A Lithic Analysis
of the Jackson Site (DiMe-17) in Southwestern Manitoba

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Abstract

The Jackson site (DiMe-17) is a Late Precontact site located in the Lauder Sand Hills of southwestern Manitoba. Primarily a bison kill and processing locale for Vickers focus people, this winter occupation has a calibrated radiocarbon date range between A.D. 1427 and A.D. 1683. Although a small Blackduck component was evident in the southwest corner of the site, the Vickers focus occupation was the dominant presence at this site and is the focus of this thesis.

Archaeological investigations between 1994 and 1997 yielded a sample from 36 one square metres excavation units and 67 shovel tests pits. As part of an extensive investigation of Plains Woodland occupation of the region over the past 1200 years, excavation of the site served to provide additional information about Vickers focus occupation within the *Makotchi-Ded Dontipi* locale.

This study offers a lithic analysis that encompasses the debitage and tools with an emphasis on the spatial distribution of the lithic materials. This seeks to assess the validity of the proposed activity areas at the Jackson site. The lithic analysis verified the presence of habitation and kill areas. Lithics from the east-central part of the site indicated processing activities as opposed to a large midden area associated with faunal processing as initially proposed in earlier studies. Late Side-notched projectile point types dominate the assemblage from the site. Plains and Prairie Side-notched point styles are affiliated with the Mortlach phase, Central Plains Tradition, Mississippian Tradition, and Middle Missouri Tradition. The Vickers focus people may have interacted and exchanged lithic materials with these groups. The Vickers focus people utilized exotic (Knife River flint, Tongue River silicified sediment, obsidian) as well as local materials (chalcedony, chert) to manufacture their tools.

Acknowledgments

I wish to express appreciation towards my committee members, Drs. Urve Linnamae, Ernie Walker, Bev Nicholson and Mary Marino. Dr. Walker served as my advisor for this thesis and Dr. Marino was the external examiner. Dr. Margaret Kennedy acted as defence Chairperson.

I was provided with funding by the University of Saskatchewan through a series of teaching assistantships, which gave me an opportunity to teach and interact with the undergraduates within the department. Financial aid from the Vivian Williams Morton and Arthur Silver Morton scholarship and University of Saskatchewan's Vice President's Student travel grant permitted me to attend archaeological conferences. These experiences allowed me to learn about current research regarding lithic assemblages from other Canadian archaeological sites. It also gave me the opportunity to speak with other professionals regarding the Jackson site. The Saskatchewan Archaeological Society awarded me with a research grant, which enabled me to purchase digital calipers, which are an asset when measuring thousands of flakes. The grant also provided the means to acquire research materials from other accredited universities and institutions across Canada and the United States. I would like to thank Drs. Bev Nicholson and Scott Hamilton for ensuring employment every summer since 1996. In addition, they provided me with an opportunity for the last two years to be involved in the SCAPE project as laboratory supervisor and manager. This experience has given me the chance to interact with different researchers from a variety of disciplines, attend conferences, and participate in the creation of the PC based cataloguing program (ArchWizard).

Acknowledgment must also be given to avocational archaeologists, Doug Jackson and the late Ray Bradshaw, who discovered the Jackson site. They recognized the importance of this site and realized that the impending road construction would ultimately destroy the site and reported their findings to Dr. Nicholson. During the years of investigations, many field school students, supervisors, paid crew both in the field and in the lab, and one volunteer exposed themselves to poison ivy, mosquitoes, and cold showers. These folks are thanked for their hard work, careful recording, and determination. I would also like to express gratitude to Dr. B.A Nicholson for allowing me to use the Jackson site lithic assemblage for my research and for providing me laboratory space at Brandon University while completing my analysis.

A special thank you to my editor angels, Dr. Scott Hamilton and Jill Taylor-Hollings for their critical evaluations and suggestions scribbled along the margins of my numerous drafts. As well as for their time that they gave to read the drafts despite their hectic schedules. Scott and Jill also provided me with invaluable advice and words of encouragement when I needed to hear those words the most. Dr. Hamilton also supplied me with many maps and radiocarbon data for this thesis.

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My student experience at the University of Saskatchewan would not have been complete without some very special people. Kim, Jeremy, and Keila, along with the Grad Movie night gang, shared some memorable times, particularly the Oscar movie party and murder mystery dinner. A special thank you is extended to Tomasin Playford who shared with me her invaluable advice about thesis organization and formatting. Bev, Scott, Tomasin, Jill, Niki, Kim, and Janet gave moral and emotional support unselfishly.

My husband, Dave Norris, deserves a gold medal because he met me when I first entered the graduate program and despite the difficult times has stayed by my side. He

has remained patient when I was feeling overwhelmed and frustrated. Dad, Mom, Keith, Marilyn, and my grandmother for giving me encouragement. They reminded me that work should not be the only thing a person survives on.

This thesis is dedicated to those people who stood by my side.

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Chapter One
Goals of the Lithic Analysis of the Jackson Site

1.1 Introduction

This thesis presents the results of an analysis of the stone tools and debitage recovered from the excavation units at the Jackson site (DiMe-17), located within the Lauder Sand Hills of southwestern Manitoba (Figure 1.1). Excavation of this site occurred between 1993 and 1997 under the co-direction of Drs. B.A. Nicholson and S. Hamilton as part of an extensive investigation of Plains Woodland occupation of the region spanning the past 1200 years.

The Jackson site appears to be a winter occupation and consists of a small bison kill with associated midden/processing and habitation areas (Playford 2001). The primary cultural occupation is represented by the Vickers focus although there is also a small Blackduck component in the southern portion of the site (Hamilton and Nicholson 1999:15). A broad range of materials was recovered from the Vickers focus occupation. This consists of severely smashed and processed animal bone, fire modified rock, stone tools and debitage, and pottery. Hamilton and Nicholson (1999) proposed that there was patterned variation in the distribution of shovel recoveries that is suggestive of localized activity areas. This issue was addressed, in part, by Playford (2001) who focused her attention upon the nature of the faunal assemblage. This thesis also offers a critical examination of the proposed activities areas by specifically investigating the nature of the lithic assemblage.

1.2 Research Goals

The priority of this analysis is to assess the lithic tools and debitage recovered from the excavation units, as opposed to the shovel tests, within the proposed kill, midden/processing, and habitation areas of the Jackson site. This re-evaluation of the activity areas is accomplished by: (1) organizing the tools and debitage into types; (2) identifying stone raw material selection; and (3) evaluating these results in the spatial context of recovery. This culminates in a comparison of the Jackson lithic assemblage with those recovered from other comparable sites that are also thought to contain habitation, midden, processing, and kill areas. It is important to re-examine the proposed activity areas offered by Hamilton and Nicholson (1999) because these

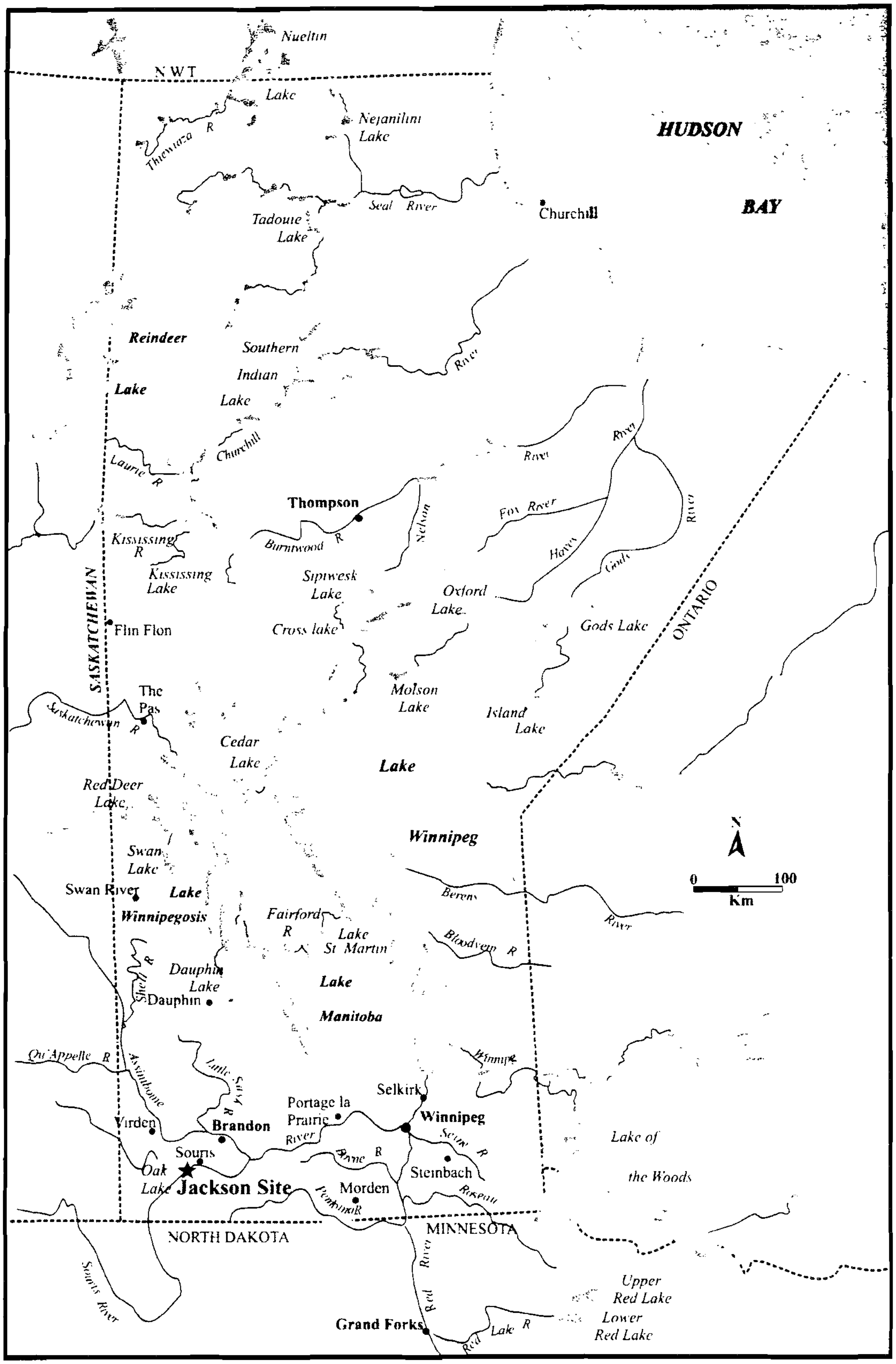

Figure 1.1 Location of the Jackson site within the Lauder Sand Hills of southwestern Manitoba (after Welsted et al. 1996).

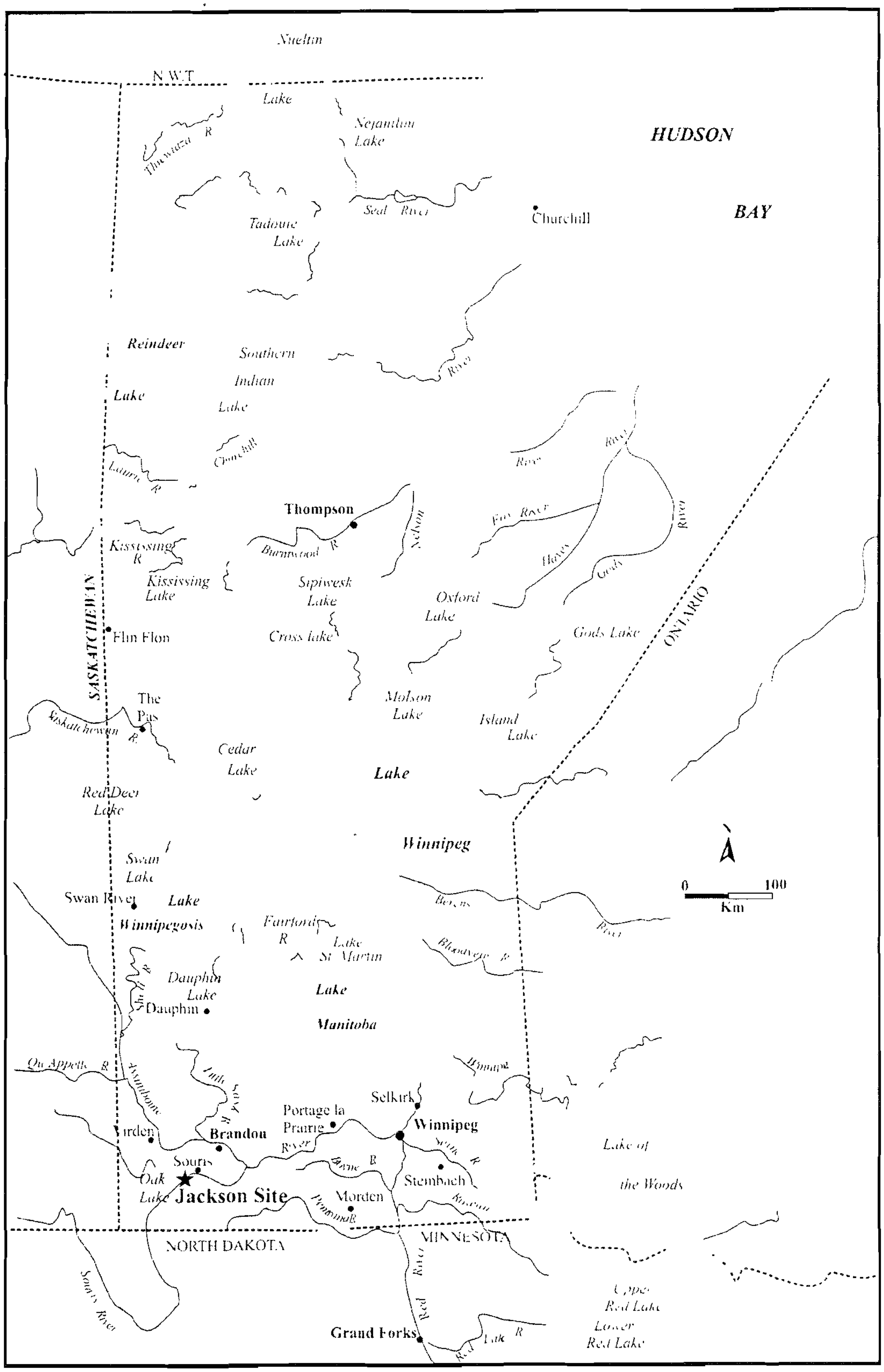

Figure 1.1 Location of the Jackson site within the Lauder Sand Hills of southwestern Manitoba (after Welsted et al. 1996).

interpretations relied upon simple evaluation of the quantity and density of cultural materials recovered from only the shovel tests. Given the wide spacing between the individual shovel test pits and also the comparatively small sample recovered from each 50 cm wide test pit, such provisional explanations risk misinterpretation.

The identification of activity areas within archaeological sites is dependent upon the definition of activity-specific artifact assemblages. Thus, this analysis of the Jackson site begins with the classification of the stone tools according to function. The debitage is then organized into types that reflect either manufacturing or tool maintenance activities. Debitage is also analytically beneficial since it can be used to indirectly infer the use of curated tools that were not deposited at the site. In this study, the lithics are categorized into activity-specific classes by completing an attribute analysis for each of the stone tool and debitage types.

It is also necessary to identify the lithic raw material types and to examine local and exotic material selection by the Jackson site occupants. The results of this assessment will provide information about the involvement of Vickers focus people in exchange networks and to demonstrate local lithic preferences. It is also essential to consider the changing density and nature of lithic raw materials across the site to aid in understanding activity areas within the site.

Finally, the results of the lithic analysis of the site are compared to other archaeological sites reported across the Northern Plains. This will contribute to the establishment of a set of criteria that can be used to infer habitation, midden, processing, or bison kill activities. Such an evaluation ultimately will contribute to the critical evaluation of the preliminary activity area determinations offered by Hamilton and Nicholson (1999). This analysis may lead to modification of the present interpretation of the activity areas at the site.

The Jackson site is ideal to use for this lithic analysis. It consists of an adequate sample size of each category of tools and debitage that makes it ideal to use for a morphological and technological analysis. However, this sample size and more importantly the wide distribution of the lithic assemblage proved to be inadequate for a detailed spatial analysis. The apparent presence of several discrete activities associated with bison procurement, processing, and consumption provides an excellent opportunity to assess the expression of these activities in the lithic assemblage. Playford (2001) completed a faunal analysis and another graduate student will be studying the pottery from the sites in the *Makotchi-Ded Dontipi* locale, which will include the Jackson site. Thus, this site will become the only Vickers focus occupation that has had the three primary artifact sub-assemblages subjected to comprehensive analysis.

1.3 Chapter Summary

Chapter One presents the primary aims and objectives of the thesis overall. This includes a review of the benefits of using stone tools and debitage to understand aspects of human behavior. In addition, the rationale for discussing lithic raw material procurement and utilization at the Jackson site is also introduced in this chapter.

Chapter Two offers information about the geographical setting and the history of site investigation. This includes a brief summary of the geology and hydrology of the Glacial Lake Hind Basin (GLHB). The climate, vegetation, and fauna of the Transitional Grassland eco-region are described with emphasis on the Lauder Sand Hills region. Finally, the Jackson site is described in terms of its location and size, and also with reference to the internal variability apparent in artifact recoveries that have suggested discrete activity areas (Hamilton and Nicholson 1999). The chapter concludes with a brief discussion of the previous lithic analyses conducted using the Jackson site collection.

Chapter Three provides an overview of the Late Precontact Northern Plains culture history, including both the Late Woodland bison hunter and gatherers and the Plains village traditions. This cultural context is important because these groups may have either co-existed with Vickers focus or influenced their lithic technology and procurement. This discussion includes reference to Blackduck phase, Mortlach phase, Middle Missouri Tradition, Central Plains Tradition, and Mississippian Tradition. The Plains/Prairie Side-notched and Triangular point series are also discussed because of the ubiquitous presence of these tool forms across sites found throughout the Northern Plains. The chapter concludes with an extended summary of the current interpretation of Vickers focus occupation in southwestern Manitoba.

Chapter Four provides the methodological and theoretical frameworks used to analyze the lithic assemblage, and evaluate the subsequent interpretations of the Jackson site. This discussion introduces the attributes used in this thesis. The three analytical components of the thesis are described in detail. This includes the observation of lithic attribute states used in the analysis of the debitage. The second phase of research offers a detailed analysis of the formal and expedient tools. Finally, the third research phase outlines the procedures used to examine the spatial distribution of lithic materials.

Chapter Five includes the results from each analytical component. This discussion is organized to reflect the recoveries from each of the activity areas proposed by Hamilton and Nicholson (1999). Debitage, utilized flakes, and formed tools are described for each activity area.

Chapter Six reviews the lithic raw materials utilized by the Jackson site occupants, and offers comparison to the pattern of recovery at other Vickers focus sites in the Tiger Hills and Lauder Sand Hills regions. In addition, the criteria used to evaluate the proposed activity areas at the Jackson site are also presented. The chapter concludes with an evaluation of the activity areas proposed by Hamilton and Nicholson (1999).

Chapter Seven offers a concluding summary of the lithic analysis of the Jackson site.

Chapter Two
Geographical Setting and Site Background

2.1 Introduction

The Jackson site is located in the Lauder Sand Hills of southwestern Manitoba, within the Glacial Lake Hind Basin (GLHB). This area consists of aspen parkland, mixed prairie, localized wetlands, as well as stabilized and actively eroding sand dunes. This mosaic of microhabitats might have ensured a diverse range of plant and animal resources for the region's Precontact occupants. The formation of these habitats relates directly to Holocene landscape transformation that began with the Pleistocene deglaciation of the GLHB. The ecological diversity and dynamism of the region was produced through a series of geological and environmental processes stemming from the late Pleistocene and early Holocene epochs. These geological processes also are important since they contribute to local lithic sources. Given that the focus of this thesis is the nature of the lithic technology evident at the Jackson site, it is also important to offer a generalized overview of the relevant bedrock geology of Manitoba. Although not obviously relevant to the topic, the overall glacial history of Manitoba influenced the eventual formation of the Lauder Sand Hills region.

2.2 Glaciation and Geomorphology of Southwestern Manitoba

Four natural regions of Manitoba represent the general geological structure of Manitoba: 1) Hudson Bay Lowlands; 2) Precambrian Shield; 3) Manitoba Lowlands; and 4) Southwestern Uplands (Figure 2.1). The most northern and eastern zones (Hudson Bay Lowlands and Precambrian Shield) are important for this discussion only in the context of glacial transportation of clasts suitable for the production of stone tools. During the Pleistocene epoch, as the Laurentide glacier expanded from the northeast towards the southwest across Manitoba, it transported clasts in the ice (Corkery 1996). This includes thick accumulations of glacial debris that formed a variety of landscape features. These include terminal moraines, ground moraines, outwash plains, as well as glacio-fluvial and glacio-lacustrine sorted sediments (Young 1996:243). With deglaciation and the associated glacio-fluvial processes, a wide range of materials consisting of sand and gravel were deposited that derive from numerous sources over a broad geographic area (Corkery 1996). An extensive variety of useable lithic materials (Figure 2.2) were thereby deposited in southwestern Manitoba as a till mantle overlying the predominantly Cretaceous bedrock that formed the Southwestern Uplands (Manitoba Escarpment) (see also Thomson 1994:5). These bedrock deposits underlay some of the major uplands found within the southwestern portion of the province, of which Riding and Turtle Mountains are particularly important to this thesis.

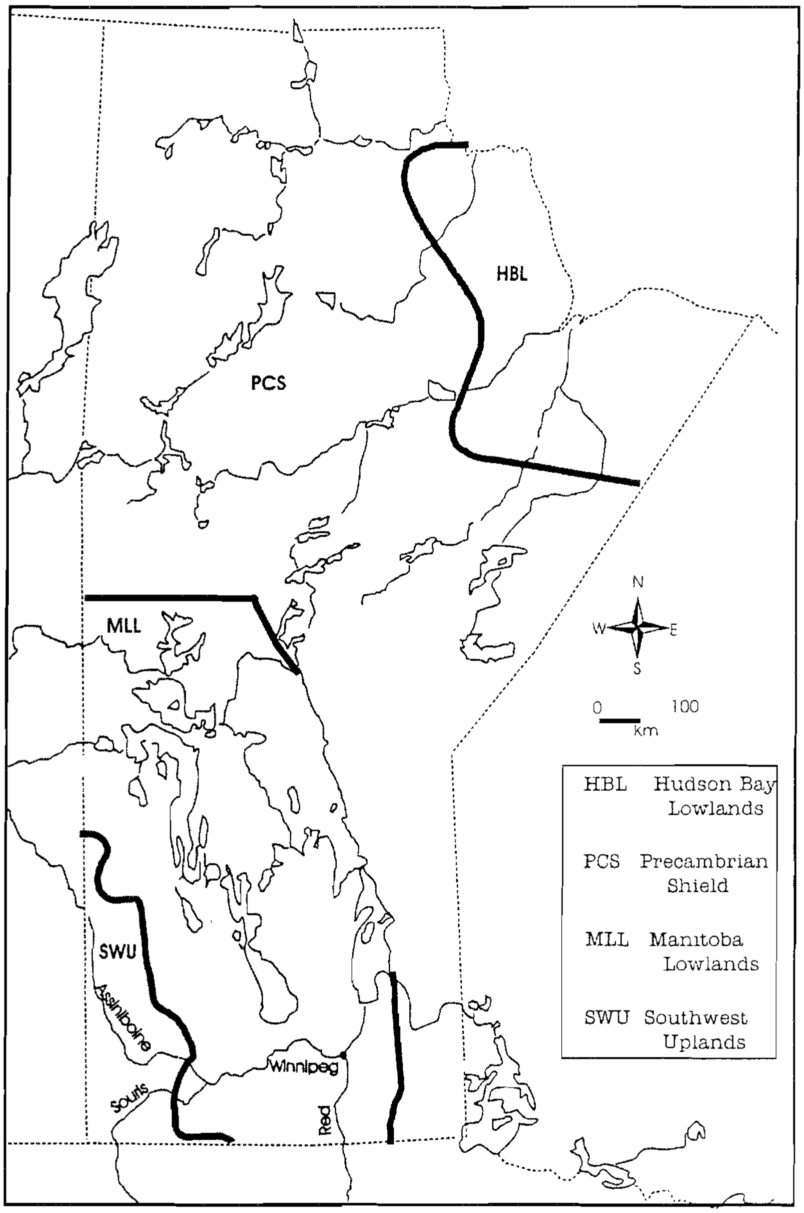

Figure 2.1 Physiographic regions of Manitoba (after Corkery 1996).

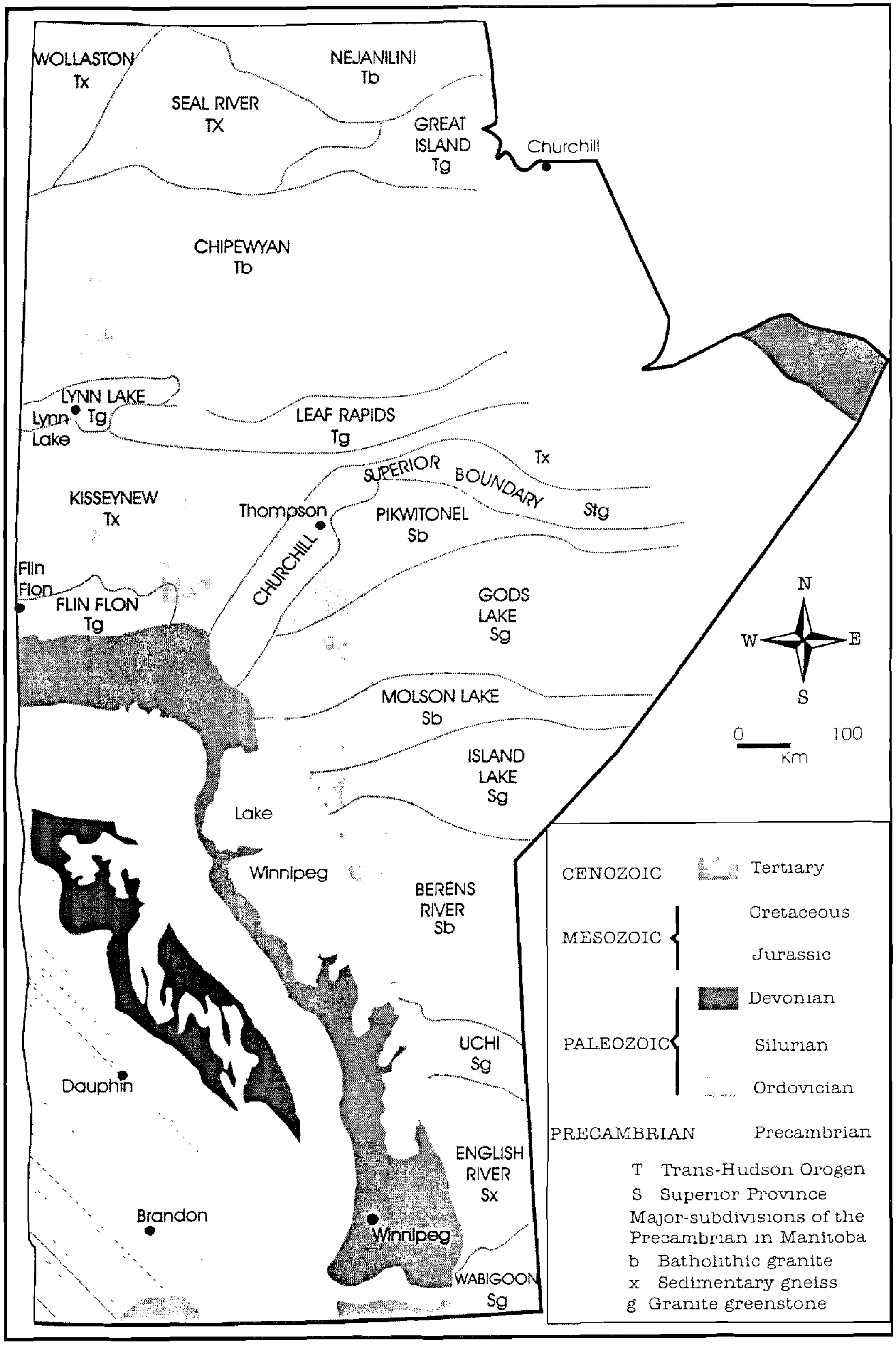

Figure 2.2 Generalized geology of Manitoba (after Corkery 1996).

The Jackson site is located within the Souris River Plain of the Southwest Uplands (Figure 2.3). Mesozoic strata underlie the area and they are occasionally exposed along the Manitoba Escarpment face (Corkery 1996:21). Thick deposits of glacial till and sediments of post-glacial origin cover the majority of the bedrock. Located to the south, Turtle Mountain is the most prominent landscape feature in southwestern Manitoba. It consists of Paleocene age rock that was subsequently buried by thick accumulations (up to 150 m) of glacial drift primarily consisting of fine sandy and silty shales (Corkery 1996:21). It was within these geomorphological features that significant quantities of suitable lithic materials were deposited and were subsequently collected by Aboriginal people.

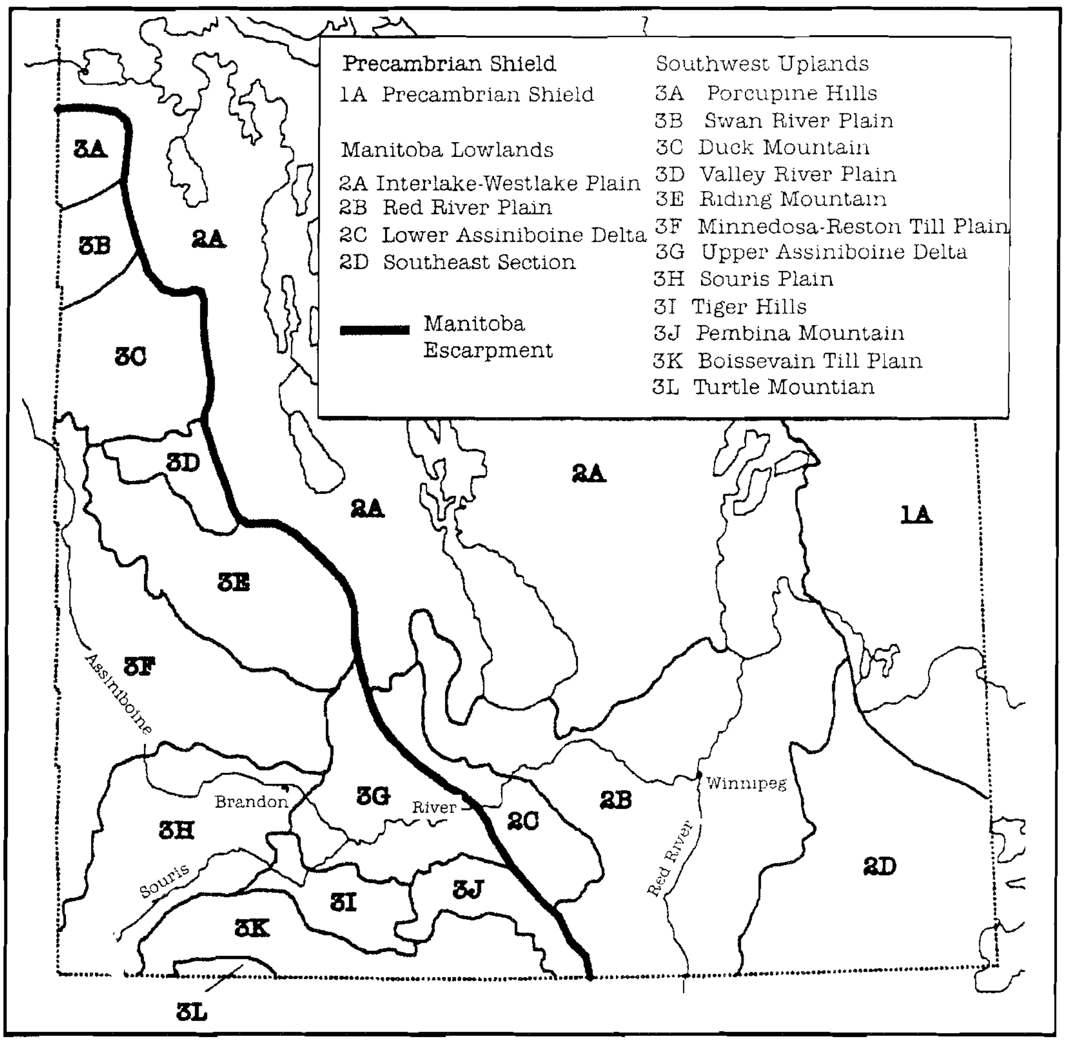

Figure 2.3 Physiographic regions of southwestern Manitoba (after Corkery 1996).

With cycles of glacial advance and retreat, large quantities of glacial, glacio-fluvial, and glacio-lacustrine sediments accumulated upon the eroded bedrock. "Most Quaternary deposits in southwestern Manitoba were deposited as a direct result of Pleistocene glaciation. Only a small portion of them-including eolian dunes, alluvium, and organic rich sediments-were deposited during the Holocene or other interglacials" (Sun and Teller 1997:11). Meltwater outwash channels eroded down through the bedrock and till accumulations and proglacial meltwater lakes formed and then abruptly drained. The consequences of these glacial and post-glacial processes contributed significantly to the current landscape of the province. Evidence of these processes include former lakebeds composed of fine silts and clays, strand lines (along the Manitoba Escarpment), spillways (Assiniboine Valley; Souris and Pembina rivers), and deltas.

The origins of the Lauder Sand Hills directly relate to the formation and subsequent desiccation of one of these proglacial lakes. Beginning about 15,000 years ago, the Laurentide ice sheet began to gradually recede (Figure 2.4). The Wisconsinan period began about 75, 000 years ago (Corkery 1996:17) and ended as early as about 12, 000 years ago in what is now southern Saskatchewan and Manitoba. However, glacial conditions persisted in the north until as late as 8, 000 years ago (Corkery 1996:17). During the Late Wisconsinan period, two ice lobes, the Red River Lobe and the Souris Lobe (Figure 2.5), dominated southern Manitoba (Sun and Teller 1997:15). Deglaciation of the Souris Lobe within the GLHB (Figure 2.4) probably began after 12,000 years ago (Sun and Teller 1997:15). As this lobe melted and retreated northwards, meltwater remained trapped on the recently exposed land to form various phases of Glacial Lakes Hind and Souris (Sun and Teller 1997). Glacial Lake Hind covered approximately 4,000 km^2 and laid down thick accumulations of clay and silt clay as lake bottom sediments (Sun and Teller 1997:9). These meltwater lakes formed within what is now the GLHB (Figure 2.4).

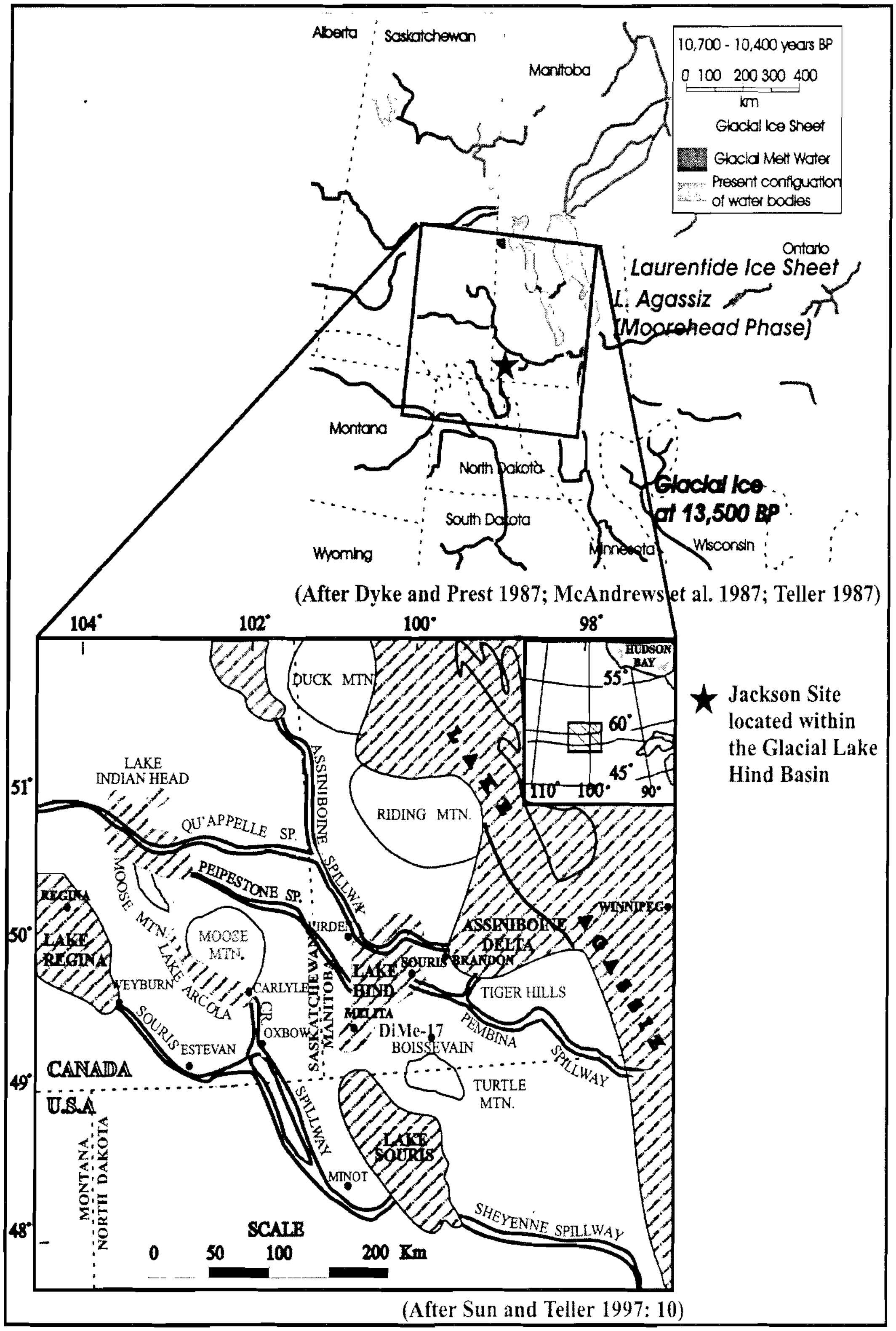

Figure 2.4 Coverage of the Laurentide ice sheet in Canada and the location of the GLHB (after Sun and Teller 1997; Hamilton, personal communication 2003).

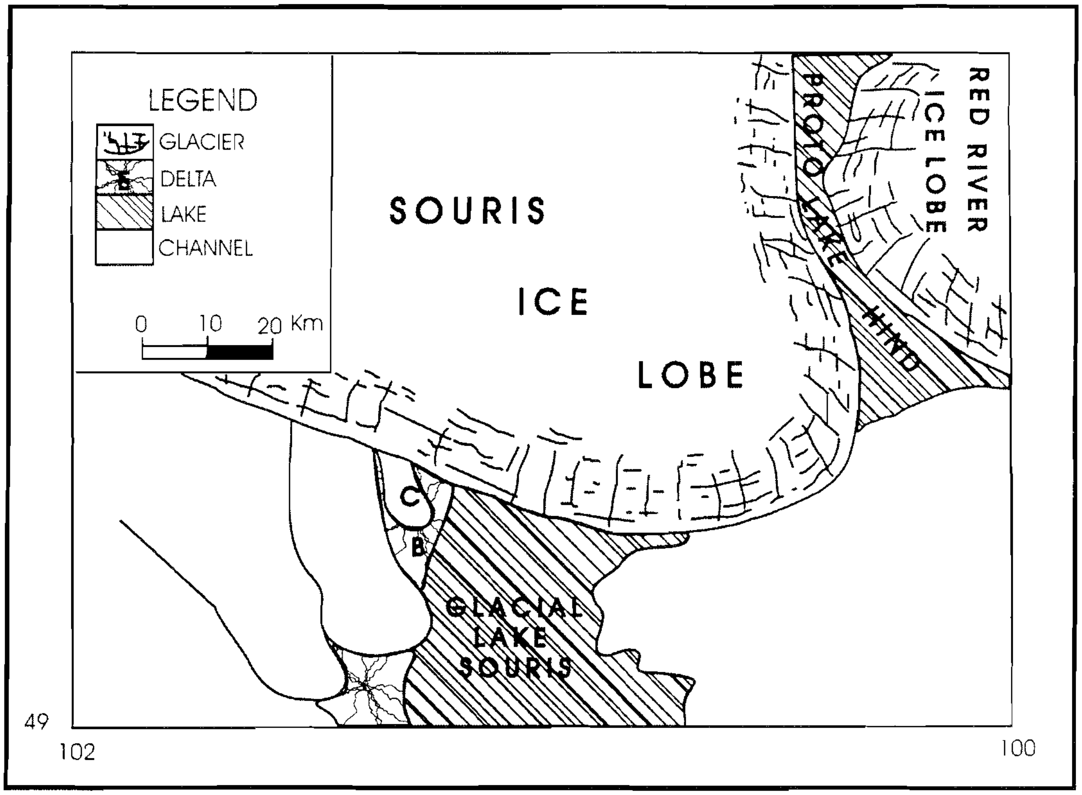

Figure 2.5 Location of the ice lobes, Glacial Lake Souris, and proto Glacial Lake Hind (after Sun and Teller 1997).

The GLHB forms a shallow topographic basin located north of the Turtle Mountain upland, east of the Moose Mountain upland, and south of the Riding Mountain upland (Figure 2.4). Both the Souris and Assiniboine rivers drain into and through the basin and both follow remnant glacial meltwater channels. The basin accumulated meltwater directly from the glacier and from a series of meltwater lakes in Saskatchewan, North Dakota, and western Manitoba that drained into Glacial Lake Hind through a series of spillways. The outlets of these spillways formed a series of deltas located along the western shore of this proglacial lake.

With subsequent drainage of Glacial Lake Hind, these deltas became relict landscape features and a source of considerable sediment that was reworked to eventually form the many sand dune complexes within the GLHB. There were 12 deltas along the margin of the GLHB. "Of the 12 deltas, 9 form an irregular and nearly continuous fringe of coarse sediment between the higher elevation till to the west and the finer lacustrine sediments in the lake basin in the east" (Sun and Teller 1997:11). The elevations of these deltas differ dramatically and suggest that the lake into which they drained varied significantly in level throughout its duration. The Lauder delta formed late in the deglaciation sequence and resulted from the abrupt drainage of Saskatchewan's Glacial Lake Regina into the GLHB. The flood eroded the upper Souris River valley and redeposited most of this material into Glacial Lake Hind (Corkery 1996:19). The Lauder delta is one of the two low elevation deltas along the west margin of the basin. It is located north of the Souris river and consists of "6 m of massive, non-stratified, and clast supported cobbles, underlain by till and areas of well laminated clayey silt" (Sun and Teller 1997:13). Given its location, the Lauder delta is specifically relevant for the discussion of the Jackson site. Clasts within the Lauder delta might have provided a local source of both coarse and fine-grained lithic materials for Precontact groups, and definitely affected the ground water and local ecosystems near the Jackson site.

2.3 The Current Hydrology of the Lauder Sand Hills

The current landscape of the Lauder Sand Hills resulted directly from hydrological and aeolian processes dating to the Holocene period. As noted earlier, a series of deltas were formed along the west shore of GLHB. With the drainage of Glacial Lake Hind, these coarse sediments were subjected to erosion by the prevailing northwestern wind and were distributed south and east from their place of primary deposition. "Ground drifting" sand covered the clay and silt lakebed sediments. When this sand encountered an impediment, it accumulated into dunes until continued wind erosion reworked and redeposited it. Because bedrock and clay sediments underlie the aeolian sediments in the GLHB, groundwater became trapped and retained within the coarse sand mantle. This contributed to the formation of the Oak Lake aquifer (Figure 2.6) (Hamilton and Nicholson 1999). Precipitation draining into the coarse sands also might have collected within the aquifer throughout the Holocene period.

The Assiniboine and Souris rivers currently occupy the remnants of ancient glacial meltwater channels. These rivers were the primary drainage and water source in the GLHB. They drain an extensive area within southeastern Saskatchewan and northern North Dakota, but both now carry considerably less water than during the early Holocene period (Sun and Teller 1997:10). Despite the presence of the major spillway channels, the basin contains a large quantity of surface and subsurface water within the

Oak Lake aquifer (Figure 2.6). Eventually, surface depressions began to fill with water, creating small lakes and sloughs.

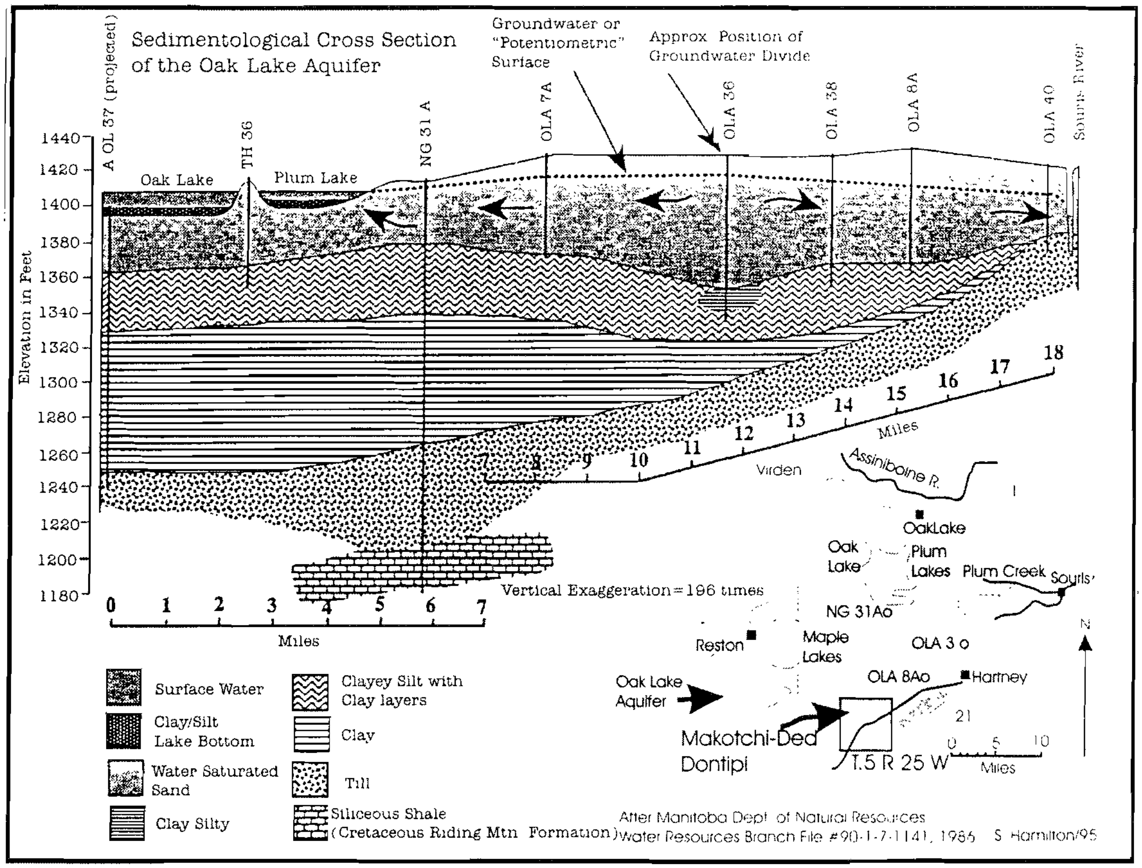

Figure 2.6 Oak Lake aquifer and surrounding microhabitats (after Hamilton and Nicholson 1999).

These wetlands supported and protected arboreal vegetation from chronic prairie fires. In turn, these forest/wetland microhabitats (also including the Souris River) served to break the force of the wind, resulting in the deposition of sand in the form of dunes (Hamilton and Nicholson 1999:9). These processes had a significant effect upon the surface hydrology and biotic capacity of the region, and directly contributed to the mosaic of microhabitats that are presently found within the GLHB.

The localized wetlands were relatively stable and drought resistant and sustained mixed forest and grassland. These areas would have maintained a fairly reliable resource base. The lush vegetation and available water would have attracted a variety of aquatic, avian and mammalian species. Late Precontact groups, such as Vickers focus people, could have used these localized areas that surround the Jackson site. In the winter, these areas may have also offered shelter from the harsh prairie winds and provided a variety of grasses, sedges and shrubs for bison seeking shelter in the forest/wetland microhabitats.

Today the hydrology in the Lauder Sand Hills is dramatically different compared to the Late Precontact period (Hamilton and Nicholson 1999). The local extinction of bison, complex farming practices, modern settlement, and the prevention of natural prairie fires have promoted the expansion of the aspen-oak forest. Agricultural settlement of the region has also significantly reduced the groundwater level thereby obliterating most of the original hydrologic systems. In 1969, construction of a drainage canal from the Maple Lakes to the Souris River occurred (Hamilton and Nicholson 1999:14). This canal rapidly decreased the local ground water levels, accelerated rates of soil desiccation, and destroyed aquatic microhabitats. The wetland vegetation that surrounded these dried potholes was subsequently killed and they became colonized and overgrown with aspen trees.

In order to address and control for environmental change over the past 120 years, Hamilton and Nicholson (1999:10) used 19^{th} century records of the Canadian Dominion Land Survey to construct an ecological model of the area. While these records are valuable for documenting the general pattern of the past ecological situation, they were insufficient to interpret sites. In the situation of the Jackson site, detailed topographic mapping and vegetation inspection resulted in the observation of dead and overgrown willow thickets situated in localized hollows. This suggests that ground water was much nearer to the surface and likely created shallow sloughs and potholes within and around the archaeological deposits. Hamilton and Nicholson (1999:17) manipulated the topographic data within a Geographic Information System to create a model of former water levels using the distribution of relict wetland vegetation (dead willow clumps) to approximate the former pothole shorelines.

According to this model, all elevations below 435.25 m above sea level (ASL) were interpreted as former wetlands. Land up to 25 cm above this level was reclassified as aquatic vegetation associated with wetland margins. Hamilton and Nicholson (1999:17) further proposed that the spatial configuration of these now-extinct wetlands served to support and protect a localized grove aspen-oak forest between 436 and 436.25

m ASL. The resulting model illustrated a series of closely spaced small wetlands, each associated with concentric rings of woody vegetation (Hamilton and Nicholson 1999:17). It is not clear how resilient these forest/wetland microhabitats were in face of periodic drought. However, given the huge volume of groundwater within the Oak Lake aquifer (Figure 2.6), the Lauder Sand Hills region may have persisted as an isolated forest habitat for an extended period.

2.4 Climate

The province's topography and the mid-continental position control the climate of Manitoba. The Lauder Sand Hills are located within the Transitional Grassland ecoclimatic region (Figure 2.7). The absence of major topographic features allows influences from air masses from each of the cardinal directions, although the prevailing westerlies are more prevalent and produce the cold and warm fronts often experienced in the province. "Manitoba can be affected by bitterly cold air masses from the Arctic, mild air originating from the North Pacific, hot and dry airstreams from the American Great Plains, and even tropical flows from the Gulf of Mexico" (Blair 1996:33). These air masses contribute to a severe continental climate, with hot summers and cold winters.

July is the warmest and most humid month with average high temperatures of 26°C and an average low temperature of 12°C, and January is the coldest month with an average temperature range of -22°C to -33°C (Blair 1996:34). There are approximately 250 days per year when the maximum temperature rises above the freezing point. The amount of precipitation varies with the season with droughts and floods periodically occurring in many regions in Manitoba. Although heaviest during the summer, precipitation from May to September ranges from 254 mm to 355 mm. Snowfall amounts fluctuate annually, but average 1270 mm. The interaction between climate and hydrology of southern Manitoba have made it possible to sustain aspen parkland, mixed grass prairie, and sand dune ecology in the Lauder Sand Hills (Figure 2.8).

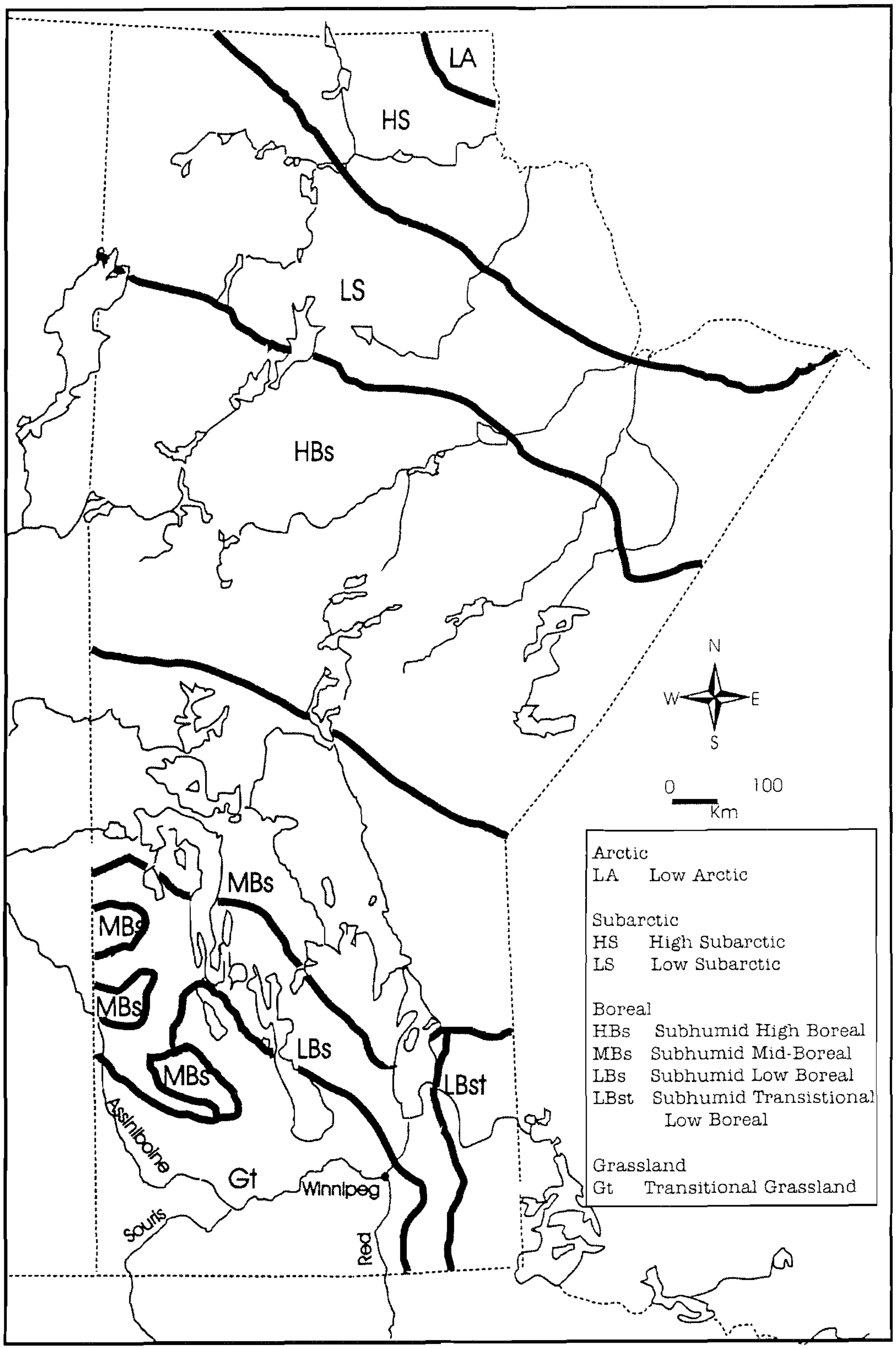

Figure 2.7 Ecoclimatic regions of Manitoba (after Scott 1996).

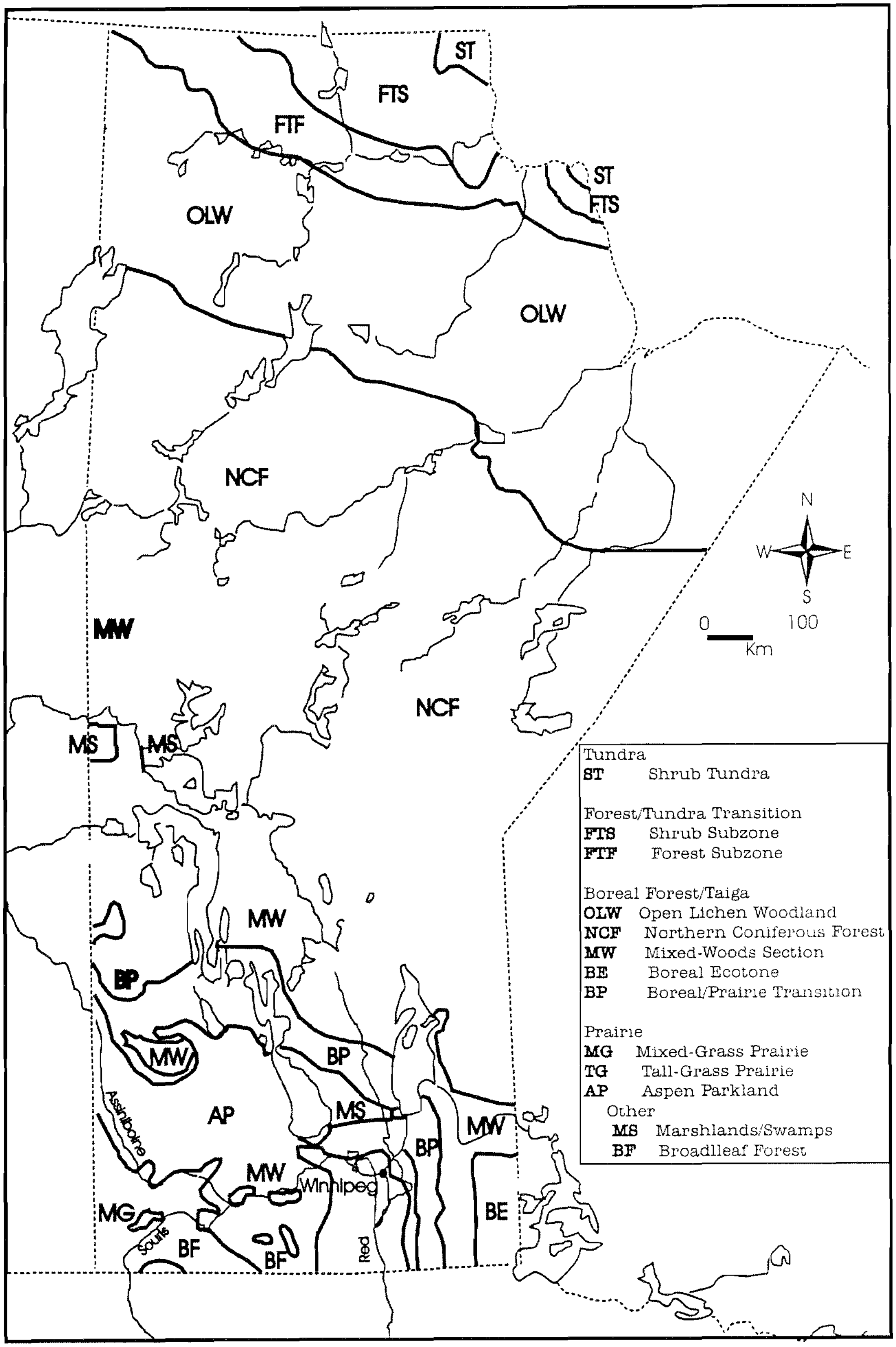

Figure 2.8 Natural regions of Manitoba (after Blair 1996).

2.5 The Ecology of the Lauder Sand Hills

Paleoenvironmental reconstructions of the Lauder Sand Hills suggest that the diverse ecology would have provided a variety of resources useful to Vickers focus people. Hamilton and Nicholson (1999) offered a reconstruction of the ecological situation prior to significant transformation caused by homestead agricultural settlement. They examined late 19th and early 20th century maps that document the biomass in the region. Relying heavily upon the Ernest Thompson Seton's 1905 thematic map, Hamilton and Nicholson (1999) generalized that grasslands covered much of southern Manitoba with a few exceptions. These exceptions included isolated forest habitats upon the uplands of the Manitoba Escarpment, within the deeply incised and sheltered river valleys, and along the margins of lakes, sloughs and other wetlands. Because of the high water table, lands associated with the Oak Lake and Assiniboine aquifers also exhibited forest cover.

The Lauder Sand Hills currently consist of a mosaic of biotic microhabitats that include aspen forest, wetlands, mixed prairie grassland, and sand dunes (Figure 2.9). Each of these ecosystems grade into each other in this region (Hohn and Parsons 1993:5). Because of modern human intervention, the aspen-oak forest cover is presently likely much more extensive than formerly. Historically, the Jackson site was located within a localized forested area surrounded by grassland meadows and stabilized and actively eroding sand dunes. Each of these microhabitats contains a variety of floral and faunal species. The location of the site within this environment would have been an ideal choice for Vickers focus people because a diverse and reliable resource base is near the site.

2.5.1 Aspen Parkland

In response to climatic changes over the last 3,500 years, the aspen parkland has encroached southward into the mixed grass prairie region of southern Manitoba with its most dramatic expansion occurring over the last century (Scott 1996:46). Meyer and Epp (1990:1) identified the aspen parkland as representing part of an ecotone located between major ecosystems or biomes (Figure 2.8). It consists of forest and grassland communities that are "intermingled in a mosaic of irregular isolated patches and more or less solid stands, as well as numerous aquatic communities" (Bird 1961:3).

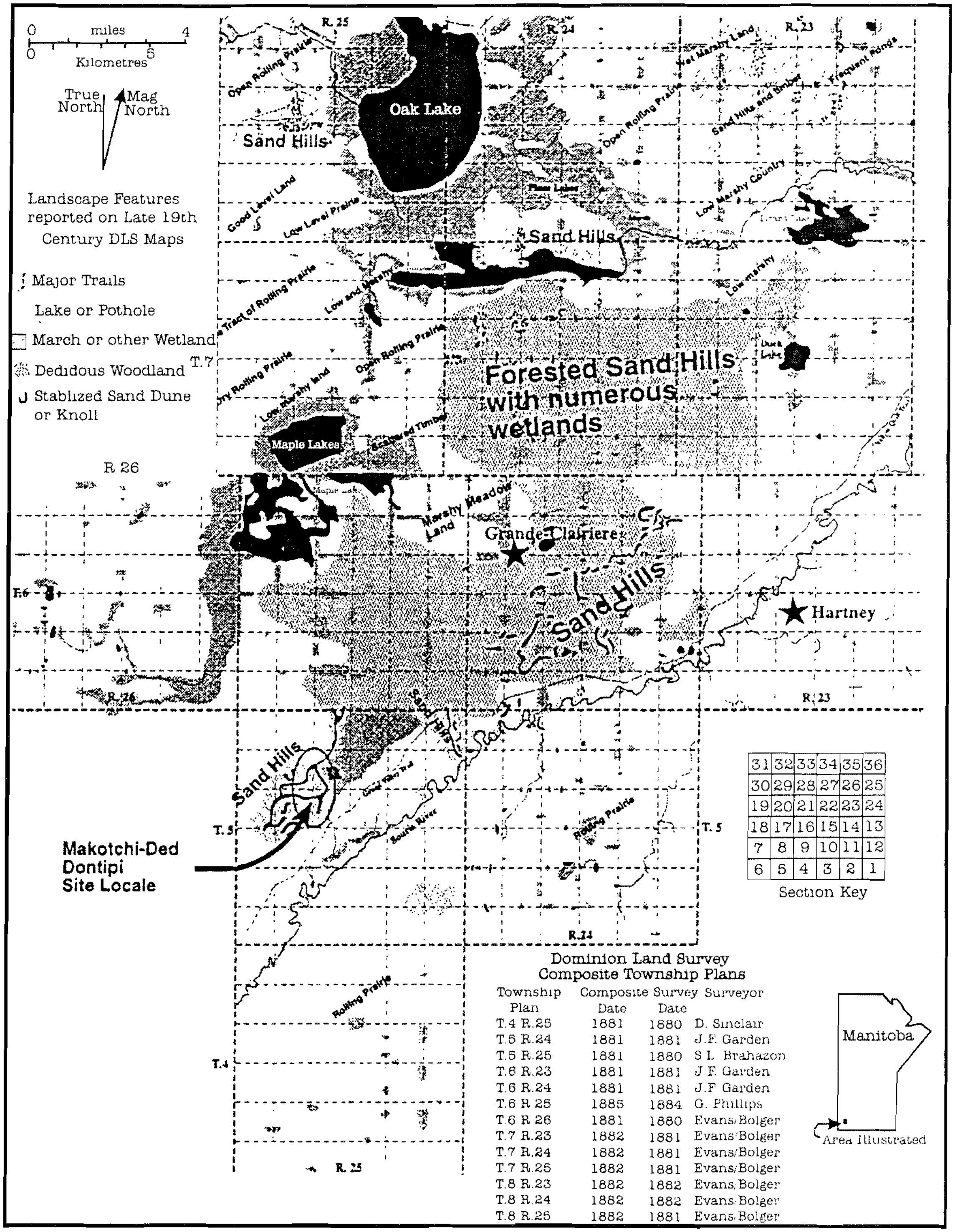

Figure 2.9 Ecosystems of Makotchi-Ded Dontipi locale (after Hamilton and Nicholson 1999)

This vegetation mosaic of mixed forests, localized wetlands, and grasslands are particularly prominent within the Lauder Sand Hills. A variety of trees, shrubs, and floral species populate the aspen parkland. Generally, the forested areas consist of small, isolated groves that are restricted to depressions and on the north and east facing slopes where typically more moisture is available.

Birch (*Betulaceae sp.*) and Trembling aspen trees (*Populus tremuloides*) are often located within the forests. Several species of shrubs are found in the area including prickly rose (*Rosa acicularis*), prairie rose (*Rosa arkansana*), scattered hazel (*Corylus spp.*), saskatoon (*Amelanchier alnifolia)*, and dogwood (*Cornus stolonifera)* (Hohn and Parsons 1993:5). Some of the local flowers in the area include primroses (*Primulaceae*), honey suckles (*Caprifoliaceae*), and lady slippers (*Cypripedium candidum*) which are considered rare in the Lauder Sand Hills. Many areas within the aspen parkland also feature marshes, potholes, lake deltas, and lagoons (Scott 1996:47). Within such areas, reeds (*Phragmites australis)*, cattails (*Typha spp),* and bulrushes (*Scirpus spp)* are typically present.

2.5.2 Mixed Grass Prairie

The mixed grass ecoregion (Figure 2.8) extends throughout southwestern Manitoba and in some remnant areas of the aspen parkland (Scott 1996:45) such as the Lauder Sand Hills region. Farther to the south, this ecoregion grades gradually into short grass prairie. Many varieties of grasses and shrubs typically found in a mixed grass prairie ecotone are also evident in the Lauder Sand Hills. Rough fescue grasses (*Festuca scabrella*) dominate the grasslands (Vickers 1994:3). In the drier locations of this area, blue grama (*Bouteloua gracilis)* and needle-and-thread grass (*Stipa comata)* varieties are often growing. Additional grass species include northern wheat grass (*Agropyron smithii)*, June grass (*Koeleria cristata)*, little bluestem (*Andropogon scoparius)*, grama-spear grass (*Stipa comata*), with broadleaf herbs and sedges (*Carex spp.)* growing in moister areas (Scott 1996:45). Creeping juniper (*Juniperus horizontalis)* shrub covers many of the well-drained sandy soil locations (Scott 1996:45). The protected depressions found near potholes, small lakes, along rivers and on sandy deltaic deposits consist of woody stands interspersed with shrubs.

2.5.3 Sand Hills

Found throughout the Lauder Sand Hills are actively eroding and stabilized sand dunes. This area consists of rolling terrain and deep valleys. A variety of trees grow in the dune areas, but not to the same extent or size as those found in the aspen parkland. According to Hohn and Parsons (1993:3-5), stunted trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and isolated bur oaks (*Quercus macrocarpa*) are often present throughout the sand hills. Bur oaks favour the high areas of the dunes, north facing slopes, and areas of direct sunlight. Prairie rose (*Rosa arkansana*), poison ivy (*Rhus radicans*) and creeping juniper (*Juniperus horizontalis*) are some of the shrubs found interspersed among the dunes (Hohn and Parsons 1993:3). A variety of grasses (*Gramineae sp.*), cactus (*Cactaceae sp.*), and sedges (*Cyperaceae sp.*) cover the sides of the sand dunes. Also found in the area are abundant quantities of chokecherries (*Prunus virginiana*), raspberries (*Rubas idaeus*), strawberries (*Fragaria virginiana*), snowberries (*Symphoricarpos occidentalis*), and saskatoon berries (*Amelanchier alnifolia*).

2.5.4 Fauna

The Transitional Grassland ecoclimatic region provides for a diverse array of faunal species that may have been available to Jackson site inhabitants. Avian species are the largest group of fauna present in the region. A variety of migratory waterfowl use the area at least on a seasonal basis, although the extensive wetlands in the region are favoured for nesting by some species such as various ducks (*Anatidae*) (Scott 1996:48). In the aspen groves, several non-waterfowl avian species such as blue jays (*Cyanocitta cristata),* sharp tail grouse (*Pedioecetes phasianellus),* and American kestrel (*Falco sparverius)* (Scott 1996:49) are found. Mourning doves (*Zenaida macroura*), great crested flycatchers (*Myiarchus crinitus*), and many species of swallows (*Hirundinidae*) and raptors such as falcons (*Falconidae*) (Hohn and Parsons 1993:19) are present in each of the ecosystems.

Small mammals in the region include a variety of species of voles and mice (*Cricetidae*) and gophers (*Geomyidae*). These animals are evident in the faunal assemblage at the Jackson site according to Playford (2001). Also known to live in the region are the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), whitetail jackrabbit

(*Lepus townsendi*), badger (*Taxidea taxus*), porcupine (*Erethizon dorsatum*), and striped skunk (*Mephitis mephitis*) (Hohn and Parsons 1993:20). Black bear (*Ursus americanus*), beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) are also documented to frequent the Lauder Sand Hills. Larger mammals such as the white-tailed deer (*Odocoileus virginianus*) are presently common in the area, although mule deer (*Odocoileus hemionus*) and wapiti (*Cervus elaphus*) were likely historically present. Perhaps the most economically important species that formerly occupied the region were bison (*Bison bison*), particularly in both the aspen parkland and grasslands. Bison would have used forests and river valleys for shelter and food during the fall and winter seasons while relying on the grasslands in the summer months. This is only a partial list of the faunal resources that might have been available to Vickers focus people residing at the Jackson site.

2.6 Jackson Site

Research in the Lauder Sand Hills of southwestern Manitoba has produced a substantial amount of information about the Late Precontact period (Hamilton and Nicholson 1999; Nicholson and Hamilton 1997, 1998, 1999). In light of the dense Late Precontact occupation, these researchers have named this area *Makotchi-Ded Dontipi*, a Dakota phrase meaning 'the place where we live'. Throughout the late 1990's, a series of surveys, test excavations, and field schools occurred at the Jackson site. Hamilton and Nicholson (1999:15) estimated that the site covers approximately 26,000 square meters and might represent either a single or several closely spaced occupations. Based on the faunal remains and pottery affiliations, they classified the site as a bison kill/processing occupation utilized by Vickers focus people as defined by Nicholson and Hamilton (1998). The Late Precontact period of occupation was confirmed by the radiocarbon dates to be discussed in section 2.10.2. A faunal analysis of the assemblage indicated that people occupied the site in the winter, possibly from early November until late April (Playford 2001:92). While other species are marginally represented, the people were primarily concerned with processing the bison they killed in a nearby area (Playford 2001).

Several analysts have examined the material culture from the Jackson site. This has included a study of the pottery (Nicholson and Hamilton 1998), lithics (Belsham

1999; Nicholson and Hamilton 1998; Walker 1999), and the fauna (Playford 2001), as well as some consideration of the paleoenvironment and spatial distribution of the cultural materials (Hamilton and Nicholson 1999; Walker 1998). In the larger context of Vickers focus regional distribution, the site has also been compared with other sites found in the *Makotchi-Ded Dontipi* locale and with sites in the Tiger Hills region of southwestern Manitoba (Nicholson and Hamilton 1996, 1997, 1999, 2001). The author has been involved in the investigation of the site since 1995 as a laboratory assistant and excavator. This led to a developing interest in the nature of the lithic assemblage consisting of a substantial amount of debitage and tools recovered during the excavations and survey. During the cataloguing of other Vickers focus sites, it was recognized that a detailed lithic analysis should be completed. Dr. Nicholson offered the opportunity to use the lithic materials from this site for this thesis.

2.6.1 Excavation History

Upon construction of a new section of grid road through the area in 1993, local avocational archaeologists (Ray Bradshaw and Doug Jackson) noted cultural material in the freshly graded ditches. They surface collected the materials and reported their finds to Dr. B.A. Nicholson. Subsequent investigation led Nicholson to designate one such cluster of disturbed materials as the Jackson site. Beginning in 1994 and continuing until 1997, field schools and small excavation crews examined undisturbed parts of the site (Figure 2.10). In total, excavators completed 36 1-m^2 excavation units and dug 67 shovel tests at the site.

Standard archaeological field techniques, which included troweling, careful shovel shaving and screening, were utilized at the Jackson site. Five-centimetre arbitrary levels were excavated in each of the units and a 3.175 mm metal hardware mesh screen was used. When possible, diagnostic artifacts and identifiable bone were provenienced using below surface grid coordinates tied to a NE datum in each unit. Field catalogue forms were completed for each recovery and included a brief description of the item, location, depth, date of collection, and count.

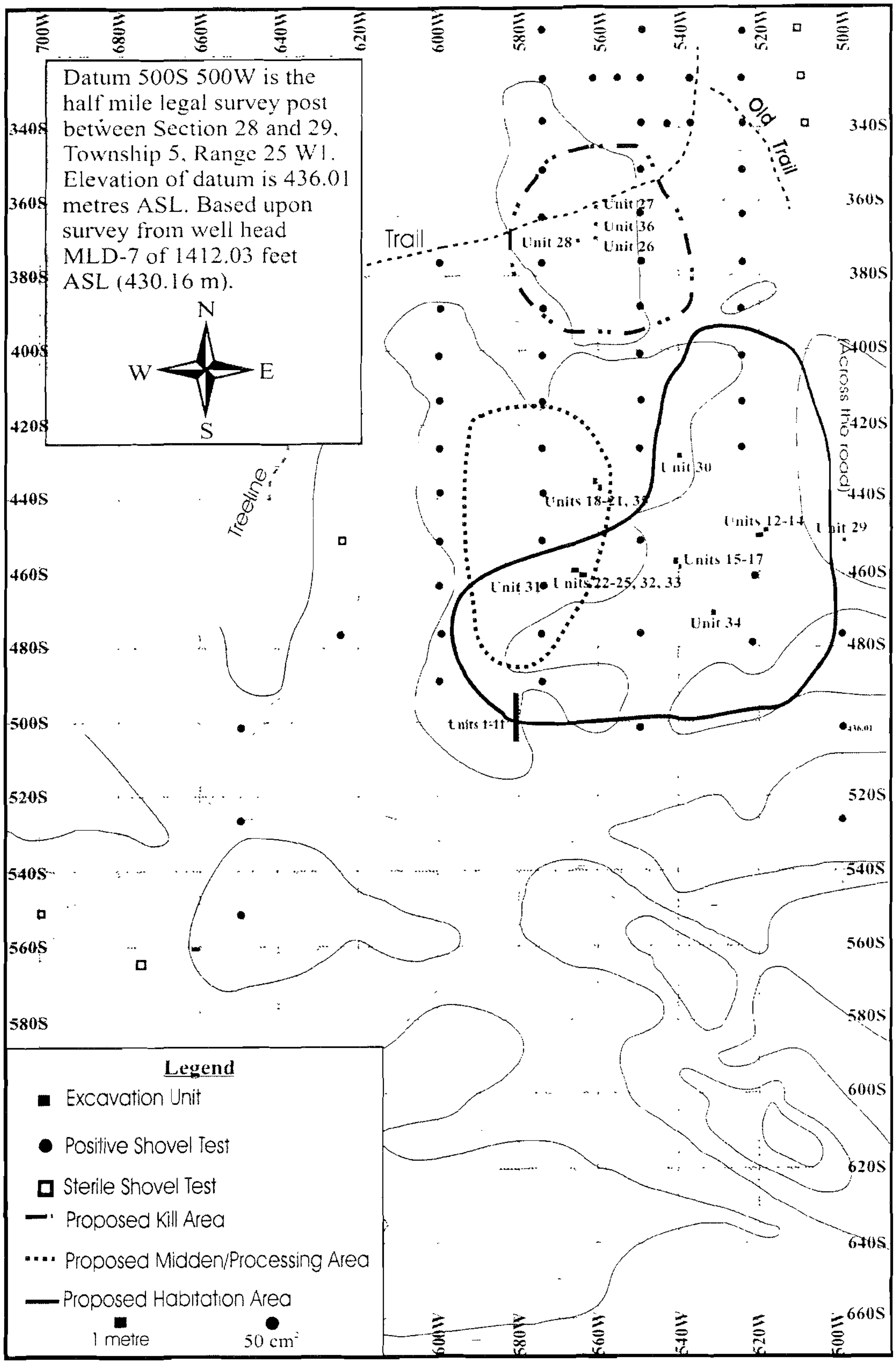

Figure 2.10 Excavation units and shovel tests of the Jackson site (after Hamilton and Nicholson 1999).

After each level was finished, black and white along with colour photographs were taken. The level floor plans were also drawn. When the unit was completed, wall profiles were photographed and drawn. The drawings entailed labelling the stratigraphic levels and providing a Munsell soil colour for the different soil types and levels. All of the artifact recoveries were brought back to the lab for washing, drying, sorting, and verification of identifications. Detailed maps of features were made along with accurate descriptions and photographs. Each excavator completed daily field notes.

In 1994 and 1995, shovel test excavations were completed and served to determine the horizontal extent of the site (Nicholson and Hamilton 1998:4). The test pits were 50 x 50 cm and excavated to a depth of 60 cm below surface. These shovel tests were located at 20 m intervals along survey lines that were spaced 20 m away from each other. For each shovel test pit, excavators recorded information about the stratigraphy, however, they did not document the vertical provenience for artifacts and bones. These widely spaced shovel tests were acceptable to define the boundaries of the site and provided adequate results to address the intra-site patterning of archaeological materials that might indicate activity areas. They also supplied diagnostic material to assist with cultural affiliations and occupational information.

2.6.2 Age

Excavators collected faunal samples from each of the activity areas at the site for radiocarbon dating (Table 2.1).

Table 2.1 Uncalibrated radiocarbon dates from the Jackson site (calibrated by Hamilton using Stuiver and Reimer 1993, personal communication 2003).

Lab #	Date Tech.	Item	Conventional Radiocarbon Age BP	sd	delta C13	Calibrated Intercept	
						Cal AD	Cal BP
Beta-82792 (#1)	Conv.	bison bone	410	60	-20.1	1462	488
Beta-83864 (#2)	Conv.	bison bone	300	70	-18.1	1641	309
Beta-83865 (#3)	AMS	bison bone	290	50	-18.2	1644	306
Weighted Average of Jackson #1,2,3 see note below			**329**	**34**		1525 1558 1632	425 392 318

Three radiocarbon dates were assigned to the Vickers focus occupation. First, a bison metacarpal was collected from the upper level of the kill site area. The date assessed for this sample was 410±60 B.P. (Beta 82792). Second, a bison cervical vertebra from the kill area was submitted for radiocarbon analysis. It had a shear cut across the surface that might have been the result of a metal tool. The assessed date for this sample was 300±70 B.P. (Beta 83864). Third, a proximal portion of a bison radius, associated with a Vickers focus rim sherd, was the last sample submitted for testing. The assessed age was 290±50 B.P. (Beta 83865). These radiocarbon dates where subjected to calibration (Table 2.2) and when considered at two standard deviations, suggest that the Jackson site was occupied approximately between A.D. 1427 and 1683 (Table 2.1 and Table 2.2).

Table 2.2 Calibrated radiocarbon dates from the Jackson site (calibrated by Hamilton using Stuiver and Reimer 1993, personal communication 2003).

	Calibrated Variance		Calibrated Variance			
Lab #	Method A 1 sigma	Method A 2 sigma	Method B 1 sigma	p	Method B 2 sigma	p
Beta-82792 (#1)	AD 1438-1516	AD 1414-1644	AD 1437-1517	0.71	AD 1427-1637	1
	AD 1591-1621		AD 1583-1623	0.29		
Beta-83864 (#2)	AD 1487-1609	AD 1446-1683	AD 1491-1604	0.69	AD 1446-1683	0.88
	AD 1610-1663	AD 1744-1807	AD 1613-1661	0.31	AD 1744-1807	0.09
		AD 1933-1954*			AD 1933-1955*	0.04
Beta-83865 (#3)	AD 1520-1569	AD 1476-1675	AD 1515-1593	0.61	AD 1474-1676	0.93
	AD 1627-1660	AD 1776-1798	AD 1620-1663	0.39	AD 1774-1800	0.05
		AD 1943-1954*			AD 1941-1955*	0.03
Weighted Average	AD 1491-1603	AD 1472-1653	AD 1514-1594	0.81	AD 1483-1647	1
of Jackson #1,2,3	AD 1614-1643		AD 1619-1639	0.19		
see note below						

*Indicates Atomic Bomb Influence; **Indicates Fractionation is estimated from material type by Radiocarbon lab rather than actually calculated; Samples Jackson #2, 3, 4 are statistically the same at a 95% interval while Jackson #1 is a statistical outlier.

The radiocarbon dates confirms that the Vickers focus materials across the site and the kill area are contemporaneous (Nicholson and Hamilton 1997:30). The stratigraphic analysis indicates either a single or several closely spaced occupations by Vickers focus people. In addition, a tip from a projectile point from the proposed kill area refits with its base found in the proposed midden/processing area (Tomasin Playford, personal communication 2003), which confirms that these two areas are contemporaneous.

2.6.3 Recoveries

Diagnostic artifacts and other material culture classes have been recovered from the Jackson site. The pottery is represented primarily by body and rim sherds and resembles Vickers focus wares as defined at the Lowton type site (Nicholson and Hamilton 1998). The faunal assemblage indicates that there is a high species diversity and density evident in the activity areas, although bison *(Bison bison)* was by far the most economically important animal killed and processed at the site (Playford 2001). Prairie and Plains Side-notched projectile points, knives, scrapers, and a drill were recovered (Nicholson and Hamilton 1998). An abundance of small retouched bifacial thinning flakes, but an almost complete absence of cores and cortex flakes is evident among the debitage (Nicholson and Hamilton 1997:30). Earlier site reports documented that Knife River flint (KRF) and small amounts of Tongue River silicified sediment (TRSS) are both present. In addition, the site occupants used brown chalcedony, Swan River chert (SRC), and quartzite materials.

2.6.4 Seasonality

The seasonality of the Jackson site has been determined based on the foetal bison remains and the lithic assemblage. Hamilton and Nicholson (1999:11) suspected that the site inhabitants may have been "driving bison from the open prairie and into snow-packed willow thickets within deceptively sheltering forest groves [which] would have been an effective means of entrapment of small groups of bison." Relying on bison foetal remains, Playford (2001) was able to confirm these earlier statements and determined that occupation possibly occurred between November and April. Using the lithic assemblage from the site, Nicholson and Hamilton (1995, 1996, 1997) further attempted to support their claim about the seasonality of the site. They noted that the presence of rejuvenation flakes in the assemblage was the result of tool rejuvenation or reworking. As well, there were only two cores recovered from the site and decortication debitage was scarce. Nicholson and Hamilton (1998) suggested that the lithic raw materials were difficult to obtain during the time of occupation thus people modified preforms instead of cores at the site. They concluded, that if the lithic assemblage was indicative of a winter occupation, then premeditated curation and continual rejuvenation of tools would have occurred at the site. This would have also indicated that the lithic sources would have been unavailable possibly due to the frozen ground and accumulation of snow (Nicholson and Hamilton 1997:30).

2.6.5 Previous Lithic Analyses of the Jackson Site

Nicholson and Hamilton (1998) briefly described the projectile points, unifaces, bifaces, and utilized flakes from the Jackson site. Debitage and lithic raw materials were also recorded in their study. The sample includes materials from the surface collections, shovel tests, and units one to 36. They concluded that SRC, agate, chalcedony, KRF, TRSS, and obsidian were present. They surmised that 59 lithic tools were associated with hunting and processing of the remains. The analysis also revealed that certain tools and a small percent of the debitage exhibited evidence of thermal alteration.

The conclusions stated by Nicholson and Hamilton (1998) in their analysis of the projectile points from the Jackson site were supported by an attribute and metric study by Walker (1999). A spatial analysis also completed by Walker (1999) compared the frequencies of tools, debitage and lithic materials. The results indicated that the midden and habitation areas had similar frequencies and proportions of tools, debitage, and lithic materials. It was possible that the two areas overlapped with each other. An individual flake analysis of a small sample (n=101) of flaking debris from the three activity areas was also completed (Belsham 1999). The purpose of the study was to assess which attributes would be appropriate for this thesis.

2.7 Summary

The Lauder Sand Hills of southwestern Manitoba offers an opportunity to study the Late Precontact groups residing in the area. The Jackson site is located in a complex environment that consists of mixed prairie, aspen parkland, localized wetlands, and stabilized and actively eroding sand dunes. Significant geological changes occurred during the Pleistocene and Holocene epochs that produced the resultant geomorphic character of southwestern Manitoba including the Lauder Sand Hills. The northward retreat the Laurentide ice sheet resulted in large accumulations of glacial till, while the development and subsequent drainage of Glacial Lake Hind reworked these deposits. High velocity spillways transported clasts and allowed their accumulation within deltas whereupon they became an abundant source of lithic materials for Aboriginal groups, including Vickers focus people. Deglaciation processes occurring during the Holocene epoch also created the geomorphic and hydrological character of the Lauder Sand Hills.

Numerous localized wetlands, forested groves, and grasslands form the Lauder Sand Hills. These areas are relatively stable and drought resistant, sustain mixed forest and grassland, and maintain a reliable resource base. The localized wetlands and forested groves would have attracted a variety of aquatic, avian, and mammalian species, particularly bison. It also would have offered shelter, water, and a range of floral species for the Precontact groups residing in the area, as is the case at the Jackson site. Bison was the dominant species found in the proposed kill, midden/processing, and habitation areas of the site. Pottery, lithic tools, and debitage were also evident at the site. According to Playford (2001), the site was occupied by Vickers focus groups during the late fall and early spring between A.D. 1460 and A.D. 1645.

Chapter Three

The Cultural Influences on Vickers Focus People

3.1 Introduction

This chapter presents an overview of the Late Precontact period in southwestern Manitoba as it relates to the Jackson site. The emphasis is on the lithic assemblages associated with the cultural groups either who co-existed with or who influenced the technology of Vickers focus people. Nicholson (1996:81) has proposed that the pottery recovered from Vickers focus sites in southwestern Manitoba represents an aggregation of people drawn from diverse origins. He further suggested that the Eastern Woodland cultures of southern Minnesota, northern Iowa, as well as the Middle Missouri and Mississippian cultures might have had ancestral links to Vickers focus people. While acknowledging the current debate about the capitalization of taxonomic terms, for the purpose of this study, the term 'focus' is not capitalized.

Discussion of the Late Precontact groups offers a comparative data set for the lithic assemblages and draws attention to the ubiquitous presence of small side-notched projectile points used by many otherwise culturally discrete groups. The Late Side-notched projectile point series dominates the assemblage recovered from the Jackson site. These point styles are also evident in sites affiliated with the Mortlach phase, Central Plains Tradition, Mississippian Tradition, and Middle Missouri Tradition. These archaeological groups are discussed in this chapter because of the similar styles of projectile points present in the assemblages. These groups may have also influenced the material culture of Vickers focus people in southwestern Manitoba.

Lehmer's (1971) scheme for spatially sub-dividing the Plains is utilized in this chapter given its widespread acceptance among many Plains archaeologists. The system defines sub-regions (Figure 3.1) based upon the geographic and cultural distinctiveness that each area possesses. These divisions represent artificial constructs that are not based upon natural geographic boundaries, but rather, represent archaeological perceptions of the territorial expanse of different archaeological cultures within the

Plains culture area. People emigrating from the Eastern Woodlands, Middle Missouri, and possibly the Mississippi areas integrated their traditions and practices with the Plains life style. Archaeologists have organized these groups using terms such as 'Plains Woodland' and 'Plains Village' that are acknowledged as the expression of the adaptive strategies used on the Plains (Gregg 1994). Wood's (1998) cultural taxonomy (Figure 3.2) forms the organizational basis of this chapter. Discussion of some of these groups will illustrate the cultural context that Vickers focus people may have been part of during the Late Precontact period.

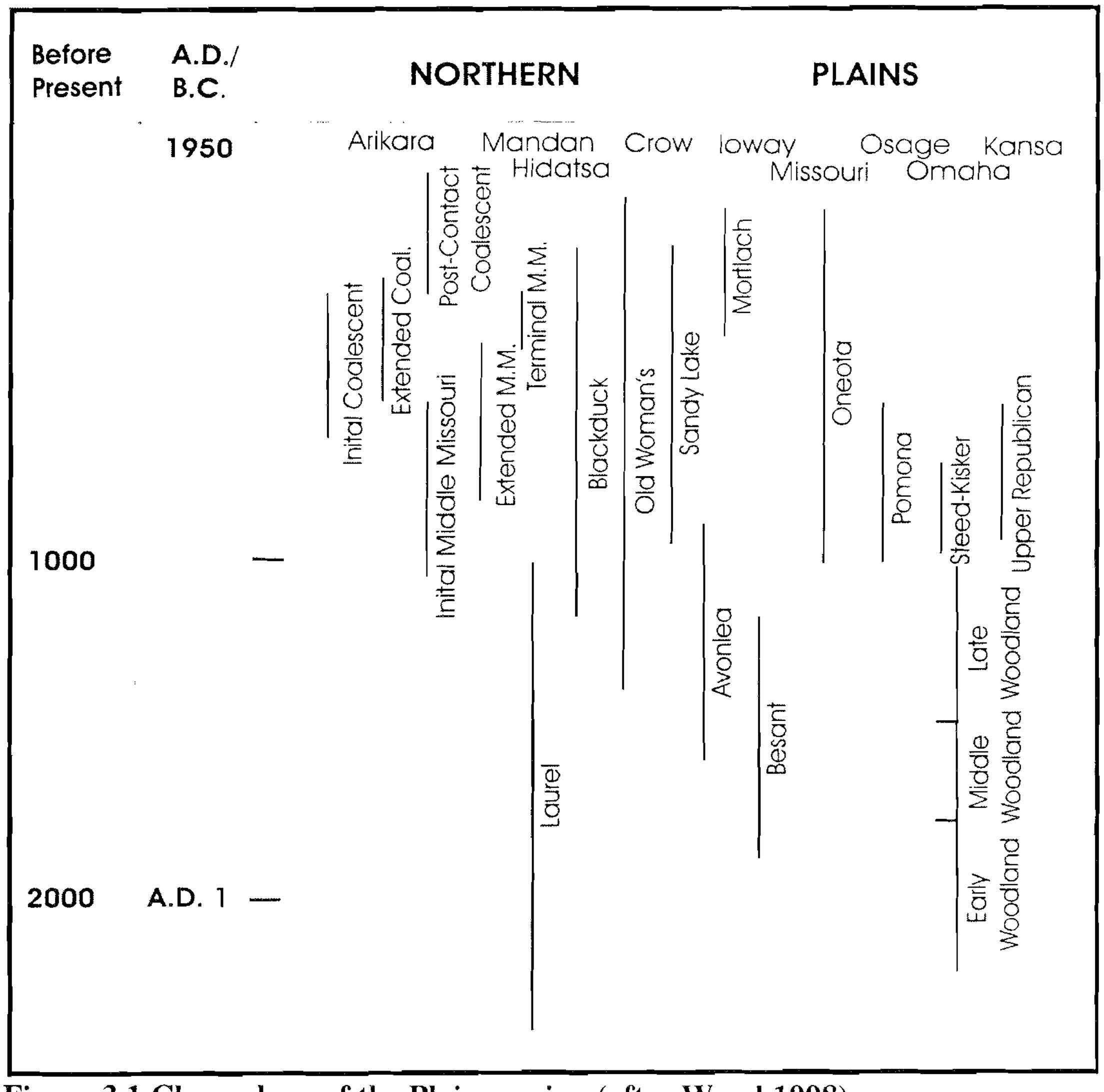

Figure 3.1 Chronology of the Plains region (after Wood 1998).

3.2 Late Precontact Period

Lehmer (1971) arbitrarily subdivided the Plains region into five spatial divisions that consist of the Northeastern Plains, Middle Missouri, Northwestern Plains, Central Plains, and Southern Plains subregions (Figure 3.2). These areas represent "a complex mosaic of seasonally and geographically induced patches, varying through time, that were both climatically manipulated by nature and culturally modified by humans (for example, by fire)" (Wood 1998:9).

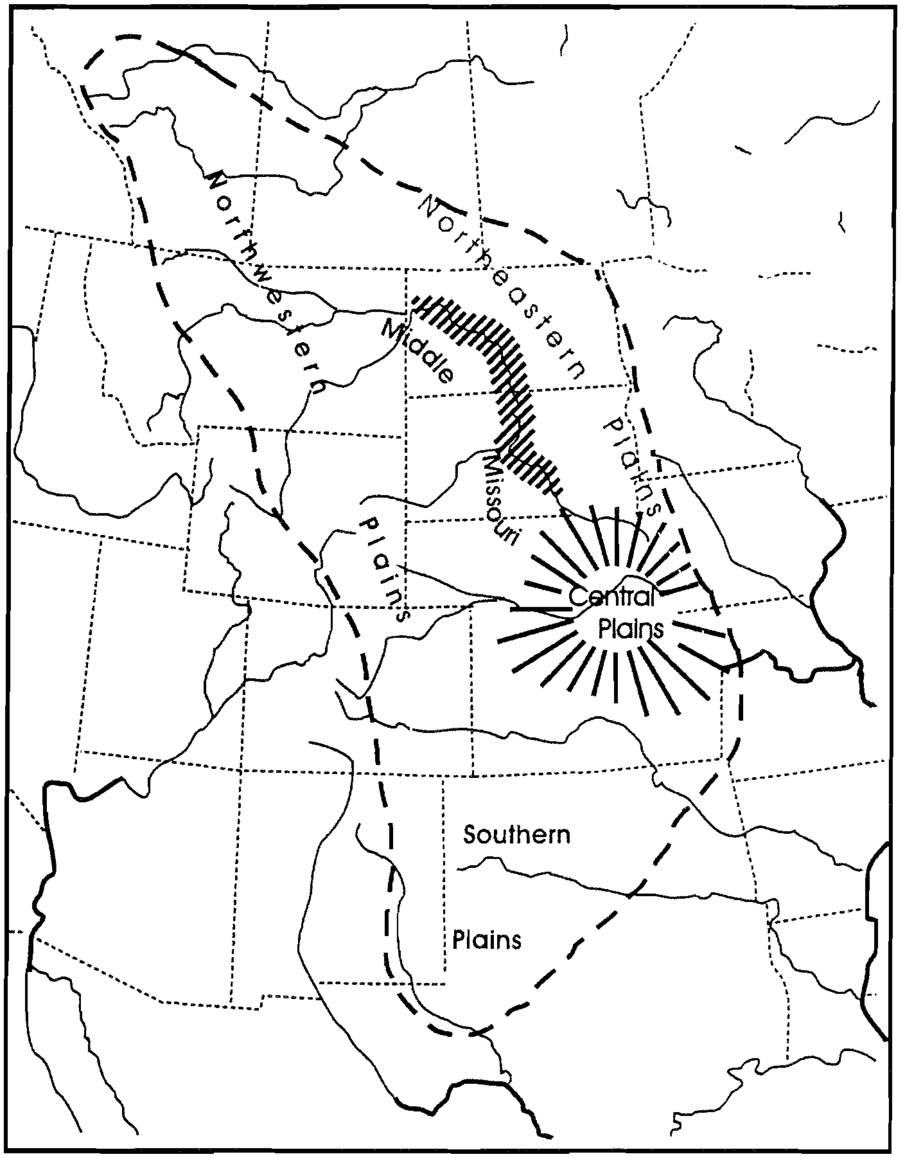

Figure 3.2 Division of the Plains region (after Lehmer 1971).

Borrowed from Johnson and Johnson (1998), the term 'Northern Plains' subsumes Lehmer's (1971) Northwestern, Northeastern and Middle Missouri subregions. While the Central Plains falls outside of this general area, it appears that some Plains Woodland influences from this area also affected Vickers focus. The Jackson site, as a primarily Vickers focus occupation, is limited to the Northeastern Plains and conforms the best to "Plains Woodland" adaptation strategies. The cultural meaning attached to this term is explored more fully below. The diversity of ceramics associated with Vickers focus sites suggests very widespread cultural influences that are better known in other parts of the Northern and Central Plains subregions.

The Vickers focus dates to the Late Precontact period, the last of the three major temporal periods assigned for the archaeological cultures residing on the Plains (Figure 3.2). It begins approximately A.D. 500 and terminates with the Historic period. The fundamental technological development defining the beginning of the Late Precontact period was the widespread use of the bow and arrow tipped with small side-notched or triangular unnotched projectile points. Also important, but not part of this discussion, was the initial emergence of pottery in certain areas of the Northern and Central Plains. The archaeological record for the Late Precontact period also emphasizes the widespread role of the Plains Villagers of North and South Dakota (Dyck 1983:126), whom might have had an influential role in the development of Vickers focus.

Different archaeologists, when describing the subsistence and adaptive response of groups living on the Northern Plains, commonly use the terms Plains Woodland and Plains Village. The Plains Woodland Tradition existed between A.D. 500 until the proto-historic/historic period (Figure 3.2). Johnson and Johnson (1998:201) defined the Plains Woodland Tradition as consisting of archaeological sites that are characterized by pottery vessels with slight out flaring rims and more distinctive neck and shoulders. The surface treatments include smooth, single stamping, or cord roughening while decoration might consist of multiple rows of cord impressions formed into complex designs. Side-notched and unnotched triangular projectile points made from a variety of lithic materials are evident in many sites. Various cultures continued to use burial mounds. They also noted that the term 'Plains' was combined with the term 'Woodland' to indicate that the groups that emigrated from the Woodland areas onto the Plains probably integrated adaptive strategies that allowed them to successfully exploit grassland and forest areas. During this time large numbers of people migrated from the Midwest onto the Plains (Johnson and Johnson 1998:225). Gregg (1994:72) stated that Plains Woodland groups relied primarily on hunting and gathering following a nomadic life style. Some groups would have balanced their subsistence strategy with fishing, hunting a range of large and medium mammals, and supplementing their diet with horticultural products (Johnson and Johnson 1998:222). These generalizations are complicated by the fact that some pottery producing groups best known for residing in the predominately coniferous forests north of the Midwest also had a presence in portions of the Northeastern Plains. Particularly prominent of these Late Woodland societies are Blackduck and Sandy Lake.

The Plains Village Tradition encompasses cultural groups in the Middle Missouri and Central Plains subregions that are discussed more fully later in this chapter. According to Dyck (1983:126), the Plains Village Tradition is not well known or thoroughly understood in terms of its expression within southern Manitoba, northern Minnesota, or northeastern North Dakota. This may be a function of the limited amount of archaeological field investigation conducted in these areas at the time of writing. The Plains Village Tradition existed from A.D. 900 until the Historic period (Wood 1998:12) (Figure 3.2). Hunting of bison and other game animals and gathering of wild plants were economically important to many of the Plains Village groups. However, they were also heavily reliant upon horticulture. These archaeological groups established semi-permanent to permanent residences that were often fortified villages and contained large populations living in earth lodges. The permanence of these villages allowed for the creation of large-scale exchange networks that involved groups from the Plains and adjoining geographic regions.

The archaeological record in southwestern Manitoba indicates that people from the Plains, Parkland, and Forest areas participated in a variety of exchange networks that covered an extensive geographical area. Native copper from the Great Lakes region, obsidian from the Rocky Mountains and Wyoming, conch shell from the Pacific Coast and the Gulf of Mexico, pipestone from Minnesota, and Knife River flint from North Dakota are sometimes recovered in archaeological sites (Riddle 1985). For example, the

Jackson site contains Knife River flint stone tools such as projectile points and end scrapers.

The Blackduck culture is included in this overview because this group may have co-existed with Vickers focus people in Lauder Sand Hills and in the Tiger Hills regions. The Mortlach phase is discussed in this chapter because Nicholson and Hamilton (1999) proposed that the Vickers focus might have led to the *in situ* development of Mortlach in the *Makotchi-Ded Dontipi* locale. The extensive reliance of Knife River flint lithic materials in southwestern Manitoba also indicates a widespread and prolonged interaction with Middle Missouri cultures in North Dakota. The lithic assemblages associated with the Mississippian groups are discussed because of their widespread influence across the Northern Plains via exchange networks that integrated cultures living in southwestern Manitoba. This summary of the Late Precontact period terminates with the discussion of Central Plains Tradition because Nicholson and Hamilton (2001:68) acknowledged that these groups possibly influenced Vickers focus people. Discussion of the cultural groups in this chapter will demonstrate that all of the groups relied on the Plains and Prairie Side-notched and Triangular projectile point styles that were part of a Plains tool kit.

3.3 Plains Side-Notched/Prairie Side-Notched/ Plains Triangular Projectile Point Series

During the Late Precontact period, the side-notched projectile point series (Kehoe 1966) was introduced on the Plains and accompanying these new point styles were additional changes in the lithic technology (Gregg et al. 1996:85). Kehoe (1966) has addressed the chronological and stylistic differences evident among the projectile point styles and proposed a typology of the points found in archaeological sites across the Northern Plains. During his analysis of the Stott site (DiMa-1), Nicholson (1976) re-classified the unnotched Triangular projectile points identified by Kehoe (1966) into three categories (NT-1, NT-2, and NT-3). In 1996, Peck added new sites to the current database on Late Side-notched points, and re-evaluated the characteristics and sites used for the Late Side-notched series created by Kehoe (1966) and revised by Nicholson (1976). Peck and Ives (2001) proposed a restructured taxonomy for the Late Side-notched projectile points from the Northern Plains. Archaeological sites in southeastern

Saskatchewan during the interval 650 B.P. to the Historic period belong to the Mortlach Group which is associated with Mortlach pottery and the Mortlach phase (Peck and Ives 2001). Alternatively, projectile points present in sites located in southern Alberta and Saskatchewan and among points found outside of southeastern Saskatchewan affiliated with later time periods are identified as the Cayley Series (1250-650 B.P.) which is associated with Saskatchewan Basin complex including Late Variant pottery and the Old Women's phase (Peck and Ives 2001). For this study, Kehoe's (1966) descriptions of the Plains and Prairie Side-notched and Triangular projectile points are applied. Comments offered by other researchers (Dyck 1983; Gregg et al. 1996; Lehmer 1971; Vickers 1994) regarding the tool description, chronology and cultural relationships between the groups using the Late Side-notched projectile point series are also included. These projectile point styles are consistent over a considerable area, thus making it difficult for archaeologists to use these tool types as diagnostic indicators for specific groups present during the Late Precontact period (Kooyman 2000:125).

Plains Side-notched, Prairie Side-notched, and Triangular projectile points are commonly recovered from sites in Alberta, Saskatchewan, southern Manitoba, northern Ontario, Minnesota, and the Dakotas. These point styles are particularly relevant to the discussion of the Jackson site lithic assemblage because of the high recovery rate of similar projectile points from each of the proposed activity areas. It is difficult to confirm the temporal existence of the Plains, Prairie, and Triangular forms. Gregg et al. (1996:85) have suggested that this series existed between A.D. 600 and 1000, however, Dyck (1983:126) noted an associated temporal span of A.D. 800 to 1780.

According to Kehoe (1973), beginning approximately A.D. 730, Prairie Side-notched points appeared in the archaeological record at the Gull Lake site and continued to be used until A.D. 1250 ± 80 (S-203). Kehoe (1966) and Dyck (1983) both agree that the Prairie Side-notched point style is reminiscent of Middle and Late Woodland points recovered in the Eastern Woodlands culture area. Kehoe (1966) summarized the distinguishing features of Prairie Side-notched points and his description is used to identify the projectile point styles from the Jackson site (see chapter 5).

Prairie Side-notched projectile points are typically defined by poor flaking qualities and lack of symmetry (Kehoe 1966:830). The points are irregular in outline and often the central portion of the tool was unmodified by secondary flaking, leaving broad flake scars, lumps, rough areas, and hinge fractures. Prairie Side-notched projectile points have side notches that are close to and usually touching the basal edge (Dyck 1983:129). Kehoe (1966:830) commented that this style of point sometimes appeared to have corner notches because of the low placement of the notches. These notches are large, wide, shallow, and range from V- to U-shaped. The base of the point is narrower than the proximal portion of the blade and the base is usually convex. Most of the points have irregular, very sharp lateral edges. There are six varieties of Prairie Side-notched points (see Kehoe 1966 for additional descriptions).

Kehoe (1973:192) stated that the Plains Side-notched projectile point replaced the Prairie Side-notched point around A.D. 1300. However, at many archaeological sites, including the Jackson site, Plains and Prairie Side-notched types are found together in the same occupation. According to Dyck (1983:129), the Plains Side-notched projectile point begins about A.D. 1400 and terminates during historic times. In Saskatchewan, it appeared around A.D. 1300 and persisted until A.D. 1750 (Vickers 1994:24). Dyck (1983:132) has suggested that there was a source area in the Middle Missouri while Kehoe (1973:192) has recommended that the Mississippians developed the design for the Plains Side-notched point. Kehoe (1966) also summarized the distinguishing characteristics of the Plains Side-notched point and his description is used in this study.

Unlike the Prairie Side-notched point, the Plains Side-notched point has a well-defined outline, and sharp angles at the base and notches. Kehoe (1966) and Dyck (1983) stated that the workmanship of Plains Side-notched points was similar to the quality present on Avonlea points. On some of the Plains points, the flake removals seemed to be smaller and more regular (Dyck 1983:129). Plains Side-notched points have a higher flaking quality, but portions of the original blank might remain intact. The side notches on Plains projectile points are well removed from the base, thus giving the point a very sharp triangular outline (Dyck 1983:129). These notches are usually U-shaped, small, deep, narrow, and are located high on the blade. "They are usually at least deep as they are wide, frequently in the later varieties considerably deeper than wide, and forming very acute angles" (Kehoe 1966:832). The base of the point is often the same width as the proximal end of the blade or sometimes wider particularly among the varieties dating to the later periods. Base corners are either square or form acute angles. The base is usually straight or concave. The straight bases are often ground. Kehoe (1966:832) further stated that the edges of Plains Side-notched points are often very sharp, regular and rarely appear serrated. There are seven varieties of Plains Side-notched points (see Kehoe 1966 for additional descriptions).

Unnotched triangular projectile points have been recovered from numerous archaeological sites in association with Plains and Prairie Side-notched projectile points. They are generally triangular shaped and have a straight to slightly concave base. Some of the points exhibit a thinned base, possibly for hafting purposes. Flaking quality on these point styles is fair to good. These points have also been called performs by some archaeologists and this term is used in this study (see chapter five).

The lithic technology associated with Plains and Prairie projectile points is similar. During the Late Precontact period, the lithic reduction strategy exhibits "a shift to use of expedient cores to produce flake tools rather than bifacial reduction of blanks" (Kooyman 2000:127). In addition, an increasing reliance of bipolar core technology is evident among many lithic assemblages on the Northern Plains. This technique allowed for the creation of small flake blanks from pebble-sized pieces of excellent quality stone (Gregg et al.1996:85). Many people find it is impossible to differentiate between manufacturing processes associated with Plains and Prairie Side-notched projectile points in an archaeological assemblage because the reduction techniques and by-products are similar.

3.4 Blackduck Phase

Late Woodland Blackduck people migrated into southern Manitoba from the forests of northern Minnesota and adjacent parts of northwestern Ontario (see also Dyck 1983:126). Blackduck people probably did not influence the emergence of Vickers focus people in southwestern Manitoba. Blackduck pottery has been found in or near Vickers focus components such as the Jackson site, leaving at least the possibility of co-existence. Blackduck sites are located in northern Minnesota, northwestern Ontario, southern Manitoba, and central Saskatchewan (Meyer et al. 1999:153) (Figure 3.3). At approximately A.D. 750, Blackduck groups began to develop in northern Minnesota and northwestern Ontario. They gradually spread into the aspen parkland and onto the Plains and continued to exist until A.D. 1000 (Meyer and Hamilton 1994:112). They used a hunting and gathering strategy that included bison procurement in the fall, forest resources in the winter, and captured spawning fish in the spring (Nicholson 1996:72).

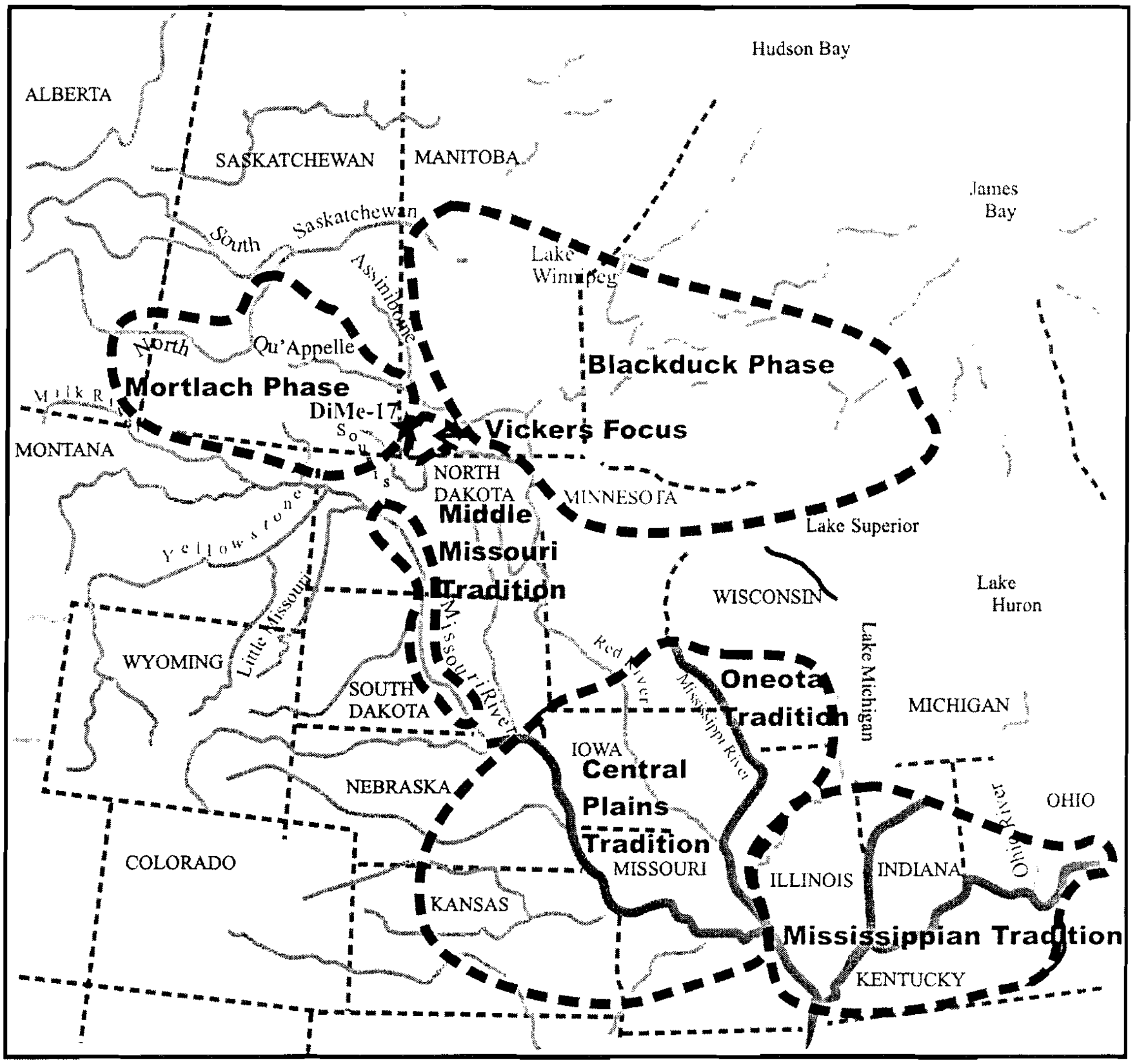

Figure 3.3 Archaeological cultures discussed in chapter three (after Schlesier 1994; Hamilton and Nicholson 1999).

The termination dates for the Blackduck culture varies across the Northern Plains. At the Stott site in southwestern Manitoba, Blackduck occupations date to between A.D. 800 and 900 and again around A.D. 1000 and 1200 (Badertscher et al. 1987). By A.D. 1400, Blackduck people disappeared from the Northern Plains, but may have persisted into the Protohistoric period in the Boreal Forest of northern Ontario (Meyer and Hamilton 1994).

Both Prairie and Plains side-notched projectile points are associated with Blackduck sites (Dyck 1983). Their lithic tool kit, generally indistinguishable from other Plains assemblages, includes small triangular unnotched projectile points, stone hide scraping tools, ovate knives, and stone drills. They relied on a variety of lithic materials to manufacture their tools although a preference for Knife River flint seems evident at many archaeological sites. In this sense, Blackduck is primarily distinguishable only based on their distinctive ceramics.

3.5 Mortlach Phase

According to Malainey (1991:22), Mortlach aggregate sites are located in the region between the Missouri and Qu'Appelle rivers including southern Saskatchewan and parts of Montana and North Dakota (Figure 3.3). Mortlach archaeological assemblages are also recognized in southern Alberta and southwestern Manitoba (Walde 1994; Nicholson and Hamilton 1999). Johnson and Johnson (1998:24) have stated that the Mortlach phase existed between A.D. 1520 and A.D. 1790, although Vickers (1994:26) indicated "a progression of dates from A.D. 1300 to A.D. 1730 should document the Mortlach/One Gun spread from east to west. However, the data are not yet adequate to demonstrate this."

Malainey (1991) and Walde (1994) have both analysed the pottery collected from various Mortlach sites in Saskatchewan and attempted to further define the Mortlach phase. Since Malainey (1991) did not include the analysis of lithics in her study, Walde's (1994) thesis and Wettlaufer's (1955) report supplied the descriptions of the stone tools and lithic raw materials typically associated with Mortlach people.

The lithic assemblage found at the Mortlach sites is similar to other Northern Plains sites. This includes a variety of Plains Triangular, Plains Side-notched, and Prairie Side-notch projectile point types. Consistent with the generalizations noted above regarding the Late Side-Notched points in general, Wettlaufer (1955:22) asserted that Mortlach phase utilized a flake tool technology. Additional tools associated with the Mortlach phase include blades, scrapers, and hammer stones. Wettlaufer (1955) noted that a hammer stone from the Mortlach site exhibited evidence of thermal alteration. However, additional explanations regarding if Mortlach people utilized heat when manufacturing their tools were not included in his report. Flintknappers may have thermally altered the material to improve its flaking quality or it may have accidentally burned, possibly as a result from a prairie fire or discard into a fire pit.

Plains Side-notched projectile points and bifacial end scrapers were the typical tools associated with Mortlach sites studied by Walde (1994). He noticed that large numbers of Plains Side-notched points were associated with Mortlach pottery sub-assemblages recovered from numerous sites in south-central Saskatchewan. "The results of ceramic and lithic raw material analyses then, suggest differentiation between parkland and grassland Mortlach material cultures" (Walde 1994:92). In addition, many of the assemblages included in Walde's study exhibit a pattern of a high relative frequency of formal tools relative to debitage. Consequently, Walde (1994:92) suggested that projectile points and end scrapers, particularly those made of Knife River flint (KRF), may have been the product of trade between Middle Missouri groups and Mortlach hunters living in Saskatchewan. As a result, Walde recorded for the type of lithic raw materials used to produce formed tools. The majority of the formal tools appear to have been formed from local lithic materials that include Swan River chert, silicified wood, silicified peat, fused shale, and local cherts. Knife River flint was the most common exotic lithic material, however, obsidian was present in some site assemblages. Walde (1994) addressed the issue of lithic exchange systems by examining the relative abundance of KRF and fused shale in relation to distance from the primary quarry zone. Generally, sites located at greater distances from the sources of KRF in North and South Dakota contained fewer KRF projectile points than sites situated closer to the quarry (Walde 1994) (Table 3.1)

Within a 100 km radius (Table 3.1) of the Knife River flint quarries, a large percent of the projectile points recovered from Mortlach sites were made of KRF (Walde 1994). In sites located up to 200 km from the source area, the percentage of KRF projectile points decreased significantly and continued to drop at a steady rate in sites, such as Long Creek and Sanderson, located in the Estevan area of Saskatchewan. Between 400 and 500 km from the KRF quarries among the Qu'Appelle drainage sites including Gilmore, Lake Midden, Stoney Beach, Walter Felt, and Long John, the percentage of KRF projectile points varies widely.

Table 3.1 Distribution of Knife River flint projectile points and end scrapers in Mortlach sites (from Walde 1994).

	Distance (km) from Source	Percentage of KRF
Plains Side-Notched Projectile Points	100	60
	200	25
	350-500	10-20
	500+	low
Plains Snub-nosed Endscrapers		
	100	85
	200	50
	400	60-70
	500-700	10

For example, 27% of the projectile points were KRF at the Stoney Beach site compared to the Long John site which had 5% of its projectile points made of KRF (Walde 1994:88-89). Only a small percentage of projectile points made of KRF were evident in sites located 450 km away from the KRF quarries (Table 3.1). In sites situated 600 km away from the source area, trace amounts of KRF materials were present in the assemblages.

The distribution of bifacial end scrapers in Mortlach sites in south central Saskatchewan differed from the pattern evident among the Plains Side-notched projectile points (Table 3.1). In sites located approximately 100 km from the KRF source, a large percentage of the end scrapers were made of KRF as was the case at the Evans site. However, between 200 km and 600 km from the KRF quarries, the percentage of KRF end scrapers present in sites steadily decreased with distance, with some unexpected variability (Walde 1994:89). At some sites located 400 km from source area, the percentage of KRF end scrapers significantly increased and then resumed the pattern of distance-related decline (Walde 1994:89).

The fluctuations in the percentages of Plains Side-notched projectile points and bifacial end scrapers made of Knife River flint suggested to Walde (1994) that different exchange networks might have been utilized in south central Saskatchewan. The distribution of KRF Plains Side-notched points in the Qu'Appelle valley sites, for instance, may represent destination nodes in the exchange network (Walde 1994:88-89).

He further noted that it was possible that many of the KRF projectile points were used, but that a small percentage of Plains Side-notched points were redistributed in the local area or further north. The distribution of bifacial end scrapers made of KRF coincides with the northern border of the grasslands, particularly among sites located 600 km from the KRF quarries (Walde 1994:89). According to Walde (1994:89), "there was apparently little exchange of KRF end scrapers across that frontier. Relatively few KRF projectile points crossed that line either, but that could be attributed to distance alone." Mortlach people may have been involved in an exchange network that was dependent upon several middlemen situated in sites located along the major river systems in North Dakota, south central Saskatchewan, and possibly south western Manitoba.

Nicholson and Hamilton (1999) proposed that Vickers focus people residing in the *Makotchi-Ded Dontipi* locale might have interacted with Mortlach people. A small number of pottery vessels that feature Mortlach design techniques are evident at the Jackson site (Nicholson and Hamilton 1999:24). The cultural relationship between Mortlach and Vickers focus remains the subject of debate. Therefore, the present lithic analysis may offer insight when Walde's (1994) observations are compared to the lithic recoveries from the Jackson site in Chapter 6.

3.6 Central Plains Tradition

Lehmer (1971:28) defined the Central Plains subarea (Figure 3.1) to "correspond approximately to the maximum extent of agricultural village populations in the southernmost part of South Dakota, western Iowa, northwestern Missouri, Nebraska, and Kansas north of the Arkansas drainage." Several regional variants have been identified within the Central Plains Tradition representing small groups of people residing in a variety of ecological niches that might have resulted in minor site-specific adaptations. The Central Plains Tradition is defined on the basis of different groups of people participating in a diversified subsistence economy that incorporated small scale maize horticulture with hunting and gathering of local resources (Wedel 2001:173). People established semi-permanent villages near streams and smaller tributaries to gain access to a wider range of hunting and fishing resources to supplement wild plant collecting. Steinacher and Carlson (1998:235) stated that this tradition began approximately A.D. 900 with the integration of small-scale horticulture into an established hunting and gathering society. Possibly, in response to deteriorating climatic conditions resulting in droughts and famines, they suggested that the Central Plains Tradition terminated around A.D. 1450, coinciding with the reconstruction and re-organization of social and political systems of many of the groups. The once-dispersed settlements merged to form large compact villages (Steinacher and Carlson 1998:235). Given the diversified subsistence economy, the lithics recovered from the different archaeological sites reflect this type of pattern.

A variety of lithic tools, such as projectile points, cutting tools, and scraping implements have been recovered from several Central Plains Tradition sites. Most of the projectile points consist of a wide range of forms and are usually small and bifacially chipped. A vast majority of the points have triangular forms. The points are unnotched, side-notched, or basally notched (Wedel 2001; Steinacher and Carlson 1998). Given the range of tool forms in the assemblages it seemed possible that many of these tools are multi-functional. A variety of bifacially flaked knives that range in size and form might indicate that people designed them for specific activities that involved different types of materials. Some of these knives are diamond shaped with bevelled edges, ellipsoidal, or oblong. Plano-convex and unifacial end and side scrapers are found in many sites. Gravers resembling end scrapers, drills, retouched and utilized flakes are also common in many Central Plains Tradition sites (Steinacher and Carlson 1998:241-242). The lithic tool kit also includes a large assortment of ground stone tools. Pipes and wood working tools such as sandstone abraders and hammer stones are also evident. Plant processing implements include manos, metates, grinding slabs, pitted nutting stones, disks, and chipped or ground celts (Wedel 2001; Steinacher and Carlson 1998).

3.7 Mississippian Tradition

Archaeological sites identified as belonging to the Mississippian Tradition are located in the major valleys of the Mississippi River and along its numerous tributaries (Figure 3.3). Mississippian influences are often evident in the artifact assemblages associated among many of the Plains Village groups. Their widespread influence is often noted in discussions about the Central Plains Tradition, Middle Missouri Tradition, and the Oneota complex (Gibbon 1994:133). The Mississippian Chiefdoms are noted for their widespread exchange network that extended into the Northern Plains. They also had some level of influence in the Northeastern Plains with the periodic recovery of Mississippian grave goods recovered from burial mounds.

Within the heartland of Mississippian culture, complex chiefdoms developed that featured status inequality, the construction of large temple mounds, and large populations concentrated in permanently occupied villages. The first Mississippian centres emerged as early as A.D. 200, but the majority appear between A.D. 700 to 1000. The Mississippian culture was comparatively short-lived, with many of the major centres become abandoned in the A.D. 1200 to 1400 period. During their brief florescence, they had a significant impact upon the Central Plains and portions of the Northern Plains.

Mississippian influences across the Northern Plains region first become apparent between A.D. 700 and 900 as Mississippian satellite communities began to appear in the northern part of the Mississippi river valley (Syms 1977). A second influx of Mississippian influences occurred in the Central Plains region including southeastern Nebraska and the Dakotas and in the Upper Mississippi valley and western prairies approximately A.D. 900 and 1200. According to (Gibbon 1994:133) "this transformation involved, in part, the 'mississippianization' of the upper [Mississippi] valley and western prairies with Mississippian culture largely confined to the upper Valley, and Plains Village and Oneota villages distributed throughout the prairie provinces to the west". Many Plains Woodland hunting and gathering groups adopted some of the Mississippian cultural practices into their own culture through contacts made with the various Mississippian societies.

Numerous authors have developed models to explain the influence that the Mississippian culture had on the different Plains cultures (Gibbon 1994:136). Discussions pertaining to exchange networks emphasize the dependence and involvement of intermediaries to ensure that relationships and the exchange of products were maintained between Plains villagers and nomadic hunter gathers and Mississippian societies (Syms 1977:110). The Mississippian culture disappeared from the archaeological record approximately between A.D. 1250 and 1300 resulting in a shift to a Late Woodland tradition around A.D. 1300 and 1350 (Gibbon 1994:137). This pattern continued until the early historic period "but only in attenuated form in the Middle

Mississippi area after the 'collapse' of such centres as Cahokia and Aztalan about A.D. 1300" (Syms 1977:110). The lack of contact with Cahokia (collapsed about A.D. 1250 - 1300), geographical isolation, independent political and cultural developments, and the deterioration of a subsistence base led to the decline of the Mississippian culture (Gibbon 1994:137). In the context of the northwestward spread of Mississippian cultural influence and migration of horticultural villagers throughout the upper Mississippi River valley, Nicholson and Hamilton (2001:69) have suggested that Vickers focus indirectly reflects an element of this larger-scale migration of villagers. Such dramatic migration to the south would likely have a 'ripple effect' among many associated groups.

It is difficult to provide an inventory of the lithic materials used by the Mississippian people because some excavators have not always been careful to record the proveniences of lithic artifacts from the Mississippian sites (Brown et al. 1990:260). The identification of pure Mississippian traits is also complicated because it is not always possible to ascertain which material cultural traits are actually Mississippian. The quality associated with the stone tools recovered from Mississippian sites is considered to be magnificent. Small triangular side-and basally notched projectile points are often found at Mississippian sites. These point styles are frequently associated with broader regional developments evident on the Plains (Gibbon 1994:136). The presence of the Plains Side-notched projectile point on the Northern Plains has been associated with the Mississippian sphere of influence (Kehoe 1973:192). Because of this influence, the Mississippian triangular point became the template for the Plains Side-notched projectile point that was gradually adopted by the various Plains Village and Plains Woodland cultural groups. Additional tools recovered from sites include large stone hoes, discs, chisels, celts, and microliths. Some of the lithic raw materials used to make tools include white Burlington chert, local cherts and basalt.

3.8 Middle Missouri Tradition

The Middle Missouri subarea includes the stretch of the Missouri Valley from below the mouth of the White River in South Dakota, and upstream to the mouth of the Yellowstone River in North Dakota (Lehmer 1971:28) (Figure 3.3). People of the Middle Missouri Tradition constructed permanent and occasionally fortified villages, depending on the level of threat. Different groups who harvested numerous resources from a variety of environments employed a mixed subsistence strategy. However, the economic focus was on bison and cultivated plants (Winham and Calabrese 1998:290). The grasslands supplied bison and other game, river valleys, and the shorelines of the Missouri River were ideal areas for the procurement of mule deer, migratory avian species, and aquatic animals. The flexibility of this strategy was essential to the survival of the Middle Missouri people because the area was marginally suited for horticulture. The success of producing large horticultural crops that yields enough food for a winter was not guaranteed.

Lehmer (1971:65) has noted that the "Plains Villagers were geographically intermediate between the transitory camps of the hunting tribes of the Northwestern Plains and the fixed settlements of the Eastern Woodland peoples. They were also culturally intermediate." Their geographic position allowed them to build an extensive exchange network that focused on developing and maintaining reciprocal relationships with other Plains Villagers and Plains Woodland groups. Some of the Middle Missouri groups often traded meat, hides, and bone from bison and other large ungulates to supplement their diet and lifestyle. They also acquired tools from the surrounding nomadic hunter-gatherer cultures. These groups, in turn, would obtain supplies such as maize from the villagers to supplement wild food deriving from their nomadic way of life.

Deteriorating climatic conditions during the Neo-Boreal profoundly affected wild food supplies and horticultural crops. This contributed to population movements among Middle Missouri groups. These drought conditions may have contributed to widespread dispersal and movement of villagers far to the north of the Middle Missouri region. Based on similarities with Initial Middle Missouri variant pottery recovered from the Duthie site in the *Makotchi-Ded Dontipi* locale, it is suggested that Middle Missouri people migrated to this area approximately between A.D. 1000 and A.D. 1500 (Nicholson and Hamilton 2001: 67). Nicholson and Hamilton (2001:68) have suggested "the Vickers [focus] ceramic assemblage appears to be largely derived from the plains fringe of Minnesota and northern Iowa, with a strong admixture of Middle Missouri wares, as well as styles unique to the Vickers [focus] itself."

Since Lehmer's (1971) synthesis of the Middle Missouri Tradition, a significant amount of archaeological research has been conducted in the Middle Missouri region. This has resulted in the creation of many regional variants subsumed within the tradition, however, the idiosyncrasies of each variant are not addressed in this thesis. Distinctions made between the variants relied on variations evident in the different geographic areas, their temporal existence, and in the site assemblages particularly pottery. Settlement patterns, subsistence strategies, and technological systems have fluctuated since its initial formation and continued until the early historic period when dramatic changes occurred deriving out of the contact experience. Winham and Calabrese (1998:278) believed that the Middle Missouri Tradition was not indigenous to the Missouri river valley, but appeared approximately A.D. 1000 in the southern part of Northeastern Plains subarea. There is considerable debate regarding the termination dates for Middle Missouri Tradition. Winham and Calabrese (1998:278) suggested that the Initial Middle Missouri variant ended around A.D. 1250 and the Extended Middle Missouri variant ended approximately A.D. 1450. Lehmer (1971:32) noted that the Middle Missouri Tradition existed from approximately A.D. 900 until A.D. 1700.

Lehmer (1971:73) indicated that the existence of a "technological continuity throughout the span of the village cultures of the Missouri Valley in the Dakotas, and [proposes that] it also establishes the Middle Missouri Tradition as the complex which provided the technological foundation for the subsequent cultural development." The lithic tool kit of the Middle Missouri Tradition appears to be consistent throughout its temporal span. However, the analysis of tools and debitage is a relatively recent analytic focus among Middle Missouri archaeologists (Winham and Calabrese 1998:294). There are minor differences in style and form evident between the tools (Winham and Calabrese 1998:298). The lithic artifacts including projectile points, knives, bifaces, drills, scrapers, and utilized flakes exhibit excellent workmanship.

Multi-variant statistical analysis of the different small, side-notched projectile points recovered from many of the sites completed by Winham and Calabrese (1998:295) indicates that differences in form reflected variation through time. Many of the Middle Missouri Tradition tools consist of either small bifaces with a triangular outline or are triangular with notches in the lateral edges to form a distinct hafting base

(Winham and Calabrese 1998:295). Projectile points are small, lightweight, and exhibit excellent quality (Lehmer 1971:73). Lehmer (1971:73) further noted that the outer portions of the side-notches are generally wider than the inner sections and that the blade edges of the projectile points are convex and the basal shape is often concave through straight to convex.

A diverse range of cutting tools also occurs in the tool assemblages of the Middle Missouri subarea. Long, narrow bifaces and lanceolate blades probably functioned as knives (Lehmer 1971). The narrow bifaces have one convex edge opposite one straight edge and the lanceolate blades often have one lateral edge blunted. Since these edges are blunted, it has been suggested that these tools might have functioned as knives instead of projectile points. These knives exhibit good workmanship and have a variety of forms that include large side-notched and stemmed varieties with either leaf or triangular blade shapes. Lehmer (1971:89) suggested that these blades were hafted into large ribs or vertebral spines that were often used as handles for the knives. Lehmer (1971:75) also noted that the lanceolate knives were made with a bluish or a greenish-grey silicified sediment while the other knives generally consisted of milky quartz or chalcedony.

Numerous tools designed to pierce, perforate, and scrape both faunal and vegetative materials are often found at Middle Missouri sites. Drills, some of them side-notched for hafting purposes, generally have narrow tips and broad bases (Lehmer 1971:75). Some drills lack an expanded base and only consist of a narrow tip. Judging from the flaking qualities, many of these drills are either pressure flaked or constructed from flakes with the modified portion serving as the base. Several varieties of end and side scrapers are also evident in the toolkits. Plains snub-nosed end scrapers are common tools found in many Middle Missouri archaeological sites. Gregg et at. (1996:87) suggested that this type of end scraper might have been a possible diagnostic artifact for the Plains Village Tradition. Most of these scrapers consist of convex dorsal surfaces shaped by pressure flaking at right angles to the long axis and are small (less than 2.5 cm) (Lehmer 1971:75). Some scrapers have percussion flaked convex dorsal surfaces and are generally larger.

Ground stone tools and expedient tools are found within Middle Missouri subarea sites. Grooved mauls shaped from granite cobbles, pecked and polished celts of diorite or granite are common tools found in Middle Missouri sites. Other ground tools include sandstone shaft smoothers and irregular shaped smooth stones that have no ascribed function. Expedient stone tools such as utilized flakes are often part of the site assemblages. These flakes have usually been formed into irregular shapes and might have chipped cutting or scraping edges. At many Middle Missouri village sites, caches of stone blanks have also been found. Stone blanks are flaked by percussion technique into rough ovals that measured 5.0 to 25.0 cm in dimension (Lehmer 1971:75). These blanks served as a source of lithic material that was brought into the villages to be manufactured into tools later.

Knife River flint is the dominant lithic material present in many Middle Missouri sites. Typically, 75% of these site assemblages consist of KRF (Lehmer 1971:119). Some of the later Middle Missouri Tradition sites contain light colour varieties of chalcedony, jasper, chert, quartzite, and quartz. The difference between earlier and later Middle Missouri sites might reflect a shift in trading relations or a change in seasonal rounds. Access to KRF might have become more difficult for some of these groups during those times. The relevance of Middle Missouri tradition materials in this thesis lies in the evidence for exchange relations with Vickers focus people and the presence of Middle Missouri pottery in Vickers focus sites. At the Jackson site, a high proportion of the formed tools such as projectile points are made of Knife River flint.

3.9 Oneota Tradition

Henning (1998) demonstrated that small clusters of Oneota sites are located in South Dakota, Minnesota, Iowa, Nebraska, Kansas, and Missouri. The development of the Oneota tradition at about A.D. 1000-1200 paralleled the decline of the Mississippian culture and settlements in the upper Mississippi River valley (Gibbon 1994:138). It is possible that Oneota people shifted their villages to counteract the effects of the failing Mississippian culture. Oneota people often interacted at different times with people of the Woodland, Mississippian, Caddoan, Central Plains, Middle Missouri, and Coalescent traditions. Henning (1998:345) viewed the Oneota tradition as a culture that linked the Plains with the Eastern Woodland, particularly considering the variable patterns of climatic change that affected the availability of natural resources on the Plains.

Oneota sites date from about A.D. 900 until 1600 (Henning 1998). After A.D. 1200-1250, Oneota people began to consolidate villages, build fortifications, and reduced their emphasis on long distance bison procurement (Gibbon 1994:138). It is speculated that Oneota people used a seasonal subsistence strategy that involved hunting, particularly bison, fishing, and the gathering of wild plants. The recovery of maize, beans, squash, and sunflowers from archaeological sites indicates that they were also engaged in horticulture.

The lithic assemblage of the Oneota tradition includes a variety of hunting and cutting tools such as small, simple triangular projectile points and bifacial knives (Henning 1998:349). There are also unifacial tools used for scraping, piercing, and drilling. This includes end scrapers, side scrapers, drills, perforators, and gravers. It is possible that the end scrapers were hafted into antler or wood handles. There are also numerous flake tools present at the sites. Chert is the predominant material used to manufacture flintknapped tools.

A variety of ground stone artifacts recovered from Oneota sites include mortars, manos or hand stones, shaft abraders, grooved mauls, celts, and sharpening or abrading stones. The recovery of grooved mauls and end scrapers might suggest that the inhabitants were processing dried meat at some sites. Catlinite was a popular material used by the Oneota people. It was used to manufacture pipes, engraved tablets and pipe bowls that eventually were exchanged with other groups (Schlesier 1994:344).

3.10 Summary of the Late Precontact Culture History in Southwestern Manitoba and Adjacent Areas

The Northern Plains subregion was occupied by many diverse cultural groups. Typically, many of these groups focused predominately on hunting a variety of game animals, particularly bison, and gathering an assortment of wild plant resources. Some of the Plains Woodland groups shifted some of their attention to horticulture to supplement wild food sources. This type of subsistence strategy is also characteristic of the Plains Village tradition. Thus, while horticulture was important to many people, hunting and gathering still prevailed with most groups.

Section 3.11 reviews the research leading to the identification of the Vickers focus in southwestern Manitoba through the recognition of a distinctive pottery type, subsistençe strategies, and settlement patterns.

3.11 Definition of the Vickers Focus

In 1991, Nicholson renamed the Pelican Lake focus, originally identified by Chris Vickers in 1950, as the Vickers focus because an existing assignment of Pelican Lake in reference to a Late Archaic Plains culture was widely accepted in the literature (Nicholson 1991:167). The taxonomic term 'focus' remains as a residual name created by Chris Vickers. The distribution (Figure 3.4) of Vickers focus sites in Manitoba extends from Rock Lake in the east to Oak Lake in the west as well as the Randall site in the south and Johnas site in the north (Nicholson and Hamilton 1996:1).

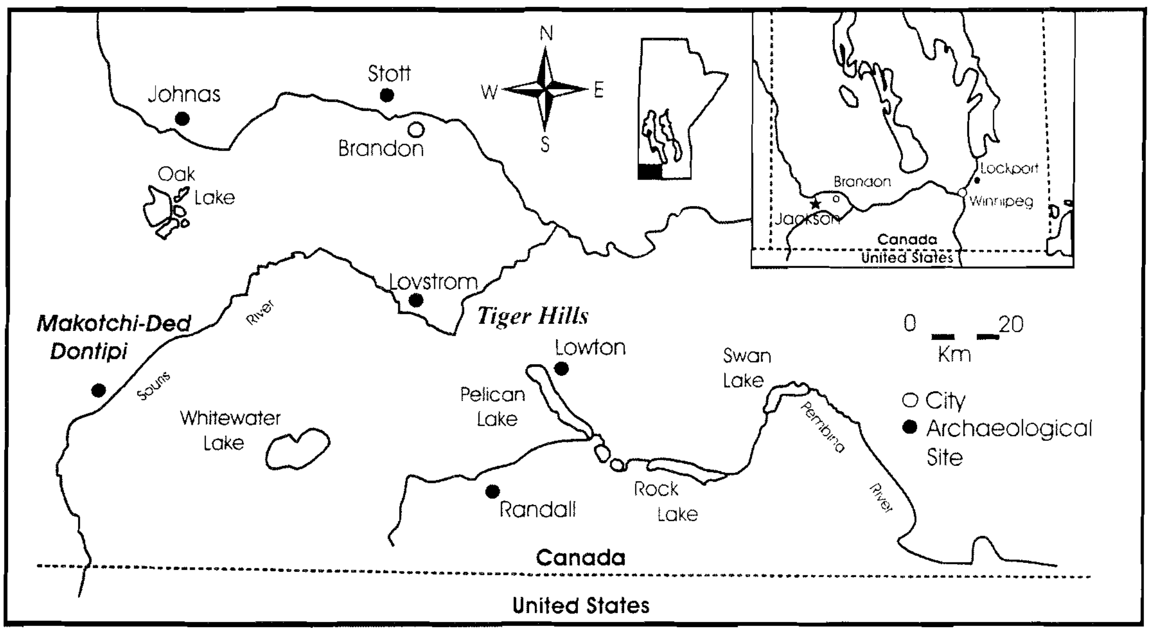

Figure 3.4 Spatial extent of Vickers focus archaeological sites in southwestern Manitoba (after Playford 2001).

There are significant differences evident in the subsistence strategies and settlement patterns between the assemblages associated with sites in the Tiger Hills and Lauder Sand Hills (Hamilton and Nicholson 1999; Nicholson 1990, 1991, 1994; Nicholson and Hamilton 1996, 1997, 1999, 2001). However, there are also similarities in the material culture of Vickers focus sites in the eastern and western site clusters that include a complex amalgamation of pottery wares and Plains stone tool technology. A brief overview about the material culture, subsistence strategies, and settlement patterns of Vickers focus people is offered (see Hamilton and Nicholson 1999; Nicholson 1990, 1991, 1994; Nicholson and Hamilton 1996, 1997, 1999, 2001; Playford 2001 for additional information).

3.11.1 Vickers Focus Pottery

The pottery found at Vickers focus sites suggest a composite society drawn from several known Northern Plains cultural groups from outside Manitoba (Nicholson 1996:69). Multiple surface finishes, decorative styles, rim forms, and temper types suggest a diffusion of traits either borrowed or originated from both the Eastern Woodlands and villages sites in the Middle Missouri and Mississippi river valleys. A distinctive style of pottery containing some attributes from other wares indicates the presence of Vickers focus people in southwestern Manitoba. The diagnostic characteristics of the Vickers focus pottery include:

> finger-pinched nodes as exterior lip decoration. Tool impressions on the interior and exterior of the lips are common and rim profiles vary from flared, through straight, to 'S' cross sections. There is also use of grog and mussel shell as well as grit for temper. Exterior finish ranges from smoothed, through obliterated fabric, to clearly defined cord/fabric marking, as well as small amounts of check stamping. Exterior brushing is also present as a minor element.... the rough textile finish vessels carry little or no other decoration. The lips of most vessels display various tool impressions made with round, sharp-edged or angular objects. Occasionally, tightly twisted cord is impressed into the clay on the rim and/or neck areas. Decoration may extend onto the neck or shoulder (Nicholson 1994:110).

The presence of shell-tempered pottery at the Lovstrom site (DjLx-1) and the Lowton site (DiLv-3) indicates a likely Eastern Woodland presence and possible Mississippian influence (Nicholson 1990:40). The interesting aspect of the pottery from Vickers focus sites is that wares identified in the assemblages indicate a variety of relationships with groups residing outside of southwestern Manitoba. Wares indicative of Mississippian influenced cultures such as Sandy Lake, Great Oasis, Cambria, Oneota and other composite groups from the Northeastern Plains Village complex including Scattered Village complex and Middle Missouri Village cultures are present (Nicholson

1996:69). Given the complex nature of the pottery found at Vickers focus sites, it is asserted that Vickers focus represents the migration of a complex amalgam of diverse people into southern Manitoba.

3.11.2 Settlement and Subsistence Strategies of Vickers Focus People

There are two regional site clusters of Vickers focus sites in southwestern Manitoba each representing different strategies of resource utilization and settlement patterns (Nicholson and Hamilton 2001:56) (Figure 3.4). The calibrated radiocarbon dates from the Tiger Hills/Killarney Plains region and the sites in the *Makotchi-Ded Dontipi* locale form a weakly expressed east to west temporal continuum (Hamilton and Nicholson 1999:7). Nicholson and Hamilton (1999:11) propose that a "time-transgressive shift in subsistence strategy occurred between ca. A.D. 1400 and A.D. 1650. While horticulture appears to have played a supporting role in the Tiger Hills region, the sites located in southwestern Manitoba at *Makotchi-Ded Dontipi* indicate a shift to an intensive forager economy." The Tiger Hills region might represent one of the first occupied areas, dating approximately A.D. 1450, when Vickers focus people initially ventured into this area to settle after migrating from their eastern homeland (Nicholson and Hamilton 1999:15). Perhaps because of climatic changes that resulted in possible failed crops in the Tiger Hills, Vickers focus people gradually migrated westward to populate the Lauder Sand Hills region around A.D. 1600 (Nicholson et al. 2002; Nicholson and Hamilton 1999:15).

3.11.3 Vickers Focus Archaeological Sites in the Tiger Hills Region

The Tiger Hills/Killarney Plain forms the eastern cluster of Vickers focus sites in southwestern Manitoba (Figure 3.4). The soils are medium-textured silt and sandy loams developed on outwash glacial tills found along the Pembina trench (Nicholson and Hamilton 2001:58). Most of the Vickers focus sites in the Tiger Hills region are located in seasonally warm locations adjacent to small potholes or sloughs that are removed some distance from major rivers and lakes (Nicholson 1993). The favourable environmental conditions and the presence of probable horticultural implements in the artifact assemblages provide support for the horticultural hypothesis concerning this area of Vickers focus sites (Nicholson 1991, 1993, 1994). The recovery of horticultural implements includes scapula and stone hoes from the Lowton and Lovstrom sites

(Nicholson 1990:36,38).

Archaeological investigations in this region suggest that Vickers focus people utilized a mixed subsistence strategy that possibly involved small-scale horticulture supplemented by a bison-focused hunting and gathering economy (Nicholson 1991, 1993, 1994, 1996). This type of subsistence strategy is similar to both the Plains Woodland and perhaps even the Plains Village Traditions. As noted earlier, the oldest Vickers focus occupations in southern Manitoba appear to have been based at a particularly large, long-term residence site (i.e. Lowton Site) that served as a headquarters surrounded by a series of smaller seasonal, and task-specific resource extraction settlements (Nicholson and Hamilton 1996:3; 2001:66). This arrangement offered logistical advantages in that it allowed exploitation of a larger hinterland. The Lowton site (a long-term residence) and the Lovstrom site (a seasonal camp) exemplify this type of relationship.

The Lowton site is the type site for the Vickers focus (Nicholson and Hamilton 1999:15). It is located in a cultivated field approximately 5 km from the Pembina trench in the Tiger Hills (Figure 3.4). There are several potholes, small lakes, and isolated forest groves surrounding the site. It is the largest Vickers focus site in the eastern site cluster and encompasses an estimated 35 hectares of land (Nicholson and Hamilton 2001:57). Private collections held by avocational archaeologists in the area include a variety of pottery sherds, stone tools, catlinite pipes, and discs. The pottery is consistent with wares from the Mississippian sites from northern Alabama to the upper Mississippi regions of Illinois, Iowa, and Minnesota (Nicholson 1994:106-107). Stone hoes, ground axes and mauls, projectile points and bifaces and a diverse assemblage of boring tools and retouched flakes are also evident at the Lowton site (Nicholson 1994:107-110). Recent archaeological investigations at this site indicate that intact cultural deposits survive below the plow zone and several bone collagen dates suggest a probable site occupation about A.D. 1450 (Nicholson and Hamilton 2001:58).

The Lovstrom site (Figure 3.4) is located on the high valley wall of the Souris River at its junction with Jock's Creek (Nicholson 1994:104). It covers approximately eight hectares, however, the Vickers focus occupation extends over only one hectare. The Lovstrom site is a multi-component site. A scapula hoe was recovered from the

Vickers focus occupation that dates to circa A.D. 1450 and suggests possible evidence of horticultural activity (Nicholson and Hamilton 2001:58). As well, the pottery associated with this component resembles wares found among horticultural groups from Plains Woodland sites in the Dakotas and Minnesota. This site also contains Blackduck/DuckBay pottery recovered from stratigraphic units horizontally and vertically separated from the Vickers focus occupation (Nicholson 1990:39). This stratigraphic placement was also evident at the Jackson site. The Lovstrom site may have been a summer occupation given its location on the high bluff overlooking the Souris Valley (Nicholson and Hamilton 2001:66).

The Randall site locality (Figure 3.4) is located between Killarney Lake and Pembina River north of Killarney, Manitoba (Nicholson and Hamilton 2001:61). It is located within a biotic mosaic of parkland-forest-prairie habitat with potholes interspersed throughout the area. The materials were indiscriminately surface collected from several artifact clusters found throughout a single field by Gordon Randall. The artifacts in the Randall collection indicate that the materials may derive from a multi-component site. The collection consists of pottery from Vickers focus, Laurel and Sandy Lake ware, early and late Blackduck, Mortlach, and a variety of Middle Missouri vessels (Hartlen 1997; Taylor-Hollings 1999). Nicholson and Hamilton (2001:61) mentioned that some of the lithic tools present in the collection might have come from the adjacent Richards site in the west. The materials from this site could not be assigned a date because of disturbance through cultivation.

In summary, Nicholson and Hamilton (2001:66) proposed that the sites located in the Tiger Hills/Killarney Plain region represent a centre based settlement strategy in which a large, long term village served as the home base for the surrounding short term task specific resource extraction sites. Vickers focus people may have focused upon small-scale horticulture supplemented by hunting and gathering (Nicholson 1990:173). Excavators recovered stone hoes and other crude grinding implements indicative of horticultural activities from the Lowton and Lovstrom sites. Vickers focus people relied on a variety of local materials such as chert to make their stone tools, however, Tongue River silicified sediment, Knife River flint, and obsidian were also used. People may have obtained these materials through exchange networks extending into the Middle

Missouri and Central Plains subareas. Vickers focus people also had access to catlinite pipes and gorgets, but these have been found only at the Lovstrom site. Nicholson et al. (2002) also believes that based on the calibrated radiocarbon dates, which cluster between A.D. 1400 and 1600, that Vickers focus people occupied the Tiger Hills region until circa A.D. 1450.

3.11.4 Vickers Focus Archaeological Sites in the Lauder Sand Hills Region

The second cluster of Vickers focus sites is located on the southwestern edge of the Lauder Sand Hills (Figure 3.4). This area is referred to as the *Makotchi-Ded Dontipi* locale, which includes the Bradshaw, Vera, and Jackson sites, all of which have a Vickers focus component. As described in Chapter 2, an isolated mosaic of forest and localized wetlands surrounded by mixed grass prairie characterizes this region that offered a diverse and rich resource base for Vickers focus people. The distribution of sites and artifact assemblages vary considerably from those found in the Tiger Hills. Many of the sites in the *Makotchi-Ded Dontipi* locale (Figure 3.5) are closely clustered spatially and temporally (Nicholson and Hamilton 2001:56). Vickers focus intensively exploited a broad range of seasonal resources that focused on bison hunting and foraging, but there is no evidence to date of horticultural activity (Nicholson and Hamilton 1999:11).

Vickers focus people probably abandoned the Pembina-Souris trench region and began to intensively occupy the Lauder Sand Hills circa A.D. 1450-1600 (Nicholson and Hamilton 1997:34; Nicholson, personal communication 2003). Vickers focus people might have slightly shifted their settlement system as part of this move westward to the *Makotchi-Ded Dontipi* locale. Nicholson and Hamilton (2001:66) refer to this as a central place settlement strategy, "in which a seasonal village was strategically placed, and from which resource extraction task groups were dispatched into the surrounding area." The migration westward also seems to be associated with the abandonment of horticultural activities, and an increasingly heavy reliance on hunting bison and generalized foraging. Since many of the sites contain exotic lithic materials from North and South Dakota, Nicholson and Hamilton (1999:11) speculate that cultigens might have been part of their diet either through trade with the Middle Missouri villages.

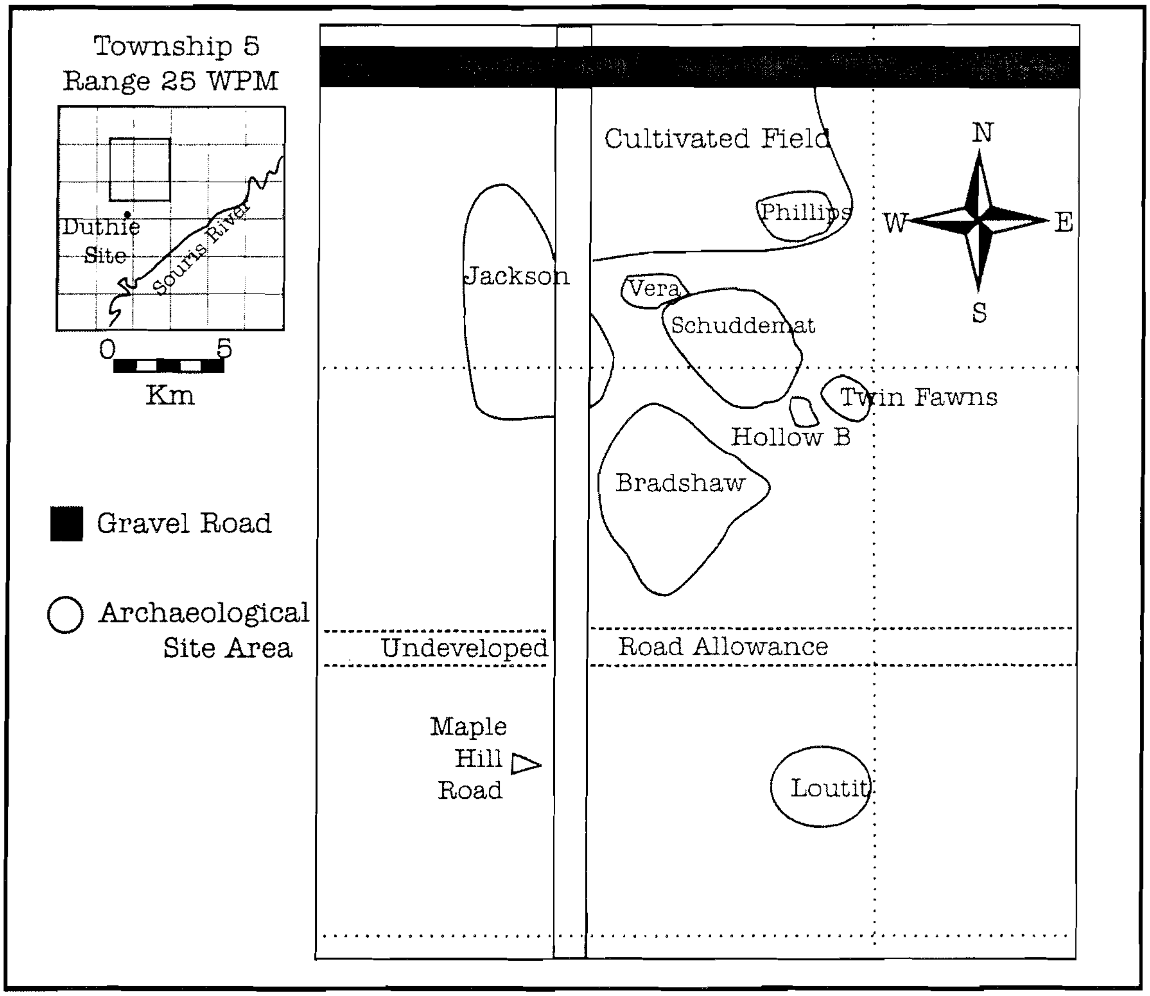

Figure 3.5 Vickers focus archaeological sites in the *Makotchi-Ded Dontipi* locale (after Nicholson and Hamilton 1996).

The calibrated radiocarbon dates from the Jackson, Vera, and Bradshaw sites range from A.D. 1420 to 1665 (Nicholson and Hamilton 2001:62).

The Bradshaw site is located east of the Jackson site (Figure 3.5). It covers approximately between 10 to 12 hectares of land. The recovery of beaver remains and duck-sized bird bone suggests that Vickers focus people occupied the site during the summer months (Nicholson and Hamilton 1997:31). Excavators recovered a few projectile points from the site. Knife River flint is present in the collection, but small amounts of other exotic materials are evident. Pottery from this site indicates a predominantly Vickers focus occupation although a small Mortlach component in the southern portion of the site is present (Nicholson and Hamilton 2001:63). Excavators did not recover evidence of horticulture. While only limited research has been conducted at this site, the widely dispersed nature of the recoveries and the somewhat greater species diversity have led Nicholson and Hamilton (2001) to propose a warm season occupation.

The Vera site is located north of the Bradshaw site and west of the Jackson site in the Lauder Sand Hills region (Figure 3.5). The spatial extent of Vera is unknown at this time although fieldwork is ongoing. It consists of multiple occupations and components that begin in the Middle Archaic period and continued to the early historic period. Only the Vickers focus occupation is relevant to this discussion.

Despite the other components present at the Vera site, the Vickers focus component is spatially discrete and readily identifiable because of the Vickers focus pottery (Nicholson and Hamilton 2001:64). A radiocarbon date of 340±60 B.P. (Beta 96109) is consistent with the dates from the Vickers focus occupation at the Jackson site. There are relatively few faunal remains recovered associated with this component, although numerous stone tools including projectile points, scrapers, knives, and utilized flakes were recovered. There are smaller quantities of exotic lithic materials evident at this site compared to other *Makotchi-Ded Dontipi* sites. There was no horticultural evidence recovered. Nicholson and Hamilton (2001) described a rim sherd believed to be from a Mandan vessel similar to wares excavated from the Mandan Double Ditch site in North Dakota. They suggest that the vessel was probably imported. Nicholson and Hamilton (2001:65) speculated that the Vickers focus occupation at the Vera site occurred in the summer. The was based upon the lack of foetal bison remains, the scarcity of faunal remains, and the presence of fire-reddened soil suggestive of hearths built on thawed ground.

To summarize, the sites in the *Makotchi-Ded Dontipi* locale are located on well-drained warm sandy soils and are adjacent to potholes. Vickers focus people appear to have established their camps at some distance from permanent water sources. The Jackson site is located approximately 5 km from the Souris River. The sites in this cluster are also smaller than the sites in the Tiger Hills region. A mixed subsistence strategy served Vickers focus that included hunting a variety of game animals, particularly bison and gathering wild plants. None of the sites investigated in the Lauder Sand Hills region contain evidence of small-scale horticulture unlike the sites in the

Tiger Hills region. Another difference recognized between the two site clusters is the utilization of certain lithic raw materials.

3.11.5 Lithic Materials and Artifacts Associated with Vickers Focus Lithic Assemblages

A few statements will be made regarding the lithic materials evident among Vickers focus assemblages because the remainder of the thesis will address the use of certain materials at the Jackson site. The reliance on particular exotic lithic materials varies between the eastern and western clusters of Vickers focus sites. In the Tiger Hills region, sites such as the Lowton site are notable for the recovery of non-local lithic materials such as catlinite, grey soapstone, KRF, obsidian, and TRSS. Nicholson (1994:113-114) suggested that the presence of these exotic materials in this region might indicate maintenance of social connections as part of an extensive exchange network that was based on kinship privileges. Knife River flint is also present in lithic assemblages among the sites in the Lauder Sand Hills; however, slightly higher amounts of Tongue River silicified sediment and lower counts of obsidian are evident in these sites. It is important to note that non-local materials deriving from the southeast, such as catlinite have not been recovered from *Makotchi-Ded Dontipi* locale. The one exception is the slightly older Duthie site (Taylor 1994) with its Initial Middle Missouri affiliations. Surface collectors recovered a smoking tube made of this material. Nicholson and Hamilton (1999:15) suggested that the differences in the proportions of exotic materials between the Tiger Hills and Lauder Sand Hills regions might reflect changes in the direction of lithic raw material exchange. Investigations regarding the differences apparent in the utilization of exotic lithic materials between the two regions yielding Vickers focus sites have not yet been completed. Therefore, it is difficult to accurately assess the magnitude of change in lithic preferences. Residents from both regions seemed to have relied on similar local lithic materials that include a variety of cherts such as Swan River chert, agates, brown chalcedony, and quartzite.

Lithic tool assemblages from both Vickers focus site clusters consist of side-notched and triangular projectile points, bifaces, unifaces, and an assortment of debitage. Ground stone axes, mauls, and stone hoes have been recovered from Vickers focus sites in the Tiger Hills region (Nicholson 1994:107-110), but not from sites in *Makotchi-Ded*

Dontipi locale. The variation evident between the tool assemblages, particularly the ground stone tools, may reflect the different subsistence strategies used by Vickers focus people in each of the regions.

3.11.6 Radiocarbon Dating

The Vickers focus dates to the Late Precontact period. For the Tiger Hills/Killarney Plains site cluster, calibrated radiocarbon dates occurred between A.D. 1300 and 1600 with a calibrated intercept occurring around A.D. 1450 (Nicholson and Hamilton 1997:29). The calibrated dates for the *Makotchi-Ded Dontipi* locale range from A.D. 1450 until A.D. 1650 with calibrated intercepts falling between A.D. 1500 and A.D. 1620 (Nicholson and Hamilton 1997:30). These dates indicate that Eastern Woodland groups first migrated to the Tiger Hills and sought to retain elements of their foraging/horticultural lifestyle and eastern trading connections. Nicholson (et al. 2002) propose that climatic changes occurring in the mid 15th century caused failure of horticultural production, and contributed to the abandonment of the Tiger Hills, and eventual migration to the *Makotchi-Ded Dontipi* locale. The terminal dates for the Vickers focus occupation at *Makotchi-Ded Dontipi* suggest disappearance of these people from southern Manitoba before the arrival of Europeans (Nicholson 1993:211).

Table 3.2 Radiocarbon dates of Vickers focus occupations (dates for non-Vickers focus occupations at the Lovstrom site have not been included in this table).

Eastern Cluster: Tiger Hills

Site	Lab Number	Uncorrected Age	Normalized Age
Lowton	S-3459	510±110	590±110
Lowton	TO-9215	350±80	-
Lowton	TO-9216	440±80	-
Lowton	TO-9217	390±50	-
Lovstrom	SFU-no#	380±50	460±55
Lovstrom	S-3032	405±110	485±110
Lovstrom	S-3033	465±100	545±100

Western Cluster: Lauder Sand Hills

Site	Lab Number	Uncorrected Age	Normalized Age
Jackson	Beta 83865	-	290±50
Jackson	Beta 83864	-	300±70
Jackson	Beta 82792	-	410±60
Vera	Beta 106109	-	340±60

3.11.7 Origins and Disappearance of Vickers Focus People

The nature of the material culture and temporal placement of Vickers focus strongly suggests origins and affiliations with the Middle Missouri and Mississippi river valleys. Specifically, Nicholson and Hamilton (1999:11) suggested ancestral links to groups in the Eastern Woodlands of southern Minnesota and northern Iowa based on pottery recoveries. Nicholson (1994:111) also proposed that the appearance of Vickers focus people in the Tiger Hills region was part of a general Plains Woodland expansion onto the prairies that coincided with the demographic transformations deriving from the collapse of the major Mississippian chiefdoms that began about A.D. 1200, and terminated circa A.D. 1500. The migrations of Vickers focus people probably began with small groups of people from the Eastern Woodlands around A.D. 1400. These groups were primarily horticulturalists/forager villagers who might have had distant ties with Mississippi and Oneota peoples. Thus, the Vickers focus presence in southwestern Manitoba might represent the most northerly expression of these larger phenomena. Climatic changes during the Neo-Atlantic and Pacific climatic episodes, socio-political conflicts, and ultimately the reliance on bison hunting and foraging all contributed to shifts from the eastern woodlands and into the northern parklands (i.e. the Tiger Hills) (Nicholson and Hamilton 1997:34), and subsequently into the *Makotchi-Ded Dontipi* locale (Nicholson et al. 2002).

The reason for the disappearance of Vickers focus people from the archaeological record remains unknown, however, some of the terminal dates corresponded to certain climatic changes. While a widespread pattern of climatic cooling is thought to begin at about AD 1500 with the Neo-Boreal climate episode, Nicholson (1996:82) has speculated that the eruption of Mount Kuawa in the South Pacific in A.D. 1453 and 1454 (Monzier et al. 1994) may have served as a prelude to the general trends of the Neo-Boreal. Apparently, this volcanic eruption ejected enough volcanic ash into the upper atmosphere to cause cooling climate conditions for perhaps a few years. Such cooling could have caused unseasonable frosts and severely affected the viability of horticulture in the Northeastern Plains (Nicholson et al. 2002). Nicholson and Hamilton (2001:69) suggested that these dates corresponded with the terminal dates assigned to the Vickers focus assemblages in the Tiger Hills region. It is possible that Vickers focus people found that the wild resources of the Tiger Hills were insufficient to sustain their population in light of crop failure, leading them to migrate westward to the Lauder Sand Hills region where the isolated forest/wetland habitats surrounded by mixed grass prairie might have provided ready access to a wider range of resources. This raises questions why Vickers focus sites abruptly disappear at ca A.D. 1650. According to Nicholson and Hamilton (1999:21), the end of the occupation of Vickers focus people in this region coincided with the appearance of the Mortlach phase in Saskatchewan. Nicholson and Hamilton (1999:25) suggest that there is a possible ancestral relationship between Vickers focus and Mortlach phase. This is consistent with the stylistic similarities of the pottery and may be a function of Vickers focus people complete acceptance of a mobile bison hunting/foraging economy that characterizes the Mortlach phase (Vickers 1994:25-26).

3.11.8 The Connection Between Vickers Focus and Mortlach Phase

The archaeological assemblages from the *Makotchi-Ded Dontipi* locale imply there was a relationship between Vickers focus people and Mortlach groups. At sites such as Twin Fawns (DiMe-23), Hollow B (DiMe-24), Schuddemat (DiMe-22), and sections of Bradshaw (DiMe-20), an increased relative frequency of shared pottery traits and a greater reliance on bison hunting are reflective of continuity between Vickers focus and Mortlach populations (Nicholson and Hamilton 1999:21-24). This relationship is also evident at the Jackson site with the recovery of pottery exhibiting Mortlach design techniques (Nicholson and Hamilton 1999:24). The radiocarbon dates assigned to the *Makotchi-Ded Dontipi* locale demonstrate that the sites "date from an Initial Middle Missouri Plains Woodland occupation at the Duthie Site of 880±80 BP to the Vickers Focus occupations about 300-350 BP and the later, multiple intercept Mortlach sites roughly 200-300 BP" (Nicholson and Hamilton 1999:21). Although the archaeological evidence from these sites suggests there might have been contact between Vickers focus and Mortlach groups, the details of that relationship are not yet fully understood.

Nicholson and Hamilton (1999:25) explored four scenarios to explain the relationship between Vickers focus and Mortlach populations. First, the groups interacted with each other, but retained their distinct cultural identities. This proposition, however, does not explain the disappearance of the Vickers focus from the *Makotchi-Ded Dontipi* locale. Second, Vickers focus and Mortlach phase people acquired pottery making techniques from a presently unknown Plains Woodland cultural source, but developed their bison hunting economies separately. Third, Vickers focus people evolved technologically into the Mortlach phase through contact with Plains Village groups. Nicholson and Hamilton (1999:25) suggest "there is an *in situ* evolution from the previously defined Vickers [focus] identified in the Tiger Hills in Manitoba to the Mortlach [phase] identified in Saskatchewan. This would be consistent with the Vickers [focus] ongoing changing subsistence economy model." In light of these scenarios, it might be useful to revisit Walde's (1994) observations about Plains Side-notched projectile points and Plains snub-nosed end scrapers made of Knife River flint among Mortlach sites in south central Saskatchewan. Distance from the KRF quarries was a factor in determining the percentage of KRF tools present in Mortlach sites. Given that the Jackson site contains high proportions of projectile points and end scrapers manufactured with Knife River flint, perhaps a relationship developed between Mortlach and Vickers focus groups through the exchange of lithic materials and possibly stone tools. In effect, perhaps the Jackson site and other similar occupations within the Lauder Sand Hills represent one of the "exchange nodes" proposed by Walde. Fourth, Vickers focus and Mortlach groups were part of the larger Plains Woodland phenomenon that was occurring throughout the Northern Plains. It is possible that both of the groups co-existed in the region, but followed different development patterns. Nicholson and Hamilton (1999) speculate that the third scenario fit best with the archaeological evidence, however, detailed analyses will be required to critically assess these options.

3.12 Summary

It is evident that the Plains Woodland and Plains Village Traditions significantly complicate the Late Precontact period in the Northern Plains. Vickers focus may have had cultural ties with many archaeological cultures distributed throughout the Central Plains and Middle Missouri regions as well as those in the Mississippi River headwaters. Part of this relationship clearly involved exchange networks that included lithic raw materials. The abundance of Knife River flint at the Jackson site, in particular, demonstrates the enduring relationship among groups within the Missouri, Red, and Assiniboine River basins. All of the groups discussed in this chapter, including the inhabitants at the Jackson site, utilized Prairie and Plains Side-notched projectile points described by Kehoe (1966). Many of the groups discussed also share a generalized Plains lithic tool kit that is common to both Plains Woodland and Plains Village traditions. Clearly, the Jackson site lithic assemblage is of great utility in placing the Vickers focus in the larger technological and cultural context of the Plains Woodland and Plains Village traditions.

Chapter Four

Theoretical and Methodological Approaches to the Lithic Analysis of the Jackson Site

4.1 Introduction

This study integrates debitage, tool, and spatial analyses of the Jackson site lithic assemblage to address the validity of the proposed activity areas offered by Hamilton and Nicholson (1999). Archaeologists have traditionally focused on diagnostic artifacts such as projectile points to generate interpretations about tool kits and their functions within a particular site. An increasing number of researchers are directing their attention to the analysis of debitage from sites (Winham and Calabrese 1998). Debitage recovered from archaeological sites provides information regarding the processes of tool manufacturing, lithic raw material preferences (particularly if no or very few tools are present in an assemblage), and the purpose of activity areas. Sometimes these studies have yielded more information about past human behaviour than the analyses of the tools. The understanding of the stone technology of Vickers focus people is known from the perspective of the projectile point styles, formed tools, lithic raw material, and application of thermal alteration observed in the assemblages from various sites in southwestern Manitoba (Nicholson and Hamilton 1998). Many researchers have not addressed in great detail the benefits of studying debitage collected from archaeological sites, including those who have analysed Vickers focus sites. This study uses information obtained from tools and debitage recovered from the excavation units at the Jackson site to provide a more complete perspective about lithic technology and the tool kit used by Vickers focus people.

After a review of previous lithic studies, it was apparent that information about the stone technology of Vickers focus people had been not been fully addressed. General statements regarding lithic raw material reliance and exchange networks have been the primary focus of the studies completed by Nicholson (1991, 1994) and

Nicholson and Hamilton (1997, 1998, 1999, 2001). They focused a substantial amount of their research on the pottery associated with Vickers focus sites, and the subsistence and settlement patterns evident between the two regional clusters in southwestern Manitoba. The inclusion of the earlier lithic studies of the Jackson site into this chapter is important because the information gathered by past researchers (Belsham 1999; Nicholson and Hamilton 1998; Walker 1998, 1999) form the foundation of this study. These early statements regarding the function of the site activity areas had been identified based on small samples of lithics from the excavation units, shovel tests, and surface collections.

Attribute and spatial analyses were deemed the most appropriate methods to assess the lithic assemblage from the Jackson site and to critically evaluate the previously proposed activity areas. The selection of attributes used for this thesis was compiled from other lithic analyses of similar assemblages. It is imperative to define the terms used in this thesis in order to present the results of this study and make it comparable to other lithic studies. The debitage and tool analysis utilized attributes useful for inferring the production process and function of the stone tools.

4.2 Previous Lithic Studies of the Jackson Site Materials

Nicholson and Hamilton (1998), Belsham (1999), and Walker (1998, 1999) have completed studies of the Jackson site lithic assemblage. That research provided an important initial context for the structure and orientation of this study. Nicholson and Hamilton's (1998) unpublished study is presently in progress, but has indirectly influenced the direction of the present research. It is hoped that the completion of that study will provide additional information about the stone technology of Vickers focus people, particularly with reference to their occupation at the Jackson site. Nicholson and Hamilton (1998) outlined the activities occurring at the site and drew attention to the thermal alteration of many of the projectile points. They described the projectile points, both complete and fragmentary specimens as well as unifaces, bifaces, and utilized flakes. Their sample included the surface collection, the shovel tests pits, and excavation units one to 36 (Figure 4.1). The tool attributes included completeness of form, lithic material, flaking pattern, presence or absence of retouch/grinding and thermal effects.

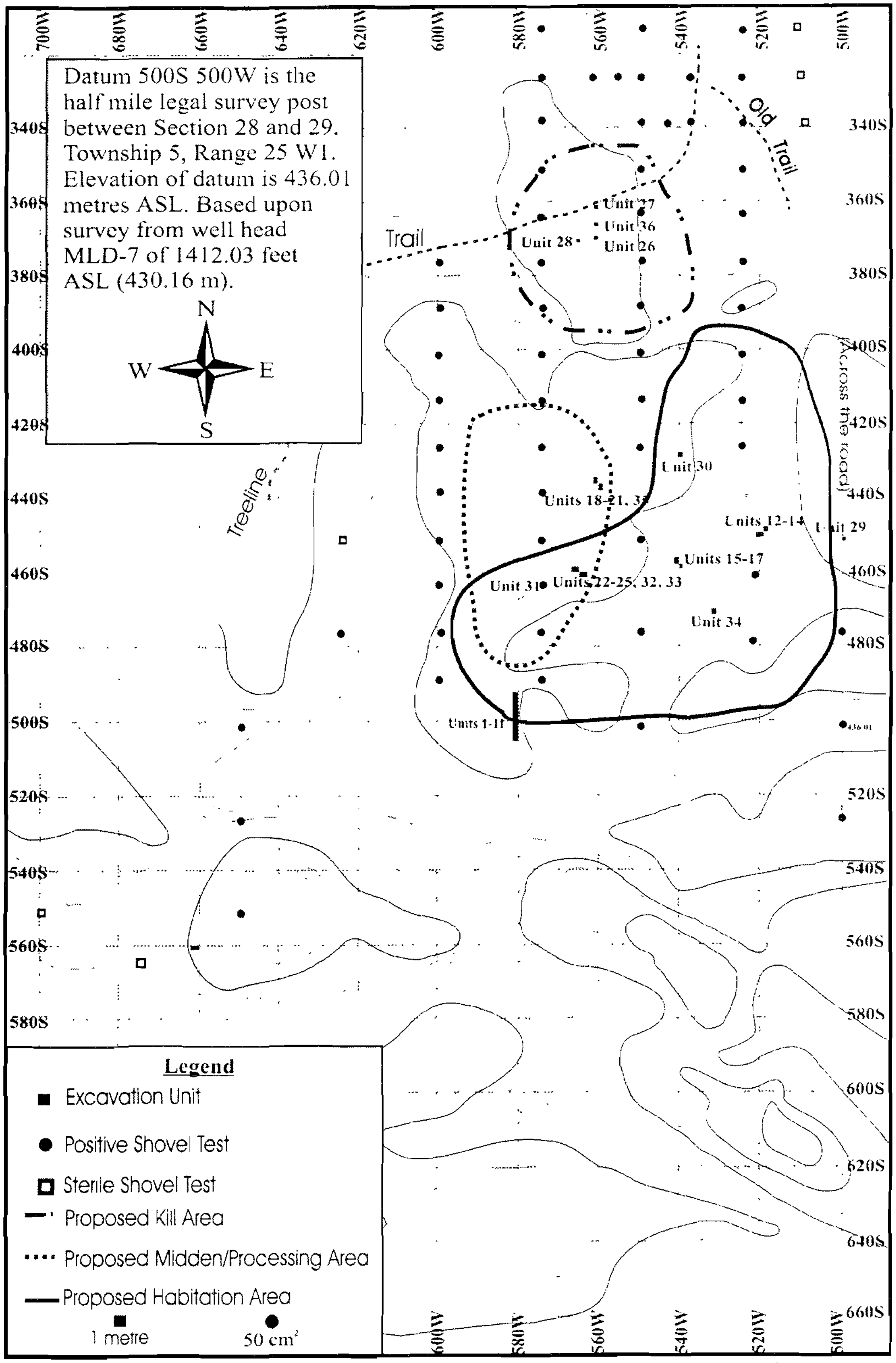

Figure 4.1 Excavation units and shovel tests at the Jackson site (after Hamilton and Nicholson 1999)

Nicholson and Hamilton (1998) concluded that the Jackson site lithics included a variety of local materials such as Swan River chert, Souris agate, moss agate, black and brown chalcedony. Exotic materials including Knife River flint (KRF), Tongue River silicified sediment (TRSS), and obsidian were also evident in the assemblage. They observed that waste flakes and utilized flakes were concentrated in the southwestern areas of the site and that retouched tools were not associated with these lithics. Their study also indicated two workstations were present at the site. They determined that:

> thirty nine points were recovered which were identifiable typologically-21 Prairie Side Notched and 18 Plains Side Notched. There are also 11 small biface tips which were likely from broken projectile points. This would indicate a recovery of 50 projectile points in this relatively small sample. Fragments from 9 large bifaces were also recovered. This gives a total of 59 lithic tools associated with killing and butchering process. The 17 unifaces and 3 perforators (total 20) are likely indicators of post butchering processing. The utilized flakes (uncounted) are also likely associated with processing activities (Nicholson and Hamilton 1998:23).

Nicholson and Hamilton (1998) drew three provisional conclusions about the use of thermal alteration at the Jackson site. First, there was a high incidence of thermal alteration apparent among the projectile points and bifaces. The majority of the projectile points seem to have been intact before burning. They noted a differential selection of thermally altered Prairie Side-notched points (42.9%) versus Plains Side-notched projectile points (22.2%). Second, there were lower frequencies of thermally altered debitage (15%) compared to the projectile points (30%). Third, there was a low occurrence of burned unifaces at the site. "The selective burning of bifaces and projectile points-associated with primary killing and processing-compared to other classes of lithics in the site indicates that the trauma is unlikely to have resulted from widespread natural burning of the site at some point" (Nicholson and Hamilton 1998:23). Their preliminary analysis indicated that certain tools exhibited evidence of thermal alteration, however, the exact method of application of fire and the purpose of the discriminating treatment among the tools remained unknown. This occurrence will be more fully addressed in a future study.

Walker (1999) also studied the projectile points from the Jackson site. The purpose of the study was to use descriptive and metric attributes selected from Van

Buren (1974) in order to classify the projectile points according to Kehoe's (1966) Plains typology. Thirty projectile points drawn from the kill, midden/processing, and habitation areas formed a random sample. The results from that analysis did not deviate substantially from Nicholson and Hamilton's (1998) study. The spatial analysis by Walker (1998) provided additional insights about the activity areas at the site.

Walker (1998) evaluated the spatial distribution and density of the stone tools and debitage in the midden/processing and habitation areas at the site. During the 1995 archaeological field investigations, Hamilton and Nicholson (1999) identified these areas in the central portion of the site. The goal of the analysis was to assess a small sample of debitage and stone tools from these areas for differences and similarities in the lithic materials and tool types. The lithics from the kill area were not included in the sample because lab personnel had not catalogued them by the time of the study. These results indicated that the midden/processing and habitation zones did not differ significantly from each other. In most cases, similar lithic materials were evident in these areas in both the debitage and tools. Some tools, manufactured of specific lithic materials, were not present in the debitage assemblage indicating that either the debitage was in an unexcavated part of the site or the site inhabitants brought completed tools to the site. It was difficult to distinguish between the midden/processing and habitation lithic assemblages because similar frequencies of tools and debitage occurred in both areas. Walker (1998) also noted inconsistencies with conclusions from her data and in the site chloropleth maps (Hamilton and Nicholson 1999) that illustrated the boundaries of these activity areas based on the density and type of materials distributed across the site. It was difficult to discriminate if the proposed habitation area consisted of a large midden extending into the proposed midden/processing area or if the proposed midden/processing area contained midden deposits because both of these site areas produced similar lithic assemblages. This preliminary analysis (Walker 1998) indicated that the activity areas and the associated features in the site required more investigation regarding the types of artifacts typically associated with these areas and the function of the activity areas.

Using a sample of 102 pieces of debitage from the units which included flakes and shatter, the author completed an individual debitage analysis that incorporated 17 attributes drawn from the archaeological literature (Belsham 1999). The purpose of that study was to evaluate which attributes would be useful for the current analysis. A random sample incorporated lithics collected from the surface, shovel tests, and excavation units. This method of sampling allowed debitage exhibiting a wider assortment of landmarks not previously identified by the researcher to be included in the study. The midden/processing and habitation areas of the site dominated the sample. The over-representation of these two activity areas in the study was the product of field sampling techniques. The kill zone, which was the smallest excavation block in the site because of labor and time constraints at the end of the field season, was under-represented. Each piece of debitage was examined using a 10X hand lens and then it was measured using metric calipers. The analysis involved calculation of the counts and frequencies for each attribute. Paired attribute analysis involved: 1) completeness of form versus lithic material; 2) completeness of form versus flake terminations; and 3) completeness of form versus dorsal scars. No correlation was evident between these attributes.

The individual debitage analysis of the midden/processing and habitation areas indicated that both site areas contained a variety of lithic materials, debitage portions, flake terminations, debitage sizes and shapes (Belsham 1999). The site occupants were probably re-sharpening tool edges, indicated by rejuvenation flakes, as they dulled during the butchering process. This sample most likely represented one flaking technique with a few stages. There were minor differences between the activity areas, but since the sample was very small, these discrepancies required further investigation.

During this review of previous lithic research about the site, it became apparent that the lithic assemblage needed to be re-analysed. Since the classification of Vickers focus sites, there has been limited work done about the lithic assemblages. Nicholson and Hamilton (1998) did not include a detailed analysis of the lithics at the Jackson site nor was it their purpose. Their interpretations stem from a combination of samples from widely separated parts of the site. They based their results on all of the excavation units, shovel tests, and surface collections. After reading their analysis, it was determined that a complete debitage analysis would be required before generalized statements regarding Vickers focus technology could be formulated. Detailed comparative inter-site analyses would enhance the understanding of the stone technology utilized by Vickers focus people. Earlier studies (Nicholson 1991, 1993, 1994; Nicholson and Hamilton 1997) regarding the lithic technology of Vickers focus people demonstrated that certain lithic raw materials were favoured by this group, particularly in regards to a reliance on exotic materials such as Knife River flint and Tongue River silicified sediment. These studies also described the types of stone tools evident at the different Vickers focus sites in southwestern Manitoba.

In his numerous publications, Nicholson (1991, 1993, 1994) and in an article co-authored with Hamilton (1997), it was stated that Vickers focus people relied on chalcedony, Swan River chert, Knife River flint, Tongue River silicified sediment, obsidian and occasionally catlinite and grey soapstone. These generalizations regarding lithic material use among Vickers focus people derived from the lithic materials recovered from the Lowton site. Different relative frequencies of lithic raw materials among sites in the *Makotchi-Ded Dontipi* locale, including the Jackson site, demonstrate that Vickers focus people selected better quality materials for formed tools (Nicholson and Hamilton 2001). Heavy reliance on Knife River flint, brown chalcedony, and Swan River chert materials was apparent in each site cluster, but there was variation in the recovery of agates, white chalcedony, quartzite, quartz, silicified peat, cherts, jasper, obsidian and Tongue River silicified sediment. The inclusion of lithic material as an attribute in this study was essential if clarification regarding the types of raw materials used by Vickers focus people was to proceed. A limited understanding regarding the lithic technology of Vickers focus people was apparent before this study especially since emphasis on other research areas overshadowed the conclusions about stone tools and lithic materials evident in the these site assemblages.

Previous research by Hamilton and Nicholson (1999) about the lithic assemblage associated with the activity areas at the Jackson site focused on shovel test recoveries. They used the primary catalogue database deriving from MacADEM (Gibson 1991) to calculate the frequencies of general categories of faunal remains, pottery, and lithics. However, Gibson (1991) designed these categories for basic cataloguing functions and these were not comprehensive enough for an intra-site analysis of discrete types of debitage and functional stone tool classes. Sample sizes and vertical provenience control deriving from the preliminary shovel testing efforts only provided a limited view of the spatial boundaries of the activity areas at the site. The spacing interval between the shovel tests also prevented a thorough assessment of the isolated lithic clusters evident within the activity areas. Walker (1999) and Belsham (1999) attempted to address intra-site variability at the site but incomplete and small samples prevented conclusive results.

For this thesis, it is important to understand the function of the Jackson site by evaluating lithics from each of the activity areas and then by comparing each area to learn if the lithics from these areas are different or similar. It is also crucial that a thorough examination of the lithic workstations, particularly comparing frequencies and proportions of debitage, stone tools and lithic materials, are included in the intra-site analysis. The trowelled excavations within the activity areas are separated from the survey shovel tests and the surface collection and remain the focus of this study. It is expected that differences will be observed between these areas, especially between the kill and midden/processing areas and that the designation of the habitation area may either be confirmed or modified. An individual flake analysis and a morphological tool analysis are the most appropriate means to gather the necessary data that might serve as a comparative database for future studies of Vickers focus.

4.3 Selection of Attributes for this Study

Technological and functional lithic studies of many researchers (Ammerman and Feldman 1974; Andrefsky 1998; Bradley 1975; Crabtree 1966, 1972; Kelly 1995; Odell 1989; Tomka 1989) provided the necessary background to assess which attributes would be appropriate for the Jackson site analysis. Their interpretations provided the basis for evaluating the significance of certain debitage and tool traits in the site assemblage. Modern flintknappers using traditional stone tool manufacturing methods assert that patterns identified by a group of attributes reflect each stage of the reduction method and should be evident in archaeological collections. Using debitage attributes, Odell (1989) differentiated between flake-core and bifacial technologies. He recognized core reduction flakes by their lack of platform preparation, minimal dorsal scarring along the perimeter, presence of bulbar scars, and the high frequency of hinge terminations. These flakes were also heavier and larger compared to other debitage. He also posited that early reduction stages typically contained a higher proportion of flakes with dorsal cortex, exhibited minimal striking platform modification, and that dorsal perimeter scarring occurred less frequently in the later reduction stages. In addition, he noticed that in the later stages of bifacial reduction there were higher incidences of faceting, battering, and grinding modifications on the striking platform.

Tomka (1989) tried to identify multidirectional core reduction, bifacial cobble/nodule reduction, and bifacial flake core reduction methods in an archaeological assemblage. He used flake type, dorsal cortex percent, cortex location, dorsal scar count, flake size, platform facet count, presence of platform grinding, and platform cortex to differentiate between methods of reduction. Tomka (1989) concluded that there were differences between the reduction methods, but the application of the results required caution. The source of the difference between the reduction strategies depended on many attributes. "For instance, the differences in the flake types produced may be due to the tool kit used and its effect on flake morphology" (Tomka 1989:148). He also stated that flake size was dependent on the size and morphology of the core and reduction techniques influenced the presence of cortex as well as the number of dorsal scars. Lastly, differences among the striking platform attributes may have been the result of the mechanics of flake removal and the relationship to tool kits. He concluded that the frequency of particular attributes changed proportionally during the reduction sequence. Individual debitage analysis could not differentiate between reduction methods, but paired attribute analysis was a more reliable method. An individual attribute lacked significant meaning but combining attributes strengthened the relationship of the single traits.

The author had difficulty assessing which attributes would yield the most useful information regarding past activities at the Jackson site. The selection of attributes chosen could cause exaggeration or under-statement of the variation that was present in the assemblage. A review of the literature demonstrates that it is common practice in archaeology to adopt the attributes used by other researchers, therefore, those deemed useful by other researchers are also used here. By employing attributes used in previous studies, the author believes that the interpretation of the results would be useful to others for comparative purposes.

Lithic specialists have explored numerous topics including manufacturing techniques (Crabtree 1972; Ellis 1965; Odell 1989; Tomka 1989), the determination of flake attributes (Patterson and Sollberger 1978) and the identification of Precontact technologies and tool types (Amick and Mauldin 1989; Baumler and Downum 1989; Kobayasi 1975; Tomka 1989). The effects of thermal alteration on different materials such as chert (Luedtke 1992; Purdy 1974; Purdy and Brooks 1971; Verrey 1981), the angle and force of impact required to produce certain flake types (Speth 1972, 1974) and explanations about the physics of flake formation (Cotterell and Kamminga 1987) have been investigated by experimentation. Lithic analysts have also evaluated the practicality of debitage typologies (Prentiss and Romanski 1989; Sullivan and Rozen 1985). The debitage attributes for this study included lithic material, form, termination, striking platform traits, bulb of percussion, size and shape, dorsal cortex, thermal effects and patina. Given that replication of the method of using sliding calipers and inconsistent results regarding striking platform angle did not occur in this study, this attribute was later not included in the assessment of the site activities. In addition, ambiguity evident in the archaeological literature regarding the reliability of eraillure scar, flake shape, and dorsal scar attributes as indicators of manufacturing technique and as indicators of certain stages in the reduction sequence prompted the author to remove these attributes from this study.

Attributes chosen for the Jackson site lithic tool analysis included lithic material, form, thermal effects, use wear presence, and size of the complete tools. In addition, the description of the haft element for tool identification purposes was also included in the analysis. For this lithic assemblage, the assignment of flake types and associated tools provided additional information about the lithic activities that accompanied the butchering and processing mainly of bison (see chapter six). It is necessary to discuss the terminology utilized in this thesis in order to provide understanding of the meaning of the analytical results produced in this study.

4.4 Definitions of the Terms Applied in the Debitage and Tool Analyses

This lithic study utilizes numerous terms and definitions borrowed from different researchers. For example, "a type is *defined* by its combination of diagnostic attributes, but it is *formulated* and *designated* by the typologist" (Adams and Adams 1991:63).

Essentially, the components of a type have developed from a group of similar artifacts and the diagnostic traits considered significant by the archaeologist. "An attribute is a definable aspect of a particular variable; that is, one of the states that it can assume" (Adams and Adams 1991:169). For example, Kehoe (1966) relied on the shape of the haft element of a projectile point to define the different point styles included in the Late Side-notched series. The shape of the base of a projectile point changes significantly over time. Thus, using these time-sensitive attributes, Kehoe (1966) proposed a taxonomic system by which the projectile points were thought to reflect a slow transformation of projectile point styles. It was quite apparent in the literature that archaeologists often switch between different descriptive and typological terms when describing a lithic assemblage. To avoid this type of confusion, definitions of common words such as tool and debitage are provided in this study.

A tool is an artifact that people have created or modified for use in a single activity or in multiple tasks. Examples found at the Jackson site include formal tools such as projectile points, knives, and scrapers as well as expedient tools such as utilized flakes. Debitage, as defined by Low (1994), refers to the residual material produced during the manufacture of stone tools. Cores, shatter, core reduction pieces, and flakes are all examples of debitage. A core is a bulk piece of lithic raw material that a flintknapper produces a variety of flakes or blades. During tool production, additional modification of these latter pieces might occur to produce the formal and expedient tools. The process of core reduction may be inferred by observation of the weathered exterior surface (or cortex) of lithic materials. Decortication debitage refers to flakes or shatter that exhibit weathering cortex on the dorsal flake surface. This is not to be confused with 'patina', which is a weathered surface that has developed subsequent to the production of the flake or core. It is the discoloration produced on lithics exposed to the environment. Rejuvenation flakes have multiple dorsal scars, a curved shape, and unless broken, always have a striking platform present. Some flakes lack these distinctive landmarks and in this study they are referred to as indeterminate or waste flakes.

4.5 Individual Flake Analysis Methodology

Individual flake analysis (IFA) and mass aggregate analysis (MAA) are two common types of investigations used in lithic analysis. Ahler (1989) reviewed the benefits and limitations of IFA and MAA, and the present author considered the advantages and disadvantages of each method before selecting the most appropriate method for this study. Mass aggregate analysis was not an appropriate method for the Jackson site because it would have prevented a detailed evaluation of the discrete lithic clusters found throughout the site. Individual flake analysis permitted comparison of the different activity areas of the site using a broader range of attributes. It was deemed important because a central element of this study was the assessment of whether the lithic assemblage would further the interpretation of the proposed activity areas at the site.

Individual flake analysis (IFA) involves examining each of the flakes from an archaeological assemblage using descriptive and metric characteristics. The purpose of IFA is to determine the "separation and discrimination of multiple discrete knapping behaviours that occurred at a single spatial context" (Ahler 1989:86). Ideally, IFA is appropriate to apply to single occupation sites especially in areas with limited taphonomic disturbances. The assemblage derived from a single occupation site can be better separated into discrete activity clusters that reflect a series of behaviours present by IFA. As the Jackson site assemblage reflects a single occupation or several closely spaced occupations, IFA was deemed appropriate for this analysis. As well, the presence of several discrete activity clusters at this site might benefit from an IFA analysis because the determination of the function of these areas is derived from a group of attributes diagnostic of activities. In addition, IFA is beneficial when assessing tool-manufacturing techniques. Some flakes have particular traits that distinguish them from a general collection. For example, notching flakes may indicate the manufacture or use of side-notched projectile points or hafted bifaces when the tools themselves may not have been present in the sample.

Ahler (1989) argued that IFA does not provide the archaeologist with the best means of addressing a lithic assemblage. His arguments have particular merit in certain situations. First, IFA includes the tabulation and recognition of the proximal, medial, and distal portions of the flake in the analysis. According to Ahler (1989), depending how the sums were treated, the archaeologist might inflate the size of the assemblage by enumerating each flake portion as a separate flake, or alternatively part of a complete flake. IFA allows the archaeologist to select unambiguous flakes that provide the most information. Second, Ahler (1989) acknowledged that IFA was time and labour consuming. Such additional time investment does allow the inclusion of important attributes, such as those associated with the striking platform, to be included in a study. Ahler (1989: 87) mentioned that if researchers incorporated shortcuts into their studies to avoid the extra time that IFA required, then researcher bias might weaken the conclusions reached. He assumed that researchers would ignore certain flake sizes while trying to save time, however, there was no evidence offered by him to support this premise. Third, Ahler (1989) believed that the selection of attributes used in IFA was subjective. This argument is also valid for other methodologies.

Individual flake analysis (IFA) offers the best opportunity to examine debitage found in the activity areas at the Jackson site. The attributes recorded in IFA give the necessary information to infer the presence of debitage types that might be diagnostic of certain activities at the site. By incorporating IFA into this study, it was possible to document numerous attributes that provided information about the reduction strategies and activities at the Jackson site.

4.6 Debitage Attributes Used for the Analysis

For the sake of efficiency, analysis began with documentation from the proximal end of the flake and concluded with the dorsal surface (Figure 4.2). Three types of data were collected: 1) non-metric attributes; 2) the presence/absence of distinctive traits; and 3) linear measurements of debitage size and striking platform dimensions. A 10X hand lens, a microscope and digital calipers were used to identify and record the various metric attributes. Identifications of the lithic materials relied on the comparative collections from the University of Saskatchewan and Brandon University. In conjunction with the comparative collections, published descriptions of these materials improved the credibility of the specimen identifications. These descriptions are included in the following sections.

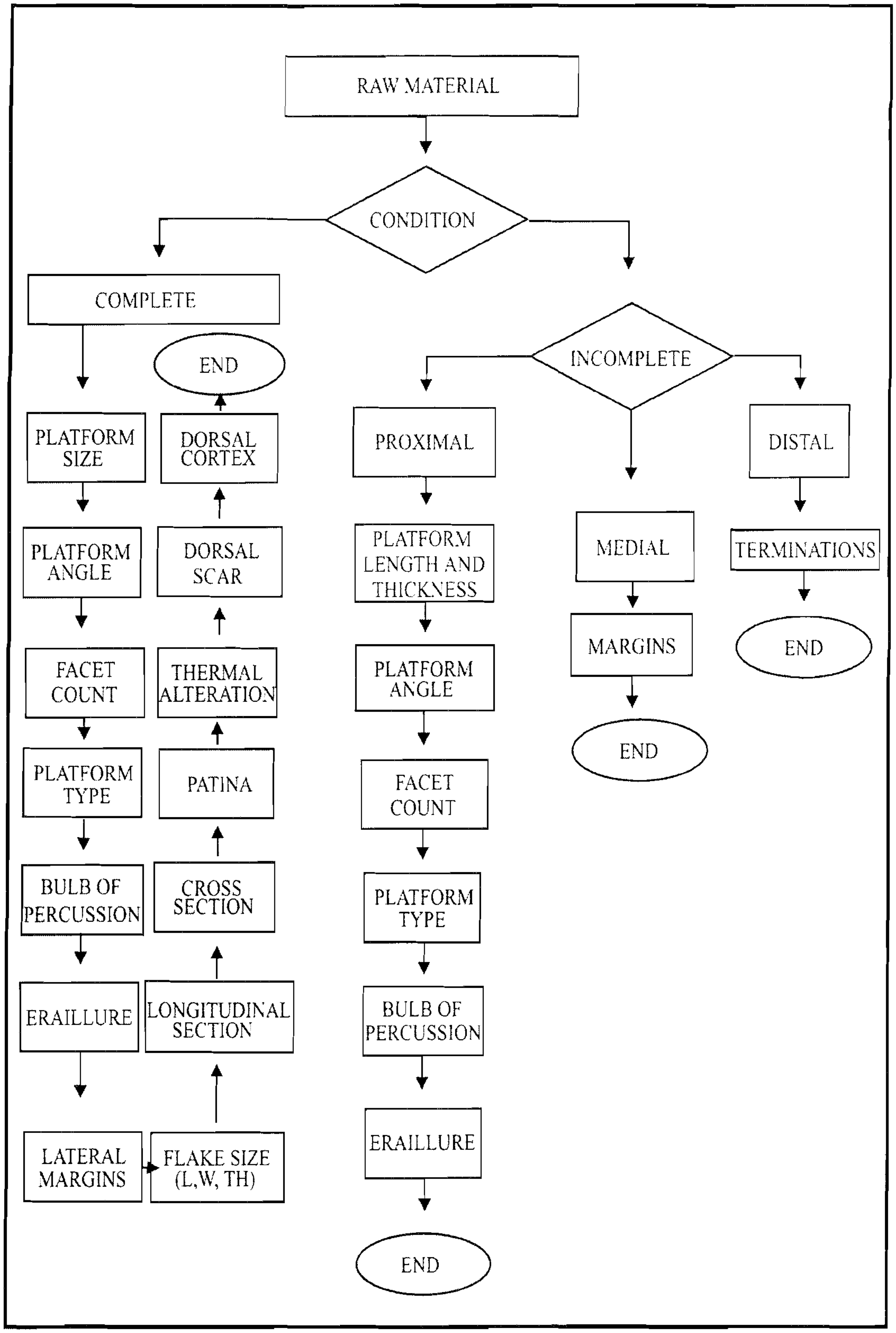

Figure 4.2 Flowchart showing the recording procedure for the debitage attributes.

4.6.1 Lithic Material

By identifying the lithic materials found in an archaeological assemblage, archaeologists can investigate trade routes, quarry locations, lithic material preferences, and effect of raw material characteristics upon tool production (Andrefsky 1998; Ingbar 1994; Jeske 1989; Sassaman 1994). Andrefsky (1998) generalized that flintknappers used higher quality stones to manufacture formed tools while they relied on low quality stones to create expedient artifacts. The availability of a lithic raw material also dictated whether the material was suitable for formed stone tools such as projectile points or for expedient tools such as utilized flakes. The quantity of the material and the accessibility to the lithic source also influenced how efficiently people modified the material to create tools. If low quality materials were available in large quantities at a local source, then the material would have been used both for the formal and informal tool types. The relationship explained by Andrefsky (1998) might be evident at the Jackson site (see chapter six).

Vickers focus people relied on both local and exotic lithic materials to manufacture their tools. For the purpose of this study, local lithic sources are those available within a 100 km radius of the site. Exotic materials include items that derive from sources beyond 100 km radius from the site. Collection of these materials would have required an extensive trip or the involvement of an exchange network. The Souris Gravel quarries or gravel deposits in the Lauder Sand Hills provided a range of local materials for Aboriginal people (Thomson 1994). The presence of exotic lithic materials at the Jackson site indicated either that Vickers focus groups participated in an exchange network with people from the southern and western regions or that they travelled to the sources.

4.6.1.1 Local Materials in the Jackson Site

The local materials identified at the Jackson site include brown and white chalcedony, silicified peat, agates including moss agate, quartzite (coarse) and jasper. A variety of cherts includes Swan River chert (SRC) and pebble chert.

Brown Chalcedony: Chalcedony is "fine-grained quartz with a conspicuous fibrous (not equidimensional) micro structure visible in thin-section when viewed under crossed nicols with a petrographic (polarizing) microscope [. It] is a crust-forming quartz that occurs as cavity fillings with the fiber direction perpendicular to the layering" (Clayton et al. 1970:287). The diaphaneity is often either transparent or translucent. In some specimens, traces of foreign materials and mineral salts might cause it to have tints of greyish-white, pale brown, dark brown or black colours throughout the piece (Crabtree 1967:12). Thermal alteration of this material produces an almost glassy lustre. According to Crabtree (1967:12), chalcedony has a tendency to craze and crack easier than coarser textured lithic materials. Various shades of brown, similar to KRF, and white colours are evident among chalcedonies.

There is a debate regarding the accurate differentiation between KRF and brown chalcedony. This confusion is especially evident in areas where both chalcedony and KRF materials exist. It is difficult to differentiate between brown chalcedony and KRF materials because the thin flakes do not always have the diagnostic characteristics. Misidentification of these materials occurs often by archaeologists who may also have simply catalogued these materials under the general categories of chalcedony or KRF. In this study, macroscopic characteristics differentiate the two materials. Brown chalcedony consists of shades of brown that range from light to dark. It is translucent, fine grained and generally lacks patina. Knife River flint is similar to brown chalcedony but KRF contains creamy inclusions. Although Clayton and his colleagues (1970) discussed how petrographic analysis could differentiate KRF from chalcedony, this method was not a viable option in this study because this type of analysis requires destruction of samples.

Silicified peat: Researchers often call this material petrified peat, but this is not the correct term because, like silicified wood, silica replaces the peat fibres. Silicified wood is differentiated from silicified peat by the predominance of non-woody plant remains, if preservation is good, otherwise is not possible to separate the two materials (Thomson 1994:68). It is found in the Souris Gravels as tabular or well-rounded cobbles. Colours include dark to light brown and light grey. Lustre is usually waxy to earthy. The diaphaneity ranges from translucent to opaque. Sometimes a cortex is present and is generally yellow brown, dull, and varies in thickness. Thermal alteration produces a sugary surface. Considering the weak fracture lines and crumbly nature of silicified peat, when heated, potlids often explode from its surface.

Agate: Agate cobbles present in the Souris Gravels range in size between 3.5 and 4.5 cm in diameter. These cobbles are well rounded and are usually covered with crescent impact scars (Thomson 1994:88). Agate is a translucent chert with altering bands of colour and moss-like inclusions (Luedtke 1992:31). The bands range from dark brown to reddish brown, and vary in size. Translucent material surrounds the banded areas. It is fine grained, has a very smooth surface, and a dull lustre. Cortex is sometimes present and is generally represents a very thin coating on the rock surface. The cortex is usually the same colour as the interior portion of the agate.

Moss Agate: While found throughout the Northern Plains, moss agate materials have been recovered from the Souris Gravel pits in southwestern Manitoba. Moss agate has the same texture and structure of other agates. The noticeable feature of this type of agate is the presence of plant fibres within the rock. They resemble tree branches and usually range from black to brown in colour. Surrounding these fibres is a translucent material that sometimes has a yellow tinge to it.

Quartzite: Quartzites are durable because of the almost complete impermeability, chemical stability and the lack of cleavage of the dominant material, quartz. Most quartzites are coarse grained. While fine varieties do exist, they are not represented in the Jackson site assemblage. They "owe their toughness and low porosities and permeabilities to a tightly interlocked texture of the dominantly quartzose constituents" (Skolnick 1965:12) and to metamorphism. Generally, quartzite is variable in colour and texture, ranges from white through grey, red, pink, orange, yellow, green, purple, and brown to black. The texture varies from fine to very coarse. Some specimens exhibit relict bedding or have blocky fracture patterns, but most quartzites exhibit homogenous textures. Quartzites have a thin cortex layer that often appears glazed or frosted.

Jasper: Jasper is found in pebble form in local glacial drift deposited throughout southwestern Manitoba, Saskatchewan, and Alberta. Red, yellow, brown, green colours are present. It has a vitreous to waxy lustre. The texture is fine grained and smooth. It is also opaque.

Chert: This study uses the descriptions for chert offered by Chesterman and Lowe (1995) as well as Campling (1980). Cherts are composed of the silica group of minerals and have minor impurities such as iron oxides, clay and carbonate minerals, as well as carbon (Campling 1980:291). Chert is present in the Souris Gravels deposit in southwestern Manitoba. The formation of chert is by direct precipitation of silica from solution in marine and connate water environments or by silica replacement of minerals in limestone and other rocks. The texture of chert is dense, smooth, but can be rough on weathered surfaces. Cherts are generally fine grained and have a dull to waxy lustre. There is a variety of colours ranging from white to grey to black, and with some varieties appearing as yellow, brown, green, and red (Chesterman and Lowe 1995:759). The diaphaneity on chert ranges from almost translucent tan to a mottled opaque red-tan, purple-tan, and speckled varieties are evident (Thomson 1994:87). Patina does not form on chert, but the outer surface can be 'vuggy' or covered by large pits representing the remnants of crystalline cavities within the rock structure (Thomson 1994:87). Lustre ranges from earthly to waxy.

Swan River Chert: It is present in glacial tills, in streambeds, and on exposed terraces along local rivers throughout west central Manitoba, Saskatchewan, and east central Alberta. An extensive outcrop is located in northwestern Manitoba in the Swan River valley (Thomson 1994). Swan River chert is difficult to identify because of the variety of colours and textures evident even on individual samples. This study uses Campling's (1980) description. He suggested that at least 25 to 30 discrete varieties of SRC existed. Archaeologists are often uncertain if they are dealing with more than one SRC variety or a different material altogether, particularly when dealing with the darker varieties of SRC. There are many different colours found among SRC varieties. Weathered surfaces are generally discoloured white, grey, or brown. Fresh surfaces range in colour and include white, beige to dark grey or blue grey, pale pink to deep red, pale yellow to deep orange, reddish brown to reddish black. Banding is common, particularly red, orange, yellow, beige, white, and grey. On the weathered pieces, lustre is dull to earthy while fresh surfaces exhibit the full spectrum ranging from dull to glassy surfaces. When heated, SRC acquires a pink or orange tinge, and the colours are probably the result of the iron content present in the rock rather than a response to thermal alteration (Elden Johnson, personal communication 2000).

The surface of SRC ranges from spongy to vuggy and consists of many small cavities, cracks, and micro-joints. Clear, translucent, and opaque areas are also visible.

These opaque, irregular-shaped mottles or spots of quartz grains found in SRC are often brown, red, orange, white or grey and generally less than one mm in size. The mottles are peg-shaped, feather-like, needle-like, or interconnected to form a network pattern. The vugs and feather-like aggregates are the most distinctive macroscopic features of SRC, but not all varieties of SRC contain vugs especially the fine-grained specimens. Some of the lighter colour varieties of SRC exhibit good conchoidal fracture characteristics, are more homogeneous, and have very few cavities or vugs. The darker types of SRC seem to contain more imperfections and exhibit fractures that range from blocky, through sub-conchoidal to conchoidal. Texture varies considerably from a heterogeneous mixture ranging from coarse crystalline to cryptocrystalline.

Pebble Chert: Pebble cherts are often present in the Souris Gravels or in pebble form mixed in glacial tills throughout the southwestern Manitoba. Round or ovoid cobbles with a thin layer of cortex are also present (Thomson 1994). Most of the pebbles cherts used for tool production are quite small, usually less than 5 cm in size. Colours include variations of grey, tan, blue, and brown. Lustre ranges from glossy to waxy. The stone texture is fine grained.

4.6.1.2 Exotic Materials in the Jackson Site

The exotic materials identified in the Jackson site assemblage includes Knife River flint (KRF), Tongue River silicified sediment (TRSS), obsidian, and Cathead chert.

Knife River Flint: "KRF is thought to be silicified lignite and distinct bedding planes, marked by impressions of flattened detrital plant debris, are often observable in poorly silicified pieces" (Gregg 1987:368). These planes, often seen with the unaided eye, are generally wavy laminations and fossils that are oriented principally along the long axes of the bedding planes. According to Clayton et al. (1970:287), KRF is extremely dark brown (10YR 2/2 or 3/2, or less commonly, 2/3, 3/1, 2/1, or 1/1). Flakes that are thinner than 2 or 5 mm are translucent and lighter in colour (10YR 3/3, 4/3, 5/3, 6/3, 3/4, 4/2, or 5/2). Light brown (10YR 5/3, 6/2, 5/2, 4/2, 4/3) varieties of KRF exist. Organic materials such as plants or peat contribute to the dark brown colour evident in KRF. For this study, creamy inclusions and/or a creamy beige cortex indicate KRF. A weathering rind or patina, up to a few millimetres thick, commonly forms on fractured surfaces and patina is used as an identifier of KRF. It occurs irregularly over the surface and may accent plant fossils and relict bedding planes (Van Nest 1985:331). Unheated KRF patina is white with bluish specks, but as it ages, it becomes purely white. The rind is generally light grey or white (10YR 7/2, 8/1, 8/2, 9/1, 6/2, 7/3, or 8/3) and some specimens have a yellow stain.

Ahler (1983) noted that thermal alteration of KRF increased the waxy lustre and intensity of ripple mark formation on freshly flaked surfaces. The colour also darkened and the translucency decreased. The lustre changed from dull to waxy. Burned specimens reveal crazing when examined with a hand lens. A greyish rind develops due to "secondary deposition of silica at the surface of the stone as micro porous solutions, saturated with silica, are forced from the interior of the stone by the heat" (Van Nest 1985:331).

<u>Tongue River Silicified Sediment</u>: This study uses Anderson's (1978) description and definition of Tongue River silicified sediment. Tongue River silicified sediment is located in the Fort Union formation (Paleocene) of northeastern Wyoming, eastern Montana, southwestern North Dakota, and northwestern South Dakota and occurs as cobbles distributed in glacial gravels (Anderson 1978:149). Colour, texture, and the presence of fossil plant impressions are diagnostic characteristics of TRSS. In its natural form, TRSS is a "light olive brown (most common) 2.5Y 5/4 to light yellowish brown 2.5Y 6/4 (Munsell Colour Company 1954)" (Anderson 1978:150). It is generally a fine-grained material but different types of textures are evident. Natural TRSS is very difficult to flake and form into tools. Anderson (1978) noted that TRSS was an excellent material to make cutting tools (utilized flakes, crude bifacial knives) rather than piercing or scraping tools (projectile points and end scrapers). Tongue River silicified sediment is often thermally altered to improve its flaking qualities. Anderson (1978) performed experiments with TRSS using heat and noted the following changes. Partially heated nodules or flakes changed from a light yellow to light red and often there would have been red streaks in the joints, in the fossil stem impressions, and on the exterior of the nodule. Thermally altered materials changed from yellow to red or a deep maroon colour. Lustre became shinier in some pieces and some specimens had light streaks. Some of the fine-grained varieties of TRSS turned a grey-black colour.

The materials that were excessively heated changed to grey to grey-black. A dull lustre was evident, some materials had light streaks, and often the material was crumbly and chunky after the procedure.

Obsidian: Sources of obsidian are located in the Rocky Mountains of Yellowstone National Park, northern British Columbia, and throughout the Pacific Northwest such as Washington and Oregon. It is produced because of volcanic activities. Obsidian is generally black, however, green, red and brown colours are evident. It has a glassy lustre and is opaque. Smaller pieces of obsidian are transparent. It is very brittle and sharp. Cortex is rough, dark grey on black specimens and is moderately thin.

Cathead chert: Cathead chert is present in numerous places along the west shore of Lake Winnipeg as well as along the shores of Lake Manitoba (Leonoff 1970:25-26). A variety of colours includes mottled or banded white cream, tan, red and grey-white. Texture is fine grained and smooth. Clasts used in tool production generally are rather small.

4.6.2 Completeness of Form

Completeness of form is an important attribute included in IFA because "the condition of the flake may tell a great deal about how the flake was removed and how other flake attributes should be interpreted" (Andrefsky 1998:87). Certain characteristics are present on proximal, medial, and distal sections (Figure 4.3). There are inconsistencies in the literature about expressing the completeness of each flake. Some researchers classify the portions of the flake into general classes of broken and unbroken while other analysts create schemes that are more elaborate. Considering the amount of variation that exists in debitage and the inability to determine what fractured the flakes, this analysis categorizes the flakes as broken and unbroken, and notes which portion was present.

The identification of the proximal end of a flake depends on locating a striking platform and if possible, a bulb of percussion. Medial portions of flakes lack a striking platform and a termination. These flake sections typically consist of blunt edges on the top and bottom of the flake. Distal flakes have no striking platforms but display feather, step, hinge, or snap terminations.

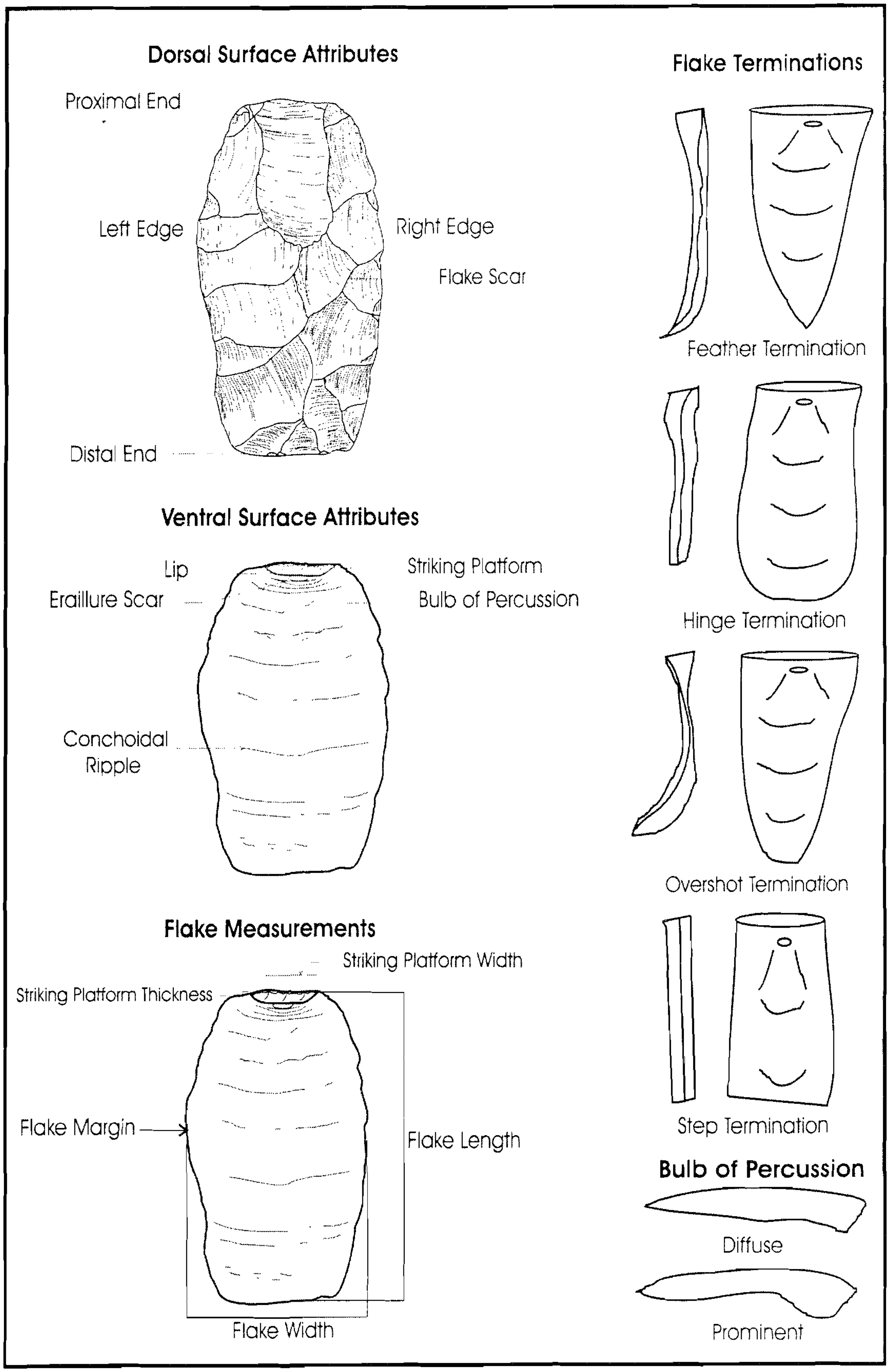

Figure 4.3 Diagram of the flake attributes used in the analysis.

4.6.3 Flake Termination

Recognizing the termination on a flake can provide information about the force of the impact that was used to detach the flake from the objective piece. Andrefsky (1998) and Crabtree (1972) noted that feather, step, and hinge terminations were often present in an archaeological assemblage, however, outré passé and snapped finishes also occurred, although usually by accidental breakage or by taphonomic forces. Figure 4.3 illustrates the different terminations evident at the Jackson site. Feather terminations have smooth, tapered distal ends that gradually sheared the flake from the objective piece. Step/snap terminations exhibit shattered edges created during the removal from the modified piece such as a core or during accidental breakage or taphonomic forces. During the removal of these flakes from the modified piece, a 90° angle always forms between the ventral surface and the blunt end. Hinge terminations are flakes with distal ends that are either rounded or sloped. To produce a hinge, an inaccurate force of impact was applied or the flaking tool was turned or rolled away from the modified edge. Outré passé terminations, also referred to as overshot, consist of a portion of the modified piece still attached to the flake.

4.6.4 Striking Platform

Lithic analysts have used the striking platform to help identify the flaking tool (Cotterell and Kamminga 1987; Hayden and Hutchings 1989), force of impact, stage of reduction (Odell 1989; Schneider 1972; Shott 1994) and the type of modified piece produced (Magne and Pokotylo 1981). Andrefsky (1998:92) defined the striking platform as a place that "contacts the ventral surface, the dorsal surface, and each lateral margin of the flake." This analysis uses this definition. The following attributes describe the proximal end of the flake and the striking platform.

<u>Bulb of Percussion</u>: The degree of prominence found on a bulb of percussion varies depending on the lithic raw material and the amount of force upon impact. Coarser materials, such as quartzite, do not always have a bulb of percussion visible. Modern flintknappers conclude that the shape of the bulb of percussion indicate the type of hammer employed during manufacture or maintenance of the tool and might suggest the possible method employed to remove the flake from the modified piece. A prominent

bulb of percussion reflects a hard hammer used with percussion flaking and a diffuse bulb of percussion indicates pressure flaking with a soft hammer (Figure 4.3).

Striking platform size: The size of the striking platform refers to the width and thickness of the platform surface (Figure 4.3). The width of the striking platform is the "distance across the striking platform from the lateral margin to lateral margin" (Andrefsky 1998:92). The thickness of the striking platform is the "greatest distance on the striking platform from the dorsal to the ventral surface" (Andrefsky 1998:92). Digital metric calipers that measured to the nearest millimetre were used to record both of these indices.

Striking Platform Facet: Many researchers include the number of facets on a striking platform as an attribute in their analysis, but few define the facet characteristics. Crabtree (1972:62) defined a facet as a "natural or artificial plane surface." This definition is vague and encompasses both types of scars found on striking platforms. If facet counts determine the amount of striking platform preparation and the number of flake removals, then one must distinguish between natural and artificial planes. For this analysis, artificial facets refer to those produced by the flintknapper and consist of raised flake scars that extend across the entire longitudinal surface of the striking platform. Multiple and parallel ridges are indicative of possible sequential flake removals. Taphonomic processes and site formation activities or disturbances produce natural facets, which consist of small, often irregular shaped flake ridges and do not extend across the full surface of the platform.

Striking Platform Edge Preparation: Throughout the manufacturing and maintenance process, the striking platform was prepared to strengthen the edge of the core or blank for subsequent flake removals. These preparations included grinding, abrading, chipping, crushing, and rubbing. Abraded edges have regular flake removals with smooth surfaces. Ground edges have irregular flake removals. Chipped edges have regular, parallel flakes removed in a row. Crushed edges have a regular sequence of chips removed but are considered more minute than ground edges. Rubbed edges have a polish. It was very difficult to differentiate between the preparation types. It was necessary to use either a10X hand lens or a microscope to examine the platforms. For this analysis, notation of the type of preparation was recorded.

Lipped Striking Platforms: The presence of a lip on the striking platforms indicates the possible use of antler, bone, or wood flaking tools. The presence of a lip is diagnostic of bifacial thinning flakes and some unifacial ones as well. For this analysis, presence or absences of the lip was documented.

4.6.5 Debitage Size

There is an extensive debate about the usefulness of flake size as an attribute in the analysis of debitage. Some researchers believe that flake size is a reliable indicator of a stage in the reduction sequence because flake sizes become progressively smaller after each stage was completed. Some archaeologists have argued that the reduction process is continuous and that discrete stages are not evident (Whittaker 1987:2; cited in Shott 1994:82). If flake size represents a particular stage then it is necessary to define the discrete stages. There is no consensus regarding how to classify the different sizes of flakes found within one assemblage.

In this study, the researcher separated the debitage into ten size categories using five millimetre increments. These size classes served as descriptive purposes (i.e. What is the dominant flake size for a site area or lithic concentration?) as well as to determine if the debitage was reflective of primary or secondary deposition (see section 6.10 Healan 1995). Upon completion of the analysis, complete and broken flakes were combined according to the five millimetre increment size classes. It was not the purpose of this study to assess the reduction sequence represented in each of the lithic clusters present throughout the site. This study also used the size classes created by Fladmark (1982:205) to discriminate between macro and micro-debitage. Macro-debitage is greater than 1.0 mm in diameter and micro-debitage is less than 1.0 mm. Fladmark (1982:205) used the ability to recognize a conchoidal ripple by the naked eye as the natural division between micro and macro debitage.

Three undergraduate students with different levels of expertise using sliding calipers completed a test of instrument reliability for non-digital calipers. The results indicated that a digital measuring device produces measurements that are more accurate. For example, the students recorded different measurements for each of the broken and complete flakes drawn from the Jackson site sample. For this study, incomplete flakes and angular fragments were placed on the 0 mm line of a ruler and the maximum length and width was measured from that point. Digital calipers measured complete flakes because the incomplete flakes and angular fragments could not be orientated to ensure that length and width were measured from the same position as was the case for complete flakes (Figure 4.3).

4.6.6 Dorsal Cortex

Dorsal cortex coverage changes between early and later reduction stages. During the early stages of tool preparation, the flintknapper removes cortex from the blank or nodule. Tomka (1989) compared bifacial and core reduction techniques by using dorsal cortex amount and the location of cortex on the flake. The highest number of flakes with 1-50% cortex coverage occurred in samples created by core reduction. The amount of cortex on the core directly reflects the quantity and the location of cortex on a flake's surface. The terms primary, secondary, and tertiary flakes are common categories applied in lithic studies to differentiate between flakes with variable amounts of cortex. "According to some analysts, the categories reflect a very specific sequence of flake removal: primary flakes were removed before secondary and tertiary flakes, and secondary flakes before tertiary flakes" (Sullivan and Rozen 1985:756). The reduction sequence is not necessarily completed using sequential stages that will involve debitage with 100% cortex coverage to be modified before pieces with no dorsal cortex. As well, cortex does not always completely cover a rock's surface. In the Jackson site assemblage, most of the lithic raw materials lack any dorsal cortex, therefore, using the categories primary, secondary and tertiary are not informative. For this study, percentage of cortex coverage was recorded

Removal of cortex can occur during any stage of the reduction sequence, therefore, decortication debitage in this study denotes cortex-bearing debitage. For this analysis, cortex measurement categories reflect 10% increments of cortex presence. The dorsal surface of each debitage fragment was divided into four quadrants. If cortex was noted in two of the four quarters, then 50% was recorded.

4.6.7 Thermal Alteration and Patina

Hester (1972) found that many Precontact groups in North America placed lithic materials, either in nodular form or as a flake blank, into a fire before or during tool manufacturing to enhance their flaking quality. Alternatively, Patterson (1979:255) proposed that burying nodules or preforms in the ground and building a fire on top produced ideal temperatures. In any case, "[the] heat treated material was easier to work, producing longer, wider, more easily controlled flakes" (Verrey 1981:15). It was also noted by Purdy (1974) that thermally altered stone generally broke easier, therefore, extra care was required from the flintknapper. Purdy (1974) also observed several effects, particularly on Florida chert, of varying firing temperatures on lithic materials. She determined that the ideal range of temperatures was between 350^0C and 400^oC. Purdy (1974:45) concluded that materials heated to 500^0C-600^0C resulted in a lateral snap due to end shock. Generally, flintknappers produced this type of flake termination when a rock was incapable of supporting the shock from the impact of the knapping tool. Heated debitage exhibit this type of termination after the application of the slightest force (Purdy 1974:45). This type of termination is evident in the Jackson site assemblage.

The observation of thermal alteration as an attribute in debitage studies is valuable because it provides additional information about manufacturing and maintenance of tools. For the Jackson site analysis, this attribute is included for descriptive purposes only. The method and degree of thermal alteration evident within the assemblage is not addressed in this study because another researcher is currently analysing this topic. This analysis relies on the descriptions by Purdy (1974), Crabtree (1972), and Whittaker (1994) to identify the presence of thermally altered stone tools and debitage.

According to Purdy (1974), decrepitation, explosion, crazing, vitreousness, and occasionally colour changes are reliable indicators of thermal alteration. Decrepitation and explosion are probably the most noticeable effects of heat on stone. A lithic material's surface may become 'sugary' or decrepitated after exposure to heat. In addition, Crabtree (1972:56) noticed that some thermally altered lithic materials exhibited a crazed surface which displayed "minute surface cracks, generally cross hatched, causing the surface to be weakened." Purdy (1974) also observed that crazing occurred at 350^0C after the chert was drenched with cool water. She noticed that predictable flake removals, such as those used in pressure flaking, were not possible at this point.

A good indicator of thermal alteration is the observation of a vitreous lustre on a usually dull lithic material. "The gradual onset of vitrification seems to go hand and hand with an increasing ease in removing flakes. If alterations take place too rapidly, dramatic, destructive events occur. It should be emphasized that vitreousness is not apparent unless the rock specimen is broken or chipped after heating. The exterior surface of the heated stone remains dull" (Purdy 1974:43-44). On some materials, flake scars exhibit increased lustre compared to the depressions on the surface of the flake. A vitreous lustre, smooth surface and decreased graininess of the surface of the rock are common indicators of thermal alteration among siliceous materials.

Heat-induced colour changes are difficult to accurately recognize in most lithic materials, as changes in colour do not always occur. According to Purdy (1974:52), changes in colour often happened at lower firing temperatures and colour, as an indicator of thermal alteration, was reliable when considered along with vitreousness. Some minerals in rocks influence the colour change of a material when heated. Swan River chert changes from a pastel pink to a dark red, if iron is present, however, changes in colour do not occur in all specimens of chert.

A few terms and definitions to describe lithics affected by heat are included in this analysis. Thermal alteration implies a process of heating materials, either naturally or by human intervention. No effort was made to determine whether the modification was purposeful or not. In cases where people used high temperatures, potlids formed. According to Whittaker (1994:73), potlids were "little round flakes that pop off the surface and leave an irregular pitted scar." These flakes lack platforms, lateral margins, and terminations. A depression remains on the surface of the specimen after a potlid explodes from the material's surface.

Patina is the last attribute recorded for the Jackson site debitage assemblage. Patination is "an alteration of the surface by molecular or chemical change" (Crabtree 1972:80). Patination refers to the development of a hydration or weathering rind on the surface of the lithic material. It can alter the original colour of the stone. Generally, older specimens have a thicker and darker patina than younger pieces of lithic materials. For example, KRF surface turns a white, creamy colour and blue when thermally altered. For the Jackson site lithic materials, the presence or absence of patina for each debitage item in the assemblage was recorded.

4.7 Tool Attributes Used for the Analysis

4.7.1 Methodology

This analysis of tool attributes is based on data from several sources (Hamilton 1981; Loy and Powel 1983; Kehoe 1966; Peck 1996; Reeves 1971, 1983; Van Buren 1974). The attributes include: lithic material, thermal effects, patina, cortex, completeness of form, use wear, haft element traits, and size. The identification of tool lithic raw material, thermal alteration, cortex, and patina descriptions are consistent with those presented in section 4.6.1 to 4.6.7. Completeness of form, including breakage patterns, and the presence of use wear are included in this study because they provide additional information about the manufacturing and maintenance activities involving tools at a bison kill/processing site. Descriptions of the haft element and tool measurements help to confirm the type identification of tools, particularly projectile points.

Specimens were divided into categories consisting of bifacial tools, unifacial tools, and utilized flakes prior to identification of specific tool types. Unifacial tools have shaping and retouch scars on one side while bifacial tools have shaping and retouch scars on both sides of the same edge or surface. Utilized flakes are expedient tools that have secondary flaking along the margins and might have use wear present.

4.7.2 Tool Orientation

Before the documentation of each attribute, care was taken to consistently orient the tools. Guidelines outlined by Reeves (1971) and Van Buren (1974) provided the necessary instructions for orientating a tool in this analysis. Figure 4.4 illustrates the proximal, distal, lateral margins and dorsal surface for unifacial and bifacial tools in the collection. For the bifacial tools, the dorsal surface is the side that has the most flaking. With the dorsal surface up, the right and left edges corresponds to the analyst's left and right. For the unifacial tools that either lack a distinctive working edge or have multiple working edges, conchoidal ripples on the ventral surface indicate the proximal and distal ends. The force of impact creates up-turned ripples in the direction of the force at the proximal end.

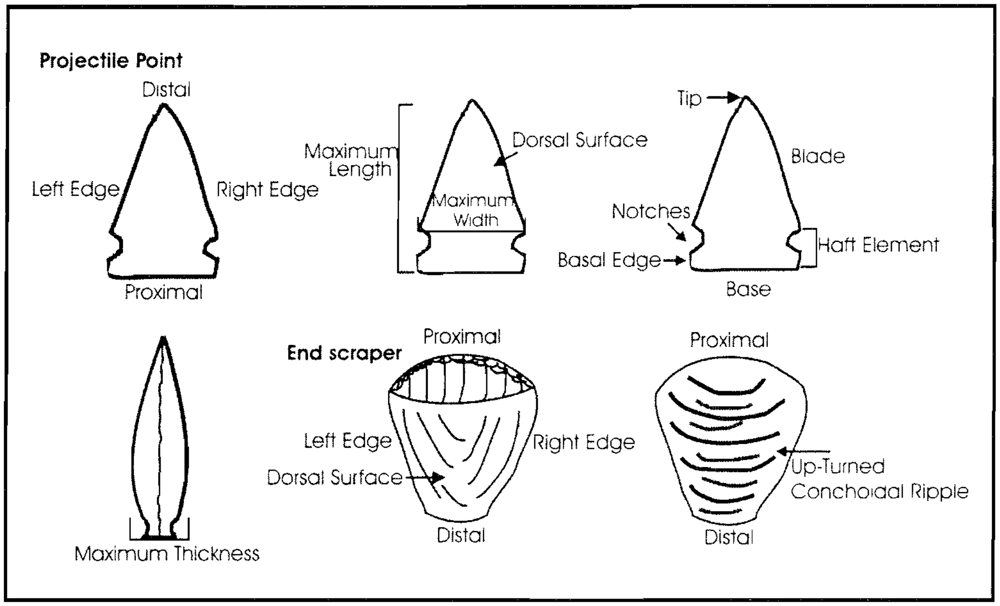

Figure 4.4 Attributes and features on stone tools.

4.7.3 Completeness of Form

The tool's state of completeness includes impact fractures and manufacturing mistakes inferred from breakage patterns provide information about tool usage and possible function. To evaluate the activity areas at the Jackson site, it is important to compare the frequency and proportions of complete and incomplete tools in each site area. It may be possible in some cases to determine if the tool broke during manufacturing, or from the impact of hitting the animal during the hunt. In this analysis, the tool portions present indicate the level of completeness according to definitions by Reeves (1971). For example, if a projectile point has only the blade and a notch present then this was noted.

4.7.4 Use Wear

The presence of use wear on the margins of incomplete tools suggests that these artifacts became broken during use instead of manufacture. The lack of use wear on stone tools at the Jackson site may indicate that the artifact was not used as part of the activities carried out at the site. Using principles outlined by Odell (1979), examination of each of the modified tool edges with a 10X hand lens and a low powered (20X) microscope occurred. For this analysis, presence or absence of wear was recorded. If smoothing, rounding, grinding, or polishing was evident, then their presence was recorded as unspecified use wear.

4.7.5 Haft Element

This attribute was used to confirm the previous tool identifications made by Nicholson and Hamilton (1998) for the Jackson site. The haft element refers to the area below the shoulder of the tool and consists of notches, basal edges, and the base of the tool. This part is considered to be diagnostic of the type of projectile point. The presence or absence of notches and their placement was recorded for each bifacial or unifacial artifact. This study uses the diagrams of base shapes by Reeves (1971) for the description of the tools. This analysis also applies Kehoe's (1966) descriptions (see section 3.8) of the Plains and Prairie Side-notched projectile points and Triangular points found on the Northern Plains.

4.7.6 Tool Size

Size measurements are commonly included in attribute studies because changes in an artifact's size reflect both the stage of the tool's use life, and changes in manufacture technique. "If the form, outline, and workmanship characteristics remain unchanged, the fact that the length of a given style of projectile point grew or diminished indicates that change of some significance took place, perhaps a change in its use or function" (Van Buren 1974:58). Comparisons of tool sizes evident between the three activity areas at the Jackson site may support interpretations regarding the different activities implied from debitage. Differences between the triangular unnotched bifaces and the side-notched bifaces may indicate that the triangular bifaces are preforms and the latter projectile points. Preforms at the Jackson site are larger than the finished tools because they required additional modifications before the flintknapper finished the tool. Figure 4.4 illustrates the size measurements used for this analysis.

4.8 Utilized Flakes

The descriptions and measurements for utilized flakes follow the same principles outlined for debitage. The presence of secondary retouch along a margin suggests utilization since confirmation of the presence of use wear was not possible in this study. Unlike the situation of waste flakes, the presence or absence of use wear was noted.

4.9 Application of Spatial Analysis to the Jackson site

Hodder (1980:121) emphasized that artifact descriptions alone do not provide adequate information about past behaviours. It is essential to add meaning to artifacts that derives from their physical setting, function, morphology, and temporal placement. The theoretical and methodological approaches discussed by Carr (1984) provide the framework for the spatial component of the lithic analysis of the Jackson site. Carr (1984:106) noted that the definition of the limits of activity areas and the organization of artifact types into tool kits are integral in an intra-site spatial analysis. There are a series of questions that provide direction and a means of organizing the distributions into activity areas. These include:

> (1) Are the artifacts of each recognized functional type randomly scattered over space, aggregated into clusters, or systematically aligned? (2) If the artifacts of a given type cluster, what are the spatial limits of clusters of that type? (3) Whether or not the artifacts of given types are clustered, randomly scattered, or systematically aligned, do artifacts of different types tend to be similarly arranged such that, for example, their frequencies covary or their presence states associate over space? (4) If the artifacts of several types both cluster and are co-arranged, what are the spatial limits of multitype clusters? (Carr 1984:106-107).

To confirm or refute the identifications of the proposed activity areas at the Jackson site, it is necessary to incorporate the results from the debitage and tool analyses into a spatial analysis because this allows a thorough examination of the lithic workstations and other discrete activity areas at the site. The purpose is to determine if the lithic assemblage confirms the designation of the activity areas as identified by Hamilton and Nicholson (1999). Illustrated on a series of schematic maps (see chapter six), the distribution of debitage types, stone tools and lithic materials from each of the excavation units within each activity area are described. This will contribute to a more comprehensive understanding of the patterned distribution of lithics within and between activity areas.

4.10 Chapter Summary

Earlier lithic studies of the Jackson site provide the groundwork of this study. Given the limited nature of that research and the need to address the variability evident in the lithic materials and tools between the *Makotchi-Ded Dontipi* locale and the Tiger Hills region, a detailed lithic analysis of a Vickers focus site, in this case the Jackson site, allows some of these concerns to be addressed in this study. Analyses of the debitage, stone tools, and spatial distributions of these materials are the methods thought appropriate to address the accuracy of the identification of the proposed kill, midden/processing, and habitation activity areas at the site. An individual debitage analysis offers the best opportunity to acquire a significant amount of information about dense lithic clusters distributed throughout the site. For this study twenty-four attributes consisting of non-metric indices, presence or absence of certain traits and metrics of each piece for debitage provides the information necessary to assess these activity areas. These attributes include lithic material, completeness of form, flake terminations, striking platform characteristics, debitage size, dorsal cortex, presence of thermal changes, and patina. These data serve to reconstruct the lithic technology Vickers focus people relied on at the Jackson site.

It is also important to include the tools in this analysis because they provide additional information regarding the function of the proposed activity areas at the site. Bifacial tools, unifacial tools and utilized flakes form the sample from the Jackson site. Attributes selected for the descriptive tool analysis include lithic material, presence of thermal changes, patina, cortex, completeness of form, use wear presence, haft element traits, and size. A spatial analysis of the site is included in this study and it focuses upon the distribution of debitage and tool types within discrete activity clusters to define the limits of the activity areas. It also serves to address the organization of the artifact types into tool kits and notes the presence of certain tools in one or all of the activity areas. It is believed that incorporating three levels of analysis, which includes debitage, tool, and spatial distribution, into a comprehensive study provides the necessary tools to understand the lithic technology used by Vickers focus people at the Jackson site.

Chapter Five

Results of the Jackson Site Lithic Analysis

5.1 Introduction

The lithic sample addressed in this analysis derives from twenty-five excavation units at the Jackson site. It includes formed tools (n=49), utilized flakes (n=42), and debitage (n=3194) collected from the proposed kill, midden/processing, and habitation areas of the site. Summaries of the results from the debitage and tool analysis, using the attributes outlined in chapter four, are included in this chapter (see appendix 1 for tool descriptions and appendix 2 for photographs of the tools). An assignment of function was not possible for the bifacial tools fragments, but descriptions of these fragments are included within the tool section for each activity area. The results from the tool and debitage analyses are organized by the activity areas established by Hamilton and Nicholson (1999).

The sample size discrepancy between areas at the Jackson site creates a problem for intra-site comparative purposes, especially when attempting to confirm or refute proposed activity areas. The block areas designated by Hamilton and Nicholson (1999) as well as Playford (2001) do not represent a contiguous block of units. Either most of these areas consist of small groups of units or individual one-metre units, thus producing variably sized lithic samples for each of the proposed activity areas. The largest block in any activity area was six metres square. Some of these units are over 100 metres apart and there was a limited amount of archaeological investigation of the areas between these units. The widely dispersed nature of the excavations is a direct consequence of the assessment-oriented focus of much of the work at the site. This made it difficult to evaluate the function of widely scattered localities as the archaeological excavations were not geared to specific testing of the activity areas but concentrated upon the general reconnaissance of the area. Additional excavations expanding on the previous excavation units could strengthen the relationships between the cultural materials.

Hamilton and Nicholson (1999) based the identifications of the activity areas not on a detailed artifact analysis, but by drawing extrapolations from the nature, density and diversity of recoveries from the survey shovel tests. The spatial extent of these proposed activity areas reflected the patterned distribution of cultural materials, but the widely dispersed sampling interval led to tentative interpretations. Thus, this lithic analysis seeks to critically assess and refine the preliminary interpretations regarding the function of the deposits by applying a more comprehensive attribute analysis. However, the present analysis faces similar problems because of the sparse number and widely scattered nature of the excavation units. In order to address the variable sample size, the recoveries from units excavated within each proposed activity area were clustered. While this generated a larger sample for analysis, it risked the inappropriate inclusion of excavation unit samples that reflect activities other than those proposed by Hamilton and Nicholson (1999). This approach offers advantages because it allows direct comparison to the results of analyses offered by Hamilton and Nicholson's (1999) and Playford (2001). The former authors offered interpretation based upon cursory examination of the shovel test pit results, while the latter critically assessed the proposed activity areas using the faunal recoveries from each of the excavation blocks at the site. This offers analytic advantages since various researchers will have examined the proposed activity areas using different artifact sub-assemblages.

5.2 Habitation Area of the Jackson Site

5.2.1 Surface Area, Blocks, and Associated Features in the Habitation Area

Hamilton and Nicholson (1999:19), estimate that the habitation area at the Jackson site is about 85 m by 60 m (Figure 5.1). Of this area, eight square meters were excavated. Playford (2001:27) referred to units 12 to 14 as block B and units 15 to 17 as block C. Also subsumed within this area are units 30 of block H and 34 of block J (Figure 5.2). Playford (2001) assigned MNI (Minimum Number of Individuals) and NISP (Number of Individual Specimens) values for each excavation block.

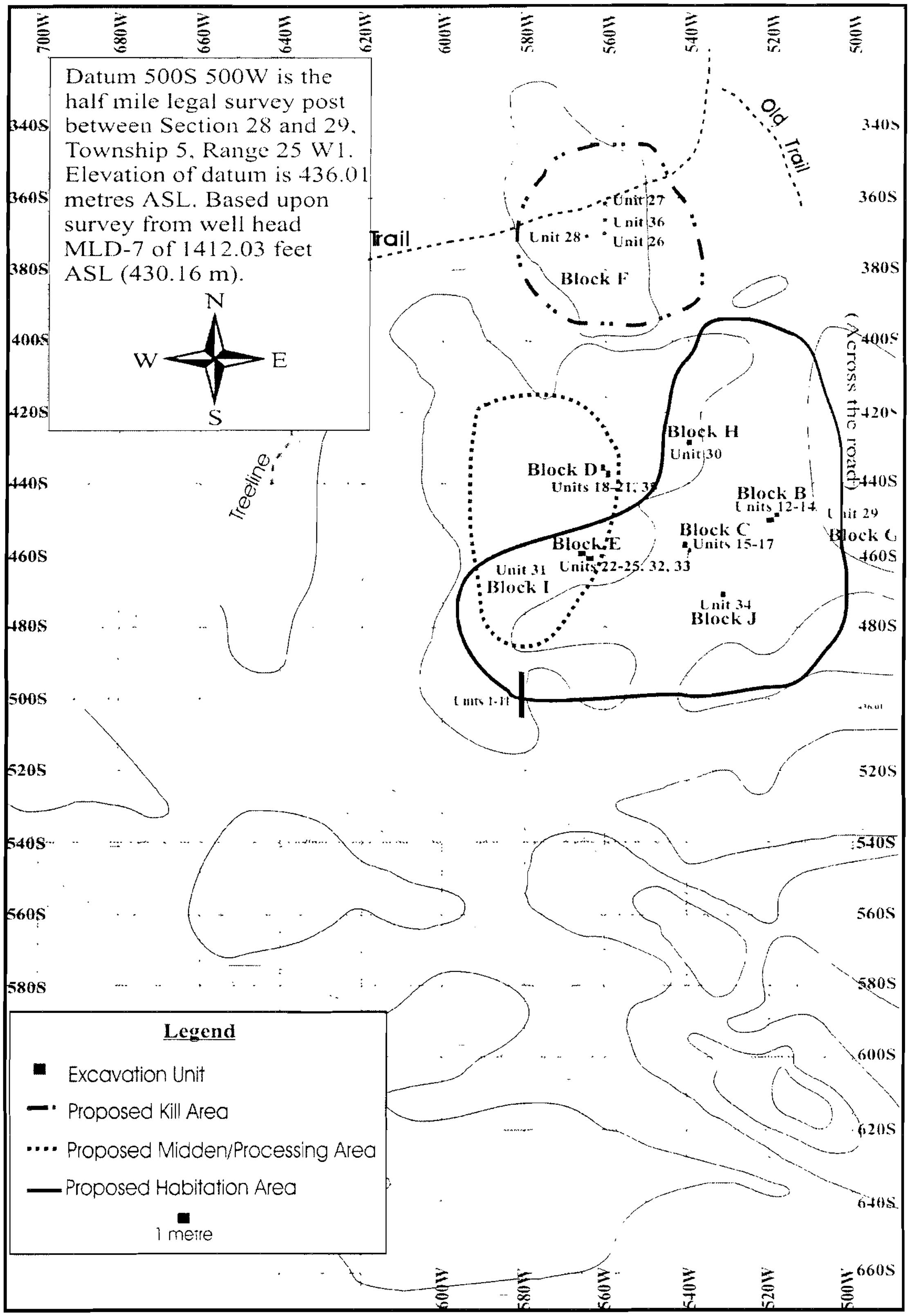

Figure 5.1 The proposed activity areas, including excavations and shovel tests of the Jackson site (after Hamilton and Nicholson 1999).

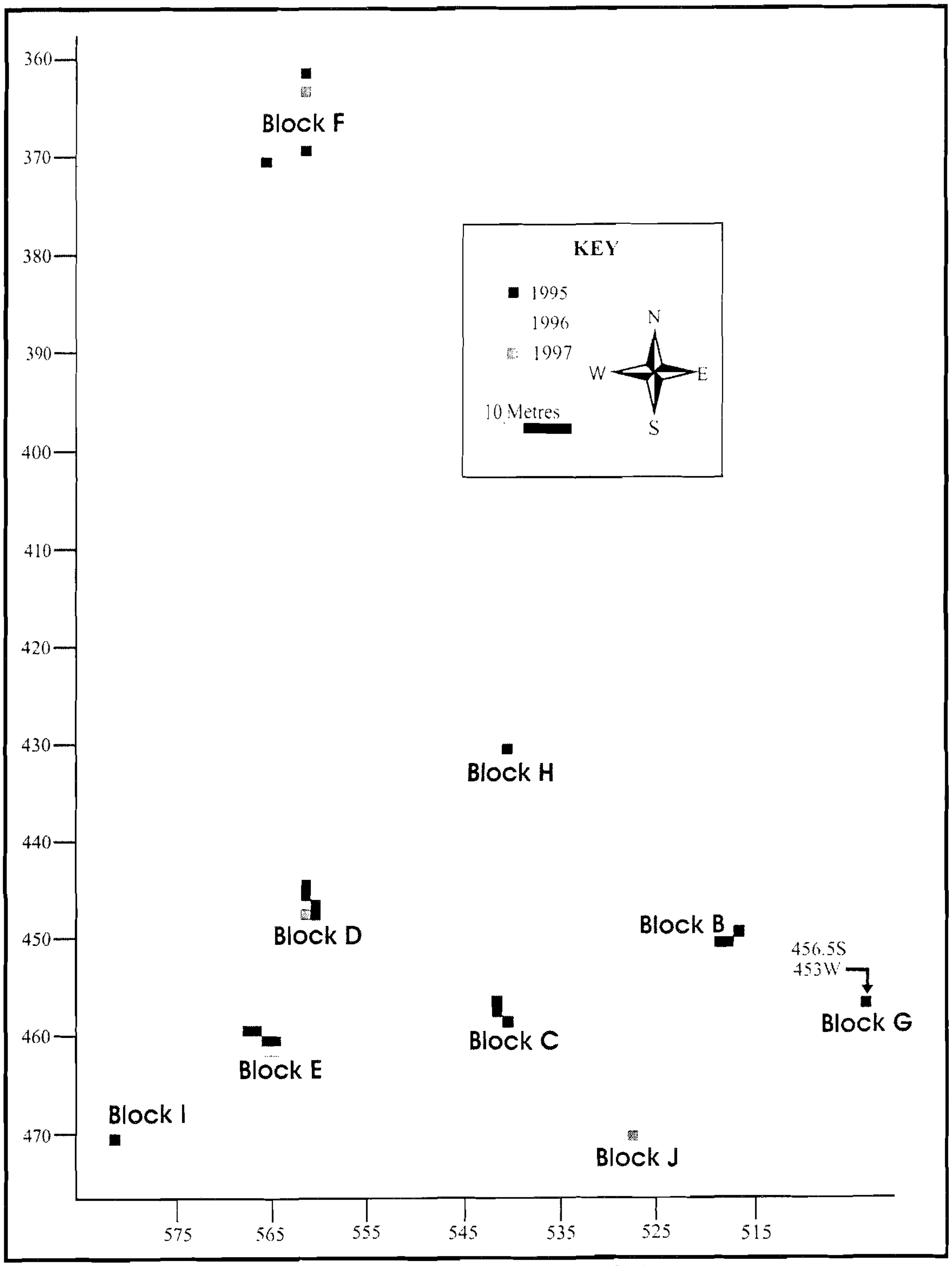

Figure 5.2 Excavation blocks identified by Playford (2001).

According to Playford (2001:34), the MNI indicated that two bison (*Bison bison*) and one rabbit (*Leporidae*) were recovered from units 12 to 14 at the Jackson site. The NISP values demonstrate that the assemblage was more diverse than indicated by the MNI values, with a range of small to large mammals being present (Playford 2001:34). A feature was located in the northwestern quadrant of unit 13. It consisted of an indeterminate greasy, organic stain that had a reddish colour (Munsell 5YR 2.5/ 2). The soil was also viscous and darker than the surrounding matrix from units 12 and 14. Playford (2001:68) speculated that this feature represented waste disposal following grease extraction. The recoveries included thermally altered bones, large ungulate tarsals and carpals, as well as rocks and charcoal.

Playford (2001:37) determined that faunal recoveries from units 15 to 17 yielded a MNI value of three bison (*Bison bison*) and two medium-sized canid (*Canis sp.*). The NISP counts also documented the presence of unspeciated micro-mammals (Playford 2001:37). Less than 30% of the unidentifiable faunal assemblage and 6% of the identifiable elements exhibited thermal alteration. Playford (2001:68-69) attributed the lack of features observed in the excavation units in block C as a reflection of the sparse sample. However, the artifact recoveries indirectly suggest that processing activities might have occurred in or near the units with a boiling or grease-rendering pit adjacent to block C.

Unit 30 was located along the northwestern edge of the proposed habitation area (Figure 5.1). The MNI counts suggest that one bison (*Bison bison*) was represented in this unit. The NISP values indicate that medium to very large sized mammals were also included in the faunal remains (Playford 2001:58). Excavators recovered only 709.0 g of bone and slightly over half of it displayed evidence of burning (Playford 2001:57). The low density of faunal remains suggested that this unit reflected a portion of the habitation area where little or no food processing or preparation occurred or was simply on the periphery of the activity area (Playford 2001:71).

Unit 34 was within the central portion of the proposed habitation area (Figure 5.1). The MNI counts showed that one bison (*Bison bison*), one medium to large immature canid (*Canis sp.*), and one garter snake (*Thamnophis sp.*) were present (Playford 2001). Recovered from this unit were 3,640 bone specimens. Less than half of the assemblage showed evidence of thermal alteration, but 76% of the identified remains exhibited this alteration (Playford 2001:62). This unit is located in an area where minimal food processing activities took place. These remains may have resulted from a scattering of faunal refuse either in the habitation area or on the outskirts of the main activity areas (Playford 2001:72). Similar to unit 30, this area exhibits a pattern of minimal faunal recovery, but exposure of dense concentrations of debitage suggestive of tool manufacturing.

A description of the lithic artifacts and debitage found in the proposed habitation area of the Jackson site will be presented next, according to the tool and debitage attributes described in chapter four. This area produced five formed stone tools, five utilized flakes, and 906 pieces of debitage. A more detailed description of each tool is presented in appendix 1 and photographs are found in appendix 2.

5.2.2 Projectile Points

One incomplete Prairie Side-notched projectile point (15-2-72) was found within the proposed habitation area. This point is made of Knife River flint (KRF) and does not have evidence of thermal alteration. It is consistent with examples noted by Kehoe (1966) (Appendix 1; Appendix 2: Figure 1).

5.2.3 Preform

Two triangular unnotched preforms, both broken, are associated with units 15 (15-2-46) and 16 (16-3-49) (Appendix 1; Appendix 2: Figure 1). They are made of KRF and Swan River chert (SRC). Considered by some people to be unnotched projectile points, other researchers have also identified them to be preforms that were intended to be notched. Both specimens exhibit thermal alteration and are larger than the projectile point found in unit 15. Whittaker (1994) proposes that biface performs might have been heat treated early in the reduction sequence in order to improve flakability. Perhaps a similar process of thermal alteration occurred in an earlier stage of production with these triangular performs.

Both of the triangular forms are wider and thicker than the finished projectile point (Table 5.1). The preforms measure an average 1.25 mm wider and an average 0.6 mm thicker than the projectile point. The difference in the width is not substantial with only one preform 3.08 mm wider and the other about the same, but the triangular forms are wider and thicker than the projectile point. There is minimal flake scaring on the dorsal and ventral surfaces, suggesting minimal finishing and edge retouching. This is consistent with the interpretation that the items represent projectile point preforms.

Table 5.1 Comparison between the sizes of the triangular preforms and projectile point

Formed Tool Type	Artifact Number	Length	Width	Thickness
Prairie Side-notched point	15-2-72	15.24 mm	9.7 mm	1.68 mm
Triangular Preform	16-3-49	17.4 mm	9.13 mm	2.22 mm
Triangular Preform	15-2-46	15.24 mm	12.78 mm	2.34 mm

5.2.4 Knife

One bifacial knife (30-3-23) is associated with this activity area (Appendix 1; photo unavailable). Only the tip is present and it is made of KRF.

5.2.5 Bifacial Fragments

In the habitation area, two bifacial fragments (16-3-101 and 30-5-1) are present (Appendix 1; Appendix 2: Figure 1). Artifact 16-3-101 might have been a base from an indeterminate side-notched bifacial lithic because it is significantly larger than the haft element associated with projectile points. It is made of SRC. Artifact 30-5-1 is also a base, possibly from a projectile point. It is made of KRF and retains cortex on its surface.

5.2.6 Scrapers

An incomplete side scraper (16-2-50) was the only unifacial tool found in this area (Appendix 1; Appendix 2: Figure 1). It is made of brown chalcedony, exhibits evidence of thermal alteration, and has cortex still present on its surface.

5.2.7 Utilized Flakes

Six utilized flakes were recovered from units 15, 17, and 30 (Table 5.2). The utilized flake from unit 15 (15-3-66) is made of KRF and the utilized flake in unit 17 (17-2-4) is made of SRC. The ones from unit 30 (30-3-15; 30-3-23; 30-4-11; 30-7-19) are of brown chalcedony (BC), KRF, SRC, and miscellaneous chert utilized flakes. Of this sample, four of these tools are broken. Only one of the utilized flakes (unit 17) in the proposed habitation area exhibits evidence of thermal alteration. Two working edges are common among these expedient tools. The average length of the utilized flakes is 19.25 mm, average width is 14.41 mm, and average thickness is 2.76 mm.

Table 5.2 Utilized flakes associated with the proposed habitation area.

Number	RM	Damage	Break	L*	W*	Th*	Retouch	Edges	Therm.
15-3-66	KRF	0	0	13.57	8.99	3.18	Cont	1	0
17-2-4	SRC	Left edge broken	0	22.15	17.32	3.58	Cont	3	1
30-3-15	BC	Broken medially into 2	Long	19.45	11.65	2.07	Dist	2	0
30-3-23	KRF	Left edge only	Dia	17.86	13.49	3.79	Dist	2	0
30-4-11	SRC	Medial only	Trans	14.12	13.62	1.99	Dist	2	0
30-7-19	CH	0	0	28.37	21.4	2.03	Dist	1	0

* L=length; W=width; Th=thickness; Therm.=thermal alteration; cont.= continuous; dist.= discontinuous; Dia=diagonal; Long=longitudinal; Trans=transverse

5.2.8 Debitage

The frequencies and proportions of debitage attributes, types, and lithic materials vary across the proposed habitation area. There were 906 pieces of debitage found within this entire area. In units 12 to 14 there are 113 pieces of debitage and 248 fragments of debitage are evident in units 15 to 17. Unit 30 has 437 pieces and 108 pieces of debitage are from unit 34. Cores are not evident in the proposed habitation area, however, the debitage assemblage seems indicative of core and bifacial reduction strategies. The subtle differences in the frequency of recovery between the excavation blocks is addressed more fully in Chapter 6.

Given the size ranges of the lithic samples in the proposed habitation area, angular fragments/shatter (16.0%) and complete flakes (24.3%) consistently occur in higher proportions as compared to other debitage types (Table 5.3). According to Sullivan and Rozen (1985), this pattern is indicative of general core reduction. In addition, 36.3% of the debitage are waste flakes (Table 5.3) that have irregular forms. Table 5.3 also illustrates that the average number of angular fragments/shatter (0=25.87) and complete flakes (0=55.25) does not deviate significantly (SD=33.10 for angular fragments and SD=37.47 for complete flakes) across the activity area. As well, the density per square metre of debitage varies across the activity area. The concentration of debitage per unit is 113.3 pieces. These results suggest that similar activities may have occurred in this part of the site.

Consistent with general core reduction activities, the moderate relative frequency of feather terminations (21.5%) suggests direct percussion to the modified piece (Table 5.3). Further insight into the reduction techniques is not possible because 55.5% of the debitage from the proposed habitation area have indeterminate terminations. In addition, 76.9% of the debitage lack a distinctive bulb of percussion (Table 5.3).

Table 5.3 Summary of the debitage forms, conchoidal rings, termination types, and bulbs of percussion for the proposed habitation area.

	Units 12-14		Units 15-17		Unit 30		Unit 34		Total		Activity Area	
	No	%	No	%	No	%	No	%	No	%	Mean	SD
Completeness												
Angular	17	15.0	36	14.5	84	19.2	11	10.2	148	16.3	25.9	33.1
Complete	23	20.4	69	27.8	102	23.3	27	25.0	221	24.4	55.3	37.5
Proximal	5	4.4	15	6.0	21	4.8	3	2.8	44	4.9	11.0	8.5
Medial	3	2.7	25	10.1	46	10.5	2	1.9	76	8.4	19.0	20.9
Distal	13	11.5	35	14.1	38	8.7	2	1.9	88	9.7	22.0	17.4
Irregular	52	46.0	68	27.4	146	33.4	63	58.3	329	36.3	82.3	43.0
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Conchoidal Rings												
Prominent	13	11.5	40	16.1	20	4.6	1	0.9	74	8.2	18.5	16.3
Faint	14	12.4	26	10.5	30	6.9	4	3.7	74	8.2	18.5	11.8
Absent	86	76.1	182	73.4	387	88.6	103	95.4	758	83.7	189.5	138.2
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Termination Types												
Indeterminate	56	49.6	91	36.7	279	63.8	77	71.3	503	55.5	125.8	103.2
Feather	24	21.2	67	27.0	86	19.7	18	16.7	195	21.5	48.8	32.5
Step	14	12.4	42	16.9	45	10.3	10	9.3	111	12.3	27.8	18.3
Hinge	15	13.3	26	10.5	6	1.4	0	0.0	47	5.2	11.8	11.3
End Shock	4	3.5	21	8.5	21	4.8	3	2.8	49	5.4	12.3	10.1
Overshot	0	0.0	1	0.4	0	0.0	0	0.0	1	0.1	0.3	0.5
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Bulb of Percussion												
Prominent	22	19.5	47	19.0	40	9.2	5	4.6	114	12.6	28.5	18.9
Diffuse	17	15.0	31	12.5	34	7.8	13	12.0	95	10.5	23.8	10.3
Absent	74	65.5	170	68.5	363	83.1	90	83.3	697	76.9	174.3	132.7
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		

Only 28.7% of the entire debitage assemblage present in the proposed habitation area has a striking platform present (Table 5.4). The remaining sample consists of broken flakes, angular fragments/shatter, and irregular forms. The striking platform width, on most of the measurable flakes, cluster between 1 and 4 mm with a

considerably broader range up to 8 mm (Table 5.4). Fifty-one percent of striking platforms range in thickness between 0.1 and 1.0 mm (Table 5.4). However, 41.5% of the assemblage has striking platforms between 1.01 and 2.0 mm (Table 5.4). Given the range of sizes present on most of the striking platforms, modified pieces are probably relatively quite small. Intensive modification of platform edges or cores did not occur because 79.2% of the sample lacks facets (see section 4.6.4) on the striking platform (Table 5.4). The high proportion of non-facetted platforms suggests that less intensive reduction activities are present (see section 4.6.4). This level of preparation is also apparent given that 46.9% of the platforms are convex smooth and 46.5% lack additional modification along the edge of the platform (Table 5.4). Battered preparation of the striking platforms is evident on 24.2% of the assemblage (Table 5.4). This suggests that different levels of preparation are present in the units.

Within the proposed habitation area, debitage generally varies between two size classes (Table 5.5). The average size of debitage ranges between 0.1 and 10.0 mm (Table 5.5). A smaller quantity of debitage is larger than 25 mm (Table 5.5). All of the debitage is macrodebitage according to Fladmark's (1982) classification (see section 4.6.5). These size classes suggest that the objective pieces were small, possibly a tool's edge, or a small core. The average debitage thickness is between 0.1 and 2.0 mm.

Table 5.4 Frequencies and proportions of the striking platform attributes for the proposed habitation area.

	Units 12-14		Units 15-17		Unit 30		Unit 34		Total		Activity Area	
	No	%	No	%	No	%	No	%	No	%	Mean	SD
Striking Platform Width												
0.1-1.0 mm	0	0.0	0	0.0	28	6.4	0	0.0	28	3.1	7.0	14.0
1.01-2.0 mm	10	8.8	23	9.3	15	3.4	12	11.1	60	6.6	15.0	5.7
2.01-3.0 mm	5	4.4	21	8.5	33	7.6	10	9.3	69	7.6	17.3	12.4
3.01-4.0 mm	7	6.2	26	10.5	26	5.9	4	3.7	63	7.0	15.8	11.9
4.01-5.0 mm	2	1.8	3	1.2	9	2.1	1	0.9	15	1.7	3.8	2.8
5.01-6.0 mm	1	0.9	6	2.4	4	0.9	0	0.0	11	1.2	2.8	2.8
6.01-7.0 mm	1	0.9	2	0.8	5	1.1	0	0.0	8	0.9	2.0	2.2
7.01-8.0 mm	3	2.7	1	0.4	1	0.2	0	0.0	5	0.6	1.3	1.3
8.01+ mm	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
N/A (Platform not present)	84	74.3	166	66.9	315	72.1	81	75.0	646	71.3	161.5	109.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		

Table 5.4 Continues

Striking Platform Thickness												
0.1-1.0 mm	15	13.3	43	17.3	77	17.6	0	0.0	135	14.9	33.8	33.9
1.01-2.0 mm	8	7.1	36	14.5	38	8.7	26	24.1	108	11.9	27.0	13.7
2.01-3.0 mm	5	4.4	2	0.8	6	1.4	1	0.9	14	1.5	3.5	2.4
3.01-4.0 mm	1	0.9	1	0.4	0	0.0	0	0.0	2	0.2	0.5	0.6
7.01+ mm	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
N/A (Platform not present)	84	74.3	166	66.9	315	72.1	81	75.0	646	71.3	161.5	109.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Striking Platform Facet Count												
0	21	18.6	58	23.4	105	24.0	22	20.4	206	22.7	51.5	39.6
1	5	4.4	16	6.5	4	0.9	5	4.6	30	3.3	7.5	5.7
2	2	1.8	5	2.0	8	1.8	0	0.0	15	1.7	3.8	3.5
3	1	0.9	3	1.2	4	0.9	0	0.0	8	0.9	2.0	0.5
4	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
N/A (Platform not present)	84	74.3	166	66.9	315	72.1	81	75.0	646	71.3	161.5	109.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Striking Platform Type												
Obliterated	1	0.9	5	2.0	38	8.7	0	0.0	44	4.9	11.0	18.1
Dihedral	2	1.8	7	2.8	4	0.9	2	1.9	15	1.7	3.8	2.4
Planar	5	4.4	6	2.4	0	0.0	0	0.0	11	1.2	2.8	3.2
Planar Facet	7	6.2	2	0.8	3	0.7	0	0.0	12	1.3	3.0	7.2
Planar Smooth	3	2.7	17	6.9	9	2.1	1	0.9	30	3.3	7.5	7.2
Convex Facet	1	0.9	10	4.0	12	2.7	0	0.0	23	2.5	5.8	6.1
Convex Smooth	10	8.8	35	14.1	53	12.1	24	22.2	122	13.5	30.5	18.2
Convex	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
Cortex	0	0.0	0	0.0	2	0.5	0	0.0	2	0.2	0.5	1.0
Not applicable	84	74.3	166	66.9	315	72.1	81	75.0	646	71.3	161.5	109.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Striking Platform Preparation												
Battered	6	5.3	18	7.3	26	5.9	13	12.0	63	7.0	15.8	8.4
Chipping	4	3.5	12	4.8	21	4.8	6	5.6	43	4.7	10.8	7.6
Crushed	3	2.7	2	0.8	1	0.2	0	0.0	6	0.7	1.5	1.3
Ground	7	6.2	13	5.2	4	0.9	0	0.0	24	2.6	6.0	5.5
Obliterated	1	0.9	0	0.0	3	0.7	0	0.0	4	0.4	1.0	1.4
Unprepared	8	7.1	37	14.9	68	15.6	8	7.4	121	13.4	30.3	28.6
Not applicable	84	74.3	166	66.9	314	71.9	81	75.0	645	71.2	161.3	109.2
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Lipped Striking Platform												
Present	9	8.0	35	14.1	80	18.3	22	20.4	146	16.1	36.5	30.9
Absent	104	92.0	213	85.9	357	81.7	86	79.6	760	83.9	190.0	124.7
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		

Table 5.5 Division of debitage into size categories for the proposed habitation area.

	Units 12-14		Units 15-17		Unit 30		Unit 34		Total		Activity Area	
	#	%	#	%	#	%	#	%	No	%	Mean	SD
Flake Length												
0.1-5 mm	58	51.3	95	38.3	192	43.9	62	57.4	407	44.9	101.8	62.4
5.01-10 mm	47	41.6	119	48.0	181	41.4	36	33.3	383	42.3	95.8	67.7
10.01-15 mm	3	2.7	14	5.6	47	10.8	7	6.5	71	7.8	17.8	20.0
15.01-20 mm	5	4.4	14	5.6	12	2.7	2	1.9	33	3.6	8.3	5.7
20.01-25 mm	0	0.0	5	2.0	1	0.2	0	0.0	6	0.7	1.5	2.4
25.01-30 mm	0	0.0	0	0.0	1	0.2	1	0.9	2	0.2	0.5	0.6
30.01-35 mm	0	0.0	1	0.4	0	0.0	0	0.0	1	0.1	0.3	0.5
35.01-40 mm	0	0.0	0	0.0	3	0.7	0	0.0	3	0.3	0.8	1.5
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Flake Width												
0.1-5 mm	67	59.3	96	38.7	239	54.7	72	66.7	474	52.3	118.5	81.3
5.01-10 mm	38	33.6	128	51.6	175	40.0	30	27.8	371	40.9	92.8	70.6
10.01-15 mm	2	1.8	6	2.4	13	3.0	4	3.7	25	2.8	6.3	4.8
15.01-20 mm	6	5.3	16	6.5	6	1.4	1	0.9	29	3.2	7.3	6.3
20.01-25 mm	0	0.0	2	0.8	0	0.0	0	0.0	2	0.2	0.5	1.0
25.01-30 mm	0	0.0	0	0.0	0	0.0	1	0.9	1	0.1	0.3	0.5
30.01-35 mm	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
35.01-40 mm	0	0.0	0	0.0	3	0.7	0	0.0	3	0.3	0.8	1.5
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Flake Thickness												
Not applicable	86	76.1	198	79.8	372	85.1	30	27.8	686	75.7	171.5	150.8
0.1-1.0 mm	17	15.0	27	10.9	35	8.0	43	39.8	122	13.5	30.5	11.1
1.01-2.0 mm	8	7.1	16	6.5	25	5.7	27	25.0	76	8.4	19.0	8.8
2.01-3.0 mm	1	0.9	3	1.2	4	0.9	6	5.6	14	1.5	3.5	2.1
3.01-4.0 mm	1	0.9	1	0.4	0	0.0	1	0.9	3	0.3	0.8	0.5
4.01-5.0 mm	0	0.0	1	0.4	1	0.2	0	0.0	2	0.2	0.5	0.6
5.01-6.0 mm	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
6.01-7.0 mm	0	0.0	1	0.4	0	0.0	0	0.0	1	0.1	0.3	0.5
7.01-12.0 mm	0	0.0	1	0.4	0	0.0	1	0.9	2	0.2	0.5	0.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		

Dorsal cortex is not evident on 95.4% of the debitage from the proposed habitation area (Table 5.6). When present, it covers between 1 and 10% of the dorsal surface; however, a few of the debitage pieces had between 91 and 100% dorsal coverage. The lack of dorsal cortex is probably the result of the type of raw lithic material and not a reflection of the stage of manufacture. Most of the materials evident consist of SRC, KRF, and brown chalcedony, which typically lack cortex. Only 11.2% of the entire assemblage in this area exhibits thermal alteration (Table 5.6).

Table 5.6 Frequencies and proportions of dorsal cortex, thermal alteration, and patina for proposed habitation area

	Unit 12-14		Units 15-17		Unit 30		Unit 34		Total		Activity Area	
	No	%	No	%	No	%	No	%	No	%	Mean	SD
Dorsal Cortex												
Absnt	111	98.2	238	96.0	414	94.7	102	94.4	865	95.5	216.3	145.7
Present									0	0.0		
1-10%	2	1.8	8	3.2	14	3.2	4	3.7	28	3.1	7.0	5.3
11-20%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
21-30%	0	0.0	0	0.0	1	0.2	0	0.0	1	0.1	0.3	0.5
31-40%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
41-50%	0	0.0	0	0.0	2	0.5	1	0.9	3	0.3	0.8	1.0
91-100%	0	0.0	2	0.8	6	1.4	1	0.9	9	1.0	2.3	2.6
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Thermal Alteration												
Present	42	37.2	26	10.5	26	5.9	8	7.4	102	11.3	25.5	13.9
Absent	71	62.8	222	89.5	411	94.1	100	92.6	804	88.7	201.0	154.5
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		
Patina												
Absent	105	92.9	219	88.3	423	96.8	102	94.4	849	93.7	212.3	150.7
Present	8	7.1	29	11.7	14	3.2	6	5.6	57	6.3	14.3	10.4
Total	113	100.0	248	100.0	437	100.0	108	100.0	906	100.0		

5.3 Midden/Processing Area of the Jackson Site

5.3.1 Surface Area, Blocks, and Associated Features of the Midden/Processing Area

The proposed midden/processing area of the Jackson site covers approximately 65 m by 30 m (Figure 5.1). Twelve square meters were excavated here. This sample derives from units 18 to 21 and 35 within block D, units 22 to 25, 32, and 33 in block E, and unit 31 in block I (Playford 2001:27) (Figure 5.2). Figure 5.1 illustrates that the midden/processing and habitation areas overlap. Units 22 to 25, 32, and 33 and unit 31 are problematic because the ambiguous nature of the shovel test recoveries led Hamilton and Nicholson (1999) to propose both the habitation and midden/processing activities. The southern part contained dense concentrations of pottery and discrete clusters of lithics. Bone was present across the entire area in dense amounts. Playford's (2001) assessment of this ambiguity led her to propose that units 18 to 21 and 35 and units 22 to 25 and 32 to 33 indicated a possible refuse disposal area.

For units 18 to 21 and 35 , the MNI and NISP counts suggested that bison (*Bison bison*) dominated the assemblage, with unspeciated large ungulates, medium-large canid (*Canis sp.),* members of the *Leporidae* family, avian, an assortment of rodents, and amphibians also being represented (Playford 2001). Playford (2001) concluded that this area yielded greater species diversity than other areas of the site. Excavators discovered a semi-circular configuration of fire-broken rock between the boundary of units 18 and 19 at 13 to 25 centimetres below surface. Playford (2001:69-70) determined that this feature contained a concentration of bison bones, which might have been the remnants from a meat-boiling pit. No visible soil staining indicative of a hearth was evident near this feature, however, sediments from this site are sometimes ambiguous because of bioturbation. The pit might have been adjacent to the excavated area or the site occupants might have used a different method, such as supporting the stomach from a bison from pieces of wood, to form a container (Playford 2001:69). A cluster of vole elements and the remains of squirrel, gopher, shrew, salamander, snake, toad, and bird were associated with the proposed boiling pit. Playford (2001:69-70) offered no suggestions explaining this occurrence, except to state that she could not dismiss these remains as being intrusive.

In units 22 to 25, 32, and 33, the MNI and NISP values suggested the presence of bison (*Bison bison*), deer (*Odocoileus sp.)* and other large ungulate remains. An abundance of medium-large canid (*Canis sp.*), an assortment of large and small rodents, birds, and a variety of amphibians were also present (Playford 2001). Within this block of units were a series of bone clusters that included concentrations of bison limb bones and two dense clusters of rodent bones. In unit 32, the high frequency of large ungulate forelimb fragments might have resulted from disposal after marrow extraction activities in the vicinity of unit 25. The clusters of canid, rodent, amphibian, and reptile indicated that these animals were either butchered and/or processed or were dumped along with the bison remains. The distribution pattern of the faunal remains in this excavation block did not clearly indicate a particular activity. Playford (2001:70) stated that "the high species diversity, the scattered nature of the faunal elements and the lack of patterned unidentified bone deposition coupled with a dearth of features and the excavation of a lithic reduction station demonstrate that block E is plausibly a refuse area." Units 22 to 25 and 32 to 33 represented a refuse area that might have included marrow extraction and processing of small animals either in or adjacent to this block.

Unit 31 is located on the edge of the overlap of the proposed habitation and midden/processing zones. The MNI and NISP counts suggest a mixed faunal assemblage consisting of bison (*Bison bison*), medium to large canid (*Canis sp.*), Northern pocket gopher (*Thomomys talpoides*), and a garter snake (*Thamnophis sp.*) despite the small surface area (Playford 2001:59). Excavators recovered 17,020 bone specimens weighing 3,074 g (Playford 2001:59). Thermal alteration was evident on 71% of the assemblage. Playford (2001:71) concluded that no specific cultural activities, such as processing or butchering, were evident in unit 31. She elaborated by stating that the distribution pattern of faunal remains indicated that unit 31 might have been located within a discard area associated with the southwest boundary of the refuse area identified in units 22 to 25 and 32 to 33 of the processing zone.

A description of the lithic artifacts and debitage found in the area will be presented next, according to the tool and debitage attributes described in chapter four. The proposed midden/processing area contains 25 formed tools, seven bifacial fragments, and 38 utilized flakes. In addition, 2236 pieces of debitage are included in this sample. A more detailed description of each tool is presented in appendix 1 and photographs are found in appendix 2.

5.3.2 Projectile Points

Nine projectile points are associated with the proposed midden/processing area of the Jackson site (Appendix 1; Appendix 2: Figure 2). This includes a Prairie Side-notched points (20-4-50) and six Plains Side-notched points (22-4-25; 23-3-18; 32-3-38; 33-5-3; 35-4-14; 35-5-6) according to descriptions by Kehoe (1966). A base (35-3-92) and a blade (33-3-6) from an indeterminate point style were also found in this area. Both of the Prairie Side-notched projectile points are broken and are composed of KRF and SRC. Knife River flint, brown chalcedony and SRC materials comprise the Plains Side-notched projectile points. Seven points are incomplete. Adjacent to the relatively complete bison skull recovered in unit 33 was the only complete KRF Plains Side-notched projectile point in this area. The two projectile point bases are composed of brown chalcedony and KRF materials. Evidence of thermal alteration is evident on two Plains Side-notched projectile points.

5.3.3 Preforms

Three triangular preforms (22-2-26; 32-3-10; 33-3-33) are associated with the proposed midden/processing zone (Appendix 1; Appendix 2: Figure 2). Two triangular preforms are made of KRF and one is made from SRC. Only one triangular preform is complete. It is difficult to confirm if these tool forms are preforms or unnotched Triangular projectile points. In addition, there is considerable variability in the amount of secondary retouch evident on each of the tool forms. Given the level of completeness for the projectile points and these tool forms, it is not possible to measure differences in size between the projectile points and the triangular preforms.

5.3.4 Knives

Five incomplete knives are present in the proposed midden/processing zone (Appendix 1; Appendix 2: Figure 3). Only the tips are present on each of the knives. Excavators recovered four knives from unit 32 (32-3-84; 32-2-61; 32-3-75; 32-4-9) and one knife from unit 24 (24-4-24). These tool forms are identified as knives because a significant portion of the fragment skews dramatically away from the long axis of the tool. None of the knives from this area is thermally altered. Two of the knives are KRF and three are SRC. Cortex is evident on one of the knives made of KRF.

5.3.5 Drill and Perforator

A side-notched drill (21-3-23) and a possible perforator (32-3-103) were recovered in this area (Appendix 1; Appendix 2: Figure 3). Both of these tools are made from KRF and lack evidence of thermal alteration. The drill is complete, has a diamond shaped cross-section, and exhibits extensive secondary retouch along each of its margins. The perforator has a triangular shaped cross-section and a relatively thick tip that might have served to make holes in materials. Only one of the margins is broken and there is a lateral break along the tip. This tool might also have been a side scraper given the extensive retouch along its edge. The manner that the tool was broken might have created the thick tip.

5.3.6 Bifacial Fragments

Seven portions from indeterminate bifacial stone tools are recovered from this area (Appendix 1; Appendix 2: Figure 3). This includes a tip from a brown chalcedony tool (35-5-18) that may have broken during either use or manufacture. A fragment from a brown chalcedony bifacial tool (25-3-69) is also present in the area. Since most of the body of the tool is missing, this prevents further identification of the type of tool. A SRC mid-section and lateral margin (32-5-29), possibly from a projectile point or a triangular preform, came from this area. None of these fragments is thermally altered or have cortex present on their surfaces. There are also four fragments present in this area but due to their small size, additional description is not possible.

5.3.7 Scrapers

There are three side scrapers (20-3-51; 22-4-12; 32-2-59) and two thumbnail-shaped end scrapers (20-3-22; 22-4-30) affiliated with the proposed midden/processing zone (Appendix 1; Appendix 2: Figure 4). The end scrapers are similar to the kinds of end scrapers recovered from many archaeological sites on the Northern Plains (Gregg et al. 1996). Each of the scrapers is made from KRF. Three scrapers exhibit evidence of thermal alteration. Two of the scrapers in this activity area have cortex associated with evidence of thermal alteration on their surfaces. Only one scraper is complete. Secondary retouch along the margins of the tools indicates that extensive rejuvenation occurred, possibly during butchering and processing the bison remains.

5.3.8 Spokeshave

One incomplete spokeshave (22-3-53) was found in this area (Appendix 1; Appendix 2: Figure 3). A concavity extends the full length of the tool and has secondary retouch. It is made of KRF and lacks evidence of thermal alteration.

5.3.9 Utilized Flakes

Thirty-eight utilized flakes come from the proposed midden/processing area (Table 5.7). Most of the utilized flakes are located in units 22 (50%) and 23 (23.6%), which are located between the proposed habitation and midden/processing areas of the site. Significantly, fewer utilized flakes are present in the area immediately surrounding these units, suggesting a localized workstation (Table 5.7). Swan River chert (63.1%) is the most common material used for forming utilized flakes, however, KRF (23.0%) and brown chalcedony (13.1%) are also favoured materials. Interestingly, most of the utilized flakes made of SRC are found in units 22 and 23. Most of these flakes lack (84.2%) evidence of thermal alteration (Table 5.7). Only 5.2% have cortex on their dorsal surfaces, particularly between KRF and brown chalcedony materials. The average length of the utilized flakes in this area is 18.02 mm, average width is 16.3 mm, and average thickness is 2.65 mm (Table 5.7).

Table 5.7 Utilized flakes from the proposed midden/processing area.

Number	RM	Damage	Break	L	W	Th	Retouch	Edges	Cortex	Therm. Alter
22-2-28	SRC	right/base broken	trans	15.71	14.78	2.06	prox/left edge	2	0	0
22-3-20	SRC	left edge/ base too	long	22.15	21.47	2.9	right edge	1	0	0
22-3-45	SRC	tip off	trans	25.27	15.67	1.53	latterall	2	0	0
22-3-55	SRC	tip and base gone	trans	11.14	22.24	1.59	sec/left edge	1	0	0
22-4-6	SRC	0	0	24.08	16.77	3.02	prim	2	0	0
22-4-29	SRC	prox/distal brok	trans	16.76	14.02	2.08	cont	2	0	0
22-4-32	SRC	base brok	trans	14.87	14.85	4.02	ser lat edge	1	0	0
22-4-39	SRC	base brok	trans	10.88	10.08	1.88	nibbling	2	0	0
22-4-40	SRC	base broken	dia	14.14	13.36	1.3	discont	2	0	0
22-4-43	SRC	prox/distal brok	trans	12.67	9.7	1.26	nibbling	2	0	0
22-4-45	SRC	base off	trans	8.83	13.49	1.35	nibbling	1	0	0
22-4-46	SRC	prox/distal broken	trans	14.97	9.7	1.78	nibbling	1	0	0
22-4-53	SRC	0	0	13.43	10.38	3.2	nibbling	1	0	0
22-4-65	SRC	left edge only	long	10.84	7.24	2.08	sec ret	0	0	0
22-4-129	SRC	lat and base broken	trans	14.37	8.62	1.68	discont	1	0	0
22-4-137	SRC	base broken	trans	15.34	20.04	2.29	cont	3	0	0
22-4-175	SRC	0	0	16.55	10.16	3.56	nibbling	3	0	0
22-5-58	SRC	tip and base gone	trans	15.01	24.98	2.14	primary	2	0	0
22-8-11	SRC	0	0	24.1	16.68	2.89	primary	1	0	1
23-3-47	SRC	0	0	14.14	9.16	1.1	cont nibbling	2	0	0
23-3-64	SRC	base gone	dia	18.56	20.78	2.84	nibbling	2	0	0
23-3-72	SRC	0	0	10.84	16.05	2.6	nibbling	1	0	0
23-3-84	SRC	0	0	24.58	18.23	2.28	discont	1	0	1
23-3-91	SRC	tip gone	trans	25.07	24.55	5.25	cont	3	0	0
23-4-16	KRF	lat only present	trans	11.18	19.96	2.43	cont	1	0	1
23-4-26	KRF	0	0	19.91	17.69	1.58	cont	2	0	0
23-4-49	KRF	prox miss/distal hinge	trans	23.09	22.8	2.11	cont	2	0	0
23-5-16	BC	distal missing	dia	23.78	25.19	2.98	cont	2	0	0
24-2-21	KRF	0	0	31.75	27.39	2.44	cont	2	10	0
24-5-37	KRF	right/prox miss	trans	12.66	8.77	1.64	cont	1	0	0
24-5-22	KRF	prox/distal es	lat	26.84	15.58	4.5	discont	2	0	1
24-4-54	BC	prox miss	lat	15.56	14.03	1.81	cont	2	50	0
24-5-60	KRF	prox gone	dia	16.97	15.59	1.24	discont	2	0	0
25-3-69	BC	0	0	15.51	19.52	3.01	0	3	0	0
32-3-103	BC	medial only	trans	21.87	7.18	3.49	cont	1	0	0
32-4-13	BC	prox only	trans	27.97	20.17	6.38	contin	1	0	1
32-2-59	KRF	0	0	22	20.37	8	cont	1	0	1
33-4-68	KRF	distal missing	obliter	21.66	22.23	2.48	cont	2	0	0

*RM=raw material L=length; W=width; Th=thickness; Therm. Alter.=thermal alteration

5.3.10 Debitage

Excavators recovered 2236 pieces of debitage from the proposed midden/processing area. There is a significant increase in the abundance of debitage in units 22 to 25, 32, and 33 compared to units 18 to 21, and 35 in this area. Units 18 to 21 and 35 are located in the northeastern portion of the area and units 22 to 25, 32, and 33 are located in the southeastern section of the area. These units straddle the border between the proposed habitation and midden/processing areas. Each excavation block has different proportions of flake types that reflect different activities. These differences may have a bearing on the confirmation of midden or processing activities at the site, which will be further addressed in chapter six. Also included in this activity area is unit 31, which is located in the south-central portion of the area. In contrast to the other units in this area, this unit contains a significantly smaller sample (n=50) of debitage.

The standard deviation for each of the debitage forms demonstrates that a considerable variety is present across the activity area. The density of debitage per square metre is 186.3. High proportions of complete flakes (27.8%), angular fragments/shatter (13.2%), and irregular flake (34.2%) forms are present (Table 5.8) across the proposed midden/processing area. According to Sullivan and Rozen (1985), this type of assemblage is indicative of general core reduction activities. Excavators recovered three exhausted cores (22-3-57; 23-2-13; 23-3-80) that further supports Sullivan and Rozen's premise.

The kinds of flake termination types also support the identification of general core reduction activities. Indeterminate flake terminations are evident on 53.1% of the assemblage, but 17.2% of the debitage have feather terminations and only 13.8% have step terminations (Table 5.8). It is difficult to determine the type of hammer used by flintknappers given that 75.8% of the flake sample lack distinctive conchoidal rings on the ventral surface of the flakes (Table 5.8). As well, relatively equal numbers of prominent and faint conchoidal rings are evident for the activity area. The standard deviation calculated for these two indices demonstrates a wide spread is present across the site area. This suggests that there are differences apparent among the flintknapping activities across the activity area. This may also suggest a mixed reduction strategy that favoured neither hard nor soft hammer manufacturing techniques. In addition, the lack of a distinctive bulb of percussion on 74.2% (Table 5.8) of the debitage prevents the determination of the type of hammer used and the method applied to remove the flakes from the objective pieces.

Of the debitage assemblage in the proposed midden/processing area, 32.6% have a striking platform present (Table 5.9). The average width of the striking platforms measures between 2.01 and 3.0 mm and that is also the largest size class evident at the site (Table 5.9). In addition, a significant proportion of the striking platforms measure between 3.01 and 4.0 mm (Table 5.9). For the debitage fragments that have intact striking platforms, 50.2% measure between 1.01 and 2.01 mm in thickness (Table 5.9). In addition, 68.1% of the sample lacks facets on the striking platform. This indicates that minimal reduction and preparation of the platform edges occurred (Table 5.9).

Table 5.8 Summary of the debitage form, conchoidal rings, termination types, and bulbs of percussion for the proposed midden/processing area.

	Units 18-21, 35		Units 22-25, 32,33		Unit 31		Total		Activity Area	
	No	%	No	%	No	%	No	%	Mean	SD
Completeness										
Angular	47	12.8	236	13.0	14	28.0	297	13.3	99.0	119.8
Complete	102	27.8	499	27.4	22	44.0	623	27.9	207.7	255.5
Proximal	24	6.5	180	9.9	6	12.0	210	9.4	70.0	95.7
Medial	20	5.4	147	8.1	7	14.0	174	7.8	58.0	77.3
Distal	40	10.9	125	6.9	1	2.0	166	7.4	55.3	63.4
Irregular	134	36.5	632	34.7	0	0.0	766	34.3	255.3	333.0
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Conchoidal Rings										
Prominent	33	9.0	253	13.9	5	10.0	291	13.0	97.0	135.8
Faint	28	7.6	211	11.6	10	20.0	249	11.1	83.0	111.2
Absent	306	83.4	1355	74.5	35	70.0	1696	75.8	565.3	697.2
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Termination Types										
Indeterminate	186	50.7	982	54.0	21	42.0	1189	53.2	396.3	513.9
Feather	76	20.7	304	16.7	5	10.0	385	17.2	128.3	156.2
Step	51	13.9	243	13.4	15	30.0	309	13.8	103.0	122.6
Hinge	31	8.4	85	4.7	3	6.0	119	5.3	39.7	41.7
End Shock	20	5.4	190	10.4	6	12.0	216	9.7	72.0	102.4
Overshot	3	0.8	15	0.8	0	0.0	18	0.8	6.0	7.9
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Bulb of Percussion										
Prominent	31	8.4	206	11.3	10	20.0	247	11.0	82.3	107.6
Diffuse	70	19.1	247	13.6	11	22.0	328	14.7	109.3	122.8
Absent	266	72.5	1366	75.1	29	58.0	1661	74.3	553.7	713.4
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		

Also discarded in this area were the products from initial core modification activities because only 0.3% of these platforms have cortex still present (Table 5.9). Convex smooth platforms are present on 58.2% of the assemblage (Table 5.9). Battered (36.7%), unprepared (29.9%), and chipped (28.5%) striking platforms predominate the sample (Table 5.9). These categories suggest a mixed reduction strategy. In addition, 67.3% of the platforms have a lip, which suggests that soft hammer bifacial reduction occurred in the area (Table 5.9). The standard deviation calculated for each of the means for the striking platform measurements indicates that there is not a significant range of variation. This could be a function of sampling or it may suggest that similar knapping activities occurred in this area.

Across the proposed midden/processing area, the size of debitage remains relatively consistent (Table 5.10 and Figure 5.9). The debitage sizes ranges from 0.1 mm to 80 mm, with the majority ranging between 0.1 and 10 mm (Table 5.10). As well, of those flakes where thickness was measured, 23.9% are between 0.1 and 1.0 mm (Table 5.10). These flakes are macrodebitage size according to Fladmark (1982).

Dorsal cortex is not present on 91.3% of the debitage recovered from the proposed midden/processing area at the site (Table 5.11). Coupled with the comparatively small flake size, the low quantity of decortication flakes may reflect tool finishing and rejuvenation activities, rather than cobble reduction and preform fabrication activities.

Table 5.9 Frequency and proportion of the debitage striking platforms in the proposed midden/processing area.

	Units 18-21, 35		Units 22-25, 32,33		Unit 31		Total		Activity Area	
	No	%	No	%	No	%	No	%	Mean	SD
Striking Platform Width										
0.1-1.0 mm	0	0.0	6	0.3	7	14.0	13	0.6	4.3	3.8
1.01-2.0 mm	24	6.5	74	4.1	8	16.0	106	4.7	35.3	34.4
2.01-3.0 mm	52	14.2	207	11.4	8	16.0	267	11.9	89.0	104.5
3.01-4.0 mm	24	6.5	176	9.7	1	2.0	201	9.0	67.0	95.1
4.01-5.0 mm	9	2.5	72	4.0	3	6.0	84	3.8	28.0	38.2
5.01-6.0 mm	2	0.5	30	1.6	0	0.0	32	1.4	10.7	16.8
6.01-7.0 mm	1	0.3	13	0.7	0	0.0	14	0.6	4.7	7.2
8.01+ mm	1	0.3	12	0.7	1	2.0	14	0.6	4.7	6.4
N/A (Platform not present)	254	69.2	1229	67.6	22	44.0	1505	67.3	501.7	640.5
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		

Table 5.9 Continues

Striking Platform Thickness										
0.1-1.0 mm	55	15.0	260	14.3	0	0.0	315	14.1	105.0	137.0
1.01-2.0 mm	54	14.7	294	16.2	19	38.0	367	16.4	122.3	149.7
2.01-3.0 mm	4	1.1	33	1.8	2	4.0	39	1.7	13.0	17.3
3.01-4.0 mm	0	0.0	2	0.1	0	0.0	2	0.1	0.7	1.2
4.01-5.0 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
N/A (Platform not present)	254	69.2	1229	67.6	29	58.0	1512	67.6	504.0	637.9
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Striking Platform Facet Count										
0	80	21.8	400	22.0	18	36.0	498	22.3	166.0	205.0
1	18	4.9	85	4.7	0	0.0	103	4.6	34.3	44.8
2	14	3.8	63	3.5	0	0.0	77	3.4	25.7	33.1
3	1	0.3	25	1.4	2	4.0	28	1.3	9.3	13.6
4	0	0.0	13	0.7	1	2.0	14	0.6	4.7	7.2
5+	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
N/A (Platform not present)	254	69.2	1233	67.8	29	58.0	1516	67.8	505.3	640.1
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Striking Platform Type										
Obliterated	9	2.5	107	5.9	0	0.0	116	5.2	38.7	59.3
Dihedral	9	2.5	26	1.4	0	0.0	35	1.6	11.7	13.2
Planar	0	0.0	6	0.3	0	0.0	6	0.3	2.0	3.5
Planar Facet	6	1.6	28	1.5	0	0.0	34	1.5	11.3	14.7
Planar Smooth	6	1.6	59	3.2	3	6.0	68	3.0	22.7	31.5
Convex Facet	7	1.9	72	4.0	3	6.0	82	3.7	27.3	38.7
Convex Smooth	75	20.4	343	18.9	8	16.0	426	19.1	142.0	177.3
Convex	0	0.0	3	0.2	1	2.0	4	0.2	1.3	1.5
Cortex	1	0.3	7	0.4	0	0.0	8	0.4	2.7	3.8
Concave	0	0.0	7	0.4	0	0.0	7	0.3	2.3	4.0
Not applicable	254	69.2	1161	63.8	35	70.0	1450	64.8	483.3	597.0
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Striking Platform Preparation										
Indeterminate	2	0.5	0	0.0	0	0.0	2	0.1	0.7	1.2
Battered	37	10.1	224	12.3	8	16.0	269	12.0	89.7	117.2
Chipping	29	7.9	175	9.6	5	10.0	209	9.3	69.7	92.0
Crushed	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
Ground	9	2.5	96	5.3	2	4.0	107	4.8	35.7	52.4
Obliterated	4	1.1	11	0.6	0	0.0	15	0.7	5.0	5.6
Unprepared	32	8.7	181	10.0	6	12.0	219	9.8	73.0	94.4
Convex-Smooth	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0.0
Cortex	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
Not applicable	254	69.2	1131	62.2	29	58.0	1414	63.2	471.3	582.3
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Lipped Striking Platform										
Present	74	20.2	408	22.4	10	20.0	492	22.0	164.0	213.7
Absent	293	79.8	1411	77.6	40	80.0	1744	78.0	581.3	729.6
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		

It might also be a factor of the type of lithic raw material used by the site inhabitants. Knife River flint, brown chalcedony, and Swan River chert are the common materials in this area and each generally lack a heavy cortex layer. In addition, 10.2% of the debitage are thermally altered (Table 5.11). This low number suggests that thermal alteration activities were not common in this site area.

Table 5.10 Debitage size classes for the proposed midden/processing area

	Units 18-21, 35		Units 22-25, 32,33		Unit 31		Total		Activity Area	
	No	%	No	%	No	%	No	%	Mean	SD
Flake Length										
0.1-5 mm	179	48.8	670	36.8	21	42.0	870	38.9	290.0	338.4
5.01-10 mm	142	38.7	784	43.1	21	42.0	947	42.4	315.7	410.1
10.01-15 mm	34	9.3	257	14.1	7	14.0	298	13.3	30.3	137.2
15.01-20 mm	5	1.4	85	4.7	1	2.0	91	4.1	30.3	47.4
20.01-25 mm	6	1.6	9	0.5	0	0.0	15	0.7	5.0	4.6
25.01-30 mm	1	0.3	8	0.4	0	0.0	9	0.4	3.0	4.4
30.01-35 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
35.01-40 mm	0	0.0	3	0.2	0	0.0	3	0.1	1.0	1.7
45.01-50 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
80 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Flake Width										
0.1-5 mm	199	54.2	727	40.0	23	46.0	949	42.4	316.3	366.4
5.01-10 mm	142	38.7	838	46.1	24	48.0	1004	44.9	334.7	439.9
10.01-15 mm	16	4.4	184	10.1	3	6.0	203	9.1	67.7	101.0
15.01-20 mm	6	1.6	49	2.7	0	0.0	55	2.5	18.3	26.7
20.01-25 mm	2	0.5	11	0.6	0	0.0	13	0.6	4.3	5.9
25.01-30 mm	2	0.5	6	0.3	0	0.0	8	0.4	2.7	3.1
30.01-35 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
35.01-40 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
45.01-50 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
80 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Flake Thickness										
0-not measured	166	45.2	1022	56.2	32	64.0	1220	54.6	406.7	537.1
0.1-1.0 mm	124	33.8	406	22.3	5	10.0	535	23.9	178.3	205.9
1.01-2.0 mm	63	17.2	316	17.4	8	16.0	387	17.3	129.0	164.3
2.01-3.0 mm	4	1.1	48	2.6	2	4.0	54	2.4	18.0	26.0
3.01-4.0 mm	4	1.1	13	0.7	1	2.0	18	0.8	6.0	6.2
4.01-5.0 mm	2	0.5	4	0.2	1	2.0	7	0.3	2.3	1.5
5.01-6.0 mm	0	0.0	1	0.1	0	0.0	1	0.0	0.3	0.6
7.01-12.0 mm	4	1.1	9	0.5	1	2.0	14	0.6	4.7	4.0
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		

Table 5.11 Dorsal cortex, thermal alteration, and patina counts for debitage from the proposed midden/processing area.

	Units 18-21, 35		Units 22-25, 32,33		Unit 31		Total		Activity Area	
	No	%	No	%	No	%	No	%	Mean	SD
Dorsal Cortex										
Absent	351	95.6	1646	90.5	46	92.0	2043	91.4	681.0	849.5
Present				0.0	4	8.0	4	0.2		
1-10%	8	2.2	80	4.4	0	0.0	88	3.9	29.3	44.1
11-20%	1	0.3	8	0.4	0	0.0	9	0.4	3.0	4.4
21-30%	0	0.0	8	0.4	0	0.0	8	0.4	2.7	4.6
31-40%	0	0.0	3	0.2	0	0.0	3	0.1	1.0	1.7
41-50%	5	1.4	28	1.5	0	0.0	33	1.5	11.0	14.9
51-60%	0	0.0	3	0.2	0	0.0	3	0.1	1.0	1.7
91-100%	2	0.5	43	2.4	0	0.0	45	2.0	15.0	24.3
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Thermal Alteration										
Present	65	17.7	155	8.5	9	18.0	229	10.2	76.3	73.7
Absent	302	82.3	1664	91.5	41	82.0	2007	89.8	669.0	871.5
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		
Patina										
Absent	319	86.9	1599	87.9	40	80.0	1958	87.6	652.7	831.3
Present	48	13.1	220	12.1	10	20.0	278	12.4	92.7	111.9
Total	367	100.0	1819	100.0	50	100.0	2236	100.0		

5.4 Kill Area of the Jackson Site

5.4.1 Surface Area, Blocks, and Associated Features in the Kill Area

The proposed kill area is located at the north end of the Jackson site, and encompasses 30 m by 30 m of area according to Hamilton and Nicholson (1999; Figure 5.1). Playford (2001) referred to this area as block F, which included units 26, 27, 28, and 36 (Figure 5.2). A historic cart trail crosses the hollow containing the bone bed and might have disturbed and damaged some of the archaeological materials. Only four one metre square excavation units were completed. It is the smallest activity area identified at the site, and because of time constraints, is represented by the smallest excavation sample.

The proposed kill area does not exhibit the same species diversity as the other activity areas at the Jackson site. The MNI indicates that five bison (*Bison bison*) and one deer (*Odocoileus sp.*) dominate the faunal assemblage. This area was not solely used for killing and primary butchering of bison and deer. The NISP values suggest small to medium sized avian species and small to very large mammals are minimally represented in the assemblage (Playford 2001:53). These faunal recoveries indicate that a small bison kill occurred at the north end of the site.

Playford (2001) also noted that unlike other kill sites, only a few of the elements were complete at the Jackson site. Most of the bone was fragmented, but differential distribution patterns were evident among the forelimbs. In unit 27, carpals were concentrated in the northern portion of the unit, however, in the southern portion of this unit and in unit 36 most of the recoveries consisted of fragmented appendicular midshafts and articular ends. Small concentrations of carpals and clusters of tarsals and pelvic fragments were evident in unit 26. Tarsals and limb bones were numerous in the northern portion of unit 27. The distribution patterns of burned and unburned unidentified bone fragments were almost identical although burned bone fragments were more numerous. The northeast quadrant of unit 27 and all of unit 36 had high concentrations of burned and unburned bone fragments (Playford 2001:71). Primary butchering and the initial processing of bison and deer probably followed shortly after the hunt. The clusters of disarticulated carpals and tarsals represent discard piles of low utility elements. The high density of smashed bone in this area suggested that preliminary intensive processing probably occurred adjacent to the kill area. Marrow extraction was likely the dominant activity in this area because of the high percentage of appendicular midshafts and articular ends (Playford 2001:71).

A description of the lithic artifacts and debitage found in the area will be presented next, according to the tool and debitage attributes described in chapter four. The proposed kill area contains 10 formed tools, four bifacial fragments and 41 pieces of debitage. A more detailed description of each tool is presented in appendix 1 and photographs are found in appendix 2.

5.4.2 Projectile Points

The kill area yielded the highest number (n=10) of projectile points compared to the other activity areas (Appendix 1; Appendix 2: Figure 5). This includes eight Plains Side-notched projectile points (26-4-2; 27-5-84; 27-7-17; 28-7-16; 28-9-39; 36-4-3; 36-6-69b; 36-8-37) and one Prairie Side-notched projectile point (36-6-16) according to descriptions by Kehoe (1966). One projectile point, of unidentified type, was also found in the area (36-6-69a). Eight projectile points are incomplete. The common breakage patterns are across the shoulder area and diagonally through the blade. Only three lithic raw materials are represented among the projectile points, with six of KRF and three of SRC, and one of banded chert. Four tools exhibit evidence of thermal alteration.

5.4.3 Bifacial Fragments

Four biface fragments (26-3-1; 27-4-87; 27-6-24; 27-4-99) were recovered from the kill area (Appendix 1; Appendix 2: Figure 6). Three of these portions resemble tips from projectile points and one is the medial section from an indeterminate bifacial tool. Three of the bifacial fragments are KRF and one is of chert.

5.4.4 Debitage

Forty-one pieces of debitage were recovered from the proposed kill area at the Jackson site. The density per square meter is 10.25. Complete flakes (36.6%) dominate the sample from this area (Table 5.12).

Table 5.12 Summary of the debitage forms, conchoidal rings, termination types, and bulbs of percussion for the proposed kill area

	Units 26, 27, 28, 36	
	No	%
Completeness		
Angular	5	12.2
Complete	15	36.6
Proximal	3	7.3
Medial	2	4.9
Distal	2	4.9
Irregular	14	34.1
Total	41	100.0
Conchoidal Rings		
Prominent	0	0.0
Faint	4	9.8
Absent	37	90.2
Total	41	100.0
Termination Types		
Indeterminate	21	51.2
Feather	13	31.7
Step	4	9.8
End Shock	3	7.3
Total	41	100.0
Bulb of Percussion		
Prominent	2	4.9
Diffuse	10	24.4
Absent	29	70.7
Total	41	100.0

Also present in high proportions (Table 5.12) are irregular forms (34.1%) and angular fragments/shatter (12.2%). Only 9.8% of the sample has faint conchoidal rings (Table 5.12). Since this is an extremely low percentage, the hammer method could not be determined using this attribute. Indeterminate termination (51.2%) is evident on a high proportion of the sample; however, 31.7% have feather terminations (Table 5.12). Diffuse bulbs of percussion are evident on 24.4% of the sample in this area (Table 5.12). Given the high proportion of complete flakes and feather terminations, tool rejuvenation was probably the dominant activity in this area. The faint type of bulb of percussion suggests soft hammer pressure flaking common in tool rejuvenation activities.

The majority of the striking platform widths (83.3%) measured between 0.1 and 3.0 mm, and 16.6% of the sample measured between 3.1 and 5.0 mm (Table 5.13). All of the striking platforms measured between 0.1 and 2.0 mm in thickness (Table 5.13). These size categories indicate that the site inhabitants were modifying a variety of small pieces, such as tool edges. A significant proportion (Table 5.13) of the platforms lack facets (77.7%), which suggests that less intensive knapping activities occurred in this area. Convex smooth platform types (44.4%) dominate the assemblage (Table 5.13). Represented in the sample are battered (44.4%) or unprepared (44.4%) platforms (Table 5.13). Only 44.4% of the flakes display lipped platforms (Table 5.13).

Consistent with the other activity areas at the site, the proposed kill area debitage (Table 5.14) is primarily macrodebitage according to Fladmark's (1982) debitage size classification. Most of the debitage measured between 0.1 and 5.0 mm (65.9%) in length suggestive of intensive resharpening activities (Table 5.14 and Figure 5.14). Significantly smaller proportions (31.7%) of debitage measured between 6.0 and 10.0 mm (Table 5.14). A vast majority (65.9%) of the debitage in this area measured between 0.1 and 1.0 mm in thickness (Table 5.14), which indicates that the objective piece had a very small area, possibly the edge of a tool.

Table 5.13 Debitage striking platform attributes for the proposed kill area.

	Units 26, 27, 28, 36	
	No	**%**
Striking Platform Width		
0.1-2.0	6	14.6
2.1-3.0	6	14.6
3.1-4.0	2	4.9
4.1-5.0	1	2.4
N/A (Platform not present)	26	63.4
Total	41	100.0
Striking Platform Thickness		
0.1-2.0	15	36.6
N/A (Platform not present)	26	63.4
Total	41	100.0
Striking Platform Facet Count		
0	11	26.8
1	2	4.9
2	1	2.4
3	0	0.0
4	0	0.0
5	1	2.4
5+	0	0.0
N/A (Platform not present)	26	63.4
Total	41	100.0
Striking Platform Type		
Indeterminate	6	14.6
Planar Smooth	2	4.9
Convex Facet	2	4.9
Convex Smooth	8	19.5
Not applicable	23	56.1
Total	41	100.0
Striking Platform Preparation		
Indeterminate	0	0.0
Battered	8	19.5
Ground	2	4.9
Unprepared	8	19.5
Not applicable	23	56.1
Total	41	100.0
Lipped Striking Platform		
Present	8	19.5
Absent	33	80.5
Total	41	100.0

Table 5.14 Debitage size classes for the proposed kill area.

	Units 26, 27, 28, 36	
	No	%
Flake Length		
0.1-5 mm	27	65.9
5.01-10 mm	13	31.7
10.01-15 mm	0	0.0
15.01-20 mm	1	2.4
Total	41	100.0
Flake Width		
0.1-5 mm	30	73.2
5.01-10 mm	10	24.4
10.01-15 mm	1	2.4
Total	41	100.0
Flake Thickness		
0.1-1.0	35	85.4
1.01-2.0	5	12.2
1.01-2.0	0	0.0
2.01-3.0	1	2.4
Total	41	100.0

None of the debitage in the proposed kill area has dorsal cortex (Table 5.15). Thermal alteration is not evident among the debitage either (Table 5.15). The lack of cortex-bearing debitage indicates that primary tool production did not occur in this area. This is consistent with the tool resharpening activities proposed above. Another explanation for the low presence of cortex-bearing debitage in this area may be the result of the type of lithic material used. Swan River chert and banded chert typically do not have cortex, however, KRF sometimes has it.

Table 5.15 Dorsal cortex, thermal alteration, and patina counts for debitage in the proposed kill area.

	Units 26, 27, 28, 36	
	No	%
Dorsal Cortex		
Absent	41	100.0
Total	41	100.0
Thermally Alteration		
Present	1	2.4
Absent	40	97.6
Total	41	100.0
Patina		
Absent	38	92.7
Present	3	7.3
Total	41	100.0

5.5 Test Unit 29

Unit 29 was located on the east side of Maple Hill road (Figure 5.1) and is outside the main activity areas at the Jackson site. This area was excavated because of recoveries from a shovel test. Playford (2001) referred to this unit as block G in her study (Figure 5.2). The MNI values suggested that two bison (*Bison bison*) and one hare (*Lepus sp.*) were evident in the faunal assemblage (Playford 2001:55). The presence of tarsals and carpals in the units suggested that the site inhabitants butchered limb bones in the vicinity. There was 4,584.8 g of bone excavated from this unit and 67% of the assemblage exhibited evidence of thermal alteration (Playford 2001: 55). She also speculated that the unit was on the edge of a refuse area where secondary faunal processing occurred and that the unit might have been associated with the proposed habitation area located across the road.

5.5.1 Projectile Point

A KRF Plains Side-notched projectile point is present in unit 29 (Appendix 1; Appendix 2: Figure 7).

5.5.2 Bifacial Fragment

A brown chalcedony bifacial fragment came from unit 29 (Appendix 1; Appendix 2: Figure 7).

5.5.3 Debitage

Unit 29 contains 11 pieces of debitage, thus, interpretations are inconclusive. Seven complete flakes are present in the assemblage (Table 5.16). Faint conchoidal rings dominate (n=6) the assemblage (Table 5.16). Faint conchoidal rings are indicative of soft hammer reduction and pressure flaking. Indeterminate terminations are evident on four of the debitage (Table 5.16). However, five flakes have step terminations and two have feather terminations (Table 5.16). This may indicate that the flaking tool used by the site inhabitants might have been rather heavy and producing too great an amount of force (Table 5.24). Given the relatively equal proportions of prominent, diffuse, and absent bulbs of percussion (Table 5.16) evident in this unit, it is not possible to confirm the type of hammer used by the site occupants.

Table 5.16 Summary of the debitage forms, conchoidal rings, termination types, bulbs of percussion in unit 29.

	Unit 29	
	#	%
Completeness		
Angular	1	9.1
Complete	7	63.6
Proximal	0	0.0
Medial	2	18.2
Distal	0	0.0
Irregular	1	9.1
Conchoidal Rings		
Prominent	1	9.1
Faint	6	54.6
Absent	4	36.4
Termination Types		
Indeterminate	5	45.5
Feather	2	18.2
Step	4	36.4
Bulb of Percussion		
Prominent	3	27.3
Diffuse	4	36.4
Absent	4	36.4
Total	11	100.0

The striking platform widths are either between 2.01 to 3.0 mm or between 3.01 and 4.0 mm (Table 5.17). Platform thickness measures between 0.1 and 2.0 mm (Table 5.17). Platform preparation is minimal. Of those pieces with striking platforms, six lack facetted platforms (Table 5.17). Striking platform types include convex facet, convex smooth, obliterated, and cortex platforms (Table 5.17). Only battered (n=2), chipped (n=2), or ground (n=2) edges are evident in unit 29 (Table 5.17). Considering that the sample consists of relatively equal proportions of debitage with prominent or faint conchoidal rings and that most of the debitage fragments lack bulbs of percussion, several types of hammers could have been used.

Most (n=8) of the debitage is between 0.1 and 10 mm, and most measure between 0.1 to 1.0 mm in thickness (Table 5.18). These debitage sizes are indicative of macrodebitage according to Fladmark (1982). Thermal alteration is not present in the assemblage (Table 5.19). Only one piece of debitage has dorsal cortex and coverage is between 91 and 100% (Table 5.19).

Table 5.17 Debitage striking platform attributes evident in unit 29.

	Unit 29	
	#	%
Striking Platform Width		
2.1-3.0	4	36.4
3.1-4.0	2	18.2
N/A (Platform not present)	5	45.5
Striking Platform Thickness		
0-2.0	6	54.6
N/A (Platform not present)	5	45.5
Striking Platform Facet Count		
0	5	45.5
1	0	0.0
2	0	0.0
3	1	9.1
N/A (Platform not present)	5	45.5
Striking Platform Type		
Indeterminate	2	18.2
Convex Facet	1	9.1
Convex Smooth	1	9.1
Convex	1	9.1
Obliterated	1	9.1
Not applicable	5	45.5
Striking Platform Preparation		
Battered	2	18.2
Chipping	2	18.2
Ground	2	18.2
Not applicable	5	45.5
Lipped Striking Platform		
Present	4	36.4
Absent	7	63.6
Total	11	100.0

Table 5.18 Debitage size classes for unit 29.

	Unit 29	
	#	%
Flake Length		
0.1-5 mm	2	18.2
5.01-10 mm	8	72.7
10.01-15 mm	1	9.1
Total	11	100.0
Flake Width		
0.1-5 mm	6	54.6
5.01-10 mm	4	36.4
10.01-15 mm	1	9.1
Total	11	100.0
Flake Thickness		
Not measured	4	36.4
0.1-1.0 mm	6	54.6
6.01-7.0 mm	1	9.1
Total	11	100.0

Table 5.19 Dorsal cortex, thermal alteration, patina for debitage from unit 29.

	Unit 29	
	#	%
Dorsal Cortex		
Absent	10	90.9
Present		
91-100%	1	9.1
Thermal Alteration		
Absent	11	100.0
Patina		
Absent	11	100.0
Total	11	100.0

5.6 Summary

Results from the lithic analysis indicate that there are discrete activity clusters present at the Jackson site. In the habitation area, a low number of tools are present, and these are indicative of cutting and scraping tasks, possibly related to faunal processing or hide preparation. The debitage recovered from this area appears to be concentrated in two discrete locations. Tool rejuvenation probably occurred in units 15 and 16 but in unit 30, a dense concentration of debitage and low recovery of tools indicates a possible workstation. Playford (2001) stated that marrow extraction occurred in the habitation area, particularly in the central portions. The site inhabitants discarded faunal remains in the northern end of the site. The midden/processing area produced the densest concentration of debitage and tools. People residing at the Jackson site probably created discard piles of faunal remains from grease rendering in boiling pits and the site occupants probably carried out marrow extraction activities in this area of the site. In the northern portion of the midden/processing area, the site inhabitants discarded the debitage produced from tool production, possibly in units 22 to 25, 32, and 33. In the overlap of the habitation and midden/processing areas, a lithic workstation was present. The dense concentration consists of small sized debitage and broken formed tools. The proposed kill area contains a small sample of debitage and a high number of projectile points and bifacial fragments. Tool rejuvenation involving edge modification probably produced the debitage evident in this area. Distributed across the site are thermally altered materials in each of the activity areas.

Evaluation of the spatial distribution of the lithic assemblage and the type of tools and debitage present in each of the activity areas will follow in chapter six.

Calculation of the standard deviation for the different debitage attribute states demonstrates that considerable variation is evident within the activity area and across the site. Exploration of these differences will commence in chapter six. Comparisons between the lithic assemblage from the proposed habitation, midden/processing, and kill areas and the criteria established from the literature regarding what kinds of stone tools and activities should be expected in a particular activity area will be outlined in chapter six. The results from that assessment will be compared to the earlier identifications made by Hamilton and Nicholson (1999) about site areas which will lead to the confirmation of the preliminary statements.

Chapter Six

Discussion of the Proposed Activity Areas at the Jackson Site

6.1 Introduction

Based on preliminary analysis of shovel test pit recoveries from the Jackson site, Hamilton and Nicholson (1999) proposed that three discrete activity areas were evident. Within a small willow-choked hollow at the north end of the site, a zone of minimally processed bison bone was found and interpreted as a bison entrapment and kill area (Figure 5.1). A midden/processing area dominated the west-central section of the site (Figure 5.1). This area contained dense concentrations of smashed bison bones and was probably the product of waste disposal after intensive bone grease extraction activities. A habitation area was evident in the east-central portion of the site and consisted of a diverse mixture of lithics, pottery, and fire-cracked rock (Figure 5.1).

Hamilton and Nicholson (1999:20) proposed that the basis of these activity zones related to the topography of the site. The site consists of an area of low knolls and shallow hollows, the latter of which appear to have once contained wetlands. They proposed that the localized wetlands supported a fringe of woody vegetation and offered some protection from chronic prairie fires, thereby producing a localized grove of forest vegetation with wetlands at its core. They further speculated that the northern hollow surrounded by a dense willow thicket trapped and contained drifting snow that accumulated from the northwest where extensive open grasslands were found. This accumulation of snow within the willow-filled hollow offered an opportunity for the hunters to entrap and kill the bison. The forested knoll immediately to the south served as a convenient place for food processing and habitation with the nearby wetland hollows allocated as work localities and middens.

This scenario is consistent with Playford's (2001) proposal that the Jackson site represents a winter occupation based on the recoveries of bison foetal remains (perhaps dating between November and April). Hamilton and Nicholson (1999:20) further speculate that, "given the tight temporal overlap of calibrated radiocarbon dates the

Jackson bison kill and domestic habitation subareas may represent either a single event or perhaps closely spaced occupations." This possibility gains credibility with the independent observation by Playford (2003, personal communication) of a projectile point refit, one portion deriving from the kill and the other from the processing area.

Given that the proposed activity areas offered by Hamilton and Nicholson (1999) were based on preliminary interpretations of the recoveries from widely spaced shovel test pits, this thesis seeks to critically evaluate their assertions by examining the lithic recoveries from the excavation units using a functional and technological perspective. To this end, a literature review of archaeological sites found on the Northern Plains provided the means to develop a sense of the lithic material generally associated with different economic activities. After establishing some criteria for defining activity areas from the literature, these are used to offer an assessment of the observations offered by Hamilton and Nicholson (1999). The patterned distribution of the lithic assemblage was also compared to the interpretations offered by Playford (2001) based upon her analysis of the features and faunal processing activities. The results from this analysis indicate that the earlier identifications are valid, however, the midden/processing and habitation areas require additional clarification regarding the discrete activity clusters.

6.2 Analysable Attributes Indicative of Cultural Activities

Generalizations presented in chapter five focuses on the patterned distributions of the lithics associated with the groups of excavation units from each of the activity areas. The functional component of the stone tools and debitage analysis suggests activity-specific traits are evident in specific localities within the site. At issue is whether they are consistent with the previous interpretations offered by Hamilton and Nicholson (1999) and Playford (2001). Further exploration of these patterns in Chapter 6 focuses upon the spatial patterns apparent in the lithic recoveries as an evaluation of the proposed activity areas identified by Hamilton and Nicholson (1999).

The tool and debitage attributes addressed in chapter six include lithic raw material, completeness of form, and debitage size. The type and density of lithic raw materials found within each activity area varied across the site. Completeness of form was chosen as an analytical attribute because, according to Sullivan and Rozen (1985), the presence of large numbers of complete flakes associated with angular fragments is suggestive of general core reduction activities. Size measurements for debitage is included in this part of the analysis as a means to differentiate between purposeful disposal of lithic waste products as opposed to loss and discard of fine debitage within a knapping station. In addition to these attributes, the determination of the discrete lithic clusters within each of the activity areas included an assessment of the types of stone tools and debitage in these clusters. The evaluation of the function of these lithic clusters also involved addressing the activity specific artifacts that may be associated with faunal processing activities.

The stone tools were categorized into functional types such as projectile points which traditionally reflect hunting and killing activities. Bifacial fragments were also included as a tool category because it is likely that most of these portions originated from tools, possibly tips and bases from projectile points. Expedient stone tools, which included utilized flakes, were also subsumed within the tool category. The types of debitage were segregated into either manufacturing or tool maintenance activities. These categories included shatter, bifacial thinning flakes, decortication flakes suggestive of reduction activities, and rejuvenation flakes suggestive of either tool resharpening or modifying activities. Because each of the activity areas at the site contained large quantities and dense concentrations of unidentified debitage types, they were included in this part of the analysis.

Each of the debitage and tool categories was mutually exclusive. Unique traits determined the type of debitage. For example, shatter with cortex present on its surfaces was categorized as decortication debitage. To assess the level of consistency that may be present among the samples recovered from the excavation units, calculation of the standard deviation for each activity area was completed. This exercise proceeded after selection of the attributes and after the stone tool and debitage types were chosen for this part of the study. The results demonstrate that a considerable range exists between the samples and suggests that each activity area probably consists of discrete lithic clusters that reflect a host of different activities.

6.3 Lithic Raw Material Selection across the Jackson Site

The Jackson site occupants relied on a diverse assortment of lithic materials for manufacturing their stone tools. Knife River flint (KRF), Swan River chert (SRC), and brown chalcedony materials are evident in high numbers throughout the site. This pattern is consistent whether one is considering the debitage or the formal and informal tools. Most of the stone tools were manufactured from KRF (61.2%) and SRC (22.4%) while a smaller percentage were made of brown chalcedony (8.1%) and chert (8.1%) materials (Table 6.1).

Table 6.1 Frequency and percentage of lithic raw materials for tools and debitage from all activity areas.

	Tools		Debitage		Total	
	No	%	No	%	No	%
Material						
Agate	0	0	49	1.54	49	1.52
Moss Agate	0	0	14	0.44	14	0.43
Brown Chalcedony	4	8.2	1065	33.6	1069	33.2
White Chalcedony	0	0	23	0.72	23	0.71
Quartzite	0	0	48	1.51	48	1.49
Swan River chert	11	22	431	13.6	442	13.7
Silicified peat	0	0	3	0.09	3	0.09
Chert	4	8.2	91	2.87	95	2.95
Pebble Chert	0	0	2	0.06	2	0.06
Knife River flint	30	61	1426	44.9	1456	45.2
TRSS	0	0	13	0.41	13	0.4
Cathead Chert	0	0	1	0.03	1	0.03
Jasper	0	0	4	0.13	4	0.12
Igneous Material	0	0	3	0.09	3	0.09
Obsidian	0	0	1	0.03	1	0.03
Total	**49**	**100**	**3174**	**100**	**3223**	**100**

When considering the assemblage from the perspective of local versus exotic sources, the pattern becomes more complicated. This relates to the difficulty differentiating between chalcedony (a local raw material) and KRF (an exotic) using macroscopic criteria. If the specimens designated as chalcedony have been correctly identified, then local sources represent 66.6% of the total assemblage, while exotic materials represent the remaining 34.0% (Table 6.1). The preference for KRF is particularly strong with projectile points, triangular preforms, scrapers, and knives (Table 6.2). The moderate percentage of stone tools made of SRC also suggests that this material was deemed adequate for piercing and cutting tools. Notably, no SRC scraping tools were recovered. The lower number of tools made of various cherts (Table 6.2) may indicate that this material was only used when other more preferable raw materials were not as readily accessible to the site inhabitants. In addition, the small representation of brown chalcedony tools may actually be of KRF because these materials are difficult to differentiate using macroscopic properties. If brown chalcedony has been incorrectly identified, then the apparent importance of KRF among the tools is even stronger than noted above.

Table 6.2 Proportions of lithic material by tool type for all of the activity areas.

Material	Knife River flint		Swan River chert		Brown chalcedony		Chert		Total	
Tool Type	No	%	No	%	No	%	No	%	No	%
Prairie SN projectile point	2	6.7	1	8.3	0	0.0	1	33.3	4	8.2
Plains SN projectile point	8	26.7	4	33.3	2	50.0	0	0.0	14	28.6
Side scraper	3	10.0	0	0.0	1	25.0	0	0.0	4	8.2
End scraper	2	6.7	0	0.0	0	0.0	0	0.0	2	4.1
Triangular preform	4	13.3	1	8.3	0	0.0	0	0.0	5	10.2
Spokeshave	1	3.3	0	0.0	0	0.0	0	0.0	1	2.0
Knife	3	10.0	3	25.0	0	0.0	0	0.0	6	12.2
Drill	1	3.3	0	0.0	0	0.0	0	0.0	1	2.0
Perforator	1	3.3	0	0.0	0	0.0	0	0.0	1	2.0
Indeterminate projectile point	1	3.3	1	8.3	0	0.0	1	33.3	3	6.1
Bifacial fragment	4	13.3	2	16.7	1	25.0	1	33.3	8	16.3
Total	**30**	**100.0**	**12**	**100.0**	**4**	**100.0**	**3**	**100.0**	**49**	**100.0**

However, when the recovered debitage is considered, the pattern of raw material selection shifts subtly. Because of the difficulty differentiating between brown chalcedony and KRF, the former is considered separately in Table 6.1. Raw materials of clearly local derivation only represent about 20% of the debitage sample (Table 6.1), but exhibit a much broader range of raw material representation than noted with the tools (Table 6.2). Only three of ten local raw materials are noted in the tool category, but all ten local categories are represented in the debitage (Table 6.1). Again, the difficulty in differentiating between KRF and chalcedony is acknowledged.

Eleven raw materials are evident only in the debitage assemblage and of those materials, 65.6% are from local sources (agate, moss agate, white chalcedony, quartzite, silicified peat, jasper, and pebble chert) and 35.3% represent exotic materials (TRSS, Cathead chert, an igneous material, and obsidian) (Table 6.1). Given the importance of exotic raw materials (predominately KRF) among the tools, the high representation of exotic materials among the debitage is to be expected (Table 6.1). However, the slight under-representation of local materials among the debitage may reflect the need to replenish their tool supply because of hunting and intensive bison processing activities that ruined the tools made from the exotic materials.

Tools requiring frequent resharpening, (i.e. projectile points, biface fragments), dominate the assemblage and consist of KRF, with some recovery of SRC tools (particularly evident among the knives). Local raw materials, other than SRC and brown chalcedony, are not as prevalent in the tool categories, but are present in modest numbers among the debitage. Vickers focus people may have used these local materials to manufacture or refurbish tools that were used for less demanding tasks, and therefore, were less frequently broken and discarded in the site.

The frequency distribution of debitage raw materials varied in each of the activity areas. For example, a diverse assortment of lithic materials was densely concentrated in the proposed midden/processing area with a narrower range of materials being found in the proposed habitation and kill areas. These differences might have resulted from the specialized activities that accompanied tasks involving bison processing. There is considerable variation in the sample size for each site area. This makes it very difficult to interpret the variability as having significance. Therefore, what can be said for each of the activity areas concerning lithic raw materials relates to the presence or absence of materials for each area.

6.4 Lithic Material Distribution in the Proposed Habitation Area at the Jackson Site

Within the proposed habitation area, KRF, SRC, and brown chalcedony materials constitute 87.7% of the recovered sample (Table 6.3). Units 12 to 14 and units 15 to 17 contained significantly different proportions of lithic materials, as can be seen in Table 6.3. Only a Prairie Side-notched projectile point and a triangular preform, both made of KRF were found in the excavation block represented by units 15 to 17. In addition to these materials, agate, moss agate, quartzite, white chalcedony, silicified peat, chert, jasper, and TRSS materials are present in lower frequency (Table 6.3).

Table 6.3 Distribution of lithic materials evident among the debitage in units 12 to 17.

Excavation Unit	12		13		14		15		16		17		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Material														
Agate	1	6.3	6	8.2	0	0.0	2	1.6	4	3.7	0	0.0	**13**	**3.6**
Moss Agate	0	0.0	0	0.0	0	0.0	0	0.0	1	0.9	0	0.0	**1**	**0.3**
Brown Chalcedony	3	18.8	23	31.5	4	16.7	52	40.6	39	36.1	7	58.3	**128**	**35.5**
White Chalcedony	0	0.0	0	0.0	0	0.0	0	0.0	1	0.9	0	0.0	**1**	**0.3**
Quartzite	0	0.0	0	0.0	1	4.2	1	0.8	4	3.7	0	0.0	**6**	**1.7**
Swan River chert	1	6.3	4	5.5	1	4.2	32	25.0	23	21.3	0	0.0	**61**	**16.9**
Silicified peat	0	0.0	0	0.0	0	0.0	1	0.8	0	0.0	0	0.0	**1**	**0.3**
Chert	3	18.8	0	0.0	0	0.0	5	3.9	5	4.6	1	8.3	**14**	**3.9**
Knife River flint	8	50.0	37	50.7	18	75.0	33	25.8	30	27.8	2	16.7	**128**	**35.5**
TRSS	0	0.0	3	4.1	0	0.0	2	1.6	1	0.9	1	8.3	**7**	**1.9**
Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	8.3	**1**	**0.3**
Total	**16**	**100**	**73**	**100**	**24**	**100**	**128**	**100**	**108**	**100**	**12**	**100**	**361**	**100**

Units 30 and 34 are significantly removed from the cluster of units noted in the centre of the habitation area. These units were selected for excavation since nearby shovel test pits yielded concentrations of lithics consistent with tool production. High proportions of KRF, SRC, and brown chalcedony materials are evident in these units although unit 30 differs somewhat from this pattern. Unlike the other units in the proposed habitation area, SRC (58.8%) dominate the assemblage, with KRF (21.2%) and brown chalcedony (9.8%) materials being recovered in lower numbers (Table 6.4). This suggests that SRC was the common material modified by the flintknapper in this area. The presence of quartzite (6.4%), white chalcedony (2.0%), chert (1.1%), moss agate (0.23%) and silicified peat (0.23%) materials indicate that other tools or cores were modified in unit 30 (Table 6.4). None of the tools recovered from this area were made of these materials, which is consistent with the absence of tools made of these local materials throughout the site. This strongly suggests that such tools were less frequently damaged and discarded, and therefore, were curated out of the site. In addition, archaeologists might not have found tools made of these materials because of the small sample size and the wide distribution of the excavation units.

Table 6.4 Distribution of lithic materials evident among the debitage in units 30 and 34.

Excavation Unit	30		34		Total	
	No	%	No	%	No	%
Material						
Agate	0	0.0	6	5.6	**6**	**1.1**
Moss Agate	1	0.2	12	11.1	**13**	**2.4**
Brown Chalcedony	43	9.8	25	23.1	**68**	**12.5**
White Chalcedony	8	1.8	2	1.9	**10**	**1.8**
Quartzite	28	6.4	0	0.0	**28**	**5.1**
Swan River chert	257	58.8	18	16.7	**275**	**50.5**
Silicified peat	1	0.2	0	0.0	**1**	**0.2**
Chert	5	1.1	1	0.9	**6**	**1.1**
Knife River flint	93	21.3	42	38.9	**135**	**24.8**
Jasper	0	0.0	1	0.9	**1**	**0.2**
Obsidian	1	0.2	0	0.0	**1**	**0.2**
Igneous Material	0	0.0	1	0.9	**1**	**0.2**
Total	**437**	**100**	**108**	**100**	**545**	**100**

Unit 34 consisted of the widest range of lithic materials compared to the other units in the proposed habitation area. Again, this indicates that a wider range of tools were manufactured or resharpened in this area than are suggested by the tool assemblage. Knife River flint dominates the assemblage, although high proportions of brown chalcedony, SRC and moss agate are also evident in unit 34. Moss agate is represented by 12 flakes, many of which are larger than the average debitage size noted in the assemblage. Moss agate was not found in even this modest quantity in the rest of the site, suggesting that a tool made of this material was modified or used in this area. No tools were found in this unit; therefore, it is not possible to indicate what the flintknapper modified in this area. Despite the presence of moss agate, tool production and rejuvenation was heavily focused on KRF, brown chalcedony, and SRC materials, with only minimal representation of other materials (Table 6.4).

A variety of lithic materials are found in the proposed habitation area at the site. Local materials dominate the debitage assemblage although exotic materials are evident among the stone tools. Knife River flint and brown chalcedony materials are the common materials in this part of the site. This suggests that most of the tools used or manufactured in this area were curated from the site or were not found.

6.5 Lithic Material Distribution in the Proposed Midden/Processing Area at the Jackson Site

The proposed midden/processing area at the Jackson site consisted of a diverse range of lithic materials (Table 6.5). Units 18 to 21 and 35, located in the northern portion of the proposed midden/processing area, consist of varying quantities of KRF, brown chalcedony, SRC, agate, chert, and TRSS materials (Table 6.5). Knife River flint (54.2%) and brown chalcedony (34.3%) materials dominate the debitage that also consist of chert (3.8%), SRC (2.1%), agate (1.9%), TRSS (1.3%) materials (Table 6.5). Based on the distribution of TRSS materials in this group of units, it seems apparent that a tool or possibly a core was modified in units 18, 19, and 20 because only these units yielded that material. Scattered throughout this group of units in barely discernable quantities is quartzite (1.0%), pebble chert (0.2%), cathead chert (0.2%) and an igneous material (0.5%), which suggests that some tool modification of these materials occurred, but were not the primary focus of the flintknappers (Table 6.5). In units 20 and 21, the stone tools consisted exclusively of KRF.

Table 6.5 Distribution of lithic materials evident among the debitage in units 18 to 21 and 35.

Excavation Unit	18		19		20		21		35		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Material												
Agate	1	1.1	1	1.5	3	3.3	0	0.0	2	1.8	7	1.9
Brown Chalcedony	50	54.9	23	34.8	21	23.1	2	20.0	30	27.5	126	34.3
Quartzite	0	0.0	2	3.0	0	0.0	0	0.0	2	1.8	4	1.1
Swan River chert	0	0.0	1	1.5	3	3.3	0	0.0	4	3.7	8	2.2
Chert	3	3.3	3	4.5	7	7.7	0	0.0	1	0.9	14	3.8
Pebble Chert	0	0.0	0	0.0	1	1.1	0	0.0	0	0.0	1	0.3
Knife River flint	35	38.5	34	51.5	55	60.4	7	70.0	68	62.4	199	54.2
TRSS	2	2.2	2	3.0	1	1.1	0	0.0	0	0.0	5	1.4
Cathead Chert	0	0.0	0	0.0	0	0.0	1	10.0	0	0.0	1	0.3
Igneous Material	0	0.0	0	0.0	0	0.0	0	0.0	2	1.8	2	0.5
Total	**91**	**100**	**66**	**100**	**91**	**100**	**10**	**100**	**109**	**100**	**367**	**100**

The densest concentration of lithic materials was located in units 22 to 25, 32, and 33 in the south-central portion of the proposed midden/processing area of the Jackson site that reflects a broader range of activities.

The range of lithic raw materials found in units 18 to 21, and 35 are also evident in units 22 to 25, 32, and 33 (Table 6.6). Knife River flint (53.4%) and brown chalcedony (37.2%) are the common materials in this area (Table 6.6). In addition, SRC (4.4%), chert (2.9%), and agate (1.2%) materials were distributed in each of the units (Table 6.6). Interestingly, there was an increased quantity of SRC and agate materials and lower amounts of chert found in the southern part of the activity area in contrast to the yield from the northern portion (Table 6.6). Brown chalcedony and KRF materials are densely concentrated in units 22, 32, and 33 (Table 6.6), but brown chalcedony seems more prevalent in units 22 (56.0%) and 23 (47.7%) while KRF materials are common in units 32 (65.9) and 33 (76.0%). This difference, however, might reflect identification error caused by the similarity between brown chalcedony and KRF materials. A tool or core of white chalcedony was possibly modified in this area given the presence of this material among the debitage. This material is not evident in units 18 to 21 and 35. Scattered throughout units 22 to 25, 32, and 33 (Table 6.6) are quartzite (0.44%), silicified peat (0.24%), and in discernable proportions, pebble chert (0.05%) and jasper (0.05%).

Table 6.6 Distribution of lithic materials evident among the debitage in units 22 to 25, 32 and 33.

Excavation Unit	**22**		**23**		**24**		**25**		**32**		**33**		**Total**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Material														
Agate	4	0.7	7	2.2	3	1.9	0	0.0	7	2.7	2	0.5	**23**	**1.3**
Brown Chalcedony	306	56.0	153	47.7	80	50.3	55	59.8	30	11.8	42	9.9	**666**	**37.0**
White Chalcedony	6	1.1	1	0.3	1	0.6	0	0.0	2	0.8	0	0.0	**10**	**0.6**
Quartzite	1	0.2	0	0.0	0	0.0	4	4.3	2	0.8	2	0.5	**9**	**0.5**
Swan River chert	8	1.5	8	2.5	1	0.6	3	3.3	22	8.6	37	8.7	**79**	**4.4**
Silicified peat	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.2	**1**	**0.1**
Chert	10	1.8	1	0.3	1	0.6	0	0.0	24	9.4	17	4.0	**53**	**2.9**
Pebble Chert	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	**1**	**0.1**
Knife River flint	211	38.6	151	47.0	72	45.3	30	32.6	168	65.9	323	76.0	**955**	**53.1**
Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.2	**1**	**0.1**
Total	**546**	**100**	**321**	**100**	**159**	**100**	**92**	**100**	**255**	**100**	**425**	**100**	**1798**	**100**

In units 22 to 25, brown chalcedony or KRF materials are evident among the stone tools.

Located in the southern part of the proposed midden/processing area, unit 31 (Table 6.7) yielded significantly smaller quantities of lithic raw materials compared to the other excavation units in the area. It consists mostly of brown chalcedony materials (96.0%) although TRSS (2.0%) and jasper (2.0%) were also found (Table 6.7). No tools were found in this unit, further suggesting that activities involving stone tool production, rejuvenation, and use did not occur in the vicinity. Alternatively, the tools may have been deposited in the area surrounding the excavation unit.

Table 6.7 Distribution of lithic materials evident among the debitage in unit 31.

Excavation Unit	**31**	
	No	**%**
Material		
Brown Chalcedony	48	96.0
TRSS	1	2.0
Jasper	1	2.0
Total	**50**	**100.0**

In summary, brown chalcedony, SRC, and KRF are strongly evident among the debitage throughout most of the proposed midden/processing area. In addition, agate and chert materials were used in these units. Knife River flint and brown chalcedony materials were used to manufacture the stone tools found in this activity area. Similar to the proposed habitation area, local materials dominate the debitage assemblage but exotic materials dominate the stone tool assemblage.

6.6 Lithic Material Distribution in the Proposed Kill Area at the Jackson Site

The sample is considerably smaller in the proposed kill area, thus fewer lithic materials is evident in this area of the site (Table 6.8). While lithic materials are very sparsely recovered throughout the area, unit 36, located in the centre of the kill zone, yielded significantly more lithics (Table 6.8). All of the debitage material from unit 26 is brown chalcedony. Knife River flint and brown chalcedony tools are also present in this unit. In unit 27, the debitage consists of brown chalcedony and silicified peat (Table 6.8). Despite the low recoveries of debitage, this unit contains a high number of stone tools of KRF (n=6) and chert (n-4) materials (see section 5.4.2). However, unit 28

(Table 6.8) has brown chalcedony and chert debitage, but tools made of KRF. Compared to the other units in this area, the quantity and number of lithic materials significantly increases in unit 36. Brown chalcedony still predominates, but high proportions of SRC and chert are evident in the unit (Table 6.8). Significantly, smaller quantities of quartzite and white chalcedony materials are present (Table 6.8). A range of raw materials is evident in the stone tools from unit 36, which consists of KRF, brown chalcedony, and chert. Consistent with the other activity areas at the Jackson site, some of the lithic materials represented among the debitage are not evident for the tools. White chalcedony, quartzite, and silicified peat were found in the debitage, but none of the tools in this area was made of these raw materials. The significant change in the quantity and variety of lithic materials in the central portion of area suggests that people may have been predominately butchering bison here. They probably used tools made with a variety of lithic materials that periodically required some edge modification.

Table 6.8 Distribution of lithic materials evident among the debitage in units 26 to 28 and 36.

Excavation Unit	**26**		**27**		**28**		**36**		**Total**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Material										
Brown Chalcedony	5	100	3	60	2	66.7	17	60.7	**27**	**65.9**
White Chalcedony	0	0	0	0	0	0.0	1	3.6	**1**	**2.4**
Quartzite	0	0	0	0	0	0.0	1	3.6	**1**	**2.4**
Swan River chert	0	0	2	40	0	0.0	6	21.4	**8**	**19.5**
Chert	0	0	0	0	1	33.3	3	10.7	**4**	**9.8**
Total	**5**	**100**	**5**	**100**	**3**	**100**	**28**	**100**	**41**	**100**

6.7 Lithic Materials Used by Vickers Focus People

As noted in the previous discussion, exotic raw materials, specifically KRF dominate the tool assemblage and represent a significant portion of the debitage (Table 6.2). This generalization is complicated by the difficulty in distinguishing between KRF and brown chalcedony (a local resource) using solely macroscopic methods. The heavy representation of KRF clearly indicates either strong exchange connections to the Middle Missouri quarry areas, or alternatively regular travel into that region. As earlier observed by Nicholson and Hamilton (1998), the proposed winter season of occupation of the site would have made it difficult to replenish the supply of stone raw material with which to manufacture new stone tools. Consistent with this earlier interpretation, the present study draws attention to the minimal number of cores recovered from the site, and the exhausted nature of those items (see section 5.3.10). Furthermore, the under-representation of large decortication flakes and the large number of small bifacial thinning flakes is consistent with the interpretation of intensive rejuvenation of stone tools. Travelling to the KRF quarries in North Dakota would have been difficult during the winter. Perhaps during the winter when preferred lithic materials are scarce, Vickers focus people made limited use of local raw materials for their stone tools. However, these local supplies would have been difficult to access because of the frozen winter conditions. Small caches of local cobbles and pebbles may have been maintained particularly when the preferred raw materials were not available. While these local materials are not strongly represented in the lithic assemblage, it is notable that they are virtually not evident in the formal tool assemblage, but are reflected in the debitage. This strongly indicates that such local materials were modified at the site.

As stated earlier in chapter three, different Northern Plains cultural groups utilized a variety of local and exotic materials for their stone tools. Vickers focus people might have fostered non-local relationships that facilitated the exchange of lithic raw materials such as KRF or stone tools with Middle Missouri groups in North Dakota. This material was also extensively used by Mortlach groups as Walde (1994) demonstrated in his study. Nicholson and Hamilton (1999:21) have commented that possible social relationship existed between Vickers focus and Mortlach based upon the recovery of Mortlach pottery, the temporal overlap of Vickers and Mortlach occupations, and the physical proximity of the sites in the *Makotchi-Ded Dontipi* locale.

As mentioned in chapter four, Nicholson (1991, 1994) and in articles co-authored with Hamilton (1999, 2001) demonstrate that differences in lithic raw material use are evident between Vickers focus groups in the Tiger Hills region and in the *Makotchi-Ded Dontipi* locale. In the Tiger Hills, particularly at the Lovstrom and Lowton sites, an abundance of KRF, TRSS, grey soapstone and catlinite materials are represented among the debitage and finished stone tools (Nicholson 1991:169; Nicholson 1994:110). There are also small quantities of obsidian evident in the assemblages. According to Nicholson (1991:171), catlinite and TRSS materials indicated trade or travel connections southeast of Manitoba while KRF materials suggested relationships toward the southwest. In the *Makotchi-Ded Dontipi* locale, none of the archaeological sites contained catlinite materials, leading Nicholson and Hamilton (1999:15) to suggest a reorientation of exchange networks had occurred. In addition, similar to sites in the Tiger Hills region, small quantities of obsidian materials were present in sites in the *Makotchi-Ded Dontipi* locale, further suggesting western exchange connections. However, the slightly younger *Makotchi-Ded Dontipi* sites contain TRSS materials, suggesting some persistence of trade connections southeast of Manitoba. The results from the present lithic analysis demonstrate that Vickers focus people residing at the Jackson site relied heavily on exotic materials for their stone tools, but made some limited use of local lithic materials, particularly SRC.

6.8 Habitation Areas

Despite the fact that habitation sites were probably the most common activity areas created by people, they have been the least studied by researchers. Dyck (1983:7-8) stated that archaeologists have directed a significant amount of their research on single function sites such as kill sites and have neglected to investigate habitation sites such as tipi camps or campsites. It is difficult to extrapolate what kind of cultural assemblage might represent a campsite. Habitation areas are "places where people spend the bulk of their time and undertake the widest variety of their daily activities" (Dyck 1983:7). Features and artifacts within these areas are generally widely scattered, and given the range of activities conducted, the artifacts do not suggest clear-cut patterns.

Dyck (1983) noted that the types of structures present, the size of the occupation area, and the density of the cultural materials varied within a habitation area. Dwellings or shelters were sometimes present and usually there were patterned artifact scatters surrounding these structures. Occasionally, archaeologists have identified dwelling floors based on roughly circular scatters of cultural debris often consisting of concentrations of ash, bones, debitage, fire-cracked rocks, and stone tools. Cultural materials are often thinly scattered over a wide area, thus, making it difficult for an archaeologist to determine the size of a habitation area. The size of the area also relates to the number of occupants and whether people repeatedly used the locality. The density of cultural materials is associated with the length of the occupation and factors of preservation. Typically, short occupations leave only a few scattered items while extended occupations have denser living floors. Dyck (1983:7) also noted that several occupations often overlap within habitation areas, thus, it is difficult to separate the different activity sets and assemblages found at these multi-stratified areas.

According to Hamilton and Nicholson (1999:20), the habitation area at the Jackson site might represent a single event or perhaps closely spaced occupations. This site does not contain stratified deposits and dense concentrations of macro-debitage suggestive of primary refuse. This suggests that the activity specific assemblages associated with the proposed habitation area at the Jackson site may have been formed within a relatively short time. Thus, the cultural materials at the Jackson site will be treated as a single occupation.

Given that the habitation area proposed by Hamilton and Nicholson (1999) includes a very large surface area, with only a small sample excavated, assessing their proposal is difficult. To compensate for these factors, examination of the patterned distribution of lithics in this area aids in addressing the diverse activities carried out in this area. To aid in this interpretation, the Harder site (Dyck 1977) and the Sjovold site (Dyck and Morlan 1995) are used to offer some interpretative framework of what should be expected from habitation assemblages deriving from the Northern Plains. The Sjovold site in Saskatchewan is ideal for offering an interpretative context to the Jackson site because it consisted of a similar faunal assemblage and features. In addition, levels II and III of the Sjovold site correspond approximately to the same age as the Jackson site. Although not similar in age, the Harder site was included in this analysis because it contained similar features to those found at the Jackson site, lacked the remains of a habitation structure, and was interpreted to be a campsite occupation.

According to Dyck (1983:7), there is no single diagnostic artifact assemblage associated with habitation areas, but rather there is generally a lack of complete and identifiable tools present. During his analysis of the Harder site in Saskatchewan, Dyck (1977) noticed that all of the stone tools were either worn out or else broken as a result of manufacture and use, which he noted was expected in a habitation site. He further notes that since habitation areas were centres of a diverse range of daily activities, one should expect the tool assemblage to reflect a variety of functions.

At the Sjovold site, in the kitchen (level II) and the campsite (level III) layers, surface hearths, discard piles, fireside lithic workstations, and anvil stones were present (Dyck and Morlan 1995). Associated with these features were large, dense concentrations of debitage, pottery sherds, and bone fragments. There was a lack of stone tools associated with the kitchen layer, however, the campsite level yielded numerous tools such as stone axes, chithos, end scrapers, chipped hammers, and projectile point tips. Dyck and Morlan (1995:222) surmised that level III was "indicative of hunter-gatherer campsite activities such as heating and cooking with wood fires, bone breaking and consumption of parts of at least five bison, hide preparation (scraping, graining and presumably tanning), a fair amount of stone tool manufacture, and other manufacturing activities including perforation, cutting and sewing of soft materials." This type of scenario was similar to the interpretations offered by Playford (2001) regarding the Jackson site faunal assemblage.

At the Sjovold site, surface hearths, rock clusters, disposal areas, and lithic scatters were present (Dyck and Morlan 1995:203-207). Debitage consisted of flakes, shatter, amorphous and spall cores. Anvil stones and modified unretouched flakes were part of the site assemblage. Some of the debitage exhibited thermal alteration. Knife River flint, miscellaneous chert, SRC, Gronlid siltstone, and quartz materials were common among the debitage and cores. Stone tools found at the site included chipping hammers, end scrapers, marginally utilized or retouched lithic (MURL), small side-notched projectile points, chipped and notched axes, and a chitho.

According to Dyck (1977), activities suggestive of a campsite occupation were evident at the Harder site. He also noted that "the multiple use of each activity area would seem a more likely possibility in a camp than in a kill-butchering or specialized processing area" (Dyck 1977:197-198). The activities probably occurred in the boundaries of a dwelling that would possibly explain how a variety of activities became intermingled and concentrated within an area. Some of the features found at the Harder site include boiling pits, discard piles, hearths, and disposal areas. Discarded in the activity areas at the Harder site were worn, broken projectile points and end scrapers.

Some of the projectile points were unfinished indicating that extensive repairs might have occurred at the site (Dyck 1977:197). Dyck (1977:198) also noted that camp areas were devoid of bifaces, large bifacial thinning flakes, and utilized flakes. In addition, the predominance of bones rich in marrow at the Harder site indicated that the site inhabitants might have removed these carcass portions from the kill area and transported them to the campsite for processing and consumption.

6.9 Habitation Area at the Jackson Site

The criteria used to assess the lithic assemblage from the proposed habitation area at the Jackson site includes the types of stone tools as well as the density and patterned distribution of the debitage. At the Sjovold (Dyck and Morlan 1995) and Harder (Dyck 1977) sites, researchers identified broken and heavily worn tools among debitage thinly scattered across the domestic area. This pattern was used to assess the proposed habitation area of the Jackson site. This area should also have a range of lithic tool types and debitage because of the diverse nature of the activities described by Playford (2001). She proposed that marrow extraction activities involving bison remains were prevalent throughout the habitation area. In addition, bifacial and core reduction activities are evident in the assemblage and the by-products may have been discarded into refuse areas such as the case identified at the Sjovold and Harder sites. Hearths, discard piles, and workstations were common at the Sjovold (Dyck and Morlan 1995) and Harder (Dyck 1977) sites. However, because of the small and widely scattered excavation sample from the Jackson site, identification of discrete features is not likely.

The proposed habitation area is located on a localized knoll surrounded by former wetlands within the central portion of the Jackson site. According to Hamilton and Nicholson (1999:18), the site inhabitants may have used this area for domestic habitation activities and the willow bog adjacent to this area may have served as a midden area. This part of the site would have been an ideal location for domestic activities because its position upon a knoll provided drier well-drained ground. More importantly, Hamilton and Nicholson's (1999) model of the surface hydrology and vegetation cover proposed that forest groves surrounding the localized wetland margins would have coalesced in the area of the knoll, providing some protection from the harsh, cold wind common in the winter. These localized wetlands/forests would have also provided water and firewood for the site inhabitants. Hamilton and Nicholson (1999) estimated from shovel test recoveries that this was the largest activity area. The initial identification of the habitation area was based upon the recovery of a diverse mixture of artifacts that included stone tools and pottery. Although Dyck (1983) stated that there was no typical lithic assemblage associated with habitation areas, the author believes that certain artifacts and activities are generally evident in domestic areas.

The proposed habitation area produced 906 debitage fragments, five expedient tools, and seven formed tools. It is difficult to infer the range of activities that may have occurred in this area because of the widely dispersed excavation areas and the small samples recovered. That being said, activities evident in this area include possibly tool manufacture, tool re-sharpening, and possibly general core reduction and discard (Figure 6.1). These activities are widely scattered across the extensive habitation area, perhaps suggesting some elements of the range of activities carried out in several different households. For instance, 30 metres separate the two lithic processing workstations located on opposite sides of the area in excavation units 30 and 34.

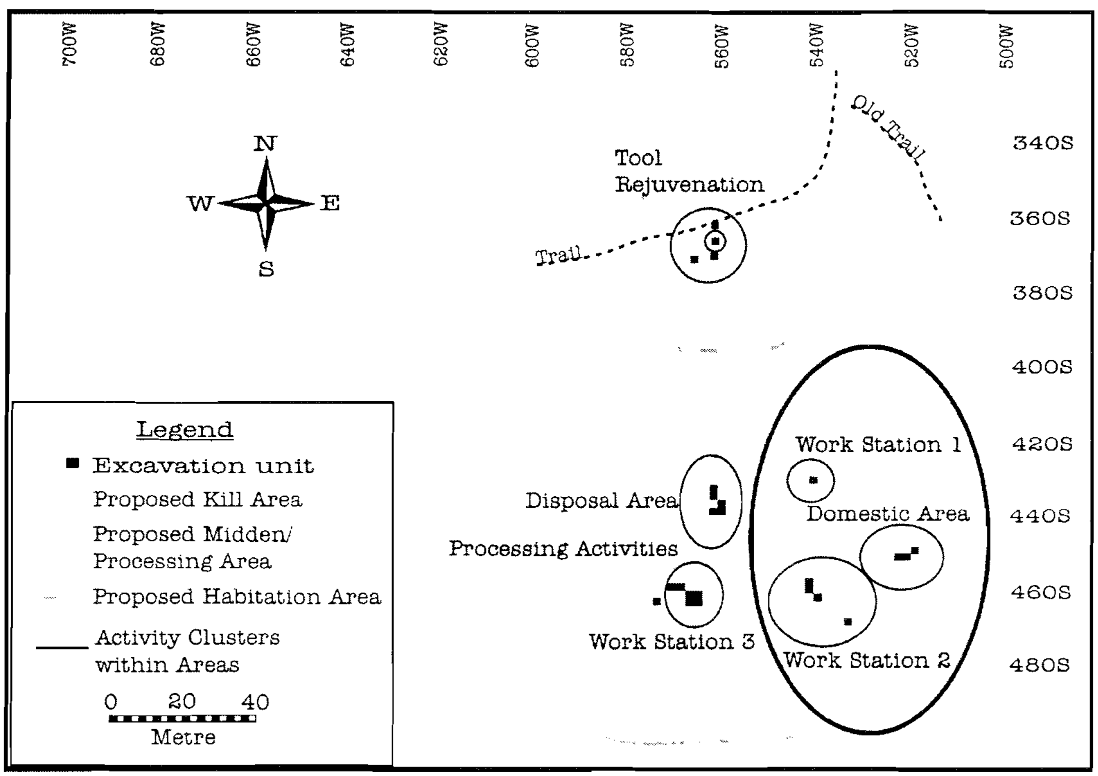

Figure 6.1 Lithic clusters evident in each of the activity areas at the Jackson site.

The central portion of the proposed habitation area yields a high density of debitage and a wide range of tool forms, although debitage is generally sparse in units 12 to 14 (Figure 6.2). Units 12 and 14 yielded only a scattering of debitage (Figure 6.2). Waste flakes and shatter consisting of brown chalcedony and miscellaneous cherts including SRC are generally scattered among these units (see Appendix 3). There were no tools recovered. It is difficult to confirm the function of these units given the small sample size, but general core reduction activities seem evident. A large majority of this assemblage consists of KRF waste flakes and shatter, although a small amount of KRF bifacial thinning flakes are also present.

Unit 13 has an interesting assortment of lithics (Table 6.9). The debitage recovered from this unit is indicative of general core reduction activities, with complete (17.8%) and angular fragments (17.8%) dominating the assemblage. The low proportion (2.7%) of bifacial thinning flakes and absence of decortication and rejuvenation flakes further suggests secondary core reduction activities. In support of this, low frequencies of platform faceting and lipping are present on the complete and proximal flakes. Higher occurrences of these types of attributes are generally associated with bifacial reduction activities. Most of the debitage measures between 0.1 and 10.0 mm (95.8%) with most of the debitage being less than 5.0 mm. The dominance of small debitage size categories suggests systematic removal of the larger useable flakes (if core reduction was being carried out), or alternatively, the small flakes may represent tool rejuvenation activities.

An interesting difference between units 12 to 14 is the distribution of thermally altered debitage. Playford (2001:35) determined that 20% of the faunal sample from this block exhibited evidence of burning. For this group of units, evidence of thermal alteration is evident on 37.2% of the debitage. Unit 13 alone has 23.8% of the total debitage from this block shows evidence of thermal alteration. Excavation notes for unit 13 indicate that a feature, perhaps a hearth might be nearby based upon the presence of sticky, viscous, dark soil. Playford (2001:68) proposed that this feature possibly resulted from waste disposal of faunal elements after marrow extraction activities. This further supports the premise that a hearth might have been present in this portion of the proposed habitation area.

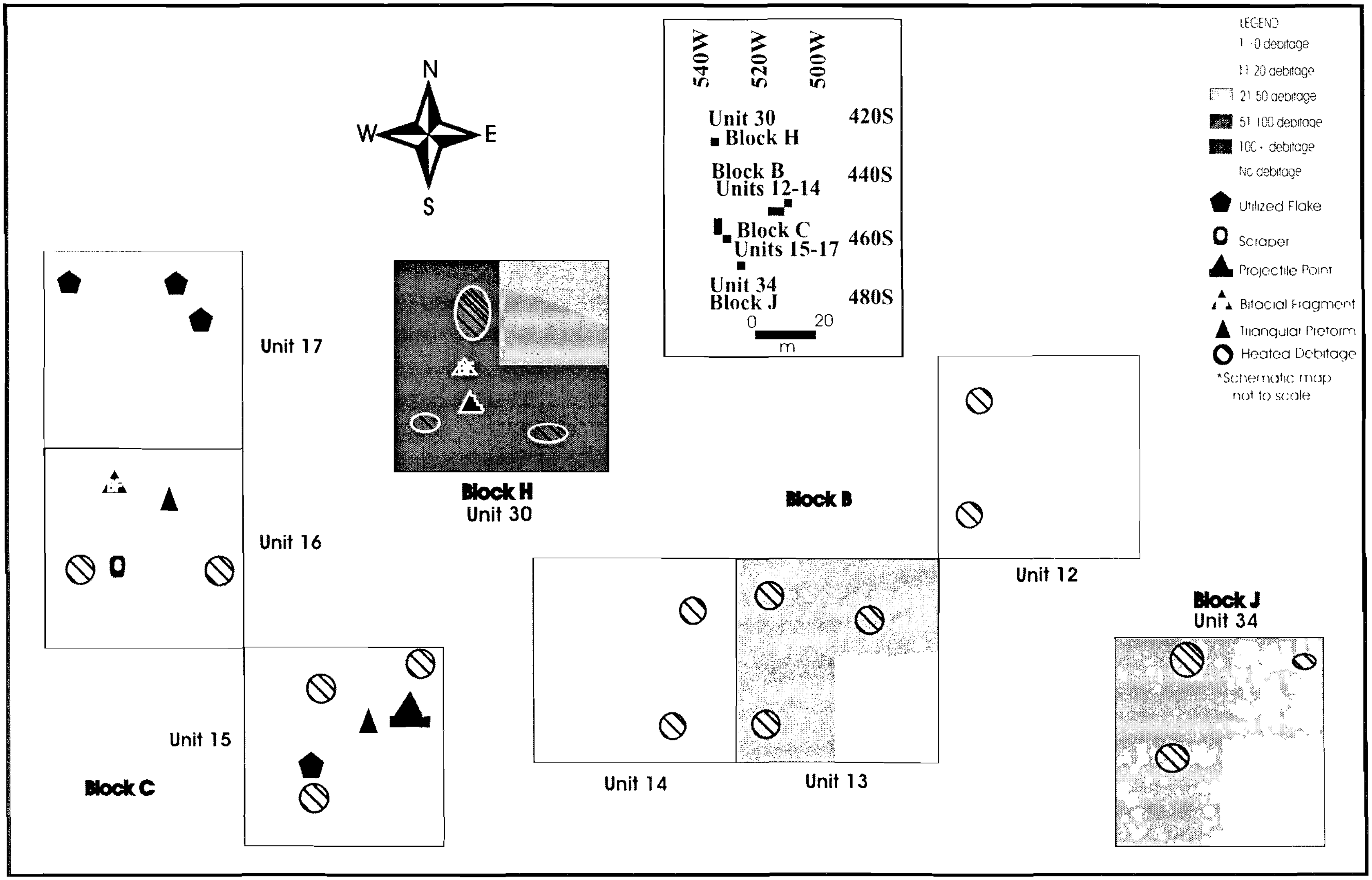

Figure 6.2 Spatial distribution of debitage and stone tools in the proposed habitation area.

Table 6.9 Analysable debitage and stone tools from the proposed habitation area.

Excavation Unit	12		13		14		15		16
Total debitage per unit	T=16		T=73		T=24		T=128		T=108
.	No	%	No	%	No	%	No	%	No
Form									
Complete	6	37.5	13	17.8	6	25.0	33	25.8	32
Proximal	0	0.0	3	4.1	1	4.2	7	5.5	7
Medial	0	0.0	2	2.7	1	4.2	7	5.5	17
Distal	2	12.5	9	12.3	1	4.2	23	18.0	12
Angular	1	6.3	13	17.8	3	12.5	20	15.6	15
N/A Non-Analysable Debitage	7	43.8	33	45.2	12	50.0	38	29.7	25
Total	**16**	**100.0**	**73**	**100.0**	**24**	**100.0**	**128**	**100.0**	**108**
Type									
Shatter	1	6.3	10	13.7	3	12.5	17	13.3	14
Decortication	0	0.0	0	0.0	0	0.0	6	4.7	2
Bifacial Thinning Flake	3	18.8	2	2.7	3	12.5	20	15.6	18
Rejuvenation Flake	1	6.3	0	0.0	0	0.0	11	8.6	23
Waste Flake	7	43.8	34	46.6	12	50.0	54	42.2	35
Heated Flake	4	25.0	27	37.0	5	20.8	12	9.4	3
N/A Non-Analysable Debitage	0	0.0	73	100.0	1	4.2	8	6.3	13
Total	**16**	**100.0**	**73**	**100.0**	**24**	**100.0**	**128**	**100.0**	**108**
Platform Facetting	2	12.5	8	11.0	0	0.0	11	8.6	13
Platform Lipping	3	18.8	3	4.1	0	0.0	17	13.3	15
N/A Non-Analysable Debitage	11	68.8	62	84.9	24	100.0	100	78.1	80
Total	**16**	**100.0**	**73**	**100.0**	**24**	**100.0**	**128**	**100.0**	**108**
Size									
0.1-5 mm	4	25.0	45	61.6	9	37.5	44	34.4	45
5.01 -10 mm	9	56.3	25	34.2	11	45.8	67	52.3	46
10.01 to 15 mm	3	18.8	0	0.0	2	8.3	7	5.5	7
15.01 to 20 mm	0	0.0	3	4.1	2	8.3	7	5.5	7
20.01 + mm	0	0.0	0	0.0	0	0.0	3	2.3	3
N/A Non-Analysable Debitage	0	0.0	0	0.0	0	0.0	0	0.0	108
Total	**16**	**100.0**	**73**	**100.0**	**24**	**100.0**	**128**	**100.0**	**108**
Tools									
Prairie	0		0		0		1		0
Plains	0		0		0		0		0
Side scraper	0		0		0		0		1
End scraper	0		0		0		0		0
Triangular Preforms	0		0		0		1		1
Spokeshave	0		0		0		0		0
Knife	0		0		0		0		0
Drill	0		0		0		0		0
Perforator	0		0		0		0		0
Indeterminate Projectile points	0		0		0		0		0
Bifacial Fragments	0		0		0		0		1
Utilized Flakes	0		0		0		1		0
Total	**0**		**0**		**0**		**3**		**3**

Table 6.9 Continues (**Mean is 113.25 Standard Deviation is 138.85).

Excavation Unit	17		30		34		Total	
Total debitage per unit	T=12		T=437		T=108		T=906	
	No	%	No	%	No	%	No	%
Form								
Complete	4	33.3	102	23.3	27	25.0	**223**	**24.6**
Proximal	1	8.3	21	4.8	3	2.8	**43**	**4.7**
Medial	1	8.3	46	10.5	2	1.9	**76**	**8.4**
Distal	0	0.0	38	8.7	2	1.9	**87**	**9.6**
Angular	2	16.7	84	19.2	11	10.2	**149**	**16.4**
N/A Non-Analysable Debitage	4	33.3	146	33.4	63	58.3	**328**	**36.2**
Total	**12**	**100.0**	**437**	**100.0**	**108**	**100.0**	**906**	**100.0**
Type								
Shatter	1	8.3	70	16.0	6	5.6	**122**	**13.5**
Decortication	0	0.0	23	5.3	6	5.6	**37**	**4.1**
Bifacial Thinning Flake	3	25.0	74	16.9	22	20.4	**145**	**16.0**
Rejuvenation Flake	4	33.3	0	0.0	0	0.0	**39**	**4.3**
Waste Flake	4	33.3	243	55.6	59	54.6	**448**	**49.4**
Heated Flake	0	0.0	26	5.9	8	7.4	**85**	**9.4**
N/A Non-Analysable Debitage	12	100.0	1	0.2	7	6.5	**115**	**12.7**
Total	**12**	**200.0**	**437**	**100.0**	**108**	**100.0**	**906**	**100.0**
Platform Facetting	0	0.0	17	3.9	5	4.6	**56**	**6.2**
Platform Lipping	3	25.0	80	18.3	22	20.4	**143**	**15.8**
N/A Non-Analysable Debitage	9	75.0	340	77.8	81	75.0	**707**	**78.0**
Total	**12**	**100.0**	**437**	**100.0**	**108**	**100.0**	**906**	**100.0**
Size								
0.1-5 mm	6	50.0	190	43.5	61	56.5	**404**	**44.6**
5.01 -10 mm	1	8.3	183	41.9	36	33.3	**378**	**41.7**
10.01 to 15 mm	0	0.0	47	10.8	8	7.4	**74**	**8.2**
15.01 to 20 mm	0	0.0	12	2.7	2	1.9	**33**	**3.6**
20.01 + mm	0	0.0	5	1.1	1	0.9	**12**	**1.3**
N/A Non-Analysable Debitage	5	41.7	0	0.0	0	0.0	**113**	**12.5**
Total	**12**	**100.0**	**437**	**100.0**	**108**	**100.0**	**906**	**100.0**
Tools								
Prairie	0		0		0		**1**	**7.7**
Plains	0		0		0		**0**	**0.0**
Side scraper	0		0		0		**1**	**7.7**
End scraper	0		0		0		**0**	**0.0**
Triangular Preforms	0		0		0		**2**	**15.4**
Spokeshave	0		0		0		**0**	**0.0**
Knife	0		1		0		**1**	**7.7**
Drill	0		0		0		**0**	**0.0**
Perforator	0		0		0		**0**	**0.0**
Indeterminate Projectile points	0		0		0		**0**	**0.0**
Bifacial Fragments	0		1		0		**2**	**15.4**
Utilized Flakes	1		4		0		**6**	**46.2**
Total	**1**		**6**		**0**		13	100.0

Units 15 to 17 revealed a higher density of debitage and tools in contrast to the sample deriving from units 12 to 14 located five metres away (Figure 6.1). This difference may be a result of the closer proximity of units 15 to 17 to the lithic workstation represented in units 22 to 25, 32, and 33. Those excavation units produced a significant increase in the density of debitage and a wider variety of tool types reflective of a broader range of activities (Figure 6.2). In units 15 to 17, a KRF Prairie Side-notched projectile point, two triangular performs made of KRF and SRC, KRF knife, and a brown chalcedony side scraper are present. Two fragments from bifaces made from KRF and SRC and a few utilized flakes are also associated with these units.

Thermal alteration was identified on both of the triangular preforms, the side scraper, and one utilized flake. Thermally altered debitage makes up 10.5% of the sample from units 15 to 17 (Table 6.9). According to Playford (2001:36), less than 30% of the entire faunal assemblage from this block had evidence of thermal alteration. Evidence of thermal alteration on brown chalcedony shatter and the presence of KRF and brown chalcedony potlids suggests that cores or some other type of objective pieces, may have been heated during the reduction process. Since excavators did not discover hearths in this area, the method of thermal alteration remains unknown. Playford (2001:68) proposed that processing activities that included marrow extraction probably occurred in this area. She also speculated that a boiling or grease-rendering feature might have been adjacent to these units.

The debitage sample recovered from units 15 and 16 is significantly different from materials present in unit 17, which generally has a small number of debitage pieces (Table 6.9). Contrasting with unit 13, these units reflect bifacial reduction activities, possibly directed toward secondary tool production or resharpening (Table 6.9). Both of these units have high proportions of complete, angular, and broken debitage, primarily medial and distal portions (Table 6.9). Large numbers of waste flakes are scattered across these units and similar proportions of bifacial thinning flakes and shatter are intermixed within the debris (see Appendix 3). In addition, high numbers of brown chalcedony and KRF rejuvenation flakes, associated with tool resharpening and maintenance activities are evident. Moderate frequencies of platform faceting (16.5%) and lipping (13.5%) suggest a greater degree of preparation along the striking platforms.

The presence of agate, brown chalcedony, chert, KRF, and SRC decortication flakes suggests that some of the tools may have had cortex present along their edges which were being trimmed. Similar to unit 13, most of the debitage in units 15 and 16 is small, between 0.1 and 10 mm in size. In the proposed habitation area, excavators found most of the tools in units 15 and 16. Higher densities of debitage are concentrated in the southern quadrants of unit 16 and the western portions of unit 15. The lack of excavation units north of unit 15 and south of unit 16 (Figure 6.2) prevents the determination whether the distribution of debitage is part of a larger pattern reflective of a broader range of activities.

The northern section of the proposed habitation area is only represented by unit 30. The recoveries suggest that general core reduction activities may have occurred, or alternatively, people may have discarded refuse from tool production activities here (Figure 6.1). The high density of debitage, the low number of stone tools, and the lack of faunal remains suggest that a lithic reduction area was present in unit 30. Compared to the other units in the habitation area, there is a broader range of lithic raw materials and a narrower range of debitage types that might indicate a narrow focus on primary tool production.

Swan River chert and KRF decortication flakes and quartzite, moss agate, chert including SRC and KRF shatter are scattered across the unit as well as large numbers of brown chalcedony waste flakes (see Appendix 3). In significantly lower proportions, KRF, quartzite, obsidian, agate, white chalcedony, and chert waste flakes are also evident. Bifacial reduction occurred here since relatively low numbers of SRC, brown and white chalcedony, KRF, and chert bifacial thinning flakes are present. A brown chalcedony notch flake associated with this cluster indicates that production or rejuvenation of a side notched tool of this material took place. The wide diversity of lithic raw materials also demonstrates that site inhabitants worked with a variety of raw materials that people used for both formed and expedient tools.

Debitage ranges in size from 0.1 to over 20 mm (Table 6.9). The smaller debitage classes dominate the assemblage (85.2%), which suggests that material loss at a primary lithic workstation rather than purposeful collection and disposal of lithic waste from elsewhere. Waste flakes and bifacial thinning flakes occur in higher numbers compared to the other debitage types evident in unit 30. The absence of rejuvenation flakes suggests that primary tool production rather than tool maintenance occurred (Table 6.9). In addition, since only 5.2% of the debitage retained cortex (Table 6.9), the lithic reduction at this workstation may have primarily involved tool resharpening activities rather than reduction of cores. Shatter is present in moderate quantities (16.0%), which is consistent with general reduction activities (Table 6.9). In addition, higher percentages of platform lipping but lower amounts of platform faceting further suggest that unit 30 samples an area where the final stages of lithic reduction occurred.

According to Whittaker and Kaldahl (2001:41), lithic workstations generally have large numbers of broken and complete stone tools as was the case at the Grasshopper Pueblo (reliance on interpretations from non-Plains sites is a function of a lack of comparable studies). In contrast to Whittaker and Kaldahl's (2001) generalization, unit 30 at the Jackson site only yielded a KRF knife tip and a KRF biface fragment with cortex in addition to a few utilized flakes. Perhaps this divergence from expectations is a function of the special circumstances of the Jackson occupation in the wintertime when the supply of stone was limited, and the occupants could not afford to discard even marginally useful flakes and tools.

Because Playford (2001:72) did not find a substantial amount of faunal remains in this unit, she concluded that the site inhabitants used this area for minor or no food preparation. Recovery of few faunal remains and a dense concentration of debitage indicate that the Jackson site inhabitants probably used this area for lithic reduction activities. The immediate area surrounding this unit requires additional investigation because the workstation may be associated with the proposed kill area, an outdoor kitchen area, or inside a dwelling, such as a tipi. It is also possible that people used this area for general discard of lithic debris. The southern quadrants of the unit contain most of the debitage and stone tools.

A second lithic workstation (unit 34) may have been present in the southern portion of the proposed habitation area at the site (Figure 6.1). The lithic assemblage from unit 34 is very similar to that unit 30 in the northern portion of the site. Given the low recovery of faunal remains from this unit, as was the case in unit 30, Playford (2001:72) noted that little cultural activity took place here. She also suggested that people may have used this part of the site as a disposal area for refuse that originated from activities occurring in the habitation area or along the outskirts of the main activity areas. This unit contains a significantly lower quantity of debitage (n=108) when compared to unit 30, but regardless of this discrepancy in sample size, it is reflective of tool production activities (Table 6.9). Despite this smaller number, a similar pattern is evident among the debitage forms and types identified in this area (Table 6.9). Complete and angular debitage forms are common in this unit (Table 6.9), which suggests that general core reduction may have been the dominant activity. Extremely low percentages of broken debitage, including proximal, medial, and distal flake portions are present. These low numbers are consistent with core reduction activities.

High numbers of brown chalcedony and lower counts of agate, moss agate, and white chalcedony waste flakes are scattered throughout unit 34 (see Appendix 3). Indeterminate igneous material and jasper waste flakes are also present. There were no tools found associated with this unit. However, waste and bifacial thinning flakes, generally reflective of bifacial reduction activities, dominate the assemblage (see Appendix 3). Shatter consisting of brown and white chalcedony, KRF, agates including moss agate, and SRC are evident in small quantities, which suggests that some general core reduction activities may have occurred here. Similar to unit 30, this area contains low percentages of decortication flakes and thermally altered debitage.

The predominantly high number of bifacial thinning flakes suggests that people focused on bifacial reduction or resharpening activities rather than general core modification. Bifacial thinning flakes of KRF, brown chalcedony, moss agate, agate, chert, SRC suggests that bifacial artifacts made of a variety of materials were used by the site occupants. Similar to the workstation located at the north end of the activity area, a single KRF notch flake is associated with this cluster. This indicates that production or rejuvenation of a side notched tool of this material occurred here. Excavators did not recover any stone tools from this unit; therefore, it is difficult to provide additional information regarding the function of this area.

The criteria used to assess the proposed habitation area at the Jackson site include: 1) a diverse assortment of stone tools that reflect a variety of functions; 2) high numbers of broken, heavily utilized tools; 3) the presence of hearths, discard piles and possibly workstations; and 4) dense concentrations of debitage and bone fragments associated with these features.

The proposed habitation area at Jackson meets only some of the criteria observed at the Sjovold and Harder sites (Dyck and Morlan 1995; Dyck 1977). It yielded a low number of functionally discrete tool types, lacks evidence of structures or features, and contains discontinuous distributions of lithic materials. While this might be interpreted as evidence contrary to the proposals offered by Hamilton and Nicholson (1999), it might also be reflecting sampling bias. This extensive area represents about 5100 square metres that have been sampled with only eight widely spaced excavation units (i.e. less than a 0.2% sample). Considered in this context, failure to recover evidence consistent with that cited by Dyck (1977) and Dyck and Morlan (1995) is to be expected. At the Harder and Sjovold sites, a much larger area was excavated within contiguous blocks of units. Their interpretations likely derive from an excavation strategy calculated to generate a larger sample of what might have associated with a discrete household assemblage. Thus, their observations might offer a comprehensive view of a small portion of a much larger site. Consequently, Dyck (1977) at the Harder site and working with Morlan at the Sjovold site (Dyck and Morlan 1995) were able to discern a variety of activity clusters such as lithic workstations and disposal areas in their entirety. Hamilton and Nicholson (1999) utilized a different approach in their preliminary exploration of the Jackson site. This generated information relative to the spatial expanse of the site and offered some limited insight into the patterned distribution of artifacts within it. However, the shovel tests and the limited area uncovered by excavations proved to be inadequate to identify discrete features or to recognize activity clusters within contiguous excavation units.

Despite the sample bias problem, the results of this study, coupled with the faunal analysis completed by Playford (2001), indicates that several discrete lithic and faunal clusters are evident in the proposed habitation area (Figure 6.2). The average sample size of lithics (0=113.25) represented in each of the one-metre square excavation units within the proposed habitation area deviated significantly when considering the standard deviation (SD=138.55, 0.05 confidence level) (Table 6.9). This suggests that discrete lithic clusters representing tool production or resharpening are present in this area, but that the excavation sample also includes materials reflecting other activities such as faunal processing and domestic habitation.

Dyck and Morlan (1995) and Dyck (1977) propose that habitation areas typically yield stone tools reflective of a broad range of activities, and that many of these tools will probably be broken or heavily worn. Only a few identifiable stone tools are evident in this area of the Jackson site. This consists of five utilized flakes and seven formal tools that include a Prairie Side-notched projectile point, two triangular preforms, one knife, one side scraper, and two bifacial fragments are present.

While the tool assemblage is small, these tool forms reflect hunting, butchering, and hide preparation activities consistent with the types of activities described for the Harder (Dyck 1977) and Sjovold (Dyck and Morlan 1995) sites. In addition, all of these tools from this area were broken.

A second set of criteria established by Dyck and Morlan (1995) and Dyck (1977) include the presence of hearths, discard piles and possibly lithic workstations. At the Jackson site, at least two discrete lithic workstations are evident in the northern (unit 30) and southern parts (unit 34) of the proposed habitation area (Figure 6.2). These areas contain dense concentrations of debitage that are suggestive of tool maintenance activities, possibly involving resharpening knifes or other biface tools. In addition, additional tool rejuvenation activities (units 15 and 16) probably occurred in the central portion of the proposed habitation area. Playford (2001) concluded that processing activities possibly involving marrow extraction were evident in this area. She also identified a faunal disposal area associated with grease rendering activities. There were no hearths found, even though conditions for the preservation of hearths is ideal in the Lauder Sand Hills (Playford 2001). It is acknowledged that such features are difficult to detect in the mottled sand of the Jackson site. The recognition of a hearth may be evident using the patterned distribution of debitage and stone tools. Based on the idea that "lithic debris laid down as a result of activities that were conducted around a hearth at the time the feature was in active use would mostly be distributed in a [crescent] arc around the feature" (Morrow 1996:356), the spatial distributions evident among the units here did not indicate a hearth feature. However, evidence of thermal alteration present on the triangular preforms and some of the debitage suggests that there was a hearth in the vicinity.

In the east-central part of this activity area, a hearth may have been present. The recovery of thermally altered bone and lithics from a 'viscous, sticky, dark soil' as described by the excavators may be suggestive of a hearth. Low densities of debitage and stone tools are scattered in this area. Evident in the area were low numbers of stone tools representative of different functions. Each of the stone tools was broken.

A third set of criteria established by Dyck and Morlan (1995) and Dyck (1977) suggests that low densities of cultural materials and scattered debris might be indicative of a habitation area. The quantity and density of the lithics varies throughout the proposed habitation area. This might suggest that the excavation sample derives from portions of several discrete households and represents an incomplete set of the full range of activities conducted here. It is also possible that the site occupants utilized several work areas associated with numerous households. Within the central portion of the proposed habitation area, a wide variety of activities including marrow extraction, hide preparation, and butchering are represented. Bifacial reduction, indicative of tool rejuvenation, probably occurred here as well.

In summary, while the Jackson site habitation assemblage does not perfectly match the criteria observed at Harder (Dyck 1977) and Sjovold (Dyck and Morlan 1995), this may well be a function of sample bias. It is clear, however, that the lithic and faunal assemblages are sufficiently diverse to suggest multiple activities that are consistent with the general perspective of what one should expect from a domestic encampment zone (Figure 6.2).

6.10 Midden and Processing Areas

Using the shovel test recoveries, Hamilton and Nicholson (1999:19-21) proposed that there was a midden/processing area situated in the western portion (Figure 5.1) of the Jackson site given the prominence of smashed bone within the assemblage. Alternatively, Playford (2001:108) proposed that this area consisted of intensive bison processing activities associated with a large disposal zone located within the southern portion of the activity area. To evaluate this area, it is important that separate criteria be formulated to define midden and processing areas on the basis of the lithic assemblage.

According to Dyck (1977:190), middens are areas consisting of refuse containing the by-products resulting from either individual or a variety of activities conducted at a site. He also proposed that a midden was formed when an activity area became unworkable because of the clutter or odour. Middens can also be formed when the site residents identify a specific place to dispose of unwanted materials. In contrast to midden areas, Frison (1973:53) suggested that people used processing areas to complete numerous tasks that included butchering, hide preparation, and tool manufacturing. Clearly, one can expect significant overlap in attributes between middens and processing areas.

It is possible to evaluate the proposed midden/processing area by incorporating the interpretations Frison (1973) made for the Wardell site. This site is appropriate for this analysis because it is a Late Precontact occupation and Frison (1973) speculated that people used the site during late autumn possibly continuing into winter. The excavations revealed kill and processing areas that contained an abundance of faunal remains and an extensive collection of lithics. Frison (1973) also included detailed descriptions of the features and lithic assemblages recovered from both of these locations.

Frison (1973:52-53) outlined that several factors, particularly wind, odour, and distance from the primary butchering area that influenced the location of processing areas within a site. He further noted that the location of processing areas was often positioned in a logical choice given the site locality. According to Playford (2001:145), the occupation of the Jackson site probably occurred during the winter months. Frison (1973) suggested that the direction of the wind probably influenced people's decision regarding where processing activities should take place. Wind often alerts scavengers of the available meat and warns bison of the presence of humans, which would ultimately complicate a hunt particularly during the summer season. If Jackson was occupied during the winter months, then the concerns over odours was minimal because the food waste would have been frozen. In addition, the proposed midden/processing area is located within a large hollow surrounded by now dead willow thickets. Perhaps such wetland vegetation cover provided the inhabitants with protection from the harsh winds that are common on the open grasslands.

According to Frison (1973:53), transporting the larger, useable faunal elements from the kill area to a second location for additional processing was another consideration made when selecting a processing locale. Approximately 100 metres separate the excavation units located in the proposed kill and midden/processing areas at the Jackson site (Figure 6.1). This is a realistic distance to carry quartered sections of bison for additional processing. The large unexcavated area located between the excavation units in the proposed kill and midden/processing areas of the Jackson site may contain evidence of additional faunal processing locales situated closer to the proposed kill area. Therefore, the location of the proposed midden/processing area seems to be in an ideal area given that the hollow would have provided adequate protection from the wind and provided a local source of firewood. Given the observation that there may have been a series of domestic areas within the proposed habitation area, it is possible that there are several processing locales at the Jackson site. Therefore, the location of the proposed midden/processing area fits with conditions outlined by Frison (1973). His interpretation of the activities at the Wardell site, also led him to identify several features common in processing areas.

People commonly used roasting pits in a processing area, particularly if the meat was for immediate consumption. Depending on the cultural group, basin-shaped fire pits, or conical shaped cooking or roasting pits designed for heating stones were common in processing areas (Frison 1973:55). At the Wardell site, fire-cracked rock and charcoal often lined the pits, which contained an assortment of faunal elements from different species mixed with the fire-cracked rock. Post molds at the Wardell site suggested the presence of possible structures, such as drying racks. Given that Frison (1973) suggests that people may have occupied the Wardell site from late autumn until early winter, preservation of these features is highly probable unlike a site occupied later in the winter such as the Jackson site. Also located at the Wardell site were hearths that indicated cooking areas. Frison (1973:57) also stated that the artifact assemblage recovered from the processing area at the Wardell site was quite different from the kill area and reflected the different types of activities conducted in that area.

The lithic assemblage associated with the processing area at the Wardell site consisted of debitage that Frison (1973:57) did not find in the kill area. Retouched flakes were the largest category of artifacts found. He suggested that these flakes were used for cutting, scraping, graving, grooving, boring, and for more specialized tasks such as combing, polishing or for smoothing hide or wood. Thin, cutting tools with one or two sharp edges were also part of the assemblage. Thousands of percussion and pressure flakes as well as exhausted cores were recovered from the processing area. This indicated to Frison (1973) that tool manufacture might have also occurred in this area.

Scraping implements, such as end scrapers, were also associated with the processing area at the Wardell site. Other implements included small, hafted tools with an outline similar to projectile points, worn or broken bifaces, gravers, and drills. Some of the hafted drills consisted of diamond-shaped cross sections and other drills had both blade edges worn smooth (Frison 1973:61). Projectile points discarded in the processing area might have remained in the muscle of the animal during transport from the kill area. There were also projectile point blanks and many were broken in a manner that was indicative of the mistakes that occur during manufacture.

Frison (1973:64-71) also discussed the presence of a variety of other artifacts found at the processing area at the Wardell site. The inclusion of these items in this section of the study serves to demonstrate the diversity of activities conducted in processing areas. Ground stone artifacts such as shaft smoothers, an abrading tool, a hammer stone, and a grooved maul were associated with the processing area at the Wardell site. Several bone tools such as awls and knapping tools made from bison ribs and long bones were also present. Excavators also recovered pottery from this activity area at the Wardell site. Processing areas might also contain several discrete disposal areas resulting from the refuse generated from a broad range of activities that include tool production, marrow extraction and grease rendering tasks.

Site occupants sometimes created disposal areas, occasionally referred to as middens, while conducting their daily activities (Dyck 1977; Dyck and Morlan 1995; Hamilton and Nicholson 1999), and recognition of these areas in an archaeological assemblage is difficult. Middens contain a variety of materials such as debitage, lithic materials, and stone tools associated with other camp debris, particularly faunal remains. It is difficult to recognize a disposal area from a purposeful activity locale, especially given the nature of camps that consist of a broad range of activities involving several individuals. For instance, middens do not contain a diagnostic set of lithics because the cultural material generally discarded in such areas represents an amalgam of activities conducted at the site.

Some researchers (Draper 1982; Healan 1995; Keeley 1991; Morrow 1996) have devised different methods and criteria to differentiate lithics disposed in a refuse area compared to those produced in a manufacturing locale. Essentially, they expected that refuse areas would not contain dense concentrations of debitage within a relatively restricted area. Nor would middens have large numbers of debitage such as shatter or decortication flakes suggestive of reduction activities as well as a large quantity of waste flakes would not be present. In addition, middens do not generally contain significant numbers of similar tool types that might be suggestive of tool fabrication. People probably cleaned their work areas regularly and discarded the debitage and broken tools elsewhere. Dumping produces damage along the edges of flakes because people do not generally carefully place each flake upon the ground in a disposal area. Modification of flake edges include tool manufacturing techniques, tool use, post-depositional cultural activities such as burning, dumping, digging, and trampling (see Hiscock 1985). It is difficult to differentiate between natural versus cultural modification in an archaeological assemblage.

Draper (1982) relied on stone tool types, the presence of hinge fractures on debitage, the appearance of specific types of striking platform preparation, and comparison of lithic materials between debitage and stone tools to identify manufacturing locales at the Philpott site, a Late Precontact fishing station on the southern coast of Oregon (see comment regarding use of non-Plains sites on page 155). Draper (1982:57) proposed that recognition of possible lithic workstations was contingent on the presence of blanks, preforms, bifacial fragments, pieces of cores, and hammer stones discarded among large numbers of waste flakes that resulted from bifacial or core modification. Draper (1982:58) also proposed that moderate quantities of flakes with hinge fractures were present in manufacturing loci, which suggested that flintknappers were unconcerned about the size or density of the hammer stone used to detach the flakes from the cores. He also noticed that in these areas, a large proportion of the striking platforms had considerable edge grinding and chipping which was indicative of people strengthening the edge of the platform for subsequent flake removals. Draper (1982:55) suggested that if a high correlation of the same lithic raw material was evident for tools and debitage at an archaeological site then he assumed that the flintknapper manufactured the tools at the site.

Healan (1995) used size-graded macrodebitage to differentiate refuse areas from manufacturing locales within an obsidian core/blade workshop excavated at the Early Postclassic city of Tula, Hidalgo, Mexico (see comment on page 155 regarding non-Plains studies). Healan (1995:691) assumed that "reduction loci would contain disproportionately large quantities of small to microscopic specimens of debitage." He utilized Dunnell and Stein's (1989) classification for microdebitage, which included debitage that consisted of an upper limit of 2 mm, which they stated, corresponded to the traditional sedimentological distinction between sand-size and gravel-size particles (Healan 1995:699). He used U.S. standard brass sieves with approximately 30% increment between mesh sizes to sort the soil samples collected from different areas at the site. These locations included: 1) interior surfaces from households; 2) exterior surfaces such as courtyards; 3) refuse deposits to provide a control sample of an area that clearly contained secondary refuse; and 4) all other general strata below the plow zone to determine what other types of debitage was associated with the areas (Healan 1995:691).

Healan (1995:697) applied factor analysis to the samples, which produced clusters of small debitage associated with primary refuse. Healan (1995:697) stated that the patterns evident in lithic refuse areas resulted from site inhabitants clearing accumulated debitage and discarded stone tools that flintknappers deemed unusable during manufacturing. There is no standard size classification assigned to refuse versus manufacturing locations in archaeological sites. The differentiation between macro or micro debitage at an archaeological site and the acceptance of what size will likely remain as primary refuse depends on a complex interplay of environmental and cultural factors, excavation methods (including screen sizes), and if the site inhabitants covered the ground during tool production to collect the waste.

For the Jackson site lithic analysis, macro-debitage was greater than 1.0 mm according to Fladmark's (1982) classification. However, the sediments from the Jackson site were sifted through a 3.175 mm metal hardware mesh screen-far coarser than measurement distinction used by Fladmark (1982) to differentiate between micro and macro debitage. Given this screen bias against the representation of the finest debitage sizes, the analyst treated all debitage smaller than 10 mm to reflect material lost in the zones of primary tool fabrication, or redeposited from a nearby workstation by natural processes.

The criteria used to assess the proposed processing area at the Jackson site include: 1) relative diversity of stone types; 2) presence of lithic workstations; and 3) presence of a range of diverse activity clusters in this area. Given the type of lithic assemblage described by Frison (1973), an assortment of stone tool types such as projectile points, scrapers, drills, and knives should be present in the processing area at the Jackson site. The processing area should also have a large number of utilized flakes. Lithic workstations containing large accumulations of debitage, rejuvenation flakes, and numerous broken tools should also be present in the area. Other features expected in the processing area at the Jackson site include cooking pits. Additional features associated with food processing such as post molds may not be present given the winter occupation of the site.

If the site inhabitants cleared portions of activity areas, such as the habitation or processing locales, this refuse should be evident in the proposed midden area of the Jackson site. The criteria used to assess the proposed midden at the Jackson site include: 1) scattered patterns of debitage, 2) closely spaced activity areas, 3) high proportions of large debitage and broken stone tools associated with other by-products such as faunal remains. If a midden area is present at the Jackson site then lithic debris should be widely scattered across a large area. Manufacturing loci tend to be concentrated within a small area. Primary refuse areas should contain small debitage and a high correlation between the lithic raw materials evident on the stone tools and among the debitage. These criteria were used to evaluate the lithic concentrations associated with proposed midden/processing area of the Jackson site.

6.11 Midden/Processing Area at the Jackson Site

The proposed midden/processing area is the second largest zone at the site (Figure 6.1). The excavated area consists of eleven square metres (approximately 0.56% of the total estimated activity area). This sample contains 2205 pieces of debitage, 28 formed tools, and 38 utilized flakes. Calculation of the standard deviation of the lithic samples recovered from each of the excavation units in this area demonstrate that several discrete lithic clusters are evident in units 18 to 20, 35 and units 22 to 24, 32, and 33 (Figure 6.3).

Debitage and stone tools are densely concentrated in eastern portion of the area (units 22 to 25, 32, 33), which suggest a possible lithic workstation. In contrast to this area, the northern section (units 18-21, 35) consists of scattered debitage and a small number of stone tools (Figure 6.3). The lack of any discernable pattern of debitage and tools among these units may indicate that the site inhabitants used this area to discard waste material and broken stone tools (Figure 6.3).

Units 18 to 20 (excluding unit 21), yielded complete (31.1%), distal (14.5%), and angular (14.1%) debitage forms in relatively high amounts (Table 6.10). These are indicative of bifacial reduction activities that often produce significant quantities of broken and complete flakes. Widely distributed throughout these units are waste flakes and shatter deriving from agate, TRSS, white chalcedony, quartzite, a variety of cherts and an indeterminate igneous material (see Appendix 3). Significantly, lower amounts of chert including SRC, quartzite, and agate waste flakes are also evident. Low numbers of agate, TRSS, and igneous bifacial thinning flakes are present, however, high numbers of KRF bifacial thinning flakes are evident (see Appendix 3). All of the tools in these units are made of KRF.

Only 16.9% of the entire debitage assemblage consists of bifacial thinning flakes (Table 6.10). An extremely low percentage (5.2%) of the debitage indicates rejuvenation activities (Table 6.10). Bifacial reduction activities may have included tool edge rejuvenation since scatters of KRF and brown chalcedony rejuvenation flakes are evident across these excavation units. The recovery of notch flakes further supports that tool rejuvenation, particularly of side notched tools occurred in the area (Table 6.10).

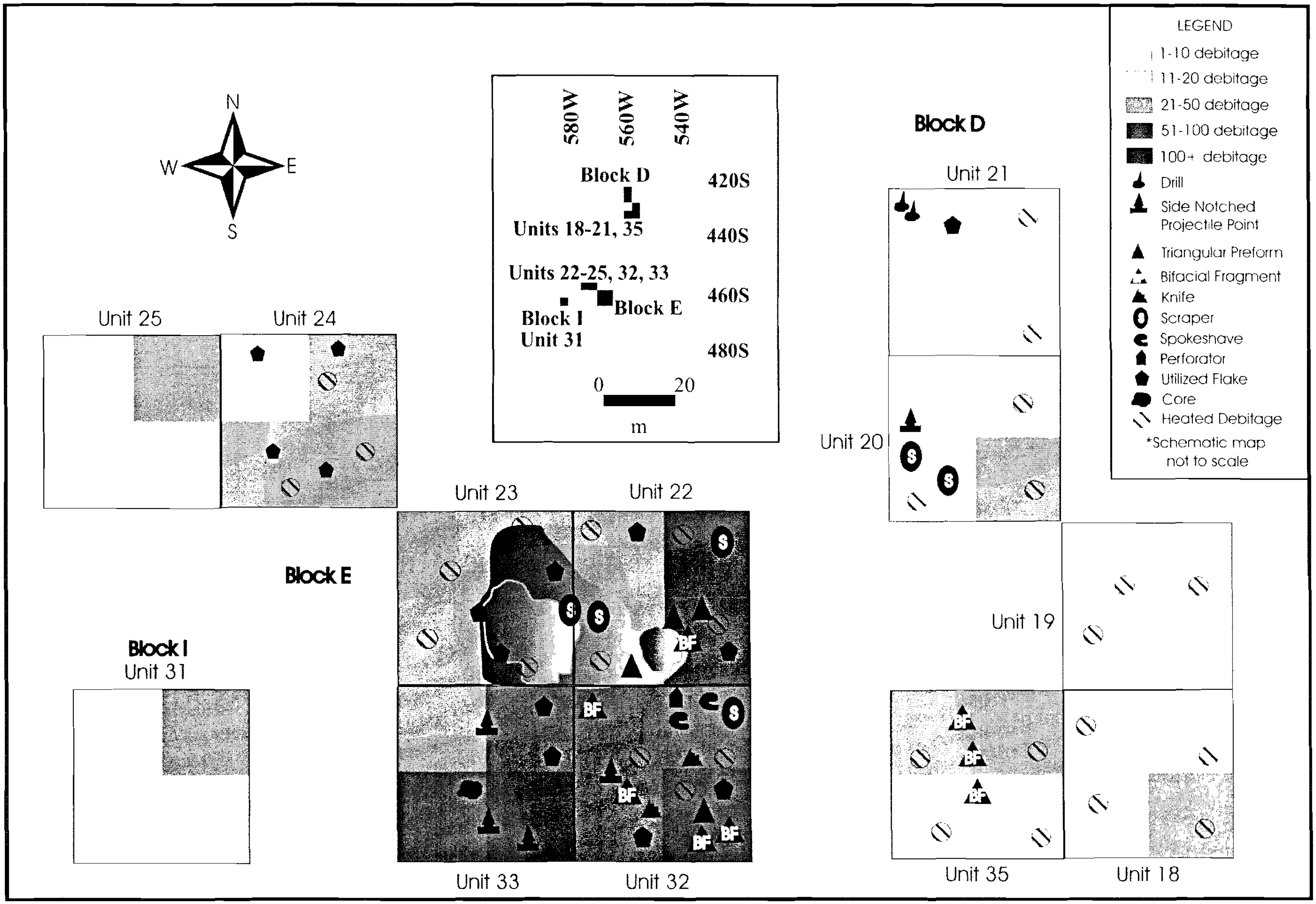

Figure 6.3 Spatial distribution of debitage and stone tools in the proposed midden/processing area.

Table 6.10 Analysable debitage and stone tools from the proposed midden/processing area.

Excavation Unit	18		19		20		21		35	
Total debitage per unit	T=91		T=66		T=91		T=10		T=109	
	No	%	No	%	No	%	No	%	No	%
Form										
Complete	27	29.7	28	42.4	22	24.2	3	30.0	22	20.2
Proximal	6	6.6	5	7.6	6	6.6	2	20.0	5	4.6
Medial	8	8.8	2	3.0	8	8.8	1	10.0	1	0.9
Distal	16	17.6	7	10.6	13	14.3	0	0.0	4	3.7
Angular	15	16.5	7	10.6	13	14.3	1	10.0	11	10.1
N/A Non-Analysable Debitage	19	20.9	17	25.8	29	31.9	3	30.0	66	60.6
Total	**91**	**100.0**	**66**	**100.0**	**91**	**100.0**	**10**	**100.0**	**109**	**100.0**
Type										
Shatter	9	9.9	11	16.7	11	12.1	1	10.0	6	5.5
Decortication	5	5.5	2	3.0	2	2.2	1	10.0	6	5.5
Bifacial Thinning Flake	15	16.5	19	28.8	8	8.8	1	10.0	15	13.8
Rejuvenation Flake	5	5.5	6	9.1	5	5.5	0	0.0	2	1.8
Waste Flake	42	46.2	12	18.2	39	42.9	4	40.0	65	59.6
Heated Flake	8	8.8	12	18.2	25	27.5	1	10.0	15	13.8
Core	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
N/A Non-Analysable Debitage	7	7.7	4	6.1	1	1 1	2	20.0	109	100.0
Total	**91**	**100.0**	**66**	**100.0**	**91**	**100.0**	**10**	**100.0**	**109**	**100.0**
Platform Facetting	15	16.5	11	16.7	10	11.0	1	10.0	4	3.7
Platform Lipping	15	16.5	26	39.4	14	15.4	2	20.0	17	15.6
N/A Non-Analysable Debitage	61	67.0	29	43.9	67	73.6	7	70.0	88	80.7
Total	**91**	**100.0**	**66**	**100.0**	**91**	**100.0**	**10**	**100.0**	**109**	**100.0**
Size										
0.1-5 mm	47	51.6	21	31.8	37	40.7	2	20.0	72	66.1
5.01 -10 mm	37	40.7	34	51.5	40	44.0	4	40.0	27	24.8
10.01 to 15 mm	4	4.4	9	13.6	10	11.0	4	40.0	7	6.4
15.01 to 20 mm	0	0.0	2	3.0	2	2.2	0	0.0	1	0.9
20.01 + mm	3	3.3	0	0.0	2	2.2	0	0.0	2	1.8
Total	**91**	**100.0**	**66**	**100.0**	**91**	**100.0**	**10**	**100.0**	**109**	**100.0**
Tools										
Prairie	0		0		1		0		0	
Plains	0		0		0		0		1	
Side scraper	0		0		1		0		0	
End scraper	0		0		1		0		0	
Triangular Preforms	0		0		0		0		0	
Spokeshave	0		0		0		0		0	
Knife	0		0		0		0		0	
Drill	0		0		0		1		0	
Perforator	0		0		0		0		0	
Indeterminate Projectile points	0		0		0		0		2	
Bifacial Fragments	0		0		0		0		1	
Utilized Flakes	0		0		0		0		0	
Total	**0**		**0**		**3**		**1**		**4**	

Table 6.10 Continues (Mean is 186.33 Standard Deviation is 169.92).**

Excavation Unit	22		23		24		25		32		33		31		Total	
Total debitage per unit	T=546		T=321		T=159		T=92		T=255		T=446		T=50		T=2236	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Form																
Complete	158	28.9	71	22.1	47	29.6	27	29.3	74	29.0	122	27.4	22	44.0	**623**	**27.9**
Proximal	53	9.7	44	13.7	19	11.9	7	7.6	36	14.1	21	4.7	6	12.0	**210**	**9.4**
Medial	42	7.7	38	11.8	26	16.4	7	7.6	20	7.8	14	3.1	7	14.0	**174**	**7.8**
Distal	38	7.0	19	5.9	8	5.0	4	4.3	29	11.4	27	6.1	1	2.0	**166**	**7.4**
Angular	86	15.8	33	10.3	15	9.4	7	7.6	42	16.5	53	11.9	14	28.0	**297**	**13.3**
N/A Non-Analysable Debitage	169	31.0	116	36.1	44	27.7	40	43.5	54	21.2	209	46.9	0	0.0	**766**	**34.3**
Total	**546**	**100.0**	**321**	**100.0**	**159**	**100.0**	**92**	**100.0**	**255**	**100.0**	**446**	**100.0**	**50**	**100.0**	**2236**	**100.0**
Type																
Shatter	41	7.5	27	8.4	8	5.0	3	3.3	25	9.8	30	6.7	8	16.0	**180**	**8.1**
Decortication	89	16.3	18	5.6	5	3.1	4	4.3	16	6.3	11	2.5	3	6.0	**162**	**7.2**
Bifacial Thinning Flake	91	16.7	70	21.8	47	29.6	12	13.0	49	19.2	93	20.9	8	16.0	**428**	**19.1**
Rejuvenation Flake	91	16.7	60	18.7	16	10.1	32	34.8	1	0.4	0	0.0	0	0.0	**218**	**9.7**
Waste Flake	201	36.8	132	41.1	69	43.4	34	37.0	113	44.3	259	58.1	22	44.0	**992**	**44.4**
Heated Flake	18	3.3	9	2.8	13	8.2	6	6.5	49	19.2	48	10.8	9	18.0	**213**	**9.5**
Core	1	0.2	2	0.6	0	0.0	0	0.0	1	0.4	3	0.7	0	0.0	**7**	**0.3**
N/A Non-Analysable Debitage	14	2.6	3	0.9	1	0.6	1	1.1	1	0.4	2	0.4	0	0.0	**145**	**6.5**
Total	**546**	**100.0**	**321**	**100.0**	**159**	**100.0**	**92**	**100.0**	**255**	**100.0**	**446**	**100.0**	**50**	**100.0**	**2236**	**100.0**
Platform Facetting	56	10.3	41	12.8	18	11.3	4	4.3	24	9.4	38	8.5	3	6.0	**225**	**10.1**
Platform Lipping	107	19.6	72	22.4	49	30.8	13	14.1	66	25.9	101	22.6	10	20.0	**492**	**22.0**
N/A Non-Analysable Debitage	383	70.1	208	64.8	92	57.9	75	81.5	165	64.7	307	68.8	37	74.0	**1519**	**67.9**
Total	**546**	**100.0**	**321**	**100.0**	**159**	**100.0**	**92**	**100.0**	**255**	**100.0**	**446**	**100.0**	**50**	**100.0**	**2236**	**100.0**
Size																
0.1-5 mm	208	38.1	144	44.9	58	36.5	34	37.0	91	35.7	135	30.3	21	42.0	**870**	**38.9**
5.01 -10 mm	223	40.8	124	38.6	69	43.4	36	39.1	112	43.9	216	48.4	21	42.0	**943**	**42.2**
10.01 to 15 mm	81	14.8	38	11.8	19	11.9	13	14.1	36	14.1	72	16.1	7	14.0	**300**	**13.4**
15.01 to 20 mm	29	5.3	12	3.7	12	7.5	6	6.5	11	4.3	17	3.8	1	2.0	**93**	**4.2**
20.01 + mm	5	0.9	3	0.9	1	0.6	3	3.3	5	2.0	6	1.3	0	0.0	**30**	**1.3**
Total	**546**	**100.0**	**321**	**100.0**	**159**	**100.0**	**92**	**100.0**	**255**	**100.0**	**446**	**100.0**	**50**	**100.0**	**2236**	**100.0**
Tools																
Prairie	0		0		0		0		0		1		0		**2**	**3.0**
Plains	1		1		0		0		1		1		0		**5**	**7.6**
Side scraper	1		0		0		0		1		0		0		**3**	**4.5**
End scraper	1		0		0		0		0		0		0		**2**	**3.0**
Triangular Preforms	1		0		0		0		1		1		0		**3**	**4.5**
Spokeshave	1		0		0		0		0		0		0		**1**	**1.5**
Knife	0		0		1		0		4		0		0		**5**	**7.6**
Drill	0		0		0		0		0		0		0		**1**	**1.5**
Perforator	0		0		0		0		1		0		0		**1**	**1.5**
Indeterminate Projectile points	0		0		0		0		0		0		0		**2**	**3.0**
Bifacial Fragments	0		0		0		1		1		0		0		**3**	**4.5**
Utilized Flakes	19		9		5		1		3		1		0		**38**	**57.6**
Total	**24**		**10**		**6**		**2**		**12**		**4**		**0**		**66**	**100.0**

Only units 20 and 21 contain formed stone tools. In unit 20, a KRF Prairie Side-notched projectile point with cortex, a complete KRF end scraper, and a broken KRF side scraper were recovered (Figure 6.3). Unit 21 has only a complete KRF side notched drill (Figure 6.3). The northern part of the proposed midden/processing zone does not have utilized flakes.

There is a low percentage of decortication flakes (3.6%) present that suggests that the lithic raw materials initially lacked either cortex, or this assemblage reflects a later reduction stage that focused on trimming bifacial tools or preforms (Table 6.10). Debitage sizes range between 0.1 and 15.0 mm with a significant proportion of debitage measuring between 0.1 and 10.0 mm.

Unit 35 also has a slightly different debitage assemblage from the adjoining units 18 to 20 (Figure 6.3). It contains the highest quantity (n=109) of debitage compared to the other units in this area. Complete flakes (20.1%) and angular fragments (15.3%) dominate the assemblage, which is consistent with general core reduction activities according to Sullivan and Rozen (1985) (Table 6.10). High proportions of waste flakes (59.6%) and bifacial thinning flakes (13.7%) are also scattered across the unit (Table 6.10). Consistent with the other units in the area, a low percentage (1.8%) of the assemblage is rejuvenation flakes. Excavators did not recover tools from this unit.

An interesting pattern is evident among the thermally altered lithics recovered from this block of units (Figure 6.3). The differences in the proportions (Table 6.10) of thermally altered debitage are minimal between units 19 (18.1%) and 35 (13.7%). Unit 20 has the highest percentage of thermally altered debitage (27.4%) and unit 18 has the lowest amount (8.7%). Excavators uncovered a semi circular arrangement of fire-cracked rock associated with bison bones in units 18 and 19. Playford (2001:69) suggested that this feature might have been the remnants of a nearby meat-boiling pit. Evidence of thermal alteration is not apparent on 83.8% of the debitage and Playford (2001:39) determined that 58.2% of the entire faunal assemblage lacked evidence of burning. Excavators recovered only one KRF potlid from this area. With the exception of the KRF side-notched drill, all of the tools exhibited evidence of thermal alteration.

In the northeastern portion of the proposed midden/processing area, general core and secondary bifacial reduction activities probably accompanied the processing of bison remains (Figure 6.3). The site inhabitants might have discarded the debitage produced from tool manufacturing and core reduction activities completed in the eastern portion in units 22 to 25, 32, and 33. Considering the scattered distribution of the debitage and the lower density of the debitage and stone tools in this area, tool production may not have occurred in this part of the site. This area reflects an eclectic mixture of activities that included tool refurbishing and general maintenance of the scrapers while they processed bison. These units are also within the portion of the proposed midden/processing area that does not overlap with the habitation area, however, the lithic and faunal assemblages are suggestive of domestic activities.

Lithic recoveries from units 22 to 25, 32, and 33 suggest that this area may not necessarily reflect a midden because the lithic assemblage indicates the presence of a large lithic workstation (Figure 6.3). Fluctuating frequencies of debitage types in this proposed midden/processing area reflect discrete clusters of activities (Table 6.11). Most of the secondary tool production probably occurred in units 22, 23, 32, and 33 because a dense concentration of debitage and tools is present in a relatively restricted area (Figure 6.3). Significantly, lower quantities of lithics are scattered in units 24 and 25 located on the periphery of the activity area. Given that the debitage recovered from these units reflects tool production and not secondary refuse, this may indicate that there was not a large midden area associated with the proposed habitation or processing areas. Instead, there may have been several small discrete disposal areas utilized throughout the site.

Evident in units 22 to 24, 32, and 33 are moderate proportions of complete flakes (27.4%) and angular fragments (14.3%), which imply general core reduction activities (Table 6.10). There are seven heavily modified cores consisting of KRF, SRC, and brown chalcedony recovered in this area. Bipolar flaking technique may have been used by the flintknappers given the presence of brown chalcedony, KRF, and SRC bipolar flakes. However, higher proportions of broken flakes (25.3%) are present which reflects bifacial reduction activities (Table 6.10). Significant numbers of brown chalcedony and KRF waste flakes (44.9%) are scattered throughout this lithic cluster (Table 6.10). In significantly lower quantities, waste flakes of quartzite, white chalcedony, agate, and cherts including SRC are scattered throughout these units (see Appendix 3). In addition, 19.3% of the debitage are bifacial thinning flakes that consist of large quantities of KRF and brown chalcedony and smaller amounts of agate, white chalcedony, chert, and SRC (see Appendix 3).

Brown chalcedony, KRF, chert, and SRC shatter (7.8%) are found throughout these units (see Appendix 3). Low amounts of KRF, brown chalcedony, and SRC decortication flakes (8.5%) are part of this concentration. Low proportions of brown chalcedony, KRF, chert, and SRC shatter (7.3%), and decortication flakes (9.6%) are scattered throughout these units (Table 6.10). Only 9.9% of the debitage sample is rejuvenation flakes (Table 6.10). These low percentages suggest that tool resharpening may have occurred in this area because rejuvenation flakes are present. Brown chalcedony and KRF notching flakes evident in this lithic cluster suggest that the site inhabitants may have resharpened side-notched tools (see Appendix 3). Most of the debitage in this excavation block measures (Table 6.10) between 5.01 and 10.0 mm (42.8%) and between 0.1 and 5.0 mm (37.1%). In addition, some of the debitage (14.4%) measured between 10.01 and 15.0 mm. Debitage measuring above 20.01 mm comprises only 5.6% of the sample and may reflect primary core reduction activities (Table 6.10).

People using this area heavily modified KRF, SRC, and brown chalcedony materials. Swan River chert is the most common material (53.4%) used for formed and expedient tools in this lithic cluster (Table 6.11). Distributed throughout these units are small quantities of KRF and brown chalcedony utilized flakes but SRC seems to be popular for utilized flakes (Table 6.11). Among the formed tools, KRF is the preferred material (Table 6.11). Eighty-five percent of the tools are broken, probably because of manufacturing mistakes. In addition, each tool retains some cortex, which suggests that some primary tool production may have occurred.

The reason for the association of the Plains Side-notched projectile point with an almost complete bison skull remains unknown. People could possibly have carried the different bison elements from the kill area for further processing and the point might have remained in the muscles.

Table 6.11 Stone tools represented in units 22-25, 32, and 33.

	Knife River flint	Brown Chalcedony	Swan River chert	**Total**
Prairie Side-notched projectile point	0	0	1	1
Plains Side-notched projectile point	2	1	1	4
Triangular preform	2	0	1	3
Knife	2	0	3	5
Spokeshave	1	0	0	1
Side scraper	2	0	0	2
End scraper	1	0	0	1
Perforator	1	0	0	1
Drill	1	0	0	1
Biface Fragment	0	0	1	1
Utilized Flakes	9	5	24	38
Total	21	6	31	58

In units 24 and 25, the quantity of debitage and tools decreases significantly, possibly as an indication of these activities occurring on the outer edge of the area. The lithic sample from these units seems consistent with general core reduction activities given the high proportion of complete flakes (29.4%) and angular fragments (33.4%) present among the debitage (Table 6.10). However, other activities geared toward bifacial reduction are also evident. Waste flakes comprise 41.0% and 23.5% of the sample are bifacial thinning flakes (Table 6.10). In addition, 19.1% of the sample is rejuvenation flakes which suggest tool rejuvenation activities. A knife and an unidentified biface fragment were associated with utilized flakes. Only 7.5% of the debitage sample exhibits evidence of thermal alteration (Table 6.10). Consistent with the adjacent units debitage sizes range between 0.1 to above 20.0 mm with the majority measuring between 0.1 and 10.0 mm (Table 6.10).

The proposed midden/processing area at the Jackson site requires additional clarification, particularly in regards to the presence of a possible midden area. Given the two sets of criteria established for this area, the lithic assemblage from throughout the area seems more reflective of processing activities, particularly in the central portion of the site and the immediately surrounding area (Figure 6.1). Beyond this central locale are a series of discrete disposal areas (Figure 6.1). It is not clear if a large midden area is associated with the habitation or processing areas of the site. Playford (2001:69) suggested that the butchering and processing of a range of animal species occurred in the northern portion, but that a refuse area was evident in the southern area. Given the presence of butchering and processing activities, it seems reasonable to expect that discrete disposal areas would be present at the site.

One of the criteria used to identify a processing area includes the presence of a range of stone tool types reflective of diverse activities. This criteria is accepted at the Jackson site. According to Frison (1973), a lithic assemblage associated with processing areas often reflects specialized tasks that include butchering, hide preparation, and tool manufacture and maintenance. An assortment of stone tools were found associated with the proposed midden/processing area. A dramatic increase in the number and diversity of stone tools is evident between the two excavation blocks (Table 6.12). Only 15.0% of the stone tools in this area are complete. The significant number of projectile points probably results from these tools remaining in the animals during transport to this area from the proposed kill locale. All of the projectile points are broken at or below the shoulder and each of the knives is broken laterally across the body. These breakage patterns may have resulted during manufacture instead of use. Each of the stone tools from both of the excavation blocks is indicative of processing activities such as butchering and hide preparation.

Table 6.12 Stone tools represented in units 18 to 21, 35 and units 22 to 25, 32 and 33.

	Units 18-21 and 35	Units 22-25 32,33	Total
Prairie Side-notched projectile point	1	1	2
Plains Side-notched projectile point	0	3	3
Triangular preform	0	3	3
Knife	0	5	5
Side scraper	1	3	4
End scraper	1	2	3
Spokeshave	0	1	1
Perforator	0	1	1
Drill	1	0	1
Biface Fragment	3	3	6
Utilized Flakes	0	38	38
Total	7	60	67

The second criteria used to define a midden/processing area at the site include the types of features associated with processing activities and midden areas. The small number and scattered distribution of units made it highly improbable that the excavations would encounter features. In addition, it may have been difficult for features to preserve within the frozen ground given that the people may have occupied the site during the winter. Despite this, the recoveries from several units suggested that activity areas, perhaps with discrete features, were located nearby (Figure 6.1). It is evident that the predominant activity in this area reflects processing activities but discrete disposal areas are scattered throughout the site area (Figure 6.1).

Playford (2001:69) suggested that the semi-circular configuration of fire-cracked rock in the northern portion of the area was probably the remnant of a meat-boiling pit. "The pit may have been adjacent to the excavated units, or the site's inhabitants used an apparatus such as a bison stomach supported on sticks as a container. Peter Fidler relates observing such a event during the winter" (Playford 2001:69). Associated with the feature was a concentration of bison bone that consisted of mostly rib bodies, thoracic spines, and long bone shafts. The articular ends of long bones were clustered surrounding the feature. It is possible that the site inhabitants were extracting marrow and boiling smashed bone for grease extraction purposes. Playford (2001:69-70) demonstrated that most of the faunal assemblage was arranged in clusters throughout this area. Given the presence of the boiling feature and the patterned distribution of faunal remains, she interpreted this to be the result of processing activities rather than people dumping the broken bison bones in this area. The clusters of bone were probably discrete clusters of refuse derived from the butchering and processing of bison. The lithic assemblage associated with this area is indicative of bifacial reduction that probably involved tool rejuvenation activities.

The distribution of thermally altered bone and lithics associated with both of the excavation blocks, suggests that hearths were probably used in the proposed midden/processing area of the site. Surrounding the possible meat-boiling feature are scatters of bone and debitage exhibiting evidence of thermal alteration. The presence of hearths in the proposed midden/processing area is more suggestive of processing activities involving cooking. These types of features are not typically associated with midden areas.

In the southern portion of the area, a lithic workstation is evident given the small size of debitage, high recovery of broken tools, and the dense concentration of lithic materials (Figure 6.1: workstation #3). Dense concentrations of debitage, particularly waste flakes, and a few cores suggest manufacturing activities. The debitage sizes cluster toward the smaller grades, indicating that the debitage in this area is primary refuse. If this concentration of debitage is the product of secondary refuse, then a higher proportion of large debitage should be evident in the area. Most of the cores were recovered in this area which indicates manufacturing activities. Playford (2001:70) suggested that the high species diversity, the lack of patterned bone deposition, and the lack of features indicated a refuse disposal area. The discard piles created from tool manufacturing activities are difficult to assess here. Scattered throughout these units were a variety of broken stone tools reflective of butchering and processing activities.

Figure 6.1 illustrates that the lithic assemblages from the different excavation blocks in this area reflect a broad range of activities. Tool rejuvenation was the predominant activity in this locality (Figure 6.1). Playford (2001:70) noted that in the southern portion of the area, the faunal materials were not indicative of any particular activity. She suggested that the scattering of bones resulted from the site occupants discarding their waste. She did notice that units 25 and 32 yielded a concentration of forelimb elements that probably represented waste from marrow extraction activities. Figure 6.3 demonstrates that the density of debitage progressively becomes smaller toward the periphery edges of the excavation block. Unit 25 has the smallest quantity of lithics in this excavation block, but unit 32 has a modest amount of debitage and the highest proportion of stone tools. Given the complexity of the area and the nature of the lithic assemblage, this workstation is probably associated with faunal processing activities.

In conclusion, this lithic analysis demonstrates that refinement of Hamilton and Nicholson 's (1999) proposed midden/processing area is necessary (Figure 6.1). The activities inferred from the lithic and faunal assemblages in this area are suggestive of tasks involving butchering and processing of bison and other animal species. Subsumed within this area are discrete clusters of refuse that were the product of faunal processing and tool rejuvenation. The lithic assemblage does not support the proposed identification of a midden within this portion of the site. Combining the terms midden and processing to describe an activity area prevents a clear understanding of the type of activities that may have occurred there. Each of these activity areas denotes significantly different behaviours practiced by people. Rather than drawing attention to midden activities at the Jackson site, it is suggested that the activities are reflective of processing tasks. The western boundary of the habitation area should not be included within the proposed midden/processing area (Figure 6.2) because the lithic assemblages associated with each of these areas are quite different.

6.12 Kill Areas

Kill areas are locations where hunters killed individual animals or mass numbers simultaneously. Dyck (1983:8-9) stated that kill areas are often recognized by "dense beds of bones intermingled with projectile points and the remains of butchering and processing tools and features." In addition, there is a general lack of pottery present in these areas. Evidence of pounds, jumps, and traps is noted at some of the deeply stratified kill sites, such as the Wardell site. Cliffs, ravines, sand dune depressions, bogs, snowdrifts, and prairie-forest borders would have been ideal natural traps used by hunters. Hamilton and Nicholson (1999:20) proposed that the hunters at the Jackson site might have relied on the deep accumulation of snow that drifted from the nearby open prairie into the localized hollow at the north end of the site to trap a small herd of bison given the topography of the area. They speculated that a barrier constructed from weaving brush and poles into the thickets might have been formed to contain the bison (Hamilton and Nicholson 1999). There is an extensive literature base documenting methods of killing, butchering, and processing at some bison kill areas (for example, the deeply stratified. Head Smashed-In Site in Alberta; Brink and Dawe 1989). The descriptions and interpretations regarding the lithic assemblage and features associated with the kill area at the Wardell site are used as a model for the proposed kill area at the Jackson site.

Sometimes features such as linear arrangement of post molds (e.g. Wardell, Wyoming, Frison 1973) or clusters of vertical bone uprights (e.g. Hokanson site, southwestern Manitoba; Hamilton 2002) are present in kill areas. Since Hamilton and Nicholson (1999) speculated that the bison were trapped within the dense willow thickets, where deep accumulations of snowdrifts would have made for a natural trap, evidence of a pound structure is not expected in this area. Also evident in some kill areas are hearths or fire pits, as was the case at the Wardell site (Frison 1973:24). Frison (1973:24) suggested that hearths were evident at the Wardell kill area given that "throughout the three levels of the kill area were small to large fires. These were not in prepared fire pits, but instead were concentrations of charcoal from a few inches up to two and one-half feet in diameter with some scattering beyond the main concentrations." Frison (1973:25) proposed that the fires were not attempts to burn the bone deposits, nor were they used to destroy annual weed growth and debris from previously butchered carcasses, but were evidence of fires to prepare beds of charcoal for cooking meat for immediate consumption after the bison were butchered. Given the nature of kill areas, a large assortment of projectile points and primary butchering lithic tools are typically recovered (Frison 1973:25).

The lithic artifact assemblage in the kill area at the Wardell site consisted of 436 projectile points. There was considerable variation in size, flaking quality, notch placement, and base style among the side-notched points at the Wardell site. Also recovered was an assortment of chipped cutting tools. Many were heavily worn and discarded after being used for primary butchering. In addition, numerous expedient tools were recovered. They were generally small retouched flakes with sharp cutting edges produced by pressure flaking along the flake margins. Bifaces with prepared, pressure flaked edges were also found. A style of retouched flake knife, often found in the kill areas at other sites, was also present. Scrapers, large choppers, and hammer stones were distributed throughout the kill area at the Wardell site. In the immediate vicinity of the site were extensive deposits of quartzite and chert river cobbles, thus Frison (1973) suggested that these cobbles served as expediency tools. Frison (1973) also noted that large numbers of tiny pressure flakes were found in the kill area, but that there was a lack of percussion sharpening flakes in the assemblage. The debitage in the kill area probably resulted from continual retouch of tool edges throughout the primary butchering process. Frison (1973) concludes that the lithics from a kill area should be distinctive from those recovered from a processing area, and his criteria are used in assessing the proposed kill area of the Jackson site.

A kill area should contain a high number of projectile points that range in size, style, and completeness. An assortment of butchering tools should also be present. If the activity area resulted from killing and primary butchering tasks, then an assemblage consisting of projectile points, knives, and utilized flakes should occur. No evidence of lithic workstations should be expected in the kill area and most of the debitage will derive from tool rejuvenation. Given the limited sample of the proposed kill area (4 m^2) at the Jackson site, a limited recovery of lithic artifacts and debitage is to be expected.

6.13 Kill Area at the Jackson Site

The proposed bison kill area at the Jackson site is the smallest activity zone identified, and contains four excavation units, which represents 0.44% of the estimated area (Figure 5.1). According to Hamilton and Nicholson (1999:18), the presence of "projectile points and small rejuvenation flakes consistent with repeated re-sharpening of butchering tools" supported the premise that a kill area was present in the northern portion of the site. Playford (2001:71) confirmed Hamilton and Nicholson's (1999) earlier assertions that this area was indeed the result of a kill. She also determined that bison dominated the assemblage, however, a deer and a small to medium-sized bird were evident in the faunal assemblage. Playford (2001:71) proposed that primary butchering occurred immediately after the kill and, given the high density of smashed bone, that intensive processing occurred adjacent to the kill and that marrow extraction activities also happened. Evident in this area were discard piles consisting of low utility elements such as carpals and tarsals. A few complete faunal elements and high concentrations of burned bone were evident in the area.

The proposed kill area contains 41 pieces of debitage and 14 formed stone tools with minimal variation in spatial distribution across the area (Table 6.13 and Figure 6.4). The lithic sample from units 26, 27, and 28 is extremely small. Unit 36 has the largest quantity (n=28) of debitage compared to the other units (Table 6.13). Unit 36 also exhibits a varied assortment of lithics. Complete flakes and angular fragments dominate the assemblage (Table 6.13). Within the debitage, 67.8% are waste flakes and 21.4% are bifacial thinning flakes (Table 6.13).

Table 6.13 Analysable debitage from the kill area of the Jackson site.

Excavation Unit	26		27		28		36		Total	
Total debitage per unit	T=5		T=5		T=3		T=28		T=41	
	No	%	No	%	No	%	No	%	No	%
Form										
Complete	1	20.0	1	20.0	0	0.0	13	46.4	**15**	**36.6**
Proximal	0	0.0	3	60.0	0	0.0	0	0.0	**3**	**7.3**
Medial	1	20.0	1	20.0	0	0.0	1	3.6	**3**	**7.3**
Distal	1	20.0	0	0.0	0	0.0	0	0.0	**1**	**2.4**
Angular	0	0.0	0	0.0	3	100.0	2	7.1	**5**	**12.2**
N/A Non-Analyzable Debitage	2	40.0	0	0.0	0	0.0	12	42.9	**14**	**34.1**
Total	**5**	**100.0**	**5**	**100.0**	**3**	**100.0**	**28**	**100.0**	**41**	**100.0**
Type										
Shatter	0	0.0	0	0.0	3	100.0	2	7.1	**15**	**36.6**
Decortication	0	0.0	0	0.0	0	0.0	0	0.0	**3**	**7.3**
Bifacial Thinning Flake	1	20.0	1	20.0	0	0.0	6	21.4	**3**	**7.3**
Rejuventation Flake	0	0.0	0	0.0	0	0.0	0	0.0	**1**	**2.4**
Waste Flake	4	80.0	4	80.0	0	0.0	19	67.9	**5**	**12.2**
Heated Flake	0	0.0	0	0.0	0	0.0	1	3.6	**14**	**34.1**
Total	**5**	**100.0**	**5**	**100.0**	**3**	**100.0**	**28**	**100.0**	**41**	**100.0**
Platform Facetting	0	0.0	1	20.0	0	0.0	3	10.7	**4**	**9.8**
Platform Lipping	1	20.0	1	20.0	0	0.0	6	21.4	**8**	**19.5**
N/A Non-Analyzable Debitage	4	80.0	3	60.0	3	100.0	19	67.9	**29**	**70.7**
Total	**5**	**100.0**	**5**	**100.0**	**3**	**100.0**	**28**	**100.0**	**41**	**100.0**
Size										
0-5 mm	1	20.0	1	20.0	0	0.0	16	57.1	**18**	**43.9**
5.01 -10 mm	4	80.0	4	80.0	3	100.0	11	39.3	**22**	**53.7**
10.01 to 15 mm	0	0.0	0	0.0	0	0.0	0	0.0	**0**	**0.0**
15.01 to 20 mm	0	0.0	0	0.0	0	0.0	1	3.6	**1**	**2.4**
20.01 + mm	0	0.0	0	0.0	0	0.0	0	0.0	**0**	**0.0**
Total	**5**	**100.0**	**5**	**100.0**	**3**	**100.0**	**28**	**100.0**	**41**	**100.0**
Tools										
Prairie	0		0		0		1		**1**	**10.0**
Plains	1		2		2		3		**8**	**80.0**
Side scraper	0		0		0		0		**0**	**0.0**
End scraper	0		0		0		0		**0**	**0.0**
Triangular Preforms	0		0		0		0		**0**	**0.0**
Spokeshave	0		0		0		0		**0**	**0.0**
Knife	0		0		0		0		**0**	**0.0**
Drill	0		0		0		0		**0**	**0.0**
Perforator	0		0		0		0		**0**	**0.0**
Indeterminate Projectile points	0		0		0		1		**1**	**10.0**
Utilized Flakes	0		0		0		0		**0**	**0.0**
Total	**1**		**2**		**2**		**5**		**10**	**100.0**

****Mean is 10.25 and standard deviation is 11.87**

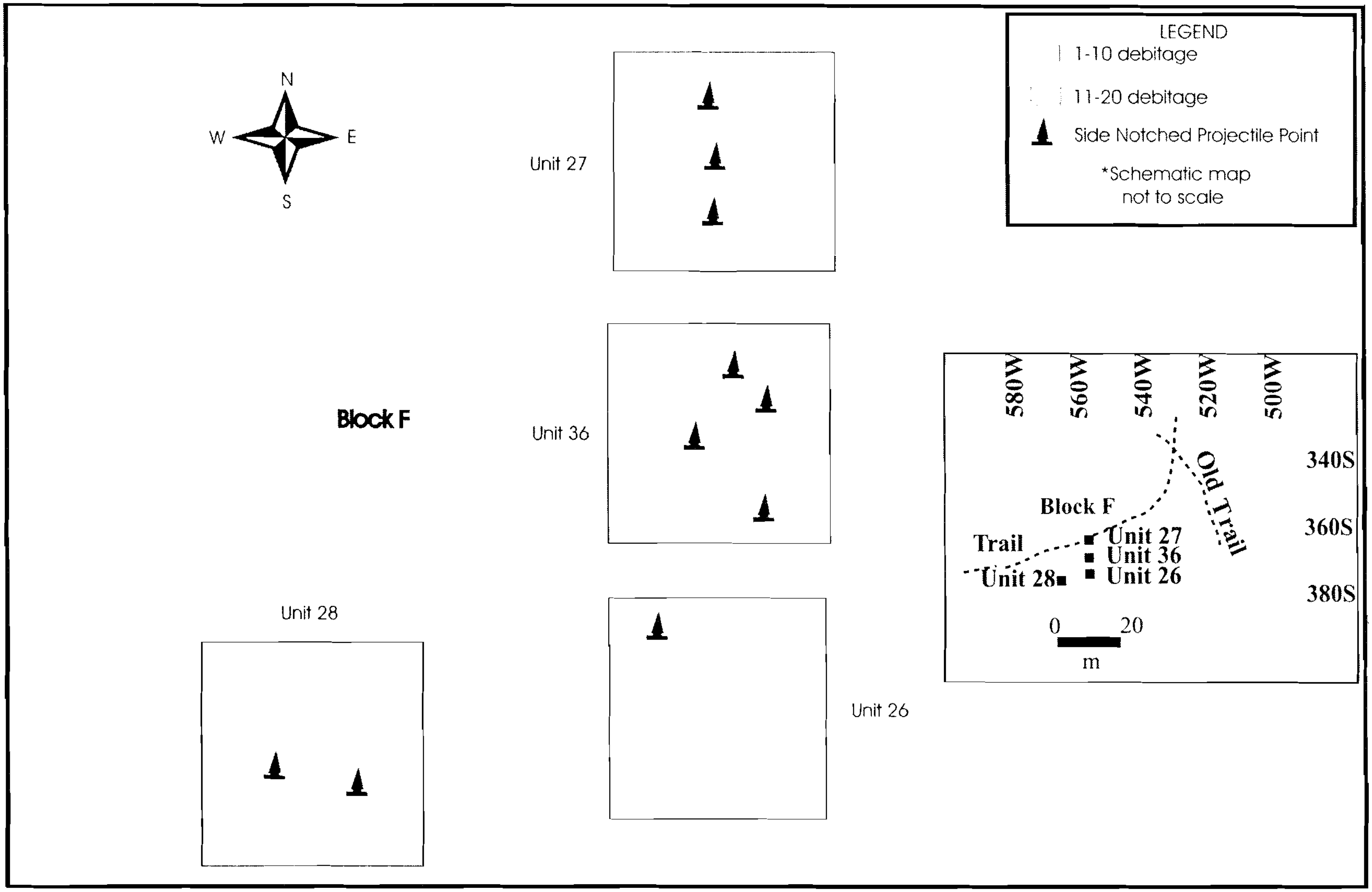

Figure 6.4 Spatial distribution of debitage and stone tools in the proposed kill area.

Given the high proportion of complete flakes and the lack of cores in the area, bifacial reduction is probably the primary activity. The high proportion of bifacial thinning flakes and complete flakes indicates that tool rejuvenation probably occurred in this area. None of the debitage has cortex present and only 3.5% of the entire assemblage exhibits evidence of thermal alteration (Table 6.13).

In conclusion, since the proposed kill area at the Jackson site produced a small lithic assemblage, it was difficult to assess the activities represented. One of the criteria used included the evidence of hearths or fire pits.

While no hearths or fire pits were exposed within the small sample, the units and the test pits yielded fire-cracked rock in the general area.

Another criteria applied to the proposed kill area include the presence of a specialized tool kit designed for hunting and killing animals. Despite the small surface area represented in this area, this locality contains the highest number of projectile points for the entire site (n=10). This is expected in a kill area. The ten projectile points include complete and broken specimens of Plains and Prairie Side-notched varieties.

Given the surface area excavated in this area, the density of projectile points recovered per square meter is 2.5 points. At the Wardell site, 426 projectile points were recovered from an excavation area (Frison 1973:20) estimated to be about 140 square metres (an estimated density of about 3 points per m^2). When it is noted that the area sampled contained three superimposed occupations and suffered from complex slope-wash and other taphonomic forces, the number of projectile points deriving from each kill event is probably less dense than noted at the Jackson site. The Hokanson site (Hamilton 2002) is used for comparative purposes because preliminary results suggest it represents a single event bison kill. Seventy projectile points were recovered from the kill area that was sampled with 17 m^2 units (density of 4 per m^2) (Hamilton 2002). When the projectile point recovery is normalized to assess density per $1m^2$, the yield from the Jackson site is probably heavier that that at the Wardell site, but not as heavy as is apparent at the Hokanson site.

Frison (1973) commented that kill areas do not contain the same tool and debitage assemblage as processing areas. Kill areas contain predominantly tools necessary for first killing the animals and then skinning and disarticulating them. These include knives, choppers, hammer stones, and retouched flakes. There are also a higher proportion of projectile points and lower amounts of debitage. Frison (1973) noted that small pressure flakes and a lack of percussion flakes are evident in kill areas. Alternatively, processing areas have tools required for cutting bone for cooking, marrow, and grease extraction activities. These include scrapers, mauls and hammer stones. These areas also have dense concentrations of pressure and percussion flakes associated with intensively modified cores.

By way of contrast, the processing area at the Jackson site has yielded dense concentrations of debitage localized in two discrete clusters. Bifacial and core reduction activities are evident. A diverse assortment of stone tools is also present in the processing area and reflects butchering and faunal processing activities. Knives, scrapers, a drill, a spokeshave, and numerous utilized flakes were recovered. The lithic assemblage associated with the proposed kill area seems to indicate activities directed toward hunting and primary butchering. Playford (2001:71) noticed that dense concentrations of smashed bone were present in the kill area that also had discrete bone clusters of low utility faunal elements such as carpals and tarsals. In addition, there were cranial and vertebral elements scattered within the area. The lack of tools associated with primary butchering such as knives in the proposed kill area may be a function of sampling or that the tools were carried to other areas of the site and discarded elsewhere, or that bone tools were employed. The lithics from the proposed kill area at the Jackson site confirms earlier statements made by Hamilton and Nicholson (1999).

6.14 Chapter Summary

Vickers focus people utilized a Plains tool kit containing Plains and Prairie Side-notched projectile points, side and end scrapers, knives, spokeshaves, and drills. The expedient tools were primarily utilized flakes. Furthermore, the Jackson site occupants had access to a wide range of raw material types, but a much narrower selection were preferred (KRF, SRC, brown chalcedony and chert). The representation of raw materials in the debitage and the formed tools exhibits an unexpected pattern. That is, the recovered tools were exclusively of KRF, SRC, brown chalcedony, and chert. The remainder of the raw material types, which are apparent in the debitage, are not evident in the tool categories. Some aspects of tool fabrication or resharpening that produced the debitage are not reflected in the tool assemblage, suggesting that these tools were more carefully curated.

Based on preliminary analysis of shovel test pit recoveries, Hamilton and Nicholson (1999) proposed that three discrete activity areas were evident at the Jackson site. Within a small hollow in the north end of the site there was a bison entrapment and kill area. The west-central part of the site contained a midden/processing area that yielded dense concentrations of smashed bison bones that probably reflect intensive bone grease extraction activities with subsequent nearby disposal. A habitation area was evident in the east-central portion of the site and consisted of a diverse mixture of lithics, pottery and fire-cracked rock. The results from this lithic analysis indicate that these identifications were valid, however, the midden/processing and habitation areas require additional clarification regarding the discrete lithic activity clusters evident within this part of the site (Figure 6.5).

The criteria used for the habitation area of the site supports the initial interpretation offered by Hamilton and Nicholson (1999). This area yielded a diverse assortment of stone tools that include a Prairie Side-notched projectile point, a side scraper, triangular performs, and utilized flakes. Low numbers of complete and identifiable stone tools are present. The entire area contains a small amount of debitage, which was scattered across the activity area. Habitation features including possible hearths and two lithic workstations were found in the northern and southern ends of the area.

The proposed midden/processing area at the site requires additional clarification, particularly in regards to the presence of a possible midden area. Based on two sets of criteria used for the proposed midden/processing area, the lithic assemblage reflects activities that accompany faunal processing tasks. A diversity of stone tool types that include Plains and Prairie Side-notched projectile points, triangular preforms, knives, side and end scrapers, a spokeshave, a drill, and a perforator are associated with the faunal remains. In addition, also present in the area are high numbers of utilized flakes. Along the eastern boundary of this area is a large lithic workstation. As well, several lithic clusters suggesting stone reduction and tool fabrication are present in the area.

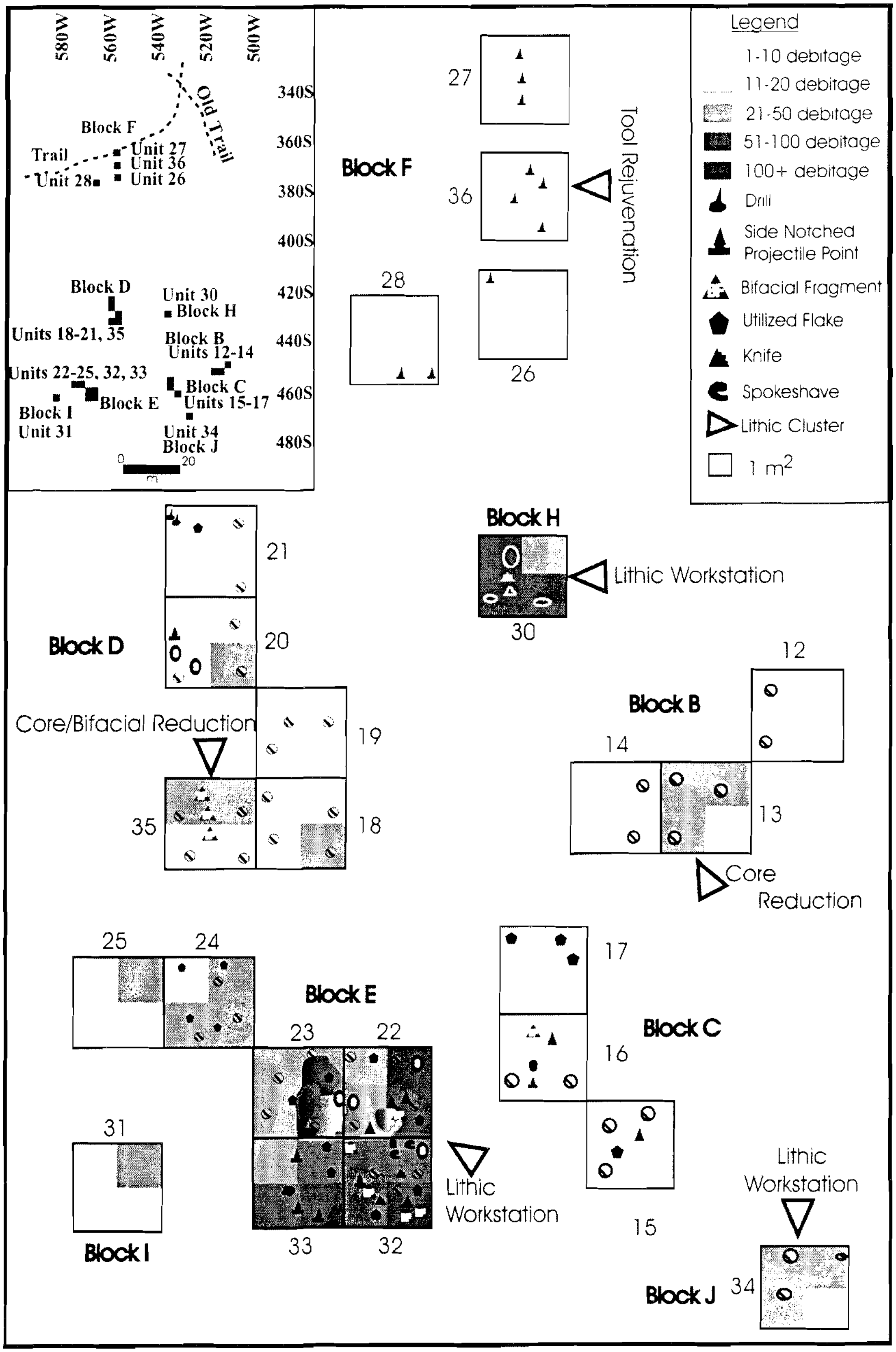

Figure 6.5 Spatial distribution of lithic clusters throughout the Jackson site.

It is not evident whether a large midden area is associated with the habitation or processing areas of the site. Recognition of a midden in this analysis is based on scattered patterns of debitage including high proportions of large debitage and broken stone tools associated with other finds such as faunal remains. Such areas should be located a relatively short distance from the main activity locale. A discard pile may be evident in the northern part of the processing area. Each of the criteria established for midden areas seems to correspond with the data, however, the small sample size prevents clear confirmation.

The criteria used for the proposed kill area at the site were met, however, the small size of the debitage sample prevents conclusive statements regarding additional activities that might have been present in the area.

Ten projectile points of the Prairie and Plains Side-notched variety are present in the area. It would seem that the earlier assessments of the activity areas derived from the shovel test recoveries were valid based on the lithic assemblage associated with the excavation units from each of the areas at the Jackson site. An exception may be the midden area, as discussed above.

Chapter Seven

Summary and Conclusions

The Jackson site is a Late Precontact bison kill and processing site that was occupied during the winter months in the Lauder Sand Hills of southwestern Manitoba. Although a small Blackduck component is evident in the southwest corner of the site, the Vickers focus occupation is the dominant presence at this site and is the focus of this thesis. The calibrated radiocarbon dates give the Jackson site a conservatively estimated age between A.D. 1427 and A.D. 1683 (p= .05) (see Table 2.1 for uncalibrated dates).

Through the processes of deglaciation, extensive varieties of lithic materials were deposited in the gravel deposits found in the Lauder Sand Hills and as a result of the subsequent formation of the Glacial Lake Hind Basin. These deposits served as sources of lithic materials for Vickers focus people. The formation of the Lauder Sand Hills also directly relates to Holocene geological processes that began during the Pleistocene glaciation and eventual deglaciation of the Glacial Lake Hind Basin during the Holocene epoch.

During the early part of the Neo-Boreal period, particularly between A.D. 1400 and 1650, numerous cultural groups living on the Northeastern Plains were affected by a series of climactic events resulted in cooler temperatures. These changes would have significant affects on the already deteriorating growing season, particularly for those Plains Woodland groups practicing horticulture. In response to declining food resources and unsuitable conditions for horticulture, subsistence strategies shifted as groups began to migrate from their homelands in search of new areas. The Tiger Hills was one of the earliest occupations where Vickers focus people resided and maintained their horticultural practices and trading connections with groups located further south. Possibly because of failing crops and a declining resource base because of climatic changes, Vickers focus people gradually migrated to the Lauder Sand Hills. This "ecological island" provided a broad range of floral and faunal resources particularly bison. This area includes a mosaic of biotic microhabitats of localized wetlands, aspen parkland, mixed grass prairie, as well as stabilized and actively eroding sand dunes.

The pottery recovered from the various Vickers focus sites in southwestern Manitoba, including the Jackson site, is indicative of an aggregation of people with ancestral origins representative of the Eastern Woodland, Middle Missouri, and Mississippian cultures. Numerous exchange networks existed between the Central Plains, Mississippi, and Middle Missouri subareas, which provided an excellent opportunity for these groups to interact with Vickers focus groups. Differences between lithic raw material procurement and utilization are apparent among the Vickers focus sites located in the Tiger Hills and in the *Makotchi-Ded Dontipi* locale. Evident in all Vickers focus lithic assemblages is a predominance of local lithic materials that include Swan River chert, silicified wood and peat, fused shale, and local cherts. Knife River flint is the most common exotic lithic material, however, obsidian and Tongue River silicified sediment were present in some site assemblages.

In the Tiger Hills region, particularly at the Lowton site, large amounts of Knife River flint, Tongue River silicified sediment, catlinite, and small amounts of obsidian are evident. In the *Makotchi-Ded Dontipi* locale, particularly at the Jackson site, large amounts of Knife River flint are present, but the amount of Tongue River silicified sediment and obsidian is considerably less. Although similar lithic materials are evident in both regions, the differences in quantities of obsidian and TRSS may suggest that a shift in the orientation of the trading direction may have occurred in the exchange network.

At the Jackson site, most of the stone tools were made from Knife River flint, brown chalcedony, Swan River chert, and banded chert. A wider range of lithic raw materials, such as moss agate, white chalcedony, quartzite, and Tongue River silicified sediment, were evident in the debitage assemblage. Given that none of the tools deposited at this site were formed from these materials, this suggests that some of the site occupants either may have manufactured or refurbished these tools at this location. These tools probably did not sustain extensive use damage, therefore, people probably curated these tools with them to an unknown location. It is also possible that the sampling methods prevented the recovery of a larger sample of tools.

The lithic tool kit at the Jackson site contains a diverse assortment of stone tools made from a wide variety of local and exotic materials. Plains Side-notched, Prairie Side-notched, and Triangular projectile points or preforms are commonly recovered from archaeological sites. Also associated with these point styles are numerous processing tools such as end and side scrapers, cutting tools including knives, and woodworking tools particularly drills, perforators, and spokeshaves. Expedient tools include retouched flakes that may have use wear evident along the lateral edges

This study addresses the association of stone tools and debitage collected from excavation units in the proposed habitation, midden/processing, and kill areas of the Jackson site. The Wardell, Harder, and Sjovold sites serve as comparative models because each site consisted of similar activity areas that may be evident at the Jackson site. This lithic analysis supports the previous identifications proposed by Hamilton and Nicholson (1999).

The habitation area at the Jackson site does meet the set of criteria derived from the Harder and Sjovold sites. These criteria included the presence of thinly scattered materials, broken or worn tools indicative of a broad range of activities. It was expected that lithic manufacturing locales consisting of dense concentrations of debitage would have been present. Hearths and disposal areas may have also been evident in the proposed habitation area at the site. A Prairie Side-notched projectile point, triangular preforms, a side scraper, a knife, utilized flakes, and some bifacial fragments are present in the area. General core and bifacial reduction activities predominate, particularly tool rejuvenation since they may have been replacing and repairing tools used to butcher the bison. Discrete activity clusters are evident throughout the habitation area. The physical distance between units 30 and 34 and units 12 to 17 suggests that several households may have been distributed throughout the area. Associated with these encampments are a series of flintknapping stations and marrow extraction and grease rendering activities. These activity clusters in this part of the habitation area may have been set aside for knapping activities because of its position away from the processing and primary butchering locales.

The proposed midden/processing area at the Jackson site is the most complex part of the site. The criteria derived from the Wardell site indicates that the lithics from the proposed midden/processing area are indicative of primarily processing activities. Prairie and Plains Side-notched projectile points were found in this area. Side and end scrapers, knives, spokeshaves, a drill, biface fragments, and a high number of utilized flakes are also part of the tool kit found in this area. Most of the debitage and tools were found in the overlap between the midden/processing and habitation areas located along the eastern boundary of the activity area. In addition, lithics from this area are densely concentrated in a relatively restricted zone. The presence of cores, shatter, and decortication flakes suggests that tool manufacturing occurred. A large midden area cannot be clearly recognized in association with the habitation or processing areas of the site, however, in the northern part of the processing area, a disposal area may have been evident. Each of the criteria established for midden areas seems to correspond with the data, however, the small sample size prevents further confirmation. As well, a meat-boiling feature was found in this area, which further suggests that this area may have served as a discard location for faunal remains to be dumped after the boiling process.

The northern end of the site located within a small willow choked hollow was identified as a bison trap and kill area. Despite the small size of the excavated area, a high number of projectile points are evident, which include Plains Side-notched and Prairie Side-notched projectile points and bifacial tips probably from projectile points. The specialized set of tools associated with this activity area supports earlier statements made by Hamilton and Nicholson (1999) and Playford (2001) who suggested that this part of the site was a kill area. Each of the projectile points is broken, probably because of impact with the body of a bison. Debitage associated with this area suggests that tool rejuvenation probably occurred here.

The Jackson site inhabitants focused primarily on tool replacement and rejuvenation activities as they processed the bison remains from the recent kill. It is possible that a habitation area is present despite the lack of structures and features. Most of the bison remains were processed in the central portion of the site. Scattered throughout this activity area are clusters of refuse containing faunal remains and lithics. North of the main processing locale was probably a general disposal area, which seems to contain products indicative of processing activities. In addition, the independent observation by Playford (2003, personal communication) of a projectile point refit, one portion deriving from the kill and the other from the processing area, indicates that these two site areas are contemporaneous.

Future research endeavours should include analyses of the lithic assemblages from other Vickers focus sites in the Tiger Hills and *Makotchi-Ded Dontipi* locale. This is important to acquire a before a better understanding of the lithic raw material preferences, manufacturing practices, and the type of tool kit associated with Vickers focus can be achieved. Additional studies are required to validate the proposal made by Nicholson and Hamilton (1999) that the distribution of lithic raw materials reflects shifts in exchange networks between Vickers focus people with those groups in the Middle Missouri and Central Plains subareas. Attention should be directed toward the lithic assemblages associated with Middle Missouri sites and Mortlach sites. These areas have demonstrated, that possibly through the trade of Knife River flint, relationships were maintained between these groups. To gain a fuller understanding about Vickers focus people, considerations of the lithics, as well as pottery and faunal assemblages will be needed.

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Appendix I

Description of the Stone Tools from the Jackson Site

Table 1 Descriptions of stone tools from each of the activity areas.

Habitation Area

Projectile Points

15-2-72 (Figure 1, A): This is a Prairie Side-notched projectile point. It is bifacially flaked along the margins; however, the central portions of the dorsal and ventral surfaces are unflaked. The tool is made of KRF. It has a triangular outline with a tapered shallow arc blade form. The point is broken diagonally across the left basal edge. A fine working edge is evident on both margins of the blade. There is no evidence of thermal alteration. The length of the point is 14.0 mm, and the width is 9.7 mm while the thickness is 1.68 mm.

Preforms

15-2-46 (Figure 1, B): This is a triangular preform made of KRF. It has a tapered shallow arc blade form, damage along the shoulder area, and a hinge termination. It consists of a pressure flaking pattern and it is difficult to identify the presence of use wear along the working edge. There is a heavy layer of patina over the surface of the tool. Thermal alteration is evident because the heat produced a change from a brown to a grey colour, crazing, and a moderate lustre. The length of the preform is 15.24 mm, the width is 12.78 mm, and the thickness is 2.34 mm.

16-3-49 (Figure 1, C): This triangular perform made with a fine variety of SRC. The right shoulder is missing and a longitudinal break crosses through the shoulder. The preform's blade has a straight, slightly converging outline. An irregular flaking pattern is evident. One working edge has fine chipping and high polish. Evidence of thermal alteration is present as indicated by a crazed surface, high lustre, and a colour change. The preform's length is 17.4 mm, the width is 9.13 mm, and the thickness is 2.22 mm.

Knife

30-3-23 (no photo is available): This knife is made of KRF. It has a triangular outline and the left edge is broken diagonally. There is lamellar flaking on the surfaces and discontinuous retouch is evident along the margins. Two working edges are present. Patina is evident on both surfaces of the tool. The length of the knife is 17.86 mm, the width is 13.49 mm, and the thickness is 3.79 mm.

Bifacial Fragments

16-3-101 (Figure 1, E): This bifacial fragment from an unidentified tool type is made of SRC. It has a rectangular outline. A shallow indent that may be a remnant of a side notch is evident on the margin of the fragment. The proximal and distal portions of the tool are missing. Both surfaces of the fragment exhibit pressure flaking, but secondary retouch is not evident along the margins. There are possibly two utilized edges indicated by polish that may suggest use wear. No thermal alteration or patina is present. The length of the fragment is 10.09 mm, the width is 28.0 mm, and the thickness is 2.93 mm.

30-5-1 (Figure 1, F): This bifacial fragment might be a base of an indeterminate tool. It is made of KRF. It has a triangular outline. A transverse break crosses the basal fragment. Lamellar flaking is present on both surfaces and there is discontinuous retouch along the margins. Two working edges are evident. Cortex covers 10% of the dorsal surface. This fragment lacks other alterations such as the effects from heat or patina.

Scraper

16-2-50 (Figure 1, D): This is a side scraper made of brown chalcedony. It has a triangular outline, a tapered shallow arc blade, and no notches. It sustained most of the damage on the left edge because only the right lateral margin of the tool is present. The dorsal surface has a random flaking pattern. Both of the working edges exhibit secondary retouch and grinding. Cortex is present on 10% of the dorsal surface and displays evidence of thermal alteration.

Midden/Processing Area

Projectile Points

20-4-50 (Figure 2, A): This is a Prairie Side-notched point. It has a square outline and a tapered shallow arc blade form. It is made of KRF. The base, tip, and the left lateral margin exhibit an impact break. The dorsal surface of this projectile point displays a regular flaking pattern, but the central portion of the ventral surface remains unflaked. Use wear is evident along the margins of the blade because the edge is flatten, has micro chipping that resembles battering, however, there is no polish evident. Cortex covers

10% of the dorsal surface. A high lustre indicates evidence of thermal alteration. In addition, the patina is red which may have resulted from thermal alteration.

22-4-25 (Figure 2, B): This is a Plains Side-notched projectile point. It is made of KRF. The right basal edge and notch are missing because a diagonal break crosses this portion of the tool. Both of the working edges of the projectile point exhibit use wear indicated by finely chipped lateral margins. The dorsal surface is extensively flaked while the central portion of the ventral surface remains unflaked. No evidence of thermal alteration is evident. The length of the projectile point is 21.85 mm, the width is 13.16 mm, and the thickness is 2.36 mm.

23-3-18 (Figure 2, C): This is also a Plains Side-notched projectile point, but it is made of brown chalcedony. Only the notch and shoulder area of the point are present because a diagonal break occurred at the neck juncture. Removal of micro-flakes from one of the lateral margins, also a working edge, indicates the presence of use wear. The second working edge is flatten and exhibits extensive flaking, possibly the result of continual battering and may indicate more intensive use wear along this margin of the tool. The notches have polish and basal thinning is evident, which possibly allowed for easier hafting to a handle. The dorsal surface is extensively flaked, but the ventral surface of the projectile point exhibits less flaking. No evidence of thermal alteration is present.

32-3-38 (Figure 2, D): This is an incomplete Plains Side-notched projectile point. It is made of a white, fine-grained SRC. A diagonal break crosses the right basal edge of the projectile point. The blade outline is triangular. Only the left side notch is present and it is U-shaped and very deep. The left basal edge and base are straight. The ventral surface is extensively flaked with a random pattern. The dorsal surface appears to have minimal flaking. There is also secondary retouch on the right blade edge.

33-3-6 (Figure 2, E): This is an unidentified side-notched projectile point. Only the base and a portion of the blade are present because a transverse break crosses the neck of the point. It is made of a fine variety of SRC. No evidence of thermal alteration is present. The small portion still evident from the blade has a finely chipped, serrated lateral edge.

33-5-3 (Figure 2, F): This is a complete Plains Side-notched projectile point, which was located near a fairly whole bison skull. It is made of KRF. The outline of the body is triangular and both of the side notches are U-shaped and deep. There is a slight slant along the basal edges and the base is straight. Random flaking is evident on the ventral and dorsal surfaces, which are completely flaked. There is fine retouch along the blade edge and it almost appears as though the blade is serrated. Basal thinning is present indicative of hafting practices.

35-3-92 (Figure 2, G): This is the proximal end of the projectile point. It is made of brown chalcedony. A single notch, basal edge, and the base are present because of transverse and longitudinal breaks across this area. A random flaking pattern is evident on the dorsal and ventral surfaces of the projectile point. It is difficult to determine if use wear is evident because the working edges are not present. The length of the fragment is 5.54 mm, the width of the base is 6.02 mm, and the thickness is 2.09 mm.

35-4-14 (Figure 2, H): This is a side notched projectile point base and it is made of KRF. It is bifacially flaked with a random flaking pattern. There is a diagonal break above the notches. The base is straight which may reflect a variety of Plains projectile points. Continuous flaking is evident along the working edge. The length is 7.34 mm, the width is 14.01 mm, and the thickness is 1.75 mm.

35-5-6 (Figure 2, I): This is a Plains Side-notched projectile point made of brown chalcedony. This point is almost complete given that the extreme portion of the tip of the blade is broken. It has a triangular outline and both of the side notches are U-shaped and deep. The basal edges and base are straight. Random flaking is present on the ventral and dorsal surfaces; however, the dorsal surface seems to have a slightly rougher exterior and appears to be unfinished. There is lustre on the point that is indicative of thermal alteration.

Preforms

22-2-26 (Figure 2, J): This is a complete triangular perform. It is made of KRF. The outline of the blade is a shallow arc. The blade has a fine working edge. The base is slanted and slightly convex. Along the basal edge is micro chipping, possibly suggestive of use wear. There is no evidence of thermal alteration evident. Patina is also not present on the surfaces. Moderate flaking pattern is evident on the dorsal and ventral surfaces. The length of the preform is 20.05 mm, the width is 15 mm, and the thickness is 1.5 mm.

32-3-10 (Figure 2, K): This triangular perform is made of a fine-grained SRC. It consists of only a blade. There are diagonal and twisted breakage patterns evident at the basal juncture of the preform. The shape of the blade is a shallow arc. The blade has a fine working edge. Evidence of use wear is difficult to determine given the material type. It seems that no polish or micro chipping are present along the lateral margins to suggest wear.

33-3-33 (Figure 2, L): This triangular perform is made of KRF. The tool is almost complete with only the tip broken. A shallow arc blade outline and a straight base are evident. The preform is quite thin in cross section. There is random flaking on the ventral and dorsal surfaces of the preform. Secondary retouch is evident along each of the edges of the tool including the base.

Knives

24-4-24 (Figure 3, A): This is a knife made with KRF. It has a triangular outline. Fifty percent of the knife's blade is skewed toward the right lateral side. Only the tip of the tool exists. The proximal end is missing because a lateral break crosses the knife's surface. In addition, cortex covers 50% of the tool's surface. There is no evidence of thermal alteration or patina. The opposite side of the working edge exhibits thinning suggesting that the tool fitted into a handle. There is a contracting flaking pattern on the dorsal surface and continuous retouch is evident on the working edge. Use wear is present along the working edge, which is ground flat with micro-chipping, and is also evident on the distal tip of the knife which is polished. The edges also have regular pressure flaking is present on the lateral edges which are also thin. On the proximal portion of the tool, grinding and a high lustre are evident which implies use wear.

32-3-61 (Figure 3, B): This is a knife made of a fine variety of blue-white SRC. The blade skews towards the left side of the tool. Only a partial blade is present because the knife is broken diagonally across the midsection. There is no evidence of thermal alteration or patina on the surfaces of the material. A removal of a large flake on the opposite side of the working edge suggests that the tool may have been hafted into a handle. There is polish along the working edge that is indicative of use wear.

32-3-75 (Figure 3, C): This knife is made of fine quality orange-white SRC. Only the tip of the tool exists because a longitudinal break crosses the midsection of the tool.

This tool may be a projectile point since it is not skewed like the other knives recovered from the midden/processing zone. A very small piece of the total tool is present which prevents accurate identification. There is no evidence of thermal alteration or presence of patina on its surface. The working edge could not be determined with confidence because of the small surface area and the type of material prevented a clear assessment of the working edge.

32-3-84 (no photo available): This is a knife made of KRF. It has a triangular body outline and a tapered shallow arc blade form. A diagonal break crosses the body of the tool, leaving only the tip of the tool. The knife is asymmetrical and is skewed 100% to the right. Regular pressure flaking is evident on the dorsal surface. There is continuous retouch along both working edges, but only the left margin has secondary retouch. The utilized edges are thin and use wear suggested by the presence of polish and extensive micro chipping is present on these edges. The proximal portion of the knife is ground and basally thinned for hafting purposes. Evidence of thermal alteration and patina are absent.

32-4-9 (Figure 3, D): This artifact is also a bifacially flaked knife. It is made of SRC. Only the tip and part of the blade of the knife are present. The blade is skewed 100% towards the right margin of the knife. There is a transverse break across the surface. The working edge is fine and has extensive secondary flaking along its margin. On the opposite edge of the utilized area, there is some secondary retouch evident. The left margin of the knife exhibits thinning suggesting it fitted into a handle. It has no evidence of thermal alteration or patina present on its surfaces.

Drill and Perforator

21-3-23 (Figure 3, E): This is a drill made of KRF. It is side-notched indicating that it fit into a handle for easier use. It has a triangular body outline and a tapered shallow arc blade form. The tip of the drill is diamond shaped. There is no damage evident on the tool thus it is complete. No evidence of thermal alteration or patina on the surface of the drill exists. A regular pressure flaking pattern is evident on the dorsal surface of the tool. It also has continuous retouch along each of the four working edges. This suggests that the drill may have been re-worked. The length of the drill is 13.86 mm, width is 11.52 mm, and thickness is 3.40 mm.

32-3-103 (Figure 3, F): This tool may be a perforator. It is made of KRF. The level completeness hinders the identification of the tool. This artifact may be the lateral margin of a side scraper. It has a triangular cross section and a relatively thick, tapered tip, which may have served as the perforator. This tip is orientated longitudinally with a flake ridge that runs down the centre of the tool. Extensive flaking is evident on the dorsal surface of the tool. Primary flaking and secondary retouch are present along the broken edge. A longitudinal break crosses the right margin of the tool and lateral breaks cross the medial and distal portions of the tool.

Bifacial Fragments

25-3-69 (Figure 3, H): This is bifacial fragment made of brown chalcedony. It has a triangular outline, however, most of the tool is missing. This prevents a determination of the tool type. It exhibits extensive damage along each of its margins and ends. There are three working edges suggested by the secondary retouch along these margins. A dihedral striking platform is evident on the proximal end of the tool. Evidence of thermal alteration and patina are absent.

35-5-18 (Figure 3, I): This is a tip from a bifacially flaked stone tool. It is made of brown chalcedony. It has a transverse break across its proximal end. There is a fine lateral edge, but no polish or chipping is present to suggest use wear. Before a person used the tool for a task, the tip might have broke from the main body of the tool or it snapped during manufacture. It is difficult to confirm if this fragment originated from a projectile point or a knife given its level of completeness.

32-5-29 (Figure 3, J): This is a fragment from a bifacially flaked stone tool. It is made of SRC. It seems to be the midsection and lateral margin from a tool. It might be a projectile point, a triangular perform or even a knife. It has a square outline and has lateral breaks on the distal and proximal ends of the fragment. There is a random flaking pattern evident on the dorsal and ventral surfaces of the tool. Continuous retouch is present on the single working edge. There is also retouch on the base to thin it and the left edge has some secondary retouch. There is no evidence of thermal alteration but there is patina over the surface of the fragment.

Scrapers

20-3-22 (Figure 4, A): This is a complete end scraper and it is the classic thumbnail shape often described of Plains end scrapers. It is made of KRF. It has an ovoid outline. Evidence of thermal alteration is evident on its surface. Thermal alteration obliterated the possible evidence of wear along the working edge of the scraper. Crazing is not evident on the dorsal surface, but is present on the ventral surface, which is also potlidded. Red cortex covers 10% of the dorsal surface and this colour of cortex may be the result of heat. Regular pressure flaking covers the dorsal and ventral surfaces. Unifacial retouch exists along the working edge, although the opposite edge has polish. Use wear is evident by the presence of micro chipping along the lateral margins. Given the thinness of the proximal end of the end scraper, it is possible that this tool fitted into a handle. The length of the end scraper is 29.34 mm, width is 23.22 mm, and thickness is 6.18 mm.

20-3-51 (Figure 4, B): This is a side scraper and it is made of KRF. It has an ovoid shape and only the tip of the tool is present. There is regular pressure flaking present on the tool's surfaces; however, the dorsal surface is extensively flaked. The ventral surface displays evidence of thermal alteration. A potlid depression is evident, within this scar, the texture is sugary, and the area surrounding the depression is smooth. Secondary retouch exists along the right lateral edge. The presence of use wear varies between the working edges with one of the edges consisting of less modification. The length of the side scraper is 17.82 mm, width is 21.34 mm, and thickness is 4.25mm.

22-4-12 (Figure 4, C): This side scraper is made of KRF. It is an incomplete tool form because the tip is broken by a diagonal break. It has two long flake scars on the dorsal surface and secondary retouch on both of the lateral margins. The base also appears to have secondary flaking along its edge. It is a very thin tool form and has a square shape.

22-4-30 (Figure 4, D): This is an end scraper made of KRF. It is similar to the classic Plains end scraper, given the thumbnail shape. It is broken at the medial section of the tool. An almost 90^0 angle is apparent on the distal end of the tool. There is extensive retouch along the working edge. Random flaking is present on the dorsal surface. The tool is extremely thick in the middle and seems to taper towards the margins.

32-2-59 (Figure 4, E): This is a side scraper made of KRF. It has a square body outline. It is incomplete because almost half of the tool is missing because of a lateral break across its surface. There is evidence of thermal alteration. Given that the working edge of the side scraper is opposite from the main area of the thermal alteration, it is possible that the tool was heated then retouched. There is secondary flaking along the working edge. The dorsal cortex is a reddish colour and the texture of the material is sugary which further indicates thermal alteration.

Spokeshave

22-3-53 (Figure 3, G): This is a spokeshave and it is made of KRF. It is incomplete and has a square body outline. Only the left lateral edge is present because a transverse break passes along the right edge. The dorsal surface has primary flaking and continuous retouch is evident along each of the three working edges. There is evidence of thermal alteration or patina on the spokeshave. The left margin has a concavity that exhibits secondary retouch. The length of the tool is 24.06 mm, width is 17.29 mm, and thickness is 2.25 mm.

Kill Area

Projectile Points

26-4-2 (Figure 5, A): This is an incomplete Plains Side-notched projectile point. It has a triangular outline and a shallow arc blade form. Given the extensive secondary retouch along the margins of the blade, serrated edges are evident. Each of the side notches is U-shaped and deep. The base and basal edges are straight. Both surfaces of the projectile point have a random flaking pattern. Evidence of thermal alteration is evident. The dorsal surface is potlidded, has a high lustre, and exhibits less flaking. Retouch does extend to the edge of the potlid. The ventral side of the projectile point is thicker than the dorsal surface.

27-5-84 (Figure 5, B): This tool is possibly a Plains projectile point. It is made of KRF. Evidence of thermal alteration is not present. It is almost complete with only the extreme tip of the tool missing because a transverse break crosses the surface. The blade of the point is a shallow arc. The side notches are U-shaped and deep. The neck of the point is thick and the base is convex. The working edge of this tool is fine. Use wear may be present with the margins exhibiting polish. The dorsal surface of the projectile point is extensively flaked. There is minimal flaking on the ventral side.

27-7-17 (Figure 5,C): This is a complete Plains Side-notched projectile point. It is made of KRF. The body outline of the point's form is triangular and the blade is a shallow arc. The side notches are U-shaped and relatively deep. The basal edges and base area are straight. On the ventral and dorsal sides, significant amounts of the tool's surface lacked extensive primary flaking. There are three longitudinal flake scars extending across the surface of the projectile point. Moderate secondary retouch is evident along the edges of the tip. Evidence of thermal alteration is not present.

28-7-16 (Figure 5, D): This is possibly a Plains Side-notched projectile point. The partial base of the tool is straight and the single side notch seems to be relatively deep. This notch is U-shaped given the sharp angle between the basal edge and base of the blade. The right basal edge is broken because diagonal break extends from the top to the bottom of the basal edge. The blade of the projectile point exhibits extensive primary flaking and secondary retouch. The blade of the point is incomplete. Evidence of thermal alteration is not present.

28-9-39 (Figure 5, E): This is possibly a Plains Side-notched projectile point made of KRF. The tip of the point is missing due to a lateral break and the left shoulder and basal edge is missing because of a diagonal break across the tool's surface. Only the right half of the projectile point is present. The body outline is triangular, the blade is a shallow arc, and the single side notch is U-shaped and deep. This projectile point has been thermally altered because of the surface displays a sugary texture and a dull lustre. The flake scars and the highest portions of these scar's ridges also have polish and are crushed. This suggests that the point may have been flaked before thermal alteration affected its surface. Extensive flake removals are evident across the point's surfaces. The working edge exhibits intensive micro chipping suggestive of use wear. Polish is evident within the side notch and along the edges of the blade of the projectile point, which may suggest intensive wear.

36-4-3 (Figure 5, F): This is an incomplete Plains Side-notched projectile point made of KRF. The point has a triangular blade form and triangular body outline. Most of the left side of the tool resembles a finished form, however, the right side requires additional retouching. The left side notch is U-shaped and relatively deep. The right side has a partially formed U-shaped notch, but it is still quite shallow. A diagonal break crosses the right basal edge. The left basal edge has a slightly rounded and square shape. The partial base appears to be straight. The point is very thin. The overall body symmetry skews to the left side. In the central areas of the dorsal and ventral surfaces of the projectile point do not exhibit extensive flaking. Only the blade edges have retouch. Evidence of thermal alteration is not present.

36-6-16 (Figure 5, G): This is a complete Prairie Side-notched projectile point. It is made of chert with bands of pink and brown colours alternating over the surface. Red patches are scattered throughout the material. The point is relatively thick and stout measuring only 15 mm in length. It has a triangular blade, triangular body outline and side notches. Both of the side notches are V-shaped and deep. The basal edges slant towards the base and are rounded. The base is straight and quite thick compared to the blade of the projectile point. There is minor lustre on the surface of the point, which may have been the result of thermal alteration.

36-6-69 a (Figure 5, H): This is the midsection of an indeterminate side-notched projectile point. This tool is made of a pink, fine-grained SRC. There is a shallow side notch on the left side of the point. Lateral breaks are evident across the neck juncture of the projectile point and across the tip of the point. Random flaking pattern present on both surfaces of the base. Evidence of thermal alteration is not present.

36-6-69 b (Figure 5, I): This is a haft element of a possible Plains Side-notched projectile point. The tool was broken at the neck/shoulder juncture. The dorsal and ventral surfaces exhibit random flaking. A partial side notch is evident on the left side. This point is made of pink, fine-grained SRC. There is lustre on the surface, which may be indicative of thermal alteration.

36-8-37 (Figure 5, J): This is a base from a Plains Side-notched projectile point. It is made of KRF. A transverse break crosses the neck juncture of the point. The basal edges slant outward and the base is straight. Secondary retouch is evident along the edge of the base and use wear suggested by polish and micro chipping may be present. Evidence of thermal alteration is not present.

Bifacial Fragments

26-3-1 (Figure 6, A): This is fragment is a tip from a bifacially flaked stone tool. Given the symmetry exhibited on this fragment, it probably broke away from a projectile point. It is made of KRF. The proximal portion of the tip exhibits an impact fracture. It displays no evidence of thermal alteration. The working edge is fine and has micro chipping indicative of use wear.

27-4-87 (Figure 6, B): This fragment is a tip from bifacially flaked tool. It is made of KRF. It exhibits a transverse break at the distal end. This fragment may be from a projectile point because it does not display the same type of symmetry evident among the knives in the midden/processing area. Some micro chipping is present along the edges and the margin is fine which suggests use wear. There is no evidence of thermal alteration evident.

27-4-99 (Figure 6, C): This fragment is a bifacially flaked tip, possibly from a projectile point. It is made of chert. It has a triangular outline and a tapered shallow arc blade form. There is a transverse break across the tip and the right edge is broken longitudinally. It has regular pressure flaking. Secondary retouch is not evident and use wear is absent. A special feature on the biface is prominent ripple marks that may be indicative of thermal alteration.

27-6-24 (Figure 6, D): This fragment is midsection from a bifacial tool. It is made of KRF. The body outline is rectangular. Only the medial section of the tool is present because a transverse break crosses the distal and proximal ends of the fragment. There is lamellar flaking on the dorsal surface and the working edge is continuously flaked. Polish and rounded edges are evident along the utilized edge.

*Artifact number 36-6-69 is labelled a and b because of duplicate numbers placed on two different artifacts during cataloguing.

Appendix II
Photographs of the Stone Tools from the Jackson Site

Photographs of the stone tools from the Jackson site.

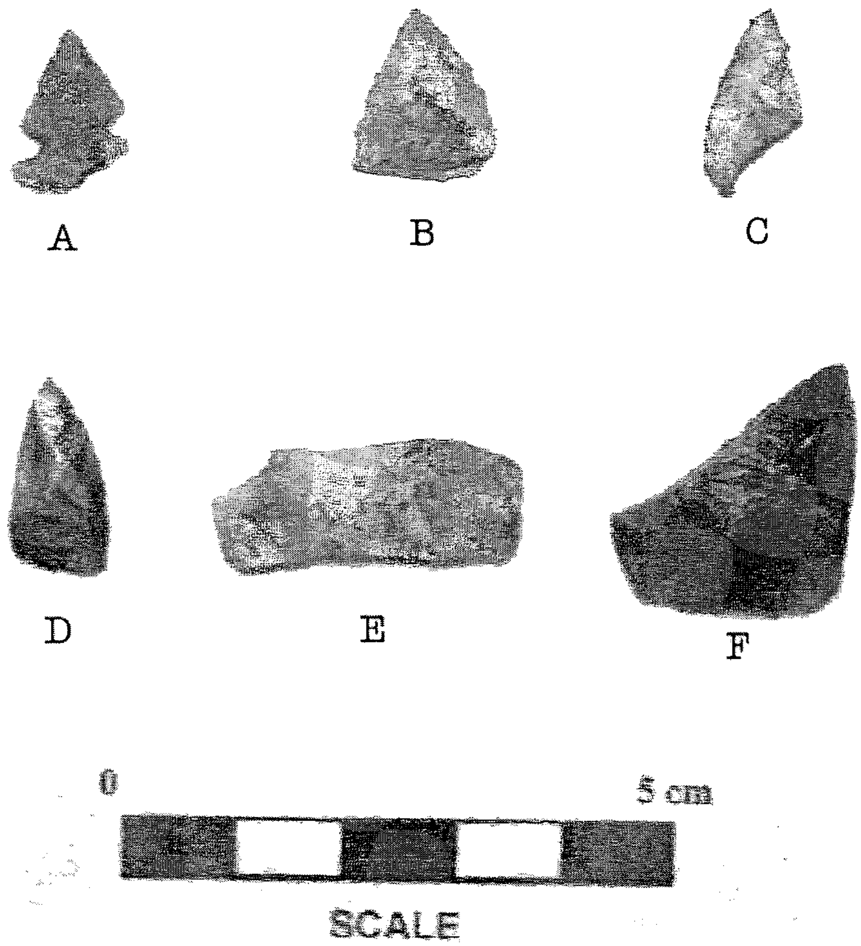

Figure 1. Formed tools recovered from the habitation area of the Jackson site: (a) 15-2-72 Prairie Side-notched projectile point; (b) 15-2-46 Triangular preform; (c) 16-3-49 Triangular preform; (d) 16-2-50 Side scraper; (e) 16-3-101 Bifacial fragment; (f) 30-5-1 Bifacial fragment.

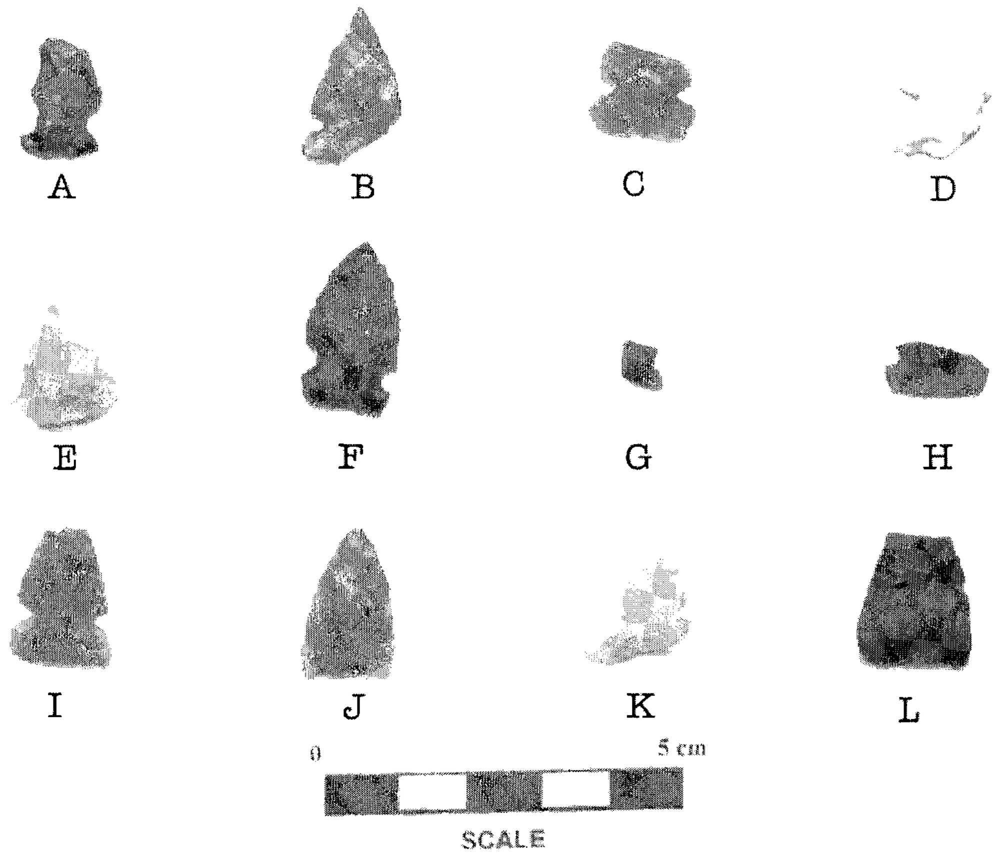

Figure 2. Projectile points and performs recovered from the processing area of the Jackson site: (a) 20-4-50 Prairie Side-notched; (b) 22-4-25 Plains Side-notched; (c) 23-3-18 Plains Side-notched; (d) 32-3-38 Plains Side-notched; (e) 33-3-6 Unidentified type; (f) 33-5-3 Plains Side-notched; (g) 35-3-92 Unidentified type; (h) 35-4-14 Unidentified type; (i) 35-5-6 Plains Side-notched; (j) 22-2-26 Triangular preform; (k) 32-3-10 Triangular preform; (l) 33-3-33 Triangular preform.

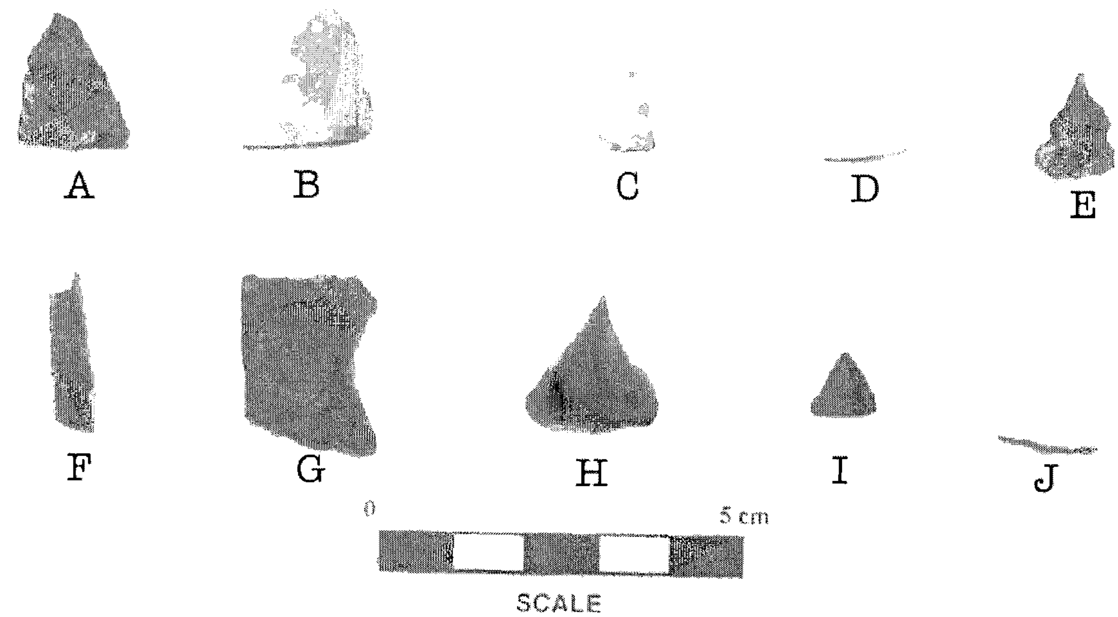

Figure 3. Knives, drills, perforator, spokeshave, and bifacial fragments recovered from the processing area of the Jackson site: (a) 24-4-24 Knife; (b) 32-2-61 Knife; (c) 32-3-75 Knife; (d) 32-4-9 Knife; (e) 21-3-23 Drill; (f) 32-3-103 Perforator; (g) 22-3-53 Spokeshave; (h) 25-3-69 Bifacial fragment; (i) 35-5-18 Bifacial fragment; (j) 32-5-29 Bifacial fragment.

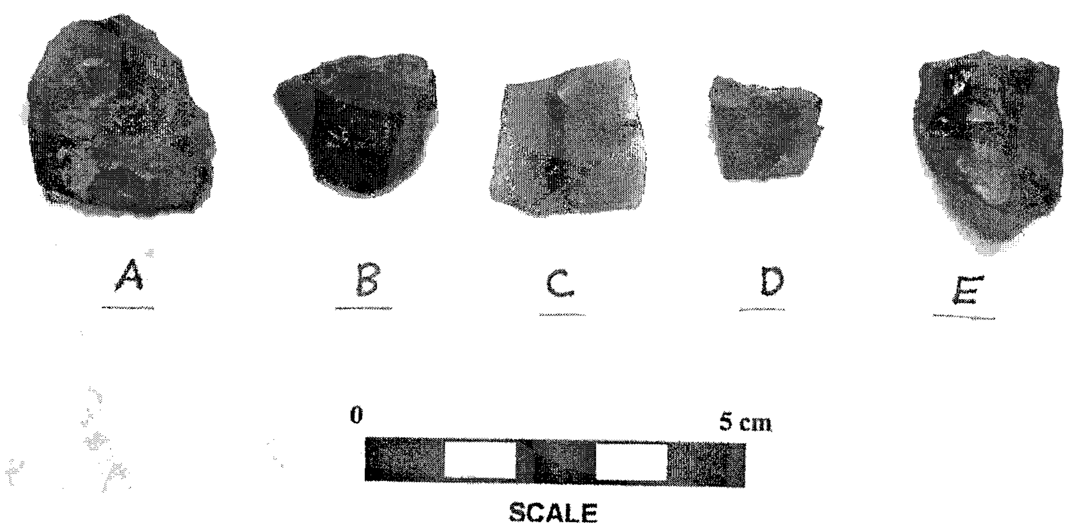

Figure 4. Side and end scrapers recovered from the processing area of the Jackson site: (a) 20-3-22 End scraper; (b) 20-3-51 Side scraper; (c) 22-4-12 Side scraper; (d) 22-4-30 End scraper; (e) 32-2-59 Side scraper.

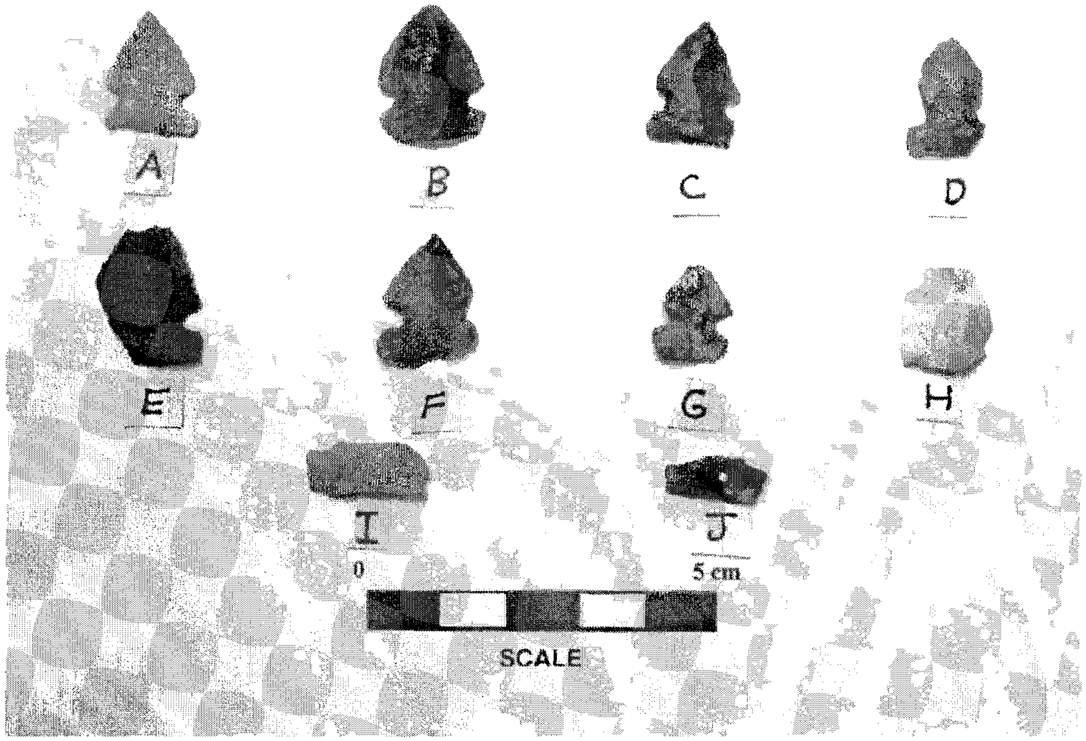

Figure 5. Projectile points recovered from the kill area of the Jackson site: (a) 26-4-2 Plains Side-notched; (b) 27-5-84 Plains Side-notched; (c) 27-7-17 Plains Side-notched; (d) 28-7-16 Plains Side-notched; (e) 28-9-39 Plains Side-notched; (f) 36-4-3 Plains Side-notched; (g) 36-6-16 Prairie Side-notched; (h) 36-6-69a Unidentified type; (i) 36-6-69b Plains Side-notched; (j) 36-8-37 Plains Side-notched.

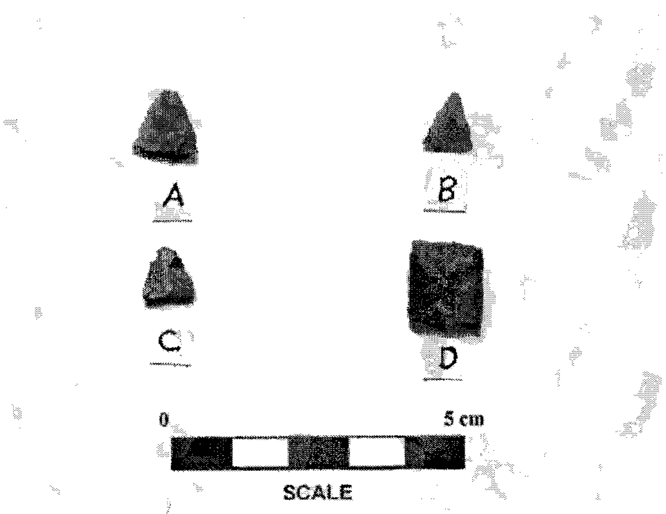

Figure 6. Bifacial fragments recovered from the kill area of the Jackson site: (a) 26-3-1; (b) 27-4-87; (c) 27-4-99; (d) 27-6-24.

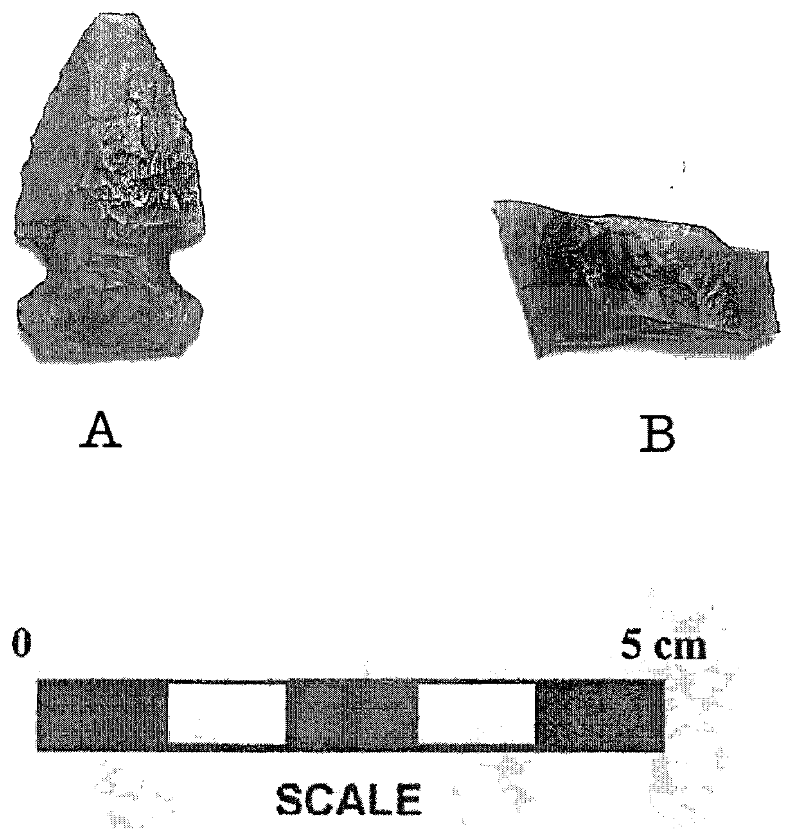

Figure 7. Formed tools recovered from unit 29 at the Jackson site: (a) 29-2-10 Plains Side-notched projectile point; (b) 29-1-13 Bifacial fragment.

Appendix III
Debitage Types Assigned for each Excavation Block

Table 1 Debitage types evident at the Jackson site.

	Waste Flake	Bifacial Thinning Flake	Shatter	Bipolar Flake	Notch	Decort-ication Flake	Potlid	Thermally Altered Debitage	Total
Units 12-14 and 17									
Agate	7	0	0	0	0	0	0	0	7
KRF	49	6	9	0	0	0	0	30	94
SRC	4	2	0	0	0	0	0	0	6
Br. Chalce	24	2	6	0	0	0	0	9	41
TRS	1	0	3	0	0	0	0	1	5
Quartzite	0	0	1	0	0	0	0	0	1
Jasper	1	0	0	0	0	0	0	0	1
Chert	3	1	0	0	0	0	0	3	7
Total	89	11	19	0	0	0	0	43	162
Units 15 to 16									
Agate	0	3	0	1	1	1	0		6
KRF	28	13	14	1	3	2	2	10	73
SRC	32	9	10	0	1	2	0	2	56
Br. Chalce	28	16	8	1	5	1	1	6	66
TRS	2	0	0	0	0	0	1	1	4
Quartzite	3	0	2	0	0	0	0	0	5
Chert	4	0	3	0	0	1	0	1	9
Moss Agai	0	1	0	0	0	0	0	0	1
Jasper	0	0	0	0	0	0	0	0	0
Silicified P	1	0	0	0	0	0	0	0	1
Wh. Chalc	1	0	0	0	0	0	0	0	1
Total	99	42	37	3	10	7	4	20	222
Unit 30									
KRF	46	32	8	1	1	0	5	11	104
SRC	173	35	43	0	2	0	4	7	264
Br. Chalce	29	7	5	0	1	0	1	6	49
Quartzite	10	0	18	0	0	0	0	0	28
Chert	2	1	2	0	0	0	0	2	7
Moss Agai	0	0	1	0	0	0	0	0	1
Silicified P	0	0	1	0	0	0	0	0	1
Wh. Chalc	5	4	0	0	0	0	0	0	9
Total	265	79	78	1	4	0	10	26	463
Units 22-25, 32, 33									
Agate	7	6	0	0	0	0	1	5	19
KRF	212	144	56	5	3	36	5	75	536
SRC	7	1	6	1	0	2	0	7	24
Br. Chalce	215	83	52	6	4	28	3	29	420
Wh. Chalc	5	3	0	0	0	0	0	0	8
Quartzite	1	0	0	0	0	0	0	0	1
Jasper	0	0	0	0	0	0	0	1	1
Chert	7	2	4	0	0	0	0	27	40
Total	454	239	118	12	7	66	9	144	1049

Units 18 to 21, 35									
Agate	5	1	1	0	0	0	0	0	7
KRF	104	46	31	4	2	10	1	44	242
SRC	6	1	1	0	0	0	0	0	8
Br. Chalce	74	23	11	0	3	1	0	8	120
TRS	3	1	1	0	0	0	0	4	9
Quartzite	2	0	2	0	0	0	0	0	4
Chert	9	0	2	0	0	0	0	5	16
Igneous M	1	1	0	0	0	0	0	0	2
Cathead C	0	0	1	0	0	0	0	0	1
Pebble Ch	1	0	0	0	0	0	0	0	1
Total	205	73	50	4	5	11	1	61	410
Units 26-28, 36									
Br. Chalce	18	5	2	1	1	0	0	0	27
Wh. Chalc	0	1	0	0	0	0	0	0	1
Chert	1	1	2	0	0	0	0	0	4
SRC	7	1	0	0	0	0	0	0	8
Quartzite	1	0	0	0	0	0	0	0	1
Total	27	8	4	1	1	0	0	0	41