type. Rather, a point is assigned to a type on the basis of the consistent co-occurrence of a large percentage of the defining characteristics....Furthermore, the association of particular attribute states and variable ranges is important in assigning particular points to a type because more than one type can exhibit a certain characteristic. For example, both Barnes points, and Crowfield points have narrow bases (under 20 mm). Nevertheless, they differ in many other characteristics associated with the same point and such narrow bases serve to distinguish both of these types from Gainey points.

2) In most cases, the point types represent Paleo-Indian populations whose technological traits varied through time rather than contemporaneously. This is supported by two

arguments: a) variation in the technologies associated with the point types reflects fairly well dated trends in adjacent areas, and b) regionalization of the point types and related complexes does not occur to the extent that might be expected if they were measuring contemporaneous social variation. Whereas in larger regions, such as the Great Plains, it might have been possible for a number of highly mobile societies to co-exist with minimum contact, it is highly improbable that a similar situation could have occurred in southwestern Ontario. During most of the Paleo-Indian occupation, southwestern Ontario was a relatively small peninsula bounded by glacial ice on the north and large glacial lakes on the west and southeast. It is doubtful if a number of distinctive Paleo-Indian societies, some known to have been interacting with neighbouring groups (Deller 1983), could have co-existed in such a small, relatively impoverished area and maintained the discreteness that they show in the archaeological record in terms of technology and patterns of lithic raw material utilization.

3) The point types are products of Paleo-Indian societies that were continually evolving. To the extent that types represent temporal markers, it follows that intermediate or transitional forms occur between them. It has been observed (Deller and Ellis 1987):

> ...given that the types are monitoring temporal variation, it seems that each represents a "slice" of a continually evolving system. In other words,

> the types represent an arbitrary segment in a temporal continuum of morphological and technological change, sufficiently separate to isolate a "different" type. We suspect that this accounts for the majority of the known Ontario fluted points which cannot be easily assigned to certain types (i.e. they appear somewhat intermediate between types).. For example, some points (i.e. Deller 1979:Figure 5-29a; Garrad 1971:#16) appear to be transitional between Gainey and Barnes points and therefore may be intermediate in time between the two. Similarly, some points appear intermediate between Barnes and Crowfield points (i.e. Deller 1976a:Plate 3V). It is worth noting that we have not seen points which are both "Gainey-like" and "Crowfield-like." This is to be expected since these are probably the most distantly separated from one another in time (i.e. they are the earliest and latest point types in the sequence).

Fluted Point Types in Southwestern Ontario

Several fluted point types have been proposed in southwestern Ontario. These include Enterline points, Gainey points, Barnes points, and Crowfield points (Roosa 1977a, 1977b; Wright 1979; Roosa and Deller 1982; Storck 1983, 1984; Deller and Ellis 1984; Ellis 1984). Of these, the Gainey, Barnes, and Crowfield types are well represented in the central Great Lakes region. The Enterline type (Roosa 1965; Roosa and Deller 1982) is poorly understood and a subject of debate in this area.

The following section will present general descriptions of the point types. Detailed descriptions of fluted point assemblages from specific sites will follow in subsequent chapters.

1) <u>Enterline Points</u>. Enterline points were named after the assemblage of fluted points from the Shoop site in eastern Pennsylvania. Witthoft (1952:483) describes the Shoop site points as follows:

> Despite differences in size and contour within our series, all specimens (and fragments preserving the part involved) show the following characteristics: fluting on both faces; concave base; slight concavity of side edges near base; fine retouching and smoothing of at least half of this concavity, extending to the ears; rounding and dulling of ears; convex edge of half of point toward tip, parabolic outline, with convexity generally increasing near tip; flat, parallel final flaking almost always perpendicular to the edge, rarely oblique; flat random chipping or obliterated longitudinal flake scars; tips not acutely pointed; forepart of point with medial ridge; thin, finely retouched rounded point.

The application of the term Enterline to specimens in the Great Lakes region was first proposed by Roosa (1963, 1965). He describes the point type (Roosa 1965:97-98):

> Although usually smaller, Enterline points are very similar to Clovis points. Enterline points often have a slight "fishtail" which seldom occurs on true Clovis points. Both types usually have relatively shallow basal concavities and short multiple fluting, often double or triple fluting. On triple-fluted Clovis points the central flute was usually removed first, followed by the small side flutes or thinning flakes. On triple-fluted Enterline points the central flute was usually last....Fluting length on Enterline points is usually less than that of points with the Folsom technique. Folsom-type fluting usually runs for at least 30 to 40 mm and is 8 to 10 mm wide. Enterline fluting seldom is this long, and the individual flute scars are rarely this wide. Length of fluting on Enterline points is roughly equal to the basal width of the point....Enterline points probably occur as far west as Wisconsin. The short point with the slight "fishtail" shown

by Ritzenthaler and Scholz (1951, Figure 1, top right) is probably an Enterline point. One or more of Kidd's Ontario points is probably of this type (Kidd 1951, Figure 87a). Mason illustrates several from Michigan 1958, Plate IID; Plate III C). Approximately one-third of New York points illustrated by Ritchie (1957) appear to be Enterline points.

Roosa (1965:89-91) uses fluting techniques as primary sorting criteria in the identification of Enterline points as well as other fluted point types:

> Following Witthoft's lead (1952) I utilize fluting and basal finishing techniques as an aid in identifying fluted point types. By using these attributes as primary sorting criteria it is possible to distinguish type clusters of fluted points, each of which contains several closely related types. Once these various fluting and basal finishing techniques are understood, and the type clusters recognized, it becomes practical to utilize certain metric attributes and outline shape as secondary criteria in distinguishing point types....There appear to be at least two basic fluting techniques, i.e. the Folsom technique and the Enterline technique (Witthoft 1952). The Enterline fluting technique is distinguished from the Folsom technique chiefly by the fact that there was little bevelling and re-bevelling of the base to provide a striking platform on Enterline points. The cross section of the base of an unfluted Enterline point was roughly symmetrical (Witthoft in Byers 1954), not bevelled as with Folsom technique. After the first face was fluted, the Enterline point was turned over and the second face fluted with little or no re-bevelling of the base. Fluting of the two faces of an Enterline point was done from essentially the same striking platform.

There are two reasons why the Enterline point type has not gained widespread recognition in the Great Lakes region: 1) to date, no site has been found in the Great Lakes region with sufficient numbers of fluted points to establish clearly their similarity to fluted points from the Shoop site, and 2) the Enterline fluting technique that has been used as a major criteria in defining the point type is controversial. Prufer 1960:446) points out that triple channel fluting was found in many eastern Paleo-Indian collections and proposed that this technique was not limited to either a particular region or a particular portion of the Paleo-Indian chronology. Gardner and Verrey (1979:19) note:

> ...we disagree with Witthoft's (1952) argument that "guide flakes" were first detached, followed by the flute itself, preferring Callahan's (1976:personal communication) explanation that the number of flakes is immaterial. The degree of thinning is of greatest importance, whether it takes 1 or 5 flakes to achieve the desired result. We also disagree with Roosa (1975:personal communication) when he emphasizes the fluting "technique" based on the preparation of the striking platform. Fluting techniques may differ from site to site, within one site, and even possibly between points made by one flint knapper (Callahan 1986:personal communication).

Moreover, attempts to compare points from the Shoop site to other types from the Great Lakes region, such as by Ellis (1984), show that Enterline points at Shoop do not differ substantially in respect to some characteristics that have been cited as being diagnostic, e.g. depth of basal concavity. For the above reasons I am reluctant to use the Enterline classification for points in the Great Lakes region, such as the specimen illustrated by Roosa (1965:F). Rather, I think that this point and others similar to it from southwestern Ontario belong to a separate type, as yet unnamed, that bears no close affiliation with the Shoop site points. In conclusion, it is recommended that the name "Enterline point" not be used to identify fluted points in southwestern Ontario until a site has been found in the Great Lakes region with a sufficient number of points to define the type clearly and to demonstrate their similarity to the points from the Shoop site.

2) Gainey Points. Gainey points are named after the Gainey site (Simons et al. 1984) in Michigan. Points of this type in the Great Lakes region initially were called Bull Brook points by Roosa (1965), who noted their similarity to points from the Bull Brook site (Byers 1954) in Massachusetts. Later, after the Gainey site was discovered in Michigan, they were renamed Gainey points (Roosa and Deller 1982) to represent a Great Lakes fluted point complex distinguished from its Bull Brook counterpart by geographic focus, settlement strategies, patterns of lithic raw material association, and technological considerations involving regional distinctiveness in terms of implement types.

Comprehensive studies comparing Gainey points to other commonly recognized fluted point types beyond the Great Lakes region have not yet been undertaken; nor, for that matter, have the other types been clearly defined. Nevertheless, based on: 1) my brief examinations of fluted points from the Gainey, Welling, Udora, and Bull Brook sites, 2) published data (Byers 1954; Curran 1984; Cox 1972; Ellis 1984; Gramly and Lothrop 1984; Grimes et al. 1984; Roosa 1965; Simons et al. 1984 and

and Witthoft 1952), and 3) detailed analyses of most of the Gainey points recovered in Ontario up to 1987; it is my impression that there are few, if any, significant differences between Gainey and Bull Brook points, nor between these types and many of the (Enterline) points that I examined from the Shoop site. Thus, a strong case might be built for eliminating the term "Gainey point" in favour of "Bull Brook". Yet, pending results from rigorous comparative studies of assemblages in the Great Lakes, Appalachian, and Atlantic regions, this thesis will follow established precedents (Roosa and Deller 1982; Ellis 1984; Roberts and McAndrews 1987; Storck 1987) by continuing to use the term "Gainey points" for Bull Brook-like points in the central Great Lakes region.

It is proposed that Gainey points are the earliest recognized fluted point type in southwestern Ontario. The following descriptions are based on a sample of 20 Gainey points that represent surface finds from a number of Ontario sites and locations. Some of these points are shown in Figure 8.

Outline shape: This is a significant criterion for distinguishing Gainey points. The lower lateral edges of Gainey points generally are parallel, although a few specimens have edges that expand very slightly from the base to a maximum width around midpoint. This contrasts with Crowfield points whose lateral edges expand rapidly from the base, and Barnes points that expand moderately from the base (see Figure 9). The degree of expansion or contraction of the lateral edges from the base is a measure referred to as "face-angle" (Ellis 1984). It is a measure of the angle between a line drawn across the base and the lateral edge at the base ignoring ear-flaring or fishtails. The measure is taken at both basal corners and averaged for each point if both corners are complete. Otherwise, the measurement for one edge is presented. The variation in face angle among Gainey points, Barnes points, and Crowfield points is illustrated in Figure 9.

Size: The sample of 20 Gainey points from southwestern Ontario ranges in length from 50 mm to 95 mm (x=68.14 mm), in maximum width from 20 mm to 37 mm (x=26.9 mm) in basal width from 19 mm to 32 mm (x=26.1 mm), and in thickness from 6 mm to 8 mm (x=7.6 mm). Basal concavities tend to be deep, ranging from 2 mm to 8.5 mm (x=4.9 mm). Generally, basal width is a useful criterion for distinguishing Gainey points from Barnes points and Crowfield points. Gainey points consistently have basal widths measuring over 20 mm whereas the other types consistently measure under 20 mm. This is illustrated in Figure 10.

Shape of the base: Two basal shapes are associated with Gainey points in southwestern Ontario: those with slightly flaring ears and those without. At present, it is unknown whether this variation is accounted for by change over a period of time, by stylistic preferences of contemporaneous knappers, or by other unknown factors. On some Gainey points without flaring ears there is a slight but distinct insetting, almost a shoulder, formed at the juncture of heavily ground and unground areas on the lower lateral edges (see Figure 8, especially point #6).

Preparation for fluting: Gainey points occasionally exhibit the remnants of a medial ridge above the fluting. They were created on the preform by removing parallel-sided flakes from each lateral edge so that they terminated along the central axis of the preform. Medial ridges served to guide the removal of the channel flake.

Characteristics of fluting: Fluting on Gainey points generally ranges in length from about one-third to two-thirds of the point's length and is accomplished by the removal of single, parallel-sided channel flakes. Often, the base of the fluting is overridden by small thinning flakes characteristic of the Barnes finishing technique.

3) Barnes Points. Barnes points are an Early Paleo-Indian fluted point diagnostic of the Parkhill complex in the Great Lakes region. They are named after the Barnes site in Michigan (Roosa 1965; Wright and Roosa 1966). It has been proposed that Barnes points were contemporaneous with the closing stages of Lake Algonquin circa 10 500 B.P. (Deller 1980b). Typical Barnes points from southwestern Ontario are shown in Figure 11.

Outline shape: In outline shape, Barnes points resemble

Cumberland points from the Tennessee-Kentucky area. Most Barnes points have fishtails. Lateral basal edges expand moderately from the waist (i.e. above the fishtail) to the maximum width of the point at or, if the point tip has not been resharpened, just below the mid-section. Face angle measurements for Barnes points cluster markedly between 95° and 100° (see Figure 9).

Size: A sample of over 100 Barnes points from southwestern Ontario ranges in length from 35 mm to 105 mm (x=61.2 mm), in maximum width from 15 mm to 25 mm (x=21.5), in basal width from 12.4 mm to 20 mm (x=16.6 mm), and in maximum thickness from 3.5 mm to 8 mm (x=5.7 mm). Generally, these measurements range between those of Gainey points and Crowfield points (see Figures 9 and 10).

Shape of the base: Most Barnes points are characterized by fishtails. Ears generally are pronounced, thick, and knobby. The depth of the basal concavity on the sample of points ranges from 2 mm to 6 mm (x=3.9 mm). Heavy grinding occurs on the lower lateral and basal edges.

Cross-section: Barnes points exhibit well executed parallel-collateral flaking which terminates along the mid line of each face. This results in a lenticular or biconvex cross section. This is similar to Gainey points but is in contrast to Crowfield points which have a flat cross-section.

Fluting: Barnes points generally have long, parallel sided fluting that extends to the tip on one face and from one half to three quarters of the length of the point on the other face. There are never more than two flutes per face. Often, the base of the fluting is overridden by one or two short thinning flakes referred to as the Barnes finishing technique.

Comparisons to other fluted point types: Because of shared similarities in technological traits, Barnes points have been compared to both Folsom ones on the western plains (for comparisons, see Storck 1983; Roosa 1965) and Cumberland points, named after the Cumberland River in Kentucky and Tennessee, near which occur the major concentrations of the latter point type (Roosa 1965, Deller 1980b). Most, if not all, of these comparisons are impressionistic. They are based mainly on published illustrations (introducing a possible bias in proportion to the tendency of authors to illustrate only "photogenic" specimens) and limited statistical data published by researchers who often stress different definitive characteristics. Furthermore, the published data seldom distinguish between finished fluted points and earlier stages of their manufacture that frequently vary considerably from the final product. Because of these and other circumstances, such as the poorly defined temporal contexts of Barnes and Cumberland points, a clear understanding of relationships between the point types and the complexes they represent has not emerged.

In the following, I will restrict my comments to general impressions of similarities and differences between Barnes and

Cumberland points. While I have studied in detail over 200 Barnes points from the Parkhill, Thedford II, and Fisher sites in Ontario, I have examined fewer than 25 Cumberland points from scattered, unknown or undisclosed loci in Kentucky and Tennessee. Many of the Cumberland specimens were mounted on boards or in display cases in private collections. This made it difficult or impossible to record crucial data such as point thickness. Other problems are a lack of consensus concerning the definition of Cumberland points, and a poor understanding of the variability ranges of their diagnostic characteristics. This might be explained by the paucity of published data concerning the type, such as detailed definitions and descriptions. Also, the definition of the type has been based primarily on isolated surface finds rather than on a large sample from a "type" site (Lewis 1954; Kneberg 1956; Peck and Painter 1985). This, and popular usage of the term "Cumberland" by relic collectors, who generally are anxious to assign a type name to isolated finds, has broadened the variability ranges thought to be associated with the point type. In fact, many researchers (Gramly: personal communication) apply the term "Cumberland point" to all fluted points in the East, including Barnes points, that are relatively slender, well fluted, and have fishtails.

My impressions are, however, that whereas Barnes points bear some similarities to Cumberland points, there are significant differences between the two types. Similarities include outline shape, length and width of fluting relative to that of the point, and the width of the constriction above the ears. Significant differences include: 1) point thickness: a sample of over 100 Barnes points from southwestern Ontario averages 5.7 mm in maximum thickness, whereas a sample of 31 Cumberland points from 28 sites in the Tennessee River Valley averages 8 mm in thickness (Kneberg 1956); 2) cross-section: prior to fluting, Cumberland preforms frequently have well developed medial ridges on both faces, whereas those on Barnes points are markedly less developed and rarely, if ever, occur on both faces; and 3) fluting modifications: the base of the fluting on most Barnes points is overridden by short flake removals that serve to deepen the fluting but do not alter its width (i.e. the Barnes finishing technique). Such modifications have not been reported on Cumberland points, nor did they occur on the sample that I examined.

These differences are not a product of the particular type of chert that was used in the manufacture of the artifacts. Both types of points have been manufactured from several varieties of chert, yet they maintain their distinctive characteristic traits. As well, at least one classic Cumberland point manufactured from Onondaga chert (frequently used in the manufacture of Barnes points) has been recovered in Ontario (see Garrad 1971:No. 8).

The Barnes and Cumberland point types distinguished by these differences tend to regionalize. Cumberland points concentrate in Kentucky and Tennessee, while Barnes points are found in the central Great Lakes region. It remains to be determined if these two forms are discrete with some overlap in Ohio or if there is a clinal variation from one to the other. The two types are associated with significant variation in lithic raw materials, settlement strategies, and possibly, differences in other implement types. These variations may represent two discrete but perhaps closely related populations, whose adaptations reflected significant differences in ecozones that they were exploiting: a periglacial environment in the case of the Parkhill group that manufactured Barnes points, and a non-glaciated region in the rolling hills and river valleys immediately to the west of the Appalachian mountian chain in northern Alabama, central and eastern Tennessee, eastern Kentucky, and southern Ohio, in the case of the Cumberland population (Peck and Painter 1985).

4) Crowfield Points. Crowfield points are a thin, multiple fluted point named after the Crowfield site (Deller and Ellis 1984) in southwestern Ontario. It is proposed that they date to a period shortly after the draining of proglacial Lake Algonquin circa 10 500 B.P. In addition to southern Ontario, examples are known to occur in the states of Ohio, Pennsylvania, and New York. The following descriptions of Crowfield points are based

largely on the assemblage from the type site. This assemblage includes shouldered and non-shouldered bifaces that will be described in greater detail in Chapter VI. A representative sample of Crowfield points is shown in Figure 12.

Outline shape: Crowfield points exhibit an outline shape ranging from what is commonly referred to as pentagonal or pumpkinseed to slightly expanding lanceolate. The lower lateral edges generally expand rapidly from a narrow base to the maximum width of the point, which occurs at or above the mid-section. Frequently, there is a break in the outline so as to give the point a slightly shouldered appearance. Face angle measurements that distinguish the points are illustrated in Figure 9.

Size: Crowfield points generally are intermediate in size between Barnes points and Holcombe points. A sample of 19 fluted bifaces from the Crowfield site ranges in length from 41 mm to 64 mm (x=56 mm), and maximum width from 26 mm to 35 mm (x=30.8 mm). The points are extremely thin in comparison to most types of fluted points. The Crowfield site sample ranges in thickness from 3.6 mm to 5.7 mm (x=4.7 mm).

Fluting: Crowfield points generally are well fluted on both faces with the flute scars extending to between the mid-section of the point and the tip. Fluting is shallow, and often expands from the base parallel to the lower lateral edges of the point. It is accomplished by the removal of from one to three flutes on each face. Flutes are often removed in series from left to right or right to left on each face. Frequently, the fluting is overridden at the base by two or three shorter flake scars.

Base: Basal concavities are shallow, ranging in depth from 0.5 mm to 4 mm with an average of 2 mm. Often, bases are steeply bevelled. Lateral basal edges and concavities are lightly ground.

Ears: Ears on Crowfield points are small, indistinct, and pointed.

Cross-Section: In cross-section, Crowfield points range from flat to slightly lenticular. Flat cross-sections were accomplished by thinning rectangular preforms from both ends prior to fluting.

Comparisons to other types: Although Crowfield points are distinct from other types of fluted points in the Great Lakes region, they are similar to Holcombe points in some respects. Deller and Ellis (1984:45) note:

> In terms of established early Great Lakes area point types (see Roosa 1963, 1965; Roosa and Deller 1982), the Crowfield points most closely resemble Holcombe points (Fitting et al. 1966; Wahla and DeVisscher 1969) which, in agreement with Griffin (1977:10) and Roosa (1965:100), we would not classify as fluted points. Similarities to Holcombe points include maximum width at or beyond midpoint, expanding lateral edges from the base, shallow basal concavities, small ill-defined ears, and thinness. However, the Crowfield points differ in that they are much wider, exhibit more markedly expanding lateral edges from the base, can have shoulders and pentagonal resharpening, usually do not have plano-convex cross-sections and are definitely fluted. Few Holcombe points are fluted (Fitting et al. 1966:55; Roosa 1965:100) and these possible flutes seem more an

"accident" of basal thinning rather than a desired product. Since the closest similarities are to Holcombe points, and assuming, in agreement with Goodyear (1982:390) and Gardner (1974:38-39) that fluted and unfluted point use was not contemporaneous, this suggests they may represent a temporal sequence of Crowfield to Holcombe.

Crowfield points also resemble fluted points found on the Reagen site in Vermont (Ritchie 1953). Similarities include pentagonal outlines, thinness, length of fluting, shallow basal concavities, small, non-flaring, indistinct ears, and lateral edges that expand markedly from a narrow base. One fluted biface from the Reagen site has a shoulder on one edge similar to some of the fluted bifaces from the Crowfield site (Ritchie 1957:Plate 15, I). Deller and Ellis (1984:50) comment:

> ...the Reagen site material itself is often considered "anomalous,", "aberrant," "an enigma," or "unique" (i.e. Snow 1980:142). While we would suggest that this is at least partially a reflection of the fact that several distinct Paleo-Indian components are present at Reagen, the Crowfield site data suggest that the fluted points from Reagen and other locations are not "aberrant" or "atypical." Instead, they are widespread and may represent a "horizon marker" for late fluted point materials throughout a large part of the northeast.

Plano Point Types in Southwestern Ontario

At least two definite Late Paleo-Indian point types occur in southwestern Ontario: Holcombe points and Madina points (Deller 1976a, 1976b, 1979; Roosa and Deller 1982; Ellis and Deller 1982). Elsewhere I have included Hi-Lo points in a Late

Paleo-Indian classification (Deller 1976a, 1976b, 1979), but at present I consider them to represent a society transitional between Late Paleo-Indian and Early Archaic populations. Accordingly, data concerning Hi-Lo points and the complex that they represent will not be included in this study.

1) Holcombe points. Holcombe points are a Late Paleo-Indian basally thinned point in the central Great Lakes region. They are named after a cluster of sites on the Holcombe beach in southeastern Michigan (Fitting et al. 1966; Wahla and DeVisscher 1969). It is proposed that they post-date the draining of proglacial Lake Algonquin circa 10 500 B.P. This is based on their occurrence on the Algonquin lake bed in southwestern Ontario, as will be discussed in Chapter VII, and their frequent manufacture from Kettle Point chert, the bedrock sources of which were available to Late Paleo-Indian societies only after the recession of Lake Algonquin (see Figure 7). Holcombe points bear many resemblances to Crowfield points and it is probable that the two types are closely related in time. Also, they are similar to Midland points in the West.

Few Holcombe points have been recovered in southwestern Ontario (see Figure 13). The following descriptions are based largely on published data concerning the Holcombe site (Fitting et al. 1966) and several isolated finds in Michigan (Wahla and DeVisscher 1969).

Outline shape: Holcombe points are lanceolate in outline with lateral edges that tend to expand moderately from a narrow base. Maximum width occurs at, or slightly above, the mid-section. In these respects, Holcombe points are similar to Crowfield points.

Size: Wahla and DeVisscher (1969:110) note that Holcombe points vary in length from 35 mm to 70 mm. They are very thin, which is a significant diagnostic attribute. Generally they tend to be smaller than Crowfield points.

Cross-section: Holcombe points examined by the author in Michigan, Ohio, and southern Ontario have cross-sections ranging from lenticular to plano convex. The plano convex specimens probably were manufactured from thin flake blanks. Occasionally, remnants of the original flake blank are visible on the finished point.

Thinning: Holcombe points often are characterized by basal thinning, as opposed to fluting, which is accomplished by the removal of one or more flakes from the base. Frequently this thinning occurs only on one face.

Grinding: Holcombe points generally have grinding on the lower lateral and basal edges.

2) Madina Points. At present, the full range of variation of Madina points is not clearly understood, nor is a published definition available for the type. The term was first used by Mr. Gordon Dibb (personal communication) in reference to

lanceolate projectile points in southcentral Ontario, such as occur on the Deavitt site (Dibb 1985). These are similar in appearance to Agate Basin points on the western plains. He does not include in the classification Ontario points such as some from the Zander site that have been compared to Hell Gap points in the West (Stewart 1984). The principal difference between the Deavitt and Zander specimens appears to be the degree of tapering of the lower lateral edges and the resultant presence or absence of slight shoulders above the lateral grinding. The lower lateral edges of the Zander site points generally appear to be more tapered than the Deavitt artifacts. There are distinct differences in chert utilization patterns between the sites, which are less than 25 km apart. The use of different raw materials especially strengthens the case for temporal separation of the two sites and related assemblages. Nevertheless, I use the term "Madina point" to describe artifacts with either lateral configuration. I prefer a broad interpretation of the type until sufficient data to warrant a meaningful cultural distinction are available. This is based largely on my belief that the degree of tapering of the stem of Madina points is not a significant criterion. Both shapes of points (i.e. those without markedly contracting stems: the Agate Basin-like variety, and those with slightly concave lower lateral edges: the Hell Gap-like variety) occur in close proximity on the surface of Heaman (Deller 1976b) and other sites in southwestern Ontario.

A representative sample of Madina points from southwestern Ontario is shown in Figure 14. The small size of the sample precludes the definitive value of all but general descriptions of the point type.

Outline shape: Madina points are lanceolate in outline. Unless altered by resharpening, they are slender in relation to the length of the point. Maximum width occurs around midpoint. The shape of the lower lateral edges below the midpoint tends to vary. On some specimens (see Figure 14, No. 1) they tend to be slightly convex. These have been compared in shape to Agate Basin points in the West. On other specimens, the lower edges tend to converge more rapidly with a straighter edge, or are slightly concave (see Figure 14, No. 5). These are similar in outline to Hell Gap points in the West.

Grinding: Madina points have moderate to heavy grinding on their lower lateral edges as far as midpoint. Often it contributes to the shouldered appearance of the point. Light grinding occurs on the base of most of the specimens.

Flaking: Flake scars on Madina points generally are broad and shallow, with poorly represented negative bulbs of percussion. Representative of their pattern of occurrence are three points from the Heaman site (Figure 14, Nos. 1, 2, 3). These exhibit:

> ...a transverse, collateral flaking which extends to or slightly over the midline on all retained surfaces. This flaking does not appear to have been applied serially or in a consistent or

patterned manner. Rather, it, as well as a superimposed, fine, edge regularization retouch, appears to have been applied in a somewhat irregular manner in a form referred to by Bradley (1974:193) as selective non-patterned flaking" (Ellis and Deller 1986:44).

Cross-section: Madina points have biconvex cross-sections, often with a slight medial ridge on one face.

Shape of the base: Bases in the small sample of Madina points tend to be straight or slightly rounded.

Size: There is considerable range in size. Although the sample is small, there appears to be one cluster of points averaging about 90 mm in length and another around 50 mm in length. Some researchers (Dibb: personal communication) suggest that differences in size might be attributed to temporal and/or social variation. Although at present there are insufficient data to establish clear relationships, I favour the inclusion of points of both sizes in one type and archaeological complex. The full range of size appears to be represented on the Heaman site.

Ellis and I (1986:55) compare Madina points with Agate Basin points on the western plains. Similarities include outline shape, lenticular cross-sections, lateral edge grinding, lack of thinning from the base, and well executed flaking consisting of shallow flake scars that lack pronounced negative bulbs. Differences include a tendency towards slight medial ridges on one face of Madina points that rarely occur on Agate Basin points, the occurrence of smaller points in the Madina complex, and straight bases.

It is proposed that Madina points post-date the draining of proglacial Lake Algonquin in southwestern Ontario. This temporal boundary is indicated by their frequent occurrence on the Algonquin lake bed (see Chapter VII). I believe that they represent a form in the central Great Lakes region that dates to a period transitional between Agate Basin and Hell Gap on the western plains.

Summary

A comparatively large number and variety of Paleo-Indian projectile points have been recovered in southwestern Ontario. These represent a number of types that are useful in defining archaeological complexes attributed to temporally and/or culturally discrete Paleo-Indian populations. The types are based on samples of points from one site or several closely related sites. They are defined on the basis of morphological traits. Generally, discrete patterns of distribution and lithic raw material exploitation are associated with each type, as well as distinctive technological traits other than those involving projectile points. These data strengthen the argument for chronological differences and behavioural variation associated with the types.

Determination of the chronological placement and sequence of the point types is complicated by the lack of directly-associated radiometric dates and sites yielding significant stratigraphic separation of Paleo-Indian components. Yet substantial clues to the chronological ordering of the point types are derived from four sources: 1) similarities to dated material in adjacent areas, 2) exploitation of lithic raw material sources that were available only during well-dated intervals of proglacial lake recession, 3) site location relative to dated geological features that generally provide maximum possible ages, and 4) provenance of archaeological materials relative to pollen associated with particular floral developments that are well dated in the area.

The point types are classified into two general categories: 1) fluted points attributed to Early Paleo-Indian populations, and 2) Plano points attributed to Late Paleo-Indian populations. Types of fluted points in southwestern Ontario are, in chronological order: Gainey points, Barnes points, and Crowfield points. Of these three types, Gainey points and Barnes points are the most similar.

Comparisons of the three types reveal trends through time in fluted point morphology towards smaller and thinner points with more tapered lower lateral edges. The trend in fluting is generally towards longer flutes between Gainey and Barnes, although some Gainey points (see Figure 8) have very long fluting; and then to shorter, multiple fluting and flattened cross sections between Barnes and Crowfield. Some of these trends have been noted elsewhere in the Northeast, as well as in the transition from Clovis to Folsom in the Southwest. For example, fluted points from stratigraphically separated components at the Thunderbird site demonstrate a trend towards "more marked fluting and deeper basal concavities..." (Gardner 1974:37). Also, if the basal width of only finished points from the stratified sequence at Thunderbird (Gardner and Verry 1979:25, 27) is considered (excluding the points from surface collections whose temporal assignment is unclear), basal widths are 25.7 mm and 26.7 mm for the early component and 17.2 mm and 19.3 mm for the later component.

At least two types of Plano points occur in southwestern Ontario: Holcombe points and Madina points. These point types date to a period after the draining of Lake Algonquin circa 10 500 B.P. This is indicated by their occurrence on the Algonquin lake bed and their frequent manufacture from Kettle Point chert, the bedrock source of which was inaccessible until after the draining of Lake Algonquin.

In conclusion, there is a fairly well established sequence of Paleo-Indian point types in southwestern Ontario, and by extension, in the central Great Lakes region. This sequence includes the Gainey, Barnes, Crowfield, Holcombe, and Madina types. The next four chapters will present data on the archaeological complexes associated with these point types.

CHAPTER IV

THE GAINEY COMPLEX

This chapter begins with a brief definition of the Gainey complex, followed by short descriptions of its manifestations in southwestern Ontario. Next, data on the Weed and Ferguson sites are presented. These are two unpublished sites with components attributed to the Gainey complex. The chapter concludes with interpretations of the data and a summary of material presented.

The Gainey Complex

The Gainey complex is an Early Paleo-Indian manifestation in the Great Lakes region that is thought to have been contemporaneous with, and closely related to, the Bull Brook phase in the East. It is possible that it dates between Clovis and Folsom on the western plains. The principal diagnostic artifacts of the complex are Gainey points, named after the Paleo-Indian component on the Gainey site (Simons <u>et al.</u> 1984) in Michigan. Other sites having Gainey components include Welling (Prufer and Wright 1970) in Ohio; Weed, Ferguson, and Uniondale in southwestern Ontario; and Udora (Storck 1982) in southcentral Ontario. It is proposed that the Paleo-Indians responsible for the Gainey complex were the first human colonizers of southwestern Ontario. Colonization probably occurred at some unknown time during the span of Lake Algonquin (i.e. sometime between 12 000 B.P. and 10 500 B.P.). The occurrence of Upper Mercer chert from Ohio on Gainey complex sites in southwestern Ontario suggests that the Gainey population in this region had ties to the south, where they possibly originated.

Gainey Complex Manifestations in Southern Ontario

The Gainey complex has a widespread distribution in southern Ontario. Figure 15 shows the location of sites and find spots where Gainey complex materials have been recovered. Summary data are given in the legend for Figure 15. Additional data concerning some of the locations and the Weed and Ferguson sites are given below.

Location 1 represents the find spot of a Gainey point base (Deller 1976b, No. A8) manufactured from Onondaga chert on the Haunted Hill site (AhHk-80) in McGillivray township, Middlesex county, Ontario, at grid reference 394853 (Parkhill 40 P/4, Edition 5). A spurred end scraper manufactured from Collingwood chert and a small amount of debitage of the same material which is diagnostic of Early Paleo-Indian components were recovered within a few metres of the point base but their precise cultural identity remains to be established. The cultivated surface of the site also has yielded a small collection of Plano points (see Chapter VII) and a wide variety of Archaic materials.

Location 2 shows the approximate find spot where the base of a Gainey point (see Figure 8, No. 5) manufactured from Onondaga chert was found by Mr. Glen Tedball of Thedford, Ontario. Tedball reports that the artifact was recovered either on Lot 17 or 18, Concession I, Bosanquet township, Lambton county, near the shoreline of proglacial Lake Warren. Lot 17 yielded a large side scraper manufactured from Collingwood chert at grid reference 332778 (Parkhill 40 P/4, Edition 4). It is unknown whether it is associated with the Gainey complex as represented by the fluted point base, or with other Paleo-Indian complexes that occur in the area.

Location 4 identifies the find spot of a Gainey point on Lot 3, Concession XIII, Lobo township, Middlesex county, Ontario (see Figure 8, No. 4; Garrad 1971:No. 20). The point was found by Mr. Henry Prangle when he was clearing bush from a low ridge that crosses his farm. The locality is approximately 3 km south (inland) of the proglacial Lake Whittlesey shoreline. Surface reconnaissance on the farm in November 1974 and June 1975 failed to locate additional evidence of Paleo-Indian occupation. The manufacture of the point from Upper Mercer chert establishes ties to chert outcrops in Ohio and suggests that ~~the point~~ might be attributable to an early Gainey phase in southwestern Ontario, if the hypothesis that Gainey populations gradually replaced the use of Upper Mercer chert with the use of Collingwood chert as they became more settled in southwestern Ontario is correct.

Location 7 represents the find spot of a Gainey point (Garrad 1971:No. 18) manufactured from Onondaga chert on Lot 18, Concession IV, Caradoc township, at grid reference 582524 (Strathroy 40 I/13, Edition 4). It was found in a cultivated field by the late W.V.V. Pardy of Mount Brydges, Ontario, who showed its precise locus of recovery to the author in May, 1961. The author searched the surface of the field on two occasions in November 1968 and recovered a possible channel flake fragment of Onondaga chert about 350 m southwest of the locus where the fluted point was found. Several Middle Archaic, Early Woodland (Meadowood), and Middle Woodland projectile points also were recovered at scattered loci. Thermally cracked rocks and chipping debris of Onondaga chert and Kettle Point chert were noted in several areas.

Location 8 represents the find spot of a Gainey point on the northwest quarter of Lot 17, Concession III, Caradoc township. It is manufactured from Onondaga chert and has roughly parallel sides from the midsection to its slightly flaring ears, a shallow basal concavity, and flat, shallow fluting accomplished by two flutes on one face. On the opposite face, the need for fluting was precluded by the presence of a broad, slightly incurved surface that is the remnant of the ventral surface of the flake on which the point was made. The bulb of percussion of this flake was located near the tip of the point. The point was found on a low sandy knoll that gradually slopes northward into a swampy area in which mastodon remains were found during the construction of a railroad water tower (W.V.V. Pardy: personal communication). It is unlikely that there is an association between these remains and the fluted point.

Location 9 identifies the find spot of a Gainey point (Figure 8, No. 2) reported to have been recovered near Reservoir Hill in London township, Middlesex county, Ontario. The point, which is manufactured from Collingwood chert, is in the collections of the University of Western Ontario (ref. 979-9-73483).

Location 10 represents the probable find spot of a Gainey point on Lot 13, Concession VII, Dunwich township, Elgin county, Ontario. Initially, this point was reported to be from a farm on Lot 22, Concession IV, Ekfrid township, Middlesex county (Garrad 1971:No. 13), but I believe this provenience to be in error. Mr. [redacted] McCallum who presently owns the farm in Ekfrid township informed me that the point was one of several artifacts that his late father donated to the University of Western Ontario. Some of the artifacts had been collected on the Ekfrid farm but the majority had been recovered on the family homestead.

farm near Wallacetown, Ontario. Reconnaissance on the former McCallum farm on Lot 13, Concession VII, Dunwich township, in 1974 located debitage that appears to represent the same type of raw material as that of the fluted point. The physiographic setting of this locality is typical of many Paleo-Indian site locations and find spots in the region. It has an excellent overview of the surrounding countryside from its location on the southern slope of the St. Thomas moraine. On the other hand, reconnaissance on the McCallum farm in Ekfrid township on several occasions in 1973 and 1974 failed to locate evidence that could be related to Paleo-Indian occupation. Furthermore, the location in Ekfrid township is not typical of most Paleo-Indian sites and find spots in southwestern Ontario. These observations led the author to conclude that McCallum senior found the fluted point somewhere on his Dunwich township farm and took it with him when he moved to the farm in Ekfrid.

Location 11 represents the find spot of a Gainey point (Figure 8, No. 8) manufactured from Collingwood chert on Lot 10, Concession X, Bayham township, Elgin county, Ontario (Garrad 1971:No. 27).

Location 12 represents the locus where Mr. Joseph Jaeger of Eden, Ontario found the base of a Gainey point (Figure 8, No. 6) on Lot 19, Concession VIII, Bayham township, Elgin county at grid reference 193364 (Tillsonburg 40 I/15, Edition 4). This location is situated at an elevation of 236 m a.s.l. on a prominent shoreline ridge that is attributed to Lake Whittlesey (Chapman and Putnam 1966:87). It overlooks a broad expanse of low, mucky terrain about 1.5 km northwest of the Little Otter Creek.

The artifact is manufactured from Bayport chert, which rarely is associated with Gainey points in southern Ontario. A possibly similar artifact, presently mislaid, is reported to have been found on the Jaeger farm (Joseph Jaeger: personal communication).

Location 13 identifies the Uniondale site on Lot 28, Concession XI, East Nissouri township, Oxford county, Ontario. The ploughed surface of this site has yielded a small collection of Gainey complex artifacts manufactured from Collingwood chert. These include a fluted point (Figure 8, No. 1) found at grid reference 958841 (Lucan 40 P/3, Edition 4), a preform tip that broke during the fluting process when the channel flake hinged through the preform, and an oval biface probably intended for manufacture into a fluted point. The artifacts were recovered over a 25 year period by Mr. Grant Gregory, who owned and farmed the land on which the site is located.

Location 15 represents the locus where Mr. James Cudney found the mid-section of a Gainey point on his farm on Lot 30, Concession XII, North Dumfries township, Waterloo county, Ontario (Jack Redmond: personal communication). It was recovered at grid reference 999476 (Ayr 40 P/8, Edition 4) south of a small swampy depression. The artifact is manufactured from Upper Mercer chert. Battering on its opposite lateral edges suggests its use as a pièce esquillée.

THE WEED AND FERGUSON SITES, SOUTHWESTERN ONTARIO

Following are summary reports on the Weed and Ferguson sites attributed to the Gainey complex in southwestern Ontario. They will be discussed independently in terms of their location, history of investigation and artifacts and jointly in terms of their relationships to other Paleo-Indian manifestations in the Northeast. These reports summarize an unpublished manuscript submitted to the Ontario Ministry of Culture and Recreation (Deller 1980a).

THE WEED SITE (AfHl-1)

Location and Physiographic Setting

The Weed site is located on the farm of Mr. Howard Hodgson on Lot 17, Concession IX, Brooke township, Lambton county, Ontario, at grid reference 282460 (Strathroy 40-1/13, Edition 4). This location is about 100 m west of Highway 79, approximately midway between the towns of Alvinston and Watford. The site is situated at a major indentation in the strandline of proglacial Lake Arkona. In the vicinity of the site, the strandline is manifested as a prominent ridge trending north-south. West of the strandline and site lies the low, flat terrain of the Warren lakebed. The fluted point component on the Weed site is concentrated in a shallow depression at an elevation of 221 m a.s.l. A low, barely distinguishable ridge flanks this depression on the north and west. The depression is situated between two small, intermittent streams about 100 m to the north and 400 m to the south. These streams flow eastward into the Brown's Creek about 600 m east of the site.

History of Investigation

In the spring of 1974, the author visited the locality of the Weed site during a survey aimed at finding evidence of Paleo-Indian occupation. This locality had been selected for survey after a study of topographic maps revealed that its physiographic setting consisted of a number of features that past experiences had demonstrated were frequently associated with Paleo-Indian sites. First, it was situated on the shoreline of a proglacial lake that had yielded Paleo-Indian artifacts in the nearby areas. Second, it was situated near a "T" configuration of streams (see Deller 1979).

The initial step of the fieldwork consisted of interviewing landowners in the shoreline area to obtain permission to conduct surface reconnaissance on their property and to find out if they had artifacts or information relevant to the archaeology of the area. The first farm that was approached was that encompassing the indentation in the proglacial lake strandline. The landowner reported that his stepson, Mr. Leroy Weed, had collected several artifacts from the farm. Weed was contacted in February, 1975. His collection from Lot 17, Concession IX, consisted of about 200 artifacts attributable mainly to Late Archaic and Middle Woodland components as well as four Hi-Lo points and a fluted point.

In 1979, Weed found a second fluted point in the cultivated field that had yielded the other Paleo-Indian artifacts. He marked this location with a stake and contacted the author, who made arrangements to conduct excavations on the site. Three days of test pitting were carried out in the summer of 1979.

Rationale of Investigation

The author's survey program in southwestern Ontario had succeeded in locating several Paleo-Indian sites with surface manifestations suggesting that significant data might be recoverable through excavations. The selection of the Weed site for excavation, rather than some of the larger sites, was based on several considerations:

1) The fluted points recovered from the surface of the site were different in morphology and raw material from those of previously excavated Paleo-Indian sites in the area, such as Parkhill and McLeod. They appeared to be similar to points from the Shoop site (Witthoft 1952) in Pennsylvania and the Lux site

(Roosa 1965) in Michigan, which Roosa (ibid.) considered to represent some of the earliest archaeological manifestations in the Northeast. Therefore it was hoped that the Weed site might provide data concerning the early colonization of the region, as well as opportunities to assess the significance of variation between these forms and those of later Parkhill complex sites that previously had been excavated in the area.

2) Whereas the previously excavated sites in Ontario (i.e. Parkhill, McLeod, Banting, Hussey, and Fisher) were associated with the shoreline of proglacial Lake Algonquin, the Weed site was associated with the shoreline of proglacial Lake Arkona. Excavation of the site would lessen the possibility of bias resulting from investigation of sites associated only with the Algonquin strandline.

3) Before the fieldwork at Weed, most of the Paleo-Indian sites that had been excavated in the Great Lakes region were relatively large in terms of artifact yield and surface area. In all probability they were occupied and re-occupied over extended periods of time, perhaps on a seasonal basis. Smaller sites that possibly represent a short term occupation by all or part of a band rarely were reported. It was thought that investigation of smaller sites would contribute to a better understanding of Paleo-Indian lifeways. Ellis and Deller (1980:93) note:

While the larger sites are certainly worthy of extended excavation, and this has been borne out by the excavation of sites such as Parkhill, the status of the smaller sites is unclear. Although these smaller sites may not be worthy of immediate extended excavation, they are certainly worthy of exploratory excavations for at least three reasons. First, it is possible that the low artifact yield on some sites is related to the buried nature of the components such that they have not been seriously disturbed by plowing. Second, there is a growing realization among archaeologists (see, for example, Shiner 1970; Moseley and McKay 1972; Finlayson 1977:226-227) that these smaller sites may be more suitable for the delineation of functional "tool kits" and the understanding of the social units occupying the sites. This assumes that the smaller sites represent single occupations while the larger sites were occupied several times. Finally, it should be obvious that a concentration on only the larger sites will provide a biased view of Paleo-Indian lifeways.

4) The presence of the Hi-Lo component in proximity to the fluted point component on the Weed site also suggested the possibility that excavations might uncover cultural remains in stratified sequence, as well as data concerning the reasons for site selection by Paleo-Indian groups that are assumed to be temporally separated by 500 to 1000 years.

Excavation Techniques

A grid of one metre squares was established on the Weed site in the area that yielded the Paleo-Indian finds. This grid was related to permanent horizontal and vertical datum points adjacent to the field so that it could be re-established for possible future excavation. Thirteen squares were excavated by removing and screening the ploughzone through 1/4 inch mesh. The exposed surface of the subsoil was cleaned and examined for features. Three squares that contained debitage attributed to the Paleo-Indian occupation were excavated to a depth of 20 cm into the subsoil.

Description of the Fluted Point Component Artifacts

Fluted Bifaces

Two fluted bifaces were found on the surface of the Weed site. One of these is a complete point manufactured from Onondaga chert (Deller 1979, No. 29a). It is lanceolate in outline with parallel lateral edges above the base and slightly flaring ears that are not as pronounced or knobby as those often associated with Barnes points. The tip has been resharpened, as indicated by an abrupt change in outline shape and differences in the nature of flaking between the tip area and the lateral edges. The base, ears, and lower lateral edges have been ground. This point appears to have been made on a flake blank according to its slight curvature in longitudinal cross-section and the presence of a facet of the flake blank located above the flute on the slightly incurved face. The point's fluting is described by Ellis and Deller (1980:116):

The flute on the dorsal face is 30.5 mm long and 9 mm wide and terminated by hinging out. This flute, and that on the opposite face, did not hinge out cleanly as is the case on Parkhill site specimens but instead, rather irregularly. The edges of this flute and that on the opposite face are irregular and indistinct compared to the Parkhill points probably because they are somewhat shallower. Comparison of thickness beyond the flutes with that on the flutes suggests a flute depth of only 1 mm. The base of the dorsal flute has been widened by the removal of a small flake from the base which overrides the right lateral edge of the flute obscuring its intersection with flakes removed from the lateral edge. The ventral face has been fluted once. This flute is 21.5 mm long by 9.5 mm wide and it was not removed up or perpendicular to the main axis of the point. Instead, it was detached at an angle, its leading edge running off towards the right lateral edge (when the point is viewed with tip up). As a consequence, there was an area not "thinned" by the flute adjacent to the left lateral edge of the point. This area was subsequently thinned by the removal of two flakes from the lateral edge prior to edge retouch. This method of facial thinning is unknown at Parkhill but does occur at the Shoop site (Witthoft 1952:484). There is some suggestion that this plano or ventral face was the first face fluted. In particular, there is a slight remnant of a bevel at the base which might have served as a platform for fluting the opposite face. However, this is difficult to confirm given some minor basal chipping after fluting.

The fluted point base (Figure 8, No. 7) is manufactured from an exotic raw material that has been identified as Upper Mercer chert from Ohio (James Payne: personal communication). Grinding on the lower lateral edges, ears, and base suggests that the point broke after it had been finished rather than during manufacture. The lateral edges are parallel, and the ears are broad, thin, and slightly pointed. The point appears to have been manufactured on a flake blank, as suggested by its plano-convex cross-section and longitudinal curvature. The incurved face of the point was the first to be fluted, probably because it was the most difficult to flute and involved the greater risk of breakage. Its fluting consists of three overlapping hinge-terminated flutes. The opposite face, the last to be fluted, has a single, broad flute whose length is obscured by the break. The lateral edges of this flute have been trimmed by the removal of several small flakes from the base in order to flatten the cross section of the basal hafting element.

Spurred End Scrapers

Two spurred end scrapers were recovered on the surface of the Weed site. One is manufactured from Bayport chert. It measures 27 mm long, 25.5 mm wide, and 6.5 mm thick. It lacks curvature in longitudinal cross-section and has a steep working edge measuring about 70 mm in length. The spur at the junction of the left lateral edge and the bit might be a product of resharpening the scraper while it remained in a haft, rather than an intentionally made accessory. The implement appears to have been made on a flake derived from a large bifacial core, as suggested by a characteristic lip on the platform at the proximal end. The other scraper is manufactured from the same raw material as the fluted point base (i.e. Upper Mercer chert). It measures 28.5 mm by 25.5 mm by 7.5 mm and has a working edge angle of about 80°.

Worked Flake

One worked flake from the surface of the site is manufactured from Upper Mercer chert. It is broken at both ends and along the side opposite the worked edge.

Debitage

Ten pieces of debitage, assigned to the Paleo-Indian occupation on the basis of raw material, were recovered in the test excavations. These include eight pieces of grey-blue Upper Mercer chert similar to the material associated with the fluted point base, scraper, and worked flake, and two pieces of Onondaga chert. One of these is a scraper resharpening flake, according to the scalar wear on its dorsal surface and its distinctive lip consisting of part of the ventral surface of the scraper that served as the striking platform.

THE FERGUSON SITE (AfHk-1)

Location and Physiographic Setting

The Ferguson site is located on the farm of Mr. Max Ferguson on the north quarter of Lot 12, Concession V, Metcalfe township, Middlesex county, Ontario, at grid reference 426491 (Strathroy 40-1/13, Edition 4). The fluted point component was first identified on the cultivated surface of a low sandy knoll at an elevation of 219 m a.s.l. A few metres to the north is a steep embankment which drops about 9 m to the floodplain of the Syndenham river. On the west is a ravine that curls around to form a shallow depression south of the site. Surface finds in this depression include a Hi-Lo point and a spurred end scraper.

History of Investigation

In July 1972, following a lead provided by Charles Garrad, the author and Reynold Welke surveyed Lot 10, Concession VI, Metcalfe township, Middlesex county, Ontario, where a fluted point (Garrad 1971, No. 15) was reported to have been found. No evidence of Paleo-Indian occupation was located, and furthermore, after discussions with the owner of the property, it was concluded that the fluted point might not have originated on that farm. The artifact was found by the landowner's uncle, named Merrick, who donated it as part of a small collection of curios to the University of Western Ontario. Since Merrick apparently had collected artifacts from neighbouring farms, survey efforts were intensified in the surrounding locality. During this survey work in March 1973, heavy concentrations of artifacts and lithic debitage attributable to Archaic and Woodland components were found on Lot 12, Concession V, Metcalfe township in a cultivated field that was named the Ferguson site after the landowner. Mr. Ferguson reported that he had known Merrick well and that the site in question was one of the areas where he frequently had searched for artifacts.

In February 1975, Mr. Leroy Weed of Petrolia, Ontario, reported that he had been collecting artifacts from the surface of the Ferguson site for a number of years. His collection from the site included a resharpened fluted point and a bifacial preform manufactured from Collingwood chert. Because Merrick's fluted point (i.e. Garrad 1971, No. 15) seems to be morphologically similar to the Ferguson site points, and since Merrick was known to collect artifacts from this site, there is a good possibility that the Merrick fluted point was recovered from the Ferguson site.

The author continued to monitor the site and found a channel flake of Onondaga chert in June 1976, about 100 m south of Weed's finds on the sandy knoll. In July 1979, four days of test excavations were carried out on the site.

Rationale of Investigation

Reasons for selecting the Ferguson site for excavation are similar to those given for the Weed site. These involve the site's uniqueness relative to most previously investigated sites in the Great Lakes region in terms of: 1) its potential for yielding data concerning the earliest colonization of the area,

2) its small size relative to that of most reported Paleo-Indian sites, and 3) the possibility of more than one Paleo-Indian component being present on the site. In addition to these considerations, the Ferguson site did not appear to be associated with a shoreline of a proglacial lake. This contrasted with the majority of previously investigated Paleo-Indian sites in the region which are situated on or near proglacial lake strandlines. A concentration on strandline-associated sites might give a biased view of Paleo-Indian lifeways.

Excavation Techniques

A grid of one metre squares was established on the Ferguson site in the area of the Paleo-Indian finds on the sandy knoll. Thirteen adjacent squares were excavated. The ploughzone in each square was removed with square-nosed shovels and passed through 1/4 inch screen. The subsoil was excavated in arbitrary 10 cm levels by trowelling and the backdirt was passed through 1/4 inch mesh. Debitage and fire-cracked rock were bagged by level and square. Implements found in situ and features were plotted on maps of each square.

Description of the Artifacts

Fluted Biface

The fluted point (Figure 8, No. 3) from the surface of the site was manufactured from Collingwood chert. It is 42.5 mm long, 28.5 mm wide, and has a maximum thickness of 6 mm beyond the fluting. The tip of the artifact exhibits three impact scars. It is widest at the base, with parallel to slightly tapering lateral edges above the base, and has a shallow (2.5 mm) basal concavity. The ears of the point are wide, thin, and pointed. They do not have the knobby appearance of those on many Barnes points from southwestern Ontario sites, but are similar to those on the Weed site points. The point is heavily ground on the base and lower lateral edges and is slightly dulled on the rest of its perimeter, including the area of the impact scars. This dulling probably results from use rather than weathering, since the debitage of Collingwood chert from the site has sharp edges. The cross-section and fluting of the point are described by Ellis and Deller (1980:101-102):

> In transverse cross-section, the point is lenticular above the fluted area but presents a relatively flat and only slightly incurved surface on the flutes themselves. In longitudinal section, the point is slightly curved, perhaps indicating it was made on a flake as opposed to a core blank, with the incurved face approximating the ventral surface of the flake blank and the outcurved surface the dorsal face. However, it is also possible that this curvature is simply a result of retouch by the knapper.
>
> The incurved face has had one short (16 mm), broad (16.5 mm) flute removed. At the basal concavity on this face is a bevel formed by the removal of several short flakes detached by "blows" from the opposite face. It is possible that this bevel is a remnant of the striking platform used to flute the opposite face or it may be an attempt to thicken and strengthen (as was the basal grinding) the concavity for contact with the haft during the use of the tool. If the former were the case, this would indicate that the

face under consideration (incurved face) was fluted first. There is no evidence for the use of a basal nipple as a striking platform for fluting this or the opposite face.

The second face has been fluted twice. Examination of the first flute scar where it is not obscured by later basal thinning, suggests the first fluting "blow" removed an expanding flake 18.5 mm long and 12 mm wide (see White 1963:9). This flute appears to originate at the bevel platform suggesting this was the second face fluted. However, this is not conclusive, again because of later reworking of the base. Because of the expanding nature of this flute, there was a wider unthinned area near the base. On the left lateral edge (when viewed with the tip up), this area missed by the first flute has been thinned by the removal of three thin tiny flakes (up to 11 mm long and 1.5 mm wide) from the base. On the right lateral edge, a second shallow flute, 6 mm wide was removed to thin the area and also to widen the original thinned area by some 2 mm. Therefore, the combined flutes were some 14 mm wide.

It should be mentioned that a comparison of the thickness of the point beyond the flutes (6 mm), with the thickness of the flutes (4 mm) suggests that the point was thinned only 2 mm by bifacial fluting or ca. 1 mm on each face. In combination with attempts to widen the base of the flute, such as those on the incurved face noted above, these operations effectively remove or preclude a pronounced ridge formed by the intersection of the lateral edges of the flute and the scars of retouch flakes removed from the lateral edge. The result is the somewhat flattened cross-section noted earlier.

Biface

A crude, bifacial artifact manufactured from Collingwood chert was recovered on the surface of the site. It is roughly rectangular in shape and is 35 mm long, 31 mm wide and 6.5 mm thick.

Debitage

Twelve pieces of Collingwood chert debitage are attributed to the Paleo-Indian occupation. Six of these flakes were produced from the reduction of bifaces and one is a scraper resharpening flake.

Typology of the Weed and Ferguson Site Fluted Points

Although Roosa (Roosa and Deller 1982) and Ellis (1984) classify the fluted points from the Weed and Ferguson sites as Enterline points, the author maintains that they conform to the Gainey type. All three researchers agree that they are different from the other two varieties of fluted points that frequently occur in southwestern Ontario: Barnes points and Crowfield points. The following establishes the similarity of the Weed, Ferguson, and Gainey site points in contrast to Barnes points from the Parkhill site and Crowfield points from the Crowfield site. Significant similarities and differences among the point samples are manifested in:

1) Outline shape: The fluted points from the Weed, Ferguson, and Gainey sites have similar outline shapes exhibiting parallel lateral edges near the base where the maximum width of the point occurs. This contrasts with Barnes points and Crowfield points. Barnes points generally are lanceolate in outline, with the maximum width occurring around mid-section and with pronounced fishtailed bases. Crowfield

points taper abruptly from the maximum width around mid-section to a narrow base without fishtails. These similarities and differences are evident in a comparison of face angles, as shown in Figure 9.

2) Basal width: The Weed, Ferguson, and Gainey site points are broad at the base, measuring in excess of 21.5 mm and ranging up to 28.5 mm. In contrast, the Barnes points from Parkhill have a basal width ranging from 12.4 mm to 20 mm with a mean of 16.6 mm (Roosa 1977b:89), and a sample of 19 fluted bifaces from the Crowfield site range from 13.1 mm to 22.8 mm with a mean of 17. mm. Furthermore, it should be noted that the flaring ears on some of the Parkhill points exaggerate the maximum basal measurements. Clearly, the Weed, Ferguson, and Gainey specimens are much broader than their Parkhill and Crowfield site counterparts.

3) Ears: The ears on the Weed, Ferguson, and Gainey site points generally are short, broad, thin, and pointed. As well, the ears on the Weed and Ferguson points flare very slightly. This contrasts with ears on Barnes points that generally are long and thick with a knobby appearance and often flair considerably into a fishtail configuration. Crowfield points do not have ears. In conclusion, the data clearly indicate that the small sample of fluted points from the Weed and Ferguson sites resembles Gainey points rather than Barnes points or Crowfield points.

Lithic Raw Material Utilization Patterns Associated with the Gainey Complex in Southwestern Ontario

Although the Gainey complex in southwestern Ontario is defined primarily on the basis of fluted point typology, its patterns of lithic raw material association also distinguish the complex from others in the region. Table 3 demonstrates that Collingwood chert and Onondaga chert are the most frequently utilized lithic materials in the manufacture of Gainey points, followed by Upper Mercer chert and Bayport chert. This pattern of chert exploitation differs substantially from those of later complexes. For example, in the Parkhill complex, which temporally follows the Gainey complex, the use of Upper Mercer chert ceases, the use of Onondaga chert is decreased in comparison to the Gainey complex, and the use of Collingwood chert and Bayport chert increases. It is noteworthy that the Gainey complex made greater use of cherts originating to the south than the Parkhill complex. This trend is interpreted as resulting from a northward colonization of Paleo-Indian populations from the states of Ohio and New York into southwestern Ontario after the retreat of the glacial ice, perhaps following northward shifting ecozones.

Significance of the Gainey Complex Distribution and Settlement Patterns

Comparison of Figures 15, 16, and 34 shows that the distribution of the Gainey complex generally overlaps with those of the other, presumably later, Early Paleo-Indian complexes. Nevertheless, subtle differences can be discerned, especially between Gainey and Parkhill manifestations in southwestern Ontario. The small amount of data presently available concerning the distribution of the Crowfield complex precludes meaningful comparisons.

In southwestern Ontario, the Parkhill complex is distributed mainly along the shoreline of proglacial Lake Algonquin. The Gainey complex also has manifestations in this area, but its heaviest concentrations occur to the south of the Parkhill complex, often on the shorelines of older proglacial lakes such as Warren, Whittlesey, and Arkona (see Figure 30).

The association of Paleo-Indian sites with glacial lake shorelines does not necessarily imply that the occupations were contemporaneous with the waters of the lake. This is especially the case for the Gainey sites on the older shorelines mentioned above. The dates for Lake Arkona are fairly well established around 13 000 B.P. (Hough 1958; Prest 1970), which seems to be too early to be contemporaneous with Paleo-Indian occupations. The oldest dates on fluted point materials, the Clovis industry in the Southwest, are around 11 300 B.P. (Haynes 1964; Frison 1978), and the oldest manifestations in the east are dated around 10 850 B.P. (see Table 1). If these dates are accurate, it can be concluded that the Arkona shoreline was occupied at least two or three thousand years after the lake had drained.

At present, it is not clearly understood why sites attributed to the Gainey complex frequently are located in the vicinity of these older shorelines, but it seems reasonable to assume that subsistence factors are involved. Until palynological reconstructions are available for the time of human occupation of the sites, and direct evidence of subsistence practices are recovered, understanding of the settlement patterns can only be suggested on the basis of analyses of the physiographic nature of the areas selected for site location.

The majority of the areas are characterized by a narrow (500 m to 800 m) belt of low, boggy terrain flanking the shoreline ridge on which the site is located. Poor drainage adjacent to the fossil beach often is compounded by clay-based soils, the flat nature of the former lake bed, and excess water that runs off the upland area. These factors contribute to muck soils in the low areas. The higher beach and backshore areas generally are characterized by loam or sandy soils.

Until conclusive data explaining the frequent association between Paleo-Indian sites and fossil shoreline areas are recovered, there are several alternatives that can be used to explain the phenomenon:

1) The fossil beaches might have offered a specific type of vegetation, as yet unidentified, that attracted the Paleo-Indians or the animals that they were hunting. A possible

scenario is that dune areas of the former beach remained open and thus attractive to animals such as caribou. It is also possible that soils associated with the shoreline ridge and beach or dune area provided an environmental niche that, for reasons presently unknown, attracted the Paleo-Indians or the animals that they were hunting. Soils adjacent to the former lake bed frequently consist of Berrien sandy loam. Many Paleo-Indian sites and isolated find spots of early artifacts, including several attributed to the Gainey complex, occur on this type of soil. It has been noted (Deller 1982):

> The basic pattern involves site location adjacent to areas of muck, with the site most frequently situated on loamy soils composed of a shallow layer of sand overlying a clay base. Under these circumstances the subsoil is usually wet. A classic example of such soil types is Berrien sandy loam which appears to be a preferred soil type by the Paleo-Indians....The two seemingly attractive soil types, muck and Berrien sandy loam (shallow sand over clay), often occur in proximity to each other, making it difficult to determine which is the significant factor to Paleo-Indian settlement. The possible significance of muck soils to Paleo-Indian settlement strategies has been discussed elsewhere (Deller 1976b). Here it is suggested that the shallow sandy soils with poorly drained subsoil might have offered the Paleo-Indians a favourable but yet unidentified type of environment, either directly through the vegetative cover associated with such soils or indirectly through the fauna attracted to them.

2) The shoreline ridges might have been followed by migrating caribou which, in turn, attracted the Paleo-Indians. However, although modern caribou are known to follow ridge tops in their migrations (Banfield 1974), the discontinuous nature

and random, meandering orientation of beach ridges in southwestern Ontario would seem to lessen their attractiveness in this respect.

3) The low lying terrain adjacent to the shoreline ridges might have been the attractive feature. Modern soils in these areas frequently consist of poorly drained muck. In southwestern Ontario there is a consistent pattern involving the location of Paleo-Indian sites and isolated find spots in proximity to areas that at present are characterized by muck soils. In the past, these areas probably offered a specific type of micro-environment, presently not clearly understood, that attracted the Paleo-Indians. The term "micro-environment" is used to describe the areas because they are relatively small in comparison to the other landmass available, but apparently not favoured, for human colonization in the region.

During the Paleo-Indian occupation, the low lying areas adjacent to the shorelines might have been bogs or marshes with permanent ponds that seasonally fluctuated in size in the lower areas. According to the large numbers of Paleo-Indian sites adjacent to these areas, they must have been more attractive than the surrounding environment which probably was dominated by spruce forests, based on ecological reconstructions for the area around 10 800 years ago (see Chapter II). It has been noted (Deller 1979:12):

It is possible that Paleo-Indians were attracted to the localities by the presence of favourable micro-environments existing in fossil shoreline areas (Deller 1976b). The micro-environments were more a product of physiography than of climate. They are found along the shorelines at poorly drained locations where the low, flat lakebed joins the uplands associated with the beach ridges. It is suggested that during prehistoric times, when the surrounding upland environment was evolving through various stages of coniferous cover, the low, flat, poorly drained areas of lakebed flanking the relict shorelines offered a richer and more attractive environment consisting of lush sedges and grasses etc. They can be thought of as rich glade areas within a more sterile coniferous environment. Furthermore, because the micro-environments were indirectly a product of static landforms, they probably remained attractive over long periods of time, accounting for the consistent orientation of a wide variety of Paleo-Indian and Archaic components to such areas.

It has been the author's observation in the sub-Arctic, confirmed by discussions with modern Inuit hunters, that caribou are often attracted to poorly drained glade areas within larger coniferous environments. If animals were attracted to the low-lying lakebed areas in prehistoric times, it is logical that early hunters would follow suit. It is also logical that they would set up their camps on the well drained uplands of the former shoreline ridge that would provide an overview of the hunting area.

The orientation of Paleo-Indian sites to fossil shorelines adjacent to boggy terrain in southwestern Ontario appears to represent a regional manifestation of a broader Paleo-Indian adaptive strategy. This involves the exploitation, probably on a communal basis, of faunal resources that were attracted to poorly drained micro-environments within broader, generally impoverished, or at least species restricted, environments. Such associations are generally found in the northern range of fluted points in the Northeast and on the western plains. For example, in the Rio Grande valley in the Southwest Judge (1973) notes a consistent pattern involving the location of Paleo-Indian sites on ridges near shallow basin-like depressions called playas. He notes (ibid:31-32):

> Some playas could have been formed through seepage action in structural depressions, others through eolian and alluvial ponding of shallow arroyos. Perhaps most frequently, however, the playas were formed through a combination of deflation and duning....As will be seen, these playas play a key role in Paleo-Indian settlement technology. Most of them probably contained water during the Late Wisconsin period.

Judge (ibid:34) suggests that the playas, which are reminiscent of the marshes and swampy terrain adjacent to the fossil beaches and dunes in southwestern Ontario were surrounded by grass and sage savannas, with juniper and oak in shallow valleys and pine and spruce on higher escarpment areas. The common factor between the playas and the swampy terrain in southwestern Ontario is that both attracted game animals, which resulted in the concentration of Paleo-Indian sites in small geographic areas.

The following model attempts to explain settlement patterns and distribution of the Gainey complex in southwestern Ontario. It proposes that:

1) Southwestern Ontario was first colonized by Paleo-Indians from the Ohio-New York State area, who were responsible for the Gainey complex.

2) Lake Algonquin existed at the time of the colonization, and the Paleo-Indians followed its shoreline into the Georgian Bay area where they discovered outcrops of Collingwood (Fossil Hill) chert.

3) Settlement-subsistence strategies of the Ontario Gainey population included a focus on attractive micro-environments located inland from Lake Algonquin. These areas consisted of low, swampy terrain adjacent to ridges. More frequently, this type of terrain occurs in fossil shoreline areas of proglacial lakes, especially those of Lake Warren, whose twin beaches in effect doubled the availability of favourable habitat within the space of a few kilometres. These belts of low-lying, often swampy terrain flanking the ridges probably attracted fauna that the Paleo-Indians were hunting. These might have included mastodon and/or caribou.

4) As time progressed, the Gainey complex gradually gave way to the Parkhill complex as the Paleo-Indians shifted the concentration of their range more to the north, especially along the shoreline of Lake Algonquin. The configuration of this lake in southwestern Ontario served to concentrate the migration routes of caribou to the southeast of the lake. This area is marked by concentrations of sites.

Summary

The Gainey complex is the earliest known Paleo-Indian complex in southwestern Ontario and one of the earliest known in the Great Lakes region. It precedes the closely related Parkhill complex into which it appears to have evolved. Diagnostic of the complex are Gainey points. These are similar in morphology to, and probably roughly contemporaneous with, Bull Brook points in the New England area. Other distinguishing criteria of the complex include its association with certain lithic raw materials and patterns of distribution that are different from those associated with later Paleo-Indian complexes in southwestern Ontario. Lithic raw materials utilized in the manufacture of Gainey points include Collingwood chert and Onondaga chert from Ontario, Upper Mercer chert from Ohio, Bayport chert from Michigan, and quartzite of unknown origin. The distribution of the complex generally overlaps with that of the Parkhill complex, but whereas the latter concentrates mainly in the vicinity of the Algonquin shoreline, the Gainey complex seems to concentrate farther to the south, especially in the vicinity of the older shorelines of Lake Warren, Lake Whittlesey, and Lake Arkona. The association with these strandlines possibly results from the Gainey population situating their camps in or near favourable micro-environments that existed adjacent to the fossil beaches. As time progressed, the Gainey population concentrated more to the north in areas adjacent to Lake Algonquin. Gradually, other changes also occurred as the Gainey complex developed into the Parkhill complex.

Gainey complex manifestations in southwestern Ontario include several find spots of Gainey points and three small sites: Weed, Ferguson, and Uniondale. The Weed site is located on the proglacial Lake Arkona shoreline in Lambton county. The cultivated surface of the site yielded a number of artifacts, including three fluted points and two spurred end scrapers attributed to the Gainey component and several Hi-Lo points attributed to a Late Paleo-Indian occupation. Limited test excavations on the site recovered a small amount of debitage associated with the Gainey complex. The Ferguson site is located on the south bank of the Sydenham River in Middlesex county. A surface collection from the site includes at least one fluted point, one fluted preform base, and one unidentified biface attributed to the Gainey occupation and a Hi-Lo point and end scraper of later Paleo-Indian vintage. Limited test excavations revealed small amounts of Collingwood chert debitage associated with the fluted point component. The Uniondale site is located in Oxford county. A fluted Gainey point, a fluted preform tip, and an oval biface have been recovered from the cultivated surface of the site by a former owner of the property. These artifacts are manufactured from Collingwood chert.

The pattern of distribution of Gainey industry artifacts manufactured from Collingwood chert suggests the range of a particular social grouping, possibly a band, that ranged between the north shore of Lake Erie and the Georgian Bay area. Chert was obtained at quarry sites in the northern part of the territory. Its consistent occurrence on a large number of sites and findspots in the southern range, which could not be the product of only one visit to the quarry, suggests repeated population movements between the northern and southern parts of the territory. It is possible that these movements represent a fairly well established seasonal round, with the northern chert sources being visited during a warm weather season. The use of Upper Mercer and Bayport cherts indicates continuing contacts with groups to the south and west.

CHAPTER V

THE PARKHILL COMPLEX

This chapter presents data on the more extensively documented Parkhill complex in southern Ontario. A definition of the complex and a brief summary of the history of its investigation will be followed by short descriptions of sites and locations that have yielded Parkhill complex materials. Next, more detailed information on several of the published and unpublished sites will be presented. They will be discussed in terms of their location, history of investigation, artifact inventories, and significance for the understanding of the complex. If the sites are unpublished, brief descriptions of the artifacts and their context will be included. The chapter will conclude with interpretations of the data. It will be demonstrated how understanding of social organization, band interaction, and seasonal resource scheduling can be derived from analyses of patterns of lithic raw material utilization.

The Parkhill Complex

The Parkhill complex is a Middle Paleo-Indian manifestation in the Great Lakes region that is thought to be contemporaneous with the closing stages of Lake Algonquin. The complex was first defined by Roosa (1977a) in collaboration with myself, based on assemblages from Parkhill and several surface investigated sites in southwestern Ontario. The most diagnostic artifacts of the complex are Barnes points that were named by Roosa after the Barnes site in Michigan (Wright and Roosa 1966). Other criteria that serve to distinguish the complex from others in the region include its distribution, distinctive patterns of lithic raw material utilization, and technological considerations that will be discussed later in this chapter.

In terms of technology, distribution, and patterns of chert associations, the Parkhill complex appears to be intermediate between the Gainey complex, out of which it probably developed, and the Crowfield complex (Deller and Ellis 1984). It has been suggested that the complex was roughly contemporaneous with Folsom on the western Plains, and Cumberland in the rolling hills immediately to the west of the Appalachian Mountains in Kentucky and Tennessee. Although the Parkhill complex is concentrated along the proglacial Lake Algonquin shoreline in southern Ontario and Michigan, it also has manifestations in New York, northern Ohio, and Wisconsin. Sites attributed to the complex include Barnes in Michigan (Wright and Roosa 1966); Parkhill, Thedford II, McLeod, Mawson, Dixon, Schofield, Wight, Mullin, and Stott Glen in southwestern Ontario (Roosa 1977a, 1977b; Deller and Ellis 1982); and Fisher (Storck 1982, 1983) in southcentral Ontario (see Figures 16 and 17).

Parkhill Complex Manifestations in Southwestern Ontario

Figures 16 and 17 show the distribution of sites and find spots where Parkhill complex materials have been found in southwestern Ontario and adjacent areas. Summary data concerning their occupations are provided in the legends that accompany the figures. More detailed data concerning some of the sites and loci are given below.

Location 2 (Figure 16) represents the Babula Farm site where the base of a Barnes point was recovered during surface reconnaissance in Gore of Camden township, Kent county (Ian Kenyon: personal communication). Visual inspection suggests that it is manufactured from either a variety of Kettle Point chert from southwestern Ontario, or Pipe Creek chert from Ohio. An ear of a fluted point manufactured from Bayport chert also was recovered.

Location 4 (Figure 16) represents the find spot of a Barnes point, manufactured from Collingwood (Fossil Hill) chert, that probably was recovered on Lot 13, Concession VII, Dunwich township in the county of Elgin. Initially, this point was reported to be from Lot 22, Concession IV, Ekfrid township, Middlesex county (Garrad 1971:No, 14), along with the Gainey point discussed in Chapter IV of this study (i.e. Location 10). For reasons outlined in Chapter IV, I believe that the latter provenance is in error and that both points were recovered on the Dunwich township location.

Location 9 (Figure 16) shows the location of the Glass site in Brant county (William Marshall: personal communication) at grid reference 632715 (Brantford 40 P/1, Edition 4). The site yielded a small surface collection of Paleo-Indian artifacts, including a Barnes point manufactured from Onondaga chert, a spurred end scraper of the same material, and two Hi-Lo points manufactured from Haldimand chert.

Location 11 (Figure 16) represents the Fisher site on the strandline of proglacial Lake Algonquin in southcentral Ontario (Storck 1983, 1984). The site is a large base camp attributed to the Parkhill complex. It consists of 19 or more artifact concentrations occurring in an area of approximately 22 ha (55 acres). Collingwood (Fossil Hill) chert is the predominant lithic raw material on the site, but small amounts of Kettle Point chert, Onondaga chert, and Bayport chert also occur in the artifact assemblages (personal observation, courtesy of Peter Storck). Bedrock outcrops of Collingwood (Fossil Hill) chert have been discovered about 15 km west of the site (Storck 1983).

It appears that the Fisher site was a summer camp that was reoccupied over a number of years. Some of the occupations might have occurred after the draining of proglacial Lake

Algonquin exposed the bedrock sources of Kettle Point chert, as indicated by the use of this material in the assemblage. Also, the small size of some of the Fisher points in comparison to the Thedford II sample and at least some of the Parkhill site points (see Figure 10) suggest that they might date from later in the Parkhill complex sequence (Deller and Ellis 1987).

Location 12 (Figure 16) represents the Banting site in Essa township, Simcoe county in southcentral Ontario (Storck 1979). The site is situated on a drumlin that at one time was probably an island in Lake Algonquin. A Paleo-Indian component is attributed to the Parkhill complex on the basis of the occurrence of Barnes points on the site (see Storck 1979:Plate 3a).

THE PARKHILL (BROPHEY) SITE, AhHk-49

Introduction

The Parkhill site is a large multi-component site located near the former shoreline of proglacial Lake Algonquin in southwestern Ontario. Although the site has extensive Archaic and Woodland components, it is best known for its Paleo-Indian occupations. The site was one of the first Paleo-Indian sites yielding fluted points to be extensively investigated in the Great Lakes region. It is the "type site" for the Parkhill complex.

The following descriptions synthesize data from previous research (i.e. Roosa 1977a, 1977b; Ellis 1979, 1984; Deller 1980b; Roosa and Deller 1982) and present significant new data concerning the distribution of occupation areas on the site.

History of Investigation

As part of a continuing search for evidence of Paleo-Indian occupations, the author regularly examined collections of artifacts belonging to various individuals known to collect prehistoric relics. During one of these routine efforts in the spring of 1973, two fragments of fluted points and a complete specimen were noted in the artifact collections of three secondary school students, Randy Laye, Gary Laye, and Ray Baxter, who were members of the Archaeological Society of Western Ontario. They revealed that the artifacts had been collected from a cultivated field north of the Parkhill Creek in McGillivray township. The area was searched by the author in June, 1973, and several concentrations of Paleo-Indian artifacts and debitage were recorded. Permission to conduct excavations on the site was obtained from the landowner, Mr. Paul Brophey, and extensive excavations were made there during the summers of 1973, 1974, and 1975. These were directed by William B. Roosa of the University of Waterloo. Surface investigation of the site by the author has continued to the present time.

Publications and theses concerning the site include Roosa 1977a, 1977b; Ellis 1979, 1984; Deller 1980b; and Roosa and Deller 1982.

Location and Physiographic Setting

The Parkhill site straddles the northwest quarter of Lot 20, Concession VI, McGillivray township, Middlesex county, Ontario. The approximate geographic centre of the site has a grid reference of 393826 (Parkhill 40 P/4, Edition 4). The site is situated at a major bend in the shoreline of proglacial Lake Algonquin, about 6.5 km northwest of Parkhill, Ontario (see Figure 17). At this point the shoreline makes a right-angle turn from an east-west to a north-south orientation. The location of the site at this bend was of strategic significance, as will be demonstrated later in this chapter. It is situated on a shoreline plain of Berrien sandy loam at an elevation of 186 m above sea level. About 300 m to the west of the site lies the low, flat, mucky terrain of the Algonquin-Nipissing lake bed. Although the site probably was located within a few hundred metres of the actual waters of Lake Algonquin, the precise distance is difficult to determine because of possible transgression when Lake Nipissing reoccupied the fossil Algonquin shoreline about six thousand years after the withdrawal of the Algonquin waters. The former Algonquin-Nipissing lake bed adjacent to the site was occupied by the

Thedford Marsh from post-Nipissing times until fairly recently, when large areas were drained in preparation for agricultural use. About 125 m to the south, the site is bordered by the Parkhill Creek which flows westward across the Algonquin shoreline. Directly south of the site, a small, northward flowing tributary enters the Parkhill Creek. This forms a "T" shaped junction that probably was inundated by the waters of Lake Algonquin at the time of the Paleo-Indian occupation. The site is crossed by a shallow arroyo which runs westward parallel to Parkhill Creek (see Figure 18, feature F), and two low, barely distinguishable ridges that run parallel to the arroyo about 150 m and 240 m to the north.

Occupation Areas

The Paleo-Indian occupation on the Parkhill site, like that at Fisher, is characterized by a number of artifact and/or debitage concentrations scattered over an area of approximately 6 ha. These concentrations, or occupation areas as they will be called in this study, vary in size from approximately 30 square m to more than 300 square m. Some might represent the cumulative effect of several smaller ones in close juxtaposition. Generally, the terrain between the occupation areas is devoid of Paleo-Indian material. The well-defined boundaries of the concentrations suggest that most of the Paleo-Indian occupations might have occurred in and/or around domiciles or shelters of some sort. The occupation areas have been assigned letters for reference purposes (see Figure 18). The excavated areas, referred to as grids (Roosa 1977a, 1977b), correspond with the occupation areas (e.g. grid A excavations are in occupation area A). The nature of the material recovered from each occupation area gives some indication of the prehistoric activities that occurred at that place. The types and numbers of artifacts recovered at each occupation area are given in Table 4.

There are two general types of occupation areas according to the assumed function of the artifacts recovered:

1) Those representing general work spaces, indicated by the presence of a variety of implement types (see Gardner 1983, Grimes et al. 1984 for similar interpretations). These might be associated with habitation areas that consisted of structures together with the encompassing general work spaces immediately adjacent to them. Areas C, D, and E are included in this category.

2) Those representing specialized activity areas. These are characterized by the predominance of one or two classes of implements. Included in this type are areas A, B, G, H, I, J, and K.

The distribution of the occupation areas across the site shows a significant pattern involving the clustering of general work-habitation areas and specialized task areas. These activities concentrate on five main regions on the site (see Figure 19).

Region 1, which consists of occupation area B, is a specialized activity area where weapons were refurbished. Broken or damaged fluted points, mostly bases, were removed from their hafts, discarded, and replaced with functional points that had been fluted on the spot. This accounts for the large numbers of fluted point bases, channel flakes, and fluted preform tips that have been recovered there. Roosa (1977a:351) suggests that this area of the site was the locus of small camps of advance scouting parties of men and boys looking for game. I interpret it as a rearmament area where groups of hunters retired to the north end of their camp to repair weapons after communal hunting at a nearby caribou crossing (Deller 1980b). This activity probably took place on several occasions, perhaps over a number of years.

Region 2 is a general work/habitation space that includes occupation areas C and E. It is interpreted as a residential area of the site where day to day activities were carried out. This interpretation is based on the wide variety of artifact types that have been recovered there (see Table 4).

Region 3 is one of the most difficult areas on the site to interpret, because it is represented by a relatively small number of artifacts. These were scattered along a low ridge north of the arroyo. Occupation areas A and J are found within this space. Some rearmament and fluted point manufacturing occurred in the area, as indicated by the recovery of fluted point bases and several channel flakes. This region has yielded more than one-half of the complete fluted points that have been recovered on the site. It also accounts for several artifacts that were manufactured from Onondaga chert and Bayport chert. I propose that at least part of the occupation in this region, especially that associated with Onondaga chert, represents temporal variation on the site.

Region 4 seems to be a specialized workshop area, as indicated by the concentration of scraping implements. A general paucity of debitage indicated that these tools probably were made elsewhere. The region consists of area G, which accounts for more than one half of the concave side scrapers recovered on the site, area H which is characterized by end and side scrapers and the only backed biface recovered from the site, and area K which also is characterized by end and side scrapers.

Region 5 is a general work/habitation space that includes occupation areas D and I. Area D probably was one of the principal habitation areas on the site.

Chronological Assignment of the Paleo-Indian Occupation

Although absolute dates are not available for the Paleo-Indian component, there are at least four indications that the site was first occupied at some time during the span of proglacial Lake Algonquin, perhaps shortly before its draining circa 10 500 B.P:

1) The site is located near the former shoreline of the lake. This alone is not conclusive evidence of contemporaneity of the lake and site, since the association of Paleo-Indian sites with fossil beaches much older than the sites is a recurring pattern in the central Great Lakes region. Nevertheless, there is circumstantial evidence that Lake Algonquin was one of the prime reasons for the site's location. The case is built around the probability that Paleo-Indians used the site as a base for large-scale hunting of caribou. That the magnitude of this activity was much greater than that associated with occasional hunting is indicated by the large-scale rearmament that occurred at area B, which is the largest known rearmament area associated with a Paleo-Indian site. The most plausible explanation for the site's location, and those of other Paleo-Indian sites clustered in the area, is that they were strategically located in a caribou migration corridor that skirted the Thedford embayment of Lake Algonquin. The particular configuration of the lake in southwestern Ontario served to channel migrating caribou through the locality and provided a favourable entrapment area in the form of an estuary that the caribou would have to cross (Deller 1980a).

2) Although the Parkhill site is located near the bedrock sources of Kettle Point chert, diagnostic Paleo-Indian artifacts manufactured from this material have not been recovered on the site. On the other hand, it occurs (in small quantities) in the Parkhill complex assemblage at the Fisher site, about 180 km to the north. Since the bedrock sources of the raw material were submerged under Lake Algonquin, it is logical to assume that at least part of the Fisher site occupation occurred after the draining of the lake exposed the chert beds. If it is accepted that the Parkhill site is contemporaneous with Lake Algonquin, and that at least some occupations at the Fisher site date to a period after Lake Algonquin drained, it can be speculated that, of the two closely related sites, Parkhill is slightly earlier. In other words, the draining of Lake Algonquin occurred during the time of the Parkhill complex, and the Parkhill site occupation occurred just before the event, while some of the Fisher occupation occurred afterwards. It also has been proposed that the temporal trend in Ontario fluted points is toward narrower bases (Ellis 1984, Deller and Ellis 1987). The narrower width of the Fisher site bases in comparison to those from Parkhill (see Figure 10) supports the earlier temporal placement of the Parkhill site.

3) Based on similarities between the Parkhill complex and the Folsom complex, it has been suggested that they are closely related in time (Roosa 1977a, Deller 1980b; Ellis 1984). The

Folsom complex is securely dated around 10 800 B.P. to 10 600 B.P. (Haynes 1964). This would place a Great Lakes area temporal counterpart within the time range established for Lake Algonquin (Karrow et al. 1975).

4) A pollen sample that was sealed in sand under a Paleo-Indian hearth on the Parkhill site was associated with a pine and spruce cover, with pine predominating (Roosa 1977a:349). This stage of vegetation succession has been radiometrically dated elsewhere in southern Ontario between 10 750 B.P. and 9750 B.P. (ibid.).

Seasonal Resource Exploitation

The Parkhill site has been interpreted as a base camp that was recurrently occupied because of its strategic location relative to caribou migrations in the spring (Deller 1980b). Evidence that hunting was an important activity at Parkhill includes the large number of fluted point bases, presumably broken during hunting, that were recovered on the site, and the high ratio of fluted points to other implements in the lithic assemblage. Circumstantial evidence that the Parkhill site was occupied in the spring include: 1) location of the camp on the leeward site of the expected northward (i.e. springtime) migration of caribou, thus permitting the animals to enter an entrapment area in the Parkhill Creek rather than deflecting them away from the trap situation as a camp on the opposite side of the creek would have done; 2) site activities indicative of large-scale hunting. Recent caribou dependent societies conduct their major hunts during the spring migration; 3) the location of the site within the southern (winter-spring) range of the Parkhill population. It is assumed that the band alternately moved north and south to keep within or near seasonal ranges of caribou; and 4) the repeated location of habitation and/or activity loci on the site relative to topographic features in positions where they would not have been seen by caribou approaching from the south during their spring migration.

THE THEDFORD II SITE, (AgHk-6)

Introduction and History of Investigation

Thedford II is a multi-component site located near the Thedford Marsh in southwestern Ontario (see Figure 17, No. 19). Although the site has yielded substantial evidence of Archaic and Woodland components, the following report concerns only the Paleo-Indian occupation attributed to the Parkhill complex.

The discovery of the site in 1978 effectively demonstrated that deductive reasoning can play a significant role in the search for early sites. Contributing to the discovery of Thedford II were the assumptions that: 1) the Thedford embayment of proglacial Lake Algonquin provided a natural obstacle that had to be circumvented by caribou migrating northward out of southwestern Ontario; 2) this feature effectively served to concentrate caribou migration routes at its southeastern extremity; and 3) this concentration of migration routes increased the attraction of early Paleo-Indian hunters to the area. Based largely on these deductions, it was decided to survey for Paleo-Indian sites at strategic locations in the corridor where caribou could most logically have been intercepted by early hunters. The Thedford II site was discovered[2] on the first day of the fieldwork. About three-quarters of the Thedford II site were excavated during the summers of 1981 and 1982 under the supervision of the author. C.J. Ellis directed the excavations during the first field season and conducted preliminary analyses of data recovered as part of his graduate studies at Simon Fraser University and Juliet Garfit directed the fieldwork during the 1982 season. Surface collecting of artifacts from ploughed, unexcavated areas of the site has continued to the present time.

Location and Physiographic Setting

The Thedford II site is located on Lot 20, Concession I, Bosanquet township, Lambton county, Ontario, at grid reference 328792 (Parkhill 40 P/4, Edition 5). It is situated in a cultivated field on a level terrace at an elevation of 195 m above sea level. This possible Lake Grassmere or Lake Lundy associated terrace drops off abruptly to the Algonquin-Nipissing lakebed about 3 km north of the site. About 700 m west of the site the terrain rises to an elevation of 206 m. This higher ground sweeps around to the south of the site where outcrops of shale are exposed on a prominent ridge. The site is flanked on the south by a small ravine, which curves to the east and eventually joins the valley of the Ausable River about 1 km northeast of the site. About 100 m to the north of the site lies a shallow branch of this ravine.

The Thedford II site is located within a 5 km radius of several proglacial lake shorelines. Deller and Ellis (1987) discuss the relationship of the site to proglacial lakes and summarize the geological history of the area:

> While the Thedford II site is not located on any traceable pro- or post-glacial lake strandline, at least three such features are located in the site vicinity. The first major strandline(s) in the area is the pro-glacial Lake Warren strandline which straddles the north edge of the Wyoming moraine about 1250 metres south of the site. The moraine itself, as with much of the surficial till deposits in the area, was laid down during the Port Huron ice advance. Lake Warren was formed and drained some time around 12 500 B.P. (Cooper 1979:39; Fullerton 1980) and during its existence, inundated the site area and laid down the deposits on which the Thedford II site is located. It is possible, given its elevation, that the large bedrock ridge to the southwest and west of the site was an island in Lake Warren. The second strandline in the region is traceable in an east-west line to a point some 6.5 km northeast of Thedford II at an elevation of ca. 640' a.s.l. This strandline has been variously attributed to either Lakes Lundy or Grassmere which both briefly formed and drained between ca. 12 500 and 12 400 B.P. (Cooper 1979: Fullerton 1980). It is possible that this strandline once passed through the immediate vicinity of the Thedford II site which is at or just below its elevation. However, there is no definitive evidence that this was the case and certainly, this strandline cannot be traced through this area today. Finally, the site is landward of the abandoned shoreline of post-glacial Lake Nipissing (ca. 5500 to 3700 B.P; Lewis 1970). This strandline is traceable in an east-west line 3 km due north of the site but disappears in the area of the mouth of the Ausable River only to reappear east of the Ausable

3.7 km northeast of the Thedford II site. This strandline is often referred to as the Nipissing-Algonquin shoreline (i.e. Cooper 1979), denoting the fact that pro-glacial Lake Algonquin (ca. 12 000 to 10 400 B.P.) was situated at a similar elevation (605') in the area (Hough 1963, 1966; Karrow et al. 1975). However, as Karrow (1980) has recently noted, the Lake Algonquin beach is only inferred to have been present at this location since the later "Nipissing transgression extensively removed and destroyed the older Algonquin features" (Karrow 1980:1271). It does seem clear though, that the Algonquin strandline was in the immediate vicinity of the traceable Nipissing strandline. The site's location and relationship to Lake Algonquin is particularly important since the time of this lake's existence corresponds to the probable age of the site.

As a result of the Nipissing transgression such a determination is largely precluded. It is probable that an inlet of Lake Algonquin (and certainly Nipissing; see Kenyon 1979) existed at the Ausable River mouth. However, even assuming the Algonquin strandline was exactly co-extensive with Nipissing, the fact the later strandline cannot be traced in the river mouth area obviates conclusions concerning the relationship of the site to Lake Algonquin. Given the present meagre data, it is possible either 1) that the Algonquin shoreline was some distance (a km or more) to the northeast of the site; 2) that the ravines surrounding the site were small, shallow, flooded "fingers" or inlets in an Algonquin "bay" at the river mouth; or 3) that these small ravines were marshy areas bordering an Algonquin bay". In short, Algonquin could have been anywhere in the immediate site vicinity from near the site to some distance (i.e. a km or more). Resolution of this problem demands extensive assessment of the deposition and sedimentation history of the Ausable River area.

Artifact Inventory and Horizontal Distribution

Detailed descriptions of the Thedford II artifacts and debitage and their horizontal distribution are included in a monograph that is currently under preparation (Deller and Ellis 1987). These data will be summarized and interpreted in the following section of this present study.

The artifacts from the Thedford II site generally are morphologically similar to those from other Parkhill complex sites in the area, such as Parkhill, McLeod, and Dixon. Nevertheless, there are significant variations in the degree of curation of some of the artifacts, as well as some variation in the frequencies of types of chert utilized that provide a basis for interpreting the nature of the prehistoric occupation. The inventory of artifacts from the Thedford II site is listed in Table 5. Representative samples of artifacts are shown in Figures 20 to 23, and distributions of artifacts by classes are shown in Figures 24 to 27.

Interpretations

The Thedford II site differs significantly in size from most other fluted point associated sites that have been reported in the northeast. Whereas sites such as Debert, Vail, Bull Brook, Shoop, Fisher, and Parkhill are characterized by large artifact assemblages derived from several discrete occupation loci probably representing multiple reoccupations, the Thedford II site is much smaller in spatial extent and total artifact yield. It appears to represent a single, short-term occupation by a small group of Paleo-Indians. This makes it valuable for interpreting the larger sites with multiple occupation loci that frequently are difficult to interpret as discrete units. As well, it contributes to a more representative understanding of Paleo-Indian lifeways than is provided by investigations focusing only on large sites. Furthermore, unlike many of the larger sites, Thedford II is almost completely excavated.

The site has furnished some of the best data in the Northeast concerning Paleo-Indian organization of camp activities. There is a discrete clustering of specific categories of implements, which suggests that certain areas of the site were specific-task oriented. Noteworthy is the concentration of gravers in the south-central part of the site (see Figure 26). This area is interpreted as a specialized work area characterized by activities associated with gravers. Northern and western segments of the camp apparently had activities associated with point manufacturing and the use of narrow end scrapers (see Figure 27).

It is proposed that at least some activity areas at Thedford II might represent work spaces associated with the division of tasks on the basis of sex. The areas of projectile point manufacturing might have been dominated by male activity. The location of these areas seemingly on the outer edge of the camp (see Figure 25), or at least in areas somewhat isolated from other work spaces is a pattern that occurs on other Paleo-Indian sites in the region. For example, the large rearmament area at the Parkhill site is located on the northern edge of the camp (see Area B, Figure 18).

Lithic Technology

Significant insights into the Parkhill lithic industry have been achieved through analyses of artifacts and debitage from the Thedford II site. In particular, the work of Ellis (1984) has provided models that effectively explain techniques and strategies of tool manufacture and how they can determine lithic technological variation within and between industries.

It is evident that the Paleo-Indians responsible for the Parkhill complex used a highly systematic procedure for manufacturing their stone implements. This system was attuned to a cycle of resource exploitation on a seasonal basis and occurred over a fairly widespread territory. It focused almost exclusively on one variety of chert (Collingwood), the properties of which also played a significant role in the design of the manufacturing strategies. Primary stages of lithic manufacture (core preparation and tool blank production) were not carried out on the Thedford II site, nor on other Parkhill complex sites in the area (Ellis 1979). Such activities generally were restricted to sites near the bedrock outcrops of the chert in the northern range of the complex. Although direct evidence of the primary stages of manufacture have yet to be recovered through excavations of quarry and workshop sites, techniques of core preparation and tool blank production can be inferred through analyses of tools in later stages of manufacture, especially those having only minor alterations to the original flake blank.

It has been demonstrated (Ellis 1984) that the Paleo-Indians responsible for the Parkhill complex generally commenced the manufacturing sequence on tabular pieces of Collingwood chert. Frequently these blocks had cortex on their top and bottom surfaces and banding throughout the material that paralleled the cortical surfaces. When banding and/or evidence of the cortical surfaces are evident on an artifact, they provide substantial assistance in visualizing the original position of the flake blank in the unaltered block of raw material. In the Parkhill industry flake blanks very rarely were removed from across the top (or bottom) surface of the block. In fact, such flake-blanks were used in the manufacture of less than one percent of all artifacts recovered on Parkhill complex sites. Artifacts made from these blanks can be identified by a parabolic orientation of the banding on the ventral or dorsal surface of the artifact, much the same as parabolic-shaped grain on some plywood.

Generally, the knappers began removing flake blanks from a side face of the block using the top as a striking platform. Blanks were removed sequentially, starting at a corner and proceeding across the block (see Figure 29, A and B). Each successful removal served to guide the next. Blanks removed from the core in such a manner are characterized by horizontal banding, in other words, at 90° angles to the longitudinal axis of the blank. Blanks that removed a corner edge of the block frequently were manufactured into backed bifaces (see Figure 21, No. 8). The corner edge of the block was incorporated into the backing on the implement. Blanks from nearer the centre of the block, providing they were straight and of suitable length, frequently were used for the manufacture of fluted points (see Figure 29, B).

In the next sequence of block reduction, the knapper continued to remove flake blanks from the side face of the core, but these were removed parallel to the banding (see Figure 29, C and D). They tended to cross the scars left from the previous sequence of removal at right angles and in fact carried them away on their dorsal surfaces. Flake blanks struck in such a manner are characterized by banding that runs the full length of the blade, parallel to its longitudinal axis. They were used as preforms for a variety of implement types but rarely in the Parkhill industry were they utilized in the manufacture of fluted points. Following the removal of the side struck flakes, the original block of raw material ideally would have been reduced to a large, rough bifacial core (Ellis 1984) with a lenticular cross section. Still at the quarry workshop site, the edges of these large bifacial cores were heavily ground and large flakes were struck off. These flakes mainly served as preforms for end scrapers.

By consistently starting the manufacturing process with cores of the same size and shape, and by following a well-established sequence of flake blank removals, the Paleo-Indians were able routinely to produce a variety of flake types, each of which was suitable for manufacture into a specific kind of implement. These strategies governing raw material selection and artifact production were culturally transmitted from one generation to the next and prevailed for the duration of the Parkhill complex. This accounts for the homogeneity of various implement types throughout the large number of Parkhill complex sites. Basic changes in the strategies for blank production and implement manufacture probably did not occur until the end of the Parkhill industry. Although subsequent industries (i.e. Crowfield) continued to use Collingwood chert, the strategies for producing blanks and manufacturing them into implements were different. This provides additional evidence of changing patterns of behaviour between the complexes.

Caching Strategies

A concentration of artifacts recovered at the north end of the camp has been interpreted as a cache (Deller and Ellis 1987). At least eight bifaces, and possibly as many as thirteen, as well as several unifacial implements were part of this concentration. This includes four fluted points, four fluted preforms, and a combination groover-end scraper (see Figure 22, No. 1). It is unknown if other unifacial implements and bifaces recovered in the vicinity of the cache were dislodged from it by ploughing. All of the artifacts from the cache possess considerable functional utility. None appears to have been discarded because it was exhausted through use or breakage. Although it is possible that the artifacts might have been offerings placed in a grave from which the organic materials have long since deteriorated, I believe that they were cached by Paleo-Indians who expected to return to the site after their seasonal round had gone full cycle. I also propose that many of the artifacts with remaining functional utility that have been recovered on seasonally reoccupied Paleo-Indian sites, such as Vail and Bull Brook, were not lost or discarded by the inhabitants but rather were cached with the anticipation of their retrieval during a return visit.

It is reasoned that the caching strategies most likely would be employed by Paleo-Indians when at least two conditions were met: 1) the seasonal round was well established. In other words, a return visit to the site was expected, and 2) it was anticipated that the cached implements would not be required before the next visit to the quarry sites. In the case of the Parkhill society, caching or abandoning of implements could be expected only on sites occupied in the spring. It would not make sense to transport surplus implements back to summer-occupied quarry sites that represent the next phase of the round. Instead, they would be left in an area to which the Paleo-Indians expected to return. Implements with remaining functional utility seldom would have been cached on sites occupied in the fall or winter, because the needs related to hunting or processing resources later in the cycle could not accurately be predicted.

In sum, fluted bifaces, end scrapers, and other implements might have been cached at periodically visited spring hunting camps, such as Thedford II, Parkhill, (and Vail), when the next phase in the cycle of resource exploitation involved a visit to the chert quarrying stations.

Chronology

The case for the chronological placement of the Paleo-Indian occupation at Thedford II is similar to that described earlier for the Parkhill site. It is built mainly on two lines of evidence. First, the occupation is attributed to the Parkhill complex, which appears to date sometime during the span of proglacial Lake Algonquin circa 11 000 B.P. - 10 600 B.P. The dating of the complex is supported elsewhere by pollen analyses (Roosa 1977a), settlement strategies (Deller 1980a, 1980b; Storck 1982), comparisons to radiometrically dated assemblages in adjacent areas (Roosa 1977a; Deller and Ellis 1987), and, to a lesser extent, by chert utilization patterns (Deller 1983). Second, differences in the size of the fluted points from Thedford II and Fisher suggest that there is an appreciable time gap between their respective occupations. Deller and Ellis (1987:150) comment:

> Our analyses of Barnes points from several locations indicate that the Parkhill complex points are not as homogeneous as previously thought. In particular, there are significant size differences between the points from Thedford II/Parkhill/Barnes and those from the Fisher site. Notable in this regard are the distinctive differences in basal and maximum widths and, to a certain extent, basal concavity depth and banding orientation between Fisher and the other sites. On this basis we suggested the Fisher site was later in time...Accepting some time depth to Barnes points, the larger points from Thedford II suggest that they are an early representative of the Parkhill complex.
>
> The age of the Parkhill complex is a matter of debate, but it appears to occur around the middle of the occupation of the area by fluted point producing groups; that is, within one or two hundred radiocarbon years of circa 10 600 B.P.

THE McLEOD SITE (AhHk-52)

Introduction and History of Investigation

The McLeod site is a multi-component, Paleo-Indian site located near the proglacial Lake Algonquin shoreline in southwestern Ontario. The most extensive Paleo-Indian occupation of the site is associated with the Parkhill complex, but artifacts diagnostic of later Paleo-Indian and transitional

Paleo-Indian/Archaic complexes also have been recovered. Since the latter are poorly represented on the site, this report will be concerned mainly with the occupation(s) that accounted for the Parkhill complex.

The McLeod site was located by the author during surface reconnaissance for Paleo-Indian sites in the summer of 1973. The presence of a Paleo-Indian component on the site was first suggested when flakes of Collingwood chert were recovered at two loci about 100 m apart in a cultivated field. Previously, the site had been surface collected by Mr. Edward McLeod. He had not recovered artifacts of Paleo-Indian vintage from the site and was not aware of the early occupation areas.

The two loci or occupation areas, identified as A and B, were partially excavated in the summer of 1975, under the direction of William B. Roosa in collaboration with the author. In 1979, a third concentration of artifacts and debitage, area C, was located by the author about 50 m southwest of area B. Probably it is the most extensive of the three areas.

Published data on the McLeod site consist of analyses of debitage (Ellis 1979) and short descriptions of the site's location and artifacts (Deller 1979, 1980a, 1980b; Ellis 1984).

Location and Physiographic Setting

The McLeod site is located on Lot 20, Concession XX, West Williams township, Middlesex county, Ontario, at grid reference 387808 (Parkhill 40 P/4, Edition 5). The site is situated on a relatively flat plain of sandy loam about 1000 m from the inferred location of the proglacial Lake Algonquin shoreline. McLeod is bordered on the east by the Seebee Creek (Ptsebee Creek) which flows north and joins the Parkhill Creek at a right-angle junction about 1200 m north of the site (see Figure 17, No. 18). It is possible that Lake Algonquin flooded the mouths of these creeks, thus forming estuaries to the north and east of the site.

Artifact Inventory and Distribution

Artifacts from the McLeod site are shown in Figure 30 and their distribution is shown in Figure 31. The complete artifact inventory is listed in Table 6.

Interpretation of the Parkhill Complex Occupations

The most extensive Paleo-Indian occupation at McLeod is attributed to the Parkhill complex. This is based primarily on artifact typology and, to a lesser extent, on patterns of lithic raw material utilization that conform to the Parkhill complex norm.

The McLeod site is considerably smaller in spatial extent and has yielded fewer artifacts than the Parkhill and Thedford II sites. There are also basic differences in artifact inventories among these sites. In contrast to the Parkhill site, McLeod has yielded few fluted point bases and channel flakes, which indicates less rearmament and fluted point manufacturing than at Parkhill. Like Thedford II, McLeod seems to have a higher proportion of unifacial tools but, in contrast, they do not appear to concentrate in specialized activity loci. McLeod appears to be more similar to the Dixon and Schofield sites in terms of size, topographic focus, and artifact inventory than it does to Parkhill and Thedford II.

Areas A, B, and C on the McLeod site are interpreted as habitation areas. This is based on the wide range of implements and evidence of their manufacture, maintenance, and discard within a space of limited extent (see Gardner 1983, Grimes et al. 1984 for similar interpretations). In respect to their spatial extent and the nature of their artifacts and debitage, these loci resemble areas A-East and A-West on the Thedford II site, and occupation areas C and D on the Parkhill site. However, specialized activity areas, such as the rearmament and fluted point manufacturing area on the Parkhill site (area B) or the concentration of gravers at Thedford II (A-Centre), do not occur at McLeod. This implies that certain kinds of resource exploitation or related activities may not have been as intensive at McLeod as it was at the other sites.

Based on presently available data, it is difficult to determine if the three occupation loci at McLeod were contemporaneous or if they represent successive reoccupations of the area. Likewise, the temporal relationship between McLeod and other Parkhill complex sites has not been clearly established. Nevertheless, based on the premise that the size of Barnes points diminished through time, it is postulated that the largest Paleo-Indian occupation at McLeod postdates its counterpart at the Thedford II site.

The exact nature of the paleoenvironment at McLeod remains to be determined. Elsewhere (Deller 1980b) it has been speculated that the site might have been situated in a spruce and jackpine dominated wooded area adjacent to open sandy beaches of Lake Algonquin. While this remains to be established, one aspect of the environment clearly can be inferred: the area offered resources highly attractive to the Paleo-Indians, as indicated by the large concentrations of Parkhill complex sites. These constitute one of the largest clusters of Paleo-Indian sites yet reported, and still more probably occur in the unsurveyed areas flanking the south bank of the Parkhill Creek opposite the Parkhill, Dixon, and Schofield sites, and in the area flanking the east bank of the Seebee Creek opposite McLeod.

If the McLeod occupations represent a manifestation of the seasonal round of the Parkhill population, it seems plausible that they occurred during the spring or fall seasons when the migration corridor area would offer its maximum resources. The least likely season of occupation probably would have been the winter, when caribou herds or other faunal resources would have been dispersed inland and farther to the south, avoiding the particularly exposed beach areas immediately adjacent to Lake Algonquin.

Interpretation of Other Paleo-Indian Occupations

A fluted preform base (Figure 31, No. 2) manufactured from Kettle Point chert might represent a transitional form between the Parkhill and Crowfield industries. Similar artifacts have been recovered occasionally as isolated surface finds along the former Algonquin shoreline in the vicinity of the McLeod site. At least one has been recovered from the surface of a small site on Lot 3, Concession XXVII, West McGillivray township, at grid reference 393856 (Parkhill 40 P/4, east half, Edition 5). This site straddles the Algonquin-Nipissing shoreline ridge. The slope of the ridge has yielded scrapers that appear to have been rolled by the Nipissing surf. This indicates that they date before 5000 B.P.

A snapped fluted preform tip (Figure 30, No. 1) also is manufactured from Kettle Point chert. Similar squared tips frequently occur on Parkhill complex sites, but at present the cultural assignment of this surface find is uncertain. It is unknown if it is associated with the Parkhill industry or if it represents a later occupation. If it was manufactured by the Parkhill society, it increases the possibility that the associated occupation of the site was closer in time to the post-Algonquin occupations at the Fisher site, which also made some use of Kettle Point chert.

A Hi-Lo point manufactured from Bayport chert was recovered from the surface of the McLeod site about 65 m southwest of area C (Deller 1979; No. 19). Hi-Lo points probably date around 10 000 B.P. (Ellis and Deller 1982). Their occurrence at McLeod and other locations in the vicinity marks the northernmost distribution of the point type in southwestern Ontario.

THE DIXON SITE (AhHk-73)

Introduction and History of Investigation

The archaeological resources surrounding the Thedford Marsh in southwestern Ontario comprise some of the richest and most diverse in the province. The terrain flanking the Parkhill Creek is particularly distinguished by concentrations of sites. From a point where the creek enters the marsh at the fossil Algonquin-Nipissing shoreline, an almost continuous mass of sites stretches along its north bank for a distance of several kilometres. These sites range from Paleo-Indian to historic Ojibway (Deller <u>et al</u>. 1985).

Dixon is one of several Paleo-Indian sites clustered in the area (see Figure 17, No. 16). The cultivated surface of the site has yielded a small assemblage of chipped stone implements and lithic debitage representing at least two Paleo-Indian components. The earliest and largest is attributed to the Parkhill complex. It will be discussed in the following section of this chapter. A much smaller occupation, attributed to the Holcombe complex, will be examined in Chapter VII.

The site was discovered in 1978 during a survey for Paleo-Indian sites in an area that was thought to have been a caribou migration corridor skirting the Thedford embayment of Lake Algonquin (Deller 1980a). Prior to the site's discovery, early artifacts had been surface-collected in cultivated areas adjacent to the site by Ray Baxter, Randy Laye, Gary Laye, Ed McLeod, Gary Zimmer, and the author. The site was named after a former owner, Mr. Bruce Dixon.

Location and Physiographic Setting

The Dixon site is located on Lot 19, Concession VI, McGillivray township, Middlesex county, Ontario, at grid reference 395823 (Parkhill 40 P/4, Edition 5). It is situated in the locality where the former Algonquin shoreline makes a right-angle bend from a north-south to an east-west orientation. Surface evidence of the Parkhill complex consists of an oval shaped concentration of artifacts and debitage encompassing approximately 150 square m. This concentration is situated at an elevation of 187 m a.s.l. on a relatively flat backshore plain of Berrien sandy loam about 500 m east of the fossil Algonquin-Nipissing strandline. It is approximately 15 m north of a steep embankment, 3 m high, that is part of the north bank of the Parkhill Creek. This location is north of the perpendicular ("T" shaped) junction of the Parkhill and Seebee Creeks. It is possible that this junction was inundated by Lake Algonquin during the Paleo-Indian occupation of the site. The Dixon site is located about 225 m southeast of occupation area D on the Parkhill (Brophey) site.

Lithic Artifacts

Paleo-Indian artifacts from the surface of the site are shown in Figure 32. Brief descriptions of the artifacts and their cultural assignment are given in Table 7.

Discussion

The variety of implement and debitage types associated with the Parkhill complex at Dixon is suggestive of a campsite. Its small extent and comparative sparseness of artifacts suggest that the occupation might have been by a small group, perhaps one household, for a short duration of time. There appear to be no specialized activity or workshop areas, such as the fluted point manufacturing and rearmament area at Parkhill or the concentrations of gravers at Thedford II. In this respect the Dixon site is similar to McLeod. It is suggested that Dixon was strategically located in the caribou migration corridor skirting the Thedford embayment of Lake Algonquin. As such, the site eventually may provide more data concerning the seasonal habits and economy associated with the Parkhill population.

At present, the relationship of the Dixon site to the nearby Parkhill site is largely unknown. It has not been determined if the occupations were simultaneous of if they represent repeated visits to the area. Future research should attempt artifact and debitage matchups between the sites in order to address this problem.

Although the age of the Parkhill complex-associated occupation has not been precisely determined, it is assumed that it was probably contemporaneous with the closing stages of Lake Algonquin. This would place it slightly earlier than some of the occupations at Fisher that appear to postdate the draining of the lake.

THE SCHOFIELD SITE

Introduction and History of Investigation

Schofield is a multi-component site located a few kilometres to the east of the Dixon and Parkhill sites in southwestern Ontario (see Figure 17, No. 15). This report concerns a small Paleo-Indian manifestation on the site which is attributed to the Parkhill complex.

The Schofield site was first visited by the author during a 1973 search for early sites along the banks of the Parkhill Creek. A small amount of Collingwood chert debitage was collected from an area encompassing about 50 square metres in a ploughed field. Although it was known that this lithic material was diagnostic of Paleo-Indian sites in the area, the precise cultural affiliation of the site could not be determined since projectile points and other diagnostic implements had not yet been recovered. The surface of the site was searched again in the fall of 1976. Circumstances were ideal for surface survey following a heavy rain, but, whereas considerable evidence of later occupations was found, no evidence of Paleo-Indian culture was recognized. In 1980, a fluted Barnes point, diagnostic of the Parkhill complex, and a side scraper manufactured from Collingwood chert were found on the site by Mr. William Baxter. He and I made individual and joint searches of the site in the fall of 1980, which resulted in the addition of one Collingwood chert flake to the Paleo-Indian collection from the site.

Location and Physiographic Setting

The Schofield site is located on the farm of Mr. Fred Schofield on Lot 16, Concession VI, McGillivray township, Middlesex county, Ontario, at grid reference 407823 (Parkhill 40 P/40, Edition 5). This location is situated on the north bank of the Parkhill Creek at an elevation of 190 m above sea level.

This site is bordered on the north and west by a shallow swale, which eventually deepens and joins the Parkhill Creek about 100 m west of the site. Site soils are classified as Berrien sandy loam. The Schofield site is located about 1.2 km east of the Dixon site, 1.5 km east of the Parkhill site, and 2 km east of the former shoreline of proglacial Lake Algonquin.

Description of the Artifacts

The fluted Barnes point from the Schofield site is manufactured from Onondaga chert. It measures 52 mm in length, 23 mm in width, and 7 mm in thickness. Fluting is 20 mm long on one face and 16 mm in length on the other. The point has heavy grinding on its lower lateral edges.

The side scraper was recovered about 12 m west of the fluted point. It was made from a slightly curved flake blank that was removed from the side of a tabular core of Collingwood chert so that the chert's banding runs parallel to the axis of the artifact (see Figure 29, C). It is rectangular in shape, measuring 73 mm long, 38 mm wide, and 8 mm in maximum thickness. Continuous retouch occurs along the full extent of one lateral edge.

Debitage

Five small flakes of Collingwood chert have been recovered from the area north of the fluted point find. Four of these are fragmentary and lack striking platforms. The remaining flake has a heavily ground striking platform and a lip, which indicates that it was struck off a bifacial preform.

Discussion

At present, the precise nature of the Paleo-Indian occupation at Schofield is unknown. If the evidence recovered from the plough-zone at the site is representative of the occupation, it appears that it left only a few artifacts and debitage scattered in one or two small areas. The presence of flakes derived from the reduction of bifaces indicates that the manufacture of lithic implements was at least one of the activities carried out on the site. The small spatial extent of the site and its paucity of surviving evidence contrasts with the other Parkhill complex sites in the surrounding area. Yet the presence of these sites in a locality frequently revisited by Paleo-Indians suggests that they might have shared a common purpose.

The temporal relationship between the Schofield site and other local sites attributed to the Parkhill complex has not been determined. If the sites are contemporaneous, they might represent an attempt by the Paleo-Indians to straddle a caribou migration corridor with a row of sites, spaced at equal intervals, which would increase the chances of contacting the animals. On the other hand, the sites probably represent repeated (non-contemporaneous) occupations of a favoured area.

THE MAWSON SITE (AhHj-1)

Introduction and History of Investigation

Mawson is a small Paleo-Indian site attributed to the Parkhill complex in Middlesex county, Ontario. The site was located by Randy Laye and Gary Laye of Parkhill, Ontario who found it after they had been swimming in a nearby sand and gravel quarry on the fossil shoreline of proglacial Lake Warren. The author visited the site with the Laye brothers in the spring of 1974. No evidence of Paleo-Indian occupation was noted at this time, but a few flakes of Collingwood chert diagnostic of Paleo-Indian cultures were recovered on the ploughed surface of the site by the author on a subsequent visit.

Location and Physiographic Setting

The Mawson site is located on the farm of Mr. Ronald Mawson, on Lot 13, Concession XIX, McGillivray township, Middlesex county, Ontario, at grid reference 487833 (Parkhill 40 P/4, Edition 5). This location is situated on the lower of "twin" Warren strandlines at an elevation of 223 m above sea level. It lies near the spring-fed source of the Moray Creek, about 9.5 km east of the Lake Algonquin strandline (see Figure 17, No. 14).

Description of the Artifacts

The single fluted point from the Mawson site has been illustrated in a previous study (Deller 1976b; Plate V, No. m). It is a resharpened Barnes point manufactured from Kettle Point chert. This lithic raw material is atypical of most southwestern Ontario Barnes points, which generally were manufactured from Collingwood chert, Bayport chert, or Onondaga chert. The point measures 28 mm long, 17 mm wide, and 6 mm thick. Fluting is 25 mm long on one face and 11 mm on the other.

Two small biface thinning flakes of Collingwood chert were recovered on the surface of the site. These demonstrate that manufacture or repair of Paleo-Indian implements was carried out on the site. Numerous flakes of Kettle Point chert and Onondaga chert also were recovered. Since the fluted point was manufactured from Kettle Point chert, some of this material might be associated with the Paleo-Indian occupation. Most, however, probably results from Archaic or Woodland occupations.

Discussion

The Paleo-Indian component on the Mawson site is attributed to the Parkhill complex on the basis of the fluted Barnes point. Two characteristics of the point suggest that it postdates most of the fluted bifaces from the Thedford II, Parkhill, and Dixon sites: 1) it is manufactured from Kettle Point chert, the bedrock source of which would not have been accessible to the Paleo-Indians until Lake Algonquin drained; and 2) the basal measurements of the point are considerably smaller than those of most points from Thedford II and Parkhill.

By the time of the Paleo-Indian occupation, the beaches adjacent to the site had been abandoned by Lake Warren for thousands of years. The reasons why Mawson and numerous other Paleo-Indian sites in the Great Lakes region, including those discussed in Chapter IV, were situated on or near abandoned strandlines has yet to be definitively resolved.

Additional research is necessary in order to more fully understand the Mawson site in terms of its temporal context and its settlement and subsistence strategies. Test excavations should be conducted on the site before sand and gravel quarrying operations encroach upon more of the prehistoric cultural evidence. Also, it would be advantageous to undertake a detailed study comparing Barnes points associated with the Algonquin shoreline with those from older shoreline areas. It seems that Barnes points from the latter areas tend to be smaller, with greater use made of Kettle Point chert, than those from the Algonquin shoreline area. This might represent changing settlement-subsistence strategies following the draining of proglacial Lake Algonquin.

THE WIGHT SITE (AgHk-9)

Introduction and History of Investigation

In 1978 the Ontario Heritage Foundation funded a project designed to locate early prehistoric sites in southwestern Ontario. The project included a survey of a 7 km stretch of terrain along the west bank of the Ausable River between the fossil Warren and Algonquin-Nipissing strandlines. This region was thought to straddle a former caribou migration corridor skirting the Thedford embayment of Lake Algonquin.

Significant numbers of Paleo-Indian sites and locations were discovered within the survey boundaries. Although a wide variety of Late Pleistocene cultures are represented, most of the sites are attributed to the Parkhill complex. One of these, the Wight site (AgHk-9), was found in the locality where the Ausable River crosses the strandline of proglacial Lake Warren (see Figure 17, No. 20).

The first indications of early materials in the area were recorded during canvassing of farmers and landowners. Several diagnostic Paleo-Indian artifacts, including a backed biface manufactured from Collingwood chert, were noted in the artifact collection of Mr. Frank Wight. Wight recalled finding the biface when he was working in a sandy field between two small ravines on his farm. The find spot was searched by the author accompanied by Wight on two occasions in 1978 and 1979, but evidence of Paleo-Indian occupation was not identified. In the spring of 1983, Wight found the mid-section of a Barnes fluted point near the find spot of the backed biface. It is probable that a Collingwood chert preform (Deller 1979:12b) in Wight's collection of artifacts also is from this area.

Location and Physiographic Setting

The Wight site is located on Lot 15, Concession I, Bosanquet township, Lambton county, Ontario at grid reference 339772 (Parkhill 40 P/4, Edition 4). This location is situated on a small sandy terrace at an elevation of 213 m a.s.l. About 50 m west of the site lies a shallow gully and swampy area, beyond which the terrain rises abruptly to a second terrace at elevation 220 m a.s.l. The proglacial Lake Warren strandline lies approximately 450 m south of the site.

Artifact Inventory

As of January 1986, the artifact inventory from the surface of the Wight site included two fluted Barnes points with impact fractures on their tips and damaged bases, one backed biface, and two flakes of Collingwood chert (Deller 1979:12a). Other fluted points and fluted point preforms recovered within a few hundred metres of the site have been published elsewhere (Deller 1979, Nos. 10a, 10b, and 12b).

Discussion

Interpretation of the Wight site is complicated by the small size of the artifact assemblage and its indefinite provenance. Nevertheless, it is observed that:

1) The Paleo-Indian component on the site is attributed to the Parkhill complex on the basis of the fluted Barnes points. The site's chronology relative to sites nearby, such as Thedford II, Parkhill, and McLeod, remains to be established.

2) The location of the site reflects both regional and local settlement patterns. On the regional level, the location of the site near a proglacial lake strandline is typical of several Great Lakes Paleo-Indian sites. On the local level, the site is one of may situated in the proposed caribou migration corridor skirting the Thedford embayment of Lake Algonquin. At present, it is difficult to determine which of the two settlement strategies played the more important role in determining the site's location.

Concerning the location of the site in the proposed migration corridor, it should be noted that while this by itself is not conclusive, it introduces the possibility that the camp was related to the hunting of caribou. Furthermore, it raises the possibility that the site was occupied during the spring season when the corridor most likely received the major influx of migrating animals.

3) The types of artifacts recovered to date from the Wight site and its environs are atypical of most known Paleo-Indian sites in the area. For example, backed bifaces and fluted point tips with impact fractures are rare on most Paleo-Indian sites in southwestern Ontario. Yet they constitute all the known Paleo-Indian artifacts from the Wight site locality. The projectile point tips with impact fractures suggest that the area was the location of hunting activities; perhaps a kill site. The backed biface is suggestive of butchering activities. These interpretations are reasonable considering the physiographic setting of the site. It is logical that caribou migrating through the area, especially those following the Lake Warren shoreline ridge, would pass by the site on the narrow peninsula between the two swamps.

THE STOTT GLEN SITE

Introduction and History of Investigation

The Stott Glen site is an early prehistoric site with a Paleo-Indian component attributed to the Parkhill complex. It was discovered in May 1985 by Mr. Glenn Stott, who found the tip of a fluted point when he was searching for prehistoric artifacts in a ploughed field on his farm. Stott recognized the significance of the find and contacted the author. He was encouraged to survey the area periodically in an attempt to locate additional evidence and record the location of finds so that possible concentrations of artifacts and/or debitage could be located. During the next month, he recovered two additional Paleo-Indian artifacts: the base of a Barnes fluted point and a small graver with multiple spurs.

Location and Physiographic Setting

The Stott Glen site is situated on the Stott farm on the east half of Lot 24, Concession V, Warwick township, Lambton county, Ontario, at grid reference 318680 (Parkhill 40 P/4, Edition 4). The Paleo-Indian assemblage was recovered from an area encompassing about 200 square metres on a small knoll on the former shoreline of proglacial Lake Arkona. This location is situated about 250 m west of Highway #7, approximately 1.1 km south of the main intersection in the small town of Arkona, Ontario (see Figure 16, No. 3).

Artifact Inventory

The artifact inventory from the Stott Glen site consists of the tip of a Barnes fluted point manufactured from Collingwood chert, a base of a Barnes point manufactured from Onondaga chert, and a multiple spurred graver manufactured from Collingwood chert. These artifacts are illustrated in Figure 33.

Discussion

The Stott Glen site is assigned to the Parkhill complex on the basis of the Barnes fluted points. In respect to their size, the points are more similar to those from the Fisher site (located approximately 205 km to the northeast) than they are to the much larger points from the Thedford II site (located 6.5 km to the north). Their comparatively small size suggests that the Stott Glen points were manufactured late in the Parkhill sequence (Deller and Ellis 1987).

The location of the site on (or near) the shoreline of proglacial Lake Arkona again raises the issue of early settlement strategies related to the use of fossil beach areas. It is possible that the site represents a small (microband) camp that was occupied in order to exploit specific resources during a seasonal round of resource exploitation. Considering the location of the site in an inland area (in relation to proglacial Lake Algonquin) in the southern range of the Parkhill population, it seems possible that it might have been occupied at some time during the winter or early spring, before the anticipated caribou migration through the Thedford embayment corridor.

THE MULLIN SITE (AeHj-1)

Introduction and History of Investigation

Mullin is an early prehistoric site attributed to the Parkhill complex in southwestern Ontario. It was discovered in

April, 1977, by Michael Heal, a student at Caradoc South School, who frequently assisted the author during field reconnaissance. Heal located the base of a fluted point when he was searching for artifacts in a cultivated field near his home. The following day the author visited the find spot with Heal and surface collected the artifacts described below.

Location and Physiographic Setting

The Mullin site is located on Lot 6, Range IV south, Ekfrid township, Middlesex county, Ontario, at grid reference 559347 (Strathroy 40 1/13, Edition 4). The Paleo-Indian assemblage was recovered from the surface of an area encompassing about 200 square metres. This area straddles a shallow depression and the lower (eastern) slope of a low sandy knoll consisting of Berrien sand. Elevation is approximately 216 m above sea level. Beyond the site, the terrain slopes gently to the west for about 250 m to a deep ravine through which flows Gentleman's Creek. This creek flows south to intersect the Thames River, which makes a large sweeping bend about 700 m southeast of the site.

Description of the Artifacts

Fluted Point Base

One base of a fluted Barnes point was recovered on the surface of the Mullin site (see Figure 11, No. 9; Deller 1979, No. 51). This artifact is manufactured from Bayport chert. It does not appear to have been broken in recent times. The artifact is finely made with delicate, flaring ears, a squared basal concavity, and well-executed fluting on both faces. It has a basal width of 19 mm and a maximum thickness of 5 mm.

End Scraper

One triangular end scraper manufactured from Collingwood chert was found on the site. It has a steeply retouched bit which forms an angle of approximately 80° with the ventral surface. Maximum width (27 mm) occurs at the bit. It is 36 mm long and 8 mm thick.

Utilized Flakes

Two utilized flakes manufactured from Collingwood chert were recovered. Both are biface thinning flakes, with evidence of light use indicated by small, scalar flake scars along one lateral edge. One had a notch 6 mm deep and 16 mm wide.

Debitage

Two small flakes of Collingwood chert were recovered from the site. One is a scraper resharpening flake; the other is a biface thinning flake. Two flakes of Bayport chert were recovered on the site, but at present their specific cultural affiliation is difficult to determine. Both Paleo-Indian and Archaic artifacts manufactured from Bayport chert have been found in the area.

Discussion

The presence of the Barnes fluted point on the Mullin site indicates that it has a component attributable to the Parkhill complex. Moreover, the use of Collingwood chert and Bayport chert is typical of other Parkhill complex sites in southwestern Ontario, such as Thedford II and Parkhill.

Whereas most known Parkhill complex sites are situated on or near the shoreline of proglacial Lake Algonquin, the Mullin site is situated more that 55 km inland from the nearest Algonquin strandline. This location is situated within the southern range of the Parkhill complex distribution. It is suggested that the Mullin site, like Stott Glen, might have been occupied during the winter season.

The concentration of early cultural materials in a shallow depression on the site is typical of several Paleo-Indian encampments in southwestern Ontario (Deller 1976a). It contrasts with distribution patterns of Archaic and Woodland materials, which generally are recovered on knolls or on the crests of higher areas on the sites. (As an aside, it might be noted that many experienced relic collectors pass over Paleo-Indian artifacts in southwestern Ontario because they are conditioned to search only on higher terrain.)

Low areas on campsites during most seasons are not suitable locations for domiciles because they are prone to flooding during rainstorms or spring thaws. During extremely cold weather seasons, however, the reverse becomes the norm. Low areas offer increased shelter from harsh winds. The threat of flooding is eliminated by freezing temperatures. This, in combination with the model of seasonal resource exploitation, outlined in Chapter I, led the author to propose that sites located in low areas were occupied during cold weather seasons.

Alternate (but in my opinion, less plausible) explanations of site location in low areas are: 1) The pattern is coincidental and thus meaningless in terms of human behaviour; 2) The artifacts were redeposited in the low areas through ploughing or erosion; and 3) The low areas represent blow-outs formed by wind erosion that exposed the artifacts.

CHERT UTILIZATION PATTERNS AND THE INTERPRETATION OF THE PARKHILL COMPLEX

In the following section of this chapter, significant aspects of Paleo-Indian lifeways are inferred through analyses of the type and nature of cherts recovered on sites attributed to the Parkhill complex. Specific patterns are interpreted as evidence of social interaction and scheduling of resources within the context of Late Wisconsin environments.

Chert Procurement Strategies

Paleo-Indian societies living near the margins of ice sheets often are interpreted by means of ethnographic analogies with more recent caribou-hunting populations. The lithic procurement strategies of the Nunamiut Eskimos provide an interesting basis for comparison with the Paleo-Indian society responsible for the Parkhill complex. Binford (1979:259) notes that the Nunamiut very rarely travel for the exclusive purpose of obtaining raw materials for tools. Instead, raw materials "...are normally obtained incidentally to the execution of basic subsistence tasks. Put another way, procurement of raw materials is embedded in basic subsistence schedules" (ibid.). This does not seem to be the case with the chert procurement strategies of the Parkhill society. It is unlikely that chert procurement was embedded in day to day activities. If the Parkhill population casually picked up cherts that frequently occur in stream-beds, along beaches, or at outcrop exposures in southwestern Ontario, there should be evidence at the base camps of: 1) a wide variety of lithic raw materials, and 2) decortification flakes. These patterns are not observed on the numerous Parkhill complex sites in southwestern Ontario, nor on other known sites attributable to societies that manufactured fluted points in this region. Rather, it has been observed (Ellis 1979, 1984) that the majority (about 80-85%) of lithic raw materials associated with these sites are from one source. Furthermore, it has been noted that (Ellis 1984; Deller and Ellis 1984):

1) Sizeable and relatively flawless pieces of lithic material were consistently employed in the Paleo-Indian assemblages. Selection of only high quality material would be

facilitated at large outcrop areas. It is questionable whether more diffuse secondary deposits could provide sufficient supplies of high grade material.

2) With few exceptions, the artifacts in the Paleo-Indian assemblages do not show the tumbled or rounded surfaces characteristic of secondary sources. Instead, when the original surfaces are present, they exhibit the flat and planar characteristics of outcrop material. Thus, it appears that the Paleo-Indians were obtaining lithic raw materials primarily from one bedrock source rather than from secondary deposits scattered at various distances from this outcrop. Moreover, since the bedrock source of the material most frequently utilized in the Parkhill complex (i.e. Collingwood chert) was located more than 175 km from the sites in southwestern Ontario, visits to the quarry would not occur frequently. These visits probably occurred on a seasonal basis. Evidence will be summarized in the following section of this chapter that the Parkhill population obtained their Collingwood chert during the summer season, while they were in the northern part of their territorial range.

Analysis of the form in which lithic raw materials were transported provides insights into strategies underlying this particular mode of behaviour. There are three general forms in which a raw material can be transported: 1) in its natural (i.e. unmodified) state, 2) as preforms, and 3) as finished products. Determination of which of these forms was employed in archaeological contexts can be achieved through an analysis of data from lithic workshop sites located at or near a lithic source, and/or sites where the products from these workshops were further modified or disposed. No Paleo-Indian quarry workshop sites have been excavated in southwestern Ontario. However, analyses of debitage from other types of Paleo-Indian sites in this region indicate that lithic materials were transported from the quarry workshops in the form of finished tools, preforms, and flake blanks rather than as cobble cores (Ellis 1979, 1984). Evidence for this includes: 1) a lack of lithic raw materials in unmodified form on these sites, 2) a lack of decortification flakes and other debitage associated with the initial stages of core preparation and reduction (i.e. roughing out of preforms on the sites), and 3) the predominance on the sites of small flakes derived from the modification of advance-stage preforms (Ellis 1979). There is corroborating evidence of this practice on sites where the actual preforms have been recovered away from the quarries. In this respect the later Crowfield site in southwestern Ontario is particularly informative (Deller and Ellis 1984). It contained a Paleo-Indian cremation that included a large number and variety of preforms in early stages of manufacture. Numerous finished artifacts were also recovered from the cremation, but it is difficult to determine if these were manufactured at the quarry workshop or were part of the active gear being carried for daily use.

This evidence indicates that Paleo-Indians in southwestern Ontario transported at least some lithic material in the form of preforms, and little, if any, in its unmodified state. The carrying of lithic material as preforms has been interpreted as an attempt to incorporate labour efficiency and flexibility into the chert exploitation system (Ellis 1979). Although the transportation of lithic material in an unmodified state allows flexibility in the type of artifact that can be manufactured, it is inefficient because excessive weight and bulk are transported in the form of the waste material that results from the manufacturing process. Distance probably was a critical factor in determining the form in which raw materials were transported. Whereas Paleo-Indians might have been willing to transport lithic raw material in unmodified, bulk form over short distances to a workshop area that was more convenient for knapping than the outcrop area, they evidently did not transport such materials long distances from the quarries.

The transportation of only finished artifacts is labour efficient, in that carrying of excessive waste bulk is eliminated, yet flexibility is reduced. For example, it would be difficult to recycle a typical fluted point into an end scraper, because the desired curvature of the blade could not be accomplished. Likewise, it would be difficult to recycle a scraper into a fluted point. If Paleo-Indian societies, whose seasonal rounds took them great distances from the chert sources over substantial periods of time, carried only finished artifacts, they would have to carry large quantities in order to guarantee that their needs could be accommodated. This would not be as labour efficient as the transportation of a basic supply of finished artifacts, supplemented by a supply of highly flexible preforms that could be manufactured into a variety of implements.

The Paleo-Indian practice of transporting lithic raw material as preforms can be regarded as a compromise between labour efficiency and flexibility. The strategy at the quarry workshop evidently was to manufacture bifacial preforms and unifacial blanks, the versatility of which allowed modification away from the quarry into a wide variety of implements. For example, the oval bifaces occasionally recovered on Parkhill complex sites could be used as tools without further modification, or they could be manufactured into implements such as fluted points or knives. In addition, flakes derived from their alteration into these tools could be made into gravers, raclettes, or scrapers. The production of these preforms at the quarry workshop would reduce significantly the transportation of excessive raw material that would be later wasted. Also, manufacture of preforms at the quarry workshop would provide valuable insights into the quality of raw material. Those with flaws that might cause breakage at later stages in the reduction sequence would be discovered and rejected before effort was wasted in their transportation to the distant camps (Ellis 1979).

Chert Identification and the Interpretation of Social Organization

The understanding of chert utilization patterns can contribute significantly to the understanding of social organization and social interaction. The following will elucidate the role of chert identification in the interpretation of the social behaviour of populations responsible for the Parkhill complex.

The Parkhill complex has a widespread distribution in the central and lower Great Lakes region. The heaviest concentrations occur along the proglacial Lake Algonquin shoreline in a broad arc from the Georgian Bay area into southcentral Michigan. Lesser concentrations also occur in northern Ohio and New York State, south of Lake Ontario. Two major divisions are recognized within the Parkhill complex adjacent to the Algonquin shoreline: one centred in the province of Ontario and the other centred in the state of Michigan. These two divisions are isolated on the basis of:

1) variation within the Barnes point type. Barnes points in Michigan appear to be larger than their counterparts in Ontario;

2) utilization patterns of lithic raw materials. Bayport chert is the predominant lithic raw material in the Parkhill complex in Michigan, whereas Collingwood chert dominated the Parkhill complex in Ontario;

3) spatial distribution. The large Barnes points manufactured from Bayport chert tend to concentrate in the southwestern Huron basin and the smaller Barnes points largely associated with Collingwood chert tend to concentrate in the eastern Huron basin.

These Ontario-centred and Michigan-centred divisions of the Parkhill complex are interpreted as evidence of two separate, but closely related, populations. At present, there is insufficient data to define precisely the nature of these groupings. They were most likely what anthropologists would term bands. The population centred in Michigan that made predominant use of Bayport chert will be referred to as the Barnes population, after the Barnes site of the Parkhill complex near Saginaw Bay. Its counterpart in Ontario is called the Parkhill population after the "type site" of the complex near Lake Huron.

Chert Type Ratios and Band Interaction

Analyses of chert types present on Parkhill population sites in southwestern Ontario suggest social interaction with the neighbouring Barnes population in Michigan. This interaction is deduced from small but consistent amounts of Michigan raw materials that occur in specific tool categories on the southwestern Ontario sites. For example, Collingwood chert consistently constitutes about 80% of the lithic raw materials on southwestern Ontario sites, and Bayport chert from Michigan consistently constitutes about 10%. Furthermore, the Bayport chert generally is associated with specific types of artifacts: fluted bifaces and end scrapers. Side scrapers and gravers manufactured from Bayport chert are rarely recovered on the southwestern Ontario sites (see Tables 4 to 7). Thus, there are markedly disproportionate ratios between the various classes of Bayport chert implements and their Collingwood chert counterparts on Ontario sites. Moreover, Bayport chert artifacts appear generally to have been manufactured outside the range or territory of the Parkhill population. Data which support this conclusion are: 1) debitage of Bayport chert resulting from the manufacture of implements is rare on sites attributable to the Parkhill population, and 2) preforms of Bayport chert occur very rarely on Parkhill population sites, despite the fact that Paleo-Indians frequently imported raw materials in preform stages. Clearly, the Bayport chert implements were imported in finished, or nearly finished form.

Although we do not have evidence to indicate whether tools made of Collingwood chert are also found on Barnes population sites, the foregoing observations lead to the conclusion that the Bayport chert implements on Parkhill population sites are evidence of interaction between the neighbouring Barnes and Parkhill populations. This interaction might have been related to the maintenance of an alliance between these groups. It seems probable that the finely made Bayport implements were either given or traded to members of the Parkhill population by their adjacent neighbours in Michigan. Interaction such as this might serve the important utilitarian functions of establishing and reinforcing social bonds between the two groups.

Although the limited quantities of Bayport chert debitage on the sites suggest that few implements were being manufactured from this material in southwestern Ontario, channel flakes of Bayport chert are recovered frequently. These do not necessarily indicate that fluted points of Bayport chert were being manufactured locally. Unfluted Barnes points made from this material are known to occur on sites in southwestern Ontario (e.g. Deller 1979, No. 10b). It is proposed that they were manufactured elsewhere, probably on sites in Michigan, and brought to Ontario as exchange commodities or gifts. They were left unfluted so that their recipients could finish them to fit already existing weapon hafting elements.

The importance of maintaining close social ties between groups of hunter-gatherers has been discussed by several researchers. Wilmsen (1973:25-26) suggests that the exchange of lithic raw materials and points did not take place because of the utilitarian value of the items themselves, but as one of several methods for maintaining interaction vital to the maintenance of subsistence alliances between groups. In a recent study concerning Paleo-Indian interaction, Hayden (1982) examines the fundamental reasons underlying the need for subsistence alliances among hunter-gatherers. He suggests that such alliances were largely a function of resource reliability. Poor or unreliable resources result in a need to maintain an elaborate, far-reaching alliance network to fall back upon in times of resource failure. This might be applicable to the Parkhill-Barnes interaction. If the subsistence economy of these Paleo-Indian populations was heavily dependent upon a single resource which is prone to periodic failure such as caribou (Fitzhugh 1972:170-172), neighbouring groups could have developed an alliance system which, among other benefits (Hayden 1982), would have provided assistance in times of low resource supply. This alliance system might have been maintained in part through exchanges of stone implements.

Chert Type Identification and the Interpretation of Seasonal Resource Exploitation and Population Movements

It is important to question why chert originating more than 175 km to the north is the dominant lithic material on sites in the southern range of the Parkhill complex, for ultimately the answer will provide clues to understanding significant aspects of Paleo-Indian lifeways. At present, these chert utilization patterns are best explained by the model suggesting the seasonal exploitation of resources (see Chapter I).

Movements of the Parkhill population between the northern and southern ranges of its territory are indicated by identification of cherts recovered on sites in these areas. The occurrence of Collingwood chert on sites in the southern range (e.g. Parkhill, Thedford II, McLeod, Dixon, Mawson, Stott Glen, and Mullin) effectively demonstrates a north to south movement from the Georgian Bay area to the southern Lake Huron area, a distance of about 175 km. A return movement from south to north is established by the occurrence of small amounts of Kettle Point chert, which originates in the south, on sites located in the northern range of the territory (see, for example, Storck 1978, Figure 5e).

Data compatible with the recurrent occupation of the northern range is found on the Fisher site (Storck 1982) near Georgian Bay. This site is characterized by a number of discrete occupation loci that are interpreted as evidence that the site was reoccupied on several occasions. Storck (1982:16) suggests: "The large size of the Fisher site and the diversity of knapping and other activities that are presumed to have occurred there suggest that the site may have functioned as an important base camp from which the surrounding area was exploited. The site could have been occupied by a number of bands on a single occasion, or, more likely, by one or two bands on an intermittent (possibly seasonal) basis over a number of years".

Bedrock outcrops of Collingwood (Fossil Hill) chert are located about 15 km to the west of the Fisher site. Although there is presently no conclusive data demonstrating that the Parkhill population exploited these outcrops during the summer or fall season, it is assumed that the procurement of chert would have been the most practical during warm weather. It is possible that cold weather might have imposed limitations other than discomfort that would have accompanied the knapping process in extreme cold. Access to the bedrock outcrops might have been restricted by snow (Deller 1979). Storck (1982:22) notes:

> Although seasonal restrictions on availability are usually thought of in connection with plant and animal resources, chert sources, whether consisting of in situ outcrops or glacially plucked and deposited nodules, may also have been accessible only during certain times of the year. The Georgian Bay region today lies in a prominent snow belt because of the combined effects of the Blue Mountain highlands and orographically induced precipitation and the abundant supply of moisture available to air masses moving across Lake Huron and Georgian Bay from the west and north across Lake Erie and Lake Ontario from the south. While climatic patterns may have been somewhat different during late glacial times when the region was presumably occupied by Early Paleo-Indian peoples, the orographic effects of the Blue Mountain highlands (although somewhat reduced because of isostatic depression of the land) and the moisture provided by the glacial lakes, such as Lake

> Algonquin, would almost certainly have created similar, if not more extensive, snow belt conditions in the region. If so, access to the chert sources may have been possible only during the snow-free seasons.

To counter the argument that the Parkhill population visited the northern part of their territory for the sole and express purpose of obtaining Collingwood chert, it is noted that the Paleo-Indians were aware of outcrops of excellent quality Onondaga chert within the southern part of their range, as indicated by the occurrence of small amounts of this lithic material on most southern range sites (see Tables 4 to 7). At present, the only reason that seems to explain the population movements between the southern and northern ranges of their territory a desire is to keep within or near the seasonal ranges of caribou.

Summary

The Parkhill complex is a Middle Paleo-Indian manifestation in the central Great Lakes region that appears to be intermediate between the Gainey complex, to which it is closely related, and the Crowfield complex. It is probable that it was contemporaneous with the terminal stages of Lake Algonquin and persisted for a short time after proglacial Lake Algonquin drained around 10 500 B.P. The principal diagnostic artifacts of the complex are Barnes points, which are similar to Gainey points except that they tend to have narrower bases, more pronounced fishtails, and their lower lateral edges expand above the fishtails to the maximum width of the point around its mid-section.

The Parkhill complex occurs on sites in Ontario, Michigan, Ohio, New York, and Wisconsin. In southern Ontario, its distribution overlaps with that of the Gainey complex, although it tends to be more heavily concentrated along the Algonquin shoreline. The occurrence of the complex in Michigan and southwestern Ontario is thought to be associated with at least two major social groupings. The Michigan group (or band) predominantly used Bayport chert in the manufacture of their stone implements. It is referred to as the Barnes population after the site of that name in Michigan. The Ontario group, referred to as the Parkhill population, ranged from the Georgian Bay area south along the Algonquin shoreline at least as far as the St. Clair river. This population made extensive use of Collingwood (Fossil Hill) chert, and less use of Onondaga chert and Kettle Point chert. They also used some Bayport chert which might have been obtained as gifts or through exchange with the Barnes group.

It is proposed that in order to exploit resources the Parkhill population moved throughout its territory on a seasonal basis. Some of these movements were related to the migratory habits of barren ground caribou. The major chert supplies for the duration of the cycle were obtained in the northern range of the territory at bedrock sources rather than from secondary deposits such as in glacial till or stream beds. It was manufactured into finished artifacts or advanced-stage preforms that were easier and more efficient to transport than unmodified materials.

Sites attributed to the Parkhill population in the southern range of its territory include Parkhill, Thedford II, Wight, McLeod, Dixon, and Schofield, which are situated in a proposed caribou migration corridor skirting the Thedford embayment of Lake Algonquin, the Mawson site on the Lake Warren shoreline, the Stott Glen site on the Lake Arkona shoreline, and the Mullin site located well inland from identifiable shoreline features. The Fisher site is located on the Algonquin shoreline in the northern range of the territory.

The Fisher and Parkhill sites are the largest and most extensively investigated sites. They are characterized by numerous occupation loci, which represent general work space associated with habitation areas, as well as special activity areas from which a limited number of implement types were recovered. Both sites probably were reoccupied several times as part of a seasonal round of resource exploitation. Fisher site occupations, some of which might post-date the draining of Lake Algonquin circa 10 500 B.P., occurred during warm weather seasons. There was more manufacturing of implements and preforms at Fisher than at Parkhill. At least some Parkhill site occupations were associated with the northward migration of caribou in the spring. Extensive rearming of weapons occurred at the north end of the camp, where more than 50 bases of fluted points were recovered in a small workshop area.

The Thedford II site is located near the Algonquin shoreline, about 7.5 km southwest of the Parkhill site. In contrast to the Parkhill and Fisher sites, the cultural remains at Thedford II appear to be the result of a single occupation. The site lacks widely scattered occupation loci, such as occur at Parkhill and Fisher, but there are concentrations of certain types of artifacts. At the south end of the camp, adjacent to a shallow ravine, concentrations of gravers were recovered. Few gravers were found at Parkhill. Collingwood (Fossil Hill) chert is the predominant lithic raw material in the Paleo-Indian assemblage at Thedford II, as it is at Parkhill and Fisher, but a larger proportion of Bayport chert was utilized in the manufacture of the chipped stone implements. There is a considerably lower ratio of implements to debitage at Thedford II than at Fisher, and its end scrapers show a wider range of variation (i.e. there are more types) than do those at the Parkhill site. End scrapers are rare at Fisher. Barnes points from both Thedford II and Parkhill generally have slightly wider basal widths than do their counterparts at Fisher. This might indicate that the Thedford II and Parkhill occupations are earlier than those at Fisher.

The McLeod site is located near the Algonquin shoreline about 1.5 km south of the Parkhill site and about 6 km northeast of the Thedford II site. It is characterized by three occupation loci, two of which have partially been excavated. It is unknown whether the occupations are contemporaneous. Although the majority of the artifacts that have been recovered are attributed to the Parkhill complex, isolated surface finds include a point attributed to the Hi-Lo complex, and fragments of two fluted point preforms that might represent a transitional form between Barnes points and Crowfield points.

In conclusion, the Parkhill complex is one of the best understood Paleo-Indian manifestations in the Northeast. Yet much remains to be learned. The precise chronology of the complex and its environmental context need to be more clearly established, and the significance of variation among sites of the complex and those of other archaeological manifestations must be determined. While some of this can be accomplished through vigorous analyses and re-analyses of the existing data, it is obvious that the data base must be increased substantially.

CHAPTER VI

THE CROWFIELD COMPLEX

Introduction

The Crowfield complex is a Paleo-Indian manifestation in the Great Lakes region that is attributed to one of the last populations to manufacture fluted points in the Northeast. The principal diagnostic artifacts of the complex are Crowfield points which are named after the Paleo-Indian component on the Crowfield site in southwestern Ontario (Deller and Ellis 1984). The complex appears to be closely related to the Holcombe complex that probably succeeded it in this region.

Crowfield Complex Manifestations in Southwestern Ontario

The Crowfield complex has a widespread distribution in the southern Great Lakes region and possibly beyond. Figure 34 shows the location of sites and find spots where Crowfield complex materials have been found. Relevant summary data are given in the legend of Figure 34, and additional information concerning some of the sites and loci are presented below.

Location 2 represents the locus where the base of a Crowfield point manufactured from Onondaga chert was recovered on Lot 20, Concession IV, Caradoc township, Middlesex county, Ontario, at grid reference 592529 (St. Thomas 40 1/14, Edition 3, W 1/2). It was found by Mr. George Traubenberg of Mount Brydges at an elevation of 246 m a.s.l. on the farm of Mr. Frank Kovacs. The artifact has rapidly expanding lateral edges from a narrow (21 mm), slightly concave (1.5 mm), bevelled base. Fluting consists of one wide scar on the first face fluted, and three overlapping scars struck from right to left on the second face to be fluted.

Other Paleo-Indian artifacts recovered near the base include a small, thin, fluted point manufactured from Onondaga chert (Deller 1976a, No. V). It is similar to most Crowfield points in thinness (i.e. 4 mm) and technique of fluting (i.e. multiple flutes struck from a bevelled base), but its outline shape bears more resemblance to Barnes points. It might represent a transitional form between Barnes points and Crowfield points.

Location 4 represents the find spot of a Crowfield point base on Lot 7, Concession III, Westminster township, Middlesex county, at grid reference 876528 (London 40 1/4, Edition 4). It was discovered in 1976 in a cultivated field on the Grieve IV site (AfHj-11) by Mr. James Keron of Thamesford, Ontario. It was found on the crest of a ridge at an elevation of 268 m a.s.l. The ridge is situated north of a low swampy area that is drained by Dingmans Creek. A broken projectile tip, possibly of a fluted point (Keron: personal communication) was recovered at the same location.

Location 5 represents the locus where Mr. William Rice recovered a Crowfield point (see Figure 12, No. 6) on Lot 18, Concession X, South Norwich township, Oxford county, Ontario, at grid reference 298491 (Tillsonburg 40 1/15, Edition 4). This location is situated on the north bank of the Otter Creek, at an elevation of 238 m a.s.l., just below the shoreline ridge of proglacial Lake Whittlesey. The artifact is manufactured from Collingwood chert. It is 64 mm long (allowing for a recent break on the tip), 32 mm wide, and 4 mm thick. Fluting on the first face to be fluted measures 44 mm in length, and 29 mm in maximum width. Fluting on the opposite face was accomplished by the removal of two long flakes (36 mm and 29 mm) and one short (8 mm) finishing flake. Maximum width of the fluting is 20 mm. The slightly concave base (2.5 mm) is lightly ground and grinding extends up one lateral edge for about 6 mm. Two potlid scars indicate that the point has been exposed to heat.

Location 6 represents the approximate location where a Crowfield point base was found by Mr. Robert Bass of Thedford, Ontario on Lot 20, Concession IV, Bosanquet township, Lambton county. The artifact is manufactured from Kettle Point chert that outcrops a few kilometres west of where the artifact was recovered. The point has expanding lateral edges which appear to have been narrowed after the first face was fluted, as suggested by flake scars struck from the lateral edges that override the flute scars. There is a slight remnant of a shoulder just below the break on one lateral edge. The point has a steeply bevelled base with a concavity of 1 mm. Two flute scars are evident on the first face to be fluted, while the second face has two flute scars that have been partly overridden by two finishing flakes. The point has a planar cross-section and is 3 mm thick.

Location 7 represents the Hussey site (Storck 1979) in Essa township, Simcoe county, Ontario, where the basal fragment of a Crowfield point was recovered (ibid., Plate 16e). This site is located on the tip of a former peninsula of Lake Algonquin. A late Paleo-Indian component also occurs on the site (ibid.).

Location 8 represents the Zander site (Prideaux 1978) on the Algonquin shoreline in Simcoe county, Ontario. This site yielded at least one Crowfield point (see Storck 1982, Figure 7c), as well as other lanceolate projectile points that appear to belong to a Late Paleo-Indian component.

Locations 9 and 10 represent the Udora and Watpool sites on the Algonquin shoreline in southcentral Ontario (Storck 1982). The recovery of Crowfield points (ibid. Figure 7f, g) on these sites suggests the presence of components attributable to the Crowfield Complex.

THE CROWFIELD SITE (AfHj-31)

Introduction and History of Investigation

Crowfield (AfHj-31) is a multi-component site on the Caradoc sand plain in southwestern Ontario (see Figure 34, Location 1). Although the site has a substantial Late Woodland (Glen Meyer) occupation, it is best known for its Paleo-Indian manifestations, hereafter described.[a] The Glen Meyer occupation was first discovered by the author and Mr. Reynold Welke during a 1968 survey for prehistoric sites. Sherds of pottery, thermally cracked rock, and chipping debris were recovered in a cultivated field on a low, sandy knoll at the junction of a small stream and a shallow gully. The site was named Crowfield after a flock of noisy crows that seemed reluctant to surrender the peninsula to the survey effort.

In April 1981, the author identified a fragment of Collingwood chert in a collection of about 50 flakes that had been gathered from the surface of the site by Joe Pelly. Pelly, a Caradoc South Public School student who frequently assisted the author in archaeological field reconnaissance, was encouraged to try to locate additional samples of this material, which is highly diagnostic of Early Paleo-Indian sites in the area. The next day Pelly located three small bifacial fragments, which appeared to have been heat shattered. The author surveyed the locus of these finds with Pelly and several more heat shattered fragments made from Collingwood chert were recovered on the sandy knoll. It was thought that the fragments might have originated in a Paleo-Indian feature with potential for radiometric dating. Therefore it was decided to evaluate the site through test excavations.

Excavations were carried out on the site between August 15 and September 2, 1981, and June 1 and August 13, 1982. The work was financed in part by the Ontario Heritage Foundation. Mr. C.J. Ellis served as field foreman during the first season's work and Ms. Juliet Garfit directed excavations during the second field season.

Location and Physiographic Setting

The Crowfield site is located on the farm of Mr. Joseph Willaeys on the east quarter of Lot 12, Concession V, Caradoc township, Middlesex county, Ontario, at grid reference 547505 (Strathroy 40 I/13, Edition 4). The location is situated near the western edge of the Caradoc sand plain, a feature of gently rolling terrain covering approximately 780 square kilometres. The sand plain is a product of glacial meltwater discharges into the standing waters of proglacial Lake Whittlesey (Chapman and Putnam 1966:86, 236-237.). The sandy soils of the plain have been extensively cultivated since the pioneer settlement of the area beginning in the 1820s. At present, crops of corn, tobacco, beans, rye, hay, and potatoes serve as the agricultural basis of the area, and woodlots of mixed maple, beech, oak, hickory, and ash are interspersed with the cultivated fields and an occasional apple orchard. The sand plain was extensively occupied in prehistoric times and most farms have yielded collections of assorted Archaic and Woodland artifacts that were gathered, for the most part, years ago when farming was less mechanized.

The Paleo-Indian component on the Crowfield site is concentrated in an area of about 150 square metres on a low sandy knoll at an elevation of 234 m a.s.l. The knoll is bordered on the west by a shallow, wooded gully that curls around to the south of the site, where it eventually feathers out. About 100 m north of the site is a small tributary stream that flows westward to intersect the Sydenham River about 12 km from the site as the crow flies.

The Crowfield Paleo-Indian Occupation

Evidence of Paleo-Indian occupation consists of a thin scattering of artifacts and two features, spaced about 7 m apart, that contained large quantities of heat shattered implements and preforms (see Table 8 for Paleo-Indian artifact inventory). The distribution of the cultural material is shown in Figures 35 and 36.

Lithic Raw Materials

Paleo-Indian artifacts from the Crowfield site are manufactured from a limited number of lithic raw materials. Onondaga chert constitutes approximately 74%, Collingwood chert about 24%, and quartz, granite, and unidentified cherts approximately 2%. Evidence that the lithic materials associated with features 1 and 2 had been exposed to intense heat include: 1) the highly fragmented nature of the artifacts, many of which were shattered into 10 or more pieces, 2) the large numbers of potlid scars on the faces of the artifacts and on the exposed fracture surfaces, 3) colour differences among various fragments of the same artifact caused by differential exposure to heat, and 4) the nature of the fractures, including irregular shapes, curved fractures in plan view, and highly pitted and irregular "sugary" fracture surfaces (see Purdy 1975).

Feature 1

On the second day of excavations, a dense concentration of heat shattered fragments of Onondaga chert and Collingwood chert was found in the ploughzone of subsquares 3 and 4 in

402N-404E. By the end of the fieldwork day, the ploughzone-subsoil interface had been exposed and the artifact concentration had been photographed and plotted on scale maps. It was evident that this concentration extended into the subsoil as well as into the adjacent squares.

Upon return to the site the following morning, we found that the feature area had been disturbed by pre-school children during our overnight absence from the site. This disturbance was confined to a small area in the ploughzone above the feature in the adjoining squares that had not been excavated, and a small shallow area of subsoil (about 10 cm) in the presumed centre of the feature. A large number of heat shattered fragments were recovered in the loosened backdirt of this disturbance. Later, the children returned the fragments they had removed. We feel confident that all of the displaced artifactual material has been recovered.

After the ploughzone from subsquares 1 and 2 in 404N-404E had been removed and screened, the entire Paleo-Indian feature 1 was exposed at the ploughzone-subsoil interface. Although no outline of the feature could be discerned, the plotted in situ materials suggest that the feature was circular in plan with a diameter of approximately 1.5 m. Since no plan outline was visible, half of the feature was excavated to determine if an outline could be distinguished in profile. No outline was visible, however, and at present the shape of the feature has been established through the three dimensional plotting of artifacts and fragments. Deller and Ellis (1984) note:

> Based on the plotting of ca. 1400 items in the feature, it was roughly circular in plan, having a diameter of ca. 150 cm. In profile, the feature was a shallow basin and extended approximately 20 cm into the subsoil. However, since it was plow-truncated, it obviously had been deeper. Assuming the surface was the same as that in the field today (a questionable assumption since plowed fields on the Caradoc Sand Plain are easily deflated by the combined action of wind, water and continued cultivation) and given that the plowzone averages 24.25 cm deep in the feature area, this suggests an original depth of ca. 45 cm.
>
> Visible disturbance of the feature is confined to tree root encroachment. A large well-defined root cut across the southwestern edge of the feature and to a depth below that of the feature itself. Several lithic fragments from the feature collapsed into this root, resulting in the recovery of debris at much lower depths in the root disturbed area than in areas to the north.

Several heat shattered fragments of artifacts were recovered in the excavations adjacent to the feature that fitted onto fragments recovered within the feature. The distribution of these fragments is shown in Figure 37. These fragments probably originated within the feature, where they were shattered by heat, and were scattered outside the feature area in recent times as a result of cultivation or levelling of the land. The landowner reported that he levelled a small knoll to the northeast of the feature, but he didn't think that this activity disturbed the area of archaeological excavations.

Feature 1 Artifacts

More than 4000 heat shattered fragments of artifacts were recovered from feature 1. After refitting, it appears that approximately 200 implements and preforms are represented (see Table 9 for inventory summary). This constitutes about 80% of the total artifact assemblage from the site.

Fluted Bifaces

At least 31 fluted bifaces have been reconstructed in whole or in part from the heat shattered fragments associated with feature 1. These represent 18.1% of the feature 1 assemblage. They have been grouped into three categories:

1) Fluted projectile points (Figure 38). There are ten fluted points manufactured from Onondaga chert and nine manufactured from Collingwood chert. There are no apparent differences in form between artifacts manufactured from these materials. They are considered to be finished points rather than advanced stage preforms, because they have grinding on their lower lateral edges. Some appear to have been resharpened, which emphasizes their pentagonal outline.

2) Shouldered fluted bifaces (Figure 39, Nos. 1-4). Seven fluted bifaces from feature 1 have shoulders on one lateral edge. Six of these are manufactured from Onondaga chert and

one is made from Collingwood chert. These artifacts are similar to the fluted points, with the exception of the shoulders. It is possible that they were used as knives rather than as projectile points.

3) Fluted preforms (Figure 39, Nos. 5-8). At least five artifacts from feature 1 are preforms for fluted points. Four of these are manufactured from Onondaga chert and one is made from Collingwood chert. These bifaces have outlines ranging from rectangular to lanceolate. Generally, they have rounded tips and are fluted or basally thinned. Bases lack grinding, ears, and basal concavities. One preform (Figure 38, No. 6) is fluted from opposite ends.

Bifacial Preforms

At least 45 bifacial preforms representing 26.3% of the feature 1 assemblage were recovered. These have been grouped into two categories:

1) Plano-convex preforms (Figure 40). Thirty Onondaga chert artifacts and nine Collingwood chert artifacts are assigned to this category. These artifacts generally are oval in shape and plano-convex in transverse cross-section. They are considered to be preforms rather than finished artifacts because they lack fine secondary marginal retouch and their edges frequently retain evidence of platform preparation for

the removal of thinning flakes. This evidence is manifested in the form of grinding and bevelling. Deller and Ellis (1982) have argued that:

> ...they are preforms for other tools, especially points. Certainly, with two possible exceptions, they are large enough to be made into points and they are beginning to approximate the width to thickness ratio range of the fluted bifaces. As Callahan (1979) has emphasized, such ratios must generally be obtained prior to final retouch and fluting.

Unheated fragments of one plano convex biface (Figure 40, No. 7) were recovered adjacent to the feature. The rest of the artifact was recovered in heat shattered condition in the pit. It appears that the artifact had been struck a blow in the centre of one face which split it into three fragments. Two of these were recovered to the west of the feature. The third fragment had been placed in the feature where it refractured due to heat. The significance of this artifact for the interpretation of the site will discussed later.

2) Biconvex preforms. Four biconvex preforms have been pieced together, of which three are manufactured from Collingwood chert and one from Onondaga chert. These artifacts are intermediate in size and refinement of flaking between the plano-convex preforms and the fluted preforms.

Backed Bifaces (Figure 42)

Fourteen bifaces are assigned to this type, which constitutes 8.1% of the feature assemblage. Eleven of the artifacts are manufactured from Onondaga chert and three from

Collingwood chert. They are described by Deller and Ellis (1984:46):

> These tools exhibit a flat "back" along one lateral edge. The back occasionally exhibits a small amount of retouch but in most cases it is an unaltered surface. This surface can be a bend or snap break, an unaltered surface of the original flake blank, or a purposefully created surface formed by a deliberate burin-like blow directed from a thick base. The back is offset towards one end of the biface (the base) such that the other end (the tip) is thin and bifacially retouched on both margins. In transverse section, the back is slightly canted such that its junction with one face of the biface is relatively acute, whereas the juncture with the other face is obtuse. At the acute juncture, the back is frequently used as a striking platform for the removal of large thinning flakes over the biface surface. This is not the case at the opposite juncture, probably because it is too obtuse to allow such removals. Instead, the surface near the obtuse juncture with the back is thinned by long removals from the base.
>
> These artifacts probably are knives. Similar implements have been found in Parkhill complex assemblages on the Parkhill, Thedford II, and Wight sites, and in the Hi-Lo complex assemblage from the Stewart site. As they are not known to occur in later assemblages, it is proposed that they are diagnostic of Paleo-Indian or transitional Paleo-Indian/Archaic assemblages in the Great Lakes region. Outside this region they are rarely, if ever, reported. However, it is possible the sway-backed knives at the Plenge site (Kraft 1973:85) are similar to this artifact type.

Crowfield Bifaces (Figure 43, Nos. 1-4)

Seven artifacts constituting 4% of the feature 1 assemblage are included in a distinctive artifact type previously unreported from other Paleo-Indian assemblages. All are manufactured from a light grey variety of Onondaga chert. They are roughly leaf shaped in outline and are characterized by finely executed serial flaking. Flake scars generally are long and parallel sided. The artifacts, hereafter called Crowfield bifaces, are thin with the exception of a bulb or knob that occurs on one of the contracting ends. Probably this represents the remains of the bulb of percussion of the flake blank from which the artifact was manufactured.

It is suggested that these artifacts are finished implements rather than preforms. This is based on their fine edge retouch, surface finish, and small size, which preludes them being preform stages of any other tool type in the assemblage, with the exception of drills. It is possible that they might be a type of knife. Also, they might represent specially made mortuary items. Further research is necessary to elucidate their function.

Alternately Bevelled Bifaces

Three Onondaga chert artifacts from feature 1 are attributed to this type (Figure 43, Nos. 5, 6, and 8). These large, well-made bifaces are roughly diamond shaped and have flat cross-sections. Alternate edge bevelling on one end might have resulted from continued unifacial resharpening. One of the specimens is smaller and has straighter edges and more pointed ends which possibly result from increased resharpening.

Alternately bevelled bifaces occur in other Paleo-Indian complexes in the Great Lakes region. They have been found on the Parkhill site and Thedford II site of the Parkhill complex and at the Hussey site (Storck 1979:Plate 18a), which has a Crowfield complex component.

Drills (Figure 43, Nos. 9, 10)

Several fragments of rod-like bifaces with diamond-shaped cross-sections were recovered in feature 1. These artifacts are manufactured from Onondaga chert. Although they are highly fragmentary, at least two artifacts are represented. To date, neither bit ends nor hafting elements of these artifacts have been located.

Other Bifaces

One bifacial artifact manufactured from Onondaga chert has a constriction near one end (Figure 43, No. 7). The short segment beyond the constriction exhibits fine marginal retouch, while the longer segment is roughly, and in some areas only unifacially, flaked. This latter segment gives the appearance of being a handle or hafting element.

Tool Blanks (Figure 44)

Thirty-nine Onondaga chert artifacts and two Collingwood chert artifacts are unmodified flakes that are considered to be blanks for tools. These artifacts constitute 22.8% of the feature 1 assemblage. They are classified into two types:

1) Wedge shaped blanks. There are at least six unmodified flakes of Onondaga chert that have triangular cross-sections (see Figure 44, Nos. 1-4). These artifacts probably are blanks for backed bifaces.

2) Flake blanks. Thirty-three Onondaga chert artifacts and two Collingwood chert artifacts are included in this category (Figure 44, Nos. 5-12). Many of the larger flakes were either struck off the corner of a large tabular core, or else were removed from extremely large bifaces.

Side Scrapers (Figure 45, Nos. 1-9)

Twenty-four side scrapers represent 14.0% of the feature 1 assemblage. Of these, 23 are manufactured from Onondaga chert and one from Collingwood chert. Eight of the side scrapers have at least one concave working edge.

Gravers (Figure 45, Nos. 11 and 12)

Three Onondaga chert artifacts in the feature 1 assemblage are classified as gravers. Two of these are made on flakes and have double spurs and at least one working edge. The other has a slender spur chipped onto a small flake.

Beaked Scrapers

Two beaked scrapers manufactured from Onondaga chert were recovered in feature 1. One is illustrated in Figure 45 (No. 10). Both have lateral edges that converge to a long, slender point or beak.

Narrow End Scraper (Figure 45, No. 13)

The feature 1 assemblage contained one narrow end scraper (groover) manufactured from Onondaga chert.

Utilized Flakes

There are two utilized flakes in the feature 1 assemblage. One is manufactured from Collingwood chert and the other from Onondaga chert. Both have slight edge wear in the form of small chips that suggest they might have been used to cut or scrape a hard surface.

Channel Flakes

Five Onondaga chert channel flakes are associated with feature 1. Attempts at matching these to the fluted points from the site have been unsuccessful. Since there is little manufacturing debris on the site, it is concluded that they were likely brought to the site from elsewhere and placed in the feature because they represented potential use as flake implements or preforms for small tools such as gravers.

Unidentified Tool Fragments (Figure 46)

There are several hundred fragments of unifacial and bifacial implements from feature 1 that have not been refitted. These are manufactured from Collingwood chert and Onondaga chert.

Granite Tools

Two artifacts associated with feature 1 are not manufactured from chert. One is a granite core tool that was recovered <u>in situ</u> in the central part of the feature. Although it is badly heat damaged, its gross attributes can be discerned. It is roughly square in outline (see Figure 47) and has intermittent flake removals on three margins. The fourth margin exhibits considerable smoothing and edge rounding. The function of this implement has not been determined. It is possible that it was some sort of chopping tool. Also, it might have been used to scoop out the depression in which the fire was built.

The second artifact is a small, round, granite cobble that was recovered in the ploughzone directly above feature 1. As a result of heavy damage due to heat and recent breakage due to being struck by a plough, its original form is difficult to determine. It is possible that the artifact was a hammerstone.

The source of the raw material for these implements has not been identified. The sand plain in the immediate vicinity of the site is stone free. The nearest source where the raw material might have originated would be in till about seven or more kilometres to the east. Later Archaic and Woodland societies that occupied the locality imported large quantities of granite cobbles, presumably for stone boiling, which Ontario Paleo-Indians rarely, if ever, practised.

Calcined Bone

A large amount of calcined bone was recovered mainly from the ploughzone at the Crowfield site. The distribution of this material generally coincided with the heaviest concentrations of Glen Meyer remains southwest of feature 1. For this reason it is thought to be associated with the Late Woodland component. Nevertheless, several fragments of calcined bone were recovered in the ploughzone above feature 1, and 13 small fragments were recovered in the subsoil in the feature 1 area. These fragments are thought to be intrusive from the Late Woodland component (Deller and Ellis 1984). Although none of the bone could be positively identified as to species, the small diameter and thick cortex on some fragments suggested they were non-human.

Feature 2

Feature 2 is situated about 7 m northwest of feature 1 (see Figure 35). It consists of a concentration of several hundred heat shattered fragments of implements, preforms, and blanks manufactured from Onondaga chert and Collingwood chert. Most of these were recovered in the ploughzone of an area measuring about 14 square metres centred around square 406N 398E. The concentration probably extends into two unexcavated squares to the west and northwest and represents a broader area of artifact concentration than that associated with feature 1. Like feature 1, no outline could be discerned in plan or profile view. The parameters of the feature are distinguished by the distribution of artifacts.

Burned Artifacts from Feature 2 and Area

Fluted Bifaces

One fluted point similar in morphology to those from feature 1 was recovered (see Figure 48, No. 1). Ridges between flake scars on this point are heavily worn, which gives the artifact a smoothed appearance, yet the heat fractures on this point are crisp and sharp. This indicates that the wear occurred before the artifact shattered in the fire.

In addition to the relatively complete fluted point, there are five fragments of at least two other fluted bifaces in the feature 2 assemblage. All are manufactured from Onondaga chert.

Bifacial Preforms (see Figure 48, No. 4)

Several heat shattered fragments in the feature 2 assemblage appear to be remnants of oval bifaces similar to those in feature 1. This is based on thickness, outline shape, and flaking properties. At least two artifacts, or 5.5% of the feature assemblage, are made from distinctive varieties of Collingwood chert. It is probable that others are too fragmentary and/or indistinct to be recognized.

Alternately Bevelled Biface (Figure 48, No. 3)

Three Onondaga chert fragments have been pieced together to form the tip of an alternately bevelled biface.

Tool Blanks

Fragments of at least seven unifacial tool blanks similar to those of feature 1 have been identified. These constitute approximately 19.4% of the recognized artifact types in feature 2. There is at least one wedge shaped blank manufactured from Onondaga chert (see Figure 48, NO. 13). Three unmodified flake blanks are manufactured from Onondaga chert and three are made of Collingwood chert.

Gravers (Figure 48, Nos. 9-12)

There are five single spurred gravers made on flakes in the feature 2 assemblage. These represent 13.8% of the recognized artifacts. Three are manufactured from Collingwood chert and two are made of Onondaga chert.

Narrow End Scraper (Figure 45, No. 14)

One narrow end scraper manufactured from Collingwood chert was recovered in feature 2.

Utilized Flakes

There are four utilized flakes in the feature 2 assemblage representing 11.1% of the artifacts. All appear to have been bifacial thinning flakes. Two are manufactured from Collingwood chert and two are made of Onondaga chert.

Channel Flakes (Figure 48, No. 2)

Two Onondaga chert channel flake fragments were recovered from feature 2. These represent 5.5% of the recognized artifact total.

Feature 2 Interpretations

There are significant similarities and differences between features 1 and 2.

Similarities include: 1) Both features consist of a concentration of heat shattered artifacts; 2) these artifacts are manufactured from Onondaga and Collingwood chert; 3) few differences are discernible in the size of the fragments and the nature of their fractures, which might indicate that the heat was approximately of equal intensity in each feature; 4) both features contain a wide variety of blank, preform, and implement types; 5) there appear to be missing artifact fragments from both features, although some from feature 2 might remain in the unexcavated area; and 6) both features represent artifact disposal patterns (i.e. the burning of relatively large numbers of blanks, preforms, and functional implements) rarely reported for habitation or workshop sites.

Features 1 and 2 differ in at least three significant respects: 1) Feature 1 contains at least four times as many artifacts as feature 2; 2) although there are fewer artifacts in feature 2, they are dispersed over a larger area. This is not due to ploughing, which would have scattered the feature along a northeast-southwest axis, and 3) the composition of the features varies in terms of artifact types and ratios. Feature 1 does not contain end scrapers, one of the most frequently occurring tool types on most Paleo-Indian sites. Feature 2 does not contain backed bifaces, lozenge shaped (Crowfield) bifaces, or drills. Feature 1 contains a higher proportion of bifacial implements. Sixty percent of the feature 1 artifacts are bifaces, in comparison to only 17% of the feature 2 artifacts. Fifty-five percent of the feature 1 artifacts are preforms, whereas 70% of the feature 2 artifacts appear to be finished implements.

Unheated Artifacts

At least 23 Crowfield artifacts show no evidence of heating. The distribution of these is shown in Figure 49.

Fluted Point Preform

The fluted point preform (Figure 49, No. 1) is manufactured from Onondaga chert. It broke during fluting of the second face when the channel flake hinged through the preform and, at the same time, an ear was sheared off by a perverse fracture. It is unknown if this artifact was being manufactured for placement in one of the features.

Bifacial Preforms

One complete plano-convex preform similar to those reconstructed from feature 1 fragments was recovered on the site (see Figure 49, No. 2). It is manufactured from Collingwood chert. In addition, there are 10 artifact fragments manufactured from Onondaga chert that are attributable to this category. Eight of these fragments exhibit bend or snap breaks on two or more, often opposing, margins. This suggests purposeful breakage (Deller and Ellis 1984:21). Two of the unheated fragments fit onto a heat shattered plano-convex preform recovered in feature 1.

Tool Blanks

There are four flake blanks manufactured from Collingwood chert that are similar to those associated with features 1 and 2.

Side Scrapers (Figure 49, Nos. 4-7)

Two side scrapers manufactured from Onondaga chert and two from Collingwood chert were recovered. One has steep retouch that might have served as backing along one lateral edge.

Gravers (Figure 49, No. 11)

There are four unheated gravers from the Crowfield site. Three are is manufactured from Onondaga chert and the other is manufactured from Collingwood chert.

Denticulates

Two denticulates are included in the unheated assemblage. One was formed by serially snapping an edge as described by Gramly (1982:41). This denticulate was made on a bifacial thinning flake of Collingwood chert (see Figure 49, No. 8). The other is made on a large flake blank of Onondaga chert.

Notches (Figure 49, No. 9)

Two unifacial implements manufactured from Collingwood chert have a notch chipped into one lateral edge. Similar artifacts are known in Parkhill complex assemblages (Deller 1979:No. 24h).

Utilized Flakes

Three utilized flakes of Collingwood chert were found on the site. There are several utilized flakes of Onondaga chert but it is difficult to determine their cultural association.

Waste Flakes

Several unheated flakes of Onondaga chert and a few flakes of Collingwood chert were recovered on the site. This material has not been examined in detail. It should be noted that some of the Onondaga chert flakes are probably associated with Woodland or Archaic components.

Interpretation of the Unheated Assemblage

The nature of the occupation that accounted for the unheated assemblage on the Crowfield site presently is not clearly understood. The artifacts might have been discarded in the usual context of habitation and/or workshop occupation or they might be related to ritual activities associated with the features.

The Uniqueness of Crowfield

The majority of Paleo-Indian sites that have been found in North America are associated with habitation and/or resource exploitation. These include base camps, such as Lindenmeier, Debert, Shoop, and Parkhill; sites associated with the killing of game animals, such as Naco, Lehner, Folsom, and Olsen-Chubbock; and sites related to the quarrying and reduction of lithic raw materials, such as West Athens Hill, Thunderbird, Williamson, and Wells Creek. These types of site have provided significant data concerning Paleo-Indian technological systems and their relationships to the Paleo-environment. Technology, and to a lesser extent subsistence, are among the best known aspects of Paleo-Indian lifeways. Nevertheless, they have provided limited data that can be used to explore other important aspects of Paleo-Indian culture.

The Crowfield site provides a data base that differs in five significant respects from those of most other Paleo-Indian sites:

1) On the vast majority of known sites associated with fluted point industries, artifacts were manufactured, maintained, and used for the exploitation of resources. Implements were discarded most frequently after they broke during use, or had become worn out through use and

resharpening. In contrast, at Crowfield there are significantly different patterns of artifact use and disposal. Large quantities of artifacts at various stages of manufacture and use were intentionally destroyed. The majority of these artifacts were burned, and some were smashed prior to burning. This treatment of material goods clearly is different from that associated with the majority of fluted point industry sites.

2) No debitage resulting from the manufacture or maintenance of Paleo-Indian implements was recovered in the features and little, if any, associated with the Paleo-Indian component was recovered in the area surrounding the features. Similarly, there is little evidence of manufacture or breakage in the heated assemblage that would indicate practical or technological reasons for the discard of the artifacts. It would appear that the focus of activities on the site involved the breaking and burning of the artifacts. This contrasts with the variety of activities generally associated with base camps and, of course, is different from what is found on kill sites and sites associated with the exploitation of lithic raw materials.

3) There is no evidence of artifact breakage as a result of use in the Paleo-Indian assemblage. This contrasts with the broken or damaged artifacts that are often recovered from workshop areas and base camps. This lack of use damage is readily apparent, for example, in two classes of artifacts:

fluted points and alternately bevelled bifaces. Unlike many fluted points discarded at base camp sites, the Crowfield points do not have impact fractures on their tips, transverse snaps across their midsections, and ear damage resulting from projectile use. Furthermore, Paleo-Indian base camps are often characterized by relatively large numbers of fluted point bases. At the Parkhill site, the ratio of fluted point bases to complete points is approximately 20 to 1. Bases of fluted points broken through use have not been recovered on the Crowfield site. Yet Crowfield has produced more complete fluted points than many large and extensively excavated sites, such as Parkhill and Debert. Moreover, the two alternately bevelled bifaces from Crowfield are the only known tools of this type that are complete. Only broken and/or recycled specimens have been recovered from other Great Lakes area sites such as Thedford II, Parkhill, and McLeod.

4) The Crowfield assemblage contains several tool forms that are seldom recovered in quantity from known occupation sites. These include finished implements, such as Crowfield bifaces and backed bifaces, and preform stages, such as the large flake blanks and simple plano-convex bifaces.

5) Whereas feature 1 on the Crowfield site contained large numbers of almost every known Paleo-Indian artifact type commonly found on Great Lakes area sites, and some that are rarely found, one of the most frequently recovered Paleo-Indian

artifacts did not occur. No end scrapers were recovered from the feature, nor were there flake blanks highly suitable for efficient manufacture into these implements. The lack of end scrapers seems even more unusual in light of the rest of the feature 1 assemblage, which includes large quantities of almost every other artifact type.

Comparison of the Crowfield and Renier Sites

Although the Crowfield site does not have known counterparts among fluted point industry sites, it is similar in several respects to the Late Paleo-Indian Renier site (Mason and Irwin, 1960) in Wisconsin. The Renier site is a Cody complex cremation burial that was located on a sandy shoreline ridge attributed to proglacial Lake Algonquin. Associated with the site were calcined fragments of human bone, thermally cracked rocks, and several heat-shattered artifacts, consisting of Eden and Scottsbluff points, large oval bifaces in various stages of manufacture, an end scraper, and an unheated combination side and end scraper.

Similarities between the Crowfield and Renier sites include the heat shattered nature of the artifacts, the lack of debitage on the sites derived from the manufacture of Paleo-Indian implements, the presence of artifacts in various stages of manufacture, and the location of both sites on sand dunes in the vicinity of proglacial lake strandlines.

Differences between the sites include the greater variety of tool forms at Crowfield, the obvious differences in projectile point typology, and the lack of fire cracked rocks and calcined human bone at Crowfield, although the latter might have been present and deteriorated. Regardless of these differences, it is believed that Renier and Crowfield served the same function.

Interpretation of the Features

Although a small handful of unheated Paleo-Indian artifacts of types generally associated with base camps were recovered from scattered loci around the two central features, the main activities at the site undoubtedly were associated with two features. These features are considered to be cremation burials. This interpretation is based on similarities between Crowfield and Renier and other later sites where similar artifact breakage patterns are associated with cremation practices (e.g., Binford 1963; Dincauze 1968; Pfeiffer 1980).

The major drawback to the cremation interpretation of the Crowfield features is the lack of calcined skeletal remains. Nevertheless, considering the antiquity of the features and the acidic soil conditions typical of the Northeast, it is not surprising that organic substances did not survive. Many Archaic and Woodland sites more recent than Crowfield that have been investigated on the Caradoc sand plain have failed to produce faunal remains (Ellis 1984). When faunal remains are present on these sites, they are frequently in badly deteriorated condition.

Alternatives to the Cremation Interpretation

Since the data in support of the cremation interpretation of Crowfield are equivocal, it is expedient to consider alternative explanations of the phenomena. The following are some of the alternatives that have been considered:

1) The Paleo-Indian features at Crowfield might represent pits where lithic raw materials were accidently over-exposed to heat during thermal alteration designed to improve flaking qualities. This is plausible in light of the suggestion (Callahan 1979; Crabtree 1966; Fitting et al. 1966; Purdy 1975) that heat treatment of lithic materials was a frequent Paleo-Indian practice. Yet, there are at least two considerations that seriously weaken the argument for accidental breakage during thermal alterations. First, it is improbable that the numerous finished artifacts in the features would require heat treatment after they had reached their finished form. Second, it is difficult to explain why some artifacts were intentionally smashed prior to being placed in the fire.

2) The Crowfield features might represent middens, where broken or worn out implements were disposed. This interpretation does not reconcile the presence in the features

of obvious tool blanks, preforms, and complete implements with considerable remaining functional utility. Also, such disposal patterns are unknown on other Paleo-Indian sites.

3) Considering the location of the features in an area that was obviously occupied by Glen Meyer populations, the heat shattered Paleo-Indian implements might represent lithic materials that were found and destroyed for some undetermined reason by later groups. This interpretation can be negated by two considerations. First, if the artifacts had been burned in Glen Meyer times, the features would be more distinct in appearance, as are other Glen Meyer features on the site. Second, even if the Glen Meyer population did recover and subsequently destroy Paleo-Indian artifacts, the uniqueness of the assemblage still requires explanation.

4) The Crowfield features might represent a burnt offering of some sort not associated with mortuary rituals.

5) The Crowfield features might be associated with a custom such as potlatching, involving the destruction of material goods. However, this seems unlikely, given the presumed small-scale, egalitarian nature of Paleo-Indian society.

6) The Crowfield features might represent a custom for which there is currently no ethnographic analogy.

Missing Artifact Fragments

Most artifacts from the Crowfield Paleo-Indian features have portions that have not been reconstructed. Although some of these portions eventually might be reconstructed from the several hundred unmatched fragments in the Paleo-Indian assemblage, it is my general impression that there are not enough unmatched fragments to account for all of the missing portions. In other words, it is possible that numerous artifact fragments were not recovered in the excavations. Yet, extreme care was taken in the field to recover all lithic materials and all backdirt was carefully screened. In fact, during the second season of field work, most of the squares in the feature 1 area that had been excavated during the first season's fieldwork were re-excavated and screened a second time. Apart from deepening the excavated area, this re-excavation demonstrated that very few artifact fragments were missed during the first season's fieldwork. It is possible that a few of the missing fragments from feature 1 might lie beyond the excavated area, but figure 36 suggests that the limits of the artifact yielding area generally had been reached.

Similarly, the artifacts from the Renier site are largely incomplete, although the reporting on this site (Mason and Irwin 1960; Mason 1981) does not indicate whether or not there are unmatched fragments remaining in the excavated assemblage.

Three alternatives can account for missing artifact fragments at Crowfield:

1) The Paleo-Indian features might represent burials of lithic materials that were burned elsewhere and transported to Crowfield for interment. It is possible that some fragments were missed by the Paleo-Indians when they swept up the burned materials for transportation. The burning of the materials away from the Crowfield pits might also account for the absence of visible soil conditions usually associated with heat, such as fire reddened and/or fused sand in the feature areas. 2) The features might represent cremation pits where several artifact fragments were swept up with the cremated bone for burial elsewhere.

3) Some artifacts might have been incomplete when they were placed in the feature by Paleo-Indians.

The Case for in situ Cremation

Despite the lack of charcoal and visible evidence of soil alteration due to heat, I believe that the Paleo-Indian artifacts were burned <u>in situ</u> on the Crowfield site. Support for this can be derived from the artifacts that were smashed on the site before they were burned. The unlikely alternative is that the artifacts were smashed on the site, taken away from the site for burning, and then returned to Crowfield for interment.

Interpretation of the Feature 1 Artifact Composition

The lack of end scrapers in the feature 1 assemblage is unusual, since end scrapers are one of the most frequently occurring artifact types on most Paleo-Indian sites. This lack cannot be attributed to sample size, inasmuch as large numbers of other artifacts, including rare types, were recovered; nor can it be attributed to occupation at a time of the year when end scrapers were not in use, since end scrapers were found in the unheated assemblage on the site. Instead, the lack of end scrapers in feature 1 might be related to sex role stereotyping. It is possible that they were not included in the cremation burial because they were implements generally used by the opposite sex.

The Significance of Crowfield

The Crowfield site is important to Paleo-Indian studies in several respects. It is one of the few sites providing data on Paleo-Indian burial and/or ritual practices. The apparent cremation burials at the site are the earliest known evidence of such customs in the New World. They suggest that cremation was one of the earliest burial practices in the Americas. If it were a widespread Paleo-Indian burial custom, this might be a factor contributing to the paucity of Paleo-Indian skeletal remains. For example, a large number of Paleo-Indian sites and find spots are now known across the continent, yet finds of Paleo-Indian skeletal remains are extremely rare. The Crowfield site thus provides a rare opportunity to study poorly understood or previously unknown aspects of Paleo-Indian ideology and technology.

Crowfield: Avenue to Ideology

Crucial to the understanding of any society is an understanding of its ideology, for a society's beliefs can influence the character and operation of all its cultural sub-systems. Archaeologists interpreting Paleo-Indian societies must continually be aware that the sub-systems they most often study, i.e. technology, subsistence, and settlement, were not only governed by the natural laws and limitations of the physical world but also were molded by social beliefs and values.

At present the study of ideology is at the frontier of Paleo-Indian research. Paleo-Indian studies have focused for the most part on technology, including the distribution of various technological systems through space and time and the relationships between technology and environment. This is largely a factor of the availability of data. On most Paleo-Indian sites the surviving evidence is of the chipped stone industry. This is particularly suited to studies of technology, especially how stone implements were manufactured and curated, and to a lesser extent, how they were used. The study of ideology presents a more difficult challenge. This is due in part to the abstract nature of the subject and to the present lack of theory showing how information can be derived from evidence remaining on archaeological sites. There is also a danger of bias resulting from the interpretation of an incompletely known prehistoric culture in terms of our own ideological framework (see Trigger 1983).

The Crowfield site provides a rare and easily recognizable opportunity to investigate at least some aspects of Paleo-Indian ideology. The presence in the cremation burials of large numbers of implements in finished and preform stages of manufacture, some of which had been "killed", suggests that the Paleo-Indians believed in an afterlife. This is not surprising in that most human groups since the Late Pleistocene have believed, or believe, in some sort of an afterlife, although its precise nature is not always clearly understood. Yet the functional nature of the tool kits in the cremation burials suggests that the Paleo-Indians thought the deceased would require implements suitable for tasks similar to those that they experienced in their daily lives. For example, the fluted points would be used for hunting and the preforms would be manufactured into tools.

The intentional smashing of artifacts prior to placing them in the cremation pit can be interpreted as ritual killing. This suggests that the Paleo-Indians may have believed that inanimate objects had spirits. The smashing or "killing" of the artifacts might have been intended to release their spirits, so they could accompany that of the deceased person.

The Paleo-Indian belief that inanimate objects had spirits represents the earliest evidence of religious beliefs in the New World.

Crowfield and the Study of Fluted Point Variability

The study of fluted point variation is of great significant to the archaeology of Paleo-Indian societies. This significance was first realized on the Western Plains, where variation in fluted points was studied in relation to components that were known to be discrete on the basis of stratigraphic separation and faunal associations. It was discovered that typological variation in fluted points could be used to identify discrete Paleo-Indian societies. Point types such as Clovis and Folsom were established. Later, the discreteness of these point types gained further recognition through radiometric dating.

In eastern North America, relatively large numbers of fluted points have been reported (Brennan 1982). In comparison to the West, there seems to be a wider variety of fluted point types. Yet fluted point typologies in most areas of the East are poorly understood. This is evidenced in the widespread application of the term Clovis to a variety of assemblages that are diverse, not only in terms of projectile point morphology, but also in terms of artifacts other than fluted points, as well as in associated patterns of distribution, settlement, and raw material exploitation. The poor understanding of eastern fluted point typologies is due in part to the necessity of working them out without the benefit of information provided by reliable stratigraphic separation of components, sufficient radiometric dating, and faunal associations. The paucity of these data adds to the difficulty of identifying Paleo-Indian societies in the East, and increases the burden placed on the role of understanding fluted point variation in the identification process.

Considerable variation has been noted within the assemblages of fluted points from large eastern sites, such as Parkhill, Fisher, Vail, Debert, and Bull Brook. These sites are characterized by multiple habitation/activity areas that suggest Paleo-Indians reoccupied the sites on several occasions. At present, the periods of time between these occupations are unknown. This makes it impossible to evaluate time as a factor in variability within assemblages from these sites. It cannot be determined if the variation represents gradual changes over lengthy periods of time or rapid change over short intervals.

In the burned artifact assemblages at Crowfield, time can be eliminated as a factor of variation, since all of the heat-shattered artifacts are associated with a single event: the fire. Thus, they provide an excellent opportunity to study variation within classes of artifacts at a given point in time.

The range of variation in size of finished Crowfield points is given in Figure 10. Finished points were identified by grinding on their lower lateral edges, which seems to have been the final step in the manufacture of fluted projectile points. There appears to be little difference in the range of variation between finished Crowfield points associated with one event in time and that of finished fluted points from the Parkhill site that were discarded over a longer period of time (see Figure 10). Depending on the length of time between occupations at Parkhill, it appears that there was a slow rate of change in fluted points as a result of time.

Crowfield and the Study of Functioning Tool Kits

In the assemblage from the Piney Creek site in northern Wyoming, Frison (1968) was able to trace the trajectory of several stone tools through the sequential butchering and processing of a group of bison. It was demonstrated that the form of these implements at the time they were discarded might be quite different from their original form. The recognition that most materials recovered on lithic sites probably represent what was no longer wanted by the occupiers when they left the locality prompted Jelinek (1977:22) to remark, "Consideration of these several factors relating to tool use, modification, and discard well might leave us in some doubt as to whether or not we ever, in fact, are likely to recover a completely functioning tool kit short of a deliberate interment or catastrophically precipitated preservation". The Crowfield site provides such a rare opportunity. Unlike artifacts generally recovered from habitation or specialized workshop sites, most of the Crowfield artifacts are in early stages of their life histories. These include large flake blanks, preforms, and numerous implements that show no signs of extensive resharpening. These are most useful for determining criteria for blank and preform selection and acceptability than are rejected or unacceptable unfinished tools found on habitation or workshop sites (see, for example, Callahan 1979:4).

Stages of Crowfield Point Manufacture

The Paleo-Indian assemblage from feature 1 at Crowfield provides a significant opportunity to study the fluted point production process, because it contains artifacts in a variety of stages of manufacture. These range from blanks, through several preform stages, to the final products. They provide clues to the nature and sequence of activities generally associated with the production of Crowfield points. In the following model, the manufacturing operation has been divided arbitrarily into five stages.

1) Blank procurement. The first stage in the manufacture of Crowfield points involved the production of suitable flake

blanks. This stage took place at workshop sites at or near bedrock quarry sources of the lithic raw material (Ellis 1984). It is evident from the Crowfield assemblage that the Paleo-Indians consistently produced several distinctive types of blanks. The patterning inherent in these types resulted from a highly methodical system of reducing tabular blocks of raw material. The first step was to select a suitable flake blank from one of these types. Ideally, this blank needed to be straight in longitudinal and transverse cross-section and free from flaws. Flenniken (1979:475) proposes that blanks for Folsom points had to be approximately twice the length, width, and thickness of the desired points. There is evidence that two types of blanks were used for fluted point manufacture in the Crowfield complex (Ellis 1984). The first type was struck <u>down</u> the side face of a tabular block from a striking platform on the top edge of the block (see Figure 29). These blanks often have cortex on the striking platform, and if the material is Collingwood chert, the banding runs perpendicular to the longitudinal axis of the blank. The second type of blank was struck <u>across</u> the side face of the block, parallel to the cortex from a platform on its lateral edge (see Figure 29). If these blanks were struck on Collingwood chert, the banding runs parallel to the longitudinal axis of the blank.

Knowledge of the types of blanks involving Collingwood chert can be of some diagnostic value. For example, the first type of blank dominates in the Parkhill industry, whereas the second type was very rarely used (see Ellis 1984).

2) Initial biface production. This stage involved the manufacture of the flake blank into a biface which was generally oval in shape. It is probable that most of these preforms were produced at or near the quarry site. The presence of several oval preforms at Crowfield (see Figure 40) suggests that this was a common form in which lithic raw material was transported long distances from the quarry site.

3) Biface thinning. Examples of this preform stage are shown in Figure 39 (Nos. 5, 6). They represent a refinement of the oval preforms. Bifacially thinned preforms begin to approximate the shape and thickness of finished Crowfield points, except their ends are often squared. They have been thinned from opposite ends, which tends to flatten their transverse cross-sections.

4) Fluting. The fluting of Crowfield points involved several steps. First, the base of the preform was steeply bevelled by the removal in series of several short chips. This created a basal concavity. Next, the base was ground and the flutes were struck. I believe that carefully isolated platforms (nipples) were less prominent than those associated with the Parkhill industry. If more than two flutes were

removed, which is frequently the case, they were struck in overlapping sequence across the face of the preform. Often, this was followed by the removal of from one to three shorter flakes that override the base of the longer flutes. These eliminate ridge scars left by the initial fluting. Next, the point was turned over, and the entire process was repeated on the opposite face.

5) Projectile point finishing. The final steps involved sharpening the tip and tapering the base, if necessary, and grinding the lateral basal edges. On some points the tapering of the base encroached on the flute scars.

THE BOLTON SITE

Introduction and History of Investigation

Bolton is a small, multicomponent site located on the edge of the Caradoc sand plain near the shoreline of proglacial Lake Whittlesey. It is situated about 5 km northeast of the Crowfield site (see Figure 34). Surface evidence of prehistoric occupations on the site includes a small collection of lithic materials attributed to the Crowfield complex.

The site was discovered in June, 1987 by Mr. James MacLeod, who found two artifacts that he thought might be fluted points when he was searching for prehistoric artifacts along a ploughed ridge near his farm. Within hours of the finds, he contacted the author who identified the artifacts as Crowfield points in late stages of manufacture. The next day MacLeod and the author retraced his footprints in the field to where the artifacts had been found within 3 m of each other. Two small end scrapers and a bifacial preform were recovered in the general area, and three days later, after a light rain, MacLeod collected a sample of debitage that included a channel flake.

The site locality had been surveyed by the author in 1964 and 1972 and by Mr. Darcy Fallon in the spring of 1987, but the Paleo-Indian component had not been discovered. Fallon's survey resulted in the discovery of two early Paleo-Indian sites of undetermined affiliation - one about a kilometre to the north and the other approximately two kilometres to the west of Bolton. The author succeeded in locating two isolated fluted points attributed to earlier occupations (Deller 1976a:Nos. V and Y) and the base of a Crowfield point (Deller 1979:No. 60) about 1.5 km to the south of the site.

Location and Physiographic Setting

The Bolton site is located on the farm of Mr. Charles Bolton on Lot 21, Concession V, Caradoc township, Middlesex county, Ontario, at grid reference 583547 (Strathroy 401/13, Edition 4). It is situated on a small sandy knoll on the northeastern edge of a low-lying area characterized by a broad belt of muck soils flanking the fossil shoreline of proglacial

Lake Whittlesey. Several hundred metres east of the site the terrain rises abruptly to form a ridge constituting the southwestern edge of the Lucan moraine that was undercut by the waters of Lake Maumee. The elevation of the site is approximately 243 m a.s.l. Site soils are classified as Guelph loam.

Description of the Artifacts

Although small, the surface collection from the Bolton site consists of a wide variety of implement types. All artifacts were manufactured from Onondaga chert, except for an end scraper that was manufactured from Bayport chert.

The fluted preform (Figure 50, No. 1) is extremely well made. It is considered to be a preform because it lacks grinding on its lateral and basal edges. It is lanceolate in outline and has a very slightly concave bevelled base. There appears to be the remnant of a slight shoulder on one lateral edge just below the mid-section, but it is indistinct due to a small, possibly heat-induced, fracture. The remains of the bulb of percussion and ground striking platform of the original flake on which the preform was made are barely visible at its tip. The artifact is 76 mm long, 33 mm wide, and 4 mm thick. Fluting was executed only on one face by the removal of at least two flutes that extended just beyond the mid-section before they terminated in hinge fractures. A potlid scar on the fluted area indicates the preform was subjected to heat after the fluting was accomplished, but it seems unlikely that heat treatment would be applied after the fluting process. Possible explanations for the artifact's exposure to heat will be addressed later. The unfluted face is the altered ventral surface of the original flake preform. There are at least three reasons why fluting might not have been attempted: 1) the face is slightly concave from tip to base which would have made the flutes difficult to remove without them hinging through the artifact; 2) the flute removals on the opposite face made the preform so thin that it might not have withstood additional attempts at fluting; and 3) the face is flat enough that fluting might not have been considered necessary.

The fluted preform base (Figure 50, No. 5) appears to have been broken recently, probably by farm machinery. The first face was fluted by the removal of at last two flutes. Ridges at both outer edges of the fluting near the base were flattened by the removal of short flakes from the base. On the last face fluted, a single wide expanding flute was removed, leaving a shallow negative bulbar depression and a bite where part of the platform was carried away from the bevelled and lightly ground base. The preform lacks grinding on its lateral edges.

The channel flake mid-section (Figure 50, No. 2) does not fit onto either fluted preform. It appears to have been the first channel flake removed from a slightly convex surface.

Heat scars on its ventral surface indicate that it was exposed to heat sometime after it was removed. Heat scars also occur on its dorsal surface.

The small oval preform (Figure 50, No. 6) is roughly flaked on both faces. It is similar to some of the specimens from the Crowfield site. Its maximum measurements are 48 mm lang, 34 mm wide, and 10 mm thick. A heat scar occurs on one face.

The beaked scraper (Figure 50, No. 4) has two heavily undercut edges that converge to form the beak. A large heat scar occurs on its dorsal surface.

The transverse scraper (Figure 50, No. 7) was made on a large expanding flake. A small spur at the distal end is isolated by fine retouch along the lateral edges. The artifact has a distinct greasy appearance that possibly results from exposure to heat. Its maximum measurements are 56 mm long, 33 mm wide, and 6 mm thick.

The side scraper (Figure 50, No. 8) and end scraper (Figure 50, No. 3) were recovered on a ridge about 50 m east of the main concentration of artifacts and debitage. The side scraper has very fine wear along a slightly concave edge. This is visible macroscopically as a continuous series of small chips from the dorsal surface along the edge. The end scraper was manufactured from a long flake of Bayport chert with curvature at its dorsal end. The flat dorsal surface results from a previous flake removal from the original core. Slight wear occurs along a break at the proximal end of the artifact.

Discussion

The paucity of data concerning the Bolton site limits conclusions that can be made regarding its size, age, and nature of occupation. Yet the site increases understanding of the Crowfield complex in several respects. Its location overlooking an expanse of low, flat, poorly-drained terrain suggests that settlement strategies associated with the complex were similar to those of other fluted point-using populations in southwestern Ontario. This knowledge should facilitate the discovery of other sites belonging to the complex.

The apparent concentration of sites in Middlesex county, and especially Caradoc township, suggests that the area was frequently reoccupied by Crowfield populations, perhaps on a seasonal basis, as they exploited resources in low areas adjacent to relict shorelines. The frequent occurrence of Hi-Lo points in these areas indicates that they remained attractive into the Paleo-Archaic transition.

At present, it appears that Bolton might have been a small campsite. This is supported by the presence of debitage associated with the manufacture and maintenance of implements typical of daily use. However, the evidence of post-manufactural heating on most of the artifacts and their recovery in a tightly concentrated area suggest the possible occurrence of a ritual feature similar to those on the Crowfield site. Nevertheless, until conclusive data are obtained, it must be taken into consideration that the artifacts might have been exposed to heat by events unrelated to the early occupation, such as forest fires or pioneer activity in more recent times.

Summary

The Crowfield complex is a Paleo-Indian manifestation that has a widespread distribution in the Northeast. It is considered to represent one of the last populations in the region to manufacture fluted points. Diagnostic of the complex are Crowfield points, which generally have multiple fluting on each face and are extremely thin. Often their outlines are almost pentagonal, which elsewhere is responsible for them being labelled "pumpkinseed" fluted points (Kraft 1973).

The precise age of the Crowfield complex has not been established, but it is estimated to date between the Parkhill complex and the Holcombe complex. This would place it around the closing phase of Lake Algonquin circa 10 500 B.P. The author favours a placement shortly after Lake Algonquin drained in the southern Huron basin.

Although the Crowfield complex is intermediate between the Parkhill and Holcombe complexes, it appears to be more closely related to the latter. This is based on similarities between Crowfield points and Holcombe points, especially in terms of outline shape and the marked thinness of the artifacts. In fact, Holcombe points appear to have replaced Crowfield points in a logical evolutionary sequence, the most significant difference being the substitution of fluting on Crowfield points with basal thinning on Holcombe points.

In southwestern Ontario, the Crowfield complex is known from a thin scattering of isolated find spots where Crowfield points have been recovered, as well as two small sites: Crowfield and Bolton.

The Crowfield site is a multi-component Paleo-Indian and Late Woodland site located on the Caradoc sand plain about 5 km west of Mount Brydges, Ontario. Excavations on the site during the summers of 1981 and 1982 revealed two Paleo-Indian features containing the heat shattered remains of more than two hundred functional implements and preforms. These included several commonly recognized artifact forms, such as fluted bifaces, oval bifacial preforms, side scrapers, beaks, and gravers, as well as several distinctive bifacial tool forms previously unreported or not widely recognized in early contexts.

Feature 1 is interpreted as likely evidence of a cremation with accompanying grave goods: the earliest known in the New World according to its association with fluted points. The lack of organic remains, such as calcined skeletal material, in the feature is not surprising considering its antiquity and the extremely poor preservative qualities of the sandy, highly acidic soil in which it was situated. Organic substances in much more recent features on the Caradoc sand plain have all but completely deteriorated.

Feature 2 contained the heat shattered remains of functional tools and implement preforms, but they are fewer in number, more widely scattered, and appear to be of poorer workmanship than those associated with feature 1. It is possible that feature 2 represents a second cremation on the site.

Feature 1, and possibly feature 2, establish cremation as one of the earliest mortuary practices in North America. Widespread cremation might be a contributing factor to the paucity of recognizable PaleoIndian skeletal material. The inclusion in the cremation burials of grave goods, some of which appear to have been ritually "Killed", suggests a Paleo-Indian belief in an afterlife where the deceased would require tools that were used in daily life. The intentional smashing or "killing" of the artifacts prior to burning suggests a Paleo-Indian belief that inanimate objects had spirits. This represents the earliest example of such beliefs in the New World.

The Bolton site is located on the eastern edge of the Caradoc sand plain, about 5.5 km northeast of the Crowfield site. Although the paucity of data concerning the site limits the conclusions that can be drawn, it appears to have been a small campsite situated close to a swampy area that provided resources of undetermined type.

In conclusion, the Crowfield site in southwestern Ontario has provided the data upon which the complex initially was defined, and other sites and isolated find spots in the region have helped to clarify its nature. Future research should aim to increase the data base in order to determine the proper temporal and environmental contexts of the complex and its relationships to other early manifestations in the Northeast.

CHAPTER VII

LATE PALEO-INDIAN MANIFESTATIONS

This chapter presents data on two Late Paleo-Indian manifestations in southwestern Ontario: the Holcombe and Madina complexes. It includes their definitions, and summaries of the site and distributional data.

THE HOLCOMBE COMPLEX

The Holcombe complex is a Late Paleo-Indian manifestation in the central Great Lakes region (Fitting et al. 1966; Stothers 1982; Roosa and Deller 1982). Its principal diagnostic artifacts are small, thin, unfluted, lanceolate points named after a cluster of sites on the Holcombe beach in southeastern Michigan (Wahla and DeVisscher 1969; Fitting et al. 1966). Holcombe complex materials also have been found on sites in Northern Ohio (Payne 1982) and southern Ontario (Sheppard 1978; Deller 1979). It is proposed that the complex is closely related to the Crowfield complex out of which it appears to have developed.

Holcombe Complex Manifestations in Southwestern Ontario

The distribution of Holcombe complex materials in southwestern Ontario is shown in Figure 51.

Location 1 represents the find spot of a Holcombe point base (Figure 13, No. 1) on the Dixon site in Middlesex county, Ontario. It was recovered by the author on a ploughed surface approximately 100 m north of the main concentration of Parkhill industry artifacts. The lithic raw material from which it is made has not been identified.

Location 2 identifies the locus where the base of a Holcombe point (Figure 13, No. 2) was recovered on the northeastern quarter of Lot 28, Concession V, McGillivray township, Middlesex county, Ontario, at grid reference 356828 (Parkhill 40 P/4, Edition 5). It was found by Mr. Walter Michielsens, of R.R. #2, Grand Bend, on the crest of the Algonquin-Nipissing shoreline ridge. The artifact is manufactured from a mottled light brown variant of Onondaga chert. Two flute scars are evident on one face and the other has been thinned by the removal of two flakes from the ground base. Grinding occurs on the lateral edges as far as the break. The artifact has a basal concavity of 4 mm and a minimum width of 16 mm that occurs above the slightly flaring ears. Width of the base at the ears is 17 mm. A maximum thickness of 6 mm occurs at the break.

Location 3 identifies the find spot of a Holcombe point base (Figure 13, No. 3) on Lot 26, Concession I, Bosanquet township, Lambton county, Ontario, at grid reference 334816 (Parkhill 40 P/4, Edition 5). Mr. William Baxter of Parkhill, Ontario recovered the artifact in loose soil that had eroded out of the west bank of the Ausable River. It has grinding on its lateral edges, which taper to a concave, ground base. Allowing for a broken ear, the estimated basal width is 18 mm. The artifact is manufactured from a light brown Onondaga chert. Basal thinning occurs on both faces.

Locations 4 and 5 represent the Tedball and Strathroy sites described later in this chapter.

Location 6 identifies the locus where a Holcombe point (Figure 13, No. 8) was recovered on the farm of Mr. Donald Anderson on Lot 15, Concession IV, Southwold township, Elgin county, Ontario, at grid reference 817286 (Port Stanley 40 I/11, Edition 4). It was found by Mr. George Connoy during surface reconnaissance on terrain flanking the west bank of Talbot Creek. The artifact is manufactured from a mottled grey and light-brown variety of Onondaga chert that frequently occurs in nodules in the area of the find. It is 60 mm long, 32 mm wide, and 6 mm thick. Grinding occurs on the concave base (depth 3 mm) and lower lateral edges to just below midpoint. One face has been thinned by the removal of at least three overlapping parallel flakes from the base.

Location 7 represents the find spot of a Holcombe point base (Figure 13, No. 4) on the farm of Mr. Fraser Clendening on Lot 19, Concession II, Harwich township, Kent county, Ontario, at grid reference 265862 (Ridgetown 41 1/5, Edition 5). The artifact was found by Mr. Ronald Watts of London, Ontario, on a low rise east of Indian Creek. It has grinding on its lateral edges that taper to a basal width of 15 mm. Its base lacks grinding and has a concavity of 3 mm. The artifact is manufactured from Onondaga chert.

THE TEDBALL SITE

Introduction and History of Investigation

The Tedball site is located on the bed of proglacial Lake Algonquin about 2 km north of Thedford, Ontario (see Figure 51, No. 4). It was recorded by the author in 1973 during a survey for Paleo-Indian sites in Lambton and Middlesex counties. The presence of the site was first indicated when a Holcombe point was noted in the artifact collection of Mr. Glenn Tedball. Tedball recalled finding the point and a small amount of chipping debris in a cultivated field not far from his home. The author visited the location with Tedball on two occasions in the spring of 1974. Three thinly-scattered concentrations of debitage were noted, and several artifacts were recovered, including an end scraper, two multiple spurred gravers, and two utilized flakes.

Location and Physiographic Setting

The Tedball site is located on the farm of Mr. Robert McCoy on the east quarter of Lot 28, Concession IV, Bosanquet township, Lambton county, Ontario, at grid reference 302827 (Parkhill 40 P/4, Edition 5). This location is on a low sandy rise (181 m a.s.l.) that is almost indiscernible from the extremely flat terrain associated with the former lake bed. The site is about 900 m north of the fossil Nipissing-Algonquin strandline which manifests itself as a pronounced 10 m high shorecliffe in the area.[1] This shoreline is cut by the Ausable River, which flows northward onto the former lake bed about 1 km east of the site.

Description of the Artifacts

Artifacts from the Tedball site are illustrated in Figure 52. These include a Holcombe point, three utilized flakes, two multiple gravers, and an end scraper.

The point appears to have been manufactured on a ~~thin~~ flake. It is 50 mm long, 25 mm wide, 4.8 mm thick, and has been bifacially thinned by the removal of short flakes from the concave base. The variety of chert from which it is manufactured has not been identified.

The utilized flakes probably originated from the reduction of bifacial cores. Both have light to moderate wear manifested as minute scalar chips along their lateral edges.

The multiple gravers each have at least six spurs around their circumference. One is manufactured from Kettle Point chert and the other is made from an unidentified chert.

The end scraper is considerably smaller than most recovered on earlier fluted point associated sites in the area. This might reflect a general trend through time towards smaller end scrapers in some Late Paleo-Indian assemblages. Deller and Ellis (1987) note that the relatively small size of Holcombe complex end scrapers may serve to distinguish them from those associated with earlier industries.

Marine Alteration of the Tedball Assemblage

During the course of its history, the Tedball site has been inundated on several occasions as water levels fluctuated in the Huron Basin. These inundations have had significant effects on the cultural materials. One of the most significant occurred between 5000 B.P. and 4500 B.P. when the site was flooded by Lake Nipissing. More recently, it has been flooded periodically as water levels in the Thedford Marsh have fluctuated.

The inundation of the Tedball site, in particular by Lake Nipissing, has altered markedly the physical characteristics of the lithic materials. Altered artifacts and debitage are worn smooth and have a highly polished, glossy brown appearance that makes them easy to distinguish from more recently deposited materials. Ellis and Deller (1986:41) describe Nipissing-altered artifacts recovered from Tedball and other sites along the Algonquin-Nipissing strandline:

> The surface discolouration of the artifacts is best described as a patina. Examination of artifacts in cross-section on margins broken by recent action indicate that this patina is a very thin rind which has coated the surface. It is probably the result of the subjection of magnetite (Fe_3O_4) or some other ferrous mineral in the cherts to an oxidizing atmosphere which has changed the ferrous minerals in the cherts to limonite with the distinctive brown colour...In turn, the limonite was precipitated over the exposed surfaces of the artifact as the "rind".

The Age of the Tedball Site

Whereas the precise age of neither the Tedball site nor the Holcombe complex has been demonstrated, geological data from the site provide reliable temporal boundaries between which the early occupations must have occurred. The location of the site on the former Algonquin lake bed indicates that it was occupied after Lake Algonquin drained. This places a maximum date of 10 500 B.P. on the early occupations. The minimum age of the waterworn assemblage is established by Lake Nipissing, which inundated the site circa 5000 B.P. to 4500 B.P. and altered the artifacts.

Lest it be argued that the Tedball site was originally situated on the Algonquin shoreline and transgression by Lake Nipissing eroded the shoreline back from the site, it should be noted that the frequent use of Kettle Point chert at the site and in the Holcombe industry tends to eliminate an occupation contemporaneous with Lake Algonquin. The waters of this proglacial lake flooded the primary bedrock sources of Kettle Point chert, rendering them inaccessible during the existence of the lake circa 11 000 B.P. to 10 500 B.P. Therefore the frequent exploitation of these resources by southwestern Ontario Holcombe societies must have occurred either before the waters rose or after the lake drained (see Figure 7). The latter period is compatible with Paleo-Indian dates elsewhere.

Based on the age estimates for the Crowfield complex, which for technological reasons is suggested to be slightly earlier than the Holcombe complex, and considering similar industries, such as Midland and Plainview that have been more securely dated on the Plains, a temporal placement in the earlier post-Algonquin period is favoured for the site.

A suggested date circa 10 200 B.P. for the Tedball site is considerably earlier than the temporal placement of the Michigan Holcombe complex suggested by Fitting (1975:46). His temporal assignment is based largely on the distribution of Holcombe materials along the Algonquin shoreline. He notes (ibid.) that, "Since hundreds of Paleo-Indian artifacts have been found along this beach and none have been found within the bed of this lake, it appears to be a good association and suggests an occupation just prior to 9000 B.C." It should be noted, however, that Paleo-Indian materials might not be found on the Algonquin lake bed because they are buried under sediments deposited when this bed was reoccupied by Lake Nipissing. The role of Lake Nipissing is an important factor that must be considered when interpreting the paucity of Holcombe complex materials below the Algonquin beach.

THE STRATHROY SITE (AfHj-7)

Introduction and History of Investigation

The Strathroy site is located on the outskirts of the town of Strathroy in southwestern Ontario. It was discovered in 1965 during an archaeological survey of the Caradoc sand plain. The site has a substantial Late Woodland (Glen Meyer) occupation and a small Late Paleo-Indian (Holcombe) component which is the focus of this study. The Holcombe component was first noted in 1970, when I recovered a preform for a Holcombe point from a locus approximately 50 m west of the main concentrations of Glen Meyer artifacts. Later a complete Holcombe point from the same general locus of the site was noted in the artifact collection of W.V.V. Pardy of Mount Brydges. This artifact was manufactured from Onondaga chert. Its present location is unknown, following Pardy's death and the division and sale of his collection of artifacts.

Test pitting was conducted on the site during the summers of 1971 and 1972 under the direction of William B. Roosa in collaboration with the author, but recognizable evidence of the Paleo-Indian occupation was not recovered.

Location and Physiographic Setting

The Strathroy site is located on the farm of Mr. Charles Mostrey on the northeast quarter of Lot 10, Concession IX, Caradoc township, Middlesex county, Ontario at grid reference 499543 (Strathroy 40 I/13, Edition 4). Evidence of Paleo-Indian occupation was recovered from an area encompassing about 400 square m straddling a low sandy knoll at an elevation of approximately 229 m a.s.l. About 10 m to the south, this area is flanked by a small tributary stream which flows west to join the Sydenham River about 1.5 km west of the site. This stream occupied a fairly broad, shallow, indistinct valley that might represent a former glacial spillway. Site soils are classified as Berrien sandy loam. The site is located in an area of stable sand dunes near the northwestern edge of the Caradoc sand plain.

Artifact Inventory

The artifacts are attributed to a Late Paleo-Indian industry on the basis of morphological traits. All were collected on the ploughed surface. They include three Holcombe points or fragments thereof (Figure 13, Nos. 6 and 7), two basally thinned point preforms (Deller 1976a:Nos. H1 and H2), two small circular scrapers, and a small end scraper. One of the point preforms is manufactured from a grey translucent unidentified chert. The end scraper and the Pardy Holcombe point are manufactured from Onondaga chert and the rest of the artifacts are manufactured from Kettle Point chert. A piece esquillée (Deller 1976a:No. H3) of unidentified chert and unknown cultural affiliation was recovered on the site, about 40 m north of the main Paleo-Indian concentration. It might be the mid-section of a Holcombe point that has been recycled. Pieces esquillées have been reported from the Holcombe site in Michigan (Fitting et al. 1966:38).

Discussion

Surface reconnaissance and test pitting on the Strathroy site have provided limited data for analytical purposes. Based on the fieldwork it is doubtful if excavation of the total area occupied by the Late Paleo-Indians would substantially increase the sample of lithic materials. Yet, the small size of the site increases its significance in some respects. Most early sites that have been investigated in the Northeast, including the Holcombe type-site cluster in Michigan, are large in terms of spatial ~~extent~~ and artifact assemblages (Fitting et al. 1966). Few small sites, such as Strathroy, have been reported. Yet they possibly represent the majority of sites associated with Paleo-Indian settlement systems in the Great Lakes region. It is necessary to investigate and report small sites in order to achieve a more balanced understanding of Paleo-Indian lifeways.

The larger sites in the Great Lakes region appear to represent several short term reoccupations of a favoured locality over a number of years. Probably they result from adherence to a structured settlement routine involving periodic visits to areas of dependable resources. As such, they represent established territorial ranges that were utilized on a patterned basis. At least some of the smaller, isolated sites, such as Strathroy, are possibly associated with the exploitation of resources that were less reliable in terms of supply or location.

The situation of the site at an elevation around 229 m a.s.l. conforms to a general pattern of Paleo-Indian site location on the Caradoc sand plain. Of 16 sites and isolated loci associated with fluted point or Holcombe complex materials, 87.5% are located on or near elevations of either 274 m (50%) or 229 m (37.5%). They appear to be associated with shoreline features of Late Pleistocene proglacial lakes; possibly Whittlesey and Arkona. Unlike most of the other sites, a distinct ridge is not visible at Strathroy. Yet, like the majority of sites, it overlooks a broad, low-lying area that might have been part of a former glacial spillway. Much has been noted about the correlation of sites with attractive micro-environments in low-lying areas, often associated with fossil lake features (Deller 1976a, 1976b, 1979).

The frequent use of Kettle Point chert by the Late Paleo-Indians on the site suggests that it was occupied sometime after the draining of proglacial Lake Algonquin exposed the chert outcrops. This imposes on the occupation a maximum possible date of 10 500 B.P. This date is substantiated by the location of other Holcombe complex sites on the bed of Lake Algonquin.

Southwestern Ontario Holcombe in Broader Perspective

It appears that the fluted point occupation of southwestern Ontario was followed by Late Paleo-Indian occupations associated with the Holcombe lithic industry. On the whole, this industry and the population it represents are not as well understood in the Great Lakes region as are the earlier fluted point associated occupations. Nonetheless, the southwestern Ontario sites provide significant, albeit limited, data concerning the Holcombe complex and the Late Paleo-Indian lifeways that it represents.

The sites and findspots extend the known distribution of the Holcombe complex in the central Great Lakes region. In southwestern Ontario, the distribution of the complex overlaps with those of earlier Paleo-Indian complexes, such as Gainey, Parkhill, and Crowfield. Yet substantial differences in technology and patterns of lithic resource exploitation indicate that these complexes are not contemporaneous.

Lithic raw materials utilized in Holcombe assemblages in southwestern Ontario demonstrate a change in chert utilization patterns from the preceding Crowfield complex. The utilized lithic raw materials most frequently used in the manufacture of Crowfield points in southwestern Ontario are Onondaga chert (60%) and Collingwood chert (33%), while Kettle Point chert is used only occasionally. Kettle Point chert gains in popularity in Holcombe industries, while the use of Collingwood chert is terminated (see Table 3). Thus, during the transition from the Crowfield complex to the Holcombe complex, the Paleo-Indian societies in southwestern Ontario appear to have replaced the use of Collingwood chert with that of Kettle Point chert. This is interpreted as representing a change in the size of territories in the Great Lakes region from the broad ranges characteristic of fluted point manufacturing societies to more localized territories typical of later societies such as Hi-Lo. Possibly this coincided with the demise of large scale hunting of caribou in southwestern Ontario.

Continued analyses of cherts utilized in Holcombe assemblages will provide a clearer understanding of territorial ranges, interaction, and population movements. A positive start has been made in Michigan where Fitting (1975:56-56) notes:

> Projectile points similar to those from the Holcombe beach have been recovered as surface finds in northern Ohio and western Michigan. The morphology is the same but distinct chert

> differences occur between various areas that provide the basis for establishing hunting territories. Black Upper Mercer Flint defines such a territory in northern Ohio; Bayport chert characterized the eastern Michigan area; and the majority of such points that I have seen from western Michigan are made of a distinctive banded chert, the source of which I do not recognize. There is some overlap of chert types with some Bayport chert in western Michigan, a minority occurrence of Upper Mercer Flint in eastern Michigan, and a minority occurrence of Bayport chert in northern Ohio. This supports the idea of trade associations and intermarriage between bands.

Although the southwestern Ontario data are limited, they extend the range of the Holcombe complex to include an additional territory or territories marked by the use of Kettle Point chert and Onondaga chert in southern Ontario.

The consistent patterning of Holcombe complex site location in southwestern Ontario probably resulted from prehistoric subsistence strategies, but at present there is insufficient data to clarify the precise nature of the relationship. The majority of known Holcombe complex sites and find spots are situated in proximity to low, poorly drained areas that presently are characterized by mucky soils. These areas might have offered attractive micro-environments. While the surrounding environment might have been dominated by coniferous forest with a low carrying capacity in terms of supporting human populations, the low-lying areas adjacent to the ridges might have offered a richer environment consisting of sedges, grasses, or lichens, that attracted animals hunted by the Paleo-Indians. Furthermore, most sites in these areas are associated with sections of the ridge that have broad, indented configurations (Deller 1976a; 1979). These may have increased the amount of ridge-edge habitat available within a short radius of the site, in contrast to locations on straight ridges (see also Storck 1982:23).

THE MADINA COMPLEX

The Madina complex is a Late Paleo-Indian manifestation in the central Great Lakes region that is thought to post-date the fluted point occupations and the draining of Lake Algonquin circa 10 500 B.P. Diagnostic of the complex are Madina points, which resemble the Agate Basin type on the western Plains. The complex also includes typical Paleo-Indian artifacts, such as triangular end scrapers, narrow end scrapers (groovers), side scrapers, spokeshaves, gravers, and borers.

At present the complex is very loosely defined. A clearer definition will emerge with better understanding of Late Paleo-Indian point typologies in the Great Lakes region. In southern Ontario, this will involve a clearer understanding of two aspects of projectile point variation: First, the significance of variation in outline shape must be determined. This will help to resolve whether the "Agate Basin-like" points, such as occur on the Deavitt and Heaman sites, represent a different society and complex than the "Hell Gap-like" points that occur on the Zander site (Stewart 1984). Second, the significance of variation in size of projectile points must be determined. At present, some researchers (Dibb: personal communication) propose that a difference in point size between sites such as Heaman (Deller 1976b) and Deavitt (Dibb 1985) might signify temporal or cultural differences.

Madina Complex Manifestations in Southwestern Ontario

In comparison to some of the earlier Paleo-Indian manifestations, the Madina complex is more thinly scattered in southwestern Ontario. Figure 53 shows the known sites and find spots where Madina complex materials have been recovered.

Location 1 represents the Heaman and Haunted Hill sites, described later in this chapter.

Location 2 represents the find spot of a Madina point (Figure 14, No. 7; Deller 1976a:d) on the Algonquin beach on Lot 45, Concession XXVII, McGillivray township, Middlesex county, Ontario, at grid reference 395856 (Parkhill 40 P/4, Edition 5). The tip of this point shows extensive resharpening. The point is manufactured from Bayport chert.

Location 3 represents a stemmed Madina point (Hell Gap-like) recovered on the Pascoe site by Mr. Edward McLeod on Lot 26, Concession V, McGillivray township, Middlesex county, Ontario, at grid reference 365825 (Parkhill 40 P/4, Edition

5). Although the point is heavily water worn and patinated, it appears to be manufactured from Onondaga chert. It is 61 mm long, 15 mm wide, and 5 mm thick.

Location 4 represents the Hall site on Lot 30, Concession V, McGillivray township, Middlesex county, Ontario. The cultivated surface of the site has yielded a small collection of Plano materials (Deller 1976b:IVE), including a heavily resharpened Madina point (Figure 14, No. 9) and a large end and side scraper (see Ellis and Deller 1986, Figure 9S). These artifacts were recovered with considerable evidence of later cultures from a broad, gentle shoreline slope that must have experienced significant wave action during Nipissing times. All of the early materials show extensive water wear and are heavily patinated. It is likely that their original provenance is highly disturbed.

Location 5 represents the find spot of a Madina point (Deller 1979:5c) on Lot 27, Concession I, Bosanquet township, Lambton county, Ontario. It was recovered on the Algonquin-Nipissing beach, about 20 m south of the shoreline ridge. The type of chert from which it is manufactured has not been identified. Other artifacts (ibid:51, 5b, and 5d) from the site that were initially identified as Plano points probably are attributable to Late Archaic components that are heavily concentrated in the area.

Location 6 identifies the approximate locus where a Madina point was found by Mr. Walter Michielsens on Lot 24, Concession IV, Bosanquet township, Lambton county, Ontario. At present, the point is in the artifact collection of Ms. Anny Michielsens of R.R. #2, Grand Bend, Ontario. The type of chert from which it is manufactured has not been identified.

Location 7 represents the approximate find spot of a stemmed Madina point mid-section on the farm of Mr. James Lacy on Lot 23, Concession I, Bosanquet township, Lambton county, Ontario. The artifact is manufactured from Onondaga chert. Presently it is in the artifact collection of Ms. Anny Michielsens.

Location 8 identifies the find spot of a Madina point (Figure 14, No. 10) on the farm of Mr. Frank Wight on Lot 15, Concession I, Bosanquet township, Lambton county, Ontario (see Deller 1979:No. 11b).

Location 9 represents the locus where a Madina point was found by Mr. George Connoy on Lot B, Concession IV, Delaware township, Middlesex county, Ontario (see Figure 14, No. 11).

Location 10 identifies the site where Mr. Francis Vink recovered a Madina point and several small rectangular shaped end scrapers in a shallow depression bordering the northwest bank of Maxwell Creek on the southwest quarter of Lot 5, Concession XIV, Chatham township, Kent county, Ontario. The point is similar in size and shape to that illustrated in

Figure 14, No. 10. It has a heavy, reddish brown patina suggesting that formerly it had been submerged under water for a lengthy period of time. It was recovered at an elevation of 178 m a.s.l.

THE HEAMAN SITE (AhHk-5)

Introduction and History of Investigation

In 1971 Mr. Edward McLeod collected a small assemblage of lithic artifacts and debitage from some terrain below the Algonquin Nipissing strandline that recently had been cleared of scrub growth and levelled with a bulldozer. The collection included diagnostic Paleo-Indian artifacts that I recognized during a 1973 survey for early sites along the Algonquin strandline. I visited the site with McLeod in November 1973 and surface collected several fragments of thermally cracked rock, a corner notched projectile point, and about 10 sherds of Middle Woodland pottery. On subsequent surveys in 1974 and 1975, the tip of a lanceolate point was recovered in the vicinity of McLeod's surface finds (Figure 14, No. 2) and several Late Paleo-Indian artifacts were found on the shoreline ridge about 150 m to the northeast. These artifacts were included in a brief report on the site (Deller 1976b). Later, the base of a fluted (Gainey) point, a spurred end scraper manufactured from Collingwood (Fossil Hill) chert, and substantial evidence of Archaic occupations, including human burials that were eroding out of the ploughed slope of the shoreline ridge, were located north of the creek. This area was named the Haunted Hill (AhHk-86) site.

Location and Physiographic Setting

The Heaman site is located on the northeastern quarter of Lot 22, Concession VIII, McGillivray township, Middlesex county, Ontario at grid reference 389851 (Parkhill 40 P/4, Edition 5). The site consists of at least two areas separated by about 150 m.

Heaman Area I.

Area I of the Heaman site is situated on the former bed of proglacial Lake Algonquin, about ~~125~~ m west of the fossil Algonquin Nipissing shoreline ridge. Surface evidence of the Plano occupation appears to be restricted to a small area of ploughed soil consisting of about 60 square m. This area is located about 30 m south of a small tributary of the Ausable River known as Moray Creek.

Nine water worn and heavily patinated tools attributed to the Plano occupation have been collected from Area I. They consist of three Madina points or fragments thereof (Figure 14, Nos. 1, 2, 3), one bifacial knife or preform, one fragmentary biface, two end scrapers, one spur or borer, and one utilized flake. Descriptions of the artifacts are given in Ellis and Deller (1986:44, 45).

Area I of the Heaman site was inundated by Lake Nipissing several thousand years after its Paleo-Indian occupation. This accounts for the distinctive wear patterns and patination on the artifacts. If the Nipissing water levels fluctuated as do those of the modern Great Lakes, the site might at times have been exposed to maximum wave damage at the very edge of the lake. On the other hand, the apparent clustering of some of the artifacts suggests that their provenance suffered only slight alteration.

It appears that deltaic sediments deposited at the mouth of the Moray Creek buried the early components on the site. According to McLeod, at least one of the artifacts was recovered from subsoil exposed at a depth of about 1 m by a root upheaval.

Heaman Area II

Area II is situated above the shoreline ridge north of the Moray Creek, about 100 m northeast of Area I. Early artifacts recovered from Area II do not appear to have been altered by the Nipissing transgression. They include a complete Madina point (Figure 14, No. 6) and a mid-section of a Madina point (Figure 14, No. 5) that have been described elsewhere (Deller 1976b; Ellis and Deller 1986).

Discussion

The small, surface-collected assemblage from Heaman raises more questions about the nature of the site than it provides answers. Yet, in a broader sense, it makes a contribution towards understanding at least some aspects of the poorly known Madina complex. The location of the site on the former bed of Lake Algonquin indicates that it was occupied after the lake drained around 10 500 B.P. This suggests that the occupation might have occurred during a period of pine domination which prevailed, at least on the upland areas, for several thousand years in post-Algonquin times. The former lake bed, however, probably was colonized by herbaceous species shortly after it became exposed. It may have remained open prairie for a considerable time, because it was particularly susceptible to grass fires, either arising through natural causes or intentionally set by humans wishing to maintain prairie conditions. These fires would have inhibited the development of arboreal species. Elsewhere I have proposed that the Madina occupation was associated with prairie-like conditions, perhaps including gregarious herbivores on the former lake bed (Deller 1982).

Some researchers are reluctant to classify the Heaman site points in the same industry as points from the Deavitt site one because the latter generally appear to be smaller

(Dibb; personal communication). However, some of the Heaman site points (e.g. Figure 14, No. 3) fall well within the size range of the Madina points from the Deavitt site. If the large and small Heaman points are contemporaneous, as the provenance of examples within a few metres of each other suggests, size appears to be eliminated as a significant factor in distinguishing the cultural affiliation of the artifacts. Rather, the differences in size might be a product of the raw materials that were utilized in their manufacture.

Age of the Madina Complex in Southwestern Ontario

Although absolute dates are not available for the Madina complex, there is circumstantial evidence that it existed between 10 500 B.P. and 9500 B.P. This consists of geological data that establish temporal parameters between which the occupations must have occurred, and comparison to securely dated artifacts elsewhere. Independently, these two lines of evidence suggest an occupation shortly after the draining of proglacial Lake Algonquin.

Geological parameters are established by the occurrence of Madina complex sites and isolated find spots on the bed of proglacial Lake Algonquin. Loci on the lake bed must have been occupied after the lake drained circa 10 500 B.P. A minimum date for the artifacts recovered on the lake bed sites is provided by Lake Nipissing. Heavy patination and water wear on the artifacts indicate that they were inundated and subsequently altered by the Nipissing transgression circa 5000 B.P. Thus, like the Holcombe complex materials previously described, Madina complex artifacts were being made and discarded on the Algonquin lake bed some time between 10,500 B.P. and 5000 B.P.

Whereas geological clues provide a broad time range for Madina complex materials in southwestern Ontario, comparisons to more securely dated artifacts elsewhere suggest a more precise dating within this range. In the west, the transition from fluted points to unfluted lanceolate forms has been radiometrically dated around 10 400 B.P. to 10 200 B.P. (Frison 1978; Frison and Stanford 1982; Holliday et al. 1983). More specifically, Agate Basin points, which Madina points closely resemble, date between 10 500 B.P. and 9500 B.P. (see Frison 1978:32-34). Using these criteria, a date circa 10 400 B.P. is suggested for the Madina complex in southwestern Ontario.

Summary

At least two Late Paleo-Indian manifestations occur in southwestern Ontario: the Holcombe complex and the Madina complex. These are classified as Late Paleo-Indian manifestations for several reasons: 1) geological data demonstrate that they represent early industries but are later in time than materials associated with fluted points; 2) they share significant technological strategies with fluted point associated industries; and 3) they are associated with unfluted lanceolate projectile points with lateral grinding that clearly are similar to Late Paleo-Indian artifacts elsewhere.

Holcombe complex manifestations in southwestern Ontario include a few isolated loci where Holcombe points have been recovered, and two small sites: Tedball, on the bed of Lake Algonquin, and Strathroy, on the Caradoc sand plain.

The Madina complex is represented by a thin scattering of sites and isolated find spots where artifacts attributed to the complex have been recovered. The best known sites are Heaman, Haunted Hill, and Hall. All have yielded small surface collections of Late Paleo-Indian artifacts consisting of lanceolate projectile points, bifacial preforms, end scrapers, and gravers. The Heaman and Hall sites are located on the former bed of proglacial Lake Algonquin and were flooded by the waters of post-glacial Lake Nipissing. This resulted in distinctive wear patterns and patination on the artifacts. At present, the effects of the Lake Nipissing transgression on the provenance of the artifacts remains to be resolved.

Direct radiometric dates have not been obtained for either the Holcombe or Madina complex and it is not known which represents the earlier industry. Nevertheless, geological data establish a time range within which both manifestations must have occurred, and more precise dating within the time range is suggested by comparisons to securely dated, similar manifestations elsewhere.

In the west, the transition from fluted point to unfluted lanceolate forms has been radiometrically dated around 10 400 B.P. to 10 200 B.P. (Frison 1978; Frison and Stanford 1982; Holliday et al. 1983). There are indications that the transition in the Great Lakes region occurred about the same time. In contrast to early Paleo-Indian (fluted point associated) artifacts, Late Paleo-Indian Holcombe and Madina complex materials are known to occur on the bed of proglacial Lake Algonquin, which drained around 10 500 B.P. The lake bed sites could have been occupied only before or after the lake's existence. Since occupations older than Lake Algonquin (i.e. 11 800-10 500 B.P.) would be well outside the radiometrically dated range of Late Paleo-Indian materials in adjacent regions, it is assumed that the occupations occurred on the lake bed after the recession of the waters circa 10 500 B.P. A minimum age for Holcombe and Madina complex materials on the former lake bed is established by Lake Nipissing, which reflooded the former Algonquin bed circa 5000 B.P. to 4500 B.P., resulting in distinctive wear patterns and patination on the lithic artifacts.

The origins of the Holcombe and Madina complexes are not clearly understood. Similarities in point morphology suggest that the Holcombe complex might have developed out of the

Crowfield complex. There does not appear to be a gradual transition between Madina points and other early types in the area, such as appears in the Gainey-Barnes or Crowfield-Holcombe sequences. This leads me to speculate that the Madina complex might represent a migration into the area rather than an *in situ* development. If so, this probably occurred shortly after the draining of Lake Algonquin. This suggests that the Madina complex dates to a period after the Parkhill complex. Probably it is temporally close to the Crowfield and Holcombe complexes, and before the Hi-Lo complex.

In conclusion, analyses of the Holcombe and Madina complexes in southwestern Ontario have made significant contributions to the understanding of Late Paleo-Indian occupations in the central Great Lakes region, but much more remains to be accomplished. In particular, more data must be collected and analyzed. This will improve the understanding of a poorly known period, when societies in southern Ontario were experiencing a major transition from Paleo-Indian to Archaic lifeways.

CHAPTER VIII

SUMMARY

Scattered across North America at the close of the Pleistocene epoch were small human populations known to modern researchers as Paleo-Indians. These are the earliest Amerindians that archaeologists have positively identified. Although their origins remain one of the major unsolved problems in New World archaeology, it is generally accepted that their ancestors, either immediate or remote, entered North America from eastern Asia.

The Diagnostic Role of Paleo-Indian Projectile Points

After Paleo-Indian artifacts first gained widespread recognition following the Folsom and Clovis discoveries in New Mexico, the analysis of lithic materials became a central focus of Paleo-Indian studies. One of the reasons for this is that lithics constitute most of the materials that survive for archaeological analyses on early sites. Of all the lithic materials, projectile points exceed the other classes of artifacts in diagnostic value. This is because they tend to show more significant variation between sites of different complexes than do the other classes of implements. This, in turn, results from projectile points being more complex and involving more decisions in their manufacture than do the less diagnostic classes of lithic tools.

Across the continent, there appear to be similar trends in the variation of Paléo-Indian projectile points from early to late. Often, these are accompanied by distinctive variation in associated cultural manifestations, such as implements other than projectile points, use of lithic raw materials, settlement patterns, and subsistence practices. Temporal and/or regional expressions of these variations have been organized into a number of archaeological complexes. These are considered to represent cultural entities that differed in one or more respects, such as chronology, economic orientation, adaptive strategies, or other significant factors. Yet in the archaeological remains, they are manifested most clearly in the variation of technological traits. Of these, the most frequently recognized is variation in projectile points.

Each cultural entity represented by an archaeological complex consisted of one or more social groups. These might be thought of as loosely-structured bands. Occasionally, individual groups within a complex can be identified in the archaeological record by their association with specific sources of lithic raw materials, in contrast to neighbouring entities that produced morphologically identical artifact assemblages.

Paleo-Indian Complexes on the Western Plains

Studies of Paleo-Indian sites on the western Plains of North America provide a useful frame of reference for Paleo-Indian research in the Northeast. Not only are the western sites of historical significance, since they were the subject of the first Paleo-Indian studies, but also they have furnished some of the most significant data on the continent concerning Paleo-Indian cultures and their temporal contexts.

Archaeological assemblages from western Plains sites have been organized into a number of Paleo-Indian complexes.

- The Clovis or Llano complex, which dates between 11 500 B.P. and 11 000 B.P., is the oldest well documented complex in North America. Its cultural origins remain to be resolved. Few base camps attributable to this complex have been discovered. It is known primarily from kill sites and associated processing and workshop areas, where Clovis fluted points and other utilitarian implements have been found in association with the remains of mammoth, horse, and camel. These include sites in Arizona, New Mexico, Oklahoma, and Colorado.

The Folsom complex postdates the Clovis complex on the western Plains. Radiocarbon dates from a number of sites range between 11 000 B.P. and 10 500 B.P. The complex is characterized by Folsom fluted points, which generally are smaller, more carefully flaked and with longer flutes than Clovis points. These have been found at several kill sites in association with the remains of extinct bison and also at pre-hunt armament sites, post-hunt processing sites, and base camps. The occupants of these sites exploited a wide variety of animal and plant resources from a variety of ecozones. Folsom sites in New Mexico and southern Colorado were probably situated in a ecotone between grasslands and pinon-juniper woodlands. Compared to the present, the regional climate was characterized by temperatures about 3°C cooler and precipitation about 9 cm to 11 cm greater.

The Midland complex, around 10 500 B.P., generally postdates the Folsom complex. It is characterized by Midland points that are similar to Folsom ones in most respects, but are not fluted.

The Plainview complex, dating to around 10 000 B.P., concentrates on the southern High Plains. Its principal diagnostic artifacts are Plainview points, which are often described as unfluted Folsom forms. The complex appears to be derived from Folsom. Possibly it was contemporaneous with Agate Basin on the northern Plains.

The Agate Basin complex has been dated between 10 500 B.P. and 9 800 B.P. Long, slender, unfluted lanceolate projectile points, often with parallel flaking, are diagnostic of this complex. The Agate Basin complex is found throughout the western Plains and adjacent areas of the Northeast.

Closely related to Agate Basin points are Hell Gap points that date between 10 000 B.P. and 9 500 B.P. A diagnostic morphological difference between these point types is a greater constriction of the lower lateral edges of the Hell Gap variety. It is probable that Hell Gap points were hafted in sockets and used for hunting bison, deer, and antelope. Other implements associated with the Hell Gap complex are similar morphologically to those in Agate Basin assemblages. This strengthens the interpretation that Hell Gap is a derivation, somewhat later in time, of Agate Basin.

Paleo-Indian Studies in the Northeast

In the Northeast there is extensive evidence of Paleo-Indian occupations, but generally they are not as well understood as their counterparts on the western Plains. One of the fundamental problems that must be resolved is the construction of an historical framework that encompasses both cultural and environmental components. This includes the identification of discrete Paleo-Indian societies and their environmental, social, and temporal contexts. In contrast to the western Plains region, Paleo-Indian culture histories in the Northeast have developed slowly. Acidic soil conditions in the Northeast have constrained the reconstruction of temporal and biological contexts by reducing the organic samples necessary for analysis.

The initial Paleo-Indian studies in the Northeast generally focused on the distribution of fluted points. These studies (i.e. Figgins 1934; Shetrone 1936; Roberts 1939) demonstrated that fluted points are more numerous and variable in the east than they are in the west. They also raised a controversy concerning the nature of the relationship between eastern and western Paleo-Indian societies. Some scholars maintained that close similarities between eastern and western assemblages indicated contemporaneity. Others suggested, on shaky evidence, that some eastern assemblages were older, based on the belief that there is a direct correlation between the distribution of a type and its age, such that the larger the area covered, the older the form.

From the early 1950s to the mid-1960s, Paleo-Indian studies in the Northeast were advanced by the investigation of several sites. Reports of these sites generally focused on lithic technology, particularly descriptions of utilitarian implements and analyses of waste products in order to determine how lithic assemblages were made and used.

The Shoop site in eastern Pennsylvania was interpreted by Witthoft (1952) as one of the oldest manifestations in the Northeast. The fluted points from Shoop, called Enterline points, were considered to be similar to Clovis points from the western Plains. The site is characterized by numerous, scattered activity loci, which presently are interpreted as representing multiple reoccupations of the site. This, combined with the fact that chert of one type (Onondaga) predominates on the site, suggests that its inhabitants were not "free wanderers", but occupied at least a loosely defined territory within which they made periodic visits to the site and chert source, probably on a seasonal basis.

Reports on the Bull Brook site in Massachusetts, the Reagen site in Vermont, the Hi-Lo and Barnes sites in Michigan, and the Potts site in New York expanded an understanding of the distribution and variability of Paleo-Indian assemblages. Roosa (1965) suggested that fluted points in the east should not be called Clovis points. Instead, the latter term should be reserved for a specific point type on the western Plains that exhibits characteristics discrete from those in the east and is associated with mammoth hunting. He advocated the classification of fluted points in the Great Lakes area into typological groups such as Enterline, Bull Brook, Barnes, Cumberland, and Ross county. Evidence of subsistence was recovered in the form of a caribou bone from the Holcombe site in Michigan, and Late Paleo-Indian cremation/burial practices were indicated at the Renier site in Wisconsin.

From the mid-1960s to the present, the Paleo-Indian data base was expanded by the discovery, investigation, and publication of several more sites: Debert in Nova Scotia; Vail and Moosehorn in Maine; Whipple in New Hampshire; Dutchess Quarry Cave, West Athens Hill, Kings Road, Twin Fields, Corditaipe in New York; Plenge and Turkey Swamp in New Jersey; Kellogg Farm and Shawnee-Minisink in Pennsylvania; Thunderbird and Fifty in Virginia; Welling and Dewitt in Ohio; Gainey and Leavitt in Michigan; and a significant number in Ontario.

Distributional and technological studies continued during this period, while environmental reconstructions and socio-archaeological problems received increasing attention. These studies confirmed a wide variety of Paleo-Indian complexes in the Northeast, some of which resembled counterparts on the western Plains. Temporal placement of these complexes generally remains unclear, although studies have implied dates between 11 500 B.P. and 10 000 B.P. for some Paleo-Indian artifacts. These temporal assignments are based on the association of fluted points with dated geological features, such as moraines and proglacial lakes. Radiometric dates from Debert (circa 10 600 B.P.), Vail (circa 10 500 B.P.) and Whipple (circa 11 050 B.P.) offered more precise dates for specific northeastern Paleo-Indian components.

Reconstructions of the environmental setting of Paleo-Indian sites and the use of ethnographic analogies were attempted by several archaeologists. It was proposed that many northeastern Paleo-Indians occupied periglacial environments, consisting of open spruce parkland or boreal-type forests. Paleo-Indian subsistence in this region was compared to that of more recent caribou hunters in the Arctic and sub-Arctic. Socio-archaeological studies involved the analysis of the distribution of tools within individual campsites in order to infer the organization of groups and their activities. Data from several sites indicated that camps were often reoccupied and revealed specialized activity areas.

Paleo-Indian Studies in Southern Ontario

Paleo-Indian research in southern Ontario has made significant contributions to the understanding of Late Wisconsin populations in the Northeast. One of the first published references to a fluted point in Ontario, and indeed on the continent, concerns a specimen found in the southwestern part of the province (Boyle 1906). Shortly after the significance of fluted points was recognized on the western Plains, Figgins (1934) published references to several fluted points from Ontario. Later distributional studies (Kidd 1951; Garrad 1971) recorded a scattering of fluted points throughout southern Ontario, with the greatest concentrations in the southwestern counties.

During the period spanning the mid 1960s to 1982, my reconnaissance efforts succeeded in locating over 200 loci yielding diagnostic Paleo-Indian artifacts, as well as several sites, including Welke-Tonkonoh (AfHj-5), Stewart (AgHj-6), Strathroy (AfHj-7), Glen Oak (AfHj-10), Parkhill (AhHk-49), McLeod (AhHk-52), Dixon (AhHk-73), Heaman (AhHk-51), Ferguson (AhHk-1), Weed (AfHl-1), Murphy (AeHk-1), Thedford II (AgHk-6), Haunted Hill (AhHk-86), Crowfield (AfHj-31), Stott Glen, and several others.

Elsewhere in the province, P.L. Storck from the Royal Ontario Museum surveyed for early sites, first on the rugged terrain north of Georgian Bay and later in gaps along the Niagara escarpment, where he speculated that Paleo hunters might have intercepted migrating caribou. A few Paleo-Indian artifacts, including a fluted point, were located. Later Storck had more success surveying Algonquin strandlines south of Georgian Bay and southeast of Lake Simcoe. Several sites were located, including Banting, Hussey, Fisher, McCarl, and Udora.

Christopher Ellis, Laurie Jackson, John Prideaux, Gordon Dibb, Peter Sheppard, Arthur Roberts, James Keron, and Peter Reid have surveyed for Paleo-Indian sites in various parts of southern Ontario. Ellis established several possible and one definite fluted point site, the Ward site, in the Niagara Peninsula. Prideaux's survey located the Zander site on the

Lake Algonquin shoreline near the Holland Marsh. Dibb located Deavitt and other sites in the Holland River valley and Roberts located a few Paleo-Indian artifacts on fossil beaches north of Lake Ontario. In Middlesex county, Keron discovered the Baker site adjacent to a relict spillway attributable to proglacial Lake Maumee.

Whereas most of the initial archaeological field work in Ontario focused on surface reconnaissance aimed at locating evidence of early occupation, there have been several recent excavations of Paleo-Indian sites. In the Georgian Bay area, the Banting, Hussey, and Fisher sites were investigated by Storck. South of Lake Simcoe, Andrew Stewart conducted excavations on the Zander site and Dibb worked on the Deavitt site. In southwestern Ontario, excavations have focused on several sites that I located. These include Parkhill, McLeod, Thedford II, Crowfield, Ferguson, Weed, Welke-Tonkonoh, and Stewart.

The Age and Environmental Setting of Paleo-Indian Occupations in Southern Ontario

Although the precise temporal contexts of the Paleo-Indian occupations in southern Ontario remain to be determined, dates for early occupations farther to the east and west suggest a time range between 11 000 B.P. and 10 000 B.P. In southwestern Ontario a similar time range is implied by geological considerations. The distribution of fluted point associated materials appears to be limited by proglacial Lake Algonquin, while later Plano materials have been recovered on the former Algonquin lake bed. This implies that the lake bed was not available for colonization by Early Paleo-Indian populations, but became accessible to Late Paleo-Indians after the lake drained, around 10 500 B.P.

The precise environmental contexts associated with the Paleo-Indian occupations also remain to be clarified. Palynological reconstructions suggest that after the withdrawal of the glacial ice from southern Ontario, the available land masses were colonized by a succession of plant communities that commenced with tundra-like vegetation and evolved through open spruce parkland to spruce forest, with pine encroachment on the drier areas. By about 10 600 B.P. the spruce-dominated cover gave way to a more closed, apparently more diverse, pine-pollen dominated forest. It is probable that around the time of the first human penetration, the area was inhabited by animal species including mastodon, caribou, black bear, marten, fisher, lynx, and snowshoe hare.

Cherts Frequently Utilized by Southwestern Ontario Paleo-Indians

Throughout the Paleo-Indian period various chert types were used for the manufacture of lithic implements. These include Collingwood (Fossil Hill) chert, Onondaga chert, Bayport chert, Upper Mercer chert, and Kettle Point chert. There is evidence that the Paleo-Indians obtained their chert from bedrock outcrops, rather than exploiting materials retrieved from secondary sources, such as stream beds or glacial till.

Collingwood (Fossil Hill) chert occurs in Middle Silurian outcrops in the southern Georgian Bay area. In the southwestern counties of Ontario, generally to the south and west of London, it was used extensively for the manufacture of Early Paleo-Indian artifacts and is highly diagnostic of early assemblages.

Onondaga chert is a Middle Devonian variety that occurs in bedrock surfaces along the modern Lake Erie shore from near Nanticoke, Ontario, east into New York State. It was utilized extensively by Paleo-Indians, as well as by numerous Archaic and Woodland societies.

Bayport chert occurs in nodular form in the Upper Mississippian Bayport formation in the Saginaw Bay area of Michigan.

Upper Mercer chert originates in the Upper Mercer formation in Ohio, in both nodular forms and in beds.

Kettle Point chert is a Middle Devonian age material whose bedrock sources presently are submerged under shallow water just off the southeastern Lake Huron shoreline. These outcrops were made alternately available and inaccessible to prehistoric societies for periods lasting up to hundreds of years by fluctuating lake levels in glacial and post-glacial times. These fairly well dated fluctuations provide significant assistance in the relative dating of assemblages using Kettle Point chert.

Paleo-Indian Point Types in Southwestern Ontario

Southwestern Ontario has yielded a wide variety of early projectile point types, including several fluted forms representing Early Paleo-Indian populations and unfluted lanceolate forms attributed to Late Paleo-Indian societies. The types are based on samples of points from one site or several closely related ones. Although the sample is small and incomplete, the types appear to represent temporal markers in a fairly continuous evolution of Paleo-Indian lifeways in the region. The transition between types appears to be quite gradual, especially considering that the development of types is sampled unevenly through time due to circumstances such as accident of discovery and/or preservation.

Individual points are assigned to a type on the basis of the consistent occurrence of traits indicated by restricted yet variable ranges. Since the types are polythetic, individual points need not exhibit all the characteristic traits but only a high percentage of them. Generally, each point type is characterized by different patterns of geographical distribution and lithic raw material association. This is further proof that the point types are meaningful in terms of other cultural manifestations.

Three factors facilitate the recognition of fluted point types in southwestern Ontario: 1) the data base is large in comparison to most other areas in the Northeast. Ontario sites that have been excavated include Fisher, Banting, Hussey, Udora, Parkhill, Thedford II, McLeod, Crowfield, Weed, Ferguson, Ward, and Baker; 2) although relatively large numbers of fluted points have been recovered, there is not a great amount of variety, such as has tended to confuse the classification of types in areas farther to the south. Almost all fluted points in southern Ontario are assignable to one of three types: Gainey, Barnes, or Crowfield. These types are clearly different and are represented by groups of sites that share diagnostic artifacts other than projectile points, as well as distinctive settlement strategies and patterns of lithic raw material utilization; and 3) sites generally yield fluted points with remarkably limited ranges of variation. They are points of one type, indicating that the sites have single fluted point components. This, above all, has simplified the process of classification.

The limited number of Ontario fluted point types is explained by the isolation of the area during the early Paleo-Indian period. Also, the relatively impoverished environments, in contrast to warmer and richer areas farther south, prohibited dense populations throughout most of the Paleo-Indian period and favoured few social groups occupying widespread territories.

Gainey points, named after the Gainey site in Michigan, generally are the largest fluted points in the region. Their lower lateral edges tend to be parallel and occasionally they have very slightly flaring ears. Similar points occur on sites over much of the Northeast, such as Welling, Shoop, Whipple, and Bull Brook. It is suggested that they date around 10 700 B.P. in southwestern Ontario.

Barnes points, named after the Barnes site in Michigan, appear to be closely related to the Gainey type. Generally, their lower lateral edges expand moderately from a narrow base with flaring ears, which creates a fishtail effect. Long, parallel-sided fluting generally extends to the tip of the point on one face and from one half to three quarters of the point's length on the other. There are never more than two flutes per face. It is suggested that Barnes points are temporally equivalent to Cumberland points farther to the south.

Crowfield points are named after the Crowfield site in southwestern Ontario. It is proposed that they slightly postdate the draining of Lake Algonquin around 10 500 B.P. They are extremely thin, have pentagonal outlines, and tend to have planar cross-sections. Fluting often was accomplished by the removal of several flakes and frequently was overridden at the base by two or three shorter flake scars. Basal concavities are shallow. Tapering of the lower lateral edges occasionally occurred after the fluting process and might have been accomplished to accommodate specific hafting elements.

Types of Late Paleo-Indian points that occur in southwestern Ontario are Holcombe points and Madina points.

Holcombe points, named after the Holcombe site in Michigan, are a small, thin, lanceolate point occurring in the central Great Lakes region. They are basally thinned rather than fluted, frequently only on one face, by the removal of one or two short flakes. In southwestern Ontario they postdate the draining of proglacial Lake Algonquin.

The Gainey Complex

The Gainey complex is one of the earliest Paleo-Indian manifestations in the Great Lakes region for which there is widespread evidence. It is considered to be contemporaneous with the Bull Brook phase in the New England and with complexes transitional between Clovis and Folsom on the western Plains. The precise relationships between the Gainey complex and the Enterline complex, as represented at the Shoop site, have not been established. It is possible that Gainey might represent a slightly later phase of Enterline.

The range of the Gainey complex in southwestern Ontario generally overlaps with that of the Parkhill complex, yet there are significant differences. Gainey complex finds are concentrated mainly to the south of the Parkhill complex, which also occurs more in the vicinity of the proglacial Lake Algonquin shoreline.

Gainey complex manifestations in southwestern Ontario include several isolated find spots of Gainey points and three relatively small sites: Weed, Ferguson, and Uniondale.

The Weed site is located on the proglacial Lake Arkona shoreline in Lambton county, Ontario. The cultivated surface of the site yielded three fluted points and two spurred end scrapers attributed to the Gainey complex and several Hi-Lo points related to later occupations. Limited test pitting recovered small amounts of debitage associated with the Gainey occupation.

The Ferguson site is located on the south bank of the Sydenham River in Middlesex county, Ontario. A surface collected assemblage from the site includes at least one fluted point, a fluted preform base, and a pièce esquillée attributed to the Early Paleo-Indian occupation. Test pitting on the site recovered small amounts of debitage associated with the Gainey complex, as well as evidence of later occupations.

The Uniondale site is located in East Nissouri township, Oxford county, Ontario. A farm collection from the site included a complete Gainey point, a fluted preform tip, and an oval biface manufactured from Collingwood chert.

The frequent use of Collingwood chert in Gainey complex assemblages in southwestern Ontario is interpreted as representing population movements between the northern and southern parts of a range or territory. The use of Upper Mercer chert from Ohio and limited amounts of Bayport chert from Michigan indicates contacts to the southwest and west.

Understanding of the Gainey occupations of southern Ontario has increased significantly in the last few years, but considerable work remains to be accomplished. Foremost, we need to discover and investigate more sites. Detailed studies of Gainey points in southern Ontario need to be completed, including their comparison to points from the Gainey, Welling, Shoop, and Bull Brook sites.

The Parkhill Complex

The Parkhill complex is a Middle Paleo-Indian manifestation in the central Great Lakes region that appears to be contemporaneous with the closing stages of proglacial Lake Algonquin. It appears to be closely related to the Gainey complex. The complex occurs on sites in southern Ontario, Michigan, Ohio, Wisconsin, and New York. In Ontario, its distribution overlaps with that of the Gainey complex, although it tends to be more heavily concentrated near the shoreline of proglacial Lake Algonquin. Parkhill complex manifestations in southwestern Ontario include several find spots, where isolated Barnes points diagnostic of the complex have been recovered, and at least nine sites representing more extensive Paleo-Indian activity: Parkhill, Thedford II, McLeod, Mawson, Dixon, Schofield, Wight, Stott Glen, and Mullin.

Parkhill, the first large fluted point associated site to be discovered and excavated in Ontario, is situated near a former embayment of proglacial Lake Algonquin in Middlesex county, Ontario. It is characterized by 10 or more discrete concentrations of artifacts and debitage that are scattered over an area encompassing about 6 ha. These occupation loci are classified into two types: habitation-general work spaces, represented by a variety of implement types, and specialized activity areas, represented by a concentration of implements that suggest a limited range of activities. One specialized activity area, Grid B, covers more than 200 square metres. It consists almost entirely of damaged finished fluted points, largely bases, and debris resulting from the manufacture of points, including more than 130 channel flakes. It is interpreted as a rearmament area, the most extensive ever reported on a Paleo-Indian site, where damaged fluted points were discarded and new ones were manufactured for their replacement.

The Parkhill site is interpreted primarily as a spring hunting camp, repeatedly reoccupied, that focused on the northward migration of caribou. The site dates to around the closing stages of proglacial Lake Algonquin and probably is slightly earlier than at least some of the Fisher site occupations.

The Thedford II site is situated on a sheltered terrace about 7.5 km southwest of the Parkhill site. About 500 square metres of the site were excavated, which represents about 70% of the occupation area. In contrast to the Parkhill site, Thedford II appears to be the result of a single occupation. Generally, it lacks widely scattered occupation loci, such as occur at Parkhill. Yet there is a distinct clustering of specific classes of implements. Gravers tend to cluster at the south end of the camp adjacent to a small ravine, and fluted point manufacturing occurred at loci to the north and west. There is a greater variety of end scrapers at Thedford II than at Parkhill, and a lower ratio of implements to debitage. Fluted points from Thedford II have slightly wider basal widths than their counterparts at Parkhill, which might indicate that they are slightly earlier in time.

The McLeod site is located near the proglacial Lake Algonquin shoreline, about 1.5 km south of the Parkhill site and 6 km northeast of Thedford II. Two of the three occupation loci at the site have been partially excavated. It is not known if they are contemporaneous. The majority of the artifacts have been assigned to the Parkhill complex, but isolated surface finds on the site include fragments of two fluted point preforms that might represent a transitional form between the Parkhill and Crowfield complexes, and a Hi-Lo point. It is suggested that the occupations at McLeod associated with the Parkhill complex might be slightly later than those at the Parkhill site.

The Mawson, Dixon, Schofield, Wight, Stott Glen, and Mullin sites are known only through investigations on their cultivated surfaces. Although it is often difficult to determine the size of a site from surface indications, these sites appear to be relatively small in comparison to Parkhill and Fisher. Surface concentrations of artifacts and debitage generally are less than 175 square metres. Judging from excavations at other Parkhill complex sites in southwestern Ontario, they probably consist of fewer than 500 artifacts.

In contrast to the Parkhill site, which probably represents a series of camps associated with population aggregation for communal hunting during annual caribou migrations, the smaller sites might represent smaller social groupings, perhaps family units, dispersed throughout a widespread territory, with less intensive hunting practices and a focus on a wider variety of subsistence resources. At these smaller sites, the ratio of fluted points to other implements is significantly lower than a representative ratio from Parkhill.

The Parkhill complex has at least two major divisions that correspond to geographical areas centred in Ontario and Michigan. These are defined primarily on the basis of utilization patterns of lithic raw materials. The Michigan centred Parkhill complex is characterized by the almost exclusive use of Bayport chert, whereas the Ontario division centred in the southeastern Huron basin, is dominated by the use of Collingwood (Fossil Hill) chert. These are interpreted as representing two closely related populations, each consisting of at least one band: the Barnes population in Michigan and the Parkhill population in Ontario.

There is evidence that the Barnes and Parkhill populations are contemporaneous with one another rather than representing just one population that changed its territory and, accordingly, its source of lithic material as time progressed. This evidence consists of a pattern recurring on most Parkhill complex sites in southwestern Ontario. It involves the presence of small amounts of Bayport chert, consistently associated with certain functional classes of implements: fluted points and end scrapers. Implements of other functional types manufactured from Bayport chert and debitage associated with the use of this material rarely are recovered. This recurring pattern cannot be explained satisfactorily as resulting from a population shifting its territory and focus on lithic sources. Rather it appears to result from the importation of certain types of artifacts in the context of exchange, gift giving, or some other type of interaction between closely related social groups that focused on different lithic sources.

According to the distribution of Parkhill complex sites dominated by the use of Collingwood chert, the territorial range of the Ontario Parkhill population stretched from the Georgian Bay area in the north to just beyond the southeastern Huron basin in the south. This distribution appears to represent a loosely defined territory through which the Paleo-Indians moved as they exploited resource rich areas on a seasonal basis. Base camps, such as Fisher, and quarry sites in the northern range of the territory probably were visited during the warm weather seasons. Repeatedly occupied southern range sites characterized by massive rearmament areas, such as occur at Parkhill, appear to have been occupied in the spring. Small scattered sites, such as Mullin and Stott Glen, that are located well inland from the Algonquin shoreline in the southern range of the territory, possibly represent winter occupied camps.

Understanding of the Parkhill complex has advanced considerably since the discovery of the Parkhill site in 1973; yet significant issues remain to be resolved. Future research should attempt to locate additional sites, and detailed investigation of some of the smaller sites must be undertaken.

This would provide a more representative view of Paleo-Indian lifeways in the central Great Lakes region. Archaeologists must strive to date the complex more accurately and place it in its proper environmental context. It is necessary that detailed inter-site comparisons be undertaken in order to better understand variations within the complex and to establish the significance of the individual sites. Finally, it is necessary to continue the formulation and evaluation of models to explain the existing data.

The Crowfield Complex

The Crowfield complex is a Paleo-Indian manifestation that is attributed to one of the last societies in the Northeast to manufacture fluted points. It appears to be closely related to the Holcombe complex, which probably succeeded it in the Great Lakes region. The principal diagnostic artifacts of the complex are Crowfield points, named after the Crowfield site in southwestern Ontario. Other sites where evidence of the complex has been recovered include Bolton in southwestern Ontario, and Hussey, Zander, and Udora in southcentral Ontario.

The Crowfield site is located on the Caradoc sand plain in Middlesex county. This feature represents the remains of a delta formed by the discharge of the Thames River into proglacial Lake Whittlesey circa 13 000 B.P. The Paleo-Indian component on the site is situated on a low sandy knoll, bordered on the southwest by a shallow gully which joins a tributary stream of the Sydenham River about 100 m north of the site.

Evidence of Paleo-Indian occupation on the site consists of two features spaced about 7 m apart that contained large quantities of heat shattered implements and preforms, as well as a small scattering of tools that were recovered around the features. Feature 1 was a basin-shaped concentration of more than 200 heat shattered artifacts. It measured approximately 1.5 m in diameter and 0.5 m deep. In the feature were commonly recognized Paleo-Indian tool forms, such as fluted bifaces, oval preforms, drills, side scrapers, gravers, and flake blanks, as well as distinctive tool forms not widely reported in early contexts, such as alternately bevelled bifaces, backed bifaces, and lozenge-shaped bifaces.

Feature 2 consisted of a concentration of several hundred heat shattered fragments of fluted bifaces, oval bifacial preforms, alternately bevelled bifaces, gravers, and tool blanks. Most of these were recovered from an area measuring approximately 14 square metres. As with feature 1, no outline could be discerned in plan or profile view. The parameters of the feature were established through the three dimensional plotting of artifacts.

Both Paleo-Indian features on the Crowfield site represent artifact disposal patterns not encountered in solely habitational or workshop contexts (i.e. the intentional burning of relatively large numbers of blanks, preforms, and functional implements). Although small numbers of unheated Paleo-Indian artifacts, including bifacial preforms, side scrapers, end scrapers, denticulates, gravers, and a fluted point preform, were recovered adjacent to the features, the main activities at the site for which there is surviving evidence were undoubtedly associated with the two features. These are interpreted as cremation burials complete with grave offerings.

The Crowfield complex remains one of the least understood early Paleo-Indian manifestations in the central Great Lakes region. In terms of some of its tool manufacturing techniques and artifact types of undetermined function, the complex appears to be curiously different from others in the area. This might be explained by differences in the nature of the data base. The Crowfield complex is known primarily from analyses of specialized ritual features, the likes of which have rarely been reported in early contexts, whereas the other complexes generally are known from a variety of habitation and workshop sites that appear to give a more representative view of Paleo-Indian lifeways.

In order to clarify the understanding of the complex, future research should endeavour to locate and investigate a wider variety of sites. These should be placed within their proper temporal and environmental contexts, and relationships to other Paleo-Indian manifestations, especially the Holcombe and Deavitt complexes, should be established.

The Holcombe Complex

The Holcombe complex is a Late Paleo-Indian manifestation in the central Great Lakes region that is suggested to date to a period shortly after the draining of Lake Algonquin. Diagnostic of the complex are Holcombe points, which frequently are interpreted as a transitional form between Paleo-Indian and Archaic materials. The complex has been identified on sites in Michigan, Ohio, and southern Ontario. Sites in southwestern Ontario that have Holcombe complex components include Strathroy, Tedball, and Dixon.

The Strathroy site is located on a small tributary stream of the Sydenham river. The cultivated surface of the site and limited test excavations have yielded a small collection of artifacts, including a complete Holcombe point, a point base, a point preform, several small end scrapers, and a small circular scraper.

The Tedball site is located on the bed of proglacial Lake Algonquin about 2 km north of Thedford, Ontario. The location of the site on the lake bed implies that it was occupied after the lake drained circa 10 500 B.P. This probably postdates the fluted point associated occupation of the area.

The cultivated surface of the site has yielded a small assemblage of artifacts, including a complete Holcombe point and several typical Paleo-Indian implements, such as gravers, spokeshaves, and end scrapers. The small size of the end scrapers distinguishes them from those found on earlier Paleo-Indian sites in the area.

Several thousand years after the Paleo-Indian occupation at Tedball, the site was inundated by the waters of Lake Nipissing, which reoccupied the former Algonquin lake bed. This transgression altered the original provenance of the artifacts as well as smoothing their surfaces and giving them a highly glossy-brown patination. The Nipissing transgression places a minimum date of 4500 B.P. on the water-rolled artifacts.

The Holcombe component on the Dixon site is represented by the base of a Holcombe point manufactured from an unidentified type of chert. This artifact was recovered about 100 m north of the major concentration of Parkhill complex materials. It demonstrates that there are at least two Paleo-Indian components on the site: the Parkhill complex, contemporaneous with the closing stages of Lake Algonquin, and the Holcombe complex, dating to early post-Algonquin times.

The Holcombe occupation of southwestern Ontario is not as clearly understood as some of the earlier fluted point associated occupations. Basic issues remaining to be resolved are its: 1) precise temporal range and environmental contexts, 2) relationships to Holcombe materials in Michigan and Ohio, and 3) relationships to other, perhaps closely related, complexes, such as Crowfield in the central Great Lakes region and Midland and Plainview on the western Plains.

The Madina Complex

The Madina complex is a Late Paleo-Indian manifestation in the central Great Lakes region. Diagnostic of the complex are Madina points, which have resemblances to Agate Basin points and Hell Gap points on the western Plains. Although the temporal and cultural relationships between the Madina complex and other Paleo-Indian manifestations are not clearly understood, it is assumed that the complex postdates most, if not all, fluted point associated occupations in the central Great Lakes regions. This is based largely on the occurrence of Madina points below the strandline of proglacial Lake Algonquin.

At present, the full range of variation within the Madina complex, especially its projectile points, is a contentious issue. Clarification can be achieved through a more precise understanding of the significance of projectile point size and the degree of tapering below the shoulders. Based on the small sample of points from the Heaman site and surrounding areas, the author favours a broad use of the term "Madina point" to include Agate Basin-like specimens, typical of those from the Deavitt and Heaman sites, and Hell Gap-like specimens, such as have been recovered on the Zander site.

The Heaman site is located in Middlesex county, Ontario, close to where the Moray Creek crosses the Algonquin-Nipissing strandline.

Area 1 of the site encompasses approximately 500 square metres. It is situated south of the creek on the Algonquin lake-bed, about 125 m west of the shoreline ridge. The Late Paleo-Indian artifact inventory from this area includes at least four projectile points or fragments thereof, one bifacial preform or knife, two large trianguloid end scrapers, and a large flake with a massive spur or borer. This area of the site was inundated by Lake Nipissing circa 5000 B.P. and all of the artifacts are water worn and heavily patinated.

The second area of the site is more diffuse and difficult to isolate because of the presence of large quantities of later Archaic and Woodland artifacts and some earlier fluted point associated materials. It consists of three scattered loci north of the Moray Creek where Madina points or point fragments were located. One of these loci is situated on the slope of the shoreline ridge and the other two are located on higher backshore areas.

More discovery and research are required before a clearer understanding of the Madina complex can be achieved. It is necessary to establish the precise temporal and environmental contexts of Madina complex sites. The significance of variation within the complex must be determined, and the relationship of the Madina complex to other Paleo-Indian manifestations must be clarified.

Concluding Statement

From a meagre, poorly understood data base in the 1960s, studies of the Paleo-Indian occupation of southwestern Ontario have progressed to the stage where not only have a relatively large number and variety of early sites been discovered (at present one of the heaviest concentrations on the continent), but several archaeological complexes, representing discrete Paleo-Indian societies or distinct phases in the development of a single society, have been recognized. Research based on these data has made significant contributions to the understanding of the Paleo-Indian tradition in the New World, especially as manifested in areas still close to the margins of continental glaciers. In particular, it has provided rare information about Paleo-Indian mortuary practices and territorial ranges that appear to have been exploited during well established seasonal rounds based on annual caribou migrations. As well, it has provided some of the most detailed data in the Northeast concerning Paleo-Indian settlement patterns, camp organization, social group interaction, point typology, technological organization, and trends through the Paleo-Indian period. Nevertheless, much remains to be accomplished. It is necessary that the data base be expanded through the discovery and scientific investigation of more sites. Methods of research and analysis that enable a more complete understanding to be derived from the available data must be devised. Models that explain these data must be created and continually evaluated. Above all, knowledge gained must be synthesized into broader realms of understanding.

It is hoped that data presented in this thesis will facilitate the work of other researchers dedicated to these tasks.

BIBLIOGRAPHY

Agogino, G.A.

1969 The Midland Complex: Is It Valid? American Anthropologist 71:1117-1118.

1972 Excavations at a Paleo-Indian Site (Brewster) in Moss Agate Arroyo, Eastern Wyoming. National Geographic Society Research Reports 1955-1960:1-6.

Anderson, T.W.

1971 Post-glacial Vegetative Changes in the Lake Huron-Lake Simcoe District, Ontario with Special Reference to Glacial Lake Algonquin. Unpublished Ph.D. dissertation, University of Waterloo.

Anderson, T.W. and C.F.M. Lewis

1985 Postglacial Water-level History of the Lake Ontario Basin. Geological Association of Canada Special Paper 30:231-253.

Ashworth, A.C.

1977 A Late Wisconsinan Coleopterous Assemblage from Southern Ontario, and its Environmental Significance. Canadian Journal of Earth Sciences 14(7):1625-1634.

Baker, W., T.N. Campbell, and G.L. Evans

1957 The Nall Site: Evidence of Early Man in the Oklahoma Panhandle. Bulletin of the Oklahoma Anthropological Society 5:1-20.

Banfield, A.W.F.

1961 A Revision of the Reindeer and Caribou, Genus Rangifer. National Museum of Canada Bulletin 177. Ottawa.

1974 The Mammals of Canada. Toronto.

Benmouyal, J.

1978 La Gaspésie. Recherches Amérindiennes au Québec 7(1-2):55-61.

Binford, L.R.

1963 The Hodges Site. A Late Archaic Burial Station. Anthropological Papers, Museum of Anthropology, University of Michigan 19:124-148.

1979 Organization and Formation Processes: Looking at Curated Technologies. Journal of Anthropological Research 35(3):255-273.

Bonnichsen, R.

1978 Critical Arguments for Pleistocene Artifacts from the Old Crow Basin, Yukon: A Preliminary Statement. In Early Man in America from a Circum-Pacific Perspective, Alan L. Bryan, ed., pp. 102-108. Occasional Papers No. 1, Department of Anthropology, University of Alberta.

Boyle, D.

1906 Annual Archaeological Report 1905: Being Part of Appendix to the Report of the Minister of Education Ontario. Toronto.

Bradley, B.

1974 Comments on the Lithic Technology of the Casper Site Materials. In The Casper Site: A Hell Gap Bison Kill on the High Plains, edited by G. Frison. Academic Press pp. 191-197, New York.

Brennan, L.A.

1982 A Compilation of Fluted Points of Eastern North America by Count and Distribution: An AENA Project. Archaeology of Eastern North America 10:27-46.

Bryan, A.L.

1969 Early Man in America and the Late Pleistocene Chronology of Western Canada and Alaska. Current Anthropology 10:339-65.

Burns, G.W.

1958 Wisconsin Age Forests in Western Ohio-II. Vegetation and Burial Conditions. Ohio Journal of Science 58:220-230.

Byers, D.S.

1954 Bull Brook - A Fluted Point Site in Ipswich, Massachusetts. American Antiquity 19(4):343-51.

Calkin, P.E. and B.H. Feenstra

1985 Evolution of the Erie-basin Great Lakes. Geological Association of Canada Special Paper 30:149-170.

Callahan, E.

1979 The Basics of Biface Knapping in the Eastern Fluted Point Tradition: A Manual for Flint Knappers and Lithic Analysts. Archaeology of Eastern North America 7(1):1-180.

Carr, K.W.

1975 The Fifty Site: A Flint Run Paleo-Indian Complex Processing Station. Unpublished M.A. Thesis, Department of Anthropology, Catholic University of America.

Cavallo, J.

1981 Turkey Swamp: A Late Palaeo-Indian Site in New Jersey's Coastal Plain. Archaeology of Eastern North America 9:1-17.

Chapman, L.J. and D.F. Putnam

1966 The Physiography of Southern Ontario. University of Toronto Press, Toronto.

Clarke, D.L.

1968 Analytical Archaeology. Methuen and Co. Ltd., London.

Cleland, C.E.

1966 The Prehistoric Animal Ecology and Ethnozoology of the Upper Great Lakes Region. Anthropological Papers, Museum of Anthropology, University of Michigan 29.

Coleman, A.P.

1899 The Iroquois Beach. Transactions of the Canadian Institute 6:29-44.

Connally, G.G. and L.A. Sirkin

1973 The Wisconsinan History of the Hudson-Champlain Lobe. Geol. Soc. Amer. Mem. 136:46-49.

Cook, H.J.

1927 New Geological and Paleontological Evidence Bearing on the Antiquity of Mankind in America. Natural History 279(3):240-247.

Cooper, A.J.

1979 Quaternary Geology of the Grand Bend-Parkhill Area, Southern Ontario. Ontario Geological Survey Report 188.

Cotter, J.L.

1937 The Significance of Folsom and Yuma Artifact Occurrences in the Light of Typology and Distribution. 25th Anniversary Studies, Philadelphia Anthropological Society, D.S. Davidson, editor, pp. 27-36.

1983 Commentary on the Paleo-Indian Tradition in Eastern North America - 20 Years Later. Archaeology of Eastern North America 11:15-18.

Cox, S.L.

1972 A Re-analysis of the Shoop Site. Unpublished paper on file, Smithsonian Institution, Washington.

Crabtree, D.E.

1966 A Stoneworker's Approach to Analyzing and Replicating the Lindenmeier Folsom. Tebiwa 9(1):3-39.

Crozier, Archibald

1939 Delaware Folsom Points. Archaeological Society of Delaware Bulletin 3:8-10.

Curran, M.L.

1984 The Whipple Site and Paleoindian Tool Assemblage Variation: A Comparison of Intrasite Structuring. Archaeology of Eastern North America 12:5-40.

Davis, E.M.

1962 Archaeology of the Lime Creek Site in Southwestern Nebraska. University of Nebraska State Museum Special Publication 3:1-106.

Davis, R.B. and T. Webb III

1975 The Contemporary Distribution of Pollen in Eastern North America: A Comparison with the Vegetation. Quarternary Research 5(3):395-434.

Davis, R.B., T.E. Bradstreet, R. Stuckenrath Jr., and H.W. Borns Jr.

1975 Vegetation and Associated Environments During the Past 14 000 Years Near Moulton Pond, Maine. Quarternary Research 5(3):435-465.

Deller, D.B.

1976a Paleo-Indian Locations on Late Pleistocene Shorelines, Middlesex County, Ontario. Ontario Archaeology 26:3-19.

1976b The Heaman Site: A Preliminary Report on a Paleo-Indian Site in Middlesex County, Ontario. Ontario Archaeology 27:13-28.

1979 Paleo-Indian Reconnaissance in the Counties of Lambton and Middlesex, Province of Ontario. Ontario Archaeology 32:3-20.

1980a An Archaeological Survey in the Counties of Lambton and Middlesex, Including Test Excavations at Two Paleo-Indian Sites. Report on file with the Ontario Ministry of Culture and Recreation, Toronto.

1980b The Parkhill (Brophey) Site, AhHk-49: Analyses of Surface Materials. M.A. Thesis, Wilfrid Laurier University.

1982 Some Paleo-Indian Cultures and Their Suggested Evolution in Southern Ontario and Michigan. Ms. on file with the author, Mount Brydges.

1983 Paleo-Indian Utilization of Exotic Lithic Raw Materials: Data Suggesting Seasonal Resource Scheduling and Social Interaction in the Central Great Lakes Region. Paper presented at the 9th Annual Archaeology Symposium, McMaster University.

De[illegible], D.B. and C.J. Ellis

1982 Archaeological Investigations at Thedford II, Crowfield and Other Paleo-Indian Sites in Southwestern Ontario, 1981. Report on file with the Ontario Ministry of Culture and Recreation, Toronto. [illegible] pp.

[illegible] Crowfield: A Preliminary Report on a Probable Paleo-Indian Cremation in Southwestern Ontario. Archaeology of Eastern North America 12:[illegible]

[illegible] Thedford II: A Paleo-Indian Site in the [illegible] River Watershed of Southwestern Ontario. Report on file with the Ontario Ministry of [illegible] and Culture, Toronto. [illegible] pp.

De[illegible], [illegible], C.J. El[illegible], and [illegible]

[illegible] Archaeology of [illegible] KEWA, Newsletter of the [illegible] Ontario Archaeological Society [illegible]

[illegible] G.[illegible]

[illegible] An Archaeological Survey of the West Holland River and Its Environs. Unpublished report on file with the Ontario Ministry of Culture and Recreation, Toronto.

[illegible] Paleo-Indian Settlement Patterns Along the Margins of the Simcoe [illegible] Paper presented [illegible]

[illegible] and D. Lorrain

[illegible] Bonfire Shelter: A Stratified [illegible] Val Verde County, Texas. Texas Memorial Museum Miscellaneous Papers No. 1, Austin.

Dincauze, D.F.

1968 Cremation Cemeteries in Eastern Massachusetts. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University 59:1.

Dincauze, D.F. and M.L. Curran

1983 Paleoindians as Generalists: An Ecological Perspective. Paper presented at the 48th Annual Meeting of the Society for American Archaeology, Pittsburgh.

Dreimanis, A.

1977 Late Wisconsin Glacial Retreat in the Great Lakes Region, North America. Annals of the New York Academy of Sciences 288:70-89.

Dreimanis, A. and R.P. Goldthwait

1973 Wisconsin Glaciation in the Huron, Erie, and Ontario Lobes. Geological Society of America, Memoir 136:71-106.

Edwards, T.W.D., R.O. Aravena, P.Fritz, and A.V. Morgan

1985 Interpreting Paleoclimate from ^{18}O and ^{2}H in Plant Cellulose: Comparison with Evidence from Fossil Insects and Relict Permafrost in Southwestern Ontario. Canadian Journal of Earth Sciences 22(11):1720-1726.

Eisenberg, L.

1978 Paleo-Indian Settlement Pattern in the Hudson and Delaware River Drainages. Occasional Publications in Northeastern Anthropology 4.

Ellis, C.J.

1979 Analysis of Lithic Debitage from Fluted Point Sites in Ontario. M.A. Thesis, McMaster University.

1984 Paleo-Indian Lithic Technological Structure and Organization in the Lower Great Lakes Area: A First Approximation. Unpublished Ph.D. dissertation, Department of Archaeology, Simon Fraser University.

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

1980 Test Excavations on Two Small Fluted Point Sites in Ontario. In Deller (1980b):92-156.

1982 Hi-Lo Materials From Southwestern Ontario. Ontario Archaeology 38:3-22.

1986 Post-glacial Lake Nipissing Waterworn Assemblages from the Southeastern Huron Basin Area. Ontario Archaeology 45:39-60.

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

1985 Huron Basin Glacial Lakes: A Review. Geological Association of Canada Special Paper 30:79-93.

Evenson, E. and A. Dreimanis

1976 Late Glacial (14 000-19 000 Years B.P.) History of the Great Lakes Region and Possible Correlations. IGPC Project (73/1/24). Quarternary Glaciations in the Northern Hemisphere 3:217-239.

Farrand, W.R.

1977 Revision of the Two Rivers ("Valders") Drift Border and the Age of Fluted Points in Michigan. Anthropological Papers, Museum of Anthropology, University of Michigan 61:74-84.

Figgins, J.D.

1927 The Antiquity of Man in America. Natural History 27(3):229-239.

1933 A Further Contribution to the Antiquity of Man in America. Colorado Museum of Natural History Papers 12(2):4-8.

1934 Folsom and Yuma Artifacts. Proceedings of the Colorado Museum Natural History 13(2):1-6.

Finlayson, W.D.

1977 The Saugeen Culture: A Middle Woodland Manifestation in Southwestern Ontario. National Museum of Man, Mercury Series 61.

Fitting, J.E.

1963 The Hi-Lo Site: A Late Paleo-Indian Site in Western Michigan. Wisconsin Archaeologist 44(2):87-96.

1975 The Archaeology of Michigan. Cranbrook Institute of Science, Bloomfield Hills.

1977 Social Dimensions of the Paleo-Indian Adaptation in the Northeast. Annals of the New York Academy of Sciences 288:369-374.

Fitting, J.E., J. Devisscher, and E. Wahla

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

Fitzhugh, W.

1972 Environmental Archaeology and Cultural Systems in Hamilton Inlet, Labrador. Smithsonian Contributions to Anthropology 16.

Flenniken, J.J.

1978 Reevaluation of the Lindenmeier Folsom: A Replication Experiment. American Antiquity 43(3):473-480.

Forbis, R.G. and J.D. Sperry

1952 An Early Man Site in Montana. American Antiquity 18(2):127-133.

Fox, W.A.

1975 The Paleo-Indian Lakehead Complex. Canadian Archaeological Association Research Report 6:29-53.

Frison, G.C.

1968 A Functional Analysis of Certain Chipped Stone Tools. American Antiquity 33(2):149-155.

1974 Archaeology of the Casper Site. In The Casper Site, A Hell Gap Bison Kill on the High Plains G. Frison editor, Academic Press, New York.

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

1983 The Western Plains and Mountain Region. In Early Man in the New World edited by Richard Shutler, pp. 109-124 Sage Publications, Beverly Hills.

Frison, G.C. and B.A. Bradley

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

Frison, G.C. and D. Standford, eds.

1982 The Agate Basin Site: A Record of the Paleo-Indian Occupation of the Northwestern High Plains. Academic Press, New York.

Fullerton, D.S.

1980 Preliminary Correlation of Post-Erie Interstadial Events (16 000 to 10 000 Radiocarbon Years Before Present), Central and Great Lakes Region and Hudson, Champlain and St. Lawrence Lowlands, United States and Canada. United States Geological Survey, Professional Paper 1089.

Funk, R.E.

1972 Early Man in the Northeast and the Late-glacial Environment. Man in the Northeast 4:7-39.

Funk, R.E. and B. Wellman

1984 The Corditaipe Site: A Small Isolated Paleo-Indian Camp in the Upper Mohawk Valley. Archaeology of Eastern North America 12:72-80.

Funk, R.E. and F.F. Schambach

1964 Probable Plano Points in New York State. Pennsylvania Archaeologist 34(2):90-93.

Funk, R.E., G.R. Walters, W.F. Ehlers, J.E. Guildy, and G.G. Connally

1969 The Archaeology of Dutchess Quarry Cave, Orange County, New York. Pennsylvania Archaeologist 39(1-4):7-22.

Gardner, W.M.

1974 The Flint Run Complex: Pattern and Process During the Paleo-Indian to Early Archaic. Archaeology Laboratory, Department of Anthropology, Catholic University of America, Occasional Publications 1:5-47.

1977 Flint Run Paleoindian Complex and its Implications for Eastern North America. Annals of the New York Academy of Sciences 288:257-263.

1983 Stop Me If You've Heard This One Before: The Flint Run Revisited. Archaeology of Eastern North America 11:49-64.

Gardner, W.M. and R. Verry

1979 Typology and Chronology of Fluted Points from the Flint Run Area. Pennsylvania Archaeologist 49(1-2):13-46.

Garrad, C.

1971 Ontario Fluted Point Survey. Ontario Archaeology 16:3-18.

Goldthwait, R.P.

1958 Wisconsin Age Forests in Western Ohio-I: Age and Glacial Events. Ohio Journal of Science 58:209-219.

Goodyear, A.C.

1982 The Chronological Position of the Dalton Horizon in the Southeastern United States. American Antiquity 47(2):382-95.

Gordon, B.H.C.

1975 Of Men and Herds in Barrenland Prehistory. National Museum of Man Mercury Series 28.

Gramly, R.M.

1982 The Vail Site: A Palaeo-Indian Encampment in Maine. Bulletin of the Buffalo Society of Natural Sciences 30.

Gramly, R.M. and J. Lothrop

1984 Archaeological Investigations of the Potts Site, Oswego County, New York, 1982 and 1983. Archaeology of Eastern North America 12:122-158.

Griffin, J.B.

1964 The Northeast Woodlands Area. In Prehistoric Man in the New World, edited by J. Jennings and E. Norbeck, pp. 223-258. University of Chicago Press, Chicago.

1977 A Commentary on Early Man Studies in the Northeast. Annals of the New York Academy of Sciences 288:3-15.

Grimes, J.R.

1979 A New Look at Bull Brook. Anthropology 3(1 and 2):109-30.

Grimes, J., W. Eldridge, B. Grimes, A. Vaccaro, F. Vaccaro, J. Vaccaro, N. Vacarró, and N. Orsini

1984 Bull Brook II. Archaeology of Eastern North America 12:159-183.

Gruger, E.

1972a Late Quaternary Vegetation Development in Southcentral Illinois. Quarternary Research 2:217-231.

1972b Pollen and Seed Studies of Wisconsinan Vegetation in Illinois, U.S.A. Geological Society of America Bulletin 83:2715-2734.

Harrison, B. and K. Killen

1978 Lake Theo: A Stratified, Early Man Bison Butchering and Campsite, Bricsoe County, Texas. Panhandle Plains Historic Museum, Special Archaeological Report 1.

Haury, E.W.

1953 Artifacts with Mammal Remains. American Antiquity 19(1):1-14.

Haury, E.W., E.B. Sayles, and W.W. Wasley

1959 The Lehner Mammoth Site, Southeastern Arizona. American Antiquity 25(1):2-30.

Hayden, B.

1982 Interaction Parameters and the Demise of Paleo-Indian Craftsmanship. Plains Anthropologist 27-96:109-123.

Haynes, C.V.

1964 Fluted Projectile Points: Their Age and Dispersion. Science 145:1408-1413.

1968 History and Geology of the Murray Springs Clovis Site, Arizona. Paper presented at the 33rd Annual Meeting of the Society for American Archaeology, Santa Fe, New Mexico.

1982 Were Clovis Progenitors in Beringia? In Paleoecology of Beringia, edited by D.M. Hopkins, J.V. Matthews, C.E. Schweger and S.B. Young, pp. 383-398. Academic Press, New York.

Haynes, C.V., D.J. Donahue, A.J.T. Jull and T.H. Zabel

1984 Application of Accelerator Dating to Fluted Point Paleoindian Sites. Archaeology of Eastern North America 12:184-191.

Hester, J.J.

1975 Paleoarchaeology of the Llano Estacado. In Late Pleistocene Environments of the Southern High Plains, ed. Fred Wendorf and James J. Hester, pp. 247-256. Fort Burgwin Research Center, Inc., Ranchos de Taos, New Mexico.

Holliday, V.T., E. Johnson, H. Hass, and R. Stuckenrath

1983 Radiocarbon Ages from the Lubbock Lake Site, 1950-1980: Framework for Cultural and Ecological Change on the Southern High Plains. Plains Anthropologist 28:165-182.

Hough, J.L.

1958 Geology of the Great Lakes. University of Illinois Press, Urbana.

Howard, E.B.

1934 Grooved Spearpoints. Pennsylvania Archaeologist 3(6):11-15.

Hyde, E.W.

1960 Mid-Ohio Valley Paleo-Indian and Suggested Sequence of the Fluted Point Cultures. West Virginia Archaeological Society 5.

Ikawa-Smith, F.

1982 The Early Prehistory of the Americas as Seen from Northeast Asia. In Peopling of the New World. Ballena Press Anthropological Papers 23:15-35.

Irwin, H.T.

1971 Developments in Early Man Studies in Western North America, 1960-1970. Arctic Anthropology 8(2):42-68.

Irwin, H.T. and H.M. Wormington

1970 Paleo-Indian Tool Types in the Great Plains. American Antiquity 35(1):24-34.

Irwin-Williams, C., H. Irwin, G. Agogino, and C.V. Haynes

1973 Hell Gap: Paleo-Indian Occupation on the High Plains. Plains Anthropologist 18(59):40-53.

Jackson, L.

1978 Late Wisconsin Environments and Palaeo-Indian Occupation in the Northeastern United States and Southern Ontario. M.A. Thesis, Department of Anthropology, Trent University.

Janusas, S.E.

1984 A Petrological Analysis of Kettle Point Chert and its Spatial and Temporal Distribution in Regional Prehistory. National Museum of Man, Mercury Series 128.

Jelinek, A.J.

1977 Form, Function, and Style in Lithic Analysis. In Culture, Change and Continuity, Essays in Honor of James Bennett Griffin pp. 19-33. Academic Press.

Johnson, E. and V.T. Holliday

1980 A Plainview Kill/Butchering Locale on the Llano Estacado - The Lubbock Lake Site. Plains Anthropologist 25:89-111.

Judge, W.J.

1970 Systems Analysis and the Folsom-Midland Question. Southwestern Journal of Anthropology 26(1):40-51.

1973 Paleo-Indian Occupation of the Central Rio Grande Valley in New Mexico. University of New Mexico Press, Albuquerque.

Karrow, P.F.

1980 The Nipissing Transgression Around Southern Lake Huron. Canadian Journal of Earth Sciences 17:1271-1274.

Karrow, P.F., T.W. Anderson, A.H. Clarke, L.D. Delorme, and M.R. Sreenivasa

1975 Stratigraphy, Paleontology, and Age of Lake Algonquin Sediments in Southwestern Ontario, Canada. Quarternary Research 5(1):49-87.

Kelsall, J.P.

1968 The Migratory Barren-Ground Caribou of Canada. Department of Indian Affairs and Northern Development, Canadian Wildlife Service.

Kempton, J.P. and D.L. Gross

1971 Rate of Advance of the Woodfordian (Late Wisconsinan) Glacial Margin in Illinois: Stratigraphic and Radiocarbon Evidence. Geological Society of America 82:3245-3250.

Kenyon, I.T.

1979 The Sub-Greywacke Lanceolate Biface in the Ausable River Valley. KEWA, Newsletter of the London Chapter, Ontario Archaeological Society, April.

Kidd, K.E.

1951 Fluted Points in Ontario. American Antiquity 16(3):260.

Kneberg, M.

1956 Some Important Projectile Point Types Found in the Tennessee Area. Tennessee Archaeologist 12(1):17-28.

Kock, A.C.

1839 Evidences of the Contemporaneous Existence of Man with Mastodon in Missouri. American Journal of Science 36:198-200.

Kraft, H.C.

1973 The Plenge Site: A Paleo-Indian Occupation Site in New Jersey. Archaeology of Eastern North America 1(1):56-117.

Lahren, L. and R. Bonnichsen

1974 Bone Foreshafts from a Clovis Burial in Southwestern Montana. Science 186:147-150.

Leonhardy, F.C. (editor)

1966 Domebo: A Paleoindian Mammoth Kill in the Prairie-Plains. Contributions of the Museum of the Great Plains 1, Lawton.

Leverett, F.

1902 Glacial Formations and Drainage Features of the Erie and Ontario Basins. United States Geological Survey 41.

Leverett, F. and F.B. Taylor

1915 The Pleistocene of Indiana and Michigan and the History of the Great Lakes. United States Geological Survey 53.

Lewis, C.F.M.

1970 Recent Uplift of Manitoulin Island Ontario. Canadian Journal of Earth Sciences 7:665-675.

Lewis, T.M.N.

1954 The Cumberland Point. Oklahoma Anthropological Society Bulletin 2:7-8.

Loring, S.

1980 Paleo-Indian Hunters and the Champlain Sea: A Presumed Association. Man in the Northeast 19:15-83.

Luedtke, B.

1976 Lithic Material Distributions and Interaction Patterns During the Late Woodland Period in Michigan. Ph.D. Dissertation, Department of Anthropology, University of Michigan.

MacDonald, G.F.

1968 Debert: A Palaeo-Indian Site in Central Nova Scotia. National Museum of Canada Anthropology Papers 16.

Mason, R.J.

1958 Late Pleistocene Geochronology and the Paleo-Indian Penetration into the Lower Michigan Peninsula. Anthropological Papers, Museum of Anthropology, University of Michigan 11.

1962 The Paleo-Indian Tradition in Eastern North America. Current Anthropology 3(3):227-274.

1981 Great Lakes Archaeology. Academic Press, New York.

Mason, R.J. and C. Irwin

1960 An Eden-Scottsbluff Burial in Northeastern Wisconsin. American Antiquity 26(1):43-57.

McAndrews, J.H.

1972 Pollen Analyses of the Sediments of Lake Ontario. Proceedings of the 24th International Geological Congress. Section 8:223-227, Montreal.

1981 Late Quaternary Climate of Ontario: Temperature Trends from the Fossil Pollen Record. In Quaternary Paleoclimate. Edited by W.C. Mahaney. Norwich, England. pp. 319-333.

McCary, B.C.

1947 A Survey and Study of Folsom-like Points Found in Virginia. Archaeological Society of Virginia, Quarterly Bulletin 2(1).

1948 A Report on Folsom-like Point Found in Granville County, N.C. Archaeological Society of Virginia, Quarterly Bulletin 3(1).

1949 Survey of Virginia-Folsom Points 142-161. Archaeological Society of Virginia, Quarterly Bulletin 3(1).

1951 A Workshop Site of Early Man in Dinwiddie County, Virginia. American Antiquity 17(1):9-17.

1968 Survey of Virginia Fluted Points, Nos. 348-384. Archaeological Society of Virginia, Quarterly Bulletin 23(1):2-10.

McConaughy, M.A., J.D. Applegarth, and D.J. Faingnaert

1977 Fluted Points from Slippery Rock, Pennsylvania. Pennsylvania Archaeologist 47:30-36.

McNett, C.W. and B.A. McMillan

1977 The Shawnee-Minisink Site. Annals of the New York Academy of Sciences 288:282-296.

Meltzer, D.J.

1983 Variation in Eastern Fluted Projectile Points. Paper presented at the 49th Annual Meeting, Society for American Archaeology, Pittsburgh.

Meltzer, D.J. and B.D. Smith

1986 Paleoindian and Early Archaic Subsistence Strategies in Eastern North America. In Foraging, Collecting, and Harvesting: Archaic Period Subsistence and Settlement in the Eastern Woodlands, edited by S.W. Neusuis. Center for Archaeological Investigations Occasional Paper 6:3-31, Southern Illinois University, Carbondale.

Miller, N.G. and W.S. Benninghoff

1969 Plant Fossils from a Cary-Port Huron Interstadial Deposit and their Paleoecological Interpretation. Geological Society of America 123:225-248.

Miller, R.F. and A.V. Morgan

1982 A Postglacial Coleopterous Assemblage from Lockport Gulf, New York. Quarternary Research 17:258-274.

Moeller, R.W.

1980 6LF21: A Paleo-Indian Site in Western Connecticut. American Indian Archaeological Institute, Occasional Paper 2.

Morgan, A.V., R.F. Miller, and A. Morgan

1982 Paleoenvironmental Reconstruction of Southwestern Ontario Between 11,000 and 10,000 Yr. B.P. Using Fossil Insects as Indicators. Third North American Paleontological Convention, Proceedings 2:381-386.

Moseley, M. and C. McKay

1972 Peruvian Settlement Pattern Studies and Small Sites Methodology. American Antiquity 37(1):67-81.

Mott, R.J. and L.D. Farley-Gill

1978 A Late-Quaternary Pollen Profile From Woodstock, Ontario. Canadian Journal of Earth Sciences 15:1101-1111.

Muller, E.H.

1965 Quaternary Geology of New York. In The Quaternary of the United States. pp. 99-112. Princeton University Press, Princeton.

Painter, F.

1974 The Cattail Creek Fluting Tradition and its Complex-Determining Lithic Debris. The American Archaeologist 1(1):20-32.

Parkins, W.

1977 Onondaga Chert: Geological and Palynological Studies as Applied to Archaeology. M.Sc. Thesis, Department of Geological Sciences, Brock University.

Payne, J.

1982 The Western Basin Paleo-Indian and Early Archaic Sequences. Paper submitted in partial fulfillment of requirements for Honors Citation in Anthropology, University of Toledo.

Peck, R.M. and F. Painter

1985 Cumberland Fluted Projectile Points from Kentucky and Tennessee. The Chesopiean 23(3):5-9.

Peers, L.

1985 Ontario Paleo-Indians and Caribou Predation. Ontario Archaeology 43:31-40.

Peru, D.V.

1965 The Distribution of Fluted Points in the Counties of Kent and Allegan, Michigan. The Michigan Archaeologist 11(1):1-8.

Pfeiffer, J.

1980 The Griffin Site: A Susquehanna Cremation Burial in Southern Connecticut. Man in the Northeast 19:129-133.

Prest, V.K.

1970 Quaternary Geology of Canada. In Geology and Economic Minerals of Canada, edited by R.J.W. Douglas. Geological Survey of Canada, Economic Geology Report No. 1:675-764. Department of Energy, Mines and Resources, Ottawa.

Prideaux, J.

1977 Schomberg and Black River Survey. Unpublished report on file, Archaeology Division, Ontario Ministry of Citizenship and Culture, Toronto.

1978 Schomberg River Basin Survey and Excavation 1978. Unpublished report on file, Ontario Ministry of Culture and Recreation, Toronto.

Prufer, O.H.

1960 Survey of Ohio Fluted Points. Cleveland Museum of Natural History 1.

Prufer, O.H. and N.L. Wright

1970 The Welling Site (33Co-2): A Fluted Point Workshop in Coshocton County, Ohio. Ohio Archaeologist 20 (4):259-268.

Prufer, O.H. and R.S. Baby

1963 Palaeo-Indians of Ohio. The Ohio Historical Society, Columbus, Ohio.

Purdy, B.

1975 Fractures for the Archaeologist. In Lithic Technology: Making and Using Stone Tools, edited by Earl Swanson, pp. 133-141. Mouton, The Hague.

Quimby, G.

1958 Fluted Points and Geochronology of the Lake Michigan Basin. American Antiquity 23(3):247-254.

1960 Indian Life in the Upper Great Lakes, 11,000 B.C. to A.D. 1800. University of Chicago Press, Chicago.

Ritchie, W.A.

1953 A Probable Paleo-Indian Site in Vermont. American Antiquity 18(3):249-258.

1957 Traces of Early Man in the Northeast. New York State Museum and Science Service, Bulletin 358.

1965 The Archaeology of New York State. Natural History Press, Garden City.

Ritzenthaler, R. and P. Scholz

1951 Folsomoid Points in Wisconsin. Wisconsin Archaeologist 32:45-48.

Roberts, A.

1980 A Geographic Approach to Southern Ontario Archaic. Archaeology of Eastern North America 8:28-45.

1984 Paleo-Indian on the North Shore of Lake Ontario. Archaeology of Eastern North America 12:248-265.

Roberts, A. and J.H. McAndrews

1987 Southern Ontario, 8600 B.C. In Historical Atlas of Canada, edited by R.C. Harris, University of Toronto Press. Plate 3.

Roberts, F.H.H.

1935 A Folsom Complex: Preliminary Report on Investigations at the Lindenmeier Site in North Colorado. Smithsonian Miscellaneous Collections 94(4).

1939 The Folsom Problem in American Archaeology. Smithsonian Institution Annual Report 1938:531-546.

Robertson, A.

1947 The Folsom Culture in Southside Virginia. Archaeological Society of Virginia, Quarterly Bulletin 2(2).

Roosa, W.B.

1963 Some Michigan Fluted Point Sites and Types. The Michigan Archaeologist 9(3):44-48.

1965 Some Great Lakes Fluted Point Types. The Michigan Archaeologist 11(3-4):89-102.

1977a Great Lakes Paleo-Indian: The Parkhill Site. Annals of the New York State Academy of Sciences 288:349-354.

1977b Fluted Points from the Parkhill Ontario Site. Anthropological Papers, Museum of Anthropology, University of Michigan 61:87-122.

Roosa, W.B. and D.B. Deller

1982 The Parkhill Complex and Eastern Great Lakes Paleo-Indian. Ontario Archaeology 37:3-15.

Savage, H.

1981 Post-Glacial Caribou in Southern Ontario. Paper presented at the 8th Annual Symposium of the Ontario Archaeological Society, Midland, Ontario.

Schwert, D., T. Anderson, A. Morgan, A.V. Morgan, and P. Karrow

1985 Changes in Late Quaternary Vegetation and Insect Communities in Southwestern Ontario. Quaternary Research 23:205-226.

Seeman, M.F. and O.H. Prufer

1982 An Updated Distribution of Ohio Fluted Points. Midcontinental Journal of Archaeology 7(2):155-169.

Sellards, E.H.

1952 Early Man in America: A Study in Prehistory. University of Texas Press, Austin.

Sellards, E.H., G.L. Evans, and G.E. Meade

1947 Fossil Bison and Associated Artifacts from Plainview, Texas, with Descriptions of Artifacts by Alex D. Krieger. Bulletin of Geological Society of America 58:927-954.

Sheppard, P.

1977 An Archaeological Survey of the Niagara Escarpment Southwest of Collingwood Ontario (1977). Field report on file, Ontario Ministry of Culture and Recreation, Toronto.

Shetrone, H.C.

1936 The Folsom Phenomena as seen from Ohio. Ohio State Archaeological and Historical Quarterly 45:240-256.

Shiner, J.

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

Simons, D.L., M. Shott, and H.T. Wright

1984 The Gainey Site: Variability in a Great Lakes Paleo-Indian Assemblage. Archaeology of Eastern North America 12:266-279.

Sly, P.G. and C.F.M. Lewis

1972 The Great Lakes of Canada-Quaternary Geology and Limnology. 24th International Geological Congress, Field Excursion A43, Montreal.

Snow, D.R.

1980 The Archaeology of New England. Academic Press, New York.

Speiss, A.E.

1979 Reindeer and Caribou Hunters: An Archaeological Study. Academic Press, New York.

Sreenivasa, B.A.

1968 A Late-Glacial and Post-Glacial Pollen Diagram from the Waterloo Moraine, Waterloo County, Ontario. Unpublished M.Sc. Thesis, University of Waterloo.

Stanford, D.

1978 Some Clovis Points. Abstracts of the Fifth Conference of the American Quarternary Association, Edmonton.

Stewart, A.

1984 The Zander Site: Paleo-Indian Occupation of the Southern Holland Marsh Region of Ontario. Ontario Archaeology 42:45-79.

Storck, P.L.

1971 The Search for Early Man in Ontario. Rotunda, The Bulletin of the Royal Ontario Museum 4(4):18-27.

1973 Two Paleo-Indian Projectile Points from the Bronte Creek Gap, Halton County, Ontario. Royal Ontario Museum, Archaeology Paper 1:1-4

1978 Some Recent Developments in the Search for Early Man in Ontario. Ontario Archaeology 29:3-16.

1979 A Report on the Banting and Hussey Sites: Two Paleo-Indian Campsites in Simcoe County, Ontario. National Museum of Canada, Archaeological Survey of Canada, Mercury Series, Paper 93.

1982 Paleo-Indian Settlement Patterns Associated with the Strandline of Glacial Lake Algonquin in Southcentral Ontario. Canadian Journal of Archaeology 6:1-31.

1983 The Fisher Site, Fluting Techniques and Early Paleo-Indian Cultural Relationships. Archaeology of Eastern North America 11:80-97.

1984 Glacial Lake Algonquin and Early Paleo-Indian Settlement in southcentral Ontario. Archaeology of Eastern North America 12:286-298.

1987 A Question of Time. Royal Ontario Museum, Archaeological Newsletter 2(23):1-4.

Storck, P.L. and P. Von Bitter

1981 The Search Changes Direction: Ice Age Man in Ontario. Rotunda, The Bulletin of The Royal Ontario Museum 14(3):28-36.

Stothers, D.M.

1982 Earliest Man in the Western Lake Erie Basin. Man in the Northeast 23:39-48.

Terasmae, J.

1973 Notes on Late Wisconsin and Early Holocene History of Vegetation in Canada. Arctic and Alpine Research 5(3):201-222.

Terasmae, J. and H.L. Matthews

1980 Late Wisconsin White Spruce (Picea Glauca (Moench) Voss) at Bramptom, Ontario. Canadian Journal of Earth Sciences 17:1087-1095.

Trigger, B.G.

1983 American Archaeology as Native History: A Review Essay. The William and Mary Quarterly 40:413-452.

Tunnel, C.

1975 Fluted Projectile Production as Revealed by Lithic Specimens from the Adair Steadman Site in Northwestern Texas. Texas Historical Commission, Office of the State Archaeologist Special Report 18.

Voss, J.

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

Wahla, E. and J. Devisscher

1969 The Holcombe Paleo-Point. The Michigan Archaeologist 15(4):109-111.

Webb, W.S.

1951 The Parrish Village Site, Site 45, Hopkins County, Kentucky. University of Kentucky, Reports in Anthropology 7(6).

Weber, R.H. and G. A. Agogino

1968 Mockingbird Gap Paleo-Indian Site: Excavations in 1967. Paper presented at the 33rd Annual Meeting, The Society for American Archaeology, Santa Fe.

Wendorf, F. and A.D. Krieger

1959 New Light on the Midland Discovery. American Antiquity 25:66-78.

Wheat, J.B.

1972 The Olsen-Chubbuck Site: A Paleo-Indian Bison Kill. Society for American Archaeology Memoir 26.

White, A.

1963 Analytic Descriptions of the Chipped Stone Industry from the Synders Site, Calhoun County, Illinois. Anthropological Papers, Museum of Anthropology, University of Michigan 19:1-70.

Wilmsen, E.N.

1973 Interaction, Spacing Behavior, and the Organization of Hunting Bands. Journal of Anthropological Research 29:1-31.

1974 Lindenmeier: A Pleistocene Hunting Society. Harper and Row, New York.

Wilmsen, E.N. and F.H.H. Roberts

1984 Lindenmeier, 1934-1974. Concluding Report on Investigations. Reprint Edition of Smithsonian Contributions to Anthropology 24. Smithsonian Institution Press, Washington.

Winn, C.F.

1977 Vegetational History and Geochronology of Several Sites in South Southwestern Ontario with Discussion on Mastodon Extinction in Southern Ontario. Unpublished M.Sc. Thesis, Department of Geological Sciences, Brock University.

Witthoft, J.

1952 A Paleo-Indian Site in Eastern Pennsylvania: An Early Hunting Culture. Proceedings of the American Philosophical Society 96:464-495.

Wormington, H.M.

1957 Ancient Man in North America. Denver Museum of Natural History, Popular Series 4. Denver, Colorado.

Wright, H.T.

1979 Paleo-Indian Hunters of Southeastern Michigan. Paper presented at the Eastern States Archaeological Federation Meetings, Ann Arbor.

1981 Technology and Economy: Recent Research on Early Hunters of the Central Great Lakes. Paper presented at the 46th Annual Meeting of the Society for American Archaeology, San Diego.

Wright, H.T. and W.B. Roosa

1966 The Barnes Site: A Fluted Point Assemblage from the Great Lakes Region. American Antiquity 31(6):850-860.

Wyckoff, D.G. and L. Taylor

1971 The Pumpkin Creek Site: An Early Archaic Camp on the Southern Plains Border. Plains Anthropologist 16(51):20-51.

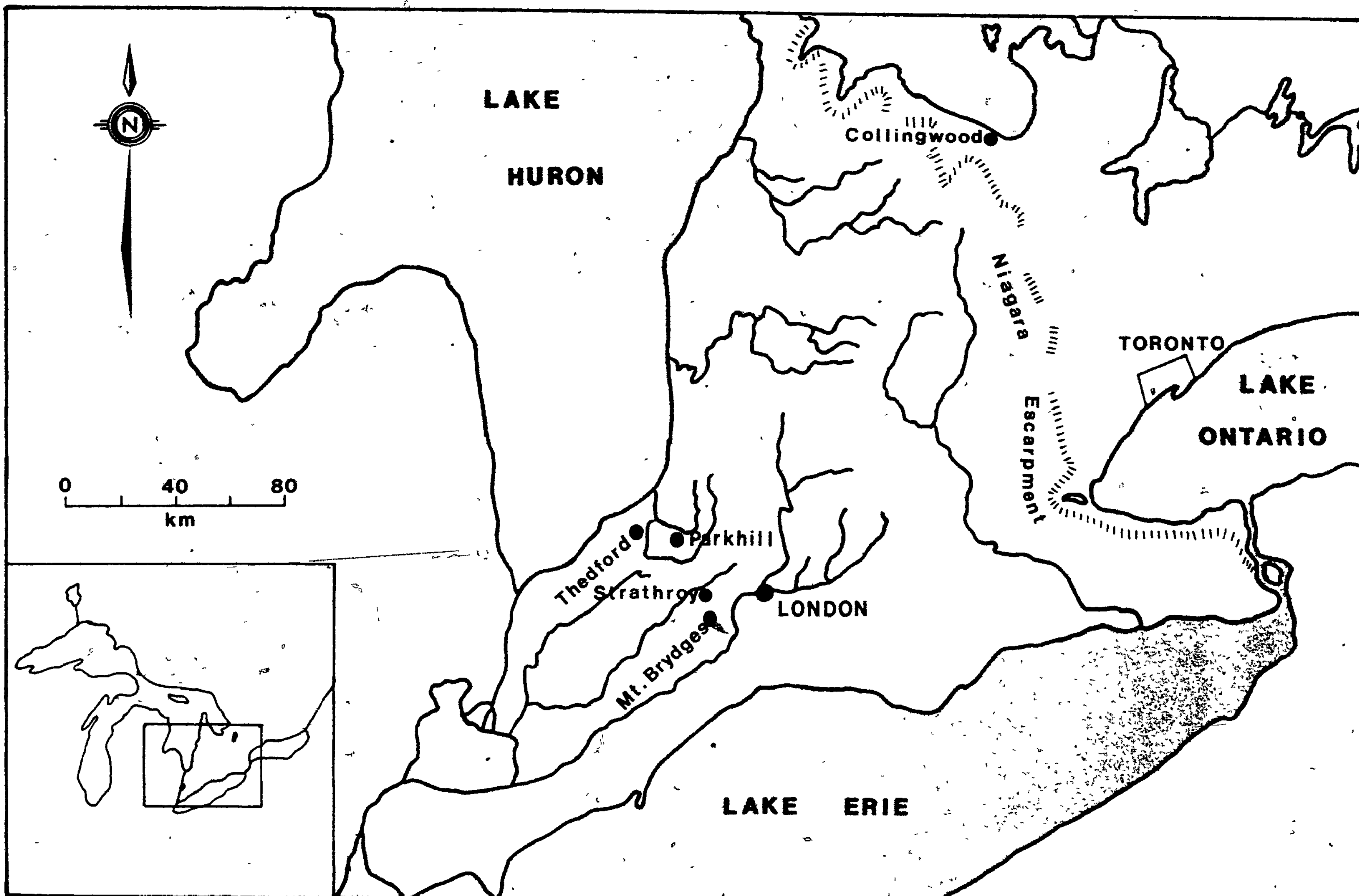


Figure 1: Southwestern Ontario.

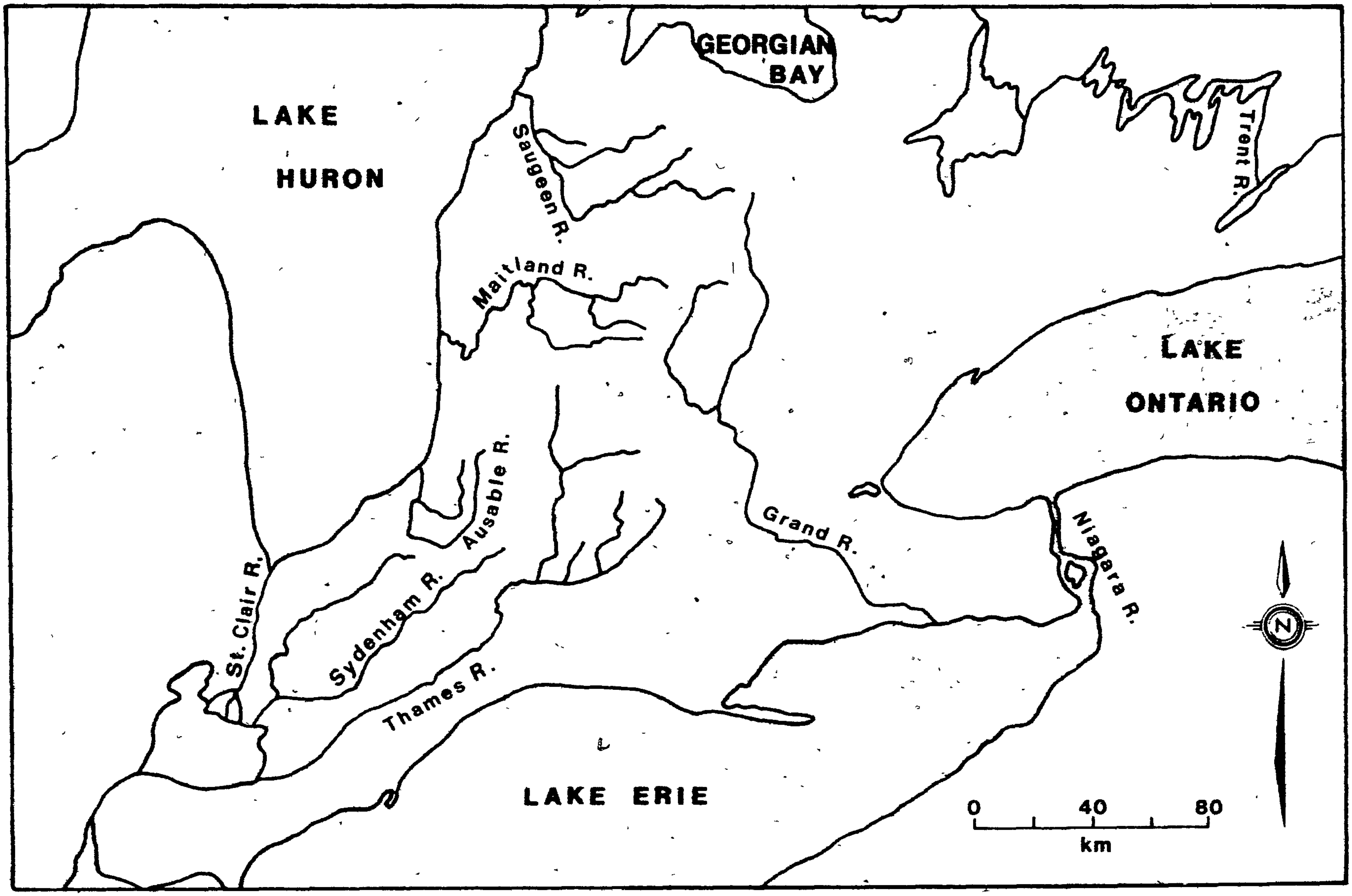


Figure 2: Lakes and Rivers, Southern Ontario.

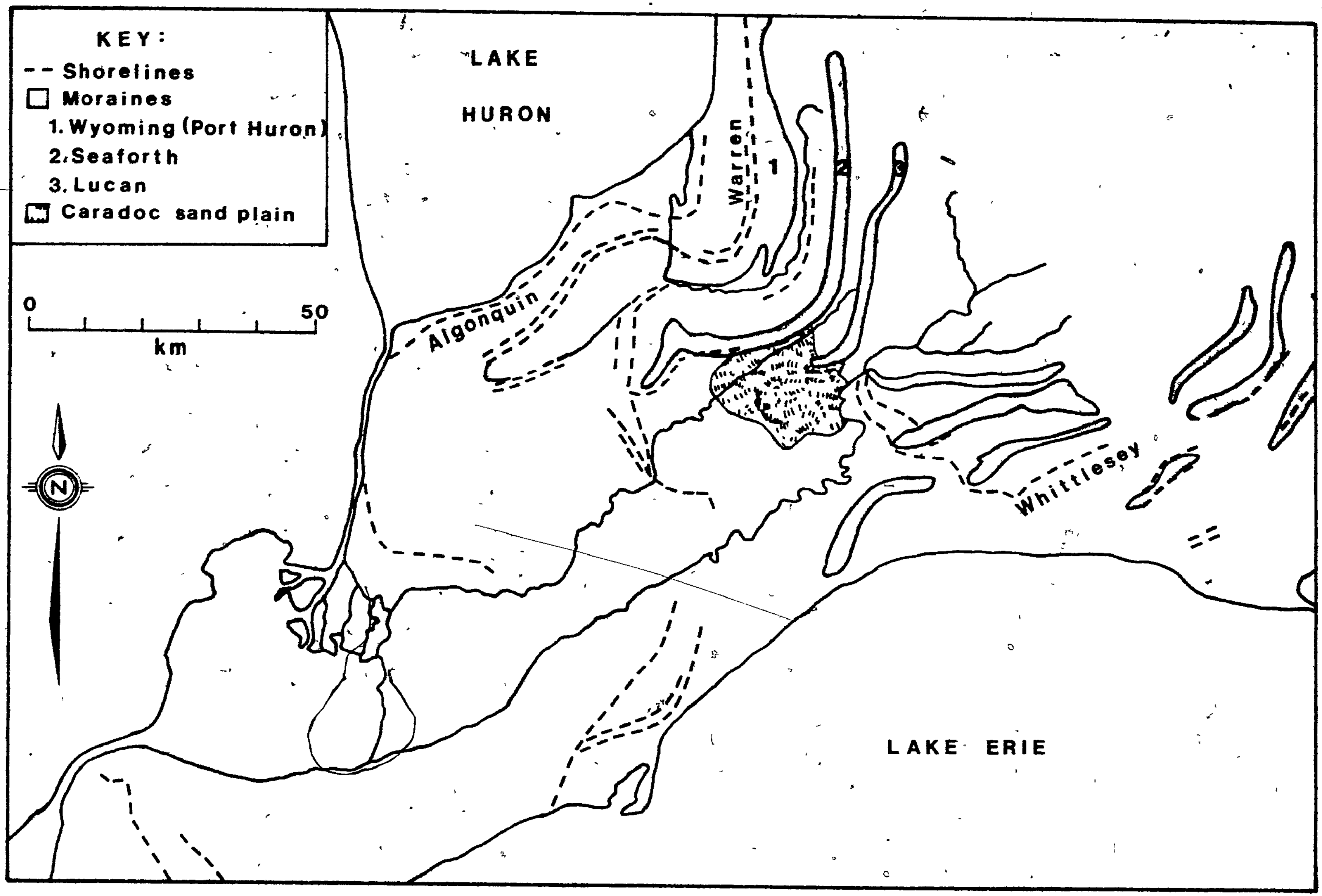


Figure 3: Physiographic Features, Southwestern Ontario.

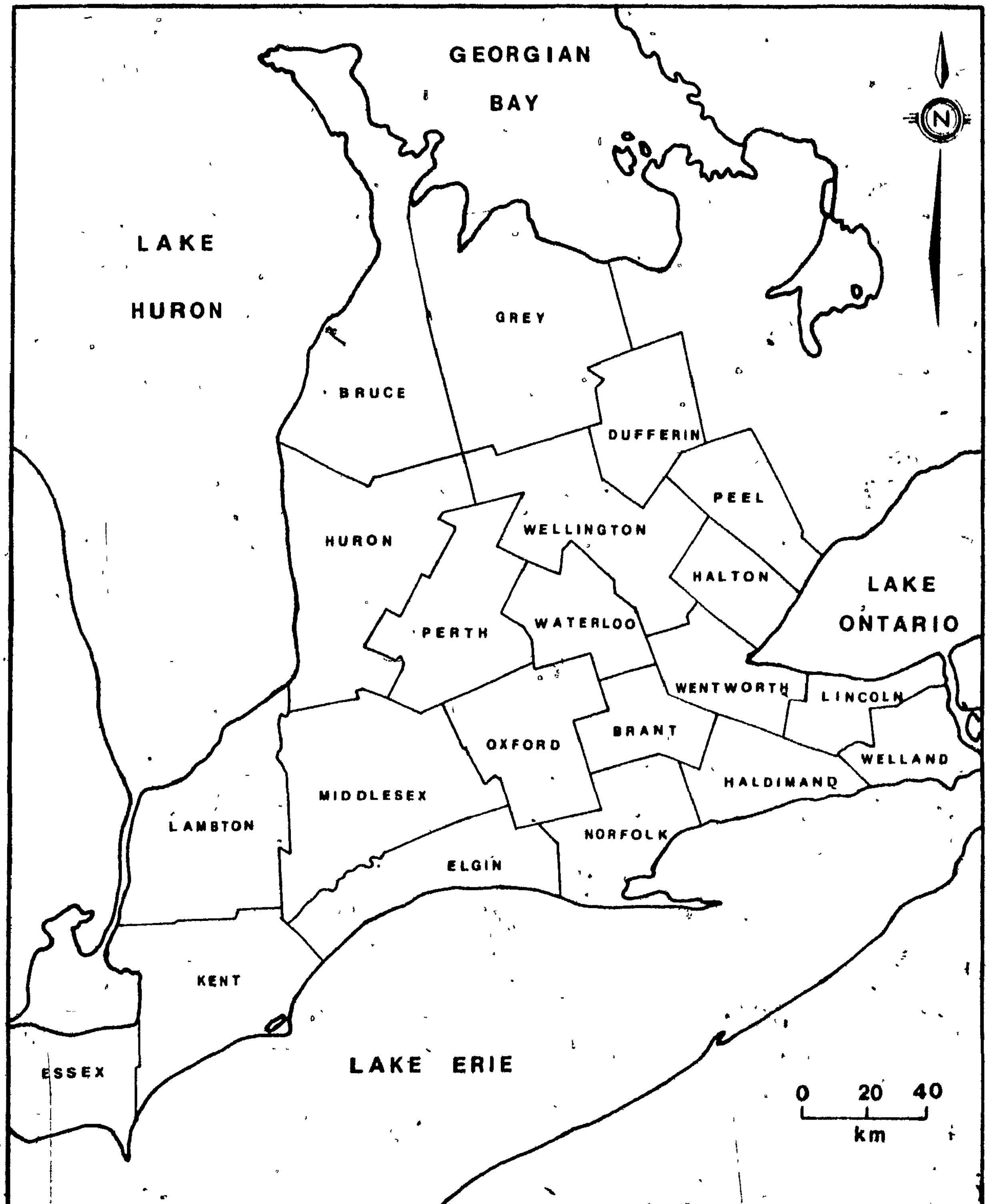


Figure 4: Counties of Southwestern Ontario.

Figure 5 Legend: Townships Referred to in Text

Figure 5 Reference	Township
1	Chatham
2	Harwich
3	Bosanquet
4	McGillivray
5	West Williams
6	Brooke
7	Mosa
8	Dunwich
9	Ekfrid
10	Metcalfe
11	Caradoc
12	Lobo
13	London
14	Westminster
15	Southwold
16	Bayham

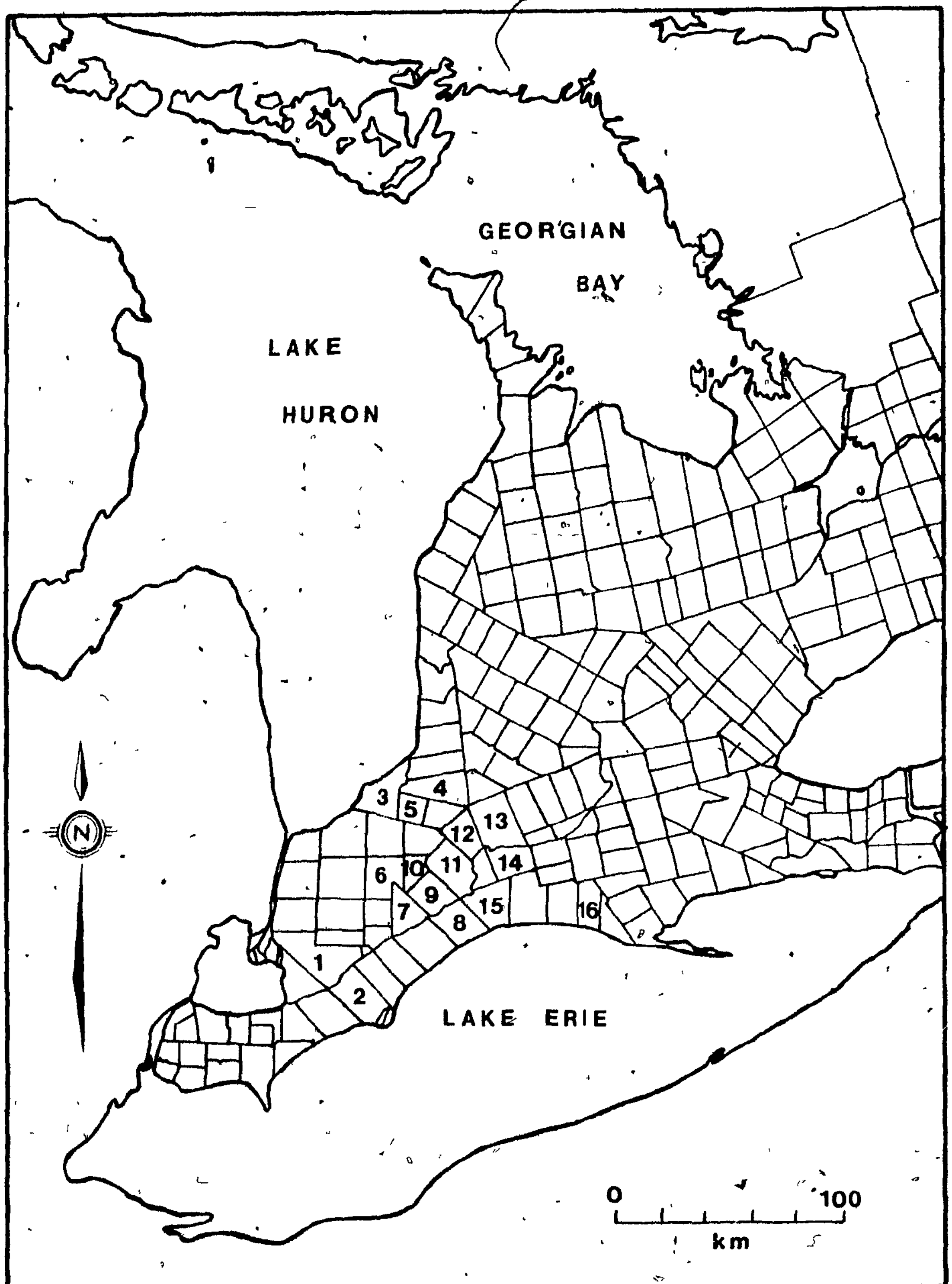


Figure 5: Townships Referred to in Text

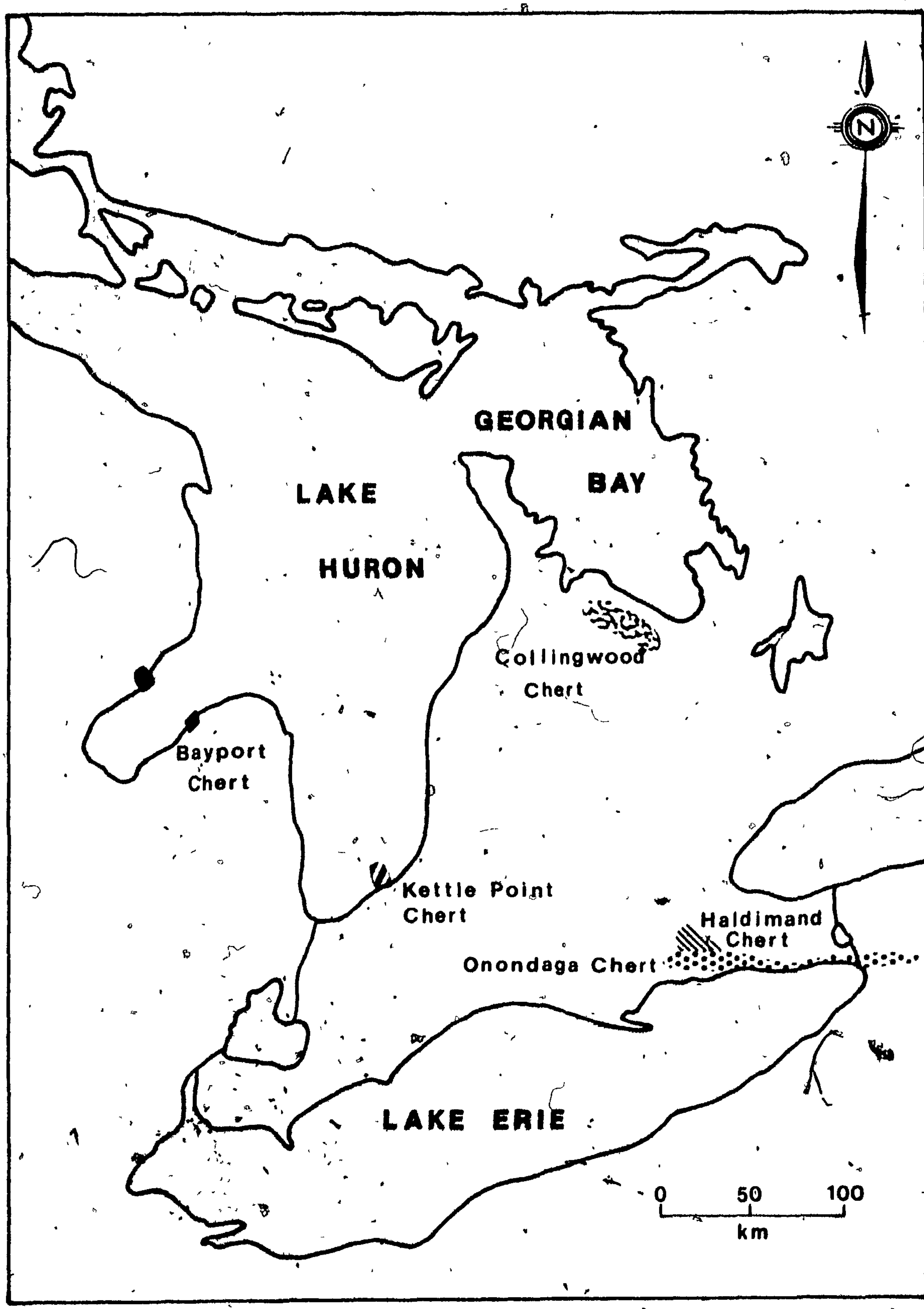


Figure 6: Chert Bedrock Outcrops.

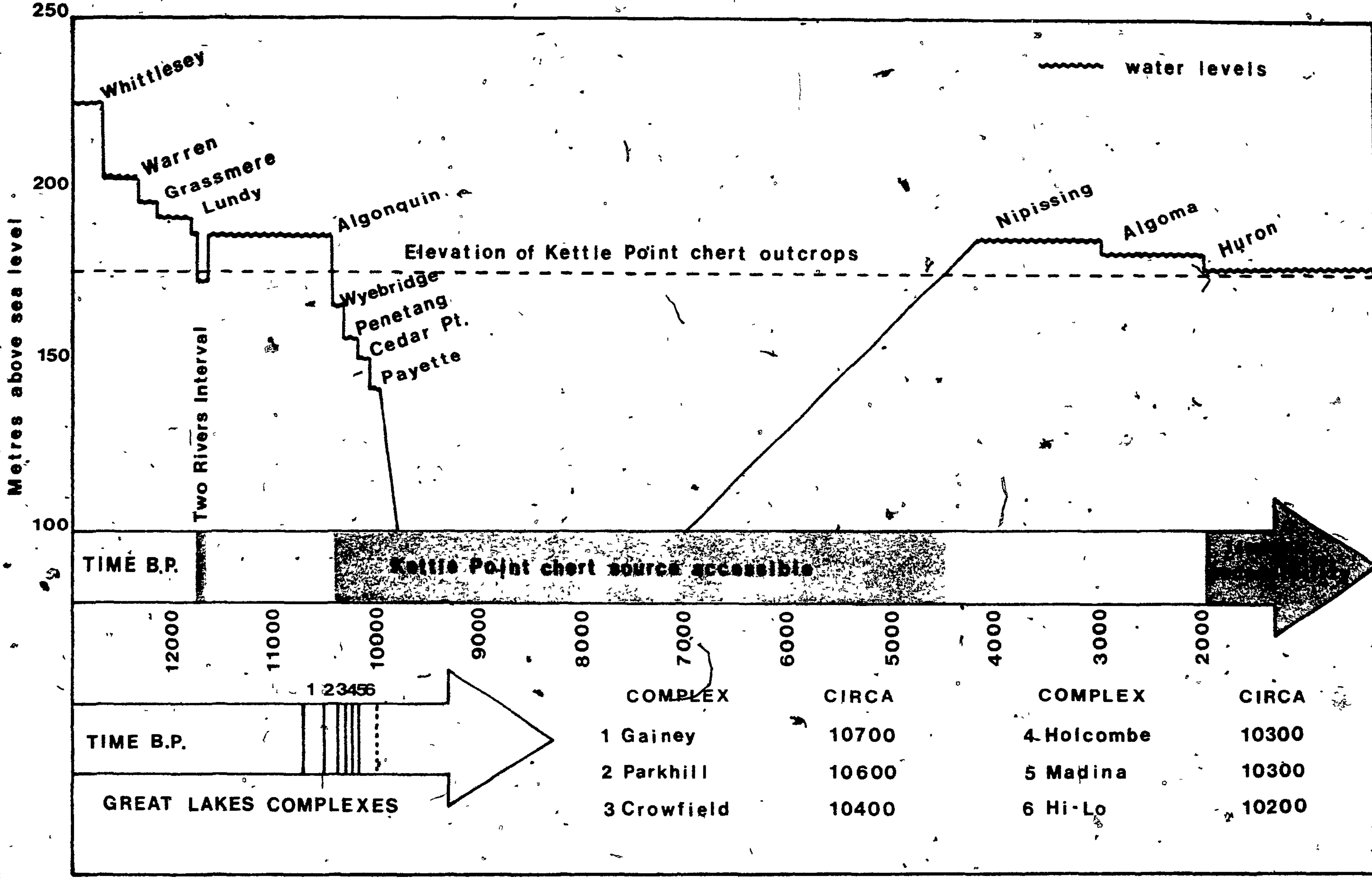


Figure 7: Lake Levels and the Accessibility of Kettle Point Chert Outcrops.

Figure 8: Gainey Points from Southwestern Ontario

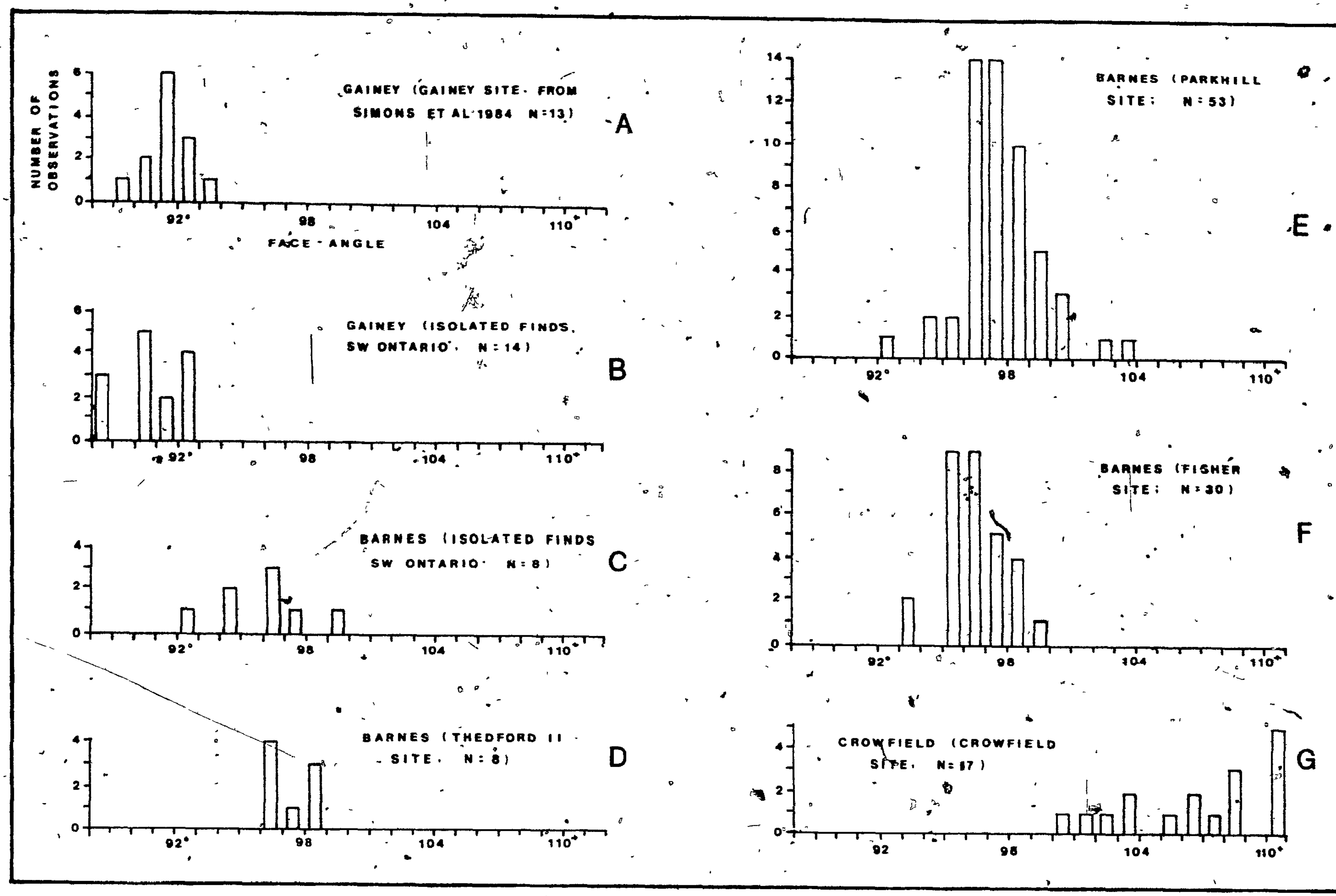
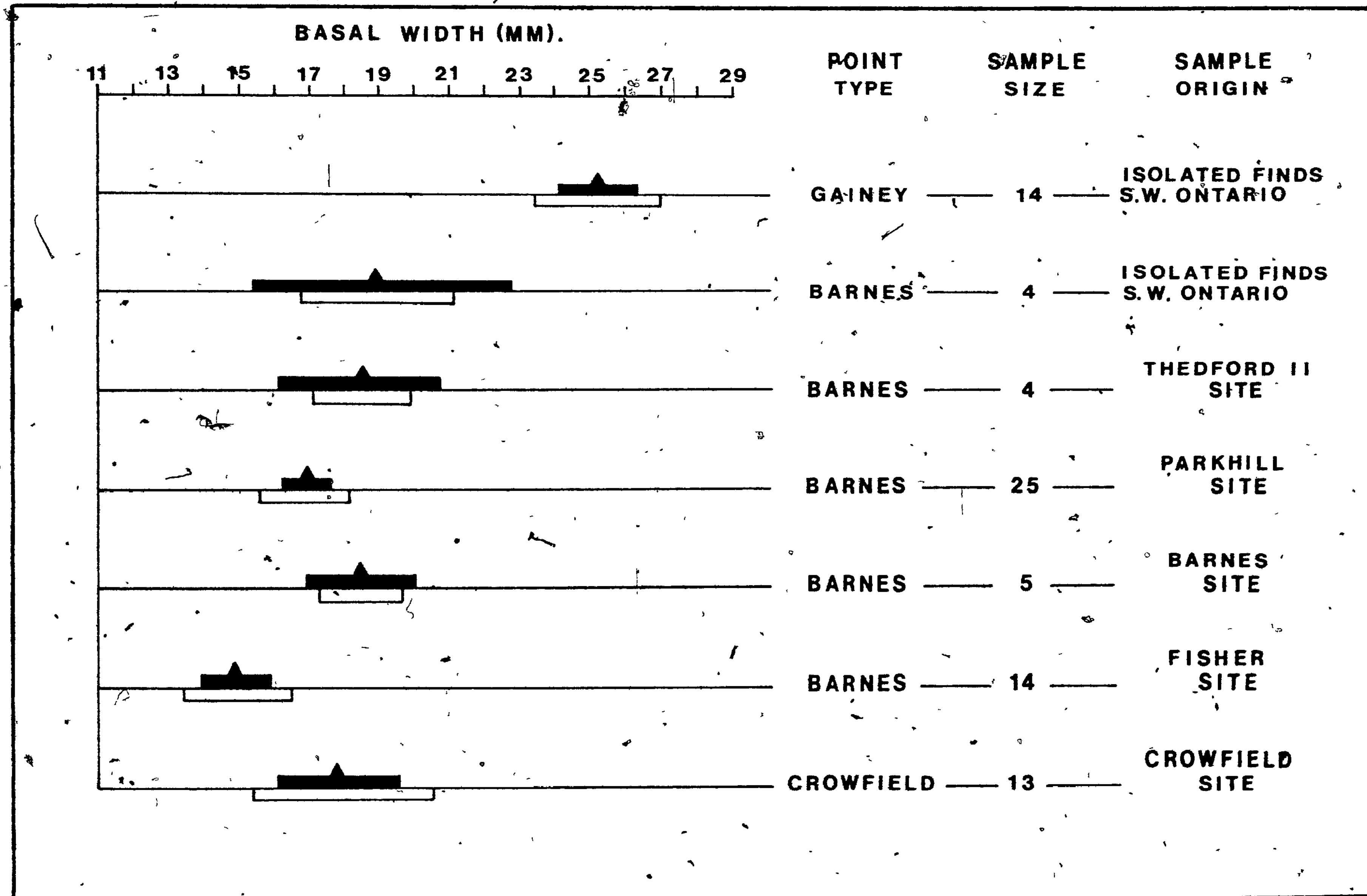


Figure 9: Face-Angle Measurements of Fluted Point Samples (After Deller and Ellis, 1987.)



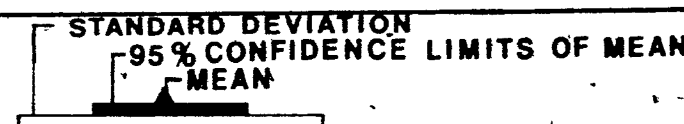


Figure 10: Basal Widths, Great Lakes Fluted Point Samples.

Figure 11: Barnes Points and Fluted Preforms from Southwestern Ontario

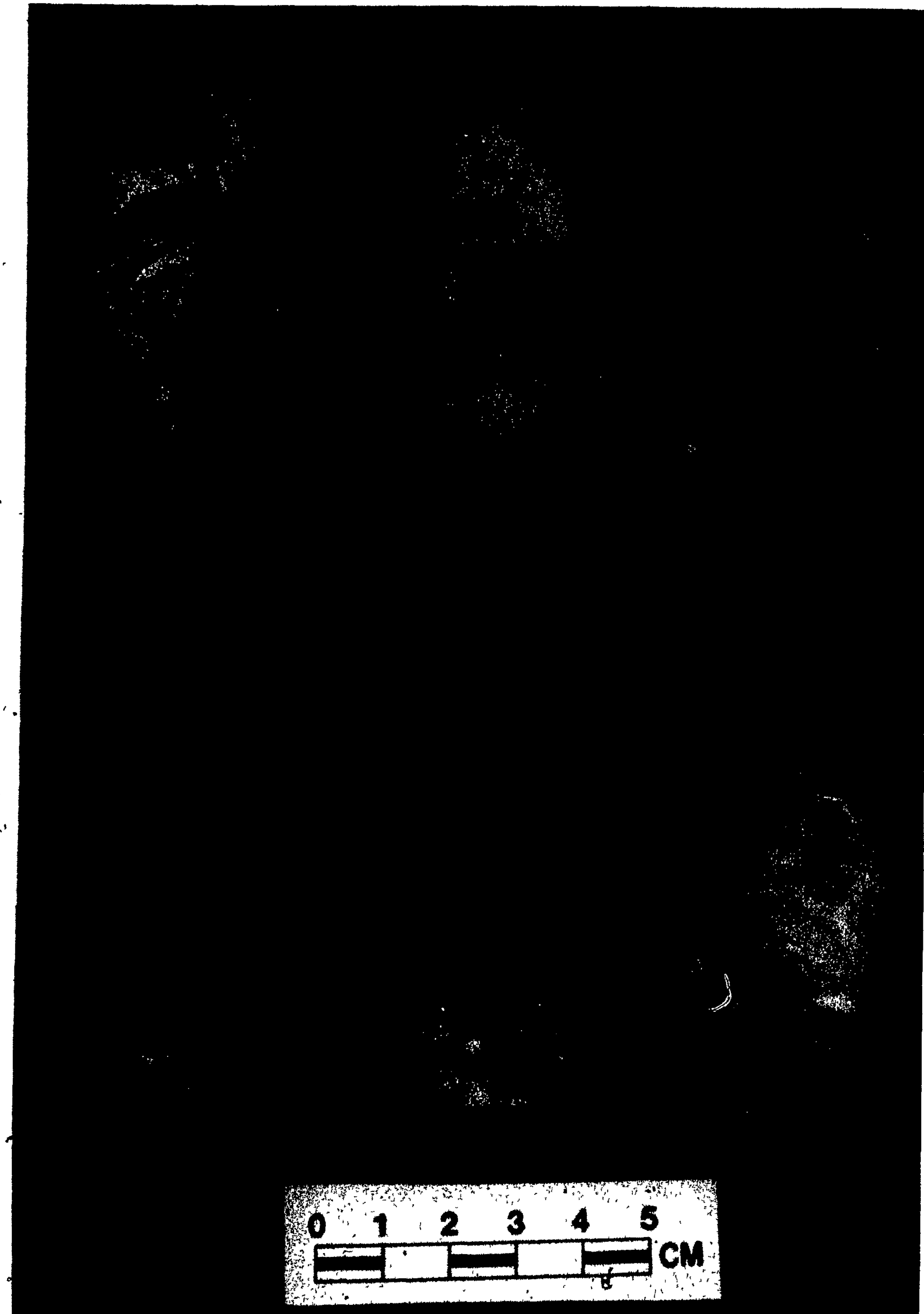


Figure 12: Crowfield Points from Southwestern Ontario

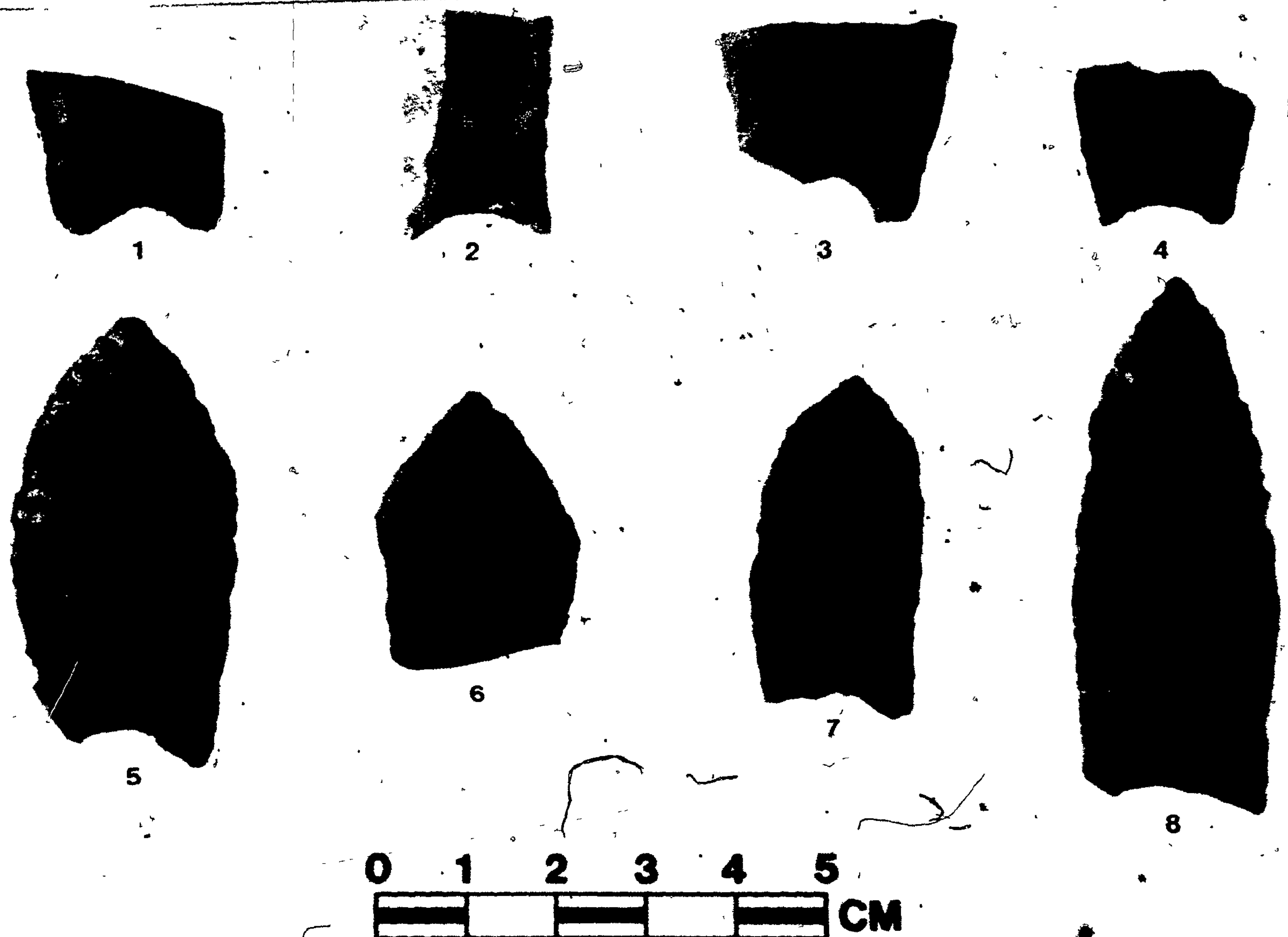


Figure 13: Holcombe Points from Southwestern Ontario

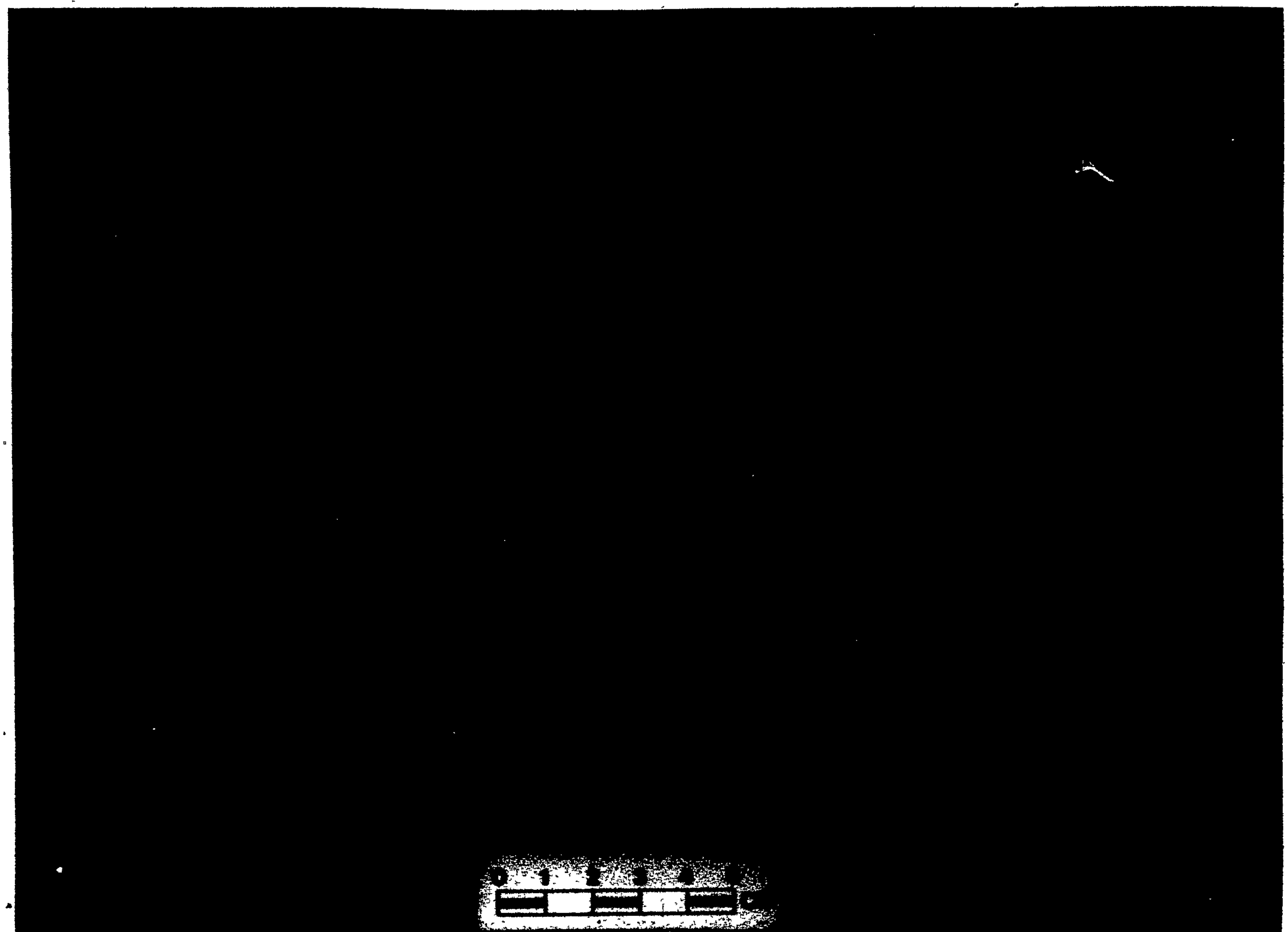


Figure 14: Madina Points from Southwestern Ontario

Figure 15 Legend: Location Summary Data

Fig. 15 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
1	Haunted Hill	21	VIII	McGillivray	Middlesex	394853(*1)	Deller 1976b:A8
2	Fluted point base	17 or 18	I	Bosanquet	Lambton		Fig. 8, No. 5
3	Fluted point			McGillivray	Middlesex		Garrad 1971: No. 21
4	Fluted point	3	XIII	Lobo	Middlesex		Fig. 8, No. 4
5	Weed Site	17	IX	Brooke	Lambton	282460(*2)	Deller 1979: No. 29a This study
6	Ferguson Site	12	V	Metcalfe	Middlesex	426491(*2)	Deller 1979: No. 41 This study
7	Fluted point	18	IV	Caradoc	Middlesex	582524(*2)	Garrad 1971: No. 18
8	Fluted point	17	III	Caradoc	Middlesex	583508(*2)	This study
9	Fluted point			London			Fig. 8, No. 2
10	Fluted point	13	VII	Dunwich	Elgin	(corrected location)	Garrad 1971: No. 13

con't.

Figure 15 Legend continued

Fig. 15 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
11	Fluted point	10	X	Bayham	Elgin		Garrad 1971:No. 27
12	Fluted point base	19	VIII	Bayham	Elgin	193364(*3)	Fig. 8, No. 6
13	Uniondale	28	XI	East Nissouri	Oxford	958841(*4)	Fig. 8, No. 1
15	Fluted pieces esquillees	30	XII	North Dumfries	Waterloo	999476(*5)	This study
16	Fluted point				Brant		Garrad 1971:No. 33
17	Fluted point			Ancaster	Wentworth		Garrad 1971:No. 36
18	Fluted point						Garrad 1971:No. 35
19	Fluted point			Binbrooke	Wentworth		McMaster University #9347
20	Kolapore						Storck 1984: Fig. 14

con't.

Figure 15 Legend continued

Fig. 15 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
21	Banting				Simcoe		Storck 1979
22	Fluted point						Garrad 1971:No. 42
23	Udora						Storck 1982:Fig. 7h
24	Fluted point			Markham	York		Garrad 1971:No. 43
25	Fluted point						Roberts 1984:plate 5
26	Fluted point			Hamilton	Northumberland		Garrad 1971:No. 45

Topographic Grid Reference Notes

*1 Parkhill 40 P/4, Edition 5.
*2 Strathroy 40 1/13, Edition 4.
*3 Tillsonburg 40 1/15, Edition 4.
*4 Lucan 40 P/3, Edition 4.
*5 Ayr 40 P/8, Edition 4.

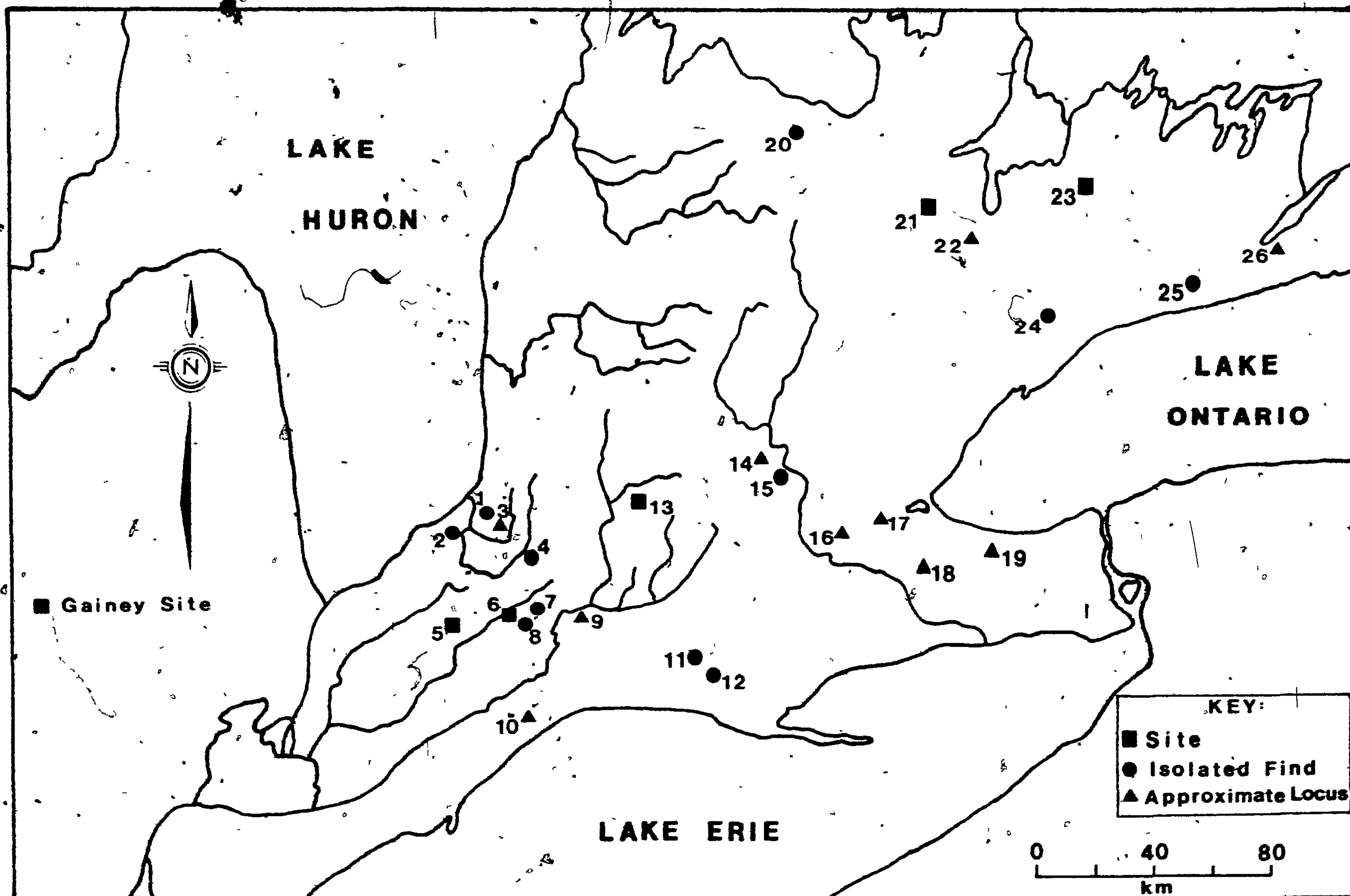


Figure 15: Distribution of Gainey Complex Sites and Locations.

Figure 16 Legend: Location Summary Data

Fig. 16 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
1	Barnes						Wright and Roosa 1966
2	Babula Farm			Gore of Camden	Kent		Ian Kenyon: personal comm.
3	Stott Glen	24	V	Warwick	Lambton	318880(*1)	This study
4	Fluted point	13	VII	Dunwich	Elgin	(corrected location)	Garrad 1971:No. 14
5	Mullin	6	IV(S)	Ekfrid	Middlesex	559347(*2)	This study
6	Fluted point				Elgin		Garrad 1971:No. 25
7	Fluted point			Biddulph	Middlesex		Kidd 1951:No. g
8	Fluted point			Onondaga	Brant		Garrad 1971:No. 34
9	Glass			Onondaga	Brant	632715(*3)	William Marshall: personal comm.
10	Fluted point			Dunn	Haldimand		Garrad 1971:No. 31

con't.

Figure 16 Legend continued

Fig. 16 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
11	Fisher						Storck 1984
12	Banting			Essa			Storck 1979
13	Fluted point			Hamilton	Northumberland		Garrad 1971:No. 14

Topographic Grid Reference Notes

*1 Parkhill 40 P/4, Edition 4.
*2 Strathroy 40 1/13, Edition 4.
*3 Brantford 40 P/1, Edition 4.

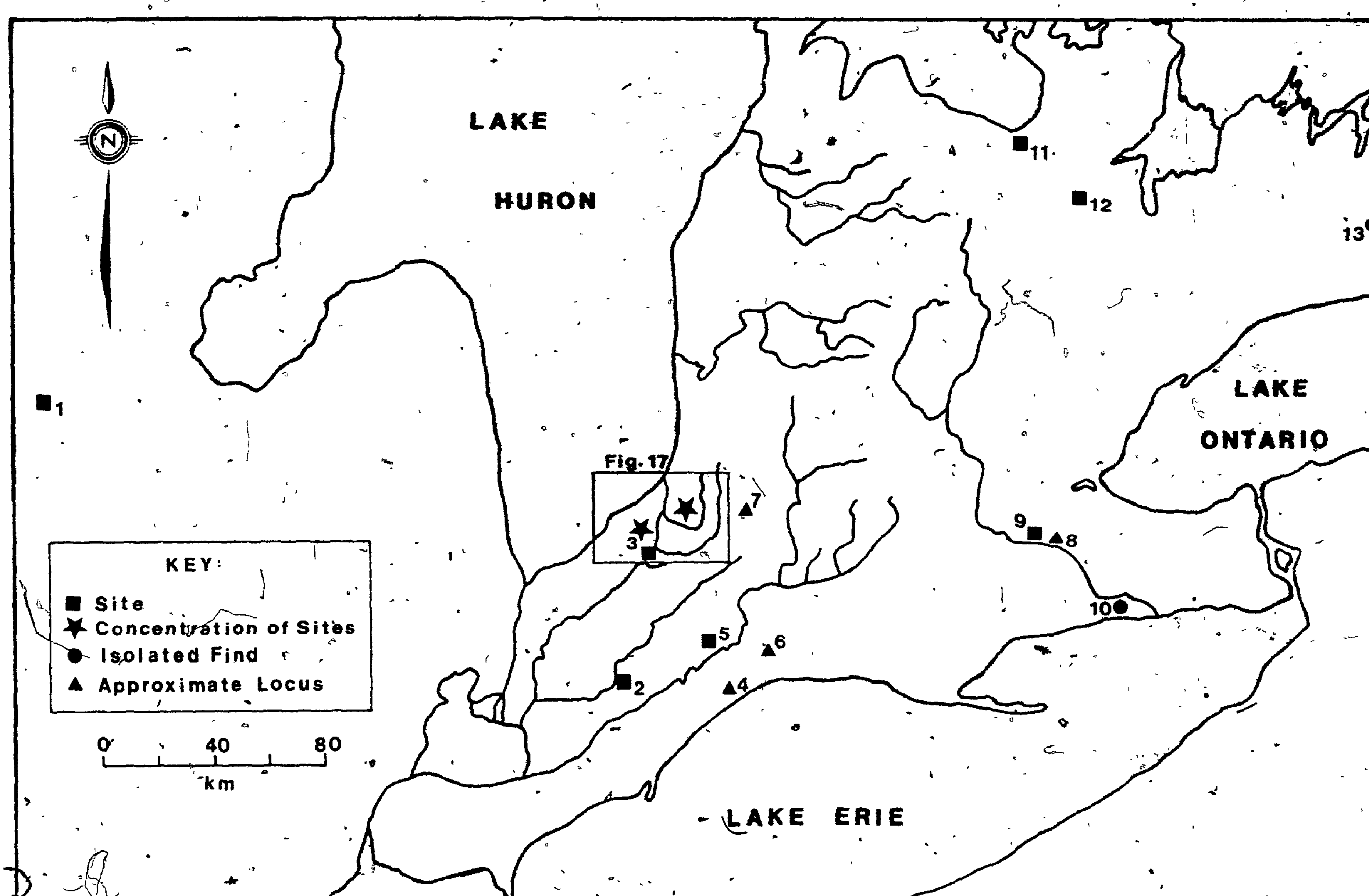


Figure 16: Distribution of Barnes Points Diagnostic of the Parkhill Complex.

Figure 17 Legend: Location Summary Data

Fig. 17 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
14	Mawson	13	XIX	McGillivray	Middlesex	487833(*1)	Deller 1976b, #vm This study
15	Schofield	16	VI	McGillivray	Middlesex	407823(*1)	This study
16	Dixon	19	VI	McGillivray	Middlesex	395823(*1)	Deller 1980a This study
17	Parkhill	20	VI	McGillivray	Middlesex	393826(*1)	Roosa 1977a This study
18	McLeod	20	XX	West Williams	Middlesex	387808(*1)	Ellis 1979 This study
19	Thedford II	20	I	Bosanquet	Lambton	328792(*1)	Deller and Ellis 1987; This study
20	Wight	15	I	Bosanquet	Lambton	339772(*1)	Deller 1979:No. 12a This study

Topographic Grid Reference Notes

*1 Parkhill 40 P/4, Edition 4.

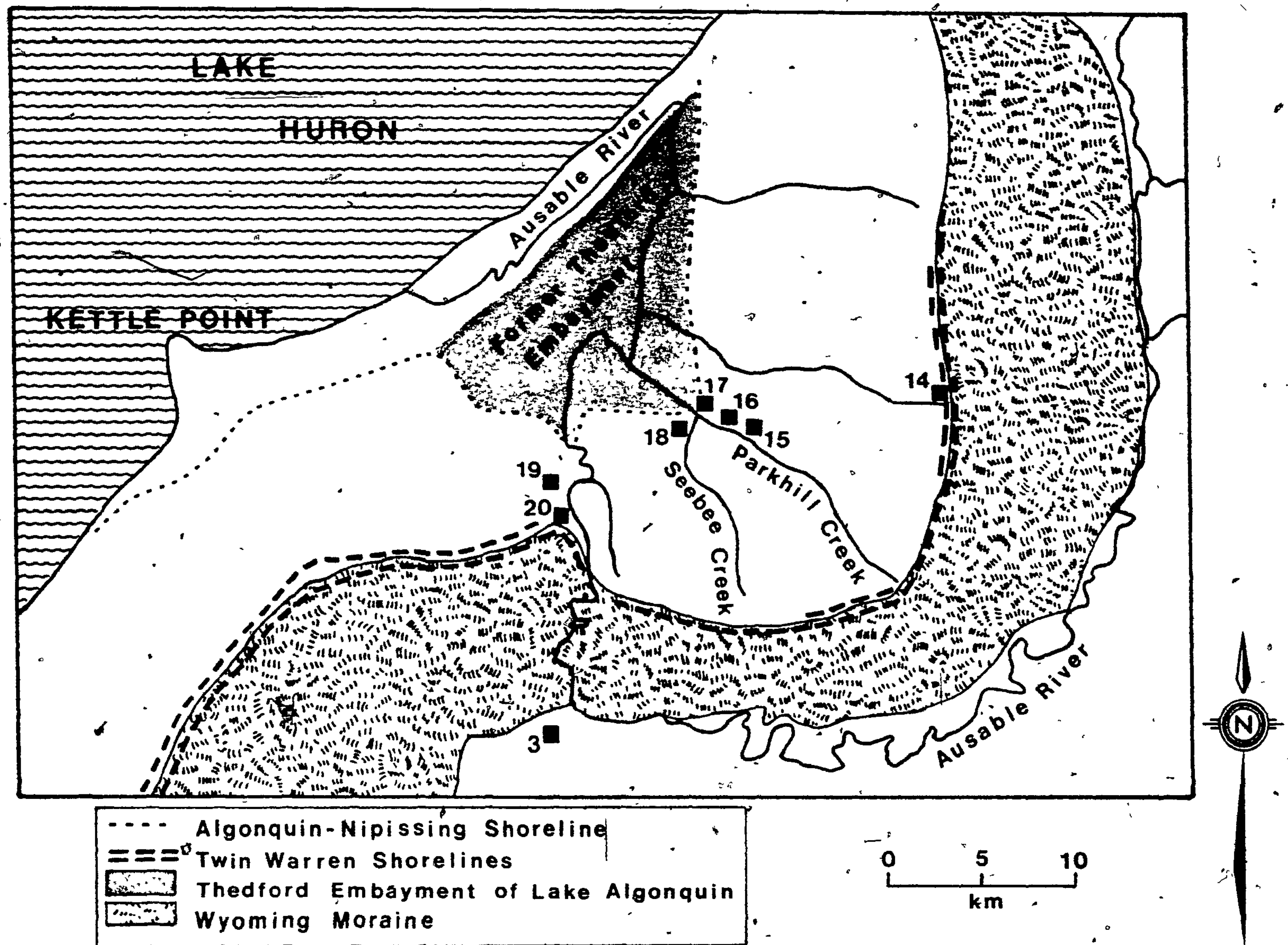
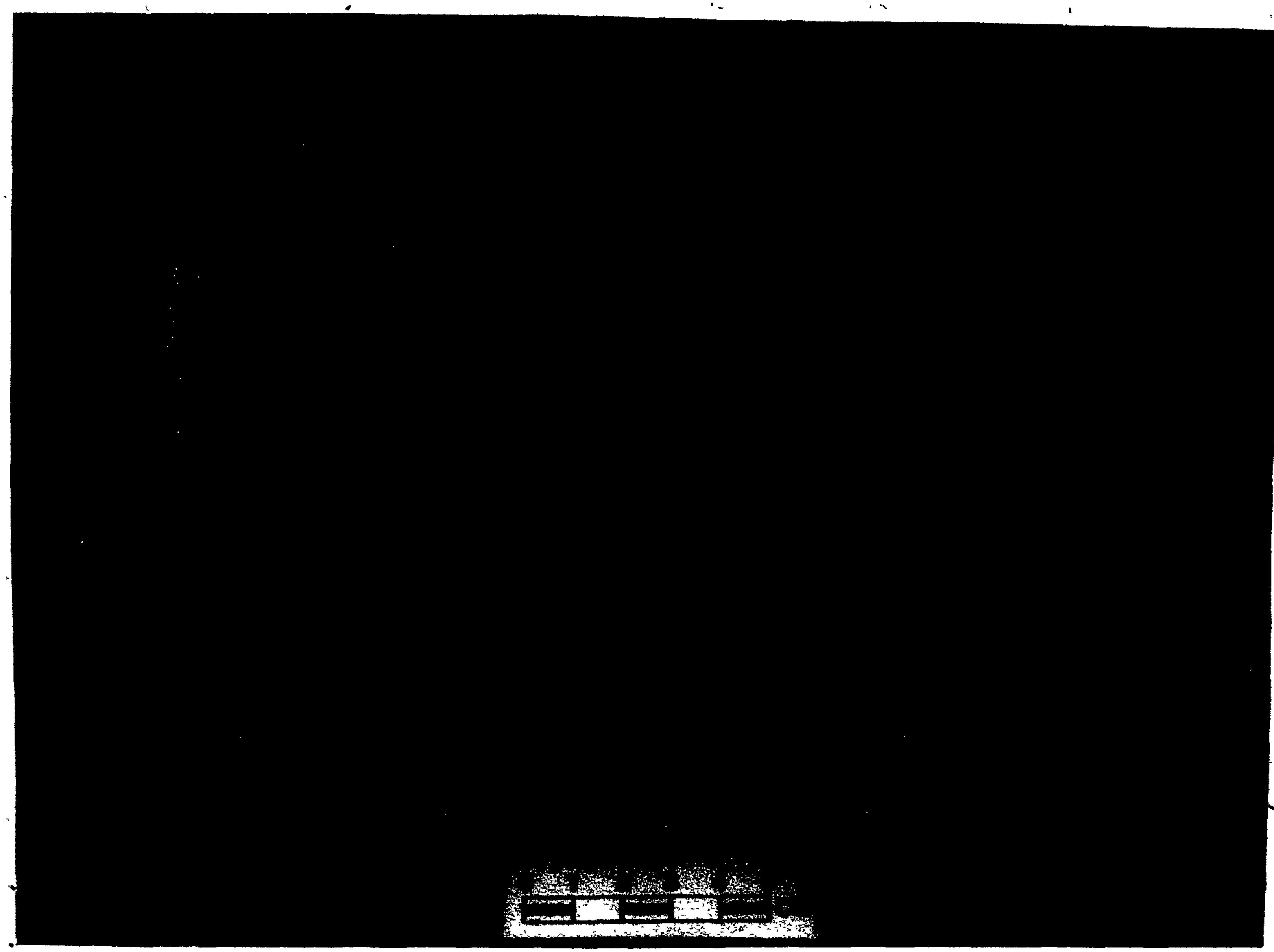


Figure 17: Parkhill Complex Sites in the Southeastern Huron Basin.

Figure 18: Occupation Areas, Parkhill Site

Figure 19: Activity Regions at the Parkhill Site



Fiugre 20: Fluted Bifaces, Thedford II Site

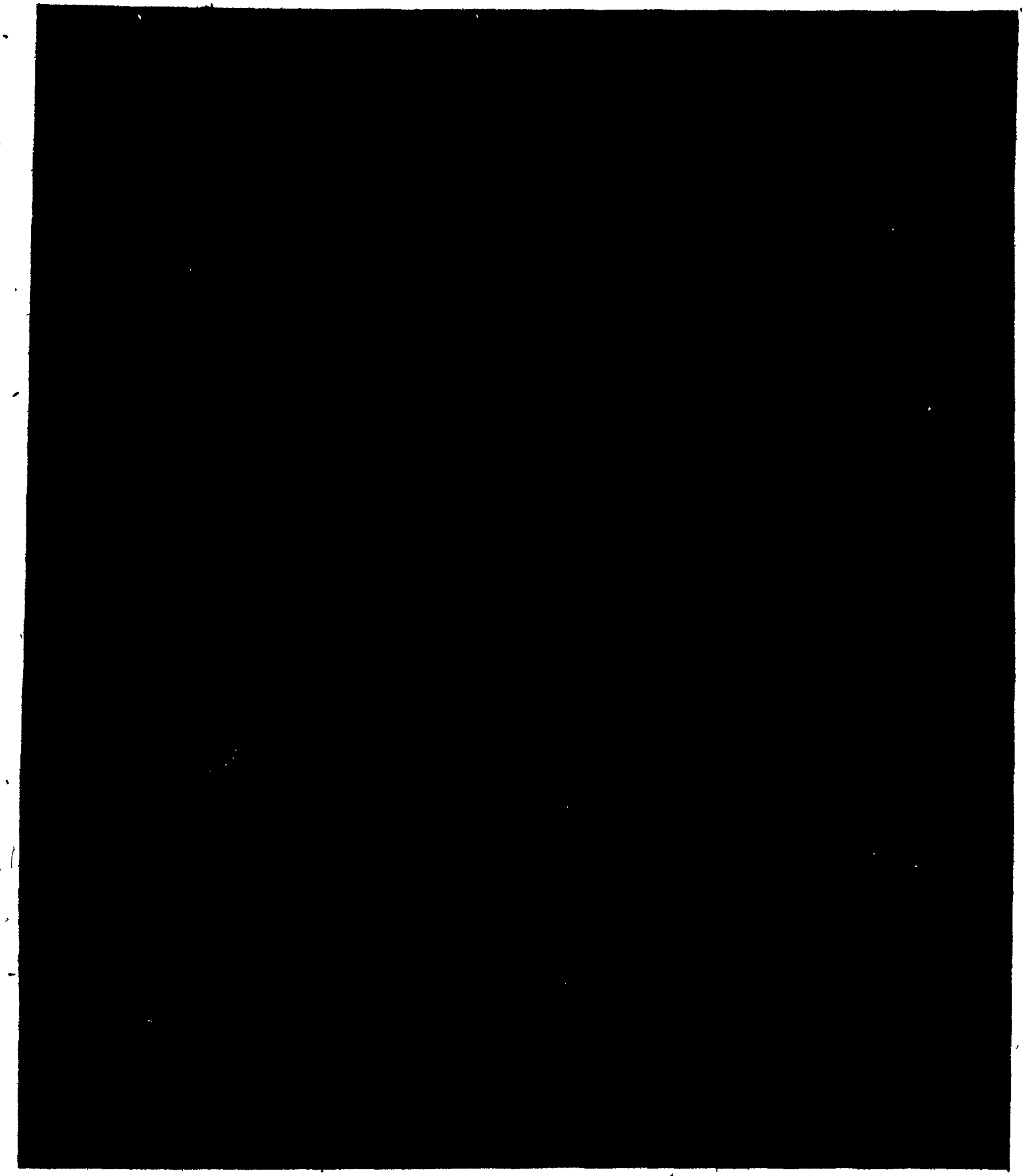


Figure 21: Bifacial Artifacts, Thedford II Site

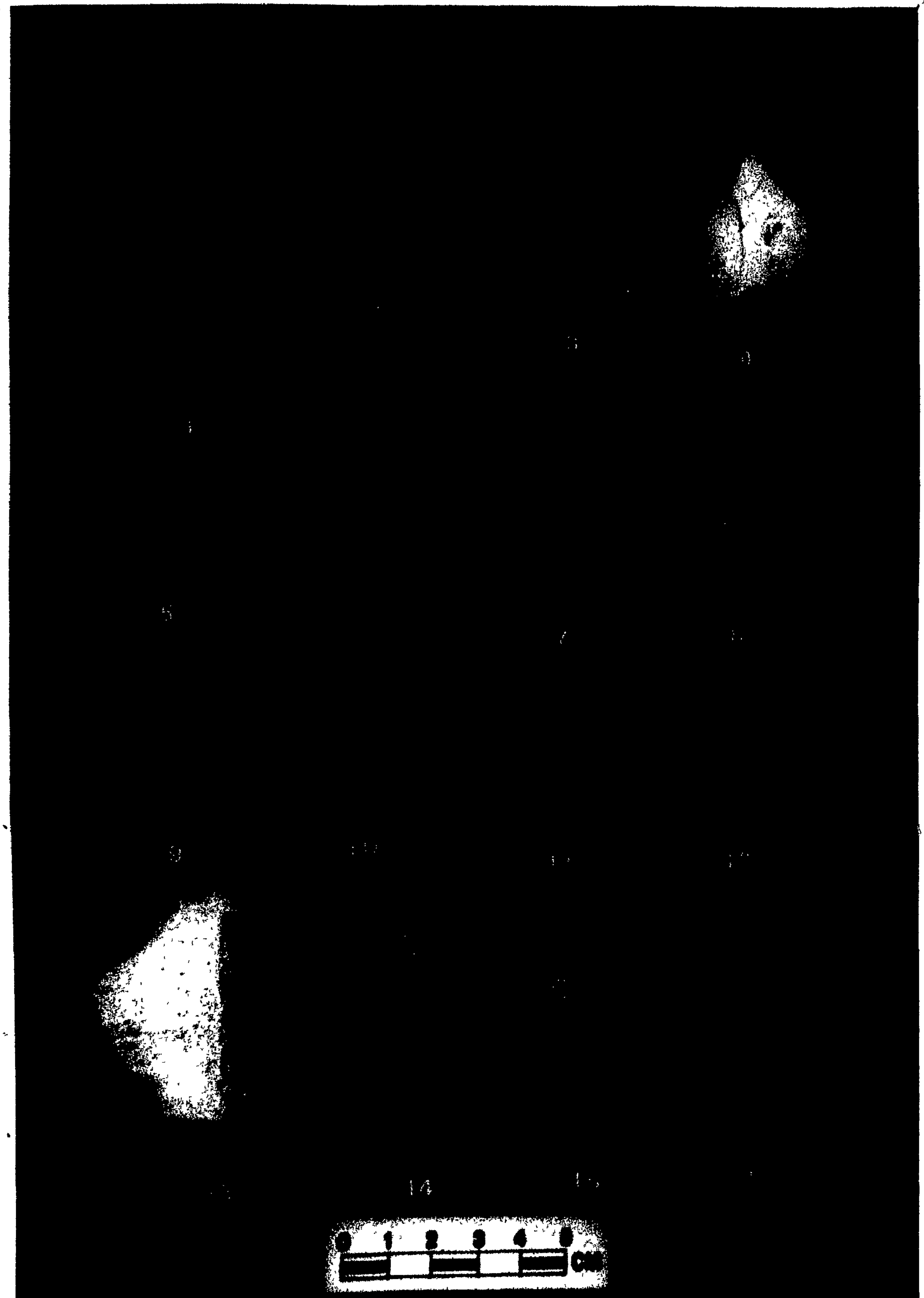


Figure 22: End Scrapers (1 & 4 Narrow Variety), Thedford II Site

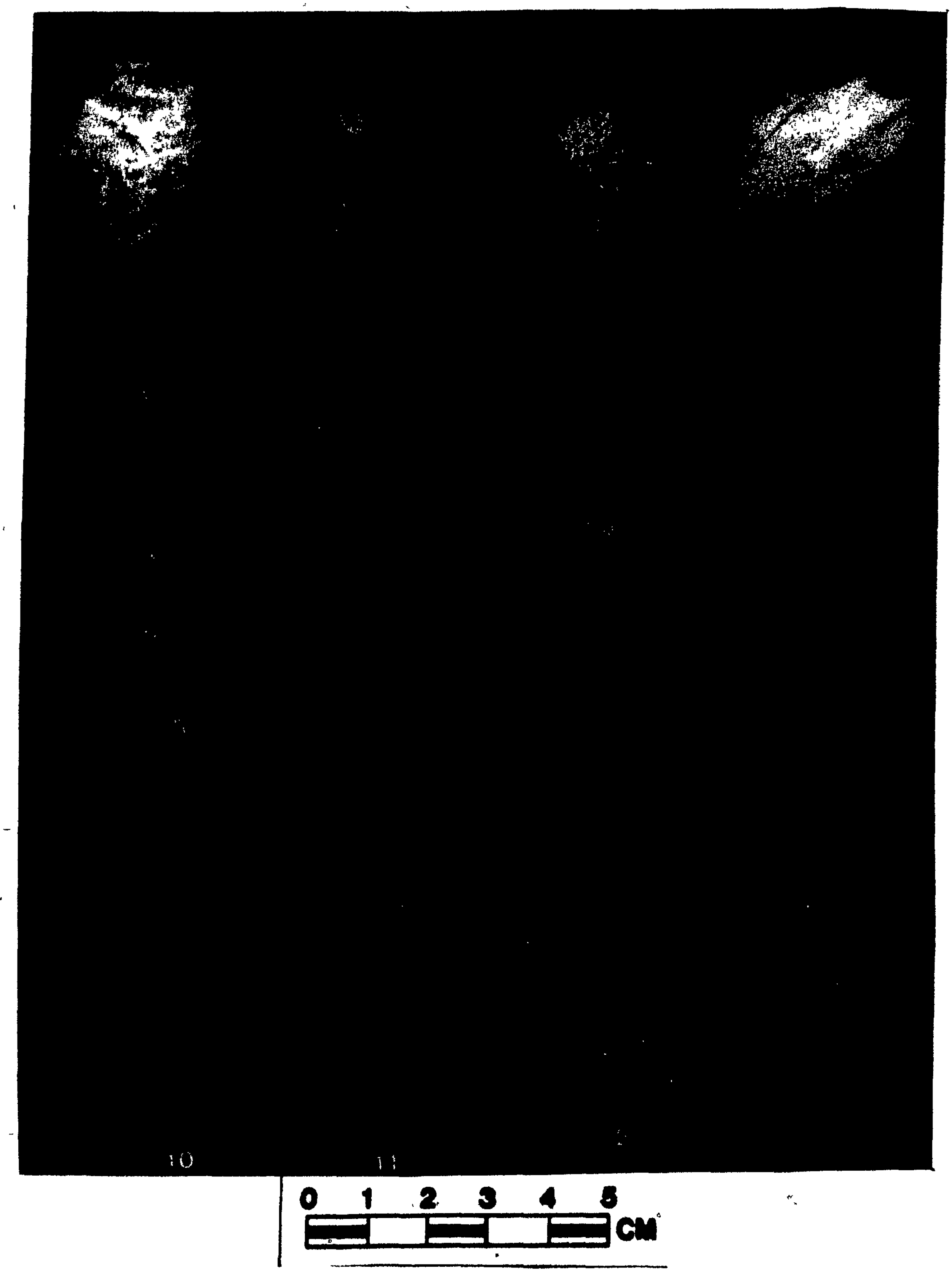


Figure 23: Gravers (1-9) and Side Scrapers (10-13), Thedford II Site

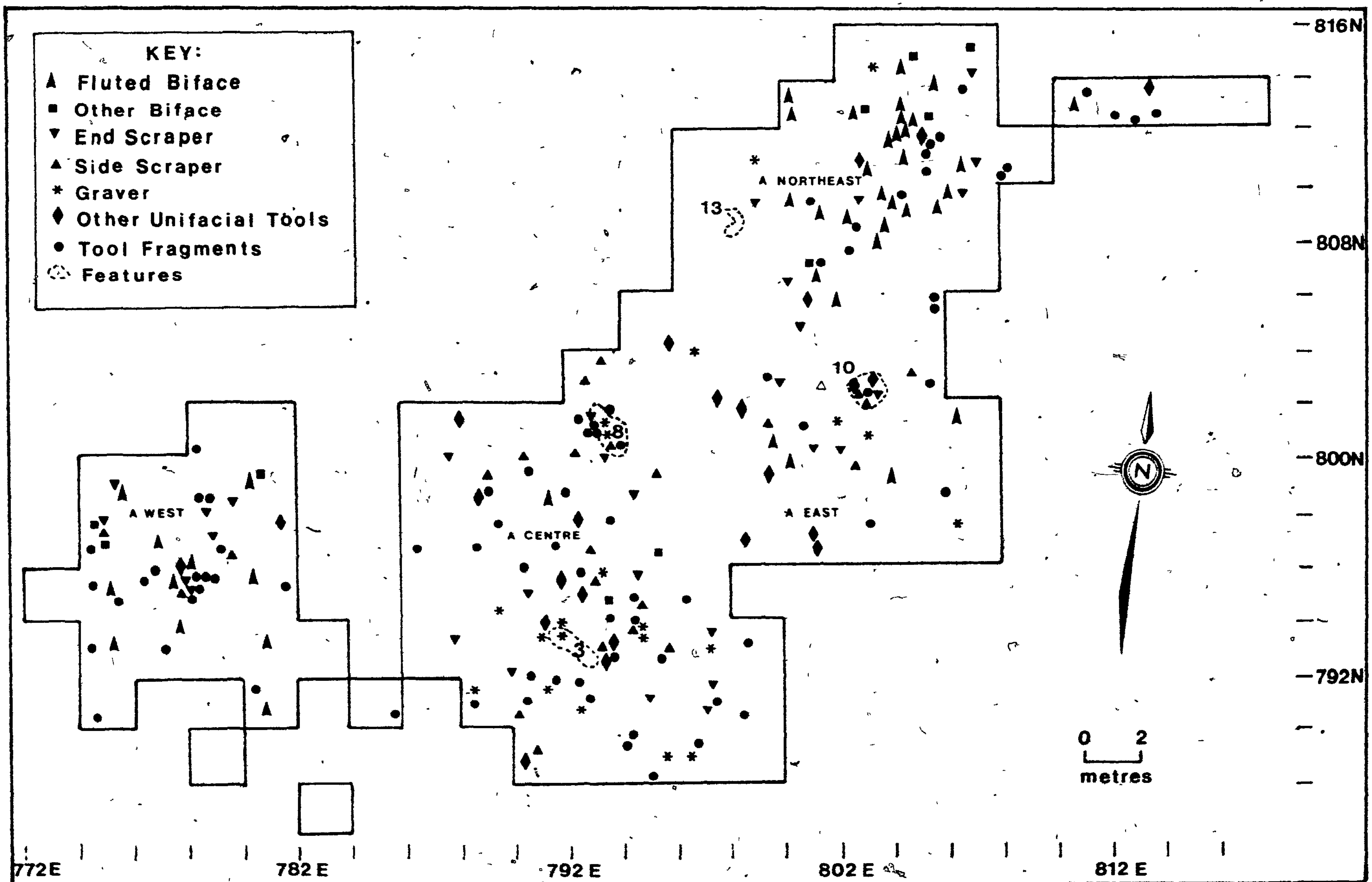


Figure 24: Distribution of Artifacts and Features, Thedford II Site (1981-82).

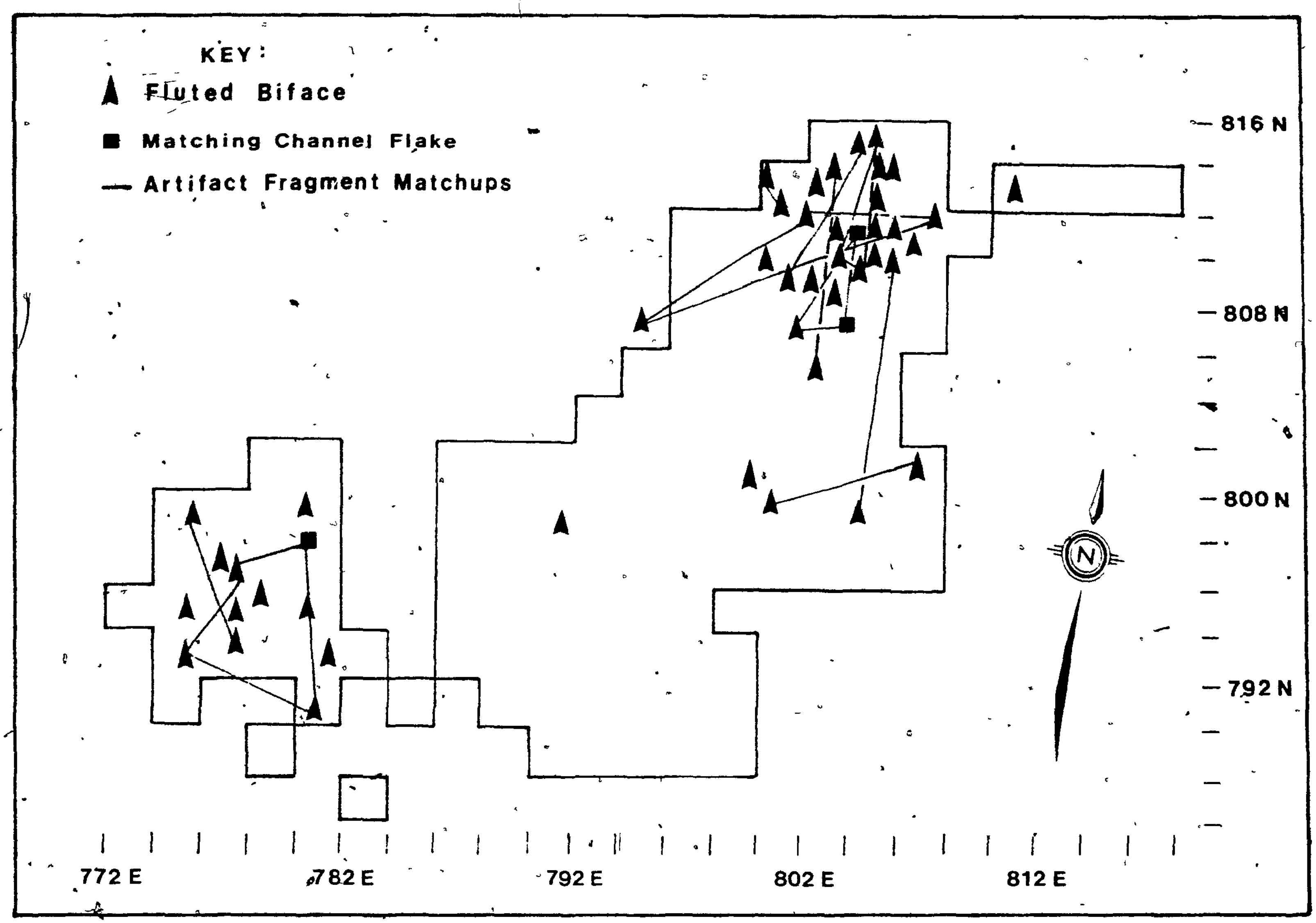


Figure 25A: Distribution of Fluted Bifaces, Thedford II Site.

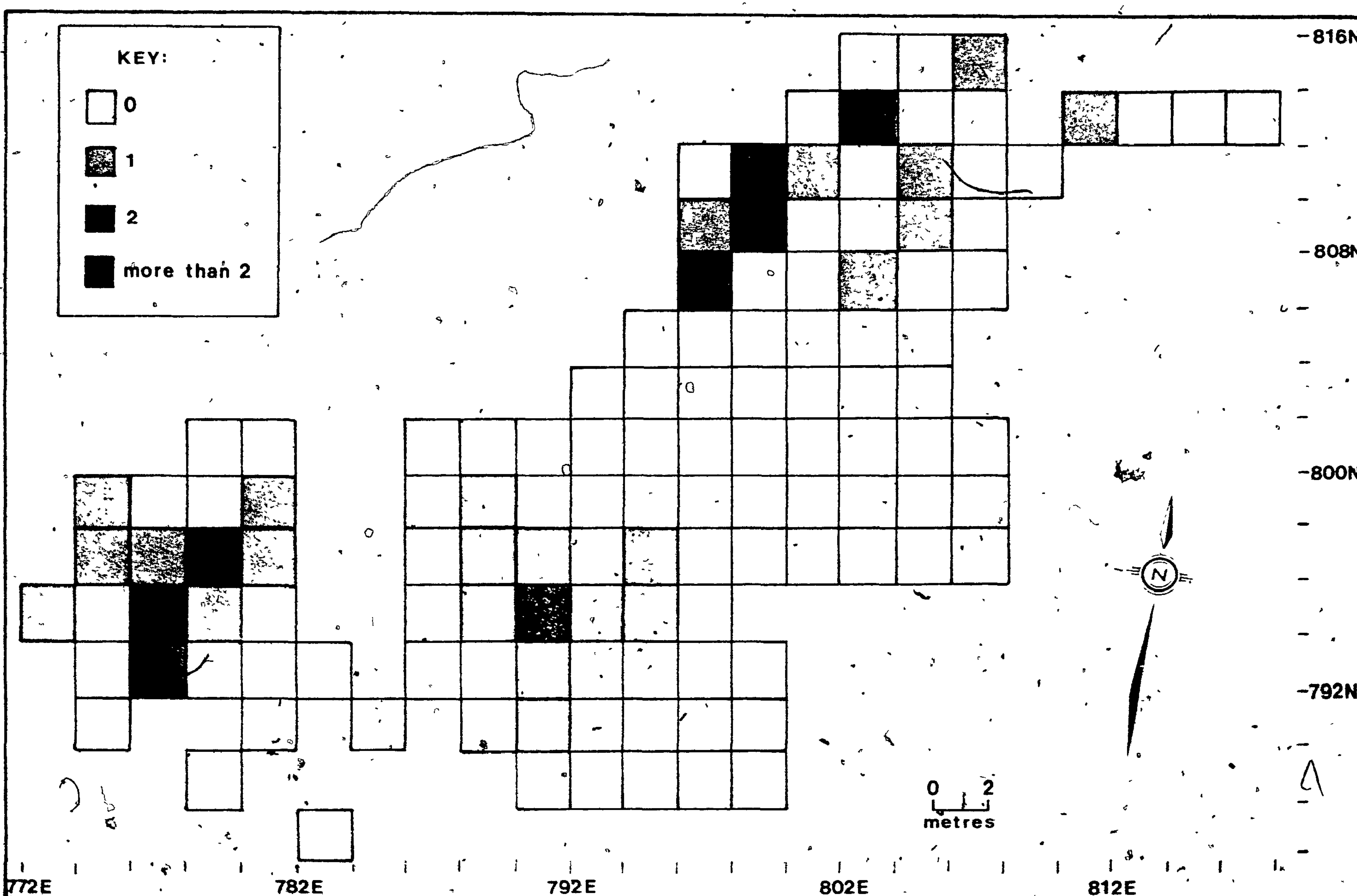


Figure 25B: Distribution of Channel Flakes, Thedford II Site.

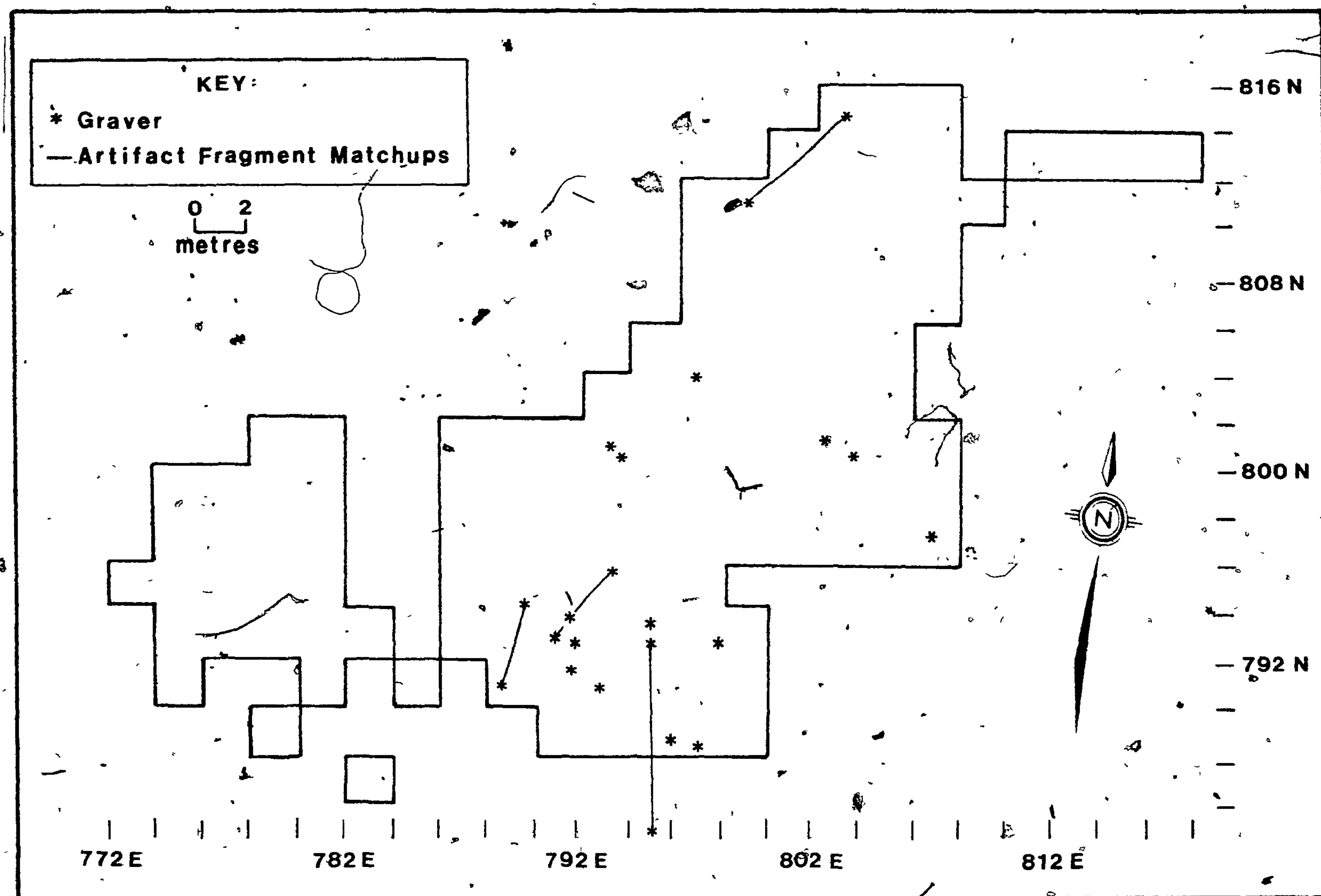


Figure 26: Distribution of Gravers, Thedford II Site.

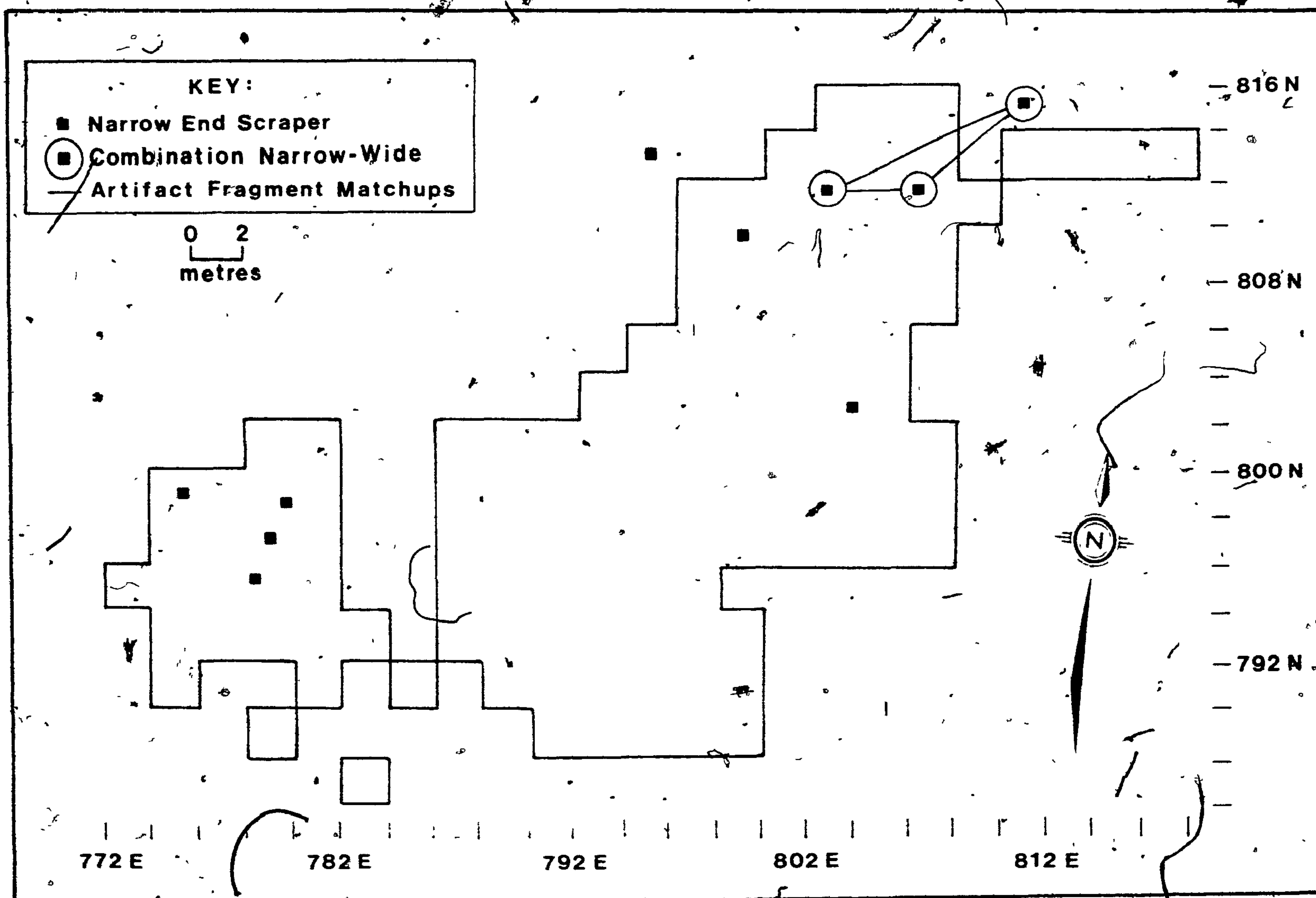


Figure 27. Distribution of Narrow End Scrapers (Groovers), Thedford II Site.

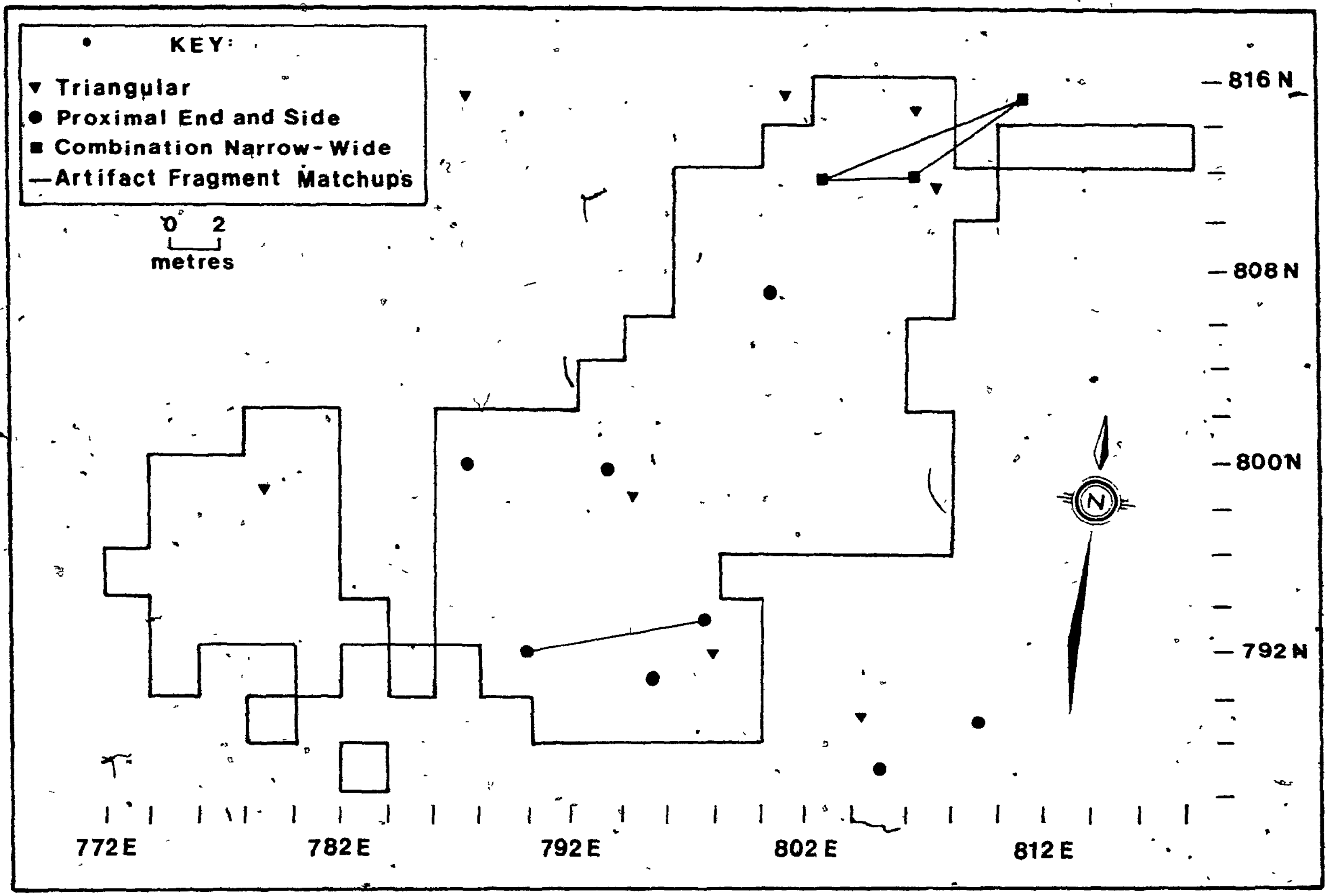


Figure 28: Distribution of End Scrapers, Thedford II Site.

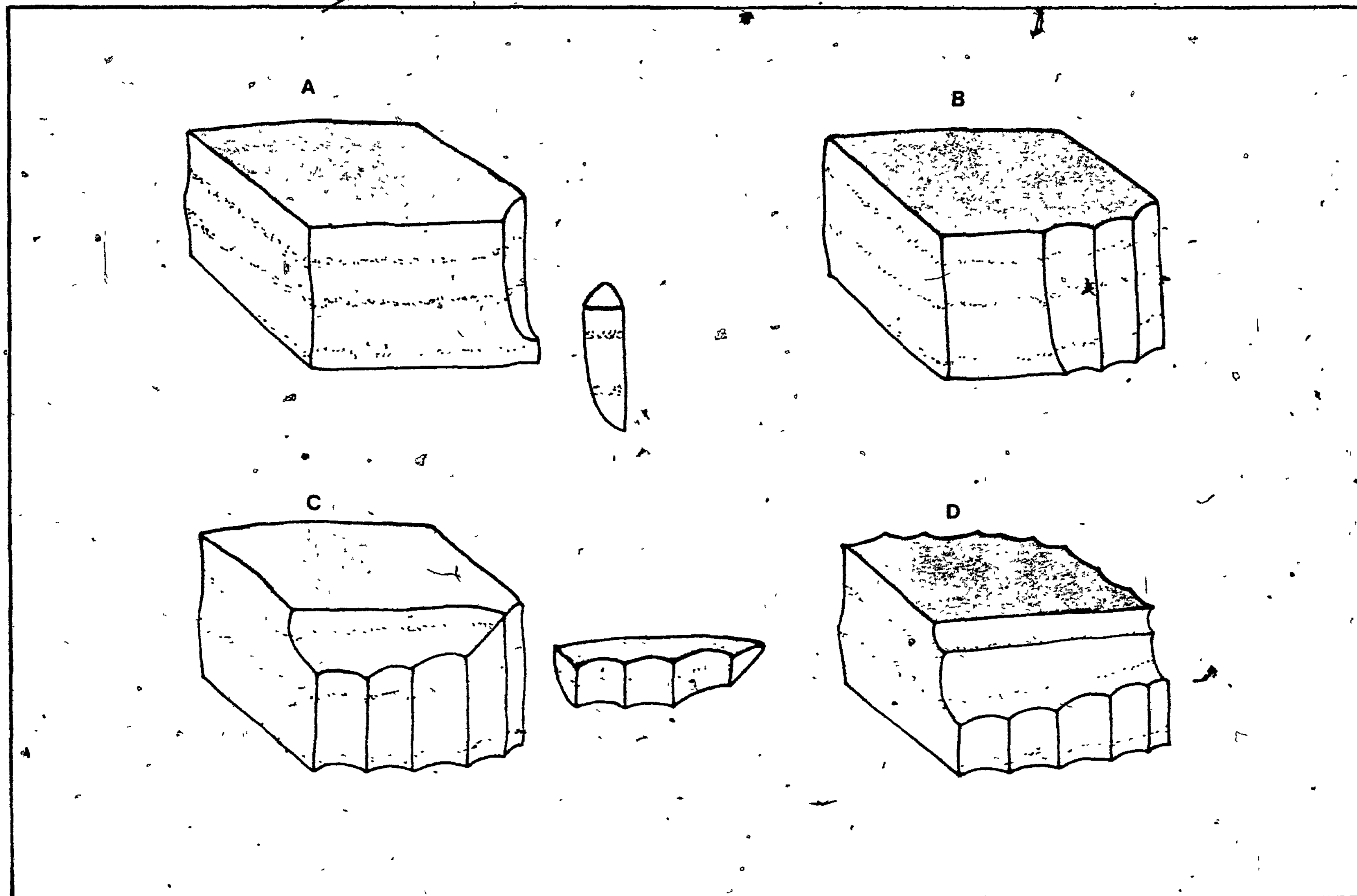


Figure 29. Parkhill Industry Core Reduction Sequence, Collingwood Chert.

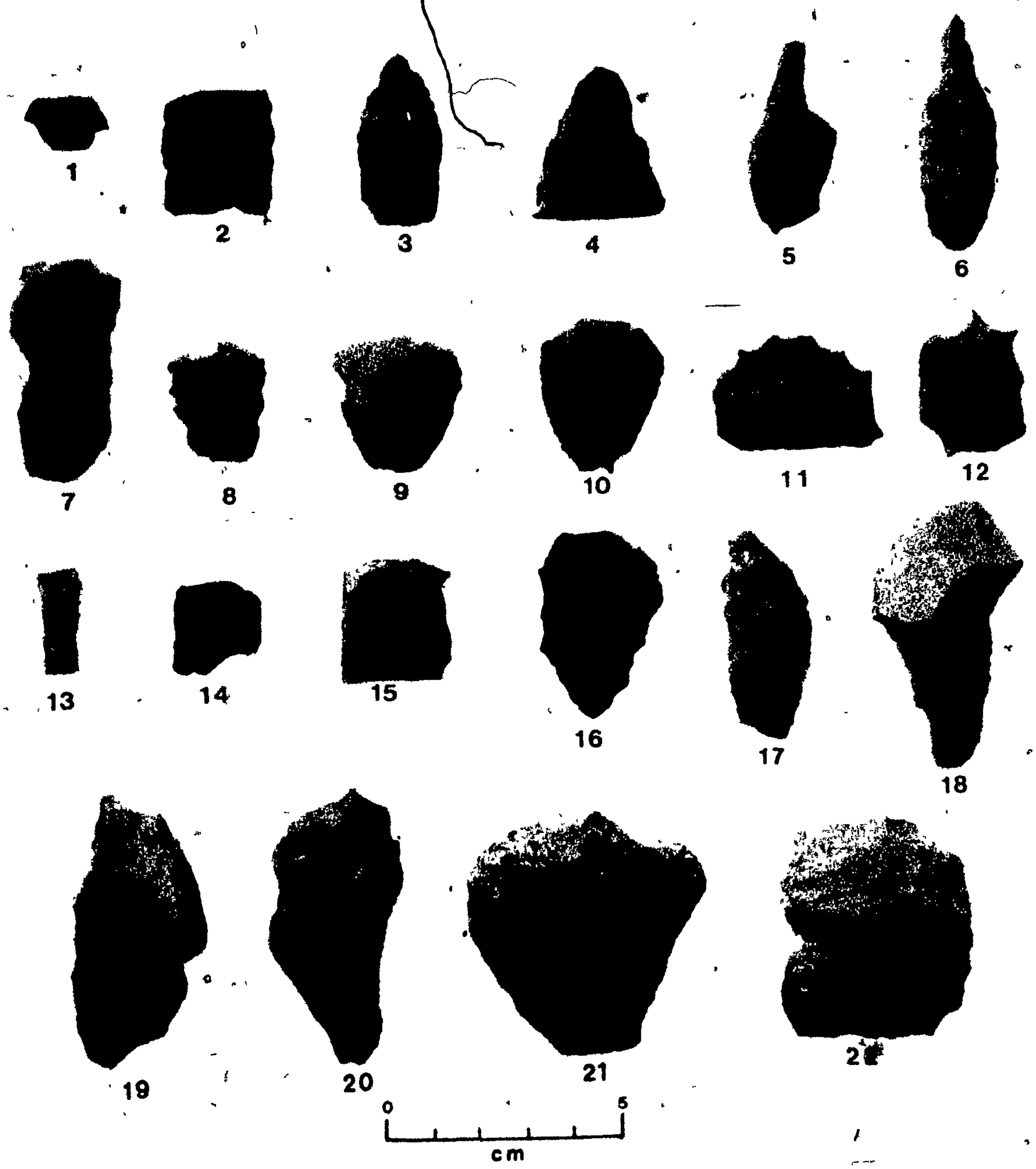


Figure 30: McLeod Site Artifacts

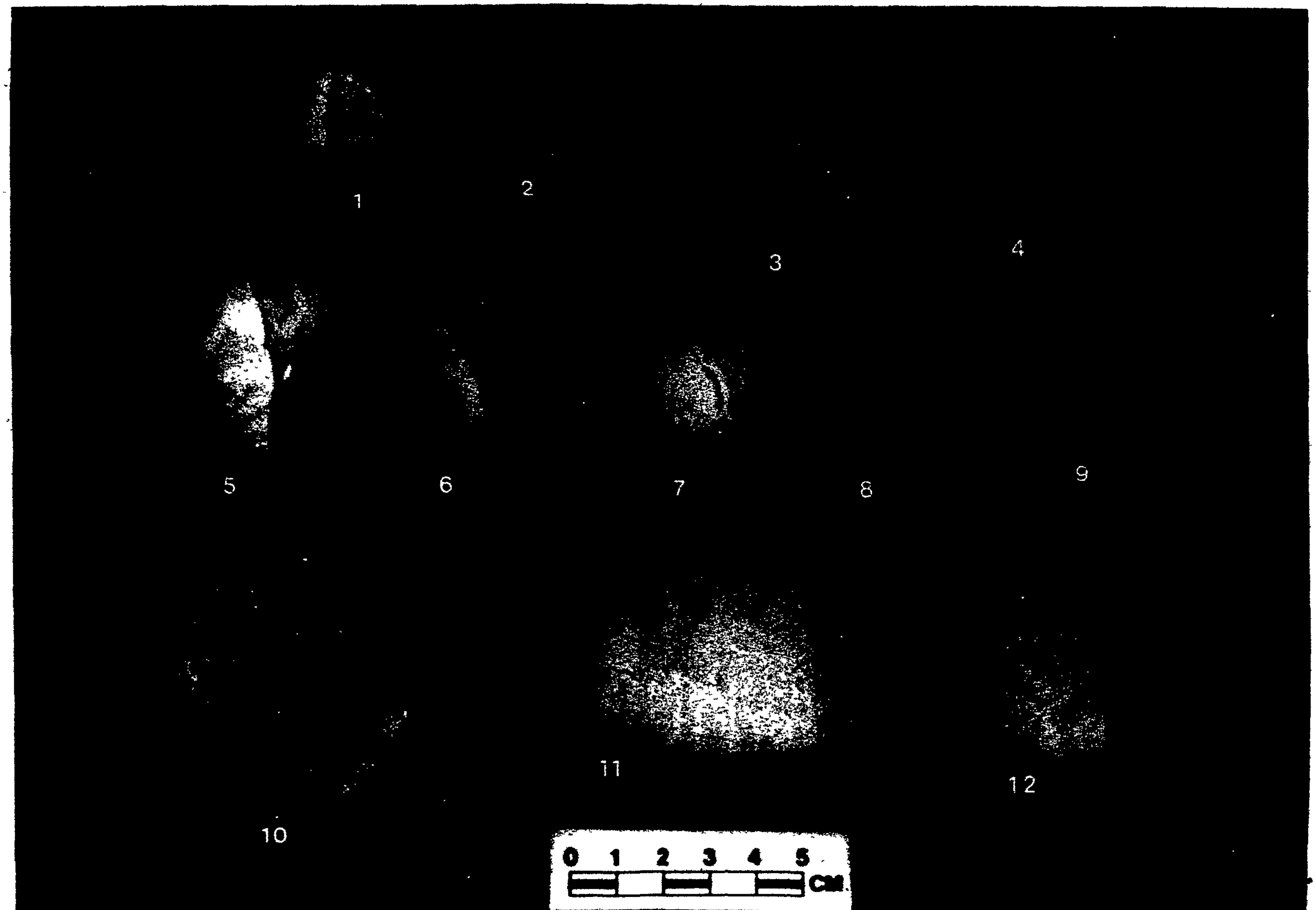


Figure 32: Artifacts from the Dixon Site, Middlesex County

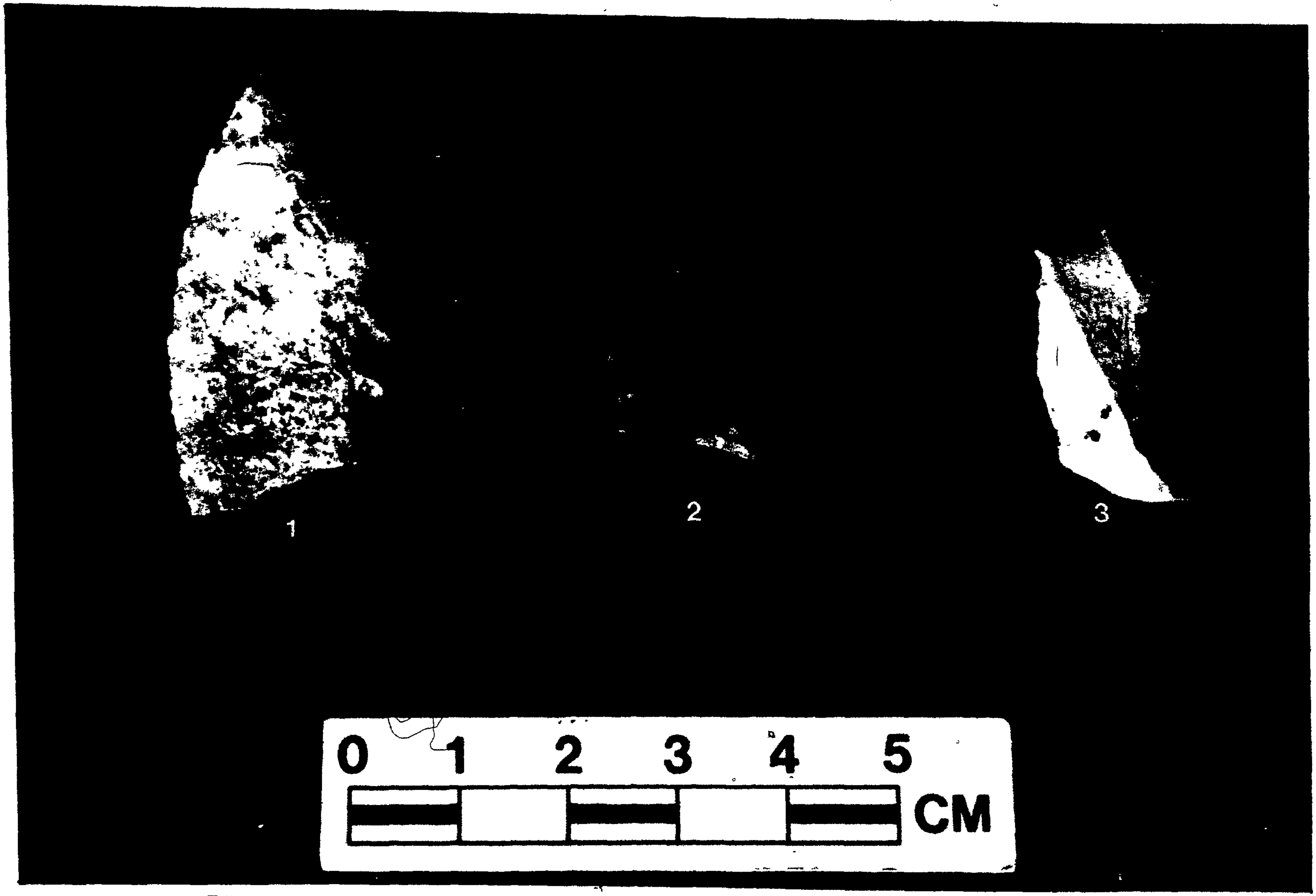


Figure 33: Artifacts from the Stott Glen Site, Lambton County

Figure 34 Legend: Location Summary Data

Fig. 34 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
1	Crowfield	12	V	Caradoc	Middlesex	547505(*1)	Deller and Ellis 1984
2	Fluted point base	20	IV	Caradoc	Middlesex	592529(*2)	This study
3	Bolton	21	V	Caradoc	Middlesex	583547(*1)	This study
4	Fluted point base	7	III	Westminster	Middlesex	876528(*3)	Jim Keron: personal comm.
5	Fluted point	18	X	South Norwich	Oxford	298491(*4)	Fig. 12, No. 6
6	Fluted point base	20	IV	Bosanquet	Lambton	—	This study
7	Hussey			Essa	Simcoe		Storck 1979
8	Zander				Simcoe		Prideaux 1978
9	Udora						Storck 1982
10	Watpool						Storck 1982

con't.

Figure 34 Legend continued

Fig. 34 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
11	Fluted point						Ritchie 1957: plate 10A #C
12	Fluted point base						Ritchie 1957

Topographic Grid Reference Notes

*1 Strathroy 40 I/13, Edition 4.
*2 St. Thomas 40 I/14, Edition 3, W 1/2.
*3 London 40 I/4, Edition 4.
*4 Tillsonburg 40 I/15, Edition 4.

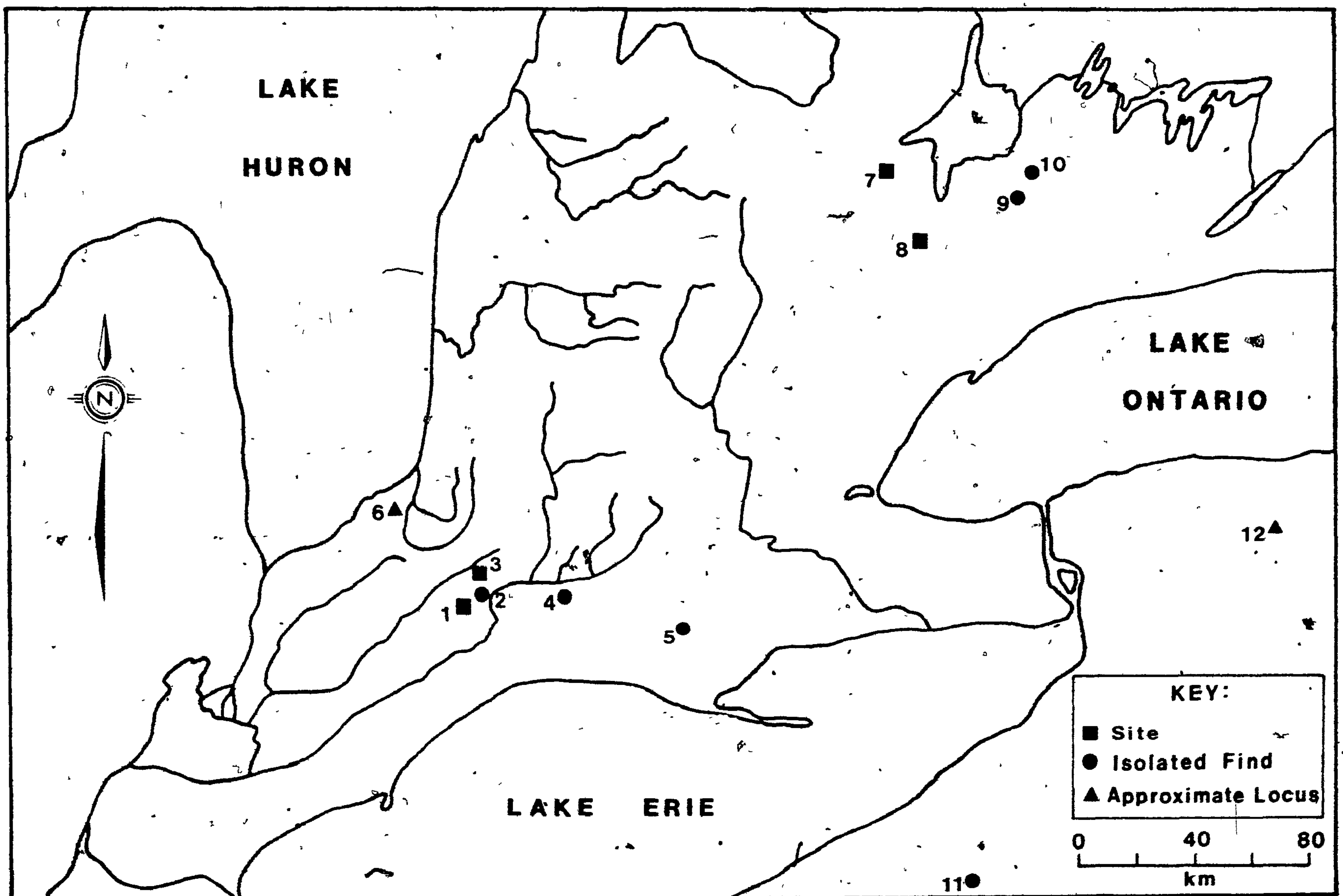


Figure 34: Distribution of Crowfield Complex Sites and Point Locations.

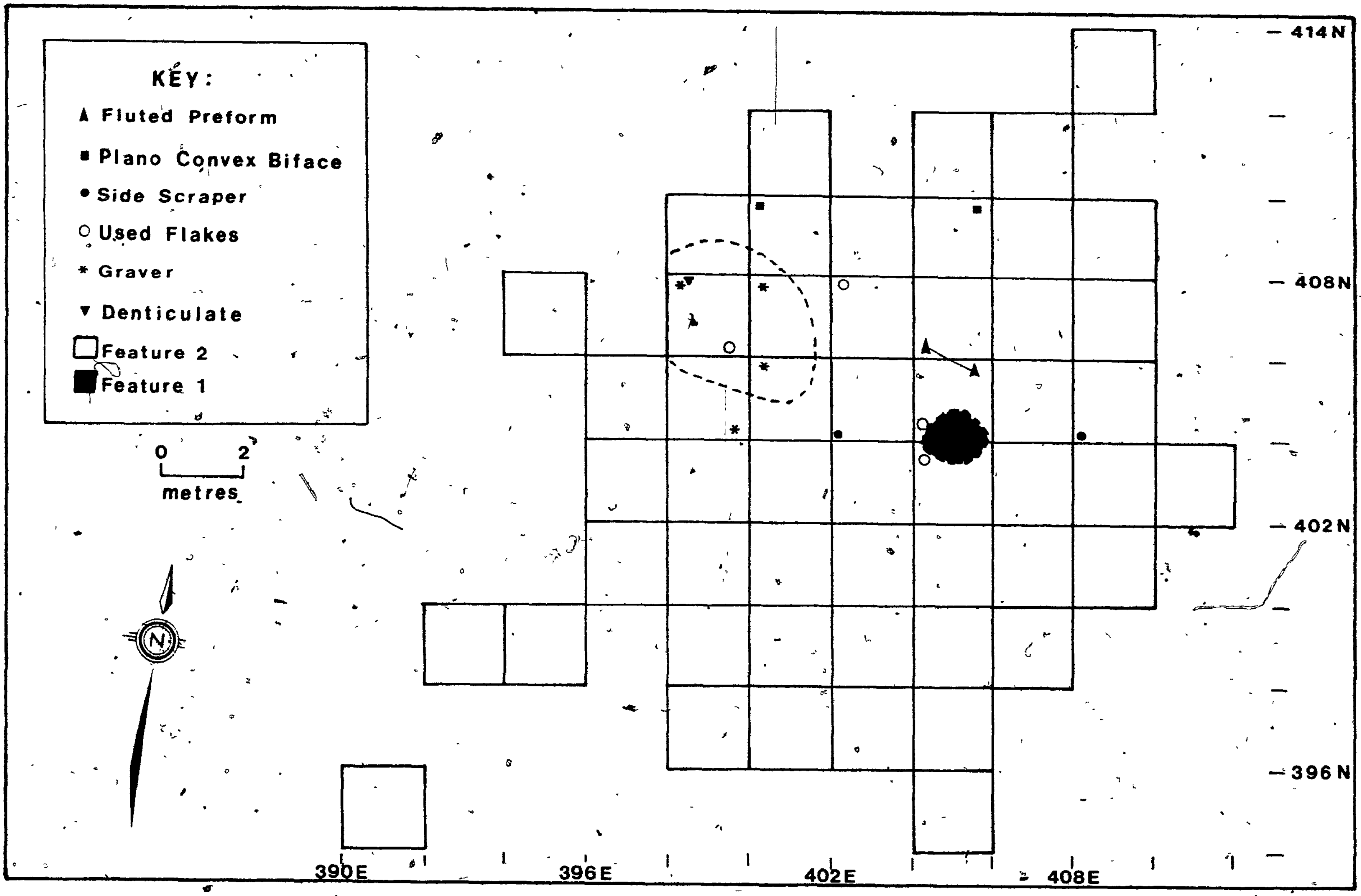


Figure 35: Distribution of Paleo-Indian Features and Unheated Implements, Crowfield Site.

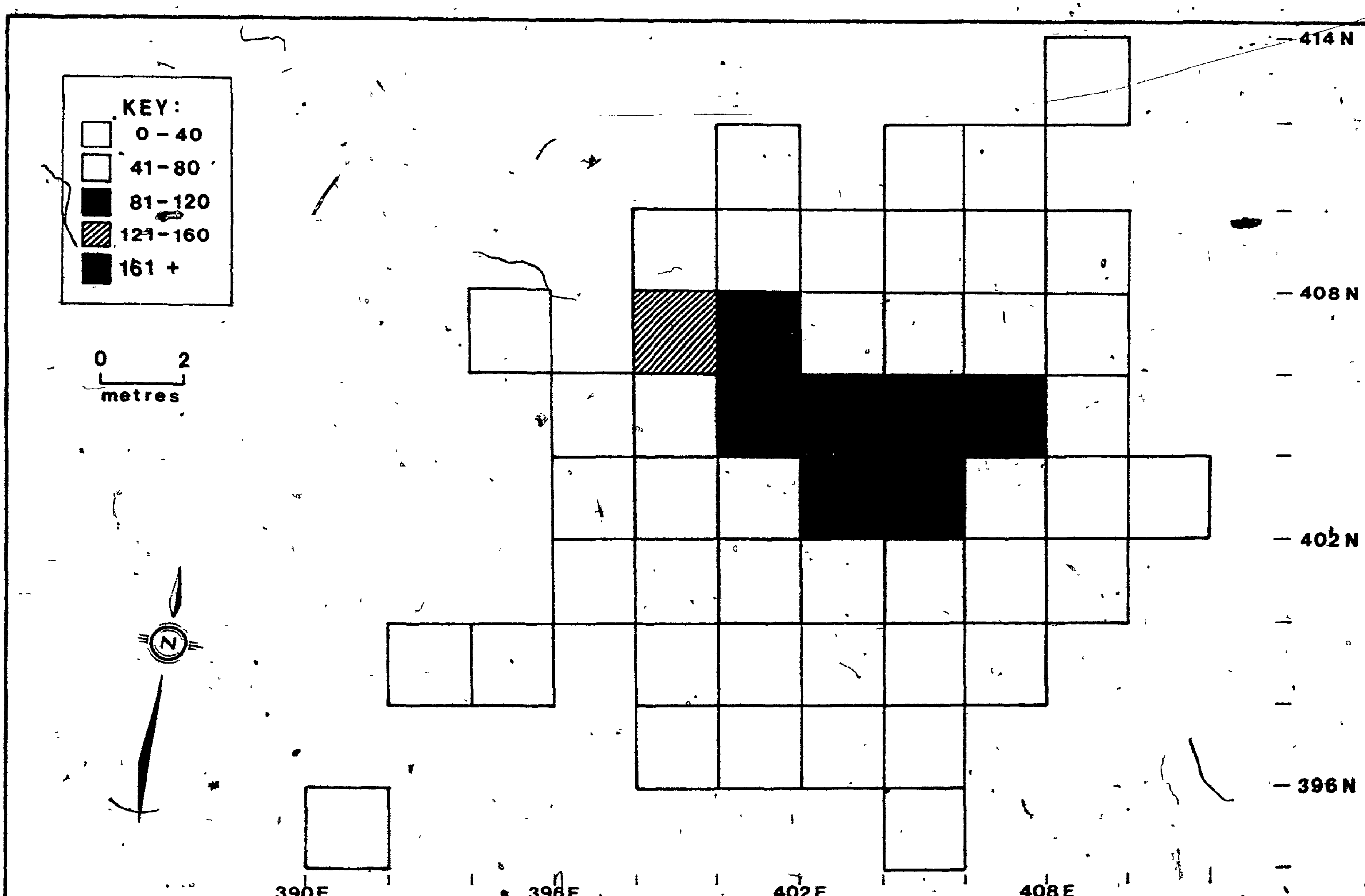


Figure 36: Distribution of Thermally Fractured Artifacts and Fragments, Crowfield Site. (Subsoil feature material not included)

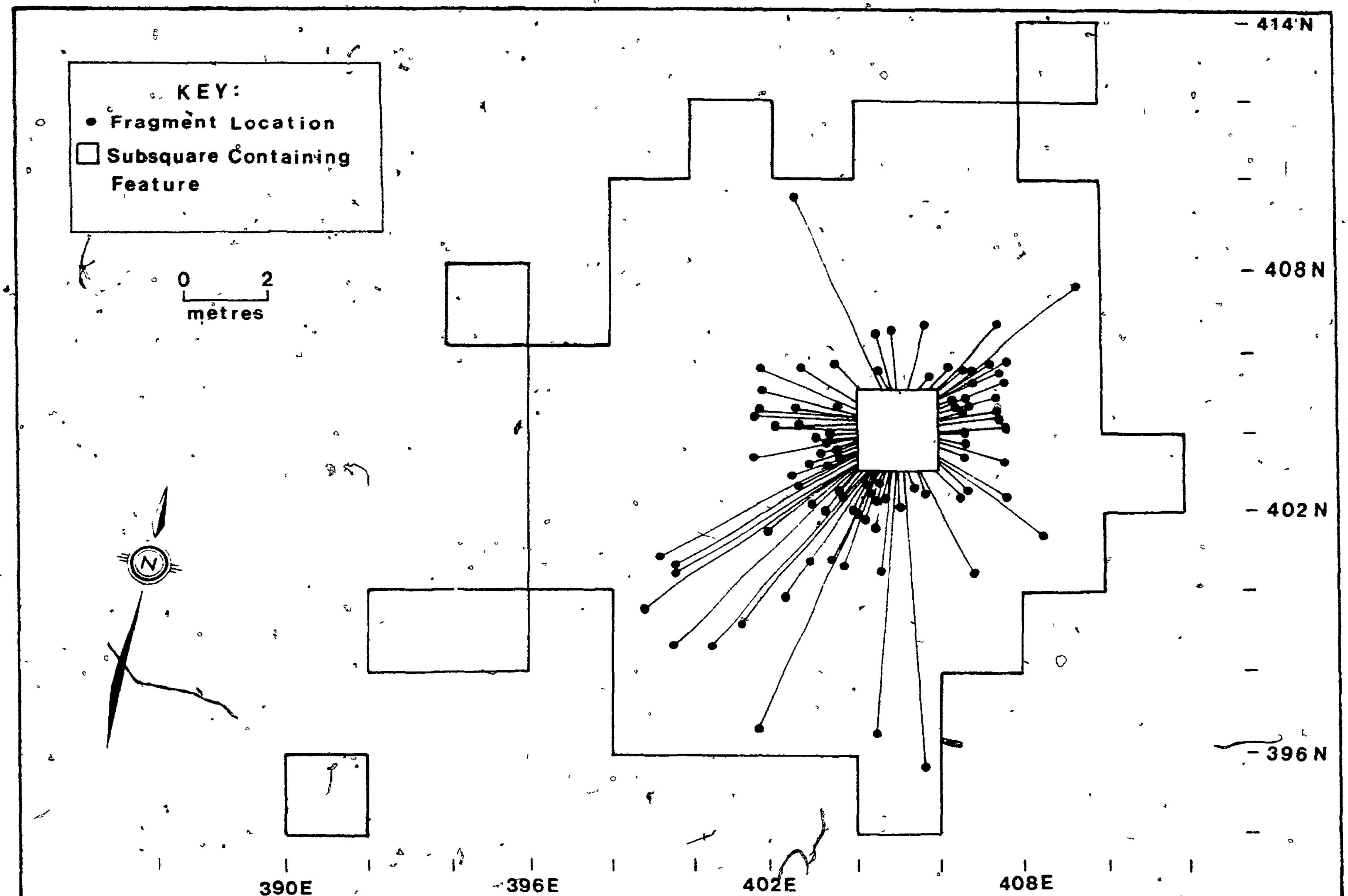


Figure 37: Distribution of Fragments Matched to Implements in Feature I, Crowfield Site.

Figure 38: Fluted Bifaces from Feature 1, Crowfield Site

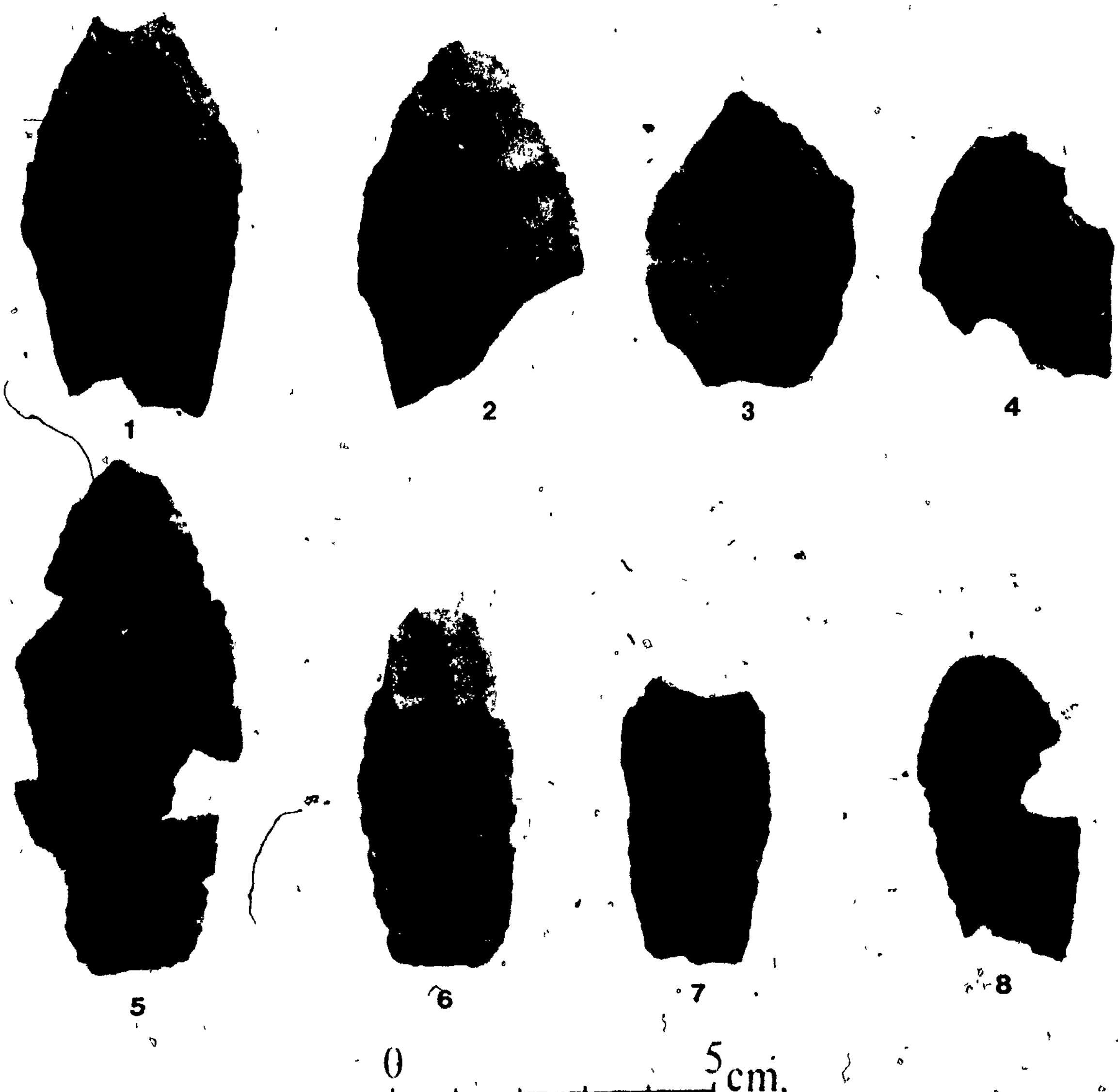


Figure 39: Fluted Shouldered Bifaces and Preforms from Feature 1, Crowfield Site

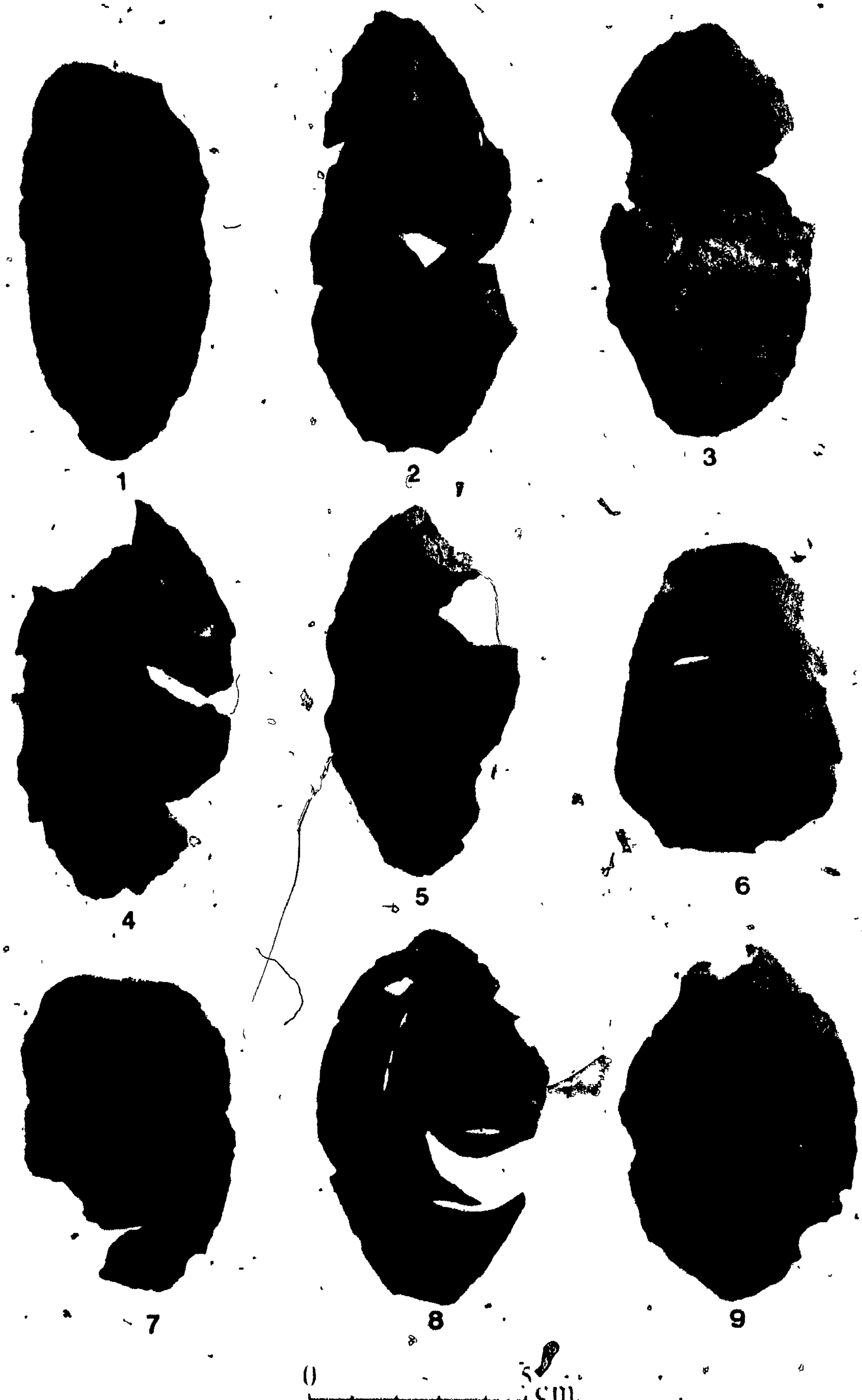


Figure 40: Plano Convex Preforms from Feature 1, Crowfield Site

Figure 41: Plano Convex Preforms from Feature 1, Crowfield Site

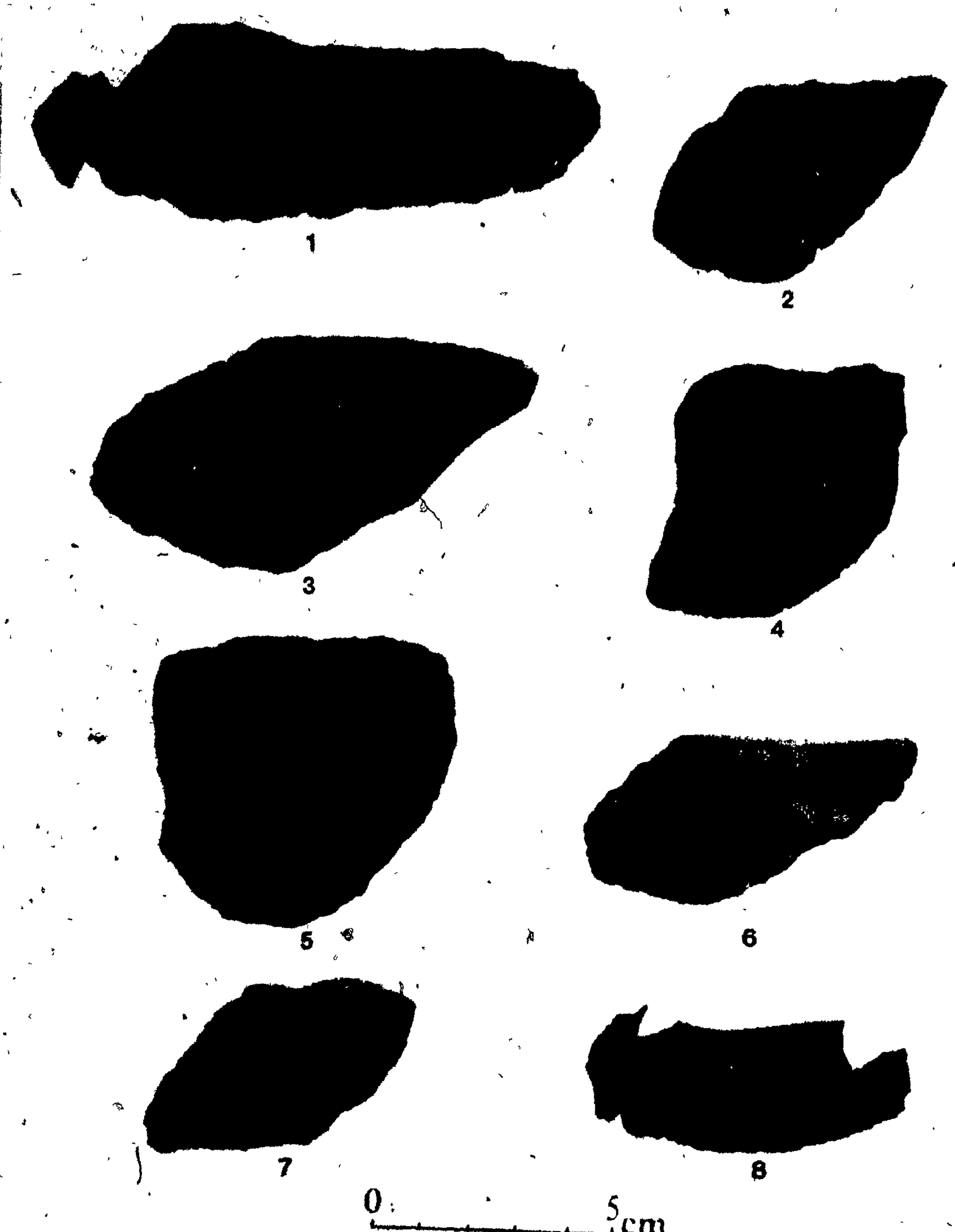


Figure 42: Backed Bifaces from Feature 1, Crowfield Site

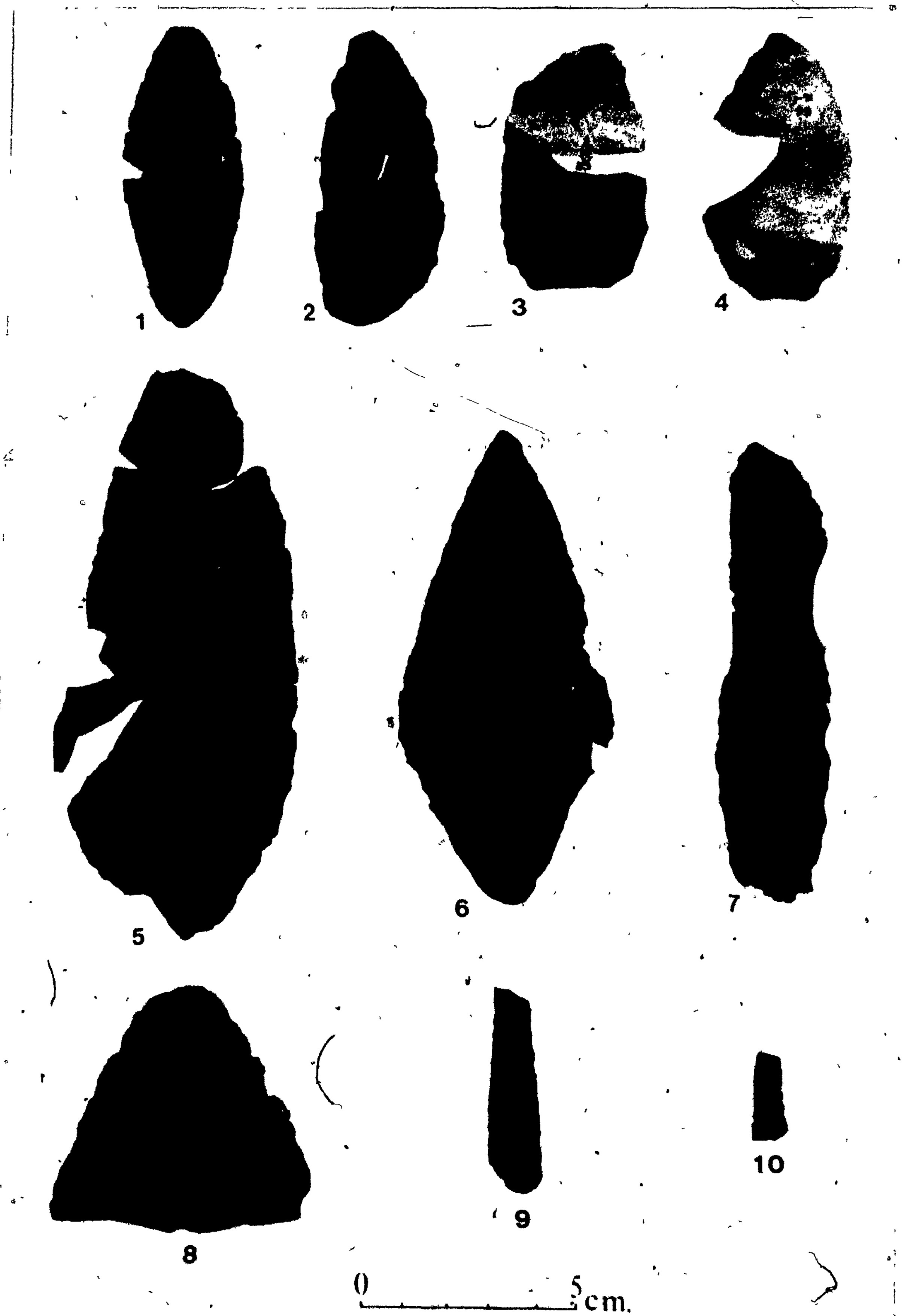


Figure 43: Other Biface Artifacts from Feature 1, Crowfield Site

Figure 44: Tool Blanks from Feature 1, Crowfield Site

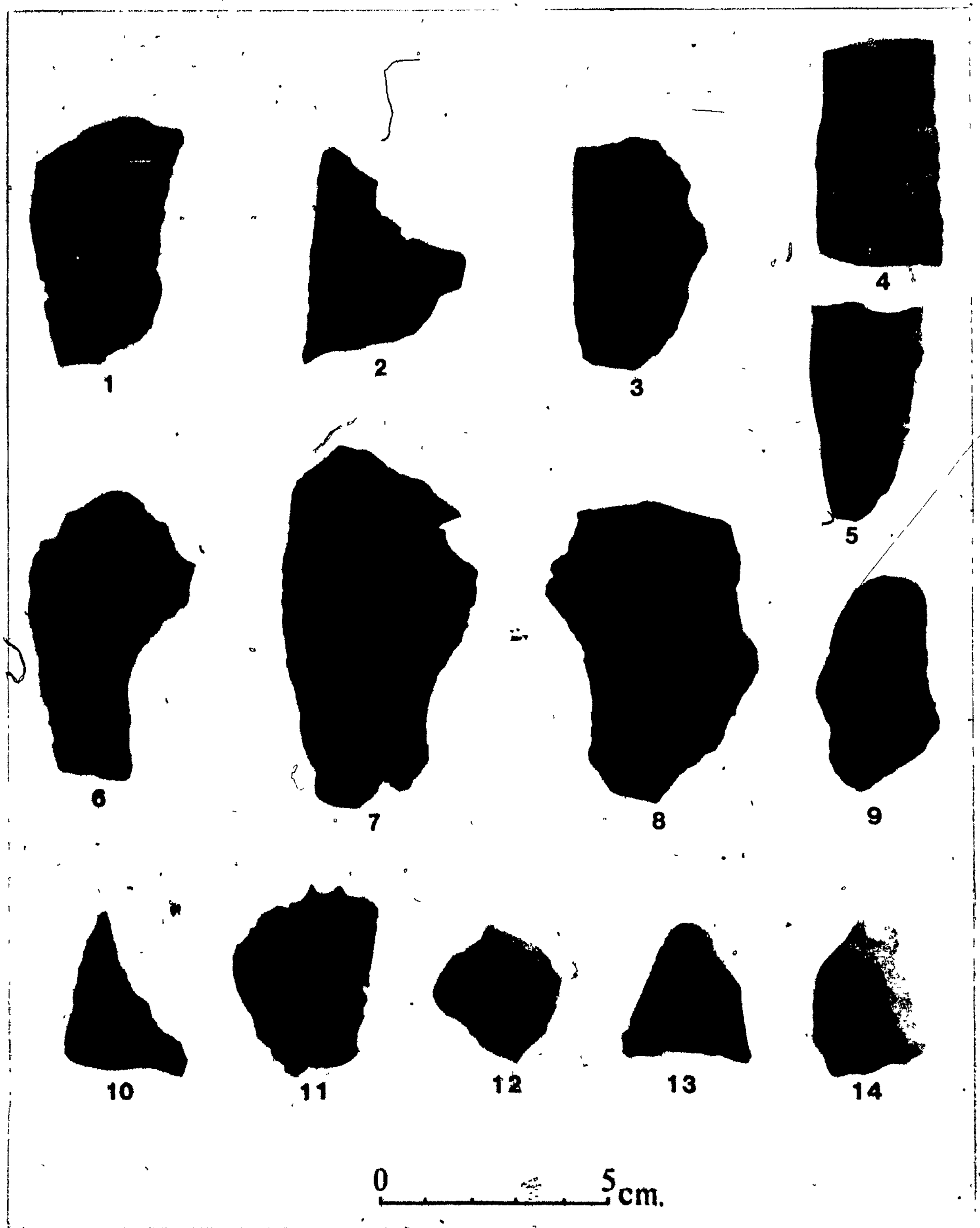


Figure 45: Uniface Implements from Feature 1, Crowfield Site

Figure 46: Unmatched Artifact Fragments from Feature 1, Crowfield Site

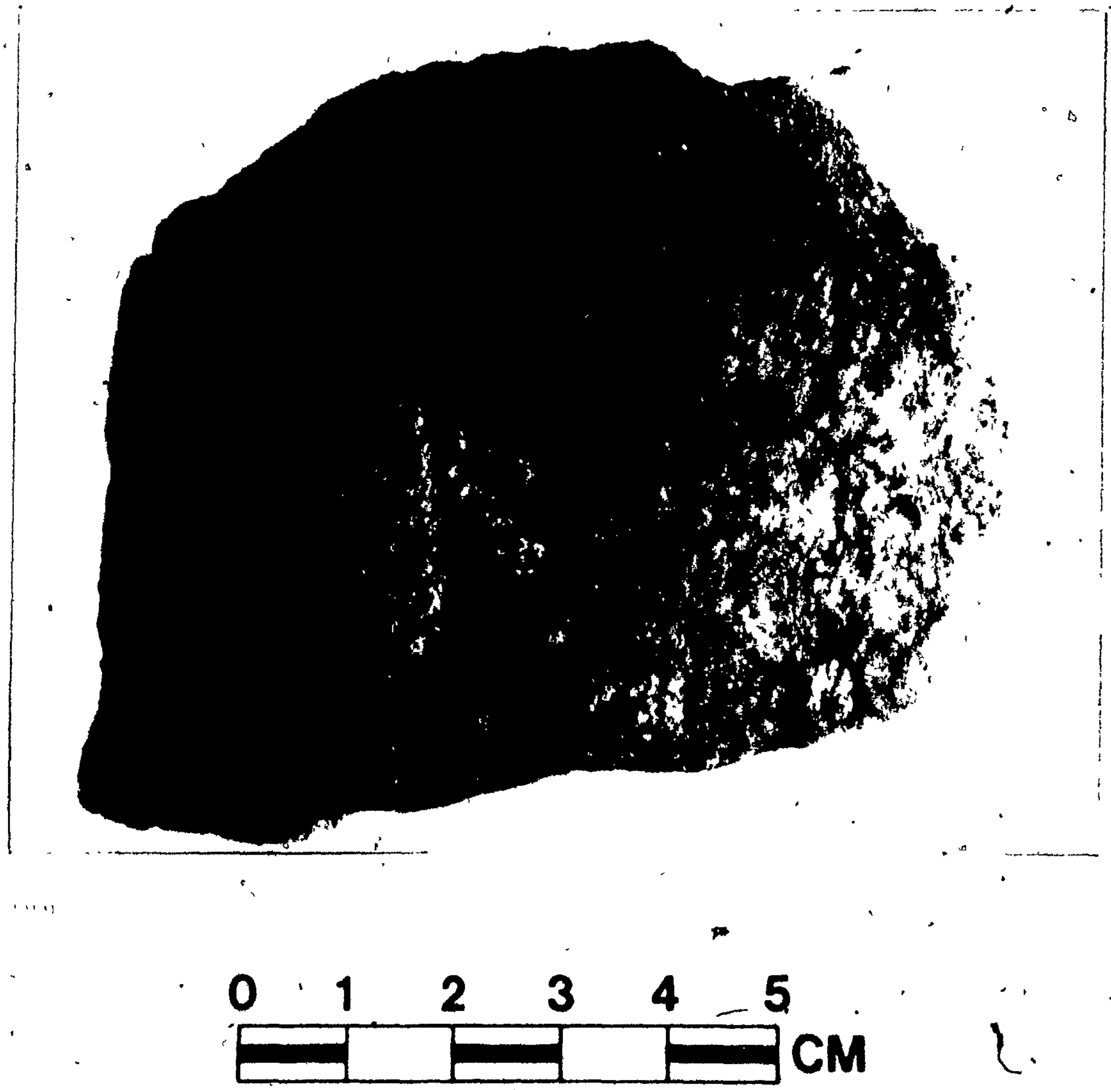


Figure 47: Granite Tool from Feature 1, Crowfield Site

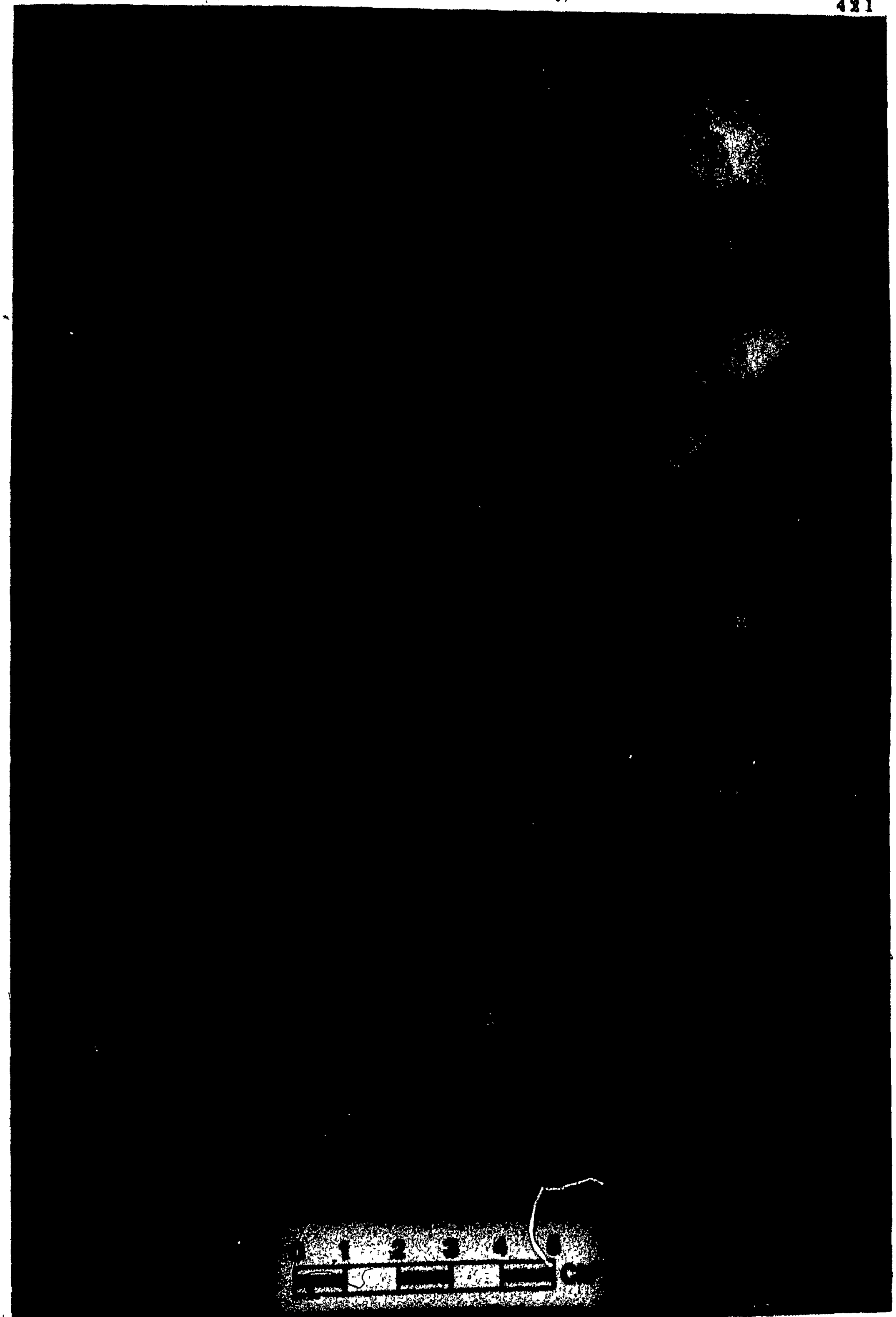


Figure 48: Artifacts from Feature 2, Crowfield Site

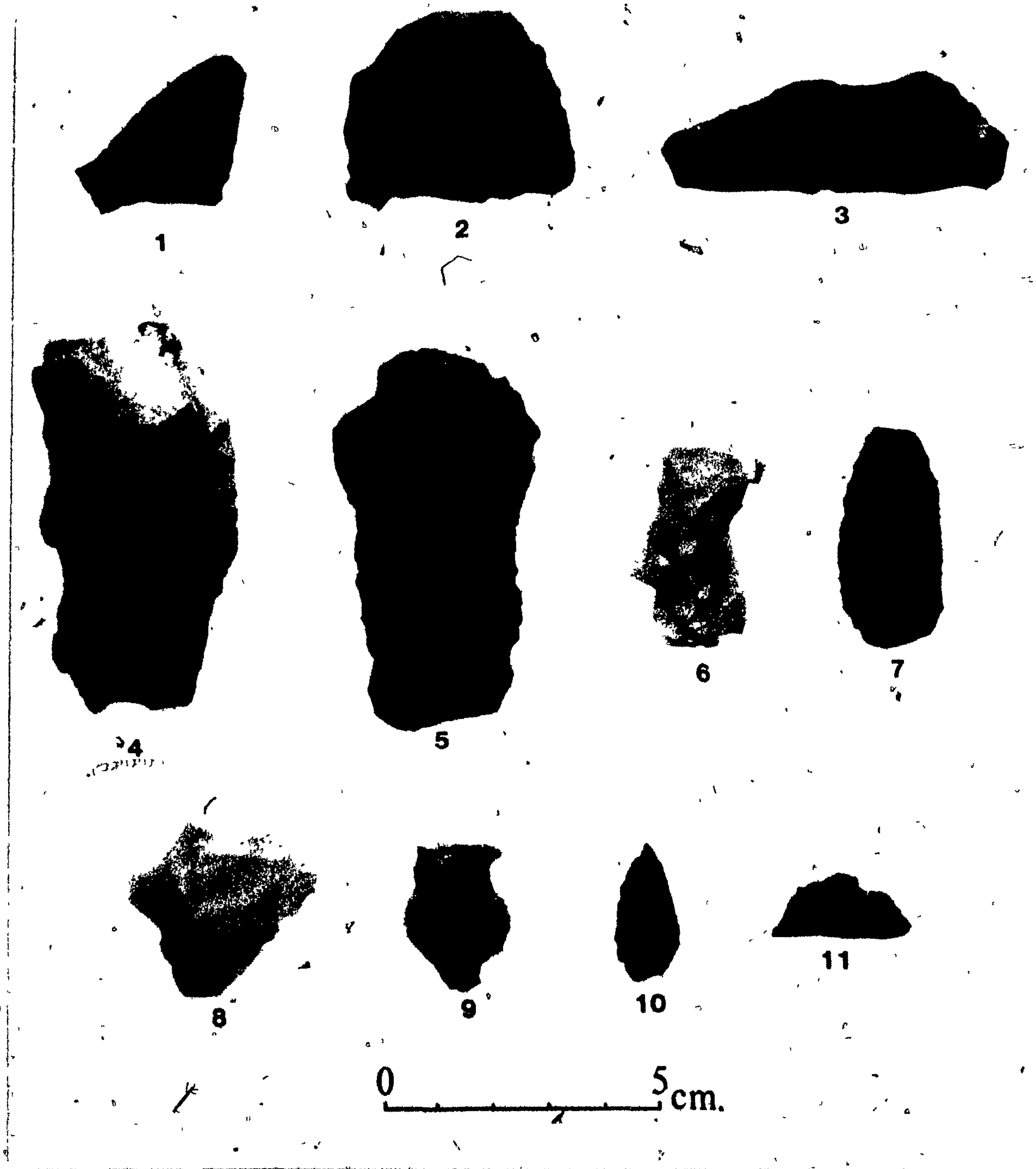


Figure 49: Unheated Artifacts from the Crowfield Site

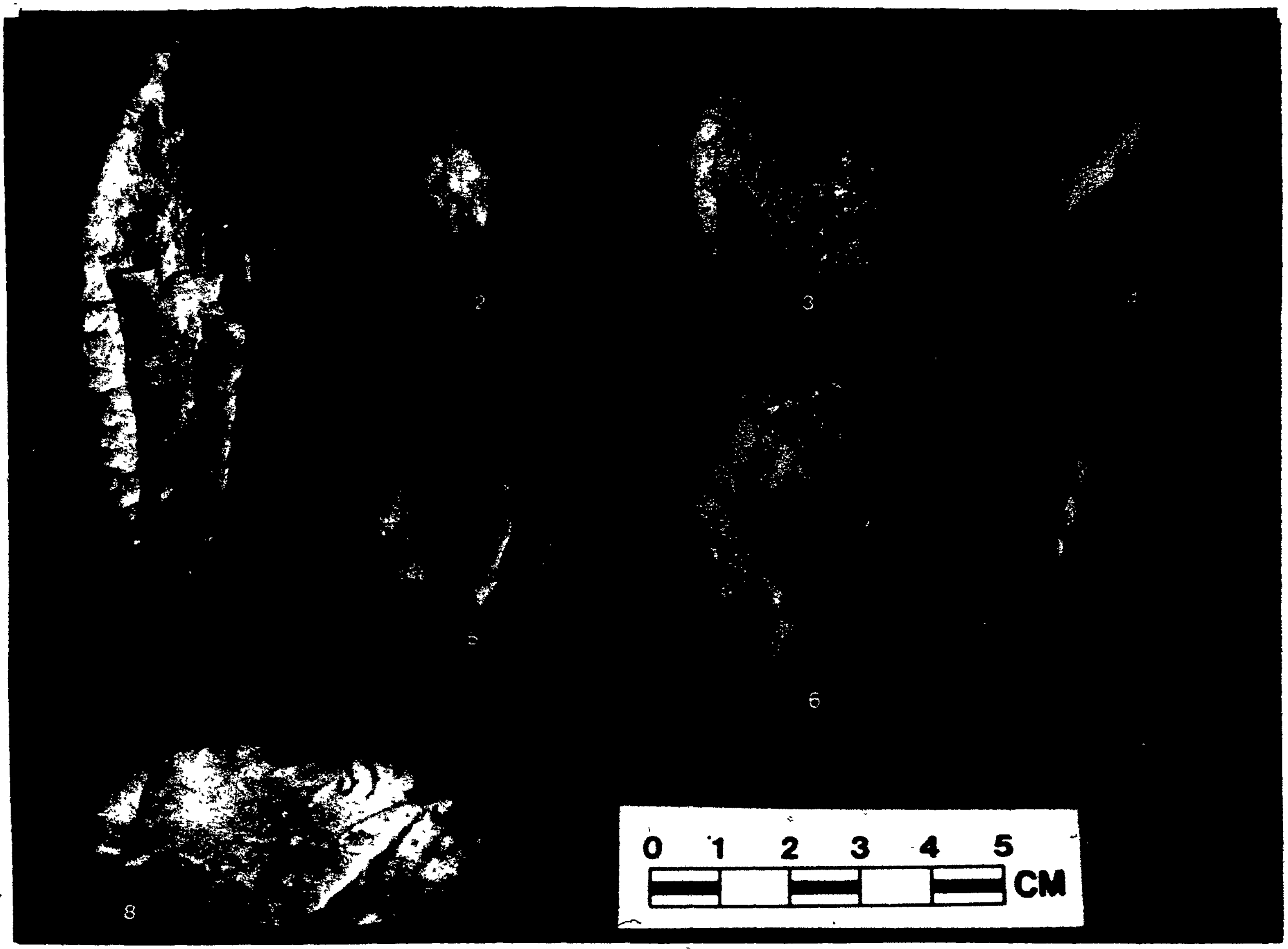


Figure 50: Artifacts from the Bolton Site, Middlesex County, Ontario

Figure 51 Legend: Location Summary Data

Fig. 51 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
1	Point base	19	VI	McGillivray	Middlesex	395824(*1)	Fig. 13, No. 1
2	Point base	28	V	McGillivray	Middlesex	356828(*1)	Fig. 13, No. 2
3	Point base	26	I	Bosanquet	Lambton	334816(*1)	Fig. 13, No. 3
4	Tedball	28	IV	Bosanquet	Lambton	302827(*1)	Ellis and Deller 1986
5	Strathroy	10	IX	Caradoc	Middlesex	499543(*2)	Deller 1976a
6	Point	15	IV	Southwold	Elgin	817286(*3)	Fig. 13, No. 8
7	Point base	19	II	Harwich	Kent	265862(*4)	Fig. 13, No. 4

Topographic Grid Reference Notes

*1 Parkhill 40 P/4, Edition 4.
*2 Strathroy 40 I/13, Edition 4.
*3 Port Stanley 40 I/11, Edition 4.
*4 Ridgetown 41 I/5, Edition 5.

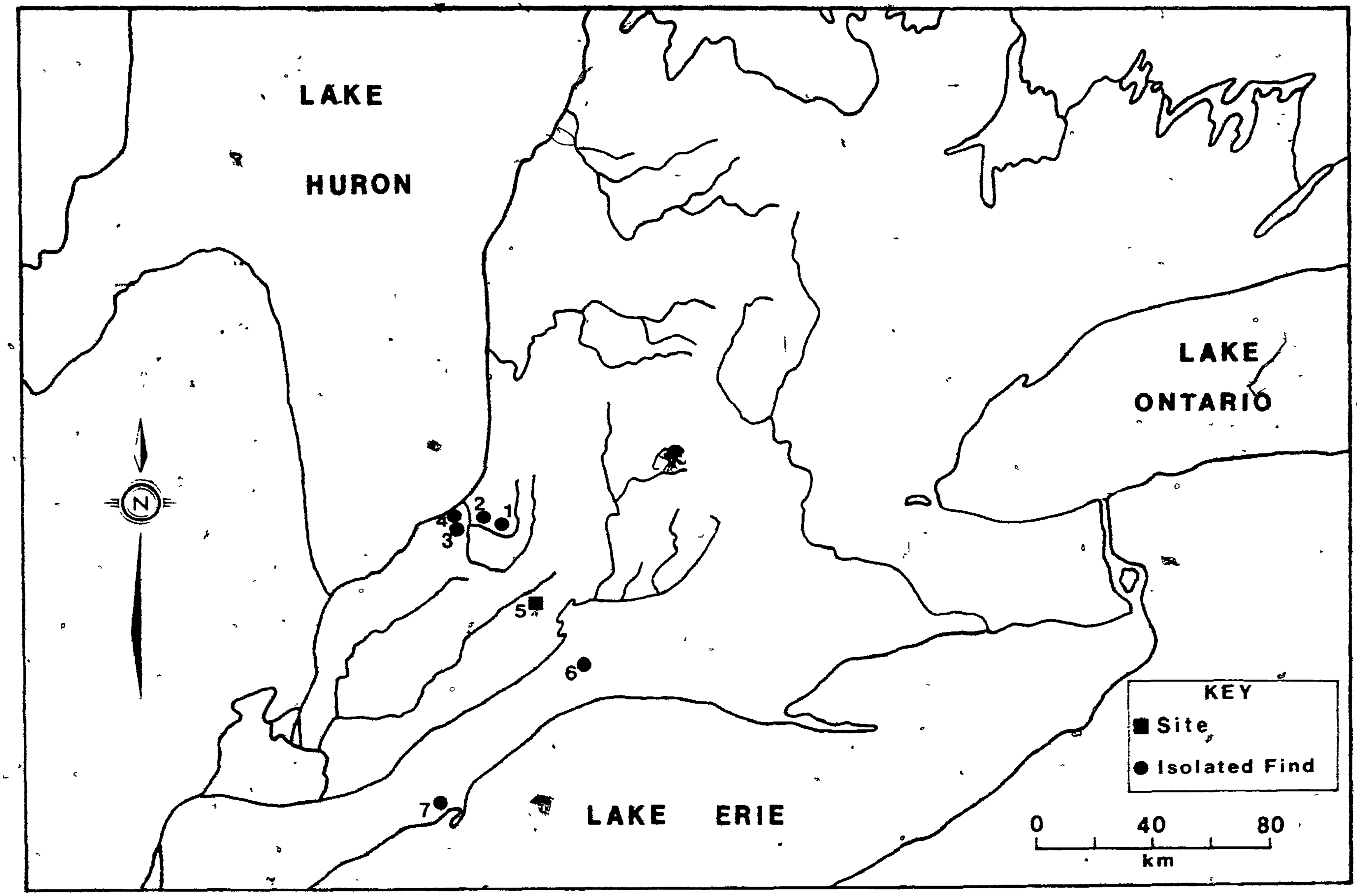


Figure 51: Distribution of Holcombe Complex Sites and Loci.

Figure 52: Artifacts from the Tedball Site, Lambton County

Figure 53 Legend: Location Summary Data

Fig. 53 Number	Site Name and/or Nature of Sample	Lot	Con.	Township	County	Topographic Grid Ref.	Reference
1	Heaman	22	VIII	McGillivray	Middlesex	389851(*1)	Deller 1976b
2	Point	45	XXVII	McGillivray	Middlesex	395856(*1)	Deller 1976a:d
3	Point	26	V	McGillivray	Middlesex	365825(*1)	This study
4	Hall	30	V	McGillivray	Middlesex		
5	Point	27	I	Bosanquet	Lambton		Deller 1979, No. 5c
6	Point	24	IV	Bosanquet	Lambton		This study
7	Point mid-section	23	I	Bosanquet	Lambton		This study
8	Point	15	I	Bosanquet	Lambton		Fig. 14, No. 10
9	Point	B	IV	Delaware	Middlesex		Fig. 14, No. 11
10	Point	5	XIV	Chatham	Kent		This study

Topographic Grid Reference Notes

*1 Parkhill 40 P/4, Edition 4.

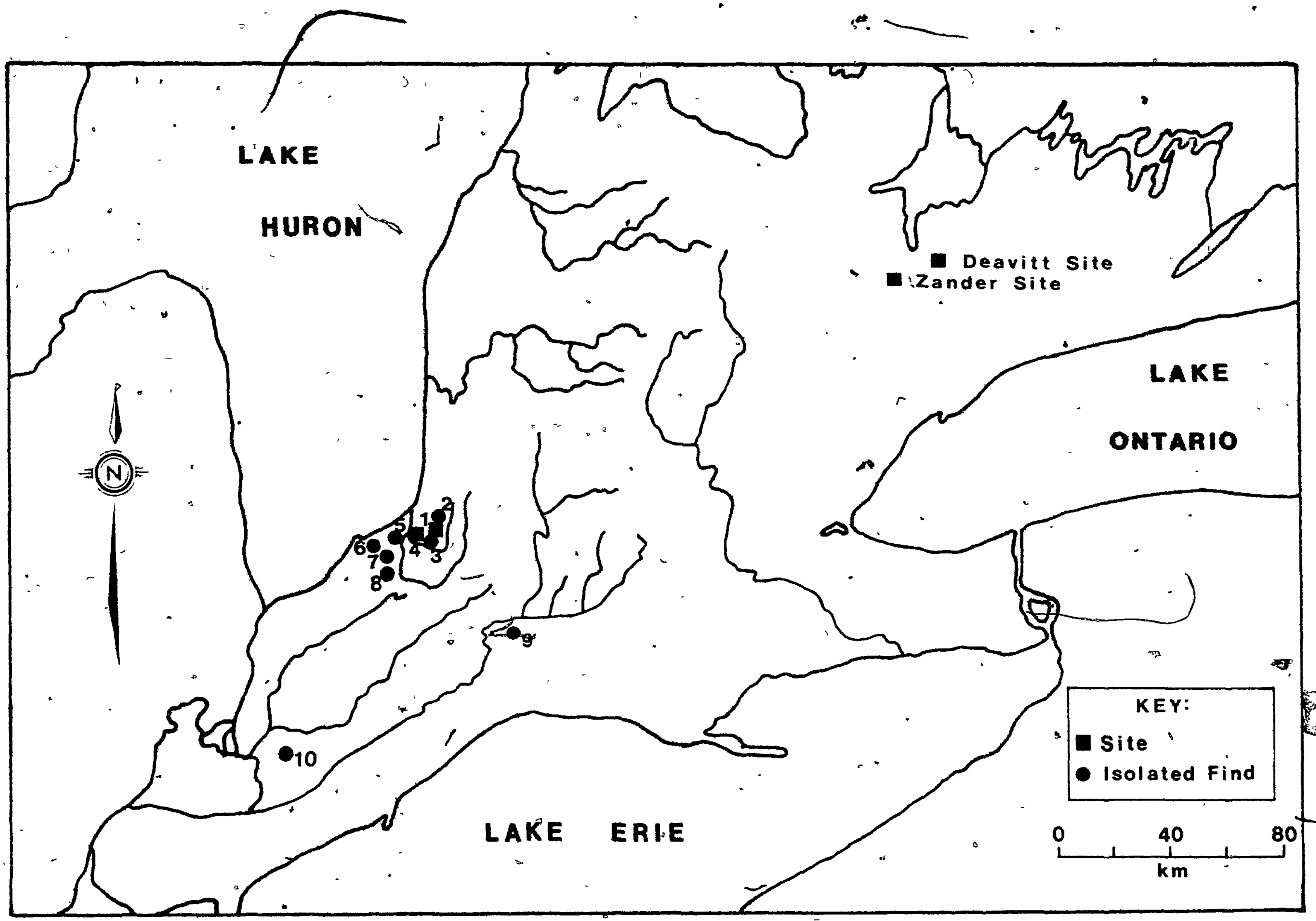


Figure 53: Distribution of Madina Complex Sites and Isolated Loci.

Table 1: Radiometric Dates Associated with Paleo-Indian Components (after Haynes 1984, Frison 1978).

Complex	Date B.P. (Note 1)	N (Note 2)	Site	Nature of Sample	Lab. No.
Clovis	11 663	3	Agate Basin	charcoal	I-499
Clovis	11 280	1	Union Pacific Mammoth	tusk organics	I-499
Clovis	11 280	3	Clovis	carbonized plants	
Clovis	11 220	1	Dent	bone organics	I-622
Clovis	11 133	2	Domebo	wood/bone organics	
Clovis	10 965	8	Murray Springs	charcoal	
Clovis	10 942	12	Lehner		
Folsom	10 990	2	Lindenmeier	charcoal	
Bull Brook	10 850	2	Whipple	hardwood charcoal	
Folsom	9 566	3	Whipple	conifer charcoal.	
Debert	10 607	3	Agate Basin	charcoal	
Debert	10 590	13	Debert	charcoal	
Folsom	10 547	3	Hell Gap	charcoal	
Debert	10 518	6	Vail	charcoal	

con't

Table I - continued

Complex	Date B.P. (Note 1)	N (Note 2)	Site	Nature of Sample	Lab. No.
Folsom	10 390	2	Hanson	charcoal	
Folsom	10 350	4	Clovis	carbonized plants	
Folsom	10 260	1	Folsom	bone organics	SMU-179
Folsom	10 083	3	Bonfire Shelter	charcoal	
Hell Gap	9 945	2	Casper		
Hell Gap	9 625	2	Sister's Hill		

Note 1: Date = Average if more than one sample available from site.
2: N = Number of samples used in calculation of average.

Table 2: Late Pleistocene and/or Early Holocene Vertebrate Species Reported from Southern Ontario (after Jackson 1978).

Species	Region of Ontario: Southwestern	South-central	south-eastern
Bear (Ursus sp.)		x	
Grizzly bear (Ursus arctos-horribilis-complex)		x	
Beaver (Castor canadensis)		x	
Bison (Bison bison)		x	
Capelin (Mallotus villosus)			x
Eastern chipmunk (Tamias striatus)			x
Caribou (Rangifer sp.)		x	
White-tail deer (Odocoileus virginianus)	x		
American elk (Cervus canadensis elephas)	x	x	
Moose-elk (Cervalces sp.)	x		
Lumpfish (Cyclopterus lumpus)			?
Columbian mammoth (Mammuthus columbi)		x	
Woolly mammoth (Mammuthus primigenius)	x	x	

con't

Table 2: con't.

Species	Region of Ontario: Southwestern	South-central	South-eastern
American marten (Martes americana)			x
American mastodon (Mammut americanum)	x	x	
Musk ox (Ovibos proximus moschatus)		x	
Bearded seal (Erignathus barbatus)			x
Harp seal (Phoca Pagophilus groenlandica)			x
Ringed seal (Phoca Pusa hispida)			x
Sculpin (Artediellus uncinatus)			x
American smelt (Osmerus Mordax)			?
Three-spined stickleback (Gasterosteus aculeatus)			x
Lake trout (Salvelinus Cristivomer namaycush)			x
Bowhead whale (Balaena mysticetus)			x
Humpback whale (Megaptera novaeangliae)			x
White whale (Delphinapterus leucas)			x

Table 3: Chert Types Used in the Manufacture of Early Projectile Points, Southwestern Ontario

Point Type	N	Upper Mercer	Onondaga	Collingwood	Bayport	Kettle Point	Haldimand	Unknown
Gainey	25	16%	32%	32%	4%	-	-	16%
Barnes	140	-	7%	77%	13%	1%	-	1%
Crowfield	45	-	60%	33%	2%	2%	-	2%
Holcombe	14	-	43%	-	14%	14%	14%	14%
Hi-Lo	132	-	8%	-	7%	31%	40%	14%

Table 4: Parkhill Site Artifact Inventory and Distribution of Types Per Area

(A) TOTAL INVENTORY

Artifact Type	N	Collingwood	Bayport	Onondaga	Unknown
Fluted bifaces	130	88%	8%	4%	
Channel flake points	4	100%			
Biface preforms	6	100%			
Backed bifaces	1	100%			
Alternately bevelled bifaces	5	80%		20%	
Other bifaces	3	67%		33%	
Biface fragments	4	50%	25%	25%	
End scrapers	46	78%	9%	11%	2%
Side scrapers	13	100%			
Narrow end scrapers (groovers)	7	86%		14%	
Beaked scrapers	5	60%		40%	
Spokeshaves	5	80%	20%		
Gravers	20	75%	10%	15%	
Other unifacial tools	11	91%		9%	
Unidentified tool fragments	42	98%	2%		
Utilized flakes	19	95%		5%	
Totals	321	87%	6%	7%	0.01%
Channel flakes	213	86%	8%	4%	2.00%

con't

Table 4 - Continued

(B) ARTIFACT INVENTORY PER SITE AREA

	Artifact Type	N	% of Area Assemblage	% Collingwood	% Bayport	% Onondaga	% Unknown
Area A	Fluted bifaces	9	64	44	33	22	
	Biface preforms	1	7	100			
	Gravers	1	7	100			
	Other tools	2	14	100			
	Utilized flakes	1	7	100			
	TOTALS	14		64	21	14	
	Channel flakes	2	-	100			
Area B	Fluted bifaces	68	68	93	7		
	Channel flake points	4	4	100			
	Biface preforms	2	2	100			
	Alternately bevelled bifaces	1	1	100			
	Other bifaces	3	3	67		33	
	Biface fragments	2	2	50		50	
	End scrapers	1	1	100			
	Side scrapers	2	2	100			
	Beaked scrapers	2	2	50		50	
	Gravers	1	1			100	
	Utilized flakes	12	12	100			
	Tool fragments	3	3	100			
	TOTALS	101		92	5	4	
	Channel flakes	142	-	93	4	1	1

con't

Table 4 - Continued

(B) ARTIFACT INVENTORY PER SITE AREA

	Artifact Type	N	% Of Area Assemblage	% Collingwood	% Bayport	% Onondaga	% Unknown
Area C	Fluted bifaces	26		88	4	8	
	Alternately bevelled bifaces	2		50		50	
	Biface fragments	1			100		
	End scrapers	5		40	20	20	20
	Side scrapers	2		100			
	Narrow end scrapers (groovers)	2		50		50	
	Beaked scrapers	1				100	
	Spokeshaves	1			100		
	Gravers	4		50	50		
	Utilized flakes	2		100		100	
	Tool fragments	10		90	10		
	TOTALS	56		73	13	13	1
	Channel flakes	42		55	24	17	5

con't

Table 4 - Continued

(B). ARTIFACT INVENTORY PER SITE AREA

	Artifact Type	N	% of Area Assemblage	% Collingwood	% Bayport	% Onondaga	% Unknown
Area D	Fluted bifaces	19	17	100			
	Channel flake points	2	2	100			
	Biface preforms	3	3	100			
	Alternately bevelled bifaces	2	2	100			
	Biface fragments	1	1	100			
	End scrapers	30	27	80	6	13	
	Side scrapers	6	5	100			
	Narrow end scrapers (groovers)	2	2	100			
	Beaked scrapers	2	2	100			
	Gravers	6	5	67		33	
	Other tools	6	5	100			
	Utilized flakes	4	4	100			
	Tool fragments	28	25	100			
	TOTALS	111		93	2	5	
	Channel flakes	20	-	100			

Table 4 - Continued

(B) ARTIFACT INVENTORY PER SITE AREA

	Artifact Type	N	% of Area Assemblage	% Collingwood	% Bayport	% Onondaga	% Unknown
Area E	Fluted bifaces	4	44	100			
	End Scrapers	1	11	100			
	Narrow end scrapers (groovers)	1	11	100			
	Gravers	2	22	100			
	Other tools	1	11			100	
	TOTALS	9		89		11	
Area G	Side scrapers	1	20	100			
	Narrow end gravers (groovers)	1	20	100			
	Spokeshaves	2	40	100			
	Other tools	1	20	100			
	TOTALS	5		100			
Area H	End scrapers	4	50	75	25		
	Side scrapers	1	12	100			
	Narrow end scrapers (groovers)	1	12	100			
	Spokeshaves	1	12	100			
	Tool fragments	1	12	100			
	TOTALS	8		88	12		

con't

Table 4 - Continued

(B) ARTIFACT INVENTORY PER SITE AREA.

	Artifact Type	N	% of Area Assemblage	% Collingwood	% Bayport	% Onondaga	% Unknown
Area I	Fluted bifaces	1	25		100		
	Backed bifaces	1	25	100			
	End scrapers	1	25	100			
	Graver	1	25	100			
	TOTALS	4		75	25		
	Channel flakes	2		100			
Area J	Fluted bifaces	2	50	50		50	
	Gravers	2	50	100			
	TOTALS	4		75		25	
	Channel flakes	5		100			
Area K	Fluted bifaces	1	9	100			
	End scrapers	4	36	100			
	Side scrapers	1	9	100			
	Spokeshaves	1	9	100			
	Gravers	3	27	100			
	Other tools	1	9	100			
	TOTALS	11		100			

Table 5: Thedford II Site Artifact Inventory

Type	N	Collingwood	Bayport	Onondaga
Fluted bifaces	32	69%	31%	-
Biface preforms	5	100%	-	-
Backed bifaces	1	100%	-	-
Alternately bevelled bifaces	5	20%	80%	-
Channel flake point	1	100%	-	-
End scrapers	37	84%	14%	3%
Side scrapers	10	100%	-	-
Narrow end scrapers (groovers)	8	88%	13%	-
Spokeshaves	6	100%	-	-
Gravers	17	100%	-	-
Other	32	100%	-	-
Total	154	86%	13%	1%
Channel flakes	41	95%	5%	-

Table 6: McLeod Site Artifact Inventory

Artifact Type	N	Collingwood	Onondaga	Kettle Point
Fluted bifaces	2	50%		50%
Pièces esquillées (reworked fluted biface)	1		100%	
Alternately bevelled bifaces	1	100%		
End scrapers	6	100%		
Side scrapers	8	100%		
Narrow end scrapers (groovers)	1	100%		
Beaked scrapers	1	100%		
Utilized flakes	5	100%		
Unidentified scraper fragments	4	100%		
Gravers	2	100%		
TOTALS	31	94%	3%	3%
Channel flakes	5	100%		
Fluted preform tip	1			100%

Table 7: Dixon Site Artifact Inventory

	N	Collingwood	Bayport
Fluted bifaces	2	2	
Backed bifaces	1		1
Alternately bevelled bifaces	1	1	
End Scrapers	7	7	
Side Scrapers	2	2	
Unidentified tool fragments	2	2	
Total	15	93%	7%
Channel flakes	1	1	

Table 8: Crowfield Site Artifact Inventory

Artifact Type	N	Onondaga	Collingwood
Fluted bifaces	32	66%	34%
Biface preforms	41	75%	25%
Backed bifaces	14	79%	21%
Alternately bevelled bifaces	3	100%	
Other bifaces	10	80%	20%
Side scrapers	15	86%	14%
Narrow end scrapers (groovers)	2	50%	50%
Spokeshaves	7	100%	
Gravers	12	67%	33%
Other unifaces	70	90%	10%

Table 9: Crowfield Site Feature Artifact Inventory

Artifact Type	N	Onondaga	Collingwood
Fluted bifaces	29	66%	35%
Biface preforms	38	71%	29%
Backed bifaces	14	79%	21%
Alternately bevelled bi.	2	100%	-
Other bifaces	10	80%	20%
Side scrapers	11	100%	-
Narrow end scrapers (groovers)	1	100%	-
Spokeshaves	7	100%	-
Gravers	3	100%	-
Other unifaces	63	94%	6%
Totals	176	83%	17%