

**POINTING IT OUT: FLUTED PROJECTILE POINT
DISTRIBUTIONS AND EARLY HUMAN POPULATIONS IN
SASKATCHEWAN**

by

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ABSTRACT

This study investigates early Paleo-Indian expansion into Saskatchewan as reflected by the distribution of fluted projectile points compared to Late Pleistocene/Early Holocene environmental changes. With an assemblage consisting solely of fluted point surface finds, this study consists of a geographic distribution analysis.

An initial study of Saskatchewan's fluted projectile points, conducted in 1966 by Tom Kehoe, made use of information from the then known database, consisting of a mere 36 artifacts. The current study examines the modern database of 78 specimens and discusses the distributions of the three separate types of fluted points found in Saskatchewan and the validity of applying terms (Clovis, Folsom, and Northwestern) derived outside the province to them.

Not only does Saskatchewan's assemblage reflect distributional differences between each fluted point type as a result of late Pleistocene/early Holocene environmental changes, but it shows typological similarities to assemblages elsewhere and changes in a time progressive manner.

Keywords: Paleoindian, Fluted Points, Late Pleistocene, Northern Plains

Subject Terms: Archaeological Survey – North America, North America – Antiquities, Paleo-Indians, Paleo-Indians – Implements, Projectile Points

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TABLE OF CONTENTS

Approval	ii
Abstract	iii
Acknowledgements	iv
Table of Contents	vi
List of Figures	viii
List of Tables	x
Chapter 1: Introduction	1
Objectives	3
Hypotheses	3
Methodology.....	4
Field Research.....	4
Literary Research.....	6
Thesis Organization	7
Chapter 2: Study area and cultural background	9
Introduction	9
Study Area	10
Early Paleoindian Period on the Plains	13
Early Paleoindian Chronology.....	16
Saskatchewan’s Early Paleoindian Projectile Points and Associated Artifacts.....	20
Artifact Types Associated with Fluted Point Assemblages.....	22
Cultural Adaptations on the Northern Plains	26
Early Paleoindian Studies in Saskatchewan and Alberta.....	31
Chapter 3: Late Pleistocene/Early Holocene Environmental Developments and Changes	36
Introduction	36
Deglaciation.....	37
Vegetation	40
Phase 1: Late Glacial Tundra	41
Phase 2: White Spruce Plant Community	41
Phase 3: Parklands.....	42
Overall Vegetation Zone Development	44
Limited Early Faunal Assemblage	46

Chapter 4: Saskatchewan’s Fluted Projectile Points	48
Introduction	48
Methods	49
Classic Typologies: Their Validity in the Saskatchewan Assemblage	51
Classic Clovis.....	52
Classic Folsom.....	53
Validity of Saskatchewan’s Fluted Points as “Classic”	54
Saskatchewan’s Assemblage.....	57
Clovis-style	58
Folsom-style	61
Northwestern Fluted.....	66
Fluted Point Discussion	68
Chapter 5: Saskatchewan’s Fluted Projectile Points Discussion	75
Introduction	75
1966 Fluted Point Distributions.....	76
Updated Fluted Point Distributions	78
Discussion.....	79
Chapter 6: Conclusions	86
Introduction	86
Hypothesis: Qualitative and quantitative data provide a strong enough basis to categorize Saskatchewan’s fluted projectile points under typological groups from neighboring regions.....	87
Hypothesis: If Saskatchewan’s fluted projectile points can be categorized under similar typological groups from neighboring regions it may be assumed that they date to the same time periods.	88
Hypothesis: Saskatchewan’s fluted projectile point types should demonstrate changes in a time progressive manner.....	88
Recommendations for Future Work.....	90
Appendices	92
Appendix A: Fluted Point Photos.....	93
Appendix B: Point Characteristics	101
Appendix C: Fluted Point Qualitative and Quantitative Data	106
Clovis Point Data Summary: Qualitative Data	106
Clovis Point Data Summary: Quantitative Data.....	107
Northwestern Point Data Summary: Qualitative Data.....	108
Northwestern Point Data Summary: Quantitative Data	110
Folsom Point Data Summary: Qualitative Data	112
Folsom Point Data Summary: Quantitative Data.....	113
Reference List.....	115
Web References.....	126

LIST OF FIGURES

Figure 1: Ecozones of Saskatchewan	11
Figure 2: The Northern Great Plains.....	12
Figure 3: Diagnostic Paleoindian projectile points from the Plains. a) Clovis, b) Goshen.....	15
Figure 4: Radiocarbon dates associated with Clovis, Goshen and Folsom points.....	19
Figure 5: A) Showing a Clovis point and B) a Folsom point.....	21
Figure 6: Spurred Endcraper	23
Figure 7: Bone rods/foreshafts (left) and use of bone rods for fluted point hafting (right)	25
Figure 8: Fossilized bone foreshaft from Grenfel, Saskatchewan.....	26
Figure 9: Deglaciation of Saskatchewan with glacial lakes and drainages	38
Figure 10: Showing a north-easterly decrease in years before present based on radiocarbon dates relating to the Late Pleistocene deglaciation of Saskatchewan	40
Figure 11: Characteristics measured and recorded on each projectile point	50
Figure 12: Depicting variation within the Folsom assemblage from the type station, Folsom, New Mexico.....	55
Figure 13: Ordinary variation in Clovis fluted points at one moment in time.	56
Figure 14: Clovis-style projectile modified into a drill	59
Figure 15: Clovis raw material	60
Figure 16: Distribution of Clovis-style points 1969 (A) and today (B).....	61
Figure 17: Three Folsom-style Knife River Flint projectiles, found south of Bromhead, Saskatchewan.....	62
Figure 18: Small sandy mound overlooking drop in elevation to the East.	63
Figure 19: Folsom-style base with channel flake (left). Channel flake refit (right).	64
Figure 20: Folsom raw material	65
Figure 21: Distribution of Folsom-style points 1966 (A) and today (B).....	66
Figure 22: Northwestern Fluted type raw material.....	67

Figure 23: Distributions of Northwestern Fluted variant points today.....	68
Figure 24: Range in widths of Northwestern Fluted Type Points	69
Figure 25: Range in widths of Folsom style points	70
Figure 26: Range in widths of Clovis style points	70
Figure 27: Basal width vs. basal depth of all fluted points in Saskatchewan	74
Figure 28: 1966 Fluted point distributions and ice frontal positions	77
Figure 29: Today's known fluted point distributions and ice frontal positions	79
Figure 30: Resharpended Clovis-style projectile point from Medstead, Saskatchewan	80
Figure 31: Folsom point distribution and paleovegetation coverage of Saskatchewan and Alberta at 12 000 ¹⁴ C BP	81
Figure 32: Folsom point distribution and paleovegetation coverage of Saskatchewan and Alberta at 10 000 ¹⁴ C BP	83
Figure 33: Saskatchewan's fluted projectile point distributions, 1966 vs. today.....	87

LIST OF TABLES

Table 1: Radiocarbon/Calendrical age comparisons	2
Table 2: Size comparisons between fluted point types.....	59

CHAPTER 1: INTRODUCTION

The initial arrival of people in the Americas and their routes of dispersion have been debated hotly by archaeologists for many years. What is agreed upon is that once arrival had occurred people dispersed rapidly across the continents, quickly populating and adapting to various environments. Of primary interest in this study is the first movement of humans into the Saskatchewan portion of the northern Plains, and their dispersal throughout that province during Late Pleistocene/Early Holocene times.

Archaeological data pertaining to the period of intense deglacial activity and environmental change beginning around 14 000 ¹⁴C BP in Saskatchewan consists solely of surface finds of fluted projectile points (Dyke et al. 2002). No intact, buried cultural deposits with such markers of early human habitation have yet been found in the province. There is a belief that the research potential of such surface finds is quite limited (Bamforth 2002:62). While it is true that they do not have a clear stratigraphic context, there is still much that can be learned through their study, such as: "General geographic distribution, specific settlement patterns, selection of lithic materials, technology and mobility..." (Gryba 2001:251). Although each of these five general areas of study will be touched upon, geographic distribution and mobility will be the primary foci of the following discussion.

It should be noted that dates used throughout this study will be in radiocarbon years before present. “Radiocarbon dates can be corrected to more closely match calendar dates using the tree-ring and marine data sets” (Carlson and Magne 2008:vi). Date calibration to calendar years before present, while providing a more conventional temporal understanding, would present inconsistencies within this work, primarily concerning Table 2 (p.59) which provides North American fluted point dates in radiocarbon years before present. Also, future advancements in radiocarbon date calibration could potentially nullify the validity of calibrated dates, if used. With this in mind, dates are presented as before present (BP) rather than ¹⁴C BP or rybc (radiocarbon years before present), as the use of radiocarbon years before present is implied throughout. The following table serves as an aid in understanding the calibrated age of uncalibrated radiocarbon dates pertaining to the period under study.

Table 1: Radiocarbon/Calendrical age comparisons
 (Note: Calibrated ages have been rounded to the nearest century)

Radiocarbon Age	Calibrated Age
9000 BP	10 200 BP
9500 BP	10 700 BP
10 000 BP	11 500 BP
10 500 BP	12 500 BP
11 000 BP	12 900 BP
11 500 BP	13 400 BP
12 000 BP	13 800 BP
12 500 BP	14 800 BP

Objectives

The main goal of this study is to investigate early Paleo-Indian occupation of Saskatchewan as reflected by the distribution of fluted projectile points and as influenced by Late Pleistocene/Early Holocene environmental changes. In order to achieve this goal, the following primary objectives must be reached.

1. To understand the Late Pleistocene/Early Holocene deglaciation of Saskatchewan and the accompanying environmental changes and processes (i.e. formation of glacial lakes, glacial advance/retreat, vegetation development and change, etc.)
2. To fully tabulate and expand on known fluted projectile point occurrences in Saskatchewan and gain an understanding of their distributions.

Identifying a relationship between these two objectives as indicated by field and library research was of utmost importance in reaching that primary goal.

Hypotheses

In developing the outlined objectives, several hypotheses can be offered, but a database consisting solely of surface finds, with no context for dating, limits their scope. The following hypotheses concern stylistic/typological origins, ages, and changes through time.

Early artifacts from Saskatchewan have been identified by other researchers (Howard 1939; Roberts 1939; Kehoe 1966; Dyck 1983; Gryba 2001) as belonging to established typological groups of artifacts excavated and dated in

neighbouring areas. Therefore the first hypothesis is that qualitative and quantitative data provide a strong enough basis to categorize Saskatchewan's fluted projectile points under typological groups from neighbouring regions. This is tested by looking at the diagnostic attributes of established fluted projectile point types found and dated on the plains.

If indeed an accurate typological correlation can be made between Saskatchewan's fluted projectile points and those from other areas of discovery, it may be assumed that they date to the same time periods. Therefore, they should demonstrate changes in a time progressive manner in at least two different ways. First, there will be an increased dependency on local raw material types through time as a direct result of an increased familiarity with the local landscape. Second, the distributions of specific fluted point types will correspond with dated paleoenvironmental shifts (i.e. geomorphological features, vegetation zones), as these would have influenced human movements.

Methodology

Field Research

The field portion of this study, conducted in the summer of 2005, increased the number of known fluted point occurrences in the province and our understanding of Saskatchewan's first populations and their distributions. It involved travelling throughout the province assessing and studying numerous privately owned and museum collections containing early Paleoindian artifacts.

In preparation for that field research, several months were spent developing contacts with the archaeological community in Saskatchewan. In

particular, those included Dr. David Meyer of the University of Saskatchewan Department of Archaeology and Tim Jones of the Saskatchewan Archaeological Society (SAS). Through their help, plans were established for visiting several well known private collections containing fluted point specimens.

The Saskatchewan Archaeological Society (SAS) and its many branches proved to be a particularly reliable and useful starting point, as most members have an interest in learning about their prized personal collections. Contact was made with each branch and all members of the SAS via an article in the monthly bulletin describing this project and asking those with relevant specimens to come forward. The development of amicable relationships and the strong interest shown by most private collectors and museum workers in small communities aided my research and opened corridors to other previously unknown private collectors.

However, it is important to state that, due to the nature of collector trading and purchasing, some collections contained specimens lacking any original provenience. They are not included in the interpretations. Along with this, several other problems were faced while examining private collections and meeting with their owners. Because of ownership issues in the past with the Saskatchewan Museum of Natural History (now the Royal Saskatchewan Museum), several private collectors were reluctant to allow me to study their collections, for fear that I would appropriate some specimens.

There also were some problems faced when studying museum collections. A tendency common in many rural museums is to arrange artifacts in

a pattern and glue them on felt backgrounds. In some cases, the museum workers allowed the projectile points to be removed from their backgrounds, but sometimes data had to be gathered by viewing only one face of a point.

Literary Research

Since the cultural material under examination in this study was found on the ground surface, the main method used in their analysis may be referred to as a form of geographic distribution analysis. Thus, that cultural material was studied in its geographic context in relation to late-Quaternary deglacial and environmental phenomena. The correlations were made between the distributions of different types of fluted points and the known Late Pleistocene/Early Holocene environmental history of Saskatchewan. That provided the information needed to formulate hypotheses regarding the time and distribution of the earliest peoples of Saskatchewan.

Documenting late Pleistocene/ early Holocene environments and their changes will require input from several sources, including geology, palynology, geography and archaeology. Understanding when the Saskatchewan landscape could first support vegetation and, therefore, fauna and humans, is essential. In particular, the extent of late Wisconsinan glaciation and the timing of deglaciation were critical to Saskatchewan's early migrants.

Yansa's (2006) study of northern Plains vegetation changes during the late Quaternary was a primary source for outlining Saskatchewan's past plant communities. Along with this, Yansa and Basinger's (1999) discussion of climate change in Southern Saskatchewan and Beaudoin and Oetelaar's (2003)

overview of Southern Alberta's Late Pleistocene/Early Holocene landscape changes will be referred to.

Geomorphological information was obtained from several sources, as no overall deglacial model has focused solely on the province. Some primary sources included Klassen's (1989) '*Quaternary Geology of the Southern Canadian Interior Plains*', and '*Late Wisconsinan and Holocene history of southwestern Saskatchewan*' (1994), plus Kulig's (1996) '*The Glaciation of the Cypress Hills of Alberta and Saskatchewan and its Regional Implications*'. A series of geological radiocarbon dates, compiled by the Geological Survey of Canada, were also important in assessing the fluted projectile point age distribution, as they indicate when specific areas would have become inhabitable following deglaciation.

Thesis Organization

Chapter two discusses background information essential to this study. This chapter is divided into four sections: 1. study area, 2. previous research, 3. Paleoindian artifact assemblages on the Northern Plains, and 4. earliest people/cultural adaptations.

Chapter three provides information on the changing environment during the late Pleistocene and early Holocene. It outlines the establishment and changes in flora, fauna, river systems and lakes following the retreating Laurentide Ice sheet, critical to the movements of Saskatchewan's earliest inhabitants.

Chapter four provides a detailed review of Saskatchewan's entire fluted projectile point database. Discussions focusing on the different types found in Saskatchewan, their distinguishing qualities (including distinct lithic types), and, in some cases, similarities to "classic" southern types comprises the majority of this chapter.

Chapter five presents a discussion of the distribution of Saskatchewan's fluted points. Focus is on specific point type distributions and their relationship to past environmental and glacial boundaries, ultimately outlining the most likely distributions of Saskatchewan's early inhabitants.

Chapter six will provide a project summary and conclusions. The environmental and archaeological evidence presented in the preceding chapters will be summarized. Suggestions for future research that will add to, and possibly change, the perspectives offered in this thesis will be discussed.

CHAPTER 2: STUDY AREA AND CULTURAL BACKGROUND

Introduction

Before early human distributions in Saskatchewan can be accurately discussed, it is necessary to present some background information.

That information will be categorized into four separate yet equally integral sections. First, a concise description of the study area will be provided, along with the *raison d'être* for its selection as a focus for this study. The second section will provide an outline of early Paleoindian cultural complexes on the Plains, leading into studies in Saskatchewan. Following this will be a section describing the different styles of fluted projectile points and other commonly associated early artifacts. Awareness of the distinguishing attributes of each artifact type play a fundamental role in the recognition of their approximate age, and therefore will be crucial in the development of temporal distributions throughout this investigation. The final section of this chapter will provide an outline of how the earliest people inhabited the Northern Plains and the cultural adaptations they developed in response to a changing environment.

Study Area

The study area examined in this thesis includes the entire province of Saskatchewan, although attention was focused primarily on its southern half where fluted projectile points have been found. When relevant, neighbouring areas are also discussed.

Saskatchewan's 651,900 km² of land currently encompasses four major ecozones (Figure 1). The northernmost ecozones, covered primarily with Boreal Forest (coniferous species), include the Taiga Shield, the Boreal Shield and the Boreal Plain, extending south from the northern margins of the province to between 54 and 51 degrees latitude (Meyer 1997). The southernmost region, covering the remainder of the province, is the Prairie ecozone. It is comprised of four ecoregions: Cypress upland, mixed grassland, moist mixed grassland, and aspen parkland (Fung et al. 1999).

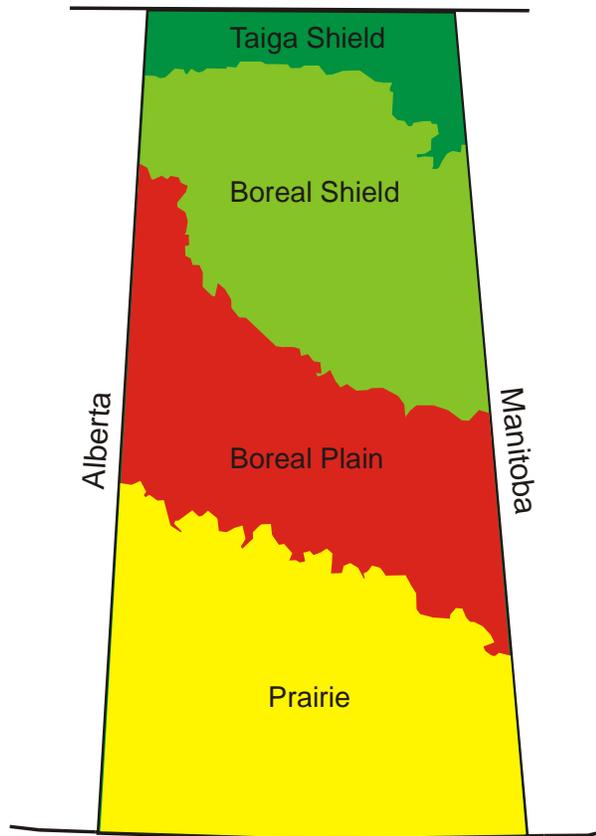


Figure 1: Ecozones of Saskatchewan
 (Modified from <http://www.climatechangesask.ca/images/eco-regmap03.gif>)

Saskatchewan’s southernmost prairie ecozone represents part of the northern segment of the Great Plains culture area, which also encompasses southeastern Alberta, southwestern Manitoba, North and South Dakota, northeastern Wyoming and central and eastern Montana (Figure 2). Although the overall Plains culture area also extends as far south as Texas.

Native grassland communities reflect differences in annual precipitation between the western and eastern portions of those northern plains. Although today altered by farming practices, they exhibit a shift from a long-grass prairie in the east to a short-grass prairie in the west. Saskatchewan’s grassland region, lying in the central portion of the northern plains, is predominantly a mixed tall

and short grass prairie, with aspen poplar, bur oak, and other trees and shrubs commonly found along rivers and perennial lakes. The northern margin of the Saskatchewan grassland is an aspen parkland transitional ecoregion, characterized by an abundance of birch and poplar, which along with the southernmost boreal transition ecoregion of the boreal plain ecozone, acts as a median between the open lands to the south and the heavily forested regions to the north (Yansa 2006:265).

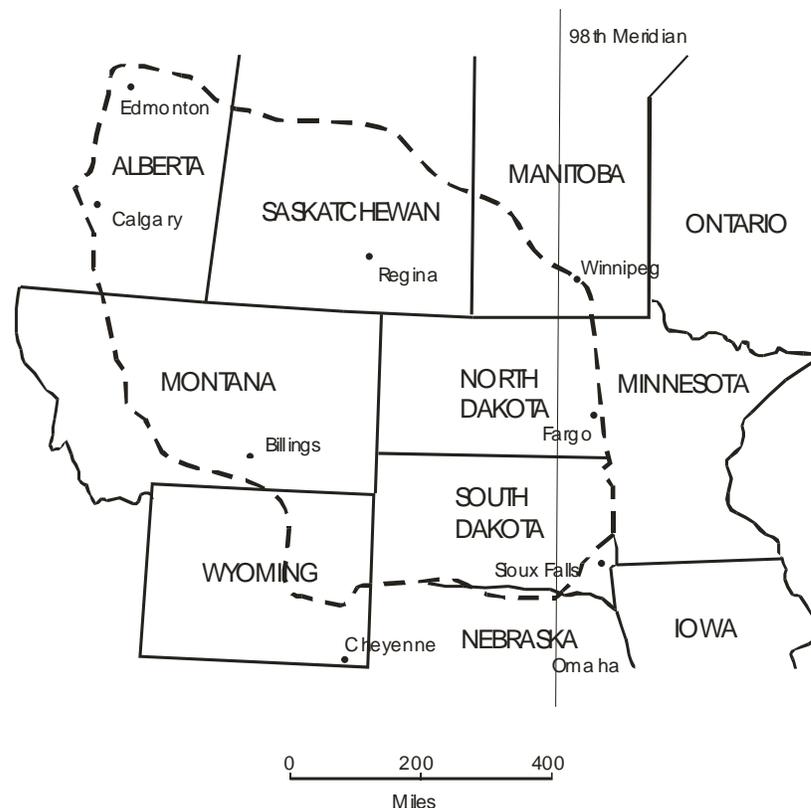


Figure 2: The Northern Great Plains
 (Modified from <http://www.unl.edu/plains/images/main/egpmap2.gif>)

The majority of the land south of the forest margin has, at one point or another, been 'broken' for grain agriculture. This practice has led to an abundance of surface collections throughout the southern third of the province, displaying a cultural record extending well into the Paleoindian period. There is a

possibility that fluted point occurrences may exist north of the forest margin in Saskatchewan, however if indeed any exist they remain to be found. Therefore the body of the following study deals primarily with the grassland/prairie portion of the province.

Early Paleoindian Period on the Plains

The beginning of research focusing on the Early Paleoindian time period, wherein past people made use of fluted projectile points, can be attributed to the 1926 discovery of the Folsom site, New Mexico (Wormington 1957). Finding fluted projectile points there directly associated with bones of an extinct subspecies of bison (*Bison antiquus figginsi*) provided the first conclusive evidence that people existed in North America as early as the late Pleistocene. Following these discoveries, the finding of cultural material associated with mammoth remains at the Dent site in Colorado and Blackwater Draw in New Mexico saw the beginning of studies concerning ice-age cultures in North America. That included attention to Pleistocene extinctions and human predator-prey relationships (Frison 1998). A more multi-disciplinary approach ensued. Incorporating paleo-ecological data in relation to past human subsistence strategies, it paved the way for more complete understandings of North America's early inhabitants and their probable role in the extinction of some late Pleistocene fauna.

Frison (1998:14576) describes the Plains Paleoindian period as a time when "...cultural groups were small and highly mobile and left behind scanty evidence of their presence...". Their sites often lacked preservation and good

stratigraphy, leading to the application of a multidisciplinary approach by archaeologists, including cooperation with specialists in other related disciplines (such as geologists, climatologists or palynologists).

The Plains of North America have produced a good deal of evidence for early Paleoindian occupations. Unfortunately, as pointed out by Frison (1998:14576), that evidence is “preserved in well stratified geologic contexts only in a few ideal situations”. Thus, our understanding of the Early Paleoindian chronology has been based on the discovery of a small number of stratigraphically intact sites, with radiocarbon dates. These discoveries have allowed the identification of characteristic morphological and technological changes in toolkits through time (Frison 1998). “Four stratified, multicomponent sites, Blackwater Draw in eastern New Mexico; Hell Gap in southeast Wyoming; Agate Basin in east central Wyoming; and Carter/Kerr-McGee in central Wyoming, complement each other in establishing and confirming the chronology” (Frison 1998:14576). They now are augmented by numerous other radiocarbon dated Early Paleoindian sites (Fieldel 1999; Waters and Stafford 2007).

Studies at these sites have resulted in the recognition of seven cultural complexes attributed to the Northern Plains Paleoindian time period, which are each identified by diagnostic stone tools. From oldest to most recent these complexes include Clovis, Folsom/Midland, Goshen, Agate Basin, Hell Gap, Alberta, and Cody (Figure 3) and cover a timespan of roughly 11 200 to 8000 BP (Frison 1998). The three earliest of these cultural complexes together are

attributed to the Early Paleoindian period, the time in which the Plains region was first occupied.

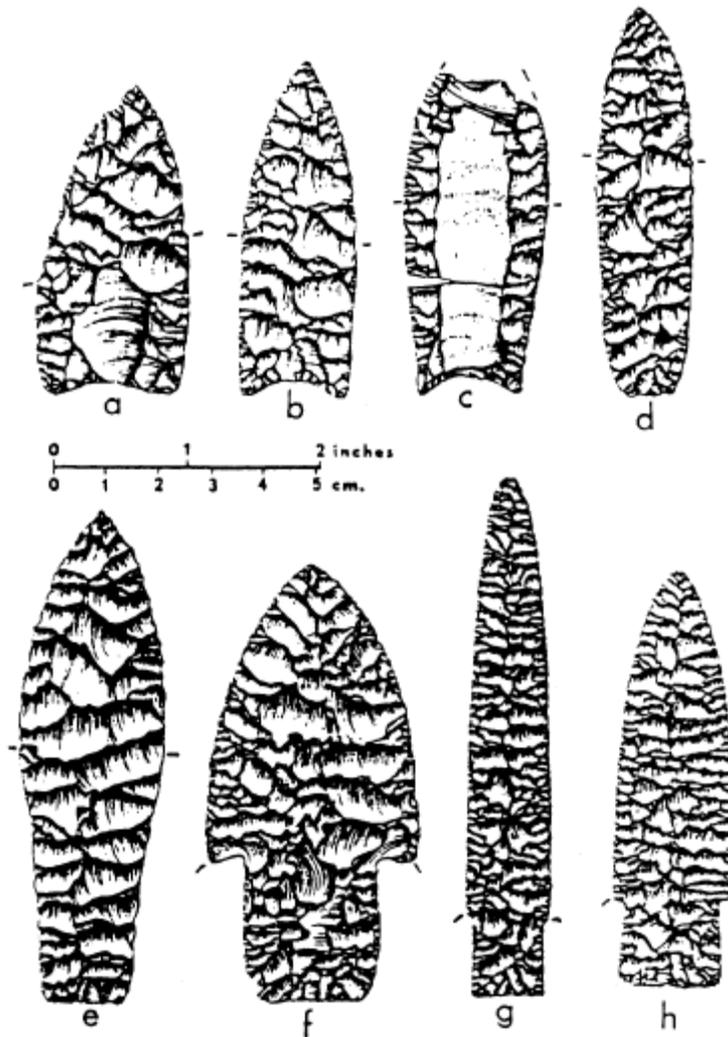


Figure 3: Diagnostic Paleoindian Projectile Points from the Plains. a) Clovis, b) Goshen, c) Folsom, d) Agate Basin, e) Hell Gap, f) Alberta, g) Eden, h) Scottsbluff (Frison 1998:14577. Used by permission of the National Academy of Sciences)

Unlike the fluted points that characterize Clovis and Folsom, the Goshen complex, which has been discovered to overlap temporally with both Clovis and Folsom, is typified by basally thinned lanceolate points commonly displaying parallel to slightly excurvate lateral edges and a concave base (Hofman and Graham 1998).

Early Paleoindian Chronology

Three types of fluted projectile points characteristic of the early Paleoindian time period have been discovered in Saskatchewan: Clovis, Folsom, and Atypical (Kehoe 1966). The latter also has been referred to as “Charlie Lake type” (Gryba 2001), “Peace River fluted” (Carlson and Magne 2008) and “Western Canadian Variant” (Roberts et al 1987). Because of the broad area existing between the Canadian Prairie provinces and the Southern Plains (the original area of Clovis and Folsom discovery), the terms “Clovis-style” and “Folsom-style” may be applied when referring to the similar variants in Saskatchewan.

The term ‘Atypical’ implies a lack of defined characteristics. The application of it to a specific type of artifact has oxymoronic connotations and will therefore be omitted throughout following discussions. Instead, projectile points of this third variety will be referred to as the Northwestern Fluted type as such a designation sheds the ambiguous nature of “atypical” and associates the type with an area of original identification.

A stratigraphic separation between Clovis and Folsom points, placing the former chronologically before the latter, was first identified at the Clovis site in Blackwater Draw, New Mexico (Haynes 1980:115). This chronological positioning of Clovis fluted projectile points at the bottom of the archaeological time sequence within most areas of North America, indicates that the people who manufactured and used these tools were the founding populations in those regions (Carlson and Magne 2008:355).

Kehoe's (1966) initial study of fluted points in Saskatchewan hypothesized that the third, Atypical (now Northwestern Fluted), type represented a very late derivative of the fluted tradition. This assumption was based on the then-known ice frontal positions during the Late Wisconsinan deglaciation and this artifact type's distribution in areas that "would have been ice-covered during the Folsom period" (Kehoe 1966:534). However, our current, updated, understanding of fluted point distributions and deglaciation during the Late Wisconsinan suggests otherwise (Klassen 1989 and 1994; Kulig 1996).

Hofman and Graham (1998:97) point out that due to experimentation and variability within technological systems, "we should not assume that Paleo-Indian complexes on the Plains represent a simple unilinear development sequence." After all, regional fluted point types have been identified in areas outside of the Plains (see Bonnichsen et al 1987, Dunbar 1991, Politis 1991, and Storck 1991). Carlson and Magne (2008:355) suggest a bidirectional evolution of fluted points out of the earliest Clovis type. These include transitions into the Folsom style on the southern Plains and what they term the Peace River (Northwestern) fluted style on the Canadian Prairies.

It is generally accepted that Clovis points were used by early people between approximately 11 500 and 10 900 BP, as indicated through C¹⁴ dating of buried components throughout the United States. Revised dates may indicate a Clovis time range within a minimum 200 radiocarbon year period, between 11 050 and 10 800 BP (Waters and Stafford 2007:1122). Dates assigned to the use of Folsom style projectile points, again indicated through dated sites throughout

the United States, occur primarily between 10 900 and 10 200 BP (Hofman 1995:432).

The Northwestern Fluted point type has been dated at the Charlie Lake Cave site in the Peace River district of North-eastern British Columbia to approximately 10 500 BP (Driver et al 1996). A projectile point from Montana sharing similar basal characteristics with the Northwestern Fluted fluted point is reported by Davis and Greiser (1992): “This Montana artifact is associated with a date on scattered charcoal of 11 000 BP, which is likely to be somewhat older than the date when the point was deposited” (Driver et al 1995:271). Although based on excavations at only one Canadian site, this places the Charlie Lake specimen well within the Folsom period, so a case may be made for the coexistence of the Northwestern Fluted and the Folsom type projectile points. This would provide support for a multidirectional fluted point evolution out of the Clovis style.

On a continental scale Morrow and Morrow (1999) suggest a North American western interior origin for fluting. This is based on the compilation of data from dated sites across both North and South America. The earliest dates from fluted point sites have been obtained in the interior of western North America with later dates occurring to the north and south into South America. Based on this an argument could be made for more recent early Paleoindian occupations in Saskatchewan and neighbouring provinces. This, of course, could change depending on future discoveries of more stratigraphically intact fluted point sites north of the 49th parallel.

Uncalibrated 14C Dates for Clovis, Goshen, and Folsom Sites

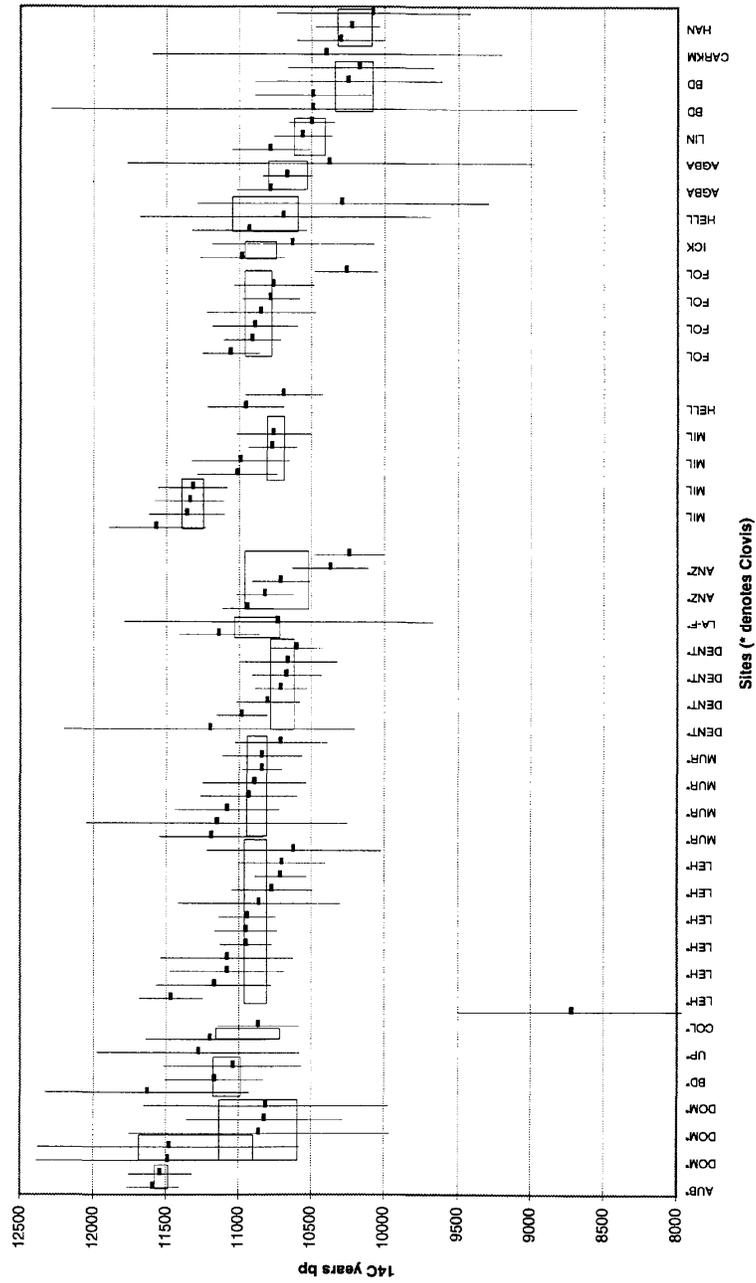


Figure 4: Radiocarbon dates associated with Clovis, Goshen and Folsom points (from Fiedel 1999:102. Used by permission of the Society for American Archaeology)

Saskatchewan's Early Paleoindian Projectile Points and Associated Artifacts

Understanding the variants of fluted projectile points, other associated artifacts accepted as early, and timeframes within which they were used on the Northern Plains as a whole, will play a large role in interpreting early human distributional changes through time in Saskatchewan. The fluted projectile points described below have been divided into types based on designations found in Kehoe's (1966) initial study, supplemented by other early Paleoindian research on the Plains.

Again, the Clovis projectile point type is the earliest diagnostic of human occupation in North America. It is characterized by a lanceolate shape with parallel to moderately convex lateral edges, greatest width at or slightly below the midpoint, a concave base, fluting extending only $\frac{1}{4}$ to $\frac{1}{2}$ up from the base, and a length between 75 mm and 110 mm (Dyck 1983; Kehoe 1966; Howard 1990:259) (see Figure 5a).

Accepted as a later derivative, Folsom-style points also occur in Saskatchewan's archaeological collections. They are on average shorter, with fluting often extending almost their entire length. The bases of Folsom points are concave and display "ears", often along with a central projection or nipple (Kehoe 1966:533) (see Figure 5b). Some Folsom assemblages also contain an unfluted form of projectile point termed "Midland" (Boyd et. al. 2003:587).

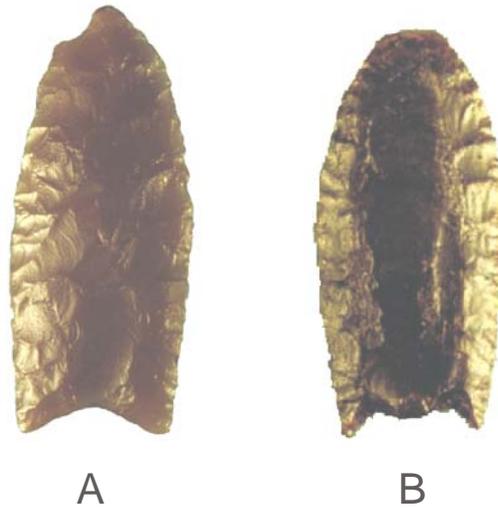


Figure 5: A) Showing a Clovis Point and B) a Folsom Point (Photos by author)

The third style of fluted projectile point, found in surface collections from Saskatchewan, is the Northwestern Fluted type. Again, the term ‘atypical’ was first applied to fluted points in Saskatchewan by Kehoe (1966), as a catch-all phrase for any fluted projectile point that could not be assigned to either Clovis or Folsom. Subsequent to this, Gryba (1988; 2001) used the term “Charlie Lake type”, because of their similarities to the lone fluted point from Charlie Lake Cave, B.C. A description of such points is provided by Kehoe (1966:534):

“[The greatest width is] near the base, in the midsection, or near the tip... [and the corners] of the base may be sharp or may form rounded “ears”... The basal concavity is usually shallow and rounded...”

This description offers little basis for the development of a type. Types, after all, are employed by archaeologists to distinguish between artifacts of different ages, which would require more diagnostic defining characteristics. Traits which do seem to be uniform throughout this typology, are a lanceolate shape, the

presence of a concave base (although often more shallow than that of Clovis or Folsom), and fluting in the form of multiple thinning scars extending distally (Carlson and Magne 2008:355). Although not a diagnostic trait, these specimens often are also highly resharpened. In addition, through personal observations, fluted points of this type generally display a greatest width near the base, which also could be attributed to their tendency to be highly resharpened.

Although there has been no intense analysis of fluted point variation on a continental scale between the northern and southern regions of North America, it has been recognized that such does exist (Bamforth 2002:91, see also Bamforth 1991 and Knudsen 1983). Unfortunately, the predominant typological approach used when looking at fluted points obscures variation in form (Morrow and Morrow 1999) and has resulted in the maintenance of such widespread terms as “Clovis” and “Folsom” when referring to fluted point finds located some distance from the original type sites, such as in Saskatchewan. That is not to say that such categorizations are false, but further analyses must be made concerning their real variations and relationships over such broad areas, as discussed in Chapter four.

Artifact Types Associated with Fluted Point Assemblages

Along with fluted projectile points there are several other artifact types considered diagnostic of early Paleoindian assemblages, including spurred end-scrapers and bone rods or foreshafts (Lahren and Bonnichsen 1974, Frison and Zeimens 1980, Rogers 1986, Lyman et al 1998).

Although end-scrapers appear in archaeological assemblages spanning the prehistory of the Northern Plains, those exhibiting a lateral projection or spur (Figure 6) have been associated only with Early Paleoindians. That was confirmed by Rogers' (1986) analysis of sites onstream terraces on the Arkansas River Drainage in Kansas. It focused on the distribution of artifact scatters on three terraces; one dating to the Holocene and two dating to the Wisconsinan (later Pleistocene) as determined by absolute dates, faunal remains and diagnostic artifacts (Rogers 1984, 1986). It was observed that spurred end scrapers, along with fluted projectile points, were evident exclusively on the earliest two terraces, while neither artifact type could be found on the more recent terrace one, or the floodplain. Further validating the association between end scrapers and fluted point assemblages, Rogers points out that "fifty percent of all sites that had fluted projectile points also had spurred end scrapers" (Rogers 1986:340).

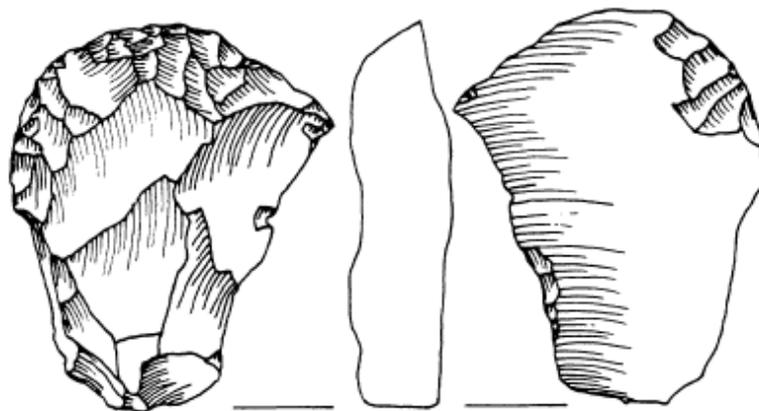


Figure 6: Spurred Endscraper (Rogers 1986:339. Used by permission of the Society for American Archaeology)

A Folsom surface assemblage was analyzed during the course of the field component which contained several spurred side-scrapers. Beyond this the majority of surface collecting in Saskatchewan focuses on projectile points rather than expedient tools and no other such scrapers were encountered.

A second artifact type diagnostic of early Paleoindian assemblages is the bone rod (Figure 7). It consists of a cylindrical shaft of bone (in a few instances mammoth ivory [Frison and Zeimens 1980; Webb, Dunbar and Walker 1990; Lyman et al 1998]) with bevelling on one or both ends. Interpreted primarily as a spear fore-shaft (Figure 7)(Lahren and Bonnichsen 1974), it also has been speculated that they may have been used as actual spear points (Frison 1982), pressure-flaker handles (Wilke et al 1991), wedges for splitting wood (Mehring 1989), sled shoes (Gramly 1993), or hafting wedges for a saw-like implement (Lyman et al 1998). Nevertheless, the direct association of such osseous rods with Clovis technology at several butchering (Blackwater Draw, Sheaman, Lind Coulee, and Broken Mammoth) and cache sites (Drake, Fenn, Anzick, Simon, and East Wenatchee) clearly demonstrates their classification as a diagnostic Clovis tool.

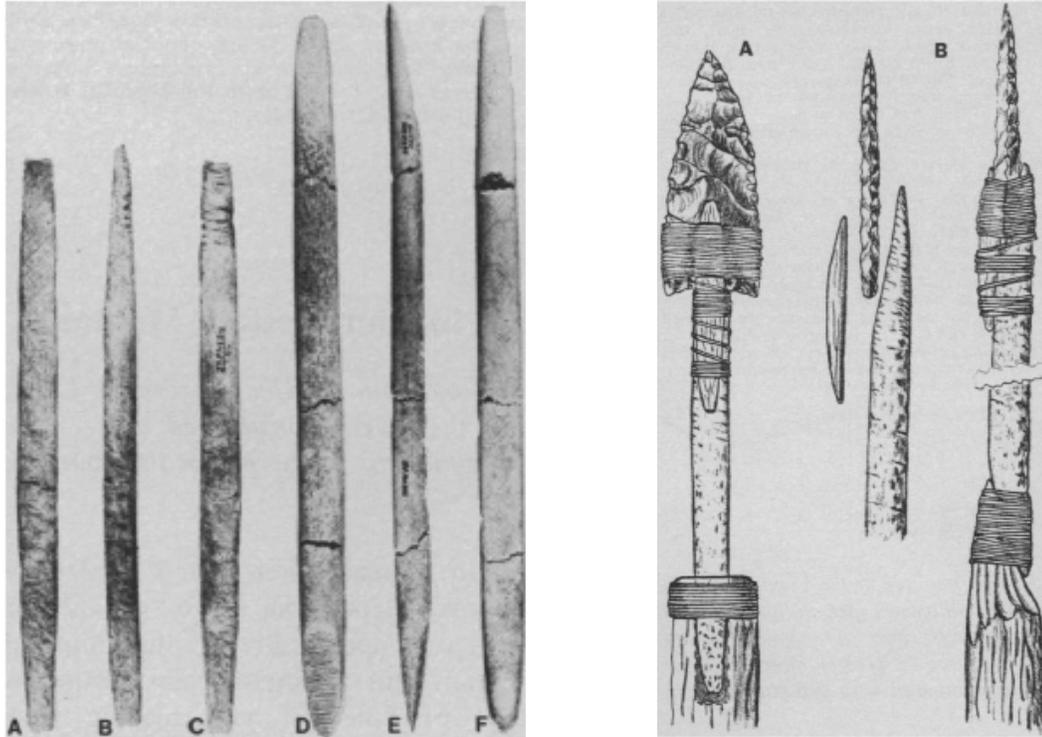


Figure 7: Bone rods/foreshafts (left) and Use of Bone Rods for Fluted Point Hafting (right) (Lahren and Bonnicksen 1974:148-149. Permission Pending)

There is only one recorded fossilized bone rod/foreshaft from Saskatchewan (Figure 8) (Wilmeth 1968). The specimen was discovered by Lt. Col. P.G.B. Lake while excavating a waterhole in a dry slough near Grenfell, Saskatchewan in the early 1900's. It displays longitudinal striations and evidence of whittling. No direct date is available for the specimen although it is noted to have occurred "immediately south of an ice frontal position dated at about 10 000 years ago" (Wilmeth 1968:100). Microscopic examinations revealed that the specimen was most likely manufactured from a mammoth or mastodon long bone.

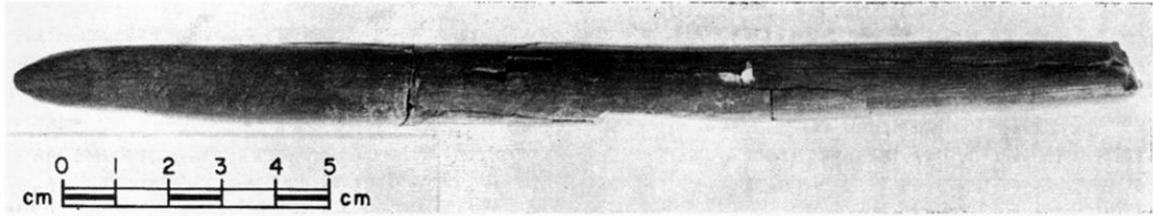


Figure 8: Fossilized bone foreshaft from Grenfel, Saskatchewan (Wilmeth 1968:101. Used by permission of the Society for American Archaeology)

Cultural Adaptations on the Northern Plains

Although understanding typological differences in toolkits dating to the late Pleistocene/early Holocene is a necessary facet of this study, it must be remembered that they reflect past human cultural preferences. Thus, it is now time to examine the actual people of that time period, and how they may have used the toolkits under analysis.

As a result of the sparse archaeological evidence available on the Northern Plains, the most commonly studied aspect of early Paleoindian lifeways are their subsistence strategies. In that regard, those first inhabitants of the Great Plains are most commonly associated with Pleistocene megafauna hunting and an associated high degree of mobility (Haynes 1984, Kelly and Todd 1988, Frison 1998, Haynes 2002, Waguespack and Surovell 2003, Fiedel 2005). Some of the more common species sought after in this time period included mammoth (*Mammuthus primigenius* and *columbi*), several sub-species of bison (*Bison antiquus* and *occidentalis*), horse (*Equus conversidens*), western camel (*Camelops hesternus*), wapiti (*Cervus canadensis*), caribou (*Rangifer tarandus*), helmeted musk oxen (*Bootherium bombifrons*), bighorn sheep (*Ovis canadensis*), and pronghorn (*Antilocapra americana*) (Frison 1998:14579-14581; Hills and Harington 2003:1521; Kooyman et al 2001:686).

Contrary to popular misconceptions invoked by modern artists' reconstructions of prehistoric hunting episodes, a wealth of animal behavioural (species, sex, age, animal condition) and environmental (time of year, weather, topographic features, vegetative cover) knowledge would have been needed for Paleoindians to complete a successful hunt (Frison 1998:14578). Thus, for some time archaeologists have focused on the subsistence strategies of Early Man in North America, including the possibility of an Early Paleoindian role in the extinction of Pleistocene megafauna (Grayson and Meltzer 2002:314; see also Martin 1967, 1984, 1990; Martin and Steadman 1999).

The Clovis culture complex, which is the oldest firmly established occupation in North America, is the only one with a definite association with mammoth hunting. The majority of stratified Clovis sites identified are located in proximity to modern and extinct hydrological features, which "...may be significant in that evidence from western sites indicates water tables lower than anytime during the previous 10 000 years" (Haynes 1980:115; Haynes 1968 see also Judge and Dawson 1972 and Judge 1973). Haynes (1980) proposes that lower water tables also could have played an integral role in late Pleistocene faunal extinctions.

Although the majority of studies concerning Early Paleoindians pertain to their highly developed hunting strategies, there have been some discoveries that have added other aspects to our understanding of their life ways. An important discovery in Montana at the Anzick Site provided an opportunity to view Clovis cultural practices other than subsistence related activities. This site offers the

only direct example of Clovis burial practices known today, through the discovery of the ochre stained remains of a 1.5 year old child dated between 11 550 and 10 680 BP, found along with over 100 stone and bone artifacts (Owsley and Hunt 2001).

The general consistency in Clovis assemblages and their widespread distribution tells us that people of this time period were highly flexible in their adaptive orientation, occupying the varied environments of Late Pleistocene North America (Haynes 1980). Along with this, the attention paid to the selection of exotic and aesthetically coloured lithic raw materials by Early Paleoindians offers a broader cultural view of these people.

The Folsom cultural complex is recognized by “one of the more distinctive early Paleoindian technologies in the Great Plains region” (Hofman 1995:422). The highly distinctive and sophisticated lithic technology employed during this time period has attracted significant archaeological attention. Folsom people are primarily associated with a highly specialized bison hunting economy, which is evidenced by the majority of Folsom sites consisting of bison kills/butcherries (Amick 1996). Similar to the Clovis complex, sites dating to the Folsom period may indicate a highly mobile settlement pattern, seen through their use of high quality exotic lithic material (Meltzer 2006), although this has been the subject of recent debate (see Bamforth 2009).

The Charlie Lake Cave site (HbRf 39), nine kilometers northwest of Fort St. John, B.C., offers the only information pertaining to subsistence strategies and cultural practices of the Northwestern Fluted type projectile point users.

Although fauna associated with the fluted point assemblage was quite diverse at this site, the only specimens related to human subsistence activity are the recovered bison bones displaying cut marks. Thus, the overall faunal assemblage, which includes small mammals, birds and fish, would indicate a localized late Pleistocene subsistence with an emphasis on specialized bison hunting.

Beyond the faunal assemblage present within the earliest component at the Charlie Lake Cave site there were several other noteworthy associations. These include a single stone bead and articulated raven (*Corvus corax*) remains. As a prominent figure in northwestern Native American mythology, associated with creation and hunting, the presence of raven remains dated to 10 500 years BP may hint at early ritual activity (Driver et al 1995:275). The perforated bead manufactured from schist is roughly pentagonal in shape and is the only such artifact discovered in definite association with a fluted point assemblage (Fladmark et al 1988:378)

Early Paleoindian populations generally have been associated with a high degree of mobility and a big game hunting economic orientation (Bamforth 1988; Frison 1992; Kelly and Todd 1988; Walker et al 2001). However, the longstanding belief that early Paleoindians were, above all, specialized hunters of extinct megafauna has been somewhat weakened in the last few years (Waguespack 2007). On the one hand it has been speculated that early populations may have practiced a more generalized hunting and gathering strategy, exploiting a variety of floral and faunal dietary resources (Grayson and

Meltzer 2002; Byers and Ugan 2005). On the other hand, it also has been argued (Waguespack and Surovell 2003; Barton et al 2004; Haynes 2002) that, although not purely specialists, early hunter-gatherers regularly ignored small prey to focus attention on the largest available game. What is agreed upon is that all early populations on the plains exploited faunal resources, to some extent, for subsistence.

Thus, the sporadic climatic fluctuations characteristic of the late Pleistocene, and the resulting stress on faunal species, would have directly affected the lifestyles of early human populations (Kelly and Todd 1988). These fluctuations subjected animals to selective pressures, with adverse effects (extinctions, population reductions, or large scale migrations) on different species. Domino effects might then ensue, with stress on faunal species causing human populations to switch territories (Kelly and Todd 1988). Such shifts, along with a low North American population density at that time, would have placed early populations in unknown terrain. "Since experience gained in hunting the faunal resources of one region more easily could be transferred to hunting in another region than could experience with plant foods" (Kelly and Todd 1988:239) more focus would have been placed on faunal exploitation rather than floral.

Following the Early Paleoindian time period, the onset of environmental stability, and resulting allopatric faunal species along with increased human population densities, would have spurred a change in human lifestyle. This would have included a decrease in mobility, along with the development of more

diverse toolkits, including regional fluted point variants, specific to particular geographical areas (i.e. “Folsom in the Rocky Mountain area and adjacent Great Plains (Bonnichsen et al 1987); Parkhill, Crowfield, and Debert in the Northeast (Storck 1991); Cumberland, Dalton, Quad, and Redstone in the Southeast (Dunbar 1991); and the Latin American fluted fishtail points (Politis 1991)” (Stanford 1991:2).

Early Paleoindian Studies in Saskatchewan and Alberta

Again, intact sites containing fluted projectile points in context are a rare occurrence on the Northern Plains. Evidence of late Pleistocene/early Holocene occupation consists primarily of surface artifacts, exposed by modern farming practices and centuries of aeolian activity. This is not to say that significant interpretations cannot be derived from such information. This section will outline some of the major archaeological discoveries regarding early Paleoindians in Saskatchewan and Alberta.

The first evidence for early Paleoindian occupation of the region was established in the 1930's through the exposure of associated cultural materials as a result of intense wind erosion (Kehoe 1966:530). That attracted the attention of archaeologists from the American Museum of Natural History and the Smithsonian Institute (Howard 1939; Roberts 1939). They published two brief reports in *American Antiquity* and a *Smithsonian Institution Publication*, announcing the “discovery of Early Man in Canada”. However, besides indicating their general location in relation to the nearest town, not much attention

was paid to the regional context in which those specimens were found. Those initial reports acted simply as indicators of the presence of early populations in Saskatchewan.

Kehoe 1966

It wasn't until 1966 that a more in-depth analysis of fluted projectile points in Saskatchewan was published by Thomas Kehoe. He discussed the then known database of 37 points, primarily to indicate a local development of the parallel-flaked Plano point tradition out of the fluted point tradition (Kehoe 1966). To a minimal degree Kehoe's study also combined such point distributions with paleo-environmental and glacial factors, briefly touching upon shifting glacial boundaries and Late Wisconsinan/ Early Holocene biome changes in Saskatchewan (Kehoe 1966:536).

Although Kehoe's work provided an overdue account of material evidence related to Saskatchewan's first inhabitants, the small number of artifacts greatly restricted any interpretations. That limited sample may have been due in part to the fact that many private collections were then unknown to the archaeological community. It wasn't until the establishment of the provincial Heritage Property Act in 1980, that private collections became known to archaeologists. Under subsections 66(1) and 66(2) of the act a Collection Registration Program came into effect from 1983 to 1986 (Conaty et al 1988), when collections and their contents were recorded throughout Saskatchewan.

Dyck 1983

Following Kehoe's analysis, a study by Dyck (1983) entitled the *Prehistory of Southern Saskatchewan* included updated discussions of fluted point occurrences in the province. Although providing an outline of the entire prehistory of Saskatchewan, the portions focusing on the Paleoindian period discussed not only the material culture present, but also focused on the environmental history of the time period. The changing late Pleistocene climate, vegetation and fauna were concisely described and divided between different Paleoindian periods (i.e. Pleistocene Hunters Period, Early Plains Indian Period) along with the accompanying projectile point types.

Alberta Inventory 1985 to Present

A list of Clovis, Folsom and Charlie Lake (Northwestern) fluted point occurrences in Alberta was begun in the mid 1980's by Eugene Gryba. Seven years of data gathering from 89 collections resulted in a database of over 150 points (Gillespie 2002:48; Gryba 1988:2). With supplementary work carrying on into the present day, Alberta's fluted point inventory now lists 226 specimens (Ives 2006:13).

This abundance of fluted point discoveries in Alberta (e.g. Gillespie 2002; Gryba 1988, 2001; Ives 2006), indicates that the early human presence north of the 49th parallel was more profuse than originally thought. Through their comparative analyses with the fluted point distributions in other western Canadian provinces (namely Gillespie 2002:81-84 and Gryba 2001) those studies were a major factor in the development of this thesis. The following section describes the main Alberta sites.

Sibbald Creek site (EgPr-2), Alberta

Salvage excavations in the Rocky Mountain foothills at the confluence of Sibbald and Jumpingpound Creek by Gryba (1983) in 1980 resulted in the discovery of mixed Paleoindian and Archaic material (Gillespie 2002). One highly resharpened fluted point, the base of another, and a channel flake were recovered (Gillespie 2002:103). The only radiocarbon date, 9570 +/- 320 B.P. was obtained from scattered charcoal within highly compressed stratigraphy, because this charcoal was not firmly associated with fluted points, the date is rejected as a valid indicator of the age of the fluted point occupation (Fladmark et al 1988; Gillespie 2002). However, the site still demonstrated an in situ Early Paleoindian presence in the Prairie Provinces.

Wally's Beach site (DhPg-8), Alberta

Planned construction in the 1990s of a new spillway at the St. Mary Reservoir, in South-western Alberta, resulted in the discovery of Late Pleistocene archaeological and paleontological materials. When the water level was drawn down, the land surface was exposed to the intense prairie winds and fluted projectile points, along with the bones and tracks of extinct Pleistocene fauna, including mammoth, camel, bison, horse, caribou, and musk ox, were revealed. Protein residue analysis on the fluted points and AMS dating on bison, horse, musk oxen, and caribou bones indicate that Early Paleoindians have been hunting Pleistocene fauna on the Canadian prairies in that location as early as 11 350± 80 years BP (Ives 2006; Kooyman et al 2001). However, due to a lack of direct association between the faunal remains and those fluted projectile points,

“it is possible that the fluted points at the site post-date the faunal material” (Gillespie 2002:105).

“Kooyman et al. estimated that...1.5-2.0 meters of sediment had been winnowed away from the original land surface” (Ives 2006:11) at the Wally’s Beach site. This adds optimism to the eventual discovery of intact fluted point sites in Saskatchewan, which may be deeply buried and difficult to detect.

CHAPTER 3: LATE PLEISTOCENE/EARLY HOLOCENE ENVIRONMENTAL DEVELOPMENTS AND CHANGES

Introduction

“Dating of climatic as well as archaeological data is crucial to developing models of human migrations” (Hall et al 2004:133). This is particularly the case when studying environments experiencing climatic shifts, which often elicit human response and adaptation visible in the archaeological record. That could include evidence that a region was abandoned as a result of increased aridity, or human expansion occurred in certain regions because of newly established plant and animal communities. It is this concept of environmental factors affecting and instigating cultural adaptations that plays an integral part in this study.

The earth’s orbit around the sun exhibits cyclic variations, which results in long-term (10-1000 kyr) climatic shifts, displayed throughout history in the form of glacial and interglacial periods (Gallet et al 2005:339). Of prime importance to archaeologists studying initial human migration movements through North America, are the environmental effects of the Late Wisconsinan glaciation.

This chapter will discuss the environmental developments and climatic shifts relevant to early people during the Late Wisconsinan/Early Holocene in Saskatchewan. As the Laurentide ice sheet retreated north-easterly, the region experienced the re-establishment of vegetation, fauna, river systems, and lakes.

In the following section Saskatchewan's environment during the Late Pleistocene/Early Holocene, will be discussed.

Deglaciation

A good understanding of Late Wisconsinan/Early Holocene environmental changes in Saskatchewan is essential in interpreting the distribution of Paleoindian finds, since it is necessary to understand the nature and timing of the glacial phenomena that those people would have faced. The stages of glacial retreat also have the potential to be directly linked to the distributions of Saskatchewan's various fluted projectile point types. There are, however, uncertainties regarding the chronology of deglaciation. There are interpretations of glacial activity in both localized regions (i.e. Southern Canadian Interior Plains, Klassen 1989) and on a continental scale (Dyke et al 2003), but no in depth syntheses at the provincial level. In fact, it may be seen that the distributions of fluted points may actually aid in understanding the extent and timing of glacial margins through their geographic constraints and positions in relation to glacial landforms.

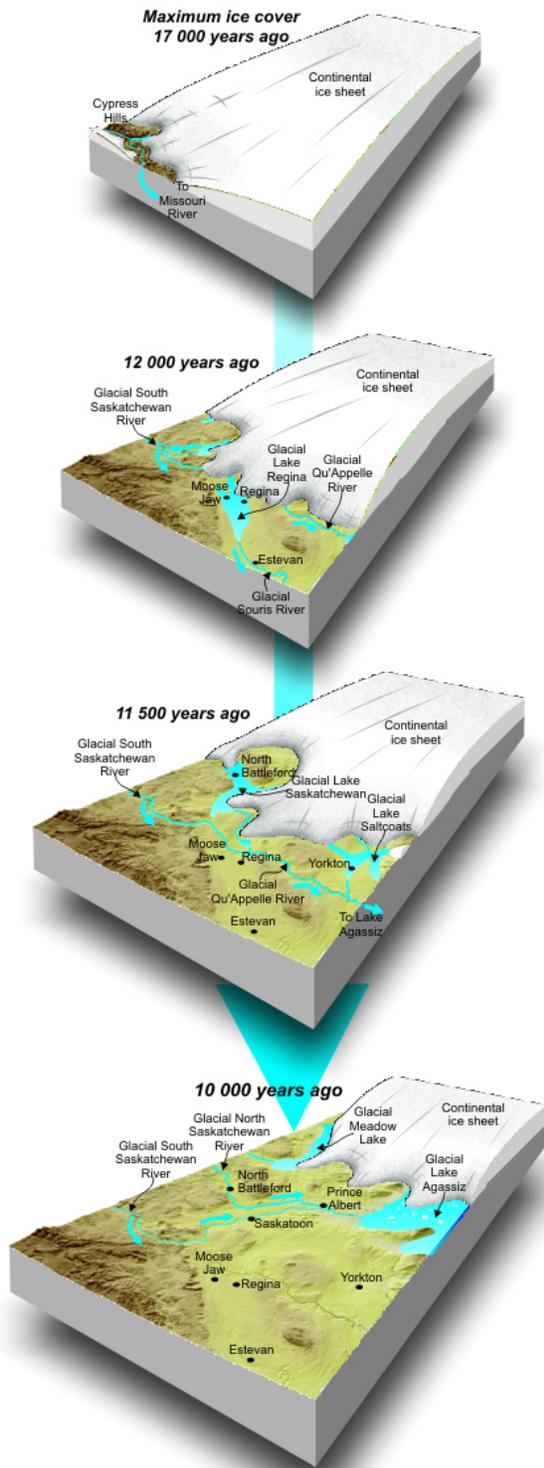


Figure 9: Deglaciation of Saskatchewan with glacial lakes and drainages in C¹⁴ years BP. (http://geoscape.nrcan.gc.ca/sask/landscape_e.php)

It is generally accepted that Early Paleoindians moved into the area opened by the retreating Laurentide ice sheet into Saskatchewan (Dyck 1983). In a very general sense this must be true, although it suggests an image of groups clustered around an ice-front. It may be more accurate to see Saskatchewan's earliest occupants following the migrating fauna, which dispersed in a northwestern fashion as land began to establish vegetation following the retreating glaciers.

The maximum extent of the Late Wisconsinan Laurentide ice sheet has been dated to approximately 20 000 ¹⁴C BP at its south-western margin (Dyke et al. 2002:9). Saskatchewan would have been completely covered during this time, except for the extreme southwestern Cypress Hills region that may have been open, yet surrounded by glacial ice and

meltwater (Kulig 1996:53). Following this glacial maximum, oscillations of the

margins of the ice sheet in Saskatchewan, which are not well defined, continued until about 14 000 ¹⁴C BP and the beginning of final glacial retreat (Dyke et al. 2002:10). Indications of such glacial phenomena evident today include end moraines, glacial lake beaches and basins, and large spillway channels.

The physical relief of Saskatchewan descends toward the northeast, which is the direction that the retreating Laurentide Ice sheet followed. That large ice mass (over a kilometre thick in some regions) and areas of higher elevation on the freshly uncovered landscape, would have acted as barriers to meltwater, forming glacial lakes connected with spillway channels. Those could have provided the earliest people with impediments potentially limiting their movements (Figure 10).

The development of glacial lakes in Saskatchewan (such as Lakes Regina, Saskatchewan, Saltcoats, Meadow Lake, and Agassiz) were accompanied by massive outburst events (Figure 9). They incised the landscape with deep spillway channels and provided the province with its current drainage system.

A series of radiocarbon dates relating to the Late Pleistocene deglaciation of Saskatchewan, when plotted against their location (latitude and longitude) affirms this north-easterly recession of the Laurentide ice sheet (Figure 10). This chart was produced using 63 dates on mollusks, preserved organics and lake sediments throughout Saskatchewan presented in a Geological Survey of Canada open file (Morlan et al 2001).

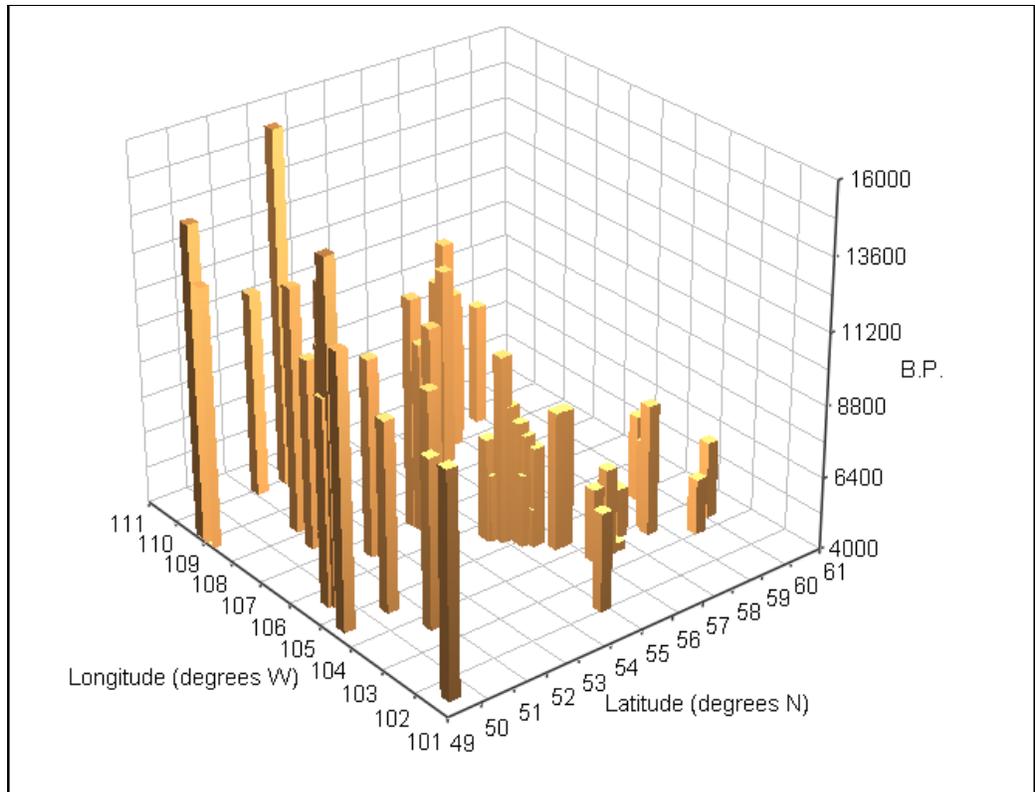


Figure 10: Showing a north-easterly decrease in years before present based on radiocarbon dates relating to the Late Pleistocene deglaciation of Saskatchewan (Compiled based on data from Morlan et al 2001)

Vegetation

With the retreat of the Laurentide ice sheet, the newly uncovered Saskatchewan landscape began a revegetation process. That would have paved the way for faunal species to return and Saskatchewan's earliest human populations.

Saskatchewan's late Pleistocene/early Holocene revegetation is divided by Yansa and Basinger (1999), into six phases, beginning at immediate deglaciation and leading up to the present day ecozones. This section will apply that six phase model, focusing on phases one through three, beginning immediately following deglaciation and lasting until c. 8800 BP. As the work

done by Yansa and Basinger (1999) focuses solely on southern Saskatchewan, information is gathered from other sources when needed.

Phase 1: Late Glacial Tundra

In contrast to studies suggesting that tundra herbs and shrubs colonized recently deglaciated terrain (e.g. Birks 1976; Maher et al. 1998), “there is no evidence for such a vegetation in the fossil records of the northern Great Plains...” (Yansa 2006:270). Instead, the existing fossil evidence would suggest that the earliest plant community consisted of an open white spruce forest (Yansa 2006:270). However it is quite unlikely that such an environment could have existed immediately following deglaciation, as the recently uncovered landscape would still need to undergo soil development. Therefore, it is assumed that tundra vegetation first colonized the region and the absence of indications of such has been attributed to a “...lack of stable depositional sites to preserve the remains of this pioneering vegetation.” (Florin and Wright 1969; Mather et al. 1998; Yansa 2006:270)

Phase 2: White Spruce Plant Community

Between 11 800 and 10 500 ¹⁴C yr BP anticyclonic wind circulations, along with the development of interconnecting waterways and faunal (i.e. bird) movement, would have prompted the migration of foreign plant seeds northward into newly deglaciated terrain (Yansa 2006:272). Such transportation devices resulted in a change in Saskatchewan’s vegetation from herbaceous tundra to open white spruce forest.

Picea glauca, or white spruce, has the ability to better "...germinate and grow in mineral soils than most other trees, because its roots can uptake nutrients from nitrogen-fixing ectomycorrhizal fungi" (Yansa 2006:271; see also Miller et al. 1994; MacDonald 2002). This hardy characteristic would have allowed for the early growth of white spruce forests, which, based on a study by Birks (1980) of vegetational developments on newly formed moraines in the Yukon, have been proven to occur as quickly as 120 years (Yansa 2006). Therefore, the development of an open white spruce plant community subsequent to a tundra phase in Saskatchewan could have occurred relatively rapidly following localized glacial retreat.

Plant macroremains uncovered at the Andrews site in south-central Saskatchewan, indicate that an open white spruce parkland existed by at least 10 300 yr BP (Yansa and Basinger 1999:147; Yansa 2006:273). Along with *Picea glauca*, this plant community also would have included deciduous shrubs and herbs. Because the retreat of the Laurentide Ice Sheet from this region has been estimated to have occurred between 11 700 and 11 300 yr BP it is possible a following 1100 to 1500 year 'lag period' may have exhibited a tundra-like landscape (Yansa and Basinger 1999:147; see also Clayton and Moran 1982).

Phase 3: Parklands

The onset of the warmer hypsithermal interval around 9000 BP would have spurred not only an increased degree of glacial retreat, but also further changes in vegetation. Also sometimes referred to as the altithermal, this early-mid Holocene warm period was characterized by higher temperatures (c.2°C warmer

than today) and a higher degree of aridity (Yansa and Basinger 1999:149). The environmental shift during this time caused greater summer warmth and reduced soil moisture, which “would have desiccated white spruce seedlings and stressed older trees” (Yansa 2006:277), therefore instigating a change in vegetation. The discovery of charred wood and charcoal within laminated sediments at several localities suggests that, with the onset of this drying period, fires also may have contributed to the disappearance of spruce trees in southern Saskatchewan (Yansa 2006:278).

Unlike the vegetation shift exhibited in North Dakota from an open spruce forest to a grassland at c.10 000 BP (Yansa and Basinger 1999; see also Grimm 1995), information derived from kettle-fill sites indicate that “... spruce forests in southern Saskatchewan were succeeded by deciduous parklands... established some time after 10 200 BP, and persisted until at least 8800 BP” (Yansa and Basinger 1999:151).

Dominant plant species of this phase, as indicated through plant macrofossils, consisted of *Populus balsamifera* (balsam poplar), *Populus tremuloides* (aspen poplar), and *Betula* cf. *B. occidentalis* (river birch) (Yansa and Basinger 1999). The development of this type of vegetation, rather than a grassland community, has been attributed to a lag in the effects of early Holocene aridity in the region as a result of an “influx of meltwater into aquifers from the melting of buried stagnant ice” (Beaudoin et al 1996; Yansa and Basinger 1999:151).

At this point it must be mentioned that plant macrofossil remains pertaining to this time period in Saskatchewan have been recovered primarily from closed drainage basins, or what are commonly referred to as 'prairie pot-holes'. As a result of Late Wisconsinan ice stagnation, these basins have acted as water traps for millennia, collecting 5 to 12 m of post-glacial sediments along with plant remains consistent with mesic and wetland environmental conditions. Therefore interpretations of such sites are solely "...representative of the species that grew in or very near to the depression..." (Yansa 1998:430) and not the surrounding area.

Overall Vegetation Zone Development

Since Yansa and Basinger's (1999) reconstructions focus primarily on these wetland environs, Strong and Hills (2005) will be used as supplementary data concerning overall vegetation development following deglaciation. These reconstructions were based on groupings of pollen sampling sites across north-central North America and presented in 2000 year time segments from 14 000 BP to the present day. It may be reasonable to assume that a combination of the following information along with the preceding discussion will provide an accurate overview of the development of Saskatchewan's vegetation following deglaciation, entailing both broad vegetation zones (following) and localized mesic wetland environs (preceding).

Around 14 000 BP the unglaciated areas south of the Laurentide ice margin, including a small portion of southern Saskatchewan, carried *Picea* (white spruce) dominated mixedwood boreal forest vegetation. Data from the

Horseman site (Klassen 1994) in southern Saskatchewan suggests that the southern margin of the boreal forest zone may have been fringed by a dry deciduous boreal forest or aspen parkland-like vegetation during this period. Again, there is no direct evidence of tundra vegetation in Saskatchewan immediately following deglaciation, possibly due to a lack of stable depositional sites.

A northern shift and north-western expansion of the boreal forest vegetation zone occurred between 14 000 and 12 000 BP. At this time the southern portion of the boreal forest zone in Saskatchewan was replaced by grassland vegetation, with evidence from South Dakota suggesting that a deciduous transition zone may have existed between the boreal forest and grassland zones. (Strong and Hills 2005)

In response to significant glacial retreat between 12 000 and 10 000 BP all vegetation zones underwent major northern expansions. *Populus* first arrived in south-central Saskatchewan around 10 400 BP and the grassland zone expanded northeast ranging across Saskatchewan, from eastern Alberta to South-western Manitoba. (Strong and Hills 2005)

The period between 10 000 and 8000 BP saw a north-eastern expansion of the boreal forest zone with an increased density of *Picea*. It was during this time that the aspen parkland zone became firmly established along the northern margin of the grassland zone and south of the boreal forest (Strong and Hills 2005).

In summary, the work of Strong and Hills and that of Yansa and Basinger establish the vegetational framework needed to place Paleoindian movement in perspective.

Limited Early Faunal Assemblage

An expanding habitable environment supporting vegetation following late Pleistocene glacial recession would have opened the area for faunal species to migrate northward into Saskatchewan. Although no stratigraphically intact late Pleistocene archaeological sites have been discovered in Saskatchewan, several locales with dated remains of Pleistocene fauna have been found. The following discussion is based on vertebrate paleontological dates presented in Morlan et al (2001:119-120).

Saskatchewan's late Pleistocene faunal assemblage consists of few accurately dated specimens. Mammoth remains have been discovered from deposits near Kyle (approximately 50 km north of Swift Current) and Saskatoon, providing late Pleistocene dates from $14\,650 \pm 360$ to $12\,000 \pm 200$ ^{14}C BP. The locale near Saskatoon also produced the remains of several other undated faunal groups including *Camelops* (camel), *Equus* (Horse), *Bison* and *Cervid* (deer/elk family) (Morlan et al 2001:119-120).

These dates, along with those relating to deglaciation and revegetation, offer fairly strong affirmation that Saskatchewan could have supported people as early as dated Early Paleoindian sites in neighbouring areas (i.e. northern United States (see Irwin-Williams et al 1973, Frison 1984, 1996 and 1998), Alberta (see

Gryba 1983 and Kooyman et al 2001), and British Columbia (see Fladmark et al 1988 and Driver et al 1995)).

CHAPTER 4: SASKATCHEWAN'S FLUTED PROJECTILE POINTS

Introduction

As introduced in chapter two, explorations into Saskatchewan's early human history began with the recognition of Folsom points from the province by American archaeologists. This chapter provides a description of Saskatchewan's current fluted projectile point database and discusses characteristics of specific artifacts and the typological categories under which they fall. It is divided into three subsections. The first discusses the methods used in assigning the projectile points to types, the second provides a brief discussion of 'classic' fluted point types, and the third presents Saskatchewan's updated fluted point database and its distribution. However, it should be noted that this study is not an examination of typologies nor does it seek to develop individual types.

Since the initial discovery of fluted points in Saskatchewan, refinement of that database can be seen as having occurred in several stages. Again, Thomas Kehoe conducted the first attempt at collecting information about Saskatchewan's fluted point occurrences in 1966, involving the analysis of 37 artifacts. Unfortunately, today even with the introduction of Saskatchewan's Heritage Branch collection registration program, the number of fluted projectile points in the province has expanded only very slightly.

In beginning this project, it was understood that the database was in dire need of expansion. Three months of fieldwork, in which previously un-catalogued specimens were located, was accomplished during the summer of 2005 to collect data for this study. Accessibility issues inhibited the re-analysis of some specimens previously examined. In such cases, the qualitative and quantitative data garnered from their original analyses (i.e. Kehoe 1966, Carlson 1992).

Methods

Information gathered for each fluted point consisted of both its characteristics and geographic location. The characteristics included overall form, maximum length, width and thickness, extent of lateral and basal grinding, basal width and indent depth, fluting length on both faces when available (Figure 11), and raw material type. Raw material type was identified based on texture and visual characteristics. Sourcing local raw material types was aided by Johnson's (1998) analysis of Saskatchewan's lithic materials. These attributes aid in classifying specific projectile points into typological groupings. Information pertaining to artifact location was divided into two categories: initial location of the find and its current repository. The initial location was most often recorded through collector descriptions, which in some cases included the physical terrain (i.e. sandy blowout, cultivated field, river terrace...etc.). Many private collectors provided in-depth geographic descriptions for some of the discovery areas, whereas in other cases the exact geographic location was only poorly defined.

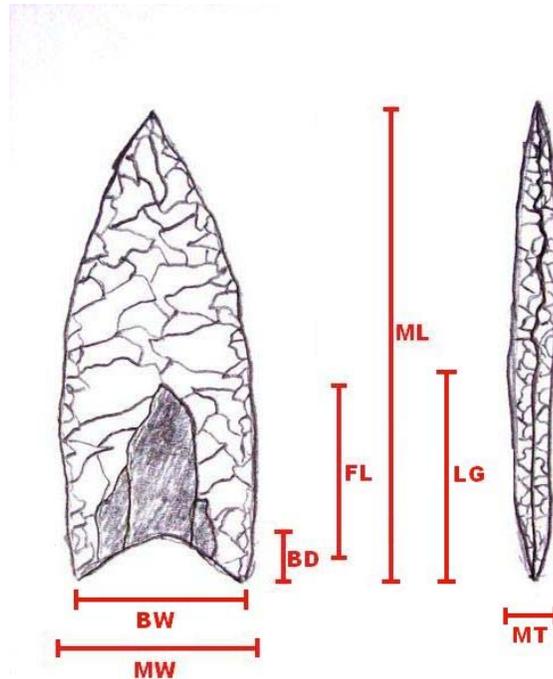


Figure 11: Characteristics measured and recorded on each projectile point (MT=Maximum Thickness, LG=Extent of Lateral Grinding, ML=Maximum Length, FL=Flute Length, BD=Basal Depth, BW=Basal Width, MW=Maximum Width)

The assignment of specific artifacts to types was accomplished through both simple visual and metric analyses. The primary diagnostic differences between Clovis-style, Folsom-style and Northwestern Fluted style projectile points consisted of the numbers of fluted/basal thinning flakes, extent to which the specimens were fluted, and overall shape (see *Saskatchewan's Fluted Point Types* in chapter 2). At the same time, it must be kept in mind that the amount of reworking and re-sharpening that a projectile point has undergone throughout its use-life can greatly alter the initial shape and size of the tool, rendering a "Clovis" or "Folsom" like point more visually similar to the Northwestern Fluted variant. This could be managed in some instances by focusing on basal characteristics. Each projectile point within this study expressed some sort of defining characteristic, enabling its assignment to one of the three described categories.

Whereas a simple visual analysis of projectile points allows sorting the Saskatchewan assemblage into three fluted point variant categories, the assessment of specific morphological traits provides a basis with which to compare Saskatchewan's fluted points with those from other areas. A series of morphological and metric traits outlined in previous studies (Howard 1990; Meltzer 2002) provide the criteria needed to define a projectile point as either 'classic' Clovis or Folsom. These traits will be discussed in the following section.

Classic Typologies: Their Validity in the Saskatchewan Assemblage

The extensive area over which fluted projectile points are found in North America may account for observed variation within each type. The archetypal Clovis and Folsom types were originally defined on specimens discovered at Folsom (Figgins 1927) and Blackwater Draw (Howard 1935) in New Mexico, and Dent (Figgins 1933) and Lindenmeier (Cotter 1935) in Colorado, far from the area under study. However, their general characteristics and type descriptions, based primarily on accounts from the original type-sites, will be discussed here to provide a basis for comparison to Saskatchewan's samples.

The often exhaustive resharpening of Northwestern Fluted style projectile points resulted in a high degree of morphometric variation. The presence of basal thinning flake scars, along with a concave base, have been the main determinants in assigning some of the Saskatchewan specimens to this type. This section will focus on the validity of comparing Saskatchewan Clovis and Folsom like projectile points with those from more 'classic' locales to the south.

Classic Clovis

A study by Howard (1990) made note of the need for a detailed type description for Clovis and acknowledges the use of the term “Clovis-like”, because of the absence of a more detailed description. It presents an overview of Clovis descriptions, such as those by Wormington 1957, Prufer and Baby (1963), Roosa (1965), Hester (1972), and Cox (1986), available at that time and summarizes Clovis morphological and technological attributes, offering an updated type description of those points.

Clovis points tend to be rather large, with the majority measuring between 75 and 110 mm in length, 25 and 50 mm in width, and 5 and 10 mm in thickness. The overall shape of this type is lanceolate, with a concave base (1-4 mm in depth) arching completely across the basal width and bordered by nearly square/slightly-rounded corners. Clovis points have moderately convex lateral edges, with the maximum width at or slightly below the midpoint and slightly tapering towards the base. They also tend to have lenticular to nearly oval cross-sections, heavy, almost crude, bifacial flaking and moderate evidence of pressure flaking. They are often fluted on both faces and display multiple channel flakes, which results in a base-to-tip tapering of the flute. The flute length is generally 1/3 to 1/2 the length of the projectile (Howard 1990). Lateral and basal grinding is evident, with minimal post-fluting retouch along the basal margins (Howard 1990).

Howard (1990:259) goes out of his way to indicate several things that classic Clovis points do not have, and the possession of which would automatically lead to classification under another type. They include “recurved

(fishtail) lateral edges...pronounced basal constrictions... [and] convex (Folsom type) channel flake platform remnants.”

Classic Folsom

Meltzer et al. (2002:23) point out that, although attempts have been made to identify a common standard for Folsom points (e.g. Howard 1935; Ingbar and Hofman 1999; Roberts 1935), the truth is that

“...within any assemblage of Folsom points, and the ones from Folsom and Lindenmeier are no exceptions, there is considerable morphometric variability about a “typical” form, as a result of variation in manufacture, raw material availability, point reworking, the number of kill or retooling events, the temporal/spatial distance from the last (or to the next) quarry visit, etc...”

Nevertheless, despite such morphometric variability, the following description offers broader parameters in order to facilitate the inclusion of most Folsom points.

“Classic” Folsom points are generally smaller than their older fluted point counterparts, varying in length from 25 to 75 mm. While maintaining a lanceolate shape, classic Folsom points are widest nearer the tip and have concave bases bordered by earlike projections, and which often have a small “nipple-like” projection in the middle of the concavity. Fluting often extends the whole length of the projectile, and Folsom points depict a finer attention to detail, evident in the small pressure flake scars. In comparison to Clovis points their lower margins and bases also depict evidence of grinding (Wormington 1957:27; Irwin and Wormington 1970:26-27).

With these traditional Clovis and Folsom archetypal descriptions in place, a basis through which similarities and differences can be made between classic

southern Plains fluted points and those found in Saskatchewan has been established. Again, it must be acknowledged that with a cultural phenomenon spanning such a large area, variation is bound to exist. The terms “classic Clovis” or “classic Folsom” will not be used when referring to those specimens discovered in Saskatchewan unless exactly matching those characteristics. Specimens depicting near-exact qualities to those discovered in the southern United States will be referred to as possessing classical traits with respect to their fluted point style designation by employing the terms “Clovis-style” and “Folsom-style” projectiles.

Validity of Saskatchewan’s Fluted Points as “Classic”

The earliest accounts of fluted projectile points from Saskatchewan, especially that of Howard (1939:278), claim them to be “...exactly like specimens from Folsom and Clovis, New Mexico, and sites in Texas and Colorado.” He also goes on to describe associated tools discovered alongside Folsom-style points in Saskatchewan, as also “...exactly like specimens from the Lindenmeier site in Colorado, and from Clovis, New Mexico” (Howard 1939:279). Also, Kehoe’s (1966:530) study accounts for several Clovis points resembling those from Dent, Colorado and the Naco and Lehner sites in Arizona. However, the validity of employing such designations when referring to Saskatchewan’s fluted projectile points is open to debate. In addition, past attempts at designating one particular fluted point as the type specimen (e.g. Roberts 1935, Ingbar and Hofman 1999) for an entire category, did not take into account variation within assemblages. There may be many different local factors (e.g. individual manufacturing, lithic

availability, reworking, etc.) that can account for such variation within an assemblage.

Meltzer et al's (2002) statement that within any Folsom assemblage, morphometric variation exists (see Figure 12) can also be applied to Clovis assemblages. For example, the Clovis points from both the Naco and Lehner sites in Arizona “provide an indication of the ordinary variation in Clovis fluted points in use at one place and moment in time” (Ives 2006:17). Note the variation (Figure 13 A and B), primarily evident in the shape of the lateral edges and the basal depths.

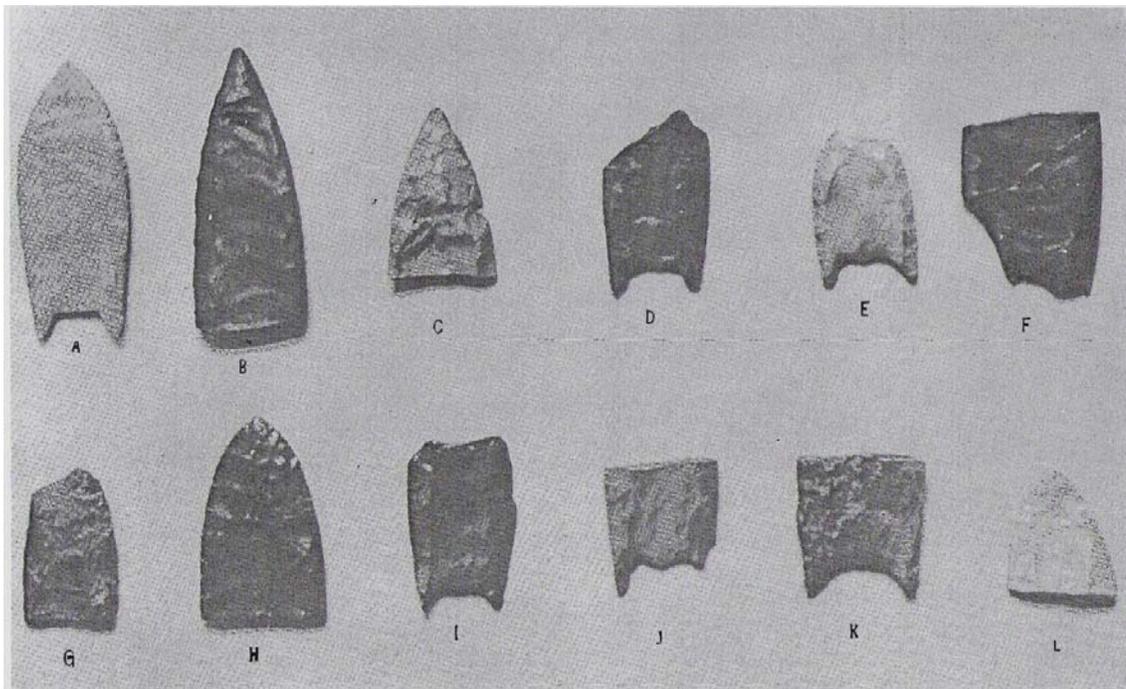


Figure 12: Depicting variation within the Folsom assemblage from the type station, Folsom, New Mexico. Note the variation in the basal indentations and 'ears'. Note also the drastic change in overall form when resharpened (E) (Wormington 1957:28 ALL RIGHTS RESERVED, BAILEY ARCHIVE, DENVER MUSEUM OF NATURE & SCIENCE)

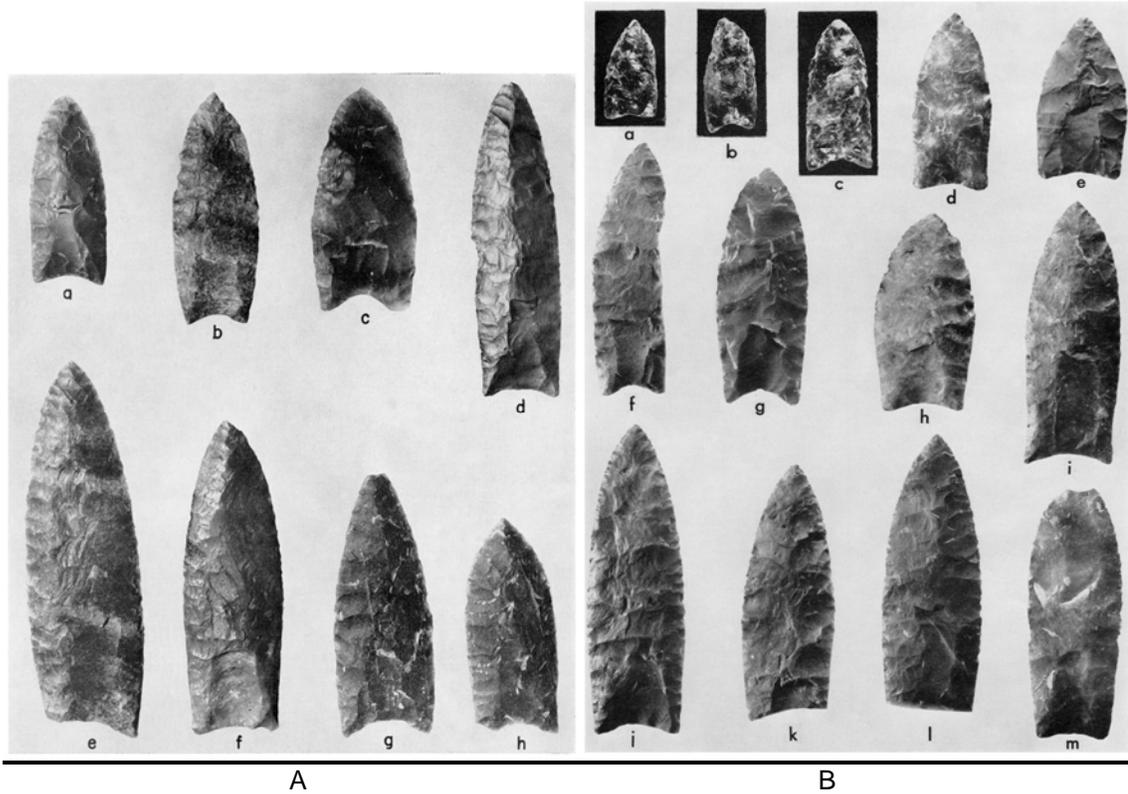


Figure 13: Ordinary variation in Clovis Fluted Points at one moment in time. Found in association with mammoth remains from the Naco(A) and Lehner(B) sites in Arizona (Haury, Emil W., et al 1953:8; Haury, Emil W., et al 1959:16. Used by permission of the Society for American Archaeology)

Ives (2006:17) points out that this “degree of formal variability among fluted points strains the nature of categories like Clovis and Folsom”. Thus, how can a strict overarching set of characteristics defining Clovis or Folsom projectile points be established? The truth is there can exist no true single type specimen, only a somewhat rough set of attributes comprised of ranges (e.g. between x and y cm long) and ‘generally has/is’ characteristics, under which a range of comparable projectile points may fall.

What then does this say about stylistically similar fluted projectile points found thousands of kilometers north of their original area of type definition? While there are no directly radiocarbon dated fluted projectile point sites in the

Canadian plains, there is no evidence that would suggest a more recent age range for the occupation of this region by the past cultures that made such artifacts. Instead, "...it is more likely that western Canadian points sharing a formal identity with Clovis [and Folsom] fluted points to the south are roughly contemporaneous with more southerly finds" (Ives 2006:17).

The formal typological definition of a type of artifacts based solely on their area of origin (i.e. the Folsom site, Folsom, New Mexico (Figgins 1927), and the Blackwater Draw locality No.1 near Clovis, New Mexico (Howard 1935), or rather where they were first publicly/academically announced, does not automatically demonstrate that region to be their technological birthplace. The validity, or rather antiquity, of stylistically similar fluted projectile points found north of the 49th parallel may therefore be considered in a similar temporal framework. This need not imply a southern origin for those specific points, but rather a bond based solely on style, functionality, and the general time span within which they were used. Therefore, again, in discussing Saskatchewan's fluted projectile point database, the terms Clovis-style and Folsom-style will be employed, rather than the more "submissive" Clovis-like and Folsom-like.

Saskatchewan's Assemblage

As stated previously, because Saskatchewan's first fluted point database was comprised of information gathered from only 37 specimens, an updated database was compiled in this study, examined in this section.

Discussion will be divided into three sections. The first two will present the distributions of each style, along with morphometric data and raw materials. The third will discuss similarities and differences between the three types of fluted points identified. Thirty-three of Kehoe's (1966) original 37 specimens have been included, along with the 47 new points recognized in the field portion of this study. Four specimens included in Kehoe's study are omitted because of excessive typological differences, and in one instance what looks like the fortuitous removal of a channel flake.

Clovis-style

Kehoe (1966), in his original analysis of Saskatchewan's fluted projectile points, identified a total of seven Clovis-style projectile points. Five were referred to as "classic-Clovis", while the other two were originally placed under his "atypical" classification. However, because of their Clovis style characteristics they are re-assigned here to the Clovis grouping. Combining these seven projectiles with others discovered through the course of this project provides a total of 21 points of this variant in Saskatchewan.

The majority of those points have been reworked, with signs of retouch evident along the lateral margins of 17 specimens. One point has been extensively worked into a drill (Figure 14), and the remaining three specimens have been broken and presumably discarded (see Appendix 1 for photos). Size measurements within this group range from 12.17cm to 3.95cm in length, with an average of 5.97 cm, and 3.40cm to 2.15cm in width, with an average of 2.70cm (see Table 2).

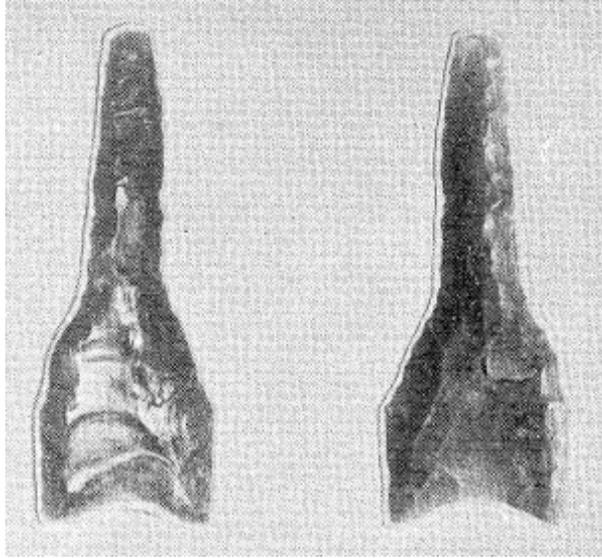


Figure 14: Clovis-style projectile modified into a drill (ref.# K2b). Specimen is fluted on both faces and depicts lateral grinding along both margins. (From Kehoe 1966:532. Used by permission of the Society for American Archaeology)

Table 2: Table 2 Size comparisons between fluted point types. (Note number of points used in measurement changes depending on completeness of projectiles)

Point Style	Average Maximum Length (cm)	Number of Specimens Measured	Average Maximum Width (cm)	Number of Specimens Measured
Clovis	5.97	19	2.70	20
Folsom	4.47	9	2.14	17
Northwestern Fluted	4.37	23	2.53	31
All	5.01	51	2.51	68

Saskatchewan's Clovis-style fluted projectile points generally depict a reliance on nearby lithic sources (Figure 15). Forty-seven percent of these have been manufactured from Knife River Flint, and 23% are of an assortment of commonly utilized fine-grained silicates. The remaining 30% are made from other locally available materials, including Swan River chert, agate, fine-grained sandstone, basalt, and silicified wood.

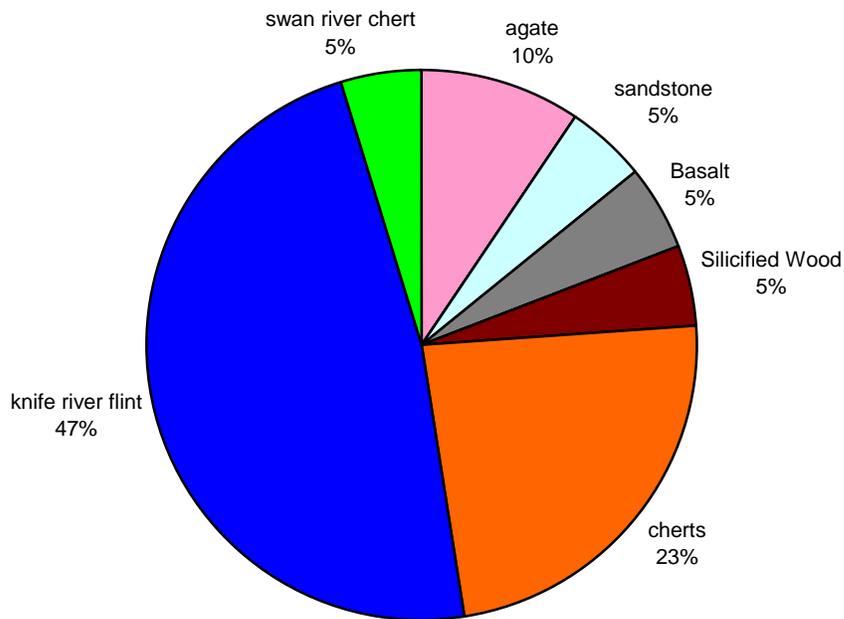


Figure 15: Clovis Raw Material

The source for Knife River Flint is in North Dakota, where it originally formed as part of the Golden Valley Formation of Eocene age (Gregg 1987:369). This form of silicified lignite, used and traded widely throughout the prehistoric Northern Plains and into North-eastern BC as a high quality flintknapping material, is fairly uniform and "...typically root beer or coffee colored...", unless heat-treated, which "darkens the color to very dark brown or very dark grayish brown" (Ahler 1983; Gregg 1987:367).

Clovis-style fluted projectile points in Saskatchewan are concentrated primarily in the southwest (14 specimens). From Figures 16a and 16b the benefits of a larger sample can be seen. Kehoe's originally limited sample

(Figure 16a) provides no real basis for interpretation, whereas the larger number of fluted points represented in Figure 16b offers a better idea of early human distributions. With several exceptions it appears as though the general trend in settlement was to be near what are now major rivers, but which would have originated as major glacial lake spillway channels during deglaciation.

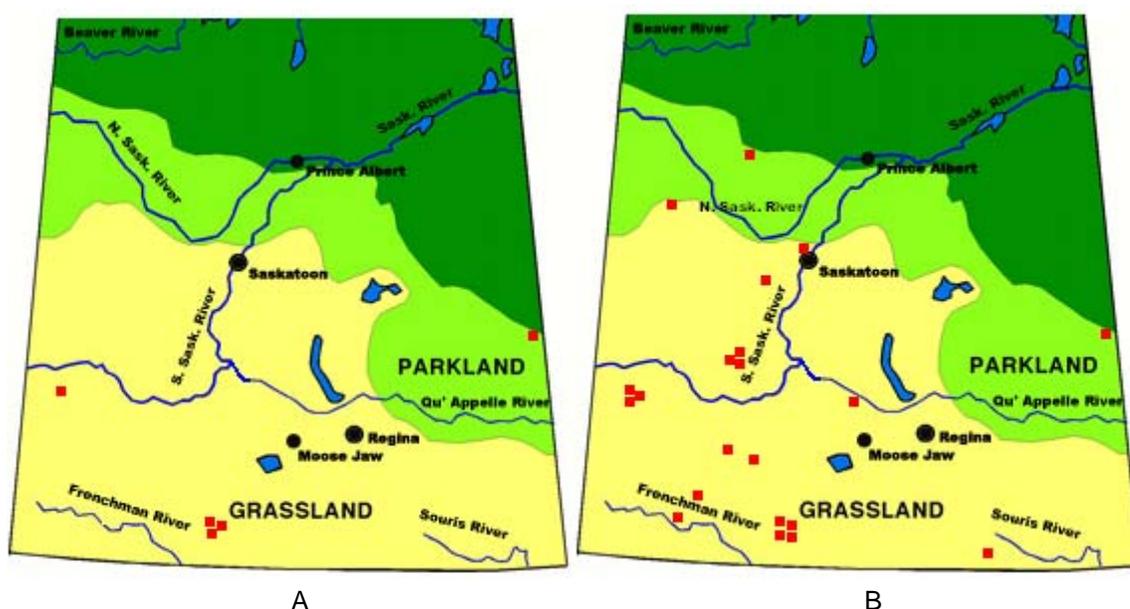


Figure 16: Distribution of Clovis-style points 1969 (A) and today (B)

Folsom-style

Throughout the field research portion of this project 12 Folsom-style projectile points were discovered. Thus, combined with the nine observed by Kehoe (1966) and Howard's (1939) three, a total of 24 Folsom-style specimens are now known in Saskatchewan. Of those, 12 are identifiable fragments, nine have been reworked, one has been reconstructed from three pieces and does not look resharpended (Figure 17), one was reported by a collector (although not studied

first-hand), and another is known through a photo only (Howard 1939:278 plate 14 Fig. 1). Sizes within this category range from 7.20 cm to 3.10 cm in length, with an average of 4.47cm, and 2.90 cm to 1.67 cm in width, with an average of 2.14 cm. This assemblage shows a general decrease in size as compared to the Clovis-style assemblage (see Table 1).



Figure 17: Three Folsom-style Knife River Flint projectiles, found south of Bromhead, Saskatchewan. 'A' (reconstructed from three pieces) and 'B' included in Kehoe (1966) along with a third that has gone missing. Specimen 'C' eroded from same locale.

The Saskatchewan Folsom-style distribution spans several areas with two or more projectiles found in relative proximity to one another. Principal sites include a small sandy mound in a cultivated field south of Bromhead, and a large area of eolian erosion located in the Qu'Appelle valley north of Rocanville.

The Bromhead site was initially discovered in 1933 by Stanley Durr, a farmer and collector from Estevan, Saskatchewan, along a mound overlooking a

slight topographical drop to the east-northeast (Figure 18). Bone and tooth fragments were found eroding out of the sandy mound, indirectly associated with four Knife River Flint Folsom-style projectile points. It has been speculated that a large alkali slough northeast of the mound, which at one point may have been a lake, would have acted as an attractant to large game (Durr personal communication 2007).



Figure 18: Small sandy mound overlooking drop in elevation to the East.

The site near the bottom of the Qu'Appelle Valley was discovered by Brenda Sarazin (another amateur collector). Its assemblage is composed of specimens indicating projectile point manufacture, all of Knife River Flint. While no complete Folsom-style projectile points have yet been found at this locale, two fragments of such, along with many channel flakes, three point tips, and a series of spurred endscrapers were collected (see Appendix A for photos). Of primary

interest is a channel flake that could be refitted to one of the projectile point fragments (Figure 19).



Figure 19: Folsom-style base with channel flake (left). Channel flake refit (right).

Raw materials displayed in Saskatchewan's known Folsom-style assemblage are slightly less diverse than those in the Clovis-style database (Figure 20). Again the choice material, of which 50% of the points in this assemblage are made, is Knife River Flint. This is even more-so the case with Folsom-style points found closer to that source area in southeastern Saskatchewan. A variety of other fine-grained cherts account for 35% of the

assemblage and the remaining 15% is comprised of agate, chalcedony, and one specimen identified by Kehoe (1966) as made from red argillite.

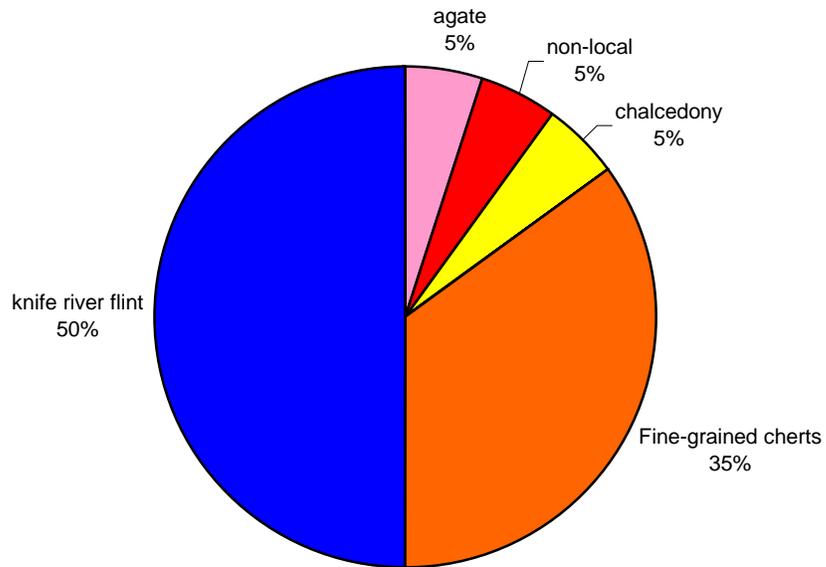


Figure 20: Folsom Raw Material

Comparisons between Folsom-style projectile point occurrences as known in 1966 and those known today show few dissimilarities (Figures 21 a and b). They are generally restricted to regions south of the South Saskatchewan and Qu'Appelle Rivers, with only two examples occurring just north of the South Saskatchewan River. This restriction in distribution, as compared to that of Clovis-style points, is rather interesting and may indicate that factors other than the process of deglaciation played a part in human distributions in the Late

Pleistocene/Early Holocene. This topic will be expanded upon in the following chapter.

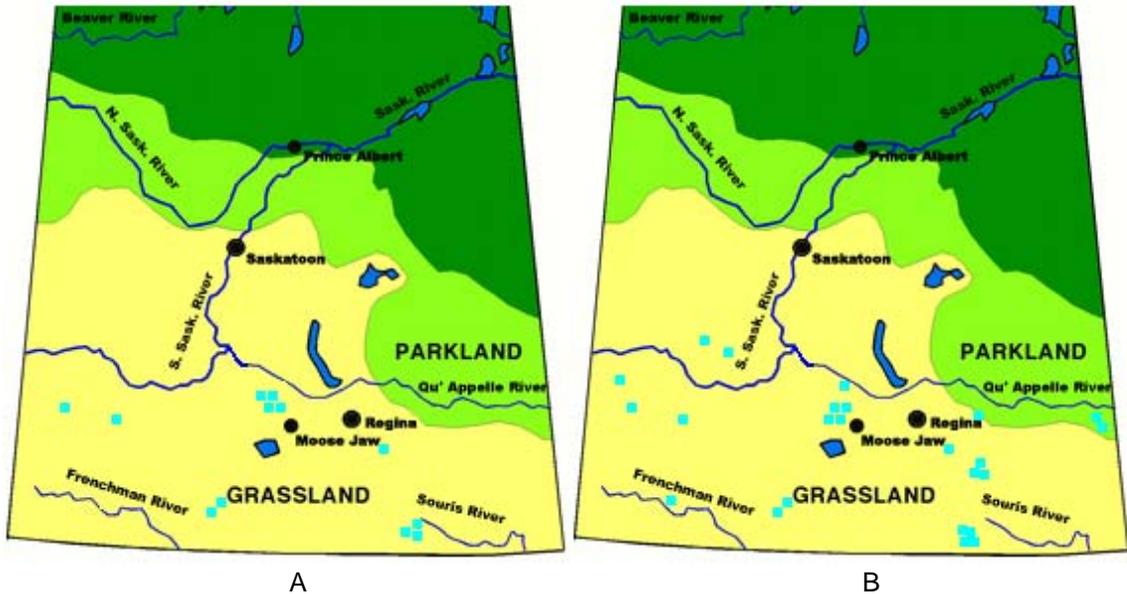


Figure 21: Distribution of Folsom-style points 1966 (A) and today (B)

Northwestern Fluted

What was originally considered again by Kehoe (1966) as a catch-all category for those fluted-points which do not fall under the Clovis or Folsom variant types, the Northwestern Fluted variant (originally termed “Atypical” by Kehoe) is well represented in Saskatchewan. To date, 35 are known in the province. The majority show signs of having been heavily reworked (59%), accounting for the formal variation, and the remainder are fragments. Size measurements for this type range from 6.58cm to 3.10cm in length, with an average of 4.37cm, and 3.20cm to 1.70cm in width, with an average of 2.53 cm. It therefore shows a smaller length, yet larger width, when compared to Folsom-style projectile points (see Table 1 for comparisons).

This type of fluted point, also, by far, shows the widest range of raw material use of any of Saskatchewan's variants (Figure 22). Also, a decline in the use of Knife River Flint (16%) for this category may indicate more of a dependence on locally collected raw stone materials, such as cherts (Swan River and miscellaneous comprise 45% of assemblage), and quartzites (9%). This may reflect a decline in seasonal mobility to regions with different local raw stone materials, which in turn may reflect environmental and cultural subsistence changes. Thus, it is likely that this projectile point type is either a younger fluted point variant, or representative of more localized human populations.

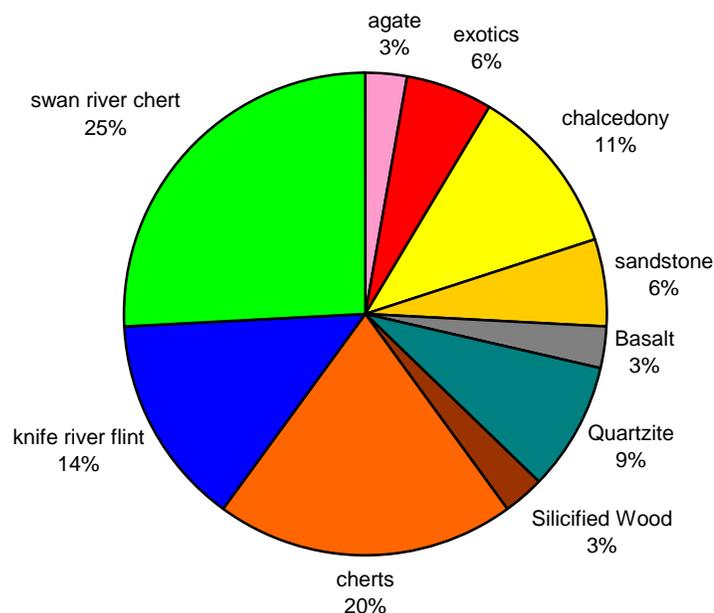


Figure 22: Northwestern Fluted type Raw Material

The distribution of Northwestern Fluted style fluted points in Saskatchewan (Figure 23) depicts less of a pattern than the Clovis and Folsom

style projectiles. An overwhelming number (31) occur in the western half of the province. This larger number may be attributed to Carlson's (1992) work in the Battleford region of the N. Saskatchewan River cataloguing many private collections, some of which included fluted projectile points. Thus, it reflects a sampling bias only.



Figure 23: Distributions of Northwestern Fluted variant points today

Fluted Point Discussion

From the fluted point data presented above several hypotheses can be formulated regarding type similarities and difference.

Similarities in morphology between the Clovis style and Northwestern fluted points could be suggestive of a link between the two. Drawing assumptions from average length comparisons between the three point types will

not be attempted due to the highly resharpened nature of the Northwestern fluted point style. The average width of Clovis and Northwestern fluted style points, on the other hand, at 2.70 and 2.53 cm respectively, are closer together than they are to the Folsom style points at 2.14 cm (Figures 24, 25 and 26). Also, when plotted against each other, the basal widths and basal depths of the Northwestern fluted and Clovis style fluted points are quite comparable, while the Folsom style points have significantly lower average basal widths and depths (Figure 28).

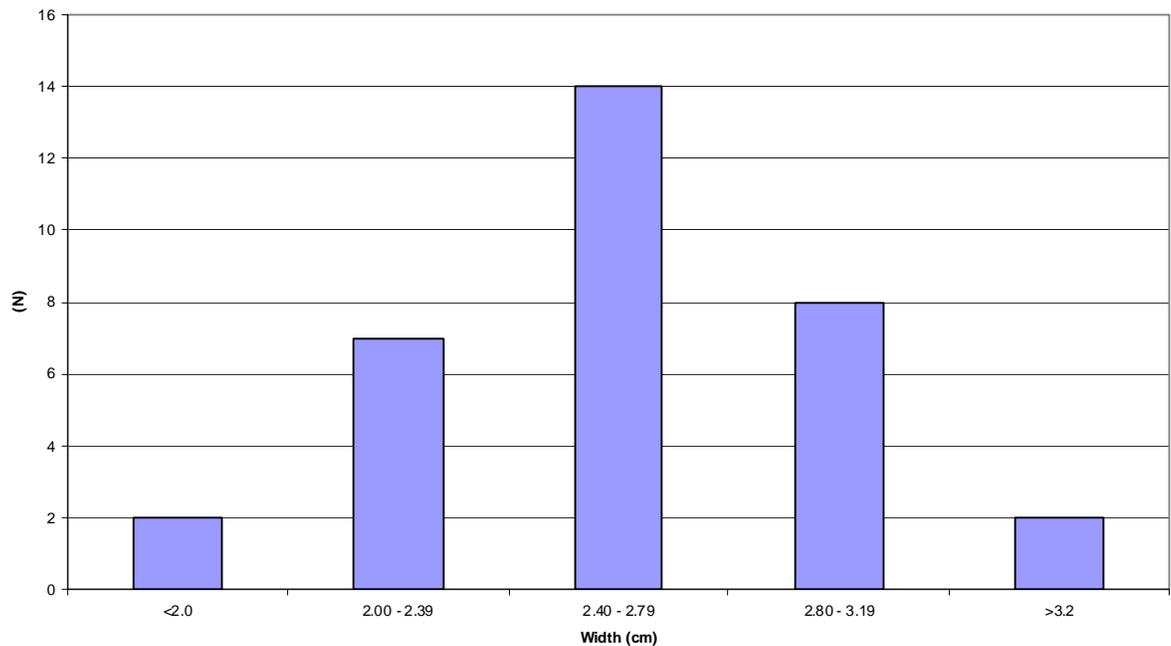


Figure 24: Range in Widths of Northwestern fluted Type Fluted Points

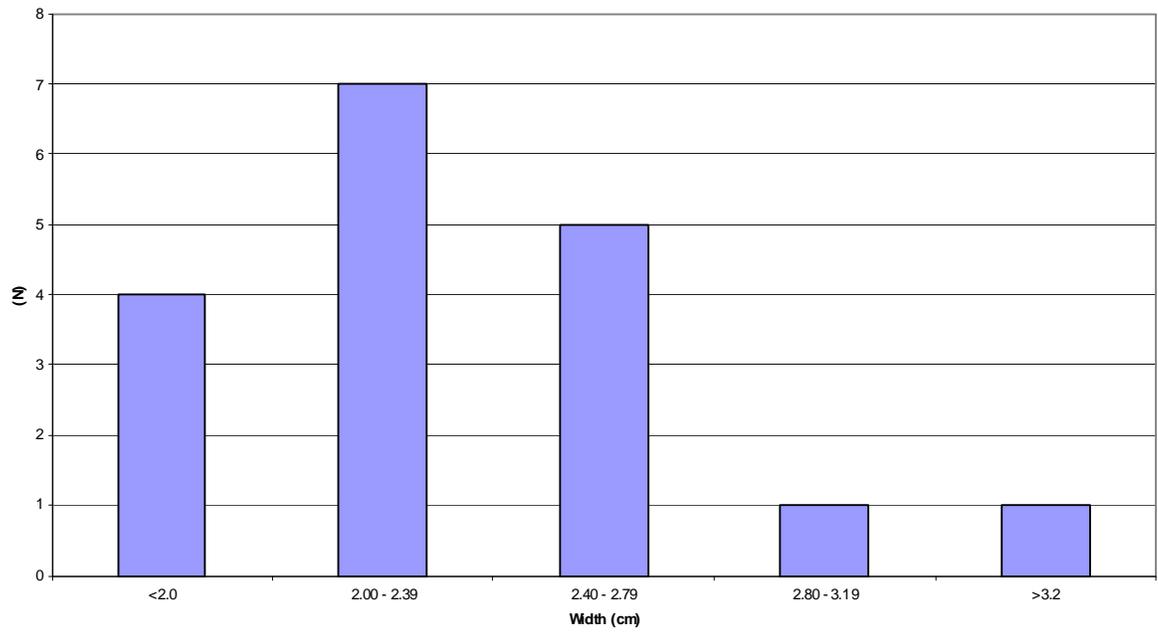


Figure 25: Range in Widths of Folsom Style Points

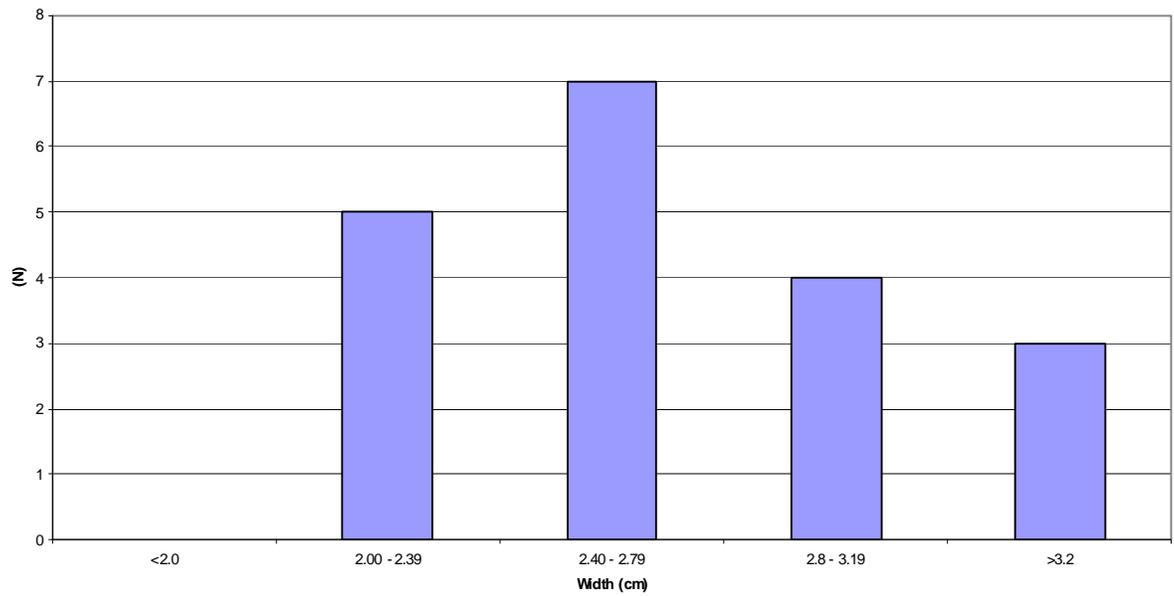


Figure 26: Range in Widths of Clovis Style Points

Variations in raw materials between the three fluted point types present further implications of cultural change. Thus, decline in the use of non-local materials in the manufacture of Northwestern fluted points may be indicative, through an increasing familiarity with local sources, of either decreased seasonal group mobility, or a localized development of the Northwestern fluted point style.

Regional Comparisons

As a way of understanding the place of Saskatchewan's fluted projectile points within a larger framework, fluted point inventories from surrounding regions within the Northern Plains are examined. However, a difficulty in such a discussion is that the only Northern Plains region outside of Saskatchewan that has been the subject of a thorough inventory of fluted points is Alberta (Gryba 1988). Although reports do exist summarizing subsamples of fluted points in north-eastern British Columbia (Driver 1998), and Montana (Davis and Greiser 1992), no overall database has been compiled (Gillespie 2002:81-82).

In preparing this thesis archaeologists were contacted in the northern prairie states (the Dakotas, Montana, Wyoming) to inquire whether any fluted point inventories have or are currently being compiled, but no positive responses were received. Therefore, comparisons will be limited to Alberta's fluted point inventory.

Gillespie (2002:84-97) used the data from the Alberta fluted point inventory to place that sample within a larger, continental framework based on Morrow and Morrow's (1999) fluted point spatial analysis of metric attributes. His analysis did not, however, focus on specific type characteristics, but rather

included metric data from all fluted point types. An application of attribute ratios was used to determine morphometric variation in fluted points from east to west and north to south across the Americas. Three of these ratios, employed by Gillespie (2002), will be used to compare the Saskatchewan and Alberta assemblages.

The first two ratios, *basal width:maximum width* and *maximum width height:total length*, show changes with latitude from north to south, the former displaying a decrease and the latter an increase (Gillespie 2002). The majority of North American points have a *basal width:maximum width* ratio of over 0.85 (Morrow and Morrow 1999:221; Gillespie 2002:85). The Saskatchewan sample, with a ratio of 0.8867, compares to the Alberta sample (0.8599) in this regard.

This is also the case with Alberta's *maximum width height:total length* ratio at 0.3455 and Saskatchewan's at 0.3528. On a continental scale these ratios correspond with the results provided by Morrow and Morrow (1999) that "fluted points from north of the 40th parallel have *maximum width height:total length* ratios which are less than 0.35" (Gillespie 2002:85).

The third and final ratio employed by Gillespie (2002:85-86) is the *basal concavity depth:basal width* ratio (Figure 27). Morrow and Morrow (1999) determine that fluted point basal depth increases from west to east, with *basal concavity depth:basal width* ratios in the west between 0.15 and 0.25 and in the east over 0.25. In comparison with the Alberta sample (0.14138), Saskatchewan's fluted points produce a ratio of under 0.15 at 0.14122. According to Morrow and Morrow (1999), this suggests similarities to the south-

western American sample rather than the northwest or northeast North American samples.

These ratios also indicate a close relationship in metric attributes between those found in Saskatchewan and those from Alberta. Gillespie (2002:95) hypothesizes that, due to variability within the Alberta fluted point sample, there may be as many as eight types of fluted points present. With an understanding of the variability within each 'classic' typological classification, often seen within assemblages from single sites, for now it is reasonable to maintain the current division of Saskatchewan's fluted points into the three types seen in the rest of the Great Plains of North America. If indeed future discoveries at stratified fluted point sites indicate a separation of a certain type into sub-types, the development of additional types may be made.

All Points Basal Width Vs. Basal Depth

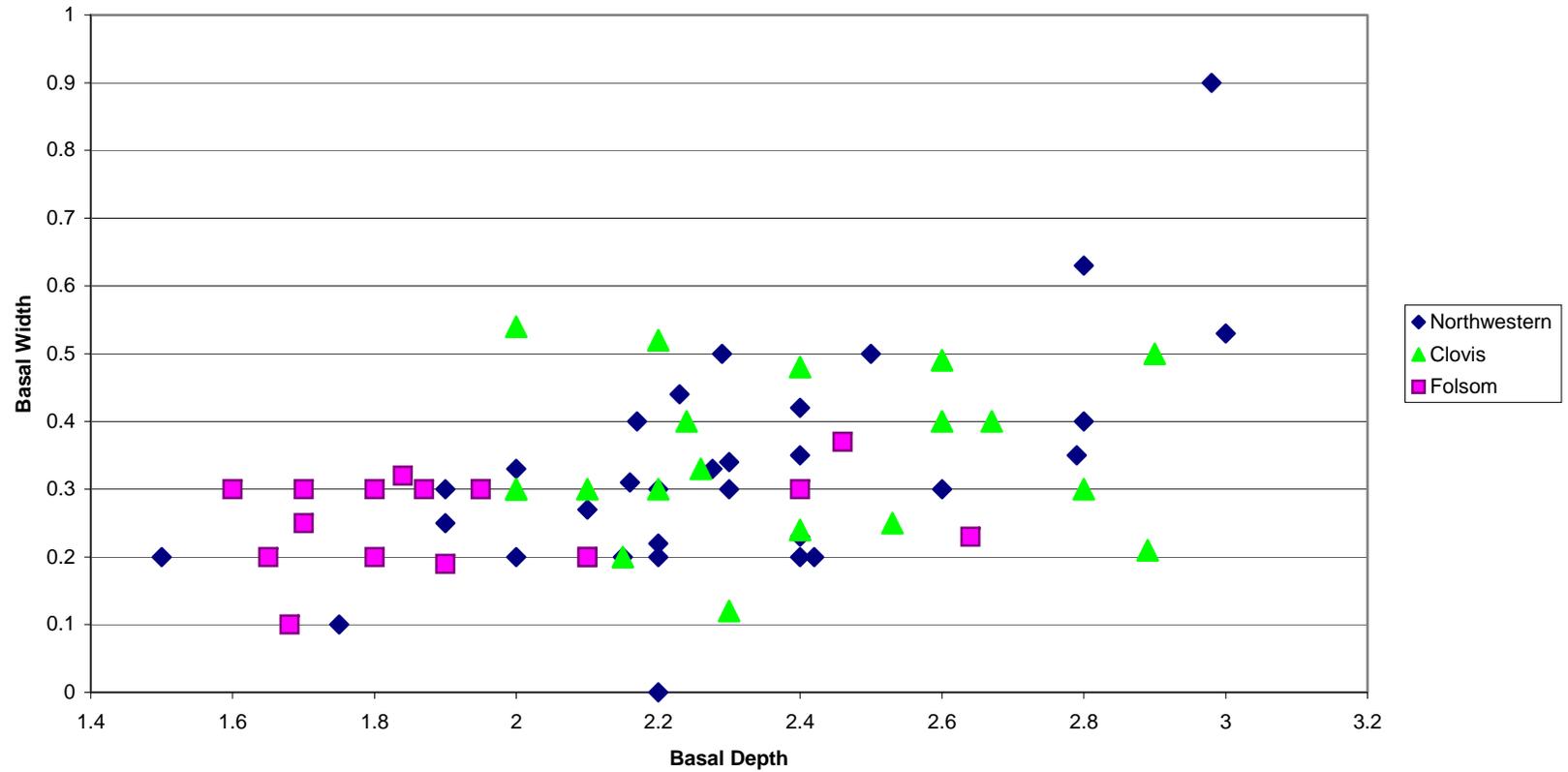


Figure 27: Basal width vs. basal depth of all fluted points in Saskatchewan

CHAPTER 5: SASKATCHEWAN'S FLUTED PROJECTILE POINTS DISCUSSION

Introduction

With a general understanding of Saskatchewan's current fluted projectile point database and the respective distributions of point types in place, the following will provide an interpretation of those distributions, and their relation to late Pleistocene-early Holocene environmental conditions. It will be divided into four sections.

First, Kehoe's (1966) distributions of Saskatchewan's fluted points will be presented and discussed. The purpose will be to identify relationships between point types and Late Pleistocene/Early Holocene glacial retreat. Discussions will then be offered as to the original hypotheses concerning the timing and pattern of initial human occupation in the province. This will provide a basis against which today's fluted point distributions are compared.

The second section will discuss the currently known distribution of fluted points in Saskatchewan. A comparison will be made between it and the present understanding of Late Pleistocene/Early Holocene glacial margins, with the 1966 database.

The third section of this chapter will discuss interpretive changes that the modern fluted point database offers concerning initial human movements into

Saskatchewan. It also will provide the ultimate *sine qua non* of this project, in which an up-to-date discussion of the timing and directionality of Saskatchewan's earliest human occupation is presented. The fourth and final section of this chapter will consist of a formal comparison of Saskatchewan's fluted projectile point sample with those from surrounding areas on the Northern Plains.

1966 Fluted Point Distributions

Kehoe's (1966) study of the 37 then known Saskatchewan fluted projectile points provided a solid basis for future work. However, because the primary focus of that study was to determine a link between Plano and fluted projectile points, only a limited effort was placed on discussing initial human distributions in the province.

Upon studying Kehoe's (1966) point distributions in relation to ice frontal positions during glacial retreat (Figure 28) a key hypothesis was made bearing on the initial objective of this thesis. It presumed that as the glaciers receded in a northeast fashion, humans followed, with sites decreasing in age from southwest to northeast. That hypothesis was partially verified by the observed point distributions, in that all the Clovis-style points, with the exception of one outlier (a heavily reworked Clovis-style point from the Arran locality), were restricted to the southwest, the Folsom-style points occurred over a slightly larger area, and the latest Northwestern fluted variants were even more widely distributed. This suggests that the manufacturers of Clovis-style points entered the province first, from the southwest, after c.12 500 BP (omitting the eastern outlier), Folsom-style after 12 000 BP, and the Northwestern fluted points after 11 500 BP. It also

should be remembered that these dates are based solely on glacial margins and do not take into account revegetation and subsequent faunal recolonization, and are therefore somewhat earlier than generally accepted Clovis, Folsom, and Northwestern fluted type dates.

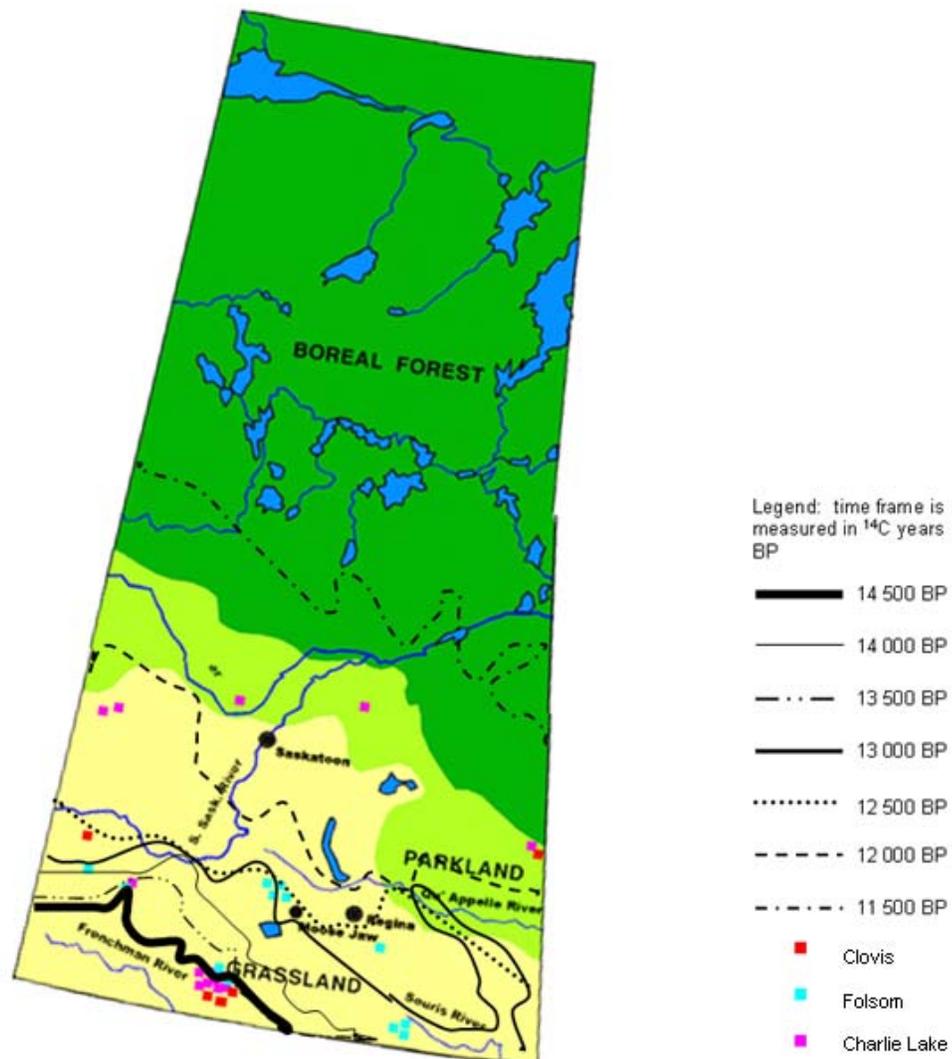


Figure 28: 1966 Fluted point distributions and ice frontal positions (point distributions from Kehoe 1966 and ice frontal positions from Dyke et al 2002)

Updated Fluted Point Distributions

When Saskatchewan's current total of 77 fluted projectile points is plotted in relation to past ice frontal positions the results are somewhat different than those observed in 1966 (Figure 29). While both the Folsom-style and Northwestern Fluted style points cover roughly the same area, the Clovis-style distribution differs. Today the northernmost Clovis-style point is located north of the North Saskatchewan River, several hundred kilometers north of that earlier 1966 distribution range.

Simply estimating the age when the province was occupied by the manufacturers of each fluted point type based just on their proximity to ice front locations as seen in Figure 29 would be insufficient, considering that would suggest that Folsom-style points were the oldest. Again, it is well documented at sites further south, that Clovis-style projectile points are older than those showing Folsom traits. In fact, to properly interpret today's known fluted point distributions in Saskatchewan, other reasons for this pattern must be sought. With Clovis-style points occurring as far north as they do, the main question will concern the more restricted distribution of Folsom-style projectile points.

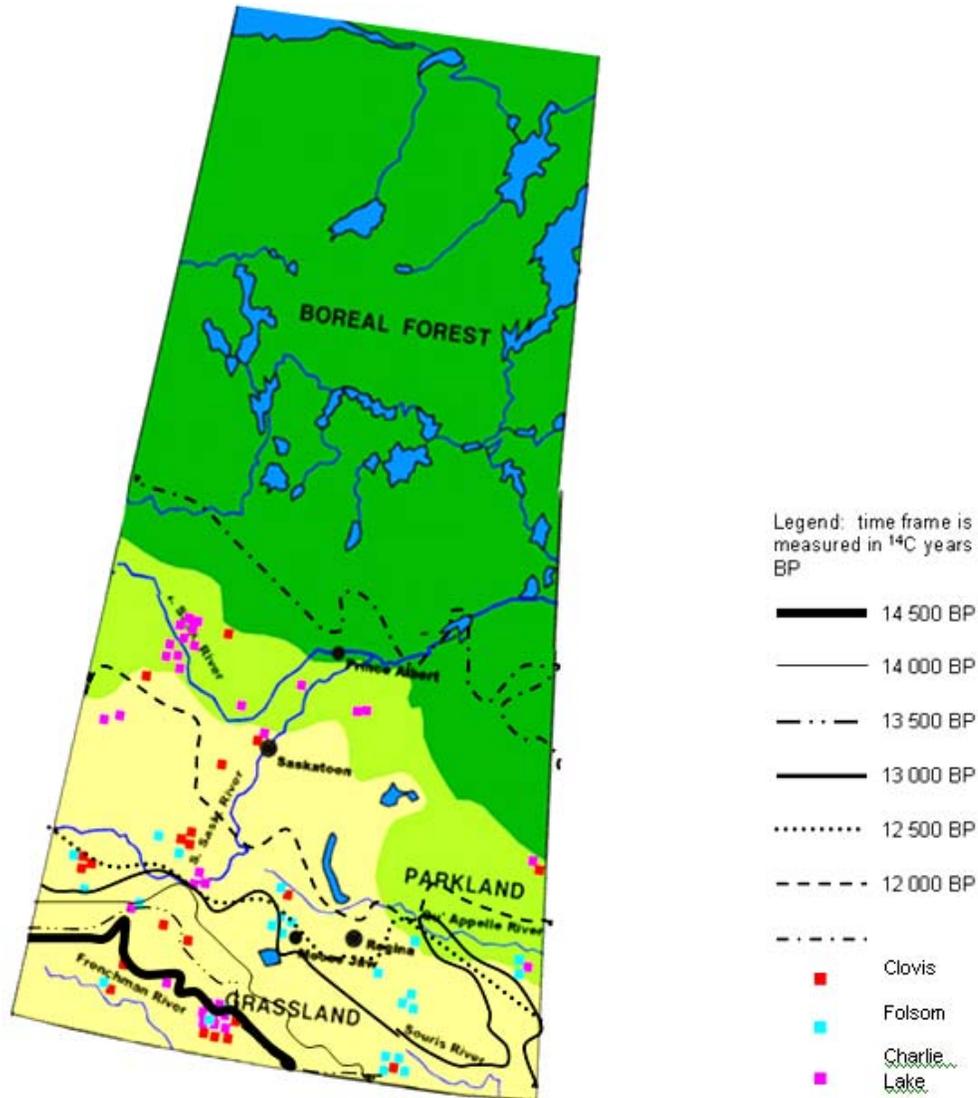


Figure 29: Today's known fluted point distributions and ice frontal positions (includes data from Kehoe 1966 and ice frontal positions from Dyke et al 2002)

Discussion

Clovis-style projectile points have been widely considered the oldest in North America, although some debate on this continues. Here we will discuss present data pertaining to ice frontal margins and late Pleistocene environmental changes in Saskatchewan and how they relate to fluted point distributions.

When examining the retreating ice-frontal positions along with Clovis point distributions, it would be accurate to assume that the earliest human occupation

of Saskatchewan occurred sometime after 12 000 BP. The northernmost Clovis-style projectile point was recovered from Medstead, Saskatchewan, between the 12 000 and 11 500 BP ice margins (Figure 30). Clovis-style projectile points in Saskatchewan are generally distributed across all areas south of both the 11 500 BP ice margin and boreal forest ecozone.



Figure 30: Resharpended Clovis-style projectile point from Medstead, Saskatchewan (Photo by Jonathan Hall 2005)

The distribution of Northwestern type fluted projectile points matches nearly exactly that of the Clovis-style. The distributions of both those point styles, based on their overall trend south of the boreal forest tree line, also could be attributed to a higher degree of grain farming in that area and resulting improved surface visibility for private collectors. Thus, a distributional difference between the Clovis-style and Northwestern Fluted types could be tied to factors of site visibility.

Folsom-style projectiles have a more restricted distribution in the province than that of Clovis and Northwestern fluted variants. The least likely cause for that would be a glacial readvance. While a minor resurgence of the Laurentide

Ice Sheet occurred between 14 000 and 13 000 BP, it advanced no more than 50 kilometers (Figure 31) in most areas and no evidence exists for any later resurgence, and, anyway, it is substantially older than that style of point.

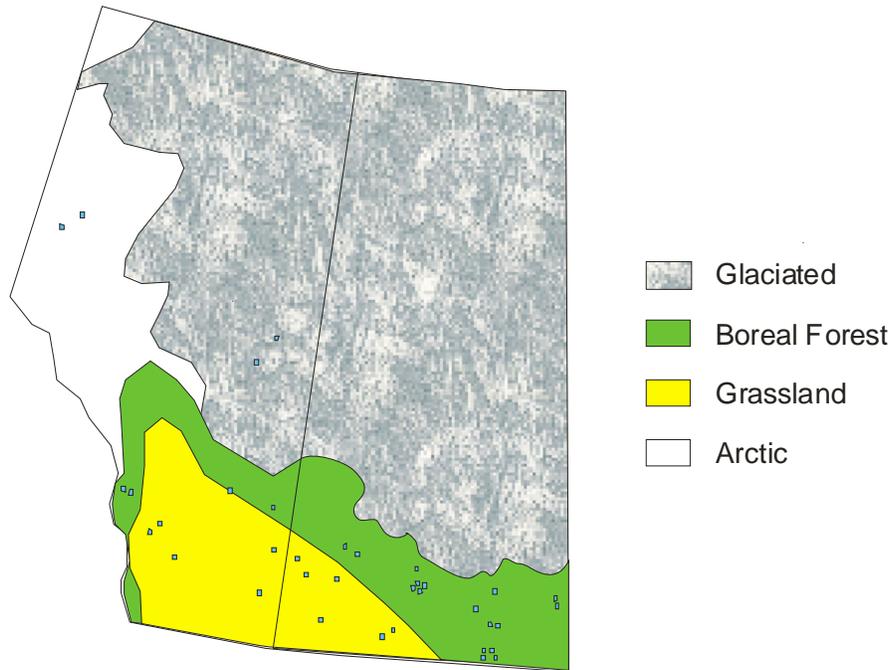


Figure 31: Folsom Point Distribution and Paleovegetation coverage of Saskatchewan and Alberta at 12 000 BP (adapted from Strong and Hills 2005)

Another reason for this apparent restriction of Folsom-style points to southern Saskatchewan may be a lack of collector discovery. This is by far the most uncomplicated explanation and likely the most valid. Southern Saskatchewan is a relatively large area, so it could be stated that a total of only 77 points is too small a sample to represent human occupation over such a broad area.

Nevertheless, the question of sufficient sampling coverage was taken into account during preliminary preparations for my fieldwork. Every regional chapter of the Saskatchewan Archaeological Society was contacted, through which the

majority of initial Paleoindian point discoveries were made. Also, field work was based out of both Saskatoon and Swift Current to assure that both central and southern Saskatchewan was covered adequately. Also, Murial Carlson's (1992) work in the North Battleford region resulted in the registration of several fluted point sites, producing 14 fluted points, and none of which contained Folsom specimens. Based on this it would seem reasonable to assume that Folsom populations remained restricted to the southern portions of the province.

The most logical interpretation of the present fluted point distribution involves environmental factors following deglaciation other than ice margin allocations. Thus, it may be possible that environmental restrictions, other than glaciation, played a significant role in the limited distribution of Folsom-style projectile points. In fact, between 14 000 and 8000 BP major vegetation changes also occurred in conjunction with deglaciation, with a northern shift in vegetation zones (Figures 31 and 32). As presented in Chapter 3, an increase in mean annual temperatures resulted in the migration of a boreal forest ecozone northward and the subsequent establishment of parkland vegetation, followed by a grassland environment in southern Saskatchewan. Because that timeframe coincides with the accepted Folsom age, this environmental change, spurred by regional warming, is considered to have had a major effect on the distribution of Folsom-style fluted projectile points (i.e. "Folsom people" were possibly following migrating herds of bison onto the expanding grasslands). Further verification concerning Folsom-style projectile point associations with specific ecozones can

be derived by comparing their distributions in Saskatchewan with those in Alberta (Figures 31 and 32).

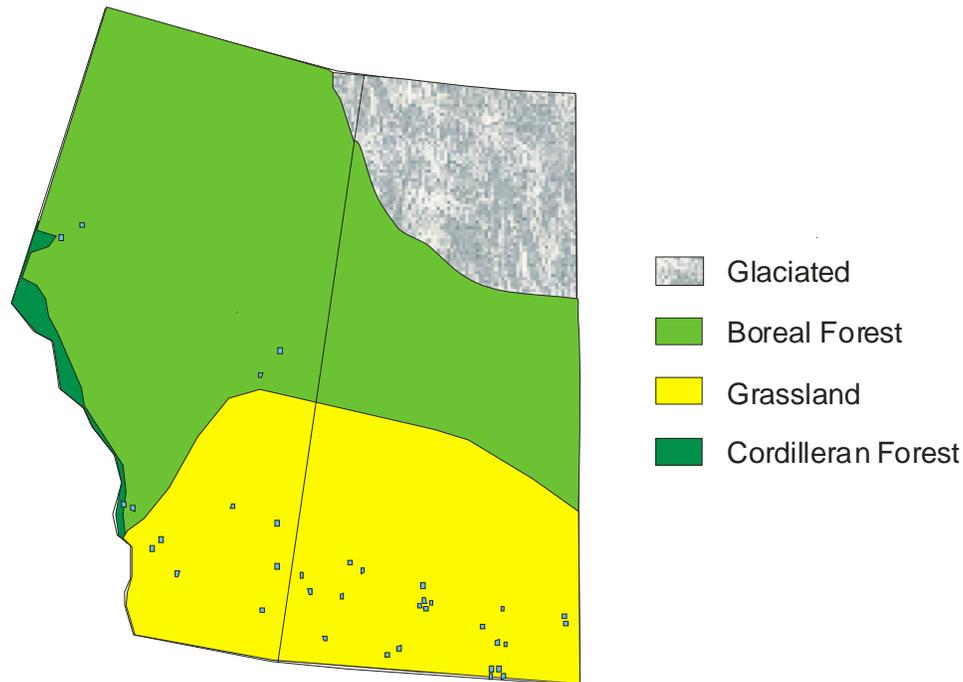


Figure 32: Folsom Point Distribution and Paleovegetation coverage of Saskatchewan and Alberta at 10 000 BP (adapted from Strong and Hills 2005)

A regional patterning and land use study of Clovis, Folsom, and Cody point distributions in Kansas, Oklahoma, and Texas (Blackmar 2001) provides support for this interpretation. Blackmar focuses primarily on determining the environments (high plains, prairie, savannah or woodland) most commonly associated with each of these toolkits. The results of this study indicate an adaptation to and occupation of all environments by “Clovis people”. On the other hand, Folsom distributions occurred primarily in the prairie and high plains regions, indicating a correlation with the range of bison (Blackmar 2001). A comparison may be drawn between the results of Blackmar’s study and this one.

Conceived as a predominantly plains-adapted culture, specializing in hunting extinct forms of bison, it would make sense to find Folsom-style projectile point distributions restricted to that food source range.

Data that would further support this interpretation includes the corresponding dates of Folsom (11 000-10 000 BP (Haynes 1980) and the timing of grassland/parkland development in Saskatchewan. Although Folsom-style points cannot be dated directly in Saskatchewan, it is likely that "...western Canadian points sharing a formal identity with...fluted points to the south are roughly contemporaneous with more southerly finds" (Ives 2006:17). Folsom distributions in Alberta also coincide with the development of parkland and grassland vegetation zones between 12 000 and 10 000 years BP.

Thus, it seems apparent that the distribution of fluted points, taken in correlation with the chronology of glacial retreat and paleovegetation patterns, indicates more than a simple expansion of range of the inhabitants. As the indigenous population changed their tool-making technology from Clovis to Folsom, most likely first in the southern Plains, there seems to have been a contemporaneous shift to a greater dependence on grassland food sources – mainly bison.

This, along with the similarities between Clovis and Northwestern fluted points, supports the theory of a multidirectional fluted point evolution out of the Clovis type. Similar dates from Folsom and the few datable Northwestern fluted point sites suggest a coexistence of groups employing these point styles. Therefore, it could be speculated that there is a continuum between Clovis and

Northwestern fluted technology, originating on the northern Plains, with Folsom technology arriving as an expansion of specialized bison hunters into the developing grassland and parkland vegetation zones during the late Pleistocene/early Holocene in Saskatchewan. The reliance on local raw materials, exhibited within Saskatchewan's Northwestern fluted type assemblage provides further support for this postulation.

CHAPTER 6: CONCLUSIONS

Introduction

The primary goal of this study was to investigate the initial occupation of Saskatchewan in the Late Pleistocene/Early Holocene as indicated by distributions of fluted projectile point types in relation to the environment of that time period. Earlier studies of Saskatchewan's fluted point assemblage had access to a limited sample of 36 projectile points and focused more on theories regarding the origin of parallel-flaked Plano points, rather than initial human migrations (Kehoe 1966).

The field research portion of this study expanded on the existing fluted point database for Saskatchewan, from that original 36 specimens to 77 (Figure 33). Along with the literary research portion, focusing on Late Pleistocene/Early Holocene environmental change, that updated database provided a firm basis from which interpretations pertaining to Saskatchewan's initial occupation could be made.

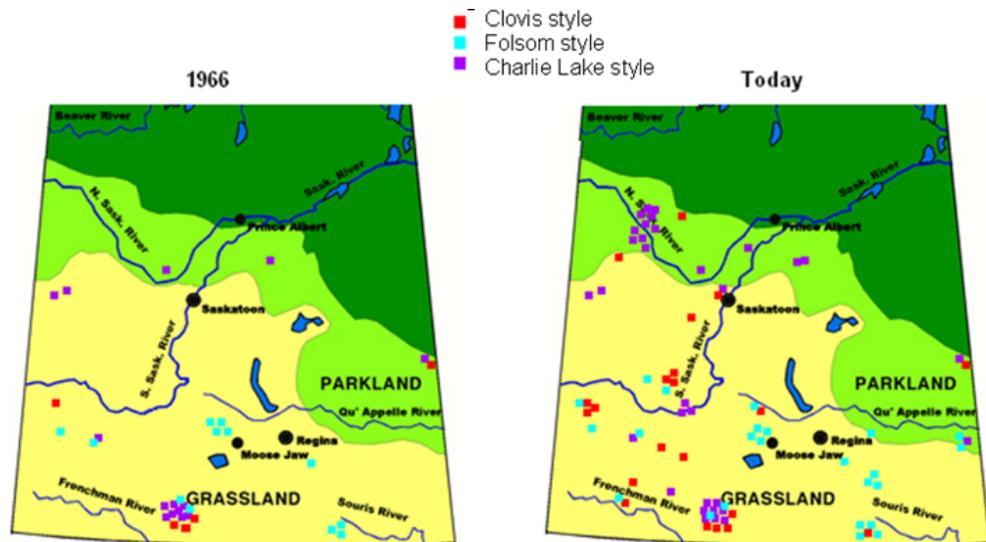


Figure 33: Saskatchewan’s fluted projectile point distributions, 1966 vs. today.

Several hypotheses were presented in the introductory chapter. This concluding section will discuss how the results of the current study verified or nullified these hypotheses.

Hypothesis: Qualitative and quantitative data provide a strong enough basis to categorize Saskatchewan’s fluted projectile points under typological groups from neighboring regions.

Fluted points discovered in Saskatchewan were first stylistically compared to their counterparts from outside of the province, in order to determine the validity of grouping them in a similar manner. A degree of variety within fluted point assemblages to the south explains why the classificatory characteristics for each type must be considered to be to some extent “loose”, and therefore many of those in Saskatchewan are likely to exhibit the same stylistic categories.

Comparisons to the fluted point characteristics identified by Morrow and Morrow (1999) place the Saskatchewan assemblage within their established morphometric results for North-western North America. Also, due to the high

degree of variation within assemblages from excavated and dated fluted point sites within the United States, it would be accurate to identify early artifacts from Saskatchewan as similar to the southern established fluted point typological groups (Clovis and Folsom).

Hypothesis: If Saskatchewan's fluted projectile points can be categorized under similar typological groups from neighboring regions it may be assumed that they date to the same time periods.

Wally's Beach and Charlie Lake Cave, the only well dated western Canadian sites with fluted projectile points, indicated a possibility of cultures existing on the northern Plains as early as sites to the south. However, no intact sites containing fluted point components have been discovered in Saskatchewan.

Late Pleistocene/Early Holocene deglaciation and the updated fluted point distributions in Saskatchewan are compared. The development of vegetation in southern Saskatchewan as early as 14 000 BP (Strong and Hills 2005) and the presence of fauna between 14 000 and 12 000 BP (Morlan et al 2001) would suggest that it was able to support human populations that made use of fluted point technology as early as those in the United States, Alberta, and British Columbia.

Hypothesis: Saskatchewan's fluted projectile point types should demonstrate changes in a time progressive manner.

A change in lithic raw material dependency between fluted projectile point types from Saskatchewan, along with fluted projectile point distributions in

comparison with paleoenvironmental shifts, demonstrated several late Pleistocene/early Holocene cultural changes.

First, a decline in the use of imported exotic materials in the manufacture of Northwestern Fluted points may either indicate decreased seasonal group mobility through an increasing familiarity with local sources or a localized development of the Northwestern Fluted point style. A close relationship between Clovis and Northwestern type fluted points may suggest the development of the Northwestern fluted variant on the northern Plains and provides further support for a bidirectional fluted point evolution for the earliest known Clovis style. The Folsom and Clovis-style assemblages show a greater focus on fine-grained silicates whereas the Northwestern Fluted variant reflects less selectivity, with a large portion of its points manufactured from local material types (Swan River Chert, sandstone, basalt and quartzite).

Second, it was determined that not only did ice frontal positions have an effect on changing human distributions, but so too did the development of vegetation zones. The restriction of Folsom-style projectile points to the southern margin of Saskatchewan between 11 000 and 10 000 BP corresponds with the development of parkland and grassland ecozones in that area. This type of vegetation and the open nature of such ecozones would have provided suitable conditions for herds of bison. Similar fluted point distributions in Kansas, Oklahoma, and Texas (Blackmar 2001) provide support for this interpretation.

This suggests that the arrival of Folsom technology in Saskatchewan reflects an expansion of early specialized bison hunters following herds into

developing grassland and parkland vegetation zones between 11 000 and 10 000 BP.

Recommendations for Future Work

In order to expand further upon our understanding of Saskatchewan's initial occupation, several recommendations are proposed.

First, an in-depth analysis of the formal variation within each type of fluted projectile point may further our understanding of the developmental history of these types. Does the high variability in Northwestern (a.k.a. Atypical) fluted points reflect experimentation by early hunters "in search for types most efficient for exploiting the new faunal resources" (Kehoe 1966:536)? The discovery of more points and the accumulation of further data may provide us with further insight into these later fluted projectile points and their manufacturers.

Second, an increase in the Folsom-style projectile point database, along with more information regarding the habitat and range of extinct bison in Saskatchewan will illustrate or verify the proposed cause for this point-style's restriction to grassland/parkland areas. What is most elusive about this time period is, that if the manufacturers of Folsom-style points restricted themselves to the south, who then occupied areas to the north in the boreal forest/herb tundra regions. The discovery of Clovis-style projectiles north of the limit of known Folsom-style distributions suggests that occupation of the boreal region occurred prior to the use of Folsom-style projectiles. This leads to several other questions: Was there a universal population shift south in Saskatchewan at that time? If not, were the users of the Northwestern fluted style projectile points

contemporaneous with those of the Folsom-style? In order to solve this ambiguity in Saskatchewan's fluted point distribution, geomorphic factors and Quaternary paleoenvironmental data must be used to predict where intact Paleo-indian sites may be found. This, of course, would be the ultimate aid in interpreting early Paleo-indian life-ways in Saskatchewan.

APPENDICES

Appendix A: Fluted Point Photos

Clovis 1



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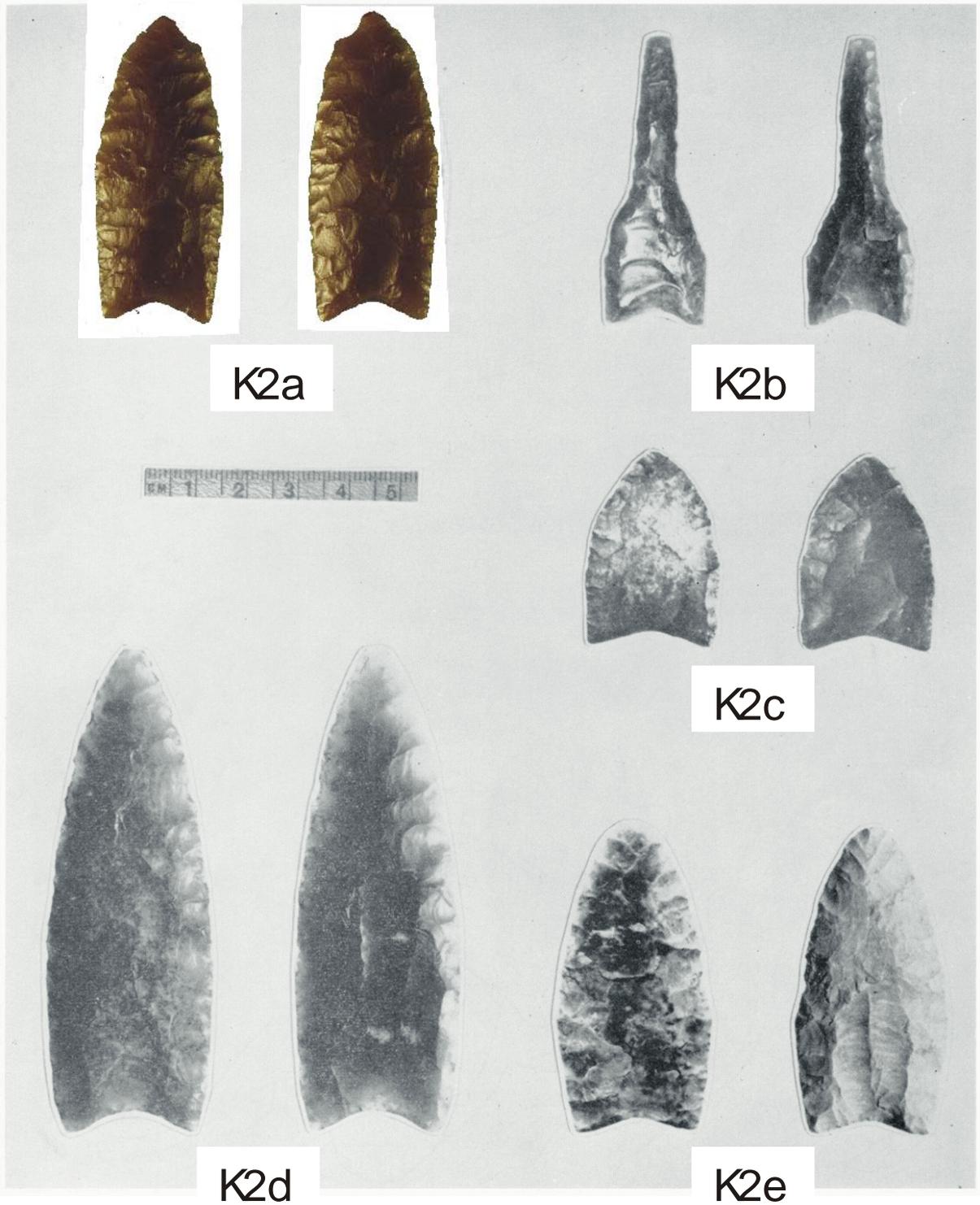
34



45

Clovis 2

(Kehoe 1966:532. Used by permission of the Society for American Archaeology)



Folsom 1



10



11



19



24



27



36



37



38



40



K3e



K3f

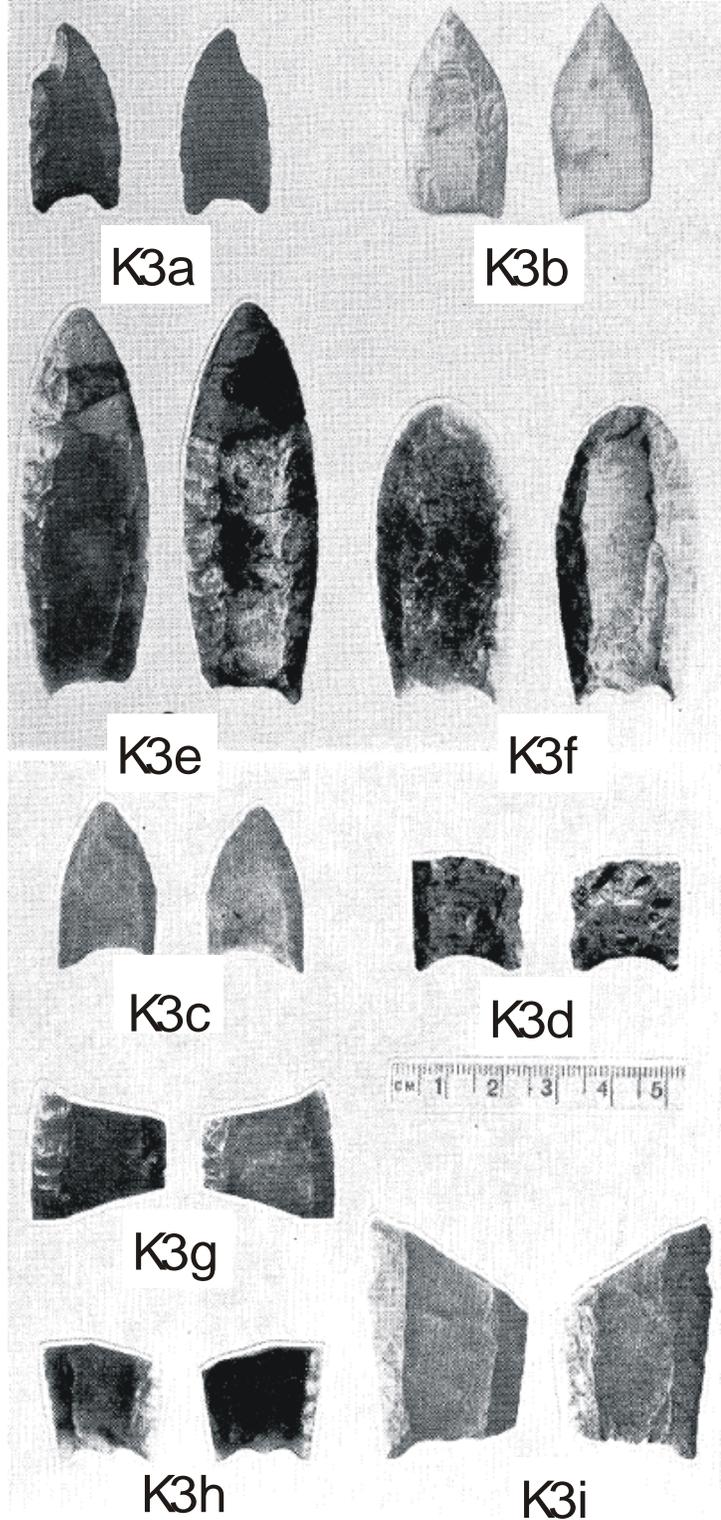


43



Folsom 2

(Kehoe 1966:534. Used by permission of the Society for American Archaeology)



Northwestern fluted 1



1



2



3



4



5



13



14



15



16



17



26



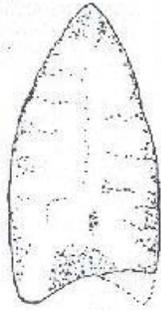
44



Northwestern fluted 2 (Carlson 1987)



46



47



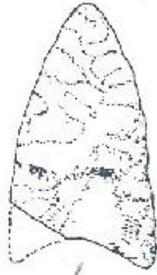
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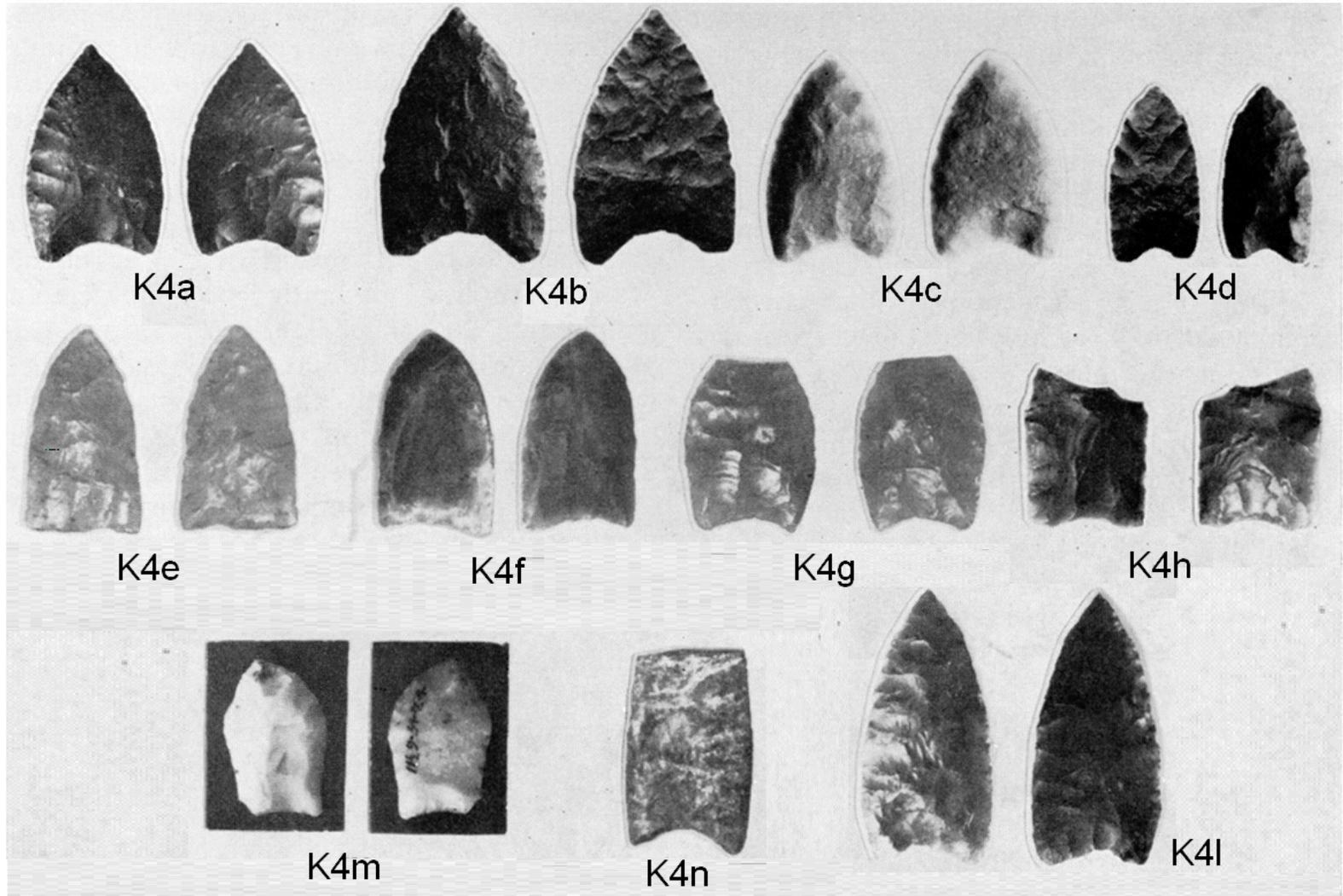


58



Northwestern fluted 3

(Kehoe 1966:535. Used by permission of the Society for American Archaeology)



Appendix B: Point Characteristics

Specimen	Clovis Attributes				Folsom Attributes				Northwestern fluted Attributes			Type Assigned
	V-Shaped base	Max. width near midpoint	Fluted 1/3 to 1/2 total length	Minor Finishing*	Basal projection #	Max. width near tip	Fluted almost whole length	Basal ears	Basally thinned ^s	Highly resharpened	Max. width near base	
1	N	N	Y	Y	N	N	N	N	N	Y	Y	Northwestern
2	N	?	N	N	N	?	N	Y	Y	?	?	Northwestern
3	N	N	N	Y	N	N	N	N	Y	Y	Y	Northwestern
4	N	N	N	Y	N	N	N	N	Y	Y	Y	Northwestern
5	Y	N	N	Y	N	N	N	N	Y	Y	Y	Northwestern
7	N	Y	N	Y	N	N	N	N	N	N	No	Clovis
8	N	Y	Y	N	N	N	N	Y	N	N	No	Clovis
9	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	Folsom
10	N	?	N	N	N	?	Y	N	N	?	No	Folsom
11	N	N	N	N	N	Y	Y	Y	N	N	N	Folsom
13	N	N	N	N	N	N	N	N	Y	Y	Y	Northwestern
14	N	?	?	N	N	N	N	N	N	?	?	Northwestern
15	N	?	?	N	N	?	N	N	Y	?	?	Northwestern
16	N	?	?	N	N	?	?	?	Y	?	?	Northwestern
17	N	N	N	N	N	N	N	N	N	Y	Y	Northwestern
18	N	N	Y	N	N	N	N	N	N	Y	Y	Clovis

	Clovis Attributes				Folsom Attributes				Northwestern Attributes			Type Assigned
	V-Shaped base	Max. width near midpoint	Fluted 1/3 to 1/2 total length	Minor Finishing*	Basal projection #	Max. width near tip	Fluted almost whole length	Basal ears	Basally thinned §	Highly resharpened	Max. width near base	
19	N	Y	N	N	N	N	Y	Y	N	Y	N	Folsom
K2a	Y	Y	Y	N	N	N	N	N	N	N	N	Clovis
21	N	Y	Y	Y	N	N	N	N	N	N	N	Clovis
22	?	N	Y	Y	N	N	N	N	N	N	?	Clovis
23	Y	?	?	?	N	N	N	N	N	?	N	Clovis
24	N	N	N	N	N	Y	Y	N	N	N	N	Folsom
K4i	N	?	Y	N	Y	?	N	N	N	?	?	Northwestern
26	N	N	N	N	N	N	N	Y	Y	Y	Y	Northwestern
27	N	N	N	N	N	N	Y	N	N	N	N	Folsom
28	N	Y	Y	Y	N	N	N	N	N	N	N	Clovis
30	N	N	Y	N	N	N	N	N	N	Y	Y	Clovis
32	Y	Y	Y	Y	N	N	N	N	N	N	N	Clovis
33	?	Y	N	Y	N	N	N	N	N	N	N	Clovis
34	N	N	Y	Y	N	N	N	N	N	N	Y	Clovis
35	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	Clovis
36	N	Y	N	N	N	N	Y	Y	N	Y	N	Folsom
37	N	Y	N	N	N	N	Y	Y	N	Y	N	Folsom
38	N	N	N	N	Y	Y	Y	Y	N	?	N	Folsom

Specimen	Clovis Attributes				Folsom Attributes				North-western Attributes			Type Assigned
	V-Shaped base	Max. width near midpoint	Fluted 1/3 to 1/2 total length	Minor Finishing*	Basal projection #	Max. width near tip	Fluted almost whole length	Basal ears	Basally thinned §	Highly resharpened	Max. width near base	
40	N	?	N	N	Y	?	Y	Y	N	N	N	Folsom
K3e	N	Y	N	N	N	N	Y	Y	N	N	N	Folsom
K3f	N	Y	N	N	Y	N	Y	Y	N	N	N	Folsom
43	?	?	N	N	?	?	Y	?	N	N	N	Folsom
44	N	Y	N	N	N	N	N	Y	Y	Y	N	North-western
45	N	Y	Y	?	N	N	N	N	N	?	N	Clovis
46	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
47	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
48	N	?	N	?	N	?	N	N	Y	?	?	North-western
49	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
50	?	?	N	?	N	N	N	N	Y	Y	?	North-western
51	N	Y	Y	?	N	N	N	N	N	Y	N	North-western
52	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
53	N	N	N	?	N	N	N	N	Y	?	Y	North-western
54	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
55	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
56	N	Y	N	?	N	N	N	N	Y	Y	N	North-western
57	?	N	N	?	N	N	N	N	Y	Y	?	North-western

Specimen	Clovis Attributes				Folsom Attributes			North-western Attributes				Type Assigned
	V-Shaped base	Max. width near midpoint	Fluted 1/3 to 1/2 total length	Minor Finishing*	Basal projection #	Max. width near tip	Fluted almost whole length	Basal ears	Basally thinned s	Highly resharpened	Max. width near base	
58	N	N	N	?	N	N	N	N	Y	Y	Y	North-western
K2a	Y	Y	Y	Y	N	N	N	N	N	N	N	Clovis
K2b	Y	?	?	?	N	?	?	N	N	Y	?	Clovis
K2c	Y	Y	Y	?	N	N	N	N	N	Y	N	Clovis
K2d	N	Y	Y	Y	N	N	N	N	N	N	N	Clovis
K2e	Y	Y	Y	Y	N	N	N	N	N	N	N	Clovis
K3a	N	N	N	N	Y	N	Y	Y	N	N	Y	Folsom
K3b	N	N	N	N	N	Y	Y	Y	N	N	N	Folsom
K3c	N	Y	N	N	N	N	Y	Y	N	Y	N	Folsom
K3d	N	?	N	N	N	?	Y	N	N	?	?	Folsom
K3g	?	?	N	N	?	?	Y	?	?	?	?	Folsom
K3h	N	?	N	N	Y	?	Y	Y	N	?	N	Folsom
K3i	N	N	N	N	Y	Y	Y	Y	N	N	N	Folsom
K4a	N	Y	Y	N	N	N	N	N	N	Y	N	North-western
K4b	N	N	N	N	N	N	N	N	Y	Y	Y	North-western
K4c	N	N	N	N	N	N	N	N	Y	Y	Y	North-western
K4d	N	N	Y	N	N	N	N	N	N	Y	Y	North-western
K4e	N	N	N	N	N	N	N	N	Y	Y	Y	North-western

Specimen	Clovis A Clovis Attributes			Folsom Attributes				North-western Attributes				Type Assigned
	V-Shaped base	Max. width near midpoint	Fluted 1/3 to 1/2 total length	Minor Finishing*	Basal projection #	Max. width near tip	Fluted almost whole length	Basal ears	Basally thinned ^s	Highly resharpened	Max. width near base	
K4f	N	Y	N	N	N	N	N	N	Y	Y	N	North-western
K4g	N	Y	N	N	N	N	N	N	Y	Y	N	North-western
K4h	N	N	N	N	N	Y	N	N	Y	Y	N	North-western
K4j	Y	Y	Y	Y	N	N	N	N	N	N	N	Clovis
K4k	Y	Y	Y	N	N	N	N	N	N	N	N	Clovis
K4l	N	N	N	N	N	N	N	N	Y	Y	Y	North-western
K4m	N	Y	Y	N	N	N	N	Y	N	Y	N	North-western
K4n	N	N	N	N	N	N	N	N	Y	Y	Y	North-western

* Minor Finishing refers to a low amount of late lithic reduction finishing flake removal (pressure flakes)

Presence of a mid-basal projection or nipple, prepared as a striking platform for the removal of long fluting flakes as seen on Folsom style projectile points

^s Evidenced by the removal of multiple longitudinal flakes, usually through pressure flaking, from the base of the projectile point

Appendix C: Fluted Point Qualitative and Quantitative Data

Clovis Point Data Summary: Qualitative Data						
Reference Number	Lithic Type	Provenience	Completeness	Material Source	Repository	Terrain
7	fine white chert	Shaunavon region	complete	local	Shaunavon Museum	no data
8	KRF ¹ patinated	Eastend cemetery	complete	N. Dakota	anonymous	no data
18	tapioca silicified sandstone	see report, Medstead Clovis by Wayne Pendree	complete-reworked	local	no data	see report
K2a	KRF	Prelate (in Kehoe)	complete	N. Dakota	no data	see report
21	chert	1/2 mile N-NE of Gray site *	complete	SW States	Daryl Heron	cultivated field
22	Agate	Leader SW 34 20 26	complete-reworked	no data	Wayne Wenzel, Leader	blowout
23	Agate	Leader SW 34 20 26	base	no data	Wayne Wenzel, Leader	blowout
28	Silicified Wood	N of Eyebrow	complete	local	Hugh (?)	blowout
30	SRC	Harris*	no data	local	Harris Museum	see report
32	KRF	Hill 2 miles West of Duck Lake +	complete	N. Dakota	Duck Lake Museum	hill
33 ⁴	KRF	2 miles E of Kyle	complete	N. Dakota	Bill Thomson, Kyle	blowout
34	fine grey/brown chert	2 miles E of Kyle	complete	local	Bill Thomson, Kyle	blowout
35 ⁵	black chert	2 miles E of Kyle	complete	no data	missing (was B. Thomson)	blowout
45	KRF	12U XP 326 427 near Cutknife	complete	N. Dakota	SAS office	cultivated field
K2b	KRF	McCord locality (DjNr-7)	modified to drill	N. Dakota	see Kehoe	no data
K2c	Brown Chert	Arran locality (EkMk-1)	complete-reworked	no data	see Kehoe	no data
K2d	KRF	McCord locality (DjNr-7)	complete	N. Dakota	see Kehoe	no data
K2e	KRF	McCord locality (DjNr-0)	complete-reworked	N. Dakota	see Kehoe	no data
K4j	Basalt	Saskatoon locality (FaNp-4)	complete-reworked	no data	see Kehoe	no data
K4k	KRF	McCord locality (DjNr-0)	complete	N. Dakota	see Kehoe	

¹ Knife River Flint

Clovis Point Data Summary: Quantitative Data

Reference Number	Max. Length (cm)	Max. Width (cm)	Max. Width from base (cm) ¹	Lateral Grinding (cm) ²	Basal Width (cm)	Basal Depth (cm)	Flute Length ³	Maximum Thickness (cm)
7	12.17	3.3	no data	3.65 - 3.44	2.89	0.21	1.5 - 1.7	0.69
8	6.42	2.47	2.5	3.46 - 2.68	2.26	0.33	1.85 - 1.9	0.67
18	4.1	2.2	no data	2.04 - 2.32	2.2	0.3	2.4-1.96 ⁶	0.7
K2a	6	2.5	3.2	2.1 - 2.15	2.1	0.3	1.95 - 2.9	0.5
21	5.74	2.66	2.5	0	2.4	0.48	3.2 - 2.64	0.7
22	5.8	2.92	1.85	2.9 - 2.6	2.8	0.3	2.75 - 2.2	0.7
23	2.6	3.4	no data	entire sides to break	2.6	0.49	2.6 - 1.84	0.6 ⁴
28	7.8	3	3.2	4.45 - 4.13	2.67	0.4	2.7 one side	0.6
30	5.1	2.5	0	2.9 - break	2.5	no data	1.9 one side	0.5
32	6.58	2.77	2.2	2.6 - 2.57	2.16	0.31	1.57 one side	no data
33 ⁴	8.8	3.16	3.88	3.51 - 3.9	2.24	0.4	1.43 - 1.2	0.7
34	6	2.7	1.7	2.1	2.2	0.52	1.6 - 1	0.7
35 ⁵	no data	no data	no data	no data	no data	no data	no data	no data
45	5.85	2.4	2	2	2.15	0.2	3.05 - 4.25	no data
K2b	5.8	2.15	1.3	1.4 - 1.4	2	0.3	no data	0.55
K2c	3.95	2.15	1.3	1.7 - 1.6	2.53	0.25	2.73 - 2.87	0.57
K2d	9.73	3.27	1.3	3.35 - 3.3	2.6	0.4	2.4 - 5.3	0.77
K2e	6.23	3.03	2.3	2.3 - 2.3	2.4	0.24	3.16 - 3.15	0.64
K4j	4.45	2.34	1.7	1.9 - 1.7	2	0.3	1.65 - 1.8	0.56
K4k	5.3	2.25	2.7	2.7 - 2.6	2	0.54	2.15 - 1.5	0.6
Average	6.06	2.69	2.10		2.35	0.35		0.63

¹ Distance from base at which maximum width occurs. Some of these measurements were not taken.

²The first number indicates the distance upwards from the base that lateral grinding occurs. When two numbers appear, they indicate different distances on the two sides of the specimen. For some specimens, measurements of the extent of lateral grinding

³When two numbers appear, they indicate different distances on the two sides of the specimen.

⁴ Broken

⁵ Some data unavailable, specimen was stolen.

Northwestern Point Data Summary: Qualitative Data

Reference Number	Lithic Type	Provenience	Completeness	Material Source	Repository	Terrain
1	KRF ⁶	Napao site *	Complete-reworked	N. Dakota	Pontieux Museum	no data
2	fine grey chert	12U XM 987 168	base	local	Don Szacacz, Swift Current	Lake shore
3	fine grey chert	13U BF 935 808	Complete-reworked	local	Don Szacacz, Swift Current	cultivated field
4	fine brown chert	12U XM 924 179	Complete-reworked	local	Don Szacacz, Swift Current	Lake shore
5	SRC ⁷	12U XM 924 179	Complete-reworked	local	Don Szacacz, Swift Current	Lake shore
13	KRF	SE 6 31 12 W of 3	complete-reworked	N. Dakota	Kindersley Museum (W.Pendree)	cultivated field
14	Sandstone	EkNv-13	base	no data	Kindersley Museum (W.Pendree)	no data
15	white chalcedony	NW 9 31 12 W of 3	base	no data	Kindersley Museum (W.Pendree)	no data
16	SRC	NW 9 31 12 W of 3	base	local	Kindersley Museum (W.Pendree)	no data
17	SRC	EcNx-50	complete	local	Kindersley Museum (W.Pendree)	no data
26	SRC	Meskanaw SW 29 46a 25 W of 2	reworked	local	Hanson, Meskanaw	no data
44	KRF	South of Bromhead	complete-reworked	N. Dakota	Souris Valley Museum, Estevan	small sandy mound in cultivated field
47	Blue-white SRC	12U XP 653 729 6miles S of Cavalier	almost complete	local	Gerry Iverson	flat lowland blowout
48	tapioca silicified sandstone	12U XP 568 744 north of former school	base	local	Larry Iverson	sinuous ridge descending to N.Sask river
53	grey-white chert	12U XP 565 836 2 miles south of Vawn	tip and base broken	exotic to region	Owen Jones, Vawn	sandy crest on knoll, undulating lowland
54	maroon/white spotted chert	12U XP 353 808 3milesN 2milesW of Paynton	basal ear missing	no data	G. Dykstra, Paynton	Sand dune 1.5km E of FgOf-9
55	taffy chalcedony	12U XP 353 808 3milesN 2milesW of Paynton	complete	no data	G. Dykstra, Paynton	Sand dune 1.5km E of FgOf-9
25	KRF	Meskanaw NW 34 43 22 W of 2	base	N. Dakota	Hanson, Meskanaw	no data

Reference Number	Lithic Type	Provenience	Completeness	Material Source	Repository	Terrain
K4a	basalt	Major locality (EIOi-2)	Complete-reworked	local	no data	no data
K4b	red argillite	McCord locality	Complete-reworked	exotic to region	no data	no data
K4c	quartzite	McCord locality	Complete-reworked	local	no data	no data
K4d	brown chert	McCord locality	Complete-reworked	local	no data	no data
K4e	agate	McCord locality	Complete-reworked	no data	no data	no data
K4f	silicified wood	Rosearay locality (EdOc-1)	Complete-reworked	local	no data	no data
K4g	tan chalcedony	McCord locality	tip missing	no data	no data	no data
K4h	brown chert	McCord locality (DjNr-4)	base	local	no data	no data
K4i	KRF	McCord locality	Complete-reworked	N. Dakota	no data	no data
K4m	white chalcedony	Kerrobot locality (EIOi-1)	Complete-reworked	local	no data	no data
K4n	KRF	McCord locality (DjNr-4)	tip is missing	N. Dakota	no data	no data
56	white chert	12U XP 905 989 5 miles north of Jackfish Lake	Complete-reworked	local	no data	no data
46	Red Fine-grained Quartzite	12U XP 704 680 bw Jackfish Lake and N.Sk river	almost complete	local	Donald Guy, Fairview Alta.	level sandy blowout
49	Jasper	12U XP 677 797 3km W of Jackfish Lake	Complete-reworked	no data	Winston Tait, Meota	NW/SE trending ridge, cultivated field
50	whitish-salmon SRC	12U XP 623 877 N of Cavalier and W of Jackfish L.	missing basal ear	sask.	Gerry Iverson	lowland hill crest blowout
51	White SRC	12U XP 623 877 N of Cavalier and W of Jackfish L.	impact fracture tip	local	Gerry Iverson	lowland hill crest blowout
52	white-pink quartzite	12U XP 623 877 N of Cavalier and W of Jackfish L.	tip broken	local	Gerry Iverson	lowland hill crest blowout
57	Pink SRC	12U XP 189 809	Missing basal corner	local	L. Foster	no data
58	Pink SRC	12U XP 381 972	Complete-reworked	local	Sam Cole, Edam	no data

⁶ Knife River Flint

⁷ Swan River Chert

Northwestern Point Data Summary: Quantitative Data

Reference Number	Max. Length (cm)	Max. Width (cm)	Max. Width from base (cm) ²	Lateral Grinding (cm) ³	Basal Width (cm)	Basal Depth (cm)	Flute Length ⁴ (cm)	Max. Thickness (cm)
1	4	2	no data	no data	2	no data	no data	no data
2	no data	no data	no data	no data	2.46	0.37	minimal ⁵	0.4
3	3.69	2.95	no data	0.9 - 0.7	2.1	0.27	1.35 ⁵	0.55
4	3.98	2.94	no data	0.88 - 0.4	2.4	0.2	1.2 - 1.3 ⁵	0.8
5	4.2	3.2	1.2	1.4 - 1.2	2.8	0.63	0.6 - 0.5 ⁵	0.8
13	4.34	2.32	no data	1.8 - 0.6	2.3	0.12	1.4 - 0.9	no data
14	3.83 ¹	2.97	no data	no data	2.4	0.23	1.81	0.8
15	2.42 ¹	2.45 ¹	no data	2.42 - 2.42	2.42 ¹	0.2	0.85 - 0.76 ⁵	0.58
16	2.77 ¹	2.98	0	2.1 (unbroken side)	2.98 ¹	0.9	entire length ¹	0.8 ¹
17	4.14	2.85	0	1.4 - 1.8	2.8	0.4	1.0 - 0.8	0.74
26	4.8	2.9	1.63	2.66 - 2.91	2.79	0.35	one surface ⁵	0.6
44	6	3.3	2.5	2.7	2.9	0.5	1.4 one surface	0.5
47	4.69	2.9	1.4	no data	2.6	0.3	ribbon flakes ⁵	no data
48	2.9 ¹	2.6	1.2	present/limited data	2.4	0.35	ribbon flakes ⁵	no data
53	3.9 ¹	2.55	1.13	no data	no data ¹	0.4 ¹	1.2	no data
54	3.4	2.2	0.6	present/limited data	1.9 ¹	0.3 ¹	0.5 ⁵	no data - biconvex
55	3.6	2.1	1.9	none	2	0.2	0.9 ⁵	no data - biplano
K4i	3.3 ¹	2.5	no data	entire sides to break	2.23	0.44	1.8 - entire length ¹	0.4
K4a	4.2	1.7	1.5	1.6 - 1.8	2.3	0.3	1.9 - 1.85	0.55
K4b	4.94	3.15	1.55	1.6 - 1.6	3	0.53	1.9 - 1.37 ⁵	0.6
K4c	4.08	2.5	1.2	1.75 - 1.7	2.3	0.34	0.1 - 0.7	0.5

Reference Number	Max. Length (cm)	Max. Width (cm)	Max. Width from base (cm) ²	Lateral Grinding (cm) ³	Basal Width (cm)	Basal Depth (cm)	Flute Length ⁴ (cm)	Max. Thickness (cm)
K4d	3.4	1.7	1.1	none	1.5	0.2	1.3 - 1.35	0.5
K4e	4	2.2	0.45	1.6 - 1.3	2.2	0	1.2 - 1.3	0.5
K4f	3.85	2.2	1.8	2.0 - 1.8	2.15	0.2	2.8 - 2.8	0.55
K4g	no data ¹	2.5	1.6	1.1 - 1.2	1.9	0.25	1.2 - 1.15	0.6
K4h	no data ¹	2.4	2.2	1.6 - 2.2	2.2	0.2	1.5 - 1.2	0.47
K4l	5.32	2.53	1.2	1.95 - 1.25	2.2	0.3	1.45 - 1.5	0.6
K4m	3.1	2.07	2	1.85 - 2.0	1.75	0.1	1.9 - 0.7	0.6
K4n	no data ¹	2.4	2	1.87 - 2.5	2.17	0.4	2.2 - 1.7	0.4
56	no data	no data	no data	1.5 - 1.5	no data ¹	no data	basally thinned	no data
46	5.42	2.7	1.9	2	2.29	0.5	basally thinned	no data
49	4.9	2.52	0.7	no data	2.4	0.42	basally thinned	no data
50	4.8	2.5	no data	no data	2.5	0.5	basally thinned	no data
51	4.75	2.41	1.67	no data	2	0.33	2.0 one surface	no data
52	4.6	2.51	1.6	no data	2.2	0.22	basally thinned	no data
57	no data	no data	no data	no data	no data ¹	no data	basally thinned	no data
58	no data	no data	no data	no data	no data ¹	no data	basally thinned	no data
Average	4.34	2.54	1.36		2.31	0.33		0.59

¹ broken

² Distance from base at which maximum width occurs. Some of these measurements were not taken.

³ The first number indicates the distance upwards from the base that lateral grinding occurs. When two numbers appear, they indicate different distances on the two sides of the specimen. For some specimens, measurements of the extent of lateral grinding

⁴When two numbers appear, they indicate different distances on the two sides of the specimen.

⁵ basally thinned

Folsom Point Data Summary: Qualitative Data

Reference Number	Lithic Type	Provenience	Completeness	Material Source	Repository	Terrain
9	no data	no data	no data	no data	missing	no data
10	KRF ⁷ patinated	Hoveland (W of Kyle)	base	N. Dakota	no data	blowout
11	grey/brown chert	Sintulata	complete-reworked	local	Gary Germann, Maple Creek	no data
19	grey chert	2 miles E of Kyle	complete	Texas	Bill Thomson, Kyle	blowout
24	orange/brown chert	Leader SW 34 20 26	base	no data	Wayne Wenzel, Leader	blowout
27	KRF	N of Tugaska 1 mile from Qu'Appelle	complete	N. Dakota	Hugh (?)	cultivated field
36	KRF	1/2 mile south of Osage, meters off main road going south	complete	N. Dakota	no data	flat sand blowout
37	fine tan chert	1/2 mile south of Osage, meters off main road going south	complete	no data	no data	flat sand blowout
38	Moss agate	1/2 mile south of Osage, meters off main road going south	base	no data	no data	flat sand blowout
40	KRF	North of Rocanville in Qu'Appelle Valley	base	N. Dakota	Brenda Sarazin, Rocanville	valley bottom blowout
K3e	KRF	South of Bromhead	complete	N. Dakota	Souris Valley Museum, Estevan	small sandy mound in cultivated field
K3f	KRF	South of Bromhead	complete	N. Dakota	Souris Valley Museum, Estevan	small sandy mound in cultivated field
K3a	red argillite	Great Sand Hills locality	complete	exotic	no data	no data
K3b	white chalcedony	Roseray locality (EcOc-1)	complete-reworked	local	no data	no data
k3c	yellow chert	Regina locality (EbNc-1)	complete-reworked	local	no data	no data
K3d	grey chert	McCord locality (DjNr-4)	base	local	no data	no data
K3g	KRF	Mortlach locality (EcNm-1)	fragment	N. Dakota	no data	no data
K3h	KRF	Bromhead locality (DgMv-1)	base	N. Dakota	no data	small sandy mound in cultivated field
K3i	KRF	Woodrow locality (DjNr-21)	base	N. Dakota	no data	no data
43	KRF	South of Bromhead	top 3/4	N. Dakota	Souris Valley Museum, Estevan	small sandy mound in cultivated field

⁷ Knife River Flint

Folsom Point Data Summary: Quantitative Data								
Reference Number	Max. Length (cm)	Max. Width (cm)	Max. Width from base (cm) ²	Lateral Grinding (cm) ³	Basal Width (cm)	Basal Depth (cm)	Flute Length ⁵ (cm)	Max. Thickness (cm)
9	no data	no data	no data	no data	no data	no data	no data	no data
10	no data	2.41 ¹	no data	no data	1.9	0.19	2	0.45
11	4.43	2.34		2.15 - 2.6	1.84	0.32	3.8 - 3.02	no data
19	3.7	2.25	1.95	1.9	1.95	0.3	2.8 - 3.3	0.5
24	2.97 ¹	2.36 ¹	no data	entire sides to break	1.95 ¹	0.3	no data ¹	0.6 ¹
27	3.8 ¹	1.73	no data	2.55 - 2.8	2.64	0.23	3.12 - 3.12	0.5
36	4.6	2.2	1.94	2	1.65	0.2	3.9 - 4.0	0.5
37	4.5	2.3	1.85	1.6	1.8	0.2	4.2	0.6
38	3.7 ¹	2.7	2.8	3.1	2.1	0.2	2.7 - 2.7	0.5
40	3.8 ¹	3.2	3.4	0	2.1	0.2	no data ¹	0.47
K3e	7.2	2.4	3.35	3.1 ⁴	1.7	0.3	5.5 - 6.5	0.4
K3f	5.5	2.5	2.7	2.9 ⁴	1.8	0.3	5.0 - 5.0	0.5
K3a	3.43	1.67	1	1.3 - 1.3	1.6	0.3	2.95 - 2.9	0.43
K3b	3.8	1.85	1.7	1.9 - 1.7	1.68	0.1	1.1 - 3.2	0.47
k3c	3.1	1.75	1.2	1.6 - 1.25	1.7	0.25	2.4 - 2.7	0.4
K3d	no data ¹	2	no data ¹	2.05 ¹	1.87	0.3	no data ¹	0.3
K3g	no data ¹	2.45	no data ¹	no data	no data	no data	no data	0.35
K3h	no data ¹	2.2	no data ¹	no data	no data	no data	no data	0.45
K3i	no data ¹	2.9	3.2	no data	2.4	0.3	no data	0.55
43	4.2 ¹	2.1	2.7 (from tip)	2	no data ¹	no data ¹	2.9 - 2.4 (from break)	0.4
Average	4.47	2.14	2.28		1.95	0.26		0.45

Ratio of Basal Width:Maximum Width= 0.91

¹ broken

² distance from base at which maximum width occurs. Some of these measurements were not taken.

³ The first number indicates the distance upwards from the base that lateral grinding occurs. When two numbers appear, they indicate different distances on the two sides of the specimen. For some specimens, measurements of the extent of lateral grinding

⁴ replica

⁵ When two numbers appear, they indicate different distances on the two sides of the specimen.

⁶ basally thinned

⁷ not including broken points for which data was unavailable

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