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Temporal variability in lithic technological organization at the Keatley Creek Site

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TEMPORAL VARIABILITY IN LITHIC TECHNOLOGICAL ORGANIZATION AT
THE KEATLEY CREEK SITE (EeRI 7)

by
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B.A. University of North Dakota--Grand Forks, 1997

Presented in partial fulfillment of the requirements
for the degree of
Master of Arts
University of Montana
2001

Approved by

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Chairman. Board of Examiners
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S. 21-01
Date
Temporal Variability in Lithic Technological Organization at the Keatley Creek Site (EeR17)

The goal of this project is to examine the temporal variability in lithic technological organization at the Keatley Creek site (EeR17). The Keatley Creek site is located in the Mid-Fraser Canyon region of south-central British Columbia. During the 1999 University of Montana, Keatley Creek field excavations, thirty-one 50x50 centimeter excavation units were excavated to determine the extent of human occupation at this site.

A total of 6,504 lithic artifacts that were recovered during the 1999 UM excavations. The cultural components associated with these lithic artifacts include: the Lochnore phase (5,500-3,500 B. P.), the Shuswap horizon (3,500-2,400 B. P.), the Plateau horizon (2,400-1,200 B. P.), and the Kamloops horizon (1,200-200 B. P.). Very few lithic artifacts were recovered dating to the Shuswap horizon, so they have been omitted from this analysis. The 6,504 recovered lithic artifacts were classified into three distinct categories: 368 tools, 320 pieces of mesodebitage, and 5,319 pieces of macrodebitage. For the purpose of this thesis, debitage and tools were examined separately.

Chi-squared tables were used to examine the variability in debitage assemblages between Keatley Creek's different cultural components by looking at cortex flakes versus non-cortex flakes, billet flakes versus secondary/bipolar flakes, and primary flakes versus other flakes. Chi-squared tables were also used to compare cultural component variability in curated versus expedient tool types and kill/butchery versus other chipped stone tool types.

The results of the chi-squared tests demonstrated that two distinct patterns of technological organization were present at Keatley Creek. One pattern is associated with the Lochnore phase and is dominated by lithic tools that are predominately curated. The lithic debris is produced by the maintenance and production of gear, representing a highly mobile hunting oriented occupation. The second pattern is associated with the Plateau horizon and the Kamloops horizon and is likely oriented towards a more sedentary lifeway. This technological pattern is dominated by expedient flake tools. The reduction activities are focused on minimal tool maintenance and limited production of flake tools, likely from curated or stockpiled cores.
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CHAPTER ONE

INTRODUCTION

The primary objective of this thesis is to identify the range of processes responsible for the temporal variability in lithic technology at the Keatley Creek Site (EeRI 7), and to examine the implications of these results for addressing anthropologically broader questions of mobility and foraging strategies. These issues are addressed using data from the 1999 University of Montana (UM) investigations at the Keatley Creek site.

The Keatley Creek site is located in the Mid-Fraser Canyon region in south-central British Columbia, and is considered to be one of the largest pithouse villages in western Canada (Figure 1). It contains over 115 visible residential-sized house depressions, and many other smaller depressions. At its height (ca. 1,000 to 1,200 B.P.), the Keatley Creek site may have had a population of between 1,000 to 1,400 people (Hayden 1997a, Hayden et al. 1996a).

The 1999 investigations at Keatley Creek centered around Housepit 7, a large housepit located in the south-eastern portion of the core village area (Figure 2). This excavation primarily focused on determining whether or not significant differences in lithic reduction and tool use were present between each of the different cultural components associated with Keatley Creek. These cultural components include: the Lochnore phase (5,000 to 3,500 B. P.), the Shuswap horizon (3,500 to 2,400 B. P.), the Plateau horizon (2,400 to 1,200 B. P.), and the Kamloops horizon (1,200 to 200 B. P.). Another goal of the 1999 UM investigations was to determine whether or not the differences in the organization of lithic technology were the result of occupational differences, systemic differences, or a mixture of both.
In order to better understand the different strategies of tool reduction and use, the northwest corner of Housepit 7 was excavated, exposing a possible older housepit that was partially uncovered, but not excavated during earlier excavations at Keatley Creek. Four 50 X 50 centimeter test pits and two 50 centimeter wide trenches were also excavated to the west of Housepit 7 (Figure 3). This was completed in order to gain a better understanding of the range of lithic technology associated with Keatley Creek. This excavation pattern allowed for the establishment of a new early occupation chronology and provided for a more complete understanding of the range of human occupations at this site.

The 1999 University of Montana investigations represent a new research focus at the Keatley Creek site, since it is focused on establishing a cultural chronology for the entire range of occupations found here. Previous research (Hayden 1992, 1997a, 1997b, 2000; Hayden et al. 1996a, 1996b, 1996c; Hayden and Ryder 1991; Hayden and Spafford 1993; Lepofsky et al. 1996; Prentiss 1993; and Spafford 1991) has focused on the socio-economic aspects of the later occupations at Keatley Creek. During various seasons, Hayden has concentrated on locating and assessing the condition and stratigraphy of various sized house floors, examining roasting and storage pits, and looking for evidence of feasting or other ceremonial subsistence activities during the Late Prehistoric Period (3,500 to 200 B. P.).

The 1999 University of Montana investigations examined the stratigraphy of Housepit 7 and the surrounding area in order to better understand the cultural chronology of Keatley Creek. As a result, the process in which the prehistoric inhabitants of Keatley Creek achieved the level of logistically organized complex hunter-gatherers was also examined. This thesis is concerned with analyzing the recovered lithic materials from Keatley Creek in order to understand the changing socio-economic characteristics of each cultural component associated with the site.
LITHIC TECHNOLOGICAL ORGANIZATION MODEL FOR THE MID-FRASER CANYON REGION

A general pattern of temporal variability in lithic technological organization may be observed within the Mid-Fraser Canyon region. Archaeological sites surrounding the Keatley Creek site have yielded similar artifacts associated with each cultural component (Lochnore phase, Shuswap horizon, Plateau horizon, Kamloops horizon) (Richards and Rousseau 1990; Sanger 1970; Stryd and Rousseau 1996). With this in mind, a model depicting the changes in the organization of lithic technology may be created. Six distinct tests were performed in order to determine the technological and functional similarities and differences between the stratigraphic units belonging to the various cultural components. These tests also provided information depicting possible reasons why shifts in lithic technological organization occurred, allowing for a better understanding of socio-economic organization.

Within this thesis, emphasis has been placed on defining the different reduction strategies used during each cultural component because of the direct link between reduction, mobility, and foraging strategies. Expedient block core reduction; biface production; blade production; portable long-term use, and quarried bipolar strategies cover the range of reduction strategies encountered at the Keatley Creek Site (Hayden et al. 1996b). Determining the use and discard practices of tools through functional analysis of each tool was also completed to gain a better understanding of the type of mobility and foraging strategy being utilized (Spafford 1991). By examining the variation between the different cultural components, some inference may be made concerning major behavioral patterns.
This is accomplished by looking at interassemblage variability in curated versus expedient lithic technologies, kill/butchery versus other chipped stone tool technologies, cortex flakes versus non-cortex flakes, billet flakes (SFU-Keatley Creek Typology) versus non-billet flakes, and primary flakes (SFU-Keatley Creek Typology) versus non-primary flakes. When all of the methods are examined together, a shift in mobility, foraging, and socio-economic patterns is visible at Keatley Creek.

Patterns of socio-economic organization are observed as a result of the combined use of lithic data from the Keatley Creek site and from other sites within the Mid-Fraser Canyon region. The complex hunter-gatherer socio-economic system developed over a long period of time in the Mid-Fraser Canyon region, but is generally present by 2,400 B.P. (Hayden 1997a). The presence of logistically organized complex hunter-gatherers is characterized by the occurrence of high population densities, semi-sedentism, reduced residential mobility, resource specialization, differential resource ownership, ascribed status, ritual feasting, delayed return economy, storage, and prestige economies (Arnold 1996; Keeley 1988; Testart 1982; Watanabe 1983).

Within the Canadian Plateau, patterns of biseasonal mobility, with warm weather logistical movement, and cold weather sedentism in winter housepit villages are seen (Hayden 1992; Richards and Rousseau 1987). Social hierarchy and ascribed status are also observed (Hayden 1998), along with delayed return subsistence economies focused on mass harvesting of specialized resources (Hayden 1992; Richards and Rousseau 1987).

Archaeological evidence suggesting the presence of logistically organized complex hunter-gatherers at the Keatley Creek site is indicated by the appearance of a large residential village, pithouses, storage pits, roasting pits, prestige items, and ritual ceremonial items (Hayden 1981, 1997a).
The Keatley Creek site is characterized by an increasing degree of socio-economic complexity and sedentism associated with each subsequent cultural component. The mobility pattern of the Lochnore phase is not well understood, but is generally considered to be a highly transient occupation (Stryd and Rousseau 1996). The Shuswap horizon is considered to be a more sedentary occupation, which is demonstrated by the appearance of storage features, and housepits with small rims (Richards and Rousseau 1987). The Kamloops and Plateau horizon occupations have a higher degree of winter sedentism, residential stability, and housepit utilization than the other occupations. This is evident by the presence of very large rims, and multiple storage features (Richards and Rousseau 1987).

Resource utilization also changes over time at Keatley Creek. The inhabitants of the Lochnore phase were opportunistic, exploiting a variety of resources (Hayden 1997a; Stryd and Rousseau 1996), while the inhabitants of the Shuswap horizon, the Plateau horizon, and the Kamloops horizon were more resource specific, focusing on salmon resources (Hayden 1997a). There was little evidence for storage during the Lochnore phase, but there is abundant evidence for storage during the proceeding horizons (Stryd and Rousseau 1996). When all of these individual adaptive characteristics are looked at as a whole, a pattern of increasing social complexity can be seen at the Keatley Creek site.

THESIS OUTLINE

This section outlines the results of the combined tests that were performed in order to better understand the occurrence of temporal variation in lithic technology at the Keatley Creek site. The first chapter begins with the introduction of the site, and is followed by the lithic technological model for the
Mid-Fraser Canyon region. The second chapter examines the current environmental context as well as the prehistoric environmental context. This section emphasizes the changes in these environmental contexts, and how it relates to the cultural changes of the prehistoric inhabitants of Keatley Creek. This section also looks at the changes in socio-economic organization during the various occupations found at Keatley Creek. The third chapter examines the theories behind lithic technological organization. It focuses on patterns of mobility and foraging strategies that can be observed within the archaeological record. This chapter also examines the changes in the lithic technological organization and mobility patterns found within the Mid-Fraser Canyon region. The lithic tools and debitage that were recovered during the 1999 UM excavations are examined in chapter four. This chapter focuses on interassemblage variability. Through the use of statistical methods, it demonstrates that there is, indeed, a shift in technological organization between the Lochnore phase and the Plateau and Kamloops horizons. The fifth, and final chapter, provides interpretations and conclusions concerning the research conducted at Keatley Creek. Areas for future research are also discussed in this chapter. Since the Keatley Creek site is one of the key village sites on the Canadian Plateau, the study of its cultural development has wide spread implications for the entire region.
CHAPTER TWO

ENVIRONMENT, PALEOENVIRONMENT, AND CULTURE

CHRONOLOGY

SITE INTRODUCTION

This chapter provides the environmental and cultural context for the 1999 UM research at the Keatley Creek Site. This is accomplished through the initial description of the current and prehistoric environments of the Mid-Fraser Canyon region. The cultural chronology for the region is then added to the environmental context in order to illustrate the range of human adaptation.

ENVIRONMENTAL CONTEXT

Since climate, topography and drainage have always affected the demography and economy of prehistoric populations (Nelson 1973), this next section will focus on these environmental issues. Variation in altitude, precipitation and temperatures played a large part in determining what fauna and flora were available to the inhabitants of Keatley Creek in the past. It is important to note that the environmental context of the Canadian Plateau is constantly changing. This affected the prehistoric populations’ means to meet needs for food, shelter, clothing, implements, medicine, and ceremony (Chatters 1998), thus affecting the appearance of the archaeological record.
SITE SETTING

The Keatley Creek site (EeRl 7) is located in the Middle Fraser Canyon region of south-central British Columbia. It is surrounded by the Clear Range to the east and the Camelsfoot Range and the Coast Mountains to the west (Ryder 1978). It is situated 25 kilometers north of the town of Lillooet, at the base of Mount Cole, 370 meters above the Fraser river on its eastern bank (Hayden et al. 1986, Lepofsky et al. 1996). The site is clustered on the back edge of a Pleistocene river terrace, in a small basin adjacent to the mountain side (Hayden and Spafford 1993).

The Keatley Creek site consists of about 115 visible residential-sized depressions, and is considered to be one of the largest village sites in western Canada (Hayden and Spafford 1993). The site contains many large residential dwellings, some as large as 20 meters in diameter. Other features such as smaller residential depressions, storage pits, and roasting pits are also present at this site (Pokotylo and Mitchell 1998).

Prehistoric villages in the Middle Fraser Canyon Region tended to be larger in size. The inhabitants of these villages had more material wealth and social power than those inhabitants of villages found elsewhere in the Canadian Plateau Region. This is due to their proximity to optimal salmon fishing locations, and also to their central location in the trade network (Hayden and Schulting 1997). This region is considered to be a prehistoric trade center, much like the Dalles area of the Columbia Plateau. Goods were continually being traded and transported from the coast to the interior and vice-versa. This central location in the trade network
allowed the inhabitants of Keatley Creek to become a dominant force on the Canadian Plateau (Hayden and Schulting 1997).

**PHYSIOGRAPHY, TOPOGRAPHY, AND BIOLOGICAL ENVIRONMENT**

The area surrounding the Keatley Creek site was formed by both glacial action and the eroding properties of the Fraser River (Hebda 1982). The stretch of river in which the Keatley Creek site is located is on a major geologic fault line. The S-bend of the Fraser River, located 7 km south of the site, occurs where the river crosses faulted bands of sandstone, conglomerates and argillite. This geologic function dictated the flow of the Fraser River, and allowed for the development of large villages up-stream.

The area around Keatley Creek is made up of river terraces, kame terraces, alluvial fans, ground moraine or glacial till, and small areas of bedrock (Ryder 1978). The till is compact and contains a fine silt and clay matrix, and is associated with areas of poor drainage (Ryder 1978). This relatively dry geographic area supports a steppe-like flora which includes: bunch grass, sagebrush, cactus, rabbit bush, and scattered ponderosa pine (Baker 1970). Sagebrush and various grasses are the most abundant vegetation found on the site today. The surrounding forested slopes are dominated by ponderosa pine and douglas fir. These forests are gradually replaced by sub-alpine meadows in the higher altitudes (Lepofsky et al. 1996).
Because of the Keatley Creek’s close proximity to an abundance of different biotic zones, there was an increased accessibility to a variety of different plant and animal resources. Salmon, lake trout, beaver, moose, deer, bighorn sheep, black bear, rabbit, water fowl, sage grouse, and California quail were utilized as food resources along with various kinds of berries and edible roots (Lepofsky et al. 1996).

**PALEOENVIRONMENTAL SUMMARY**

The Mid-Fraser Canyon region was most likely deglaciated by 13,000 B. P. Since there has been no formal geologic survey on the Mid-Fraser Canyon, this data is based on the survey of the nearby Highland Valley on the Thompson Plateau. Hebda (1982) suggests that the Mid-Fraser Canyon region would have been able to support biota and human occupation sometime after 12,000 B.P. There are seven distinct environmental periods documented for the Interior Canadian Plateau during the last 12,000 years during which humans occupied this region (Chatters 1998, Chatters and Pokotylo 1998; Hebda 1982). Climate, fauna, and vegetation are described for each of these seven environmental periods in order to understand the living conditions of the prehistoric populations in this area.

**12,000 to 11,000 B. P.**

During this time period prehistoric populations are thought to have lived along with prehistoric megafauna on the Canadian Plateau. This is evidenced by the recovery of a mastodon associated with a human occupation at the Sequim site on the Olympic Peninsula in Washington State (Chatters 1995). The climate during
this time period was cool to cold and dry (Hebda 1982). Data concerning the environment and human populations during this time period is scarce.

11,000 to 9,500 B. P.

During this time period, the dominant tree species was *Populus* most likely *Populus tremuloides*. Lodgepole pine (*Pinus cortata*) and western white pine (*Pinus monticola*) were also quite abundant during this time period (Hebda 1982). Aspen and *Artemisia spp.* may have combined to form parkland in the more arid areas and closed forests in the more wet areas. The lake levels were high during this time period, and the climate was likely cool and moist.

Human populations on the Canadian Plateau during this time period were infrequent, and were focused on hunting large game for their subsistence. The procurement of fish from the local rivers supplemented this large game diet (Chatters and Pokotylo 1998). Chatters and Pokotylo (1998) believe that the geologic stabilization of the mountain regions and landscapes after glaciation caused the human populations to avoid this region. The few groups that were present in the region were likely the maximum that the environment could easily support (Chatters and Pokotylo 1998).

9,500 to 6,400 B. P.

It is during this time period that precipitation increases (Chatters 1989). The lower forest boundaries shift down slope, creating a more forested typography (Hebda 1982). Deer were the primary food source, but other animals such as rabbits, beaver, waterfowl, muskrats, marmots, salmon, freshwater fish, small
birds, and turtles were also procured. Plant resources were also utilized to form a broad base diet (Chatters and Pokotylo 1998).

After 6,000 B. P., the climate becomes more cool and moist as the result of the maritime climatic patterns with more rain and cooler temperatures (Chatters 1998). Towards the end of this time period, there is a shift warmer and wetter winters. This caused root plants, grasses, sagebrush, hemlock, and cedar to increase in numbers (Chatters 1998; Hebda 1982). Douglas fir decreases in number, and lakes either dried out or significantly decreased in size at the end of this period (Chatters 1998; Hebda 1982).

6,400 to 4,500 B.P.

The early portion of this time period is marked by a warmer, and wetter climate (Chatters 1998; Hebda 1982). At around 5,000 B.P., the climate began to cool, which caused the expansion and closing of different types of forests (Chatters 1998; Hebda 1982). There was also an increase in precipitation between 5,000 and 4,000 B. P., which is thought to have affected the river systems (Kuijt 1989). Major hydrological systems would have increased in size and reliability, while small ephemeral streams would have flowed on a more regular basis (Kuijt 1989). The temperature of the streams would also have been cooler due to the vegetational changes. The new vegetation pattern would have caused a greater amount of shade to be over the rivers, keeping the sun from heating up the water (Hebda 1982). The impact from both the increase in the rate of discharge and the lowering of the water temperatures increased the numbers of spawning fish (salmon) that utilized the rivers annually (Fladmark 1975, Schalk 1977). The increase in spawning fish allowed human populations to begin to shift their subsistence economies.
The faunal assemblages still remained quite diverse during this time period, with a subsistence base focused on small game, ungulates, and plant resources. The utilization of salmon and freshwater mollusks increases by the end of this period, but not drastically (Chatters and Pokotylo 1998). Because of the increased moisture, there is an increase in the number and size of lakes, and poorly drained wetlands begin to develop (Hebda 1982).

4,500 to 2,800 B.P.

At 4,500 B.P., declining temperatures caused high mountain glaciers to advance, sub-alpine conifers to move downslope, and river temperatures to decrease (Chatters and Pokotylo 1998). The colder summer and winter temperatures shortened the vegetational productive seasons. The retention of snow packs lasted into the spring and summer months, causing the river to maintain a cool temperature throughout the year (Hebda 1982).

Salmon production peaked during the beginning of this time period, and ungulate populations declined because of the shift in vegetation (Kuijt 1989). Because of this decline of ungulate populations and the increase in salmon populations, the shift towards a marine diet based on anadromous fish was a natural one for prehistoric populations in this region (Kuijt 1989; Stryd and Rousseau 1996). The reduced ungulate population would have cause a great deal of resource stress on the inhabitants of the Mid-Fraser Canyon region. Since there was not a storage system in place during that time period, longer and more frequent trips would be needed in order to obtain enough food to survive (Rousseau et al. 1990).

This shift towards salmon utilization caused a great degree of change in subsistence strategies of the populations during that time period. Since salmon
spawn seasonally, and are only available during certain times of the year, prehistoric populations needed a way to make that resource last all year round. In order to accomplish this, populations shifted their subsistence and settlement strategies towards increased sedentism, the use of semi-subterranean dwellings, a highly developed storage technology, and a delayed return subsistence economy (Kuijt 1989). While salmon dominate the faunal assemblages from this period, small forest dwelling rodents and lagomorphs were also recovered in the Mid-Fraser Canyon region (Rousseau et al. 1990).

2,800 to 1,500 B. P.

There is evidence for a minor warming and drying episode during the earliest part of this period, which caused the glaciers to recede and modern vegetation patterns to emerge (Chatters 1998; Chatters and Pokotylo 1998). The forests opened up and moved upslope, allowing the prehistoric populations access to an extended food harvesting range. They now had access to roots in the uplands, and salmon from the river. Because of this greater access to roots, there is an increase in root processing ovens in the highlands surrounding the villages in the Mid-Fraser Canyon region (Pokotylo and Froese 1983).

A consequence of this greater degree of utilization of the highlands and other regions is a shift in the variety and quality in lithic materials. On the trips into the highlands task-oriented groups must have obtained roots and other resources, as well as obtaining lithic materials directly from the sources, or through trade with other groups that were encountered along the way (Chatters and Pokotylo 1998).
1,500 to 200 B.P.

The Little Climatic Optimum, which lasted from 1,050 to 750 B.P., brought on a series of droughts and floods, and increased forest openings in the Northern Plateau region. This caused adverse affects on the region that are not well understood, which are discussed in the culture history section of this chapter. The Little Ice Age, which lasted from 550 to 100 B.P., was another short-lived climatic episode that cooled the overall temperatures and caused the highland glaciers to advance. During this time period, the populations were controlling their habitat by exploiting several different habitats in order to suit the needs of their population, they obtained balance by collecting resources from meadows, steppes, and forests (Chatters 1998).

CULTURE HISTORY OF THE CANADIAN PLATEAU

This section reviews the culture history of the Canadian Plateau in south-central British Columbia between the time of de-glaciation, ca. 12,000/11,000 BP, and the contact period, ca. 200 BP. It summarizes the available archaeological data of this time period and offers a revised culture history model focused on the Mid-Fraser Canyon Region. This section also examines the different theoretical ideas for the changes documented in subsistence, social, and technological organization in this region.

CANADIAN PLATEAU CULTURE AREA

The Canadian Plateau geographic culture area lies within British Columbia between the great bend in the Fraser River to the north, the Rocky Mountains to
the east, the Coast Mountains to the West, and 50 miles above the border with the United States to the south (Richards and Rousseau 1987). There are a number of different geographical sub-divisions within this greater Canadian Plateau area. The Mid-Fraser Canyon sub-division is examined most closely since it contains the Keatley Creek site (EeRl 7). The Mid-Fraser Canyon sub-division includes the river valley itself and its surrounding drainages stretching from Big Bar to south of Lytton.

The Mid-Fraser Canyon region is quite arid, located within the rain shadow of the Coast Range. The average annual precipitation is only 25-30 cm (Pokotylo and Mitchell 1998). This region supports the Interior Douglas Fir Bioclimatic Zone (Farley 1979), which is dominated by the presence of douglas fir, sagebrush, and various grasses (Stryd and Rousseau 1996).

Linguistical organization within the Plateau Culture Area includes the Sahapitin speaking people, the Kutenai; the Upper Chinook; and the Athapaskan speaking Nicola, Carrier, Sekani, and Chilcotin (Ray 1939). The inhabitants of the Mid-Fraser Canyon Region were Interior Salishan speakers. Two ethnographic groups have been identified: the Upper Lillooet or Stl’atl’imx and the Shuswap or Secwepmc. The Thompson or Nlaka7pamux also used the Mid-Fraser area. Hayden (1992) provides an overview of the recent historic and contemporary ethnographic context of the Middle Fraser area.

**MID-FRASER CULTURAL CHRONOLOGY**

David Sanger, in his pioneering research in the Mid-Fraser region during the late 1960s, split up the archaeological past into 4 temporally distinct periods. They include the Late Period, which dates between 150 BP to 2,000 BP; the
Upper Middle Period, dating 2,000 to 3,500 BP; the Lower Middle Period, dating 3,500 to 5,000 BP, and the Early Period, dating between 5,000 and 7,000 BP (Sanger 1970). This model was the building block upon which other researchers developed cultural historical models. Stryd and Rousseau (1996) have recently divided the Canadian Plateau into three broad time periods, they include: the Early Period, dating between 11,000 and 7,000 BP; the Middle Period, dating 7,000 and 3,500 BP; and the Late Period, dating 3,500 and 200 BP (Stryd and Rousseau 1996).

**EARLY PERIOD - 11,000 to 7,000 BP**

The Early Period begins just after deglaciation on the Canadian Plateau, and continues until the end of the Hypsithermal Climatic Period (Hebda 1982). Although much of the Canadian Plateau was ice-free and supporting grasslands by 11,500 BP, there is little evidence of human activity until about 7,500 (Pokotylo and Mitchell 1998). Isolated finds dominate the archaeological record for the duration of this period.

Diagnostic projectile points from the following traditions have been found on the Canadian Plateau during this Early Period: the Plano Tradition, the Early Coast Microblade Tradition, the Early Stemmed Point Tradition, and the Western Fluted Point Tradition (Fladmark 1986, Stryd and Rousseau 1996). There is no clear agreement on the interpretation of what the presence of these contemporaneous but independent early cultural traditions means (Stryd and Rousseau 1996). It may suggest movement from a number of different groups from the south to the north at around 10,500 BP (Fladmark 1982; Stryd and Rousseau 1996), or it may represent direct contact with Plains groups from the south (Grabert 1974).
Other lithic artifacts found on the Canadian Plateau that have been associated with this Early Period include pebble choppers and leaf-shaped points. It has been suggested (Richards 1978) that these artifacts may have been derived from the Old Cordilleran Tradition found on the Columbia Plateau and the central and south coasts of British Columbia.

Because archaeological data are so sparse during this Early Period, very little is known about the inhabitants’ lifeways. A carbon isotope analysis was completed on an individual from the Gore Creek site in the Thompson River Drainage, just to the east of the Mid-Fraser Drainage, dated at 8,550±115. The results from this analysis suggests that only 8% of the diet was from marine resources (salmon), indicating a possible focus on terrestrial fauna (Pokotylo and Mitchell 1998). Because of this focus on terrestrial fauna, sites tended to be in upland areas, rather than in the river valleys. The fact that most of the archaeological surveys completed in the Canadian Plateau have been along river drainages suggests that there may be a number of Early Period sites that have not been recorded (Pokotylo and Mitchell 1998). More research will be needed before we have a full understanding of the culture history of this Early Period.

**MIDDLE PERIOD-7,000 to 3,500 BP**

The Middle Period of the Canadian Plateau Cultural Sequence begins at the onset of the Hypsithermal Climatic Period at 7,000 BP, and ends at 3,500 BP (Stryd and Rousseau 1996). This Middle Period is associated with cooler and wetter conditions in the Mid-Fraser Canyon Region, and the expansion of mesic grasslands at both low and mid elevations (Hebda 1982). There are three different cultural phases that are associated with the middle period. These phases include the Early Nesîkep phase, which lasts from 7,000 to 6,000 BP, the Lehman phase,
which lasts from 6,000 to 4,500 BP, and the Lochnore phase, which lasts from 5,500 to 3,500 BP (Pokotylo and Mitchell 1998).

**NESIKEP TRADITION-7,000 to 4,500 BP**

The Early Nesikep phase and the Lehman phase have been combined to form the Nesikep Tradition, which lasted from 7,000 to 4,500 BP (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). Stryd and Rousseau (1996) suggest that the Nesikep Tradition is a representation of an adaptive pattern that resulted from a mixing of people and cultures belonging to a number of different cultural traditions at the onset of cooler and wetter conditions. During the Nesikep Tradition, people focused on obtaining deer and elk for subsistence resources. They also procured rabbits, rodents, small birds, mollusks, salmon, freshwater fish, and plant resources (Sanger 1969, 1970).

**EARLY NESIKEP PHASE-7,000 to 6,000 BP**

The Early Nesikep phase is marked by the presence of well-made, relatively thin projectile points that are lanceolate, corner notched, and barbed in outline and have re-curved or straight lateral margins, with thin lenticular cross-sections (Stryd and Rousseau 1996). These projectile points are characterized by V shaped corner notches, straight or convex basal margins, and slight to pronounced edge grinding along both the basal and basal-lateral margins (Pokotylo and Mitchell 1998, Stryd 1973). There is also a high incidence of formed unifaces, microblades, wedge-shaped microblade cores, ground rodent incisors, bone points and needles, antler wedges, and red ochre associated with this phase (Stryd and Rousseau 1996, Stryd 1973). The most common subsistence remains recovered from Early
Nesikep phases sites are deer; but elk, salmon, steelhead trout, and bird remains have been encountered. There is no evidence for an intensified use of salmon at this time (Pokotylo and Mitchell 1998).

**LEHMAN PHASE- 6,000 to 4,500 BP**

The Lehman phase is characterized by the presence of Lehman obliquely notched points. These points are pentagonal in shape and are obliquely oriented, and they have V-shaped corner or side notches (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). The Lehman phase assemblage also includes thin, circular scrapers that have been retouched along the entire margin; lanceolate knives with straight, cortex-covered bases; horseshoe-shaped convex end-scrapers; and elliptical-shaped knives with prominent striking platforms at their bases. There is a high occurrence of medium and fine grained basalts, and an apparent absence of microblade technology associated with this cultural phase (Pokotylo and Mitchell 1998). Subsistence during the Lehman phase was focused on deer, elk, bird, rabbit, and small rodents, although a greater reliance on marine resources was developing. Carbon isotope analysis of human remains from a number of individuals dating to this time period suggest a $38 \pm 10\%$ marine diet (Chisholm and Nelson 1983). This is a substantial increase over the 8% marine diet of the Early Period.

**LOCHMORE PHASE- 5,500 to 3,500 BP**

The Lochnore phase of the Middle Period begins at 5,500 BP and lasts until 3,500 BP. Stryd and Rousseau (1996) consider the Lochnore phase to be the
initial phase of the Plateau Pithouse Tradition. The Lochnore phase has been interpreted by Stryd and Rousseau (1996) as a forest and river-oriented adaptive pattern that developed from Salishan speaking people from the coast to the Canadian Plateau moving along the Fraser River. This inland movement occurred as a result of the increasing numbers of salmon that were available inland with the onset of cooler and moister climatic conditions (Pokotylo and Mitchell 1998).

The initial part of the Lochnore phase overlaps with the Leman phase of the Nesikep Tradition, and it may indicate that two different groups were using this region (Pokotylo and Mitchell 1998, Suttles and Elmendorf 1963). Stryd and Rousseau (1996) suggest that the Lehman phase inhabitants represented a non-Salishan speaking group, while the Lochnore phase represented a Salishan speaking group. Sanger (1969) suggests that the Lochnore phase is a late manifestation of the Old Cordilleran phase. This fits nicely with Pokotylo and Mitchell’s (1998) model that the Lochnore phase inhabitants, who were fishing oriented, moved into the Mid-Fraser Region from the coast, and coexisted with the Lehman phase people for around 1,000 years. They suggest that over time, the Lochnore phase people culturally and genetically absorbed the Lehman phase people (Pokotylo and Mitchell 1998). Hayden (2000) disagrees with Pokotylo and Mitchell’s (1998) model, suggesting that it is unlikely that members of two distinct cultural traditions would have lived in the same location. He believes that the Lehman and Lochnore phases represent temporal distinctions within one cultural group (Hayden 2000). More research is needed to fully understand the cultural transitions that occurred during this time period.

Sites that date to the Lochnore phase have been encountered on lake shores, on upper terraces of major tributaries to the Fraser and Thompson Rivers, and in the valleys of these major rivers (Pokotylo and Mitchell 1998).
The lithic artifacts associated with the Lochnore phase are most often made out of coarse-grained basalt (Stryd and Rousseau 1996). Lochnore side-notched projectile points are the most common point type during this time period. These points are thick, leaf-shaped, lanceolate, unbarbed points with wide side notches, pointed or concave bases, and are heavily ground along the basal margins (Pokotylo and Mitchell 1998). Other lithic tools associated with the Lochnore phases include: macroblades, microblades, pebble choppers, edge battered pebbles, concave-ended unifaces, flake scrapers, tear-shaped bifaces, notched pebbles, crescents, concave-edged endscrapers, bipolar tools, and abraders (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996; Wilson Consultants Ltd. 1992).

Both notched and unnotched varieties of Lochnore points have been found in Lochnore phase assemblages. The notched varieties tend to be more common during the initial portion of the Lochnore phase, and the unnotched varieties become more frequent during the latter half of the phase (Stryd and Rousseau 1996). The appearance of microblade technology is also varied throughout the Lochnore phase. Microblades were originally considered to be absent from this phase, but large numbers of this tool type have been found at the Keatley Creek site (Hayden and Spafford 1993).

Non-lithic artifacts that have been associated with the Lochnore phase include: bone splinter awls, bone splinter unipoints, formed bone unipoints, bone needles, medipodial awls, antler flakes, antler wedges, unilaterally barbed antler points, drilled animal tooth pendants, worked rodent incisors, eagle claw pendants, *Limpet* shell beads, and *Olivella* shell beads (Wilson Consultants Ltd. 1992).

Subsistence during the Lochnore phase was broad based and included: deer, elk, beaver, muskrat, porcupine, marmot, turtle, rabbit, cooper’s hawk, duck,
loon, goshawk, goose, eagle, salmon, peamouth, sucker, northern squawfish, chub, burbot, whitefish, and freshwater mollusks (Stryd and Rousseau 1996).

Pithouses were initially considered to be absent from the Lochnore phase, but recent work at the Baker site, in the Thompson Drainage, has uncovered three housepits that date to the later part of this phase (Wilson Consultants Ltd. 1992). These structures predate all other Canadian Plateau dwellings by nearly 1,000 years. All three of the house depressions are round to oval in shape, and range from 3.0 to 4.5 meters in diameter and 35-50 centimeters in depth. These depressions have shallow-saucer shaped floors, steep walls, interior storage pits, and central hearths. The roof seems to have been made out of light poles, covered in birch bark, and was held up with a central support (Wilson Consultants Ltd. 1992).

There is evidence for storage of salmon, but the intensity of salmon fishing is still unknown (Pokotylo and Mitchell 1998; Wilson Consultants Ltd. 1992). The presence of storage, coupled with the large number of salmon remains uncovered at the Baker site suggest that by the end of the Lochnore phase, over-winter seasonal sedentism may have been occurring (Stryd and Rousseau 1996). Rousseau, Muir, and Alexander (1990) characterize the Lochnore phase as the beginning of the forager-collector system, as defined by Binford (1980). Although evidence for the semi-sedentary winter village pattern is absent, the presence of limited numbers of housepits, storage features, and certain kinds of faunal remains dating to the Lochnore phase supports this interpretation.

Carbon isotope analysis of an individual that dates to the Lochnore phase suggests that approximately 38% of the diet consisted of marine protein, which was obtained from salmon (Chisholm 1986). This suggests a steady increase in the importance of salmon over time in the Mid-Fraser Region.
The latter part of the Lochnore phase seems to be quite similar to the following Late Period of culture history. In fact, the differences between the Lochnore phase and the Late Period are mainly one of intensity and scale, with more intensive salmon usage, a greater degree of salmon storage, a more developed salmon procurement technology, larger pithouse villages, and a more developed trade network with the coast associated with the Late Period (Stryd and Rousseau 1996).

\textbf{LATE PERIOD-3,500 to 200 BP}

The Late Period is made up of three distinct cultural horizons, including the Shuswap horizon, (3,500 to 2,400 BP); the Plateau horizon, (2,400 to 1,200 BP), and the Kamloops horizon, (1,200 to 200 BP) (Richards and Rousseau 1987). These three cultural horizons make up the Plateau Pithouse Tradition (Richards and Rousseau 1987). The Lochnore phase may or may not be included within the Plateau Pithouse Tradition, more research is needed to fully understand the placement of this cultural component. The Plateau Pithouse Tradition is characterized by band-level, logistically organized (Binford 1980), semi-sedentary, hunter-gatherer societies that lived in pithouse dwellings and relied heavily on anadromous fish for subsistence (Richards and Rousseau 1987). It has been suggested that this shift towards semi-sedentism is a result of the changing environmental conditions during the cool, moist climatic maximum between 4,000 and 3,200 BP (Hansen 1955; Kuijt 1989). Kuijt (1989) suggests that the changes in the environment caused ungulates to reduce in density and distribution, while at the same time, caused the increase in the availability of anadromous fish. This increase in the number of anadromous fish led to the major shift in the adaptive response of the human population in the Mid-Fraser Canyon, which developed into
the Plateau Pithouse Tradition (Pokotylo and Mitchell 1998). Chatters (1995) and Prentiss and Chatters (n.d.) argue that the collector system associated with the Shuswap horizon did not develop independently in the Fraser area, but was part of a Pacific Northwest region-wide phenomenon.

**SHUSWAP HORIZON-3,500 to 2,400 BP**

The Shuswap horizon is the first fully accepted horizon of the Plateau Pithouse Tradition. The pithouses that are associated with the Shuswap horizon are quite large, averaging at about 10.7 meters in diameter. They are circular, oval, and rectangular in plan, they are steep walled with flat bottoms, they lack raised earth rims, and the floors tend to be rectangular in plan (Richards and Rousseau 1987). The houses have side entrances, hearths, and internal storage and cooking pits. The presence of large post holes indicates that there was a substantial wooden superstructure, which was most likely covered with earth. A few external storage and cooking pits have been found outside of the housepit, but they are rare, and only occur during the last 500 years of the Shuswap horizon (Richards and Rousseau 1987). External storage features are more common during the following Plateau horizon, and may indicate a shift in cultural behavior.

Lithic assemblages associated with the Shuswap horizon are less complex in workmanship, composition, and technological sophistication compared with the later horizons of the Plateau Pithouse Tradition (Richards and Rousseau 1987). Low to medium quality materials were used to make many of the tools, which resulted in their relatively crude appearance. High quality raw lithic materials such as vitreous trachydacite, jasper, and chalcedony were used to make some of the more finely made tools (Richards and Rousseau 1987).
Shuswap projectile points have a mean length of 4 centimeters, a width of 1.8 centimeters, and an average neck width of 1.10 centimeters, and were most likely used as atlatl or a spear tips (Richards and Rousseau 1987). Some of the Shuswap point forms are remarkably similar to the Hanna, Duncan, McKeen, and Oxbow points of the Northern Plains (Reeves 1969, Richards and Rousseau 1987). This may indicate some sort of contact between the Canadian Plateau and the Northern Plains groups.

Other lithic tools associated with the Shuswap horizon include key-shaped unifaces and bifaces, crude unifacial and bifacial flake tools, microblades, and cores. Formal scrapers, ground stone, and detailed artwork is very rare among Shuswap assemblages, suggesting a more expedient technological organization (Richards and Rousseau 1987).

Subsistence during the Shuswap horizon was focused on: deer, elk, black bear, sheep, muskrat, beaver, snowshoe hare, red fox, birds, fresh water mussels, trout, salmon, and trumpeter swans (Richards and Rousseau 1987; Wyatt 1971). There is evidence that salmon procurement was becoming more important during this time period, but it is not considered to be the main source of diet until the later horizons of the Plateau Pithouse Tradition (Chisholm 1986).

Trade with the coast is more common during the Shuswap horizon and is demonstrated by Dentalium shells on the Plateau, and nephrite on the coast. Several Shuswap points are also similar to the Locarno Beach phase points on the coast, indicating that there was some sort of contact between these two culture areas (Borden 1970).
The Plateau horizon is the next cultural component of the Late Period of the Canadian Plateau. This horizon is related to the climatic shift from cool and moist conditions to the more warm and dry conditions in which we still see today (Hebda 1982).

Housepits that are associated with the Plateau horizon tend to be smaller than those of the previous Shuswap horizon and the proceeding Kamloops horizon. The housepits average 6.14 meters in diameter, they are circular to oval in plan, they lack a raised earth rim, they have a central hearth feature, and a few small cooking, storage and refuse pits (Carlson 1980; Richards and Rousseau 1987; Wilson 1980). The walls of the housepits are usually steep, and the floors are flat with a basin shaped profile. There is evidence for large post holes, earth roof insulation, and benches around the edge. Evidence is present for both side and roof entrances (Eldridge and Stryd 1983; Hayden 1997a).

Plateau horizon projectile points were used as both dart points and arrow points. The dart points had an average length of 4.10 centimeters and an average width of 2.60 centimeters. The arrow points had an average length of 2.48 centimeters and an average width of 1.73 centimeters. The larger dart points were used continually throughout the Plateau horizon, but the smaller, arrow points, were only used after 1,500 BP (Richards and Rousseau 1987). Plateau points have convex bases, small barbs, and corner notches. They are similar to the Pelican Lake corner-notched points which are found on the Northern Plains, suggesting continual contact with that region (Dyck 1983).

The most common chipped stone tools dating to the Plateau horizon are crude unifacial and bifacial flake implements. There is also an increase in the use
of key-shaped scrapers. Incised and groundstone tools are rare during this time period (Richards and Rousseau 1987).

Bone and antler artifacts such as harpoons, bone points, beads, and gaming pieces are more common during the Plateau horizon than any of the earlier horizons or phases. This may be due to a greater degree of preservation, but it may also be due to an increase in social complexity, with more emphasis placed on creating labor intensive objects (Richards and Rousseau 1987).

The subsistence focus during the Plateau horizon was on marine resources (salmon), and roots. Stable carbon isotope analysis of human bone suggests that 60% of all dietary protein had a marine origin (Pokotylo and Froese 1983; Richards and Rousseau 1987). This focus on salmon and the presence of storage pits indicates that delayed return subsistence strategies were being utilized during the Plateau horizon.

There is also evidence for a trans-Rocky Mountain exchange network involving the Plateau, the Northern Plains, the East Kootenay, and the Rocky Mountain cultures during this time period. Artifacts such as nephrite, argillite, Top of the World Chert, Dentalium, and Olivella shells have been found in the Mid-Fraser Canyon Region (Reeves 1974; Richards and Rousseau 1987).

Rising village sizes, presence of exotic trade goods, variable house sizes, and increasing intensification of salmon has been suggested by Hayden (1997a; Hayden and Spafford 1993) that the Middle Fraser Canyon peoples achieved a high degree of socio-economic complexity during Plateau times. Questions exist however, regarding the precise dating of the development of this phenomenon. Large housepit floors at Keatley Creek date uniformly to the early Kamloops horizon, but feature rim deposits contain Plateau and Shuswap projectile points (Prentiss 2000). Hayden (1997a) and Prentiss (2000) have argued for long term continuity in individual housepit occupations spanning, minimally, the late
Shuswap through early Kamloops horizons. An alternate hypothesis is that projectile point sequences from housepit rims are a consequence of Kamloops horizon house construction which disturbed and mixed earlier occupation debris. If the latter is the case, then some or perhaps many large housepits were established abruptly at the temporal boundary between the Plateau and Kamloops horizons.

**KAMLOOPS HORIZON -1,200 to 200 BP**

The Kamloops horizon is the last prehistoric cultural horizon on the Canadian Plateau. Housepits dating to this horizon have an average diameter of 8.66 meters, but range between 5.0 and 22.0 meters. The housepits are oval, round, rectangular, or square in plan, and usually have raised earth rims. Central hearths, storage pits, and both side and roof entrances are associated with Kamloops housepits (Richards and Rousseau 1987).

Kamloops side-notched points are the most common points utilized during this time period. These points are small and triangular, and have small, narrow, opposing side notches, with straight to slightly convex or concave basal margins. These small points have an average length of 2.04 centimeters and an average width of 1.32 centimeters (Sanger 1970). The Kamloops multi-notched point is also found during this horizon, though it is more rare. This point type is believed to date between ca. 400 and 100 BP. It has up to four additional notches along one lateral blade margin, and it is slightly larger than the Kamloops side-notched varieties (Richards and Rousseau 1987).

Biface technology during the Kamloops horizon is quite similar to that of the previous Plateau horizon. It is dominated by fine, pressure-finishing of both points and knives. There is an increase in the quantity, quality, and variety of
ground stone artifacts made of nephrite, slate, and steatite during the Kamloops horizon (Richards and Rousseau 1987). Steatite was often carved into zoomorphic or anthropomorphic forms that demonstrated a high degree of creativity and workmanship (Sanger 1968). This horizon is also marked by the absence of microblade technology (Richards and Rousseau 1987).

Other non-lithic artifacts that have been associated with the Kamloops horizon on the Canadian Plateau include birch bark containers and woven baskets (Teit 1909). There is also an increase in the variety and frequency of antler, bone, and tooth artifacts as compared to the Plateau horizon during the Kamloops horizon. These objects were often decorated using geometric patterns of parallel lines, ticks, circles and dots (Richards and Rousseau 1987).

Subsistence during the Kamloops horizon was focused on marine resources. Stable isotope analysis indicates that 40 to 60% of their dietary protein was from salmon (Chisholm and Nelson 1983; Lepofsky et al. 1996).

The Kamloops horizon at Keatley Creek is abruptly abandoned at around 1,100 years ago. Hayden and Ryder (1991) propose that this was the result of a land slide at Texas Creek that dammed the Fraser River. Hayden and Ryder (1991) and Pokotylo and Mitchell (1998) suggest that this slide would have blocked most of the Fraser River’s salmon runs. Without the salmon runs, the inhabitants of Keatley Creek and the surrounding villages were forced to migrate out of the valley (Hayden and Ryder 1991). Since the regeneration of the salmon stocks is a slow and gradual process, Keatley Creek was never reoccupied to any significant degree (Pokotylo and Mitchell 1998).
CHAPTER THREE

LITHIC TECHNOLOGICAL ORGANIZATION

INTRODUCTION

The goal of this chapter is to discuss the theoretical approach used to explain the patterns of prehistoric lithic technology found at the Keatley Creek site. This section describes the expected relationship between land use patterns and lithic assemblages. Since stone tool production and use are directly related to broader economic systems designed to minimize the costs of obtaining resources, and buffer against shortages of these resources, patterns of land use can be recognized through the examination of lithic artifacts (Amick 1994; Torrence 1989). This chapter applies this model for change in lithic technological organization within the Mid-Fraser Canyon region.

LITHIC TECHNOLOGICAL ORGANIZATION

Binford (1977, 1981) proposed the use of middle range theory to link the archaeological record with the organizational behavior of prehistoric populations (Binford 1977). It is through the use of middle range theory that we are able to provide relevance and meaning to the recovered archaeological remains (Binford 1977). Binford (1981:26) explains that archaeological patterning is a result of human and cultural processes. We gain an understanding of these process by defining "causal relationships" through "actualistic" research. Actualistic research (ethnoarchaeology, experimental archaeology, historic archaeology) is necessary to fully understand the archaeological record. For example, Binford (1980) examined
the hunter-gatherer settlement system of the Nunamiut Eskimo located at Anaktuvuk Pass, Alaska. During his research, he described the cultural processes that led to the deposition of objects that would eventually become part of the archaeological record. Within this study, he examined how tools were formed and he developed methods for accurately diagnosing patterned variability in lithic technology (Binford 1980).

As a result of Binford's actualistic investigation among the Nunamiut, a series of researchers have focused on examining the ways in which prehistoric people used technology to aid in resource procurement, processing, storage, and other risk avoidance ventures (Binford 1979; Torrence 1989). Since within middle range theory, the changing environment is a causing factor for the shaping of hunter-gatherer adaptations (Bettinger 1991), it is natural for researchers to focus on how populations utilized the landscape for subsistence purposes. The resulting research has been economically oriented, focusing on the relationships between technology, resource distributions, foraging, and mobility (Torrence 1989).

The study of lithic technology is useful when examining the role of stone tools in prehistoric economies. It allows the researcher to make inferences of past human behavior, and it also helps them to better understand the adaptations to the environment (Flannery 1986). This study uses the theories concerning risk management and technological organization to better understand the behavior responsible for the development of the archaeological record at the Keatley Creek site.

When attempting to understand the relationship between stone tool production and use, mobility strategies, foraging strategies, lithic technology, and resource accessibility and availability must be examined (Binford 1980). Researchers of hunter-gatherer mobility practices have documented two different mobility strategies: residential and logistical (Binford 1980). Residential mobility
refers to the movement of the entire residential group to obtain food resources (Binford 1980). Logistical mobility refers to the movement of special task forces to obtain particular resources, then returning to the residential base (Binford 1980). During the various time periods at the Keatley Creek site, both residential mobility and logistical mobility have been practiced.

Residential mobility was practiced by all groups to varying degrees, but it was most often used by generalized hunter-gatherers or foragers (Ames 1985, Binford 1980; Hayden 1994). Under this mobility strategy, food is gathered daily, and is generally not stored (Binford 1980). Once the food within a suitable distance of the residential base is depleted, the residential base picks up and moves to a new location where resources are abundant (Binford 1980; Chatters 1995, Kelly 1988). If resources are scarce and dispersed as a result of environmental conditions, the mobile group may split up and form smaller residential units, thus scattering over a large area, each exploiting their own extended foraging radius (Binford 1980). There are two different types of sites associated with foragers: residential base camps and locations (Binford 1980). A residential base camp is the center of subsistence activities, which include sleeping, cooking, food processing, and tool maintenance. The residential base camp is also the place where hunting parties originate (Binford 1980). A location is a site in which procurement activities are being completed, these locations are generally “low bulk” procurement sites (Binford 1980:9). These locations are scattered over the landscape, are relatively few in number, and have very few tools associated with them (Binford 1980).

Logistical mobility is most often utilized by collectors, and is associated with complex hunter-gatherers (Ames 1985). Logistical mobility requires storage of subsistence resources for a large portion of the year, which is demonstrated by the presence of storage features, and more permanent house features (Binford
While both residential and logistical mobility strategies have residential bases and locations, only logistically organized strategies have field camps, stations, and caches. The field camp is a temporary center for a task group, this is where the group sleeps, eats, and field processes the procured resources (Binford 1980). These logistically organized task groups are composed of skilled and knowledgeable individuals who are sent out to procure specific items, such as salmon (Binford 1980). Examples of field camps include those designed for sheep hunting, fishing, and deer hunting. Field camps are larger and more visible than locations, and are used to obtain large quantities of resources (Binford 1980).

Stations are sites where task groups organize when gathering information, such as observing game movements. Examples of stations include: hunting stands, high ridges with good views, and ambush locations. Stations are generally planned locations, but are not necessarily erected by the task group (Binford 1980).

Caches are common with a logistical mobility pattern, because storage is necessary in order to preserve large quantities of food resources for future use by the members of the residential base camp (Binford 1980). Storage caches can include both above and below ground features that hold food and tool resources (Binford 1980).

The presence of these different types of sites demonstrates the complex nature of "collector", logistically organized groups. It is important to note that there is not a distinct line between foragers and collectors, rather these mobility patterns represent ends of a cultural continuum (Binford 1980).

Binford (1980) suggests that there is a causal linkage between seasonal variation in temperature and the presence of the logistical mobility pattern. He suggests that the greater the amount of seasonal temperature variation, the more likely a logistical mobility strategy would be used. So, as a result of variable environmental conditions, resources became seasonally and spatially clustered, and
the formerly residential foragers altered their mobility pattern and congregated in these areas of seasonally abundant resources. This ensuing decrease in residential mobility, caused the inhabitants to produce more substantial residential base camps and to create storage features.

It is also during this period of decreased residential mobility that tools and facilities of greater complexity begin to show up in the archaeological record (Binford 1979). With the change in mobility practices, it is natural that the lithic technological organization is also altered. Risk severity will alter the design and technological organization of the tools. In high risk environments, where unsuccessful foraging may result in deprivation or starvation, the tools must be resource specific and more technologically advanced (Binford 1979). Teit (1906) lists two examples of technologically specific tools used historically in the Mid-Fraser Canyon region, salmon dip nets and beaver spears. In low risk environments, usually in low-lying areas with high populations of plant resources, tools tend to be more flexible and multi-purpose (Torrence 1983).

Since lithic technological organization changes as a direct result of altered mobility patterns, it is important to identify these technological differences (Kelly 1988). The expected tool assemblage for foragers should be very different from the tool assemblage for collectors (Binford 1979). Different types of sites will also be recovered between these two mobility strategies. As mentioned earlier, there are two types of sites associated with residential mobility, residential base camps and locations, while logistical mobility has both residential base camps and locations, but it also has field camps, caches, and stations (Binford 1980). This increase in the types of sites correlates with the increase in the types of lithic artifacts expected to be uncovered at these sites (Binford 1979).

Within collector strategies, there may also be an increase in the number of functions of a single task group venture. For example, a task group may go out
for the purpose of procuring deer in the highlands above the site. While the deer were procured during the trip, lithic raw material may have also been obtained along with valuable information concerning locations for possible future hunting. This combines numerous tasks into one venture and reduces the cost of the different side trips that were taken (Binford 1979). Raw materials are almost never the sole reason for creating a task group, so the distance away from the residential base tells little about the accessibility of the lithic resource (Binford 1979).

There is a connection between the trip distances and the different kinds of gear that is carried by the individual (Binford 1977). Binford (1979) described three basic types of gear used by the Nunamiut during the 1970’s. These three tool types include: personal gear, site furniture, and situational gear (Binford 1979). Personal gear was carried by individuals in anticipation of certain future activities and conditions. Examples of personal gear include knives, projectile points, and other daily-use tools (Binford 1979). Site furniture describes artifacts or features that go along with the place, and included items such as hearth stones, anvils, and generally useful tools that are not transported from the site (Binford 1979). Situational gear describes items that are gathered, produced, or “drafted into use” for the purpose of carrying out a specific task (Binford 1979: 265-266). Situational gear may be made out of naturally occurring, cached, scavenged or recycled personal gear. There is little investment put into the manufacture of situational tools, and the rate of replacement is very high (Binford 1979). Situational gear tends to be of a lesser quality than either personal gear and site furniture, since with situational gear you end up having to “make do” with whatever resources you have available at that time (Binford 1979: 267). Personal and household lithics should be represented by the appearance of hafting features, while situational gear that was used for the exact same purpose would exhibit little
or no evidence of hafting features (Binford 1979). Another difference between personal and household gear versus situational gear is that the former is made in stages, and the latter is made in one setting (Binford 1979). Personal and household gear are first made into blanks to cut down on transportation costs, and are transported to the residential base camp where the blanks are further reduced into tools (Binford 1979).

Binford (1979) has demonstrated that this difference between personal and household gear versus situational gear has broader theoretical implications. He suggests that the presence of personal and household gear represents a "heavily curated" lithic technological strategy, while the presence of situational gear represents a "largely non-curated" lithic technological strategy (Binford 1979: 269).

Personal and household gear (curated items) are generally produced and maintained within residential sites, resulting in lithic debris associated with the manufacture, repair, and eventual discard of the worn out item (Binford 1979). These items tend to have a relatively long use-life due to the amount of effort placed in their maintenance (Kelly 1988). Because of this emphasis placed on maintenance, curated tools are not likely to be "worn out" at special purpose locations, since they would have been replaced or repaired prior to leaving the residential base camp (Binford 1977, 1979: 269). If a tool is broken at a special purpose location, it is most often carried back to the residential base camp to be repaired or recycled due to the higher cost of replacing the tool versus the cost of repairing the tool (Binford 1977). Binford also suggests that the manufacturing debris within the residential base camp resulting from the creation of personal and household tools will vary throughout the year. This is a result of seasonal variability in mobility patterns and the differential exploration of distinct geographical locations for the purpose of obtaining food and raw lithic resources.
The manufacturing debris associated with special purpose sites (e.g. hunting stands or camps) may be represented by a large number of finishing flakes. This is a result of "staged" items brought into the field, being finished at these special purpose sites. The artifact assemblage may be represented by core reduction flakes, biface reduction flakes, and materials used to reduce raw materials such as, wood, bone, or antler (Binford 1979: 270). The reason for the large number of lithic reduction flakes is thought to be because during the "down time" between hunting trips, blanks were made into finished products.

A large number of maintenance flakes resulting from the recycling and reuse of personal gear should be expected within special purpose sites. This is the result of personal gear being drafted for use as the source material for situational gear, or expedient tools (Binford 1979). These non-curated technologies demonstrate a direct relationship between the span of use of a expedient tool and the frequency and degree of use for a specific project. In other words, an expedient tool is used until it is dull, no longer useful, or until the task is finished and then it is discarded (Binford 1977).

It is important to note that there is a strong relationship between the amount of recycling and reuse of personal gear and the availability of raw lithic materials. If lithic resources are abundant in the area, there is little evidence for the reuse and recycling of personal gear (Binford 1979). In order to combat the reduced availability of raw lithic materials in certain areas that are often used to procure food resources, a "caching" strategy may be employed. Cores may be obtained from lithic sources and stored in these food procurement areas in anticipation for future use (Binford 1979: 270). Binford (1979) demonstrated that differential frequencies of lithic debris and tools can be expected within each site-type he described. He suggested that most of the manufacture, maintenance and eventual discard of tools was completed within the residential base camp.
Special purpose sites vary in the amount and type of lithic reduction associated with it, but are generally associated with the final stages of lithic tool production, and the creation of expedient situational gear.

Along with Binford's description of the different lithic materials associated with each type of site, it is important to make further distinctions between curated and non-curated technology. Non-curated (expedient) technology is based on manufacturing and discarding tools according to the current needs (Bamforth 1986). Expedient technologies should be technologically simple and demonstrate little formal patterning (Binford 1979). Curated technology is based on manufacturing tools in anticipation for future use. These tools can be made for a variety of tasks, are maintained and recycled, and are transported from locality to locality (Bamforth 1986). Curated technologies are more technologically sophisticated than expedient technologies, with individual tools being used for a variety of different purposes (Binford 1979). Binford (1977) suggests that it is the logistical mobility strategy that led to the adoption of curated technologies, since curation and tool maintenance are both organizational responses to conditions where increased efficiency is advantageous. Torrence (1983) agrees with this theory, adding that curation was the result of stress over needing a tool to complete a project, but not having the right tool available or time to make it. This time-stress was alleviated by making tools well in advance in anticipation of future need during these time stresses. There is a lot more time and effort expended in the production of these curated tools, so once they are produced, they are maintained until they are no longer useful, when they are either discarded or recycled and made into a different tool (Binford 1979). The degree to which tools are maintained or recycled is dependent upon the availability of good-quality lithic materials and the settlement pattern (Bamforth 1986).
Now that differences between the nature of curated and non-curated technologies have been demonstrated, distinctions within the archaeological assemblages associated with each technological system will be examined. In non-curated assemblages, the debris from manufacture, and the by-products of the activities in which tools were used should be equal since the activity took place in one location. There should also be a direct relationship between the food consumption remains and the quantity of tools and tool-making debris (Binford 1977). Some caution is necessary in determining the relationship between manufacturing debris and tools in expedient technologies, since variability in the character and efficiency of tool manufacturing techniques will cause variability in the number of tools and the associated debris (Binford 1977). The number of expedient tools associated with each site depends on the type and the intensity of activities that were performed, it also depends on the number of people involved in the task (Binford 1977).

In curated assemblages, where tools are transported and returned to the residential base camp, there should be a proportionate ratio of tools and bi-products (Binford 1977). Site-types other than the residential base camp (special purpose sites) will have a great deal of variation between the numbers of tools and the numbers of manufacturing debris. The proportions of broken to un-broken tools vary independent of one another within curated assemblages (Binford 1977). The frequency of tool types also varies between sites where curated technologies are used, due to the life expectancies of a tool under continuous use. If a relative frequency of a tool class is observed, it may be due to increased curation and maintenance, or to higher recycle rates (Binford 1977).

Another important aspect of curated assemblages is the presence of different kinds of lithic raw materials associated with different sites. As a general rule, tools made out of lithic raw material that has a more distant source, should
have a greater degree of retouch and breakage (Bamforth 1986). Bamforth (1986) suggests that local materials, often of poorer quality, are most often used for expedient tools, and non-local materials are most often used for curated tools. When non-local materials are extracted from the source, they are reduced to be easily transported back to the site, or to caches where the future need for lithic resources is anticipated (Kelly 1988). These lithic raw materials are shaped into either multidirectional cores, or into bifacial cores, from which formal tools can be fashioned or flake-tools can be extracted (Goodyear 1979; Kelly 1988).

Biface cores are more desirable than other core types since a more usable edge can be produced because of the high edge-to-weight ratio (Goodyear 1979). The bifacial form gives the tool durability, sharpness, and the ability to be re-sharpened and recycled (Kelly 1988). The use of these bifacial cores indicates that logistically organized collectors were preparing for a variety of tasks, in areas where good lithic resources may not be available (Kelly 1988).

When examining the archaeological record for evidence of the production and use of bifaces as cores in the residential base camp, the following patterns should appear: there should be a positive correlation between the utilized biface flakes, flaking debris, and bifacial fragments; a high number of used biface flakes as compared to un-retouched flake tools; a low incidence of unprepared cores; low percentages of dorsal cortex, and the presence of high-quality lithic materials (Kelly 1988).

Evidence for the use of bifaces as cores in logistical sites should show up in the archaeological record as follows. Two site-type categories should be present, one with a high number of biface reduction flakes (logistically organized), and the other with a low number of biface reduction flakes (residentially organized). Within the logistically organized strategy, the bifacial tools would be produced and maintained in the residential base camp, but would be used as tools or cores in
these logistical sites (Kelly 1988). Logistical sites would not have as high of incidence of flaking debris, because much of it would have been completed at the residential base camp. There should also be a higher incidence of utilized simple flake tools in the residential base camp as opposed to logistical camps, because at the logistical camps, the flake tool would be obtained from the bifacial core. In order to preserve lithic resources, only the minimum needed number of flake tools would be extracted from the bifacial core in logistical camps. The preservation of lithic resources within residential camps was less critical, so larger numbers of flake tools can be expected in that site type (Kelly 1988).

When bifaces are used as long use-life tools, there should be very few unifacial examples of tool types. This is due to the fact that a lot of time and effort is put into the production and maintenance of these bifaces in order to create a project-specific tool. A unifacial version of a bifacial tool suggests that less time and effort was placed into making the tool, resulting in a decreased use-life. There should also be a high correlation between bifacial debris and tool fragments, and there should be evidence of rejuvenation and resharpening at the residential base camp. Logistical sites should have a relatively low level of utilized biface reduction flakes (Kelly 1988).

The manufacture of bifaces should be represented in the archaeological record by a concentration of bifacial reduction flakes in the residential base camp. These bifacial reduction flakes are generally very small. There is very little evidence that these small retouch flakes were being utilized. There is also a lot of evidence for the hafting of tools including scrapers, spokeshaves, gravers, burins, and flake tools (Kelly 1988).

Differential use of lithic technology is identifiable within the archaeological record, it is only through careful examination that we can truly begin to understand the mechanisms behind the changes in technical organization. A few
generalizations can be made to link lithic technological organization to mobility patterns. Higher frequencies of bifacial cores are most often associated with logistical mobility, and lower frequencies of bifacial cores are generally associated with residential mobility (Kelly 1988).

As Kelly (1988) has demonstrated, mobility patterns can be deduced from examining patterns in the archaeological record. There are distinct patterns associated with each particular type of site whether or not they are logistically or residentially organized. When a particular site contains archaeological evidence for temporal variability in lithic technological organization, inferences about mobility patterns can be made.
MODEL OF LITHIC TECHNOLOGICAL ORGANIZATION AND MOBILITY WITHIN THE MID-FRASER CANYON REGION

This section outlines a model for changes in lithic technological organization during the later occupations in the Mid-Fraser Canyon region. The Lochnore phase, Plateau horizon, and the Kamloops horizon are emphasized because of their relevance to the understanding of temporal variability in lithic technology at the Keatley Creek site.

The lithic technological organization in the Mid-Fraser Canyon region during the Lochnore phase (5,500 to 3,500 B. P.) of the Middle Period (7,000 to 3,500 B. P.) was based on an economically efficient portable technology. This technological organization focused on creating light weight cores from specific raw material source locations. The tools that were manufactured from these cores were reduced in such a manner that very few waste flakes were produced (Stryd and Rousseau 1996). These tools were designed for long-term use and were dominated by microblades, scrapers, and bifaces (Photographs 1 and 2).

The archaeological sites within the Mid-Fraser Canyon region that have Lochnore phase materials associated with them are characterized by low amounts of variation within both lithic and faunal assemblages (Stryd and Rousseau 1996). It has been suggested that this limited variation during the Lochnore phase represented a residential mobility (forager) pattern (Hayden 1997b; Stryd and Rousseau 1996). Stryd and Rousseau (1996) suggested that these sites were either specialized activity residential base camps or briefly occupied locations. The recent discovery of pithouses at the Baker Site dating towards the end of the Lochnore phase may suggest that a collector-type system was practiced earlier than previously believed in the Mid-Fraser Canyon region (Hayden 2000; Wilson
Consultants 1992). Because of the fact that the data from the Baker Site is new and not very well understood, Stryd and Rousseau (1996) continue to place the development of the collector system at around 3,500 B.P., with the beginning of the Late Period. Further research at the Baker Site is needed in order to better understand the mobility pattern associated with the Locnmore phase within the Mid-Fraser Canyon region.

The Late Period is divided up into three temporally specific cultural horizons including: the Shuswap horizon (3,500 to 2,400 B.P.), the Plateau horizon (2,400 to 1,200 B.P.), and the Kamloops horizon (1,200 to 200 B.P.). Although these three cultural horizons are still considered to be part of the collector system, the later half of the Locnmore phase may also be added. This addition would push back the date for the onset of the collector system to somewhere around 4,500 B.P. Wilson et al. (1992) suggest that the Baker Site may not even be a Locnmore phase occupation. They suggest that the Baker Site is a representation of a short-lived occupation which moved up from the south (Wilson et al. 1992).

The Shuswap horizon is not well represented to date at the Keatley Creek site, but other sites within the Mid-Fraser Canyon region have provided abundant information concerning the lithic technological organization and mobility patterns of this horizon. The lithic technological organization during the Shuswap horizon is based on the use of an expedient technology (Richards and Rousseau 1987). The near absence of formal scrapers and a high incidence of flake tools may suggest that fewer curated tools were being utilized. This higher reliance on expedient tools in winter residential sites may be linked with sedentism and intensive use of stockpiled cores used for food preparation activities and gearing up for spring (Richards and Rousseau 1987).
The Shuswap horizon has been considered to be a transitional occupation in terms of mobility patterns (Richards and Rousseau 1987). This horizon was previously thought to demonstrate the shift from highly mobile, residential occupations, to semi-sedentary logistical occupations (Richards and Rousseau 1987). During the Shuswap horizon evidence for larger villages, pithouses, and storage pits have been found (Richards and Rousseau 1987), indicating a greater degree of sedentism, and the use of seasonally available resources (salmon). While this may still be considered true, evidence for pithouses and specialized fishing gear during the later half of the Lochnore phase suggests that this transition may have taken place prior to the Shuswap horizon. Like the Lochnore phase, salmon was not yet the main resource focus during the Shuswap horizon with emphasis still placed on terrestrial fauna (Richards and Rousseau 1987, Wyatt 1971).

The Plateau horizon is well represented at the Keatley Creek site and within the Mid-Fraser Canyon region. The lithic technological organization within the Plateau horizon demonstrates the expanding emphasis placed on the production of expedient flake tools. There was also an emphasis placed on the standardization of projectile points, scrapers, and ornamental items (Photograph 3). Many of the flake tools created during the Plateau horizon were associated with the processing of organic materials, including burins, notches, piercers, and borers. This suggests a greater emphasis on the creation of curated organic tools for the procurement of fish, roots, and berries.

This emphasis on more expedient lithic technology suggests a slight shift in mobility patterns towards a greater degree of sedentism (Kelly 1988). Richards and Rousseau (1987) suggest that the populations associated with the Plateau horizon used a combination of residential and logistical mobility, emphasizing the acquisition, processing and storing of fish, plant and mammalian resources. The presence of house and storage features also suggest winter sedentism.
The lithic technological organization associated with the Kamloops horizon was dominated by the presence of task-specific tools, and curated tools such as projectile points and scrapers (Photograph 4). Expedient lithic tools associated with the manufacture and working of hide, bone, wood, antler, and ornaments were also very common during this cultural horizon (Photographs 5 and 6) (Hayden et al. 1996b; Richards and Rousseau 1987). This emphasis on task-specific expedient tools suggests a logistical mobility pattern. This is backed up by the presence of large winter villages with evidence of social inequality and competitive feasting (Hayden 1997a). The mobility pattern associated with the Kamloops horizon is marked by a high degree of summer mobility followed by winter sedentism. Subsistence was maintained during the cold winter months on salmon, deer, berries, and roots that had been acquired and stored during the previous months.
CHAPTER FOUR

A TEST OF THE LITHIC TECHNOLOGICAL ORGANIZATION MODEL 
PROPOSED FOR KEATLEY CREEK

INTRODUCTION

The primary goal of this chapter is to examine the temporal variability in 
lithic technology at the Keatley Creek site (EeRI 7) in order to explore questions 
of mobility and foraging strategies. The chapter begins with a description of the 
field methodology and the methodology for the analysis of debitage and tools. 
Next, a list of the tool types and material types that were encountered during our 
1999 excavations at Keadey Creek are presented. A description of the chronology 
and interassemblage variability follows. Next, variation in lithic reduction 
strategies, and tool use and discard is examined. Finally, implications for the 
understanding of change in mobility and foraging tactics are examined.

FIELD METHODOLOGY

Since Brian Hayden had spent many seasons excavating at the Keatley 
Creek site, the 1999 University of Montana project employed the same basic 
excavation methods to insure comparability. The datum was placed within 
Hayden’s original grid system, 2 meters south of the southwest corner of unit “L” 
(Figure 4). All units that were set up during the 1999 UM investigations were 
measured off of this datum.

During the 1989 SFU investigations, a possible housepit was encountered 
underneath Housepit 7 (Alexander 1989). Because this possible housepit was
uncovered during their last week of excavations, it was covered and left for subsequent investigations. The first step of the 1999 UM investigations was to expose and excavate this early housefloor (Sub-housepit #1 [SHP1]) underneath Housepit 7. In order to expose the north edge of SHP1, a 50x50 cm subsquare (DDD-1) was opened. While excavating this subsquare, another possible small housepit was uncovered (Sub-housepit #2 [SHP2]). This sub-housepit (SHP2) was not further explored due to time constraints. During the excavation process of SHP1, an earlier housepit (SHP3) was located underneath it. A number of subsquares from unit NN were opened in order to expose the south side of this housepit.

While the three sub-housepits were being explored and excavated in the central block unit, four 50x50 cm test units were opened up to the west of Housepit 7. Little testing of surfaces outside of the housepits had previously been performed at Keatley Creek, so there was the potential to find new kinds of deposits. Since a Lochnore phase component had been discovered underneath the western rim of Housepit 7 during the 1987 SFU excavations, four test subsquares were placed to the west of the rim in order to see if the Lochnore component extended to the west. The Lochnore component was encountered, and two 50 cm wide trenches were excavated in order to demonstrate a stratigraphic relationship between the Lochnore materials recovered in 1987 and in 1999. During the excavation of the northernmost trench, another sub-house (SHP4) was found in the stratigraphic levels between the Lochnore phase and Kamloops horizon zones.

The 31 subsquares that were opened up during the 1999 UM investigations were excavated in 50x50 cm subsquares using trowels, dustpans, spoons, and bamboo sticks. The recovered sediments were sieved through 1/8 inch mesh screens. The subsquares were excavated in natural stratigraphic levels, except in instances when stratigraphic zones were larger than 10 cm deep. During these
instances, the sediments were excavated in 10 cm arbitrary levels until the next stratigraphic level was encountered. A number of distinct stratigraphic zones were uncovered during the 1999 UM investigations, including: surface, roof, rim spoil, rim slump, dump, floor, and various subfloor pit features. Since all cultural materials over 1 cm in maximum diameter were point plotted and bagged in floor sediments, these stratigraphic zones were excavated in 5 cm levels to ensure greater accuracy. One liter soil samples for flotation and sedimentary analysis was taken from each strata of each subsquare. After each subsquare was excavated to a culturally sterile level, a detailed profile for each wall was drawn. Sediment deposits larger than 1 cm in maximum diameter were indicated on the profile, as was each stratigraphic zone. Black and white and color photos were taken of each profiled wall and floor. All mapping and unit placement was accomplished using a transit and stadia rod.

LABORATORY METHODOLOGY

This section examines the procedures for studying lithic materials recovered during the 1999 UM investigations at Keatley Creek. The recovered lithic materials were first split into two different types, debitage and tools.

The greatest emphasis was placed on defining the different reduction strategies used during each cultural component. Expedient block core reduction, bifacial production, portable long-term use, and quarried bipolar strategies were the most dominant reduction strategies utilized by the inhabitants of the Keatley Creek site (Hayden et al. 1996b). Determining the use and discard practices of tools through functional analysis of each tool was completed for this project in order to gain a better understanding of the type of mobility and foraging strategy being utilized (Spafford 1991). The common thread between all aspects of the
lithic analysis section is in its effort to determine the technological and functional similarities and differences between the stratigraphic units belonging to the three different cultural components. By examining the variation between these three cultural components, some inference may be made concerning major behavioral patterns. This is accomplished by looking at interassemblage variability in curated versus expedient lithic technologies, kill/butchery versus other chipped stone tool technologies, cortex flakes versus non-cortex flakes, billet flakes (SFU-Keatley Creek Typology) versus non-billet flakes, and primary flakes (SFU-Keatley Creek Typology) versus non-primary flakes.

Through the use of these analytical techniques, differential patterns in lithic technology may be observed. If the model of lithic technological organization within the Mid-Fraser Canyon region is consistent with the Keatley Creek data, certain patterns should be observable. The tools and debitage associated with the Lochnore phase should be highly curated, transportable, and have a strong emphasis on the production and maintenance of gear. The lithics of the Plateau and Kamloops horizons should be more expedient in nature, and focused on the production of flake tools and tool maintenance. The differences in these lithic assemblages should reflect different mobility patterns, with the inhabitants of the Lochnore phase being more mobile than the inhabitants of either the Plateau or Kamloops horizons.

DEBITAGE ANALYSIS

Debitage from the 1999 UM Keatley Creek site excavation was sorted on the basis of material type, flake size, percentage of dorsal cortex, fracture
initiation, and potential for use as a tool (the SFU-Keatley Creek Typology) (Spafford 1991).

A measurement of the degree of decortication was taken by examining each flake and determining the percentage of dorsal cortex. For the purpose of this study, dorsal cortex was measured on this scale: primary (75-100% cortex cover), secondary (1-75% cortex cover) and tertiary (0% cortex cover). Mauldin and Amick (1989) have demonstrated that amount of cortex cover can be minimally useful in gauging the importance of decortication activities involved in producing a given debitage assemblage. Early stage reduction flakes will have more cortex, while later stage reduction will have increasingly less cortex.

The analysis of fracture initiation may be useful in determining the type of percussor that was used as described in the SFU-Keatley Creek debitage typology, Appendix A, also (Cotterell and Kamminga 1987; Hayden and Hutchings 1989). Hard percussors (hammerstones) generally produce cone initiations, soft percussors (antler, bone, soft stone, wood) generally produce bend initiations, and bipolar percussion generally produce wedge initiations. Pressure flaking may produce both cone and bend initiation flakes, depending upon the technique used (Cotterell and Kamminga 1987).

The examination of the suitability of a flake for use as a tool on the basis of workable edge size and fracture initiation type was also completed using the SFU-Keatley Creek debitage typology, Appendix A. Use of this typology facilitates comparisons between our research and the previous research completed at the Keatley Creek Site (Spafford 1991). There are a total of five categories that each flake may fall into under this typology: primary flake, secondary flake, billet flake, shatter, and bipolar flake.
A primary flake is considered to be suitable for use as a tool, it has a maximum dimension of >2 cm, at least 1 cm of edge that is robust enough to withstand retouch, and an edge angle of less than 45 degrees (Spafford 1991).

A secondary flake is not suitable for use as a tool, it has a recognizable ventral surface, but it cannot be classified as primary, bipolar, or bifacial (Spafford 1991). This is by far the most common flake type. Thus, these flakes tend to be smaller medial and distal fragments or cone initiation complete flakes or proximal fragments.

A billet flake has a pronounced lip, a bend initiation, a small platform area in relation to flake size, an absence of crushing on the platform, and the possible evidence of platform preparation. Billet flakes tend to occur as a result of soft hammer biface thinning (Spafford 1991). These flakes are generally not considered to be suitable for use as tools.

Shatter is debitage that lacks a recognizable ventral surface, and is not suitable for use as a tool (Spafford 1991).

A bipolar flake has crushing on both proximal and distal ends, crushing on the platform, ventral scarring, and it has a sheared, flat ventral surface (Hayden et al. 1996b). The tools produced by the bipolar lithic reduction strategy tend to be expedient in nature. Bipolar flakes may be indicative of the conservation of lithic materials. When a core or tool is exhausted, and cannot be reduced using hard or soft hammer reduction strategies, bipolar technology is employed as a reduction strategy. Bipolar reduction allows for a greater degree of lithic conservation in times of lithic material shortages, such as seen during the winter months at Keatley Creek (Spafford 1991).
TOOL TYPE ANALYSIS

During previous work at Keatley Creek, Spafford (1991) described a total of 97 distinct types of recovered tools. Spafford combined these tool types into six different tool classes on the basis of similarity of use, and include: general purpose expedient flake tools; special purpose expedient flake tools; extensively retouched tools; abraders; anvils, mortars, and pounding stones; and artifacts associated with lithic reduction.

A total of 59 out of the total 97 tool types were recovered during our 1999 excavations. These tool types have been combined to make 11 distinct classes. The tool classes utilized in this report include: projectile points and preforms; pieces esquillees; artifacts associated with lithic reduction; abraders; ornaments; heavy scrapers; expedient knives; piercers, borers, and notches; light scrapers; generalized bifaces; and microblades. Here is a list of the different tools that are associated with each tool class. Spaffords’ (1991) specific tool code is as follows. (See Appendix A for a complete definition of these tool types).

TOOL TYPES

Projectile Points and Preforms

110= Kamloops Side-Notched Point Concave Based
111= Kamloops Side-Notched Point Straight Based
112= Kamloops Side-Notched Point Convex Based
137= Kamloops Preform
119= Plateau Basally-Notched Straight Based Point
126= Shuswap Corner Removed “Eared” Point
101= Lochnore Point
11= Miscellaneous Point
36= Point Fragment
35= Point tip
134= Preform

**Pieces Esquilles**
145= Pieces Esquilles

**Artifacts associated with lithic reduction**
190= Hammerstone
206= Anvil Stone
146= Bipolar Core
186= Multidirectional Core
187= Small Flake Core
149= Microblade Core

**Abraders**
201= Abrader

**Ornaments**
209= Ornamental Ground Nephrite
214= Stone Bead
204= Steatite Tubular Pipe

**Heavy Scrapers**
164= Double Scraper
184= Retouched Spall Tool
158= Key Shaped Unifacial Scraper
141= Scraper-Like Biface
156= Alternate Scraper
165= Convergent Scraper
143= Scraper Retouch Flake With Hide Polish
183= Spall Tool
162= Endscraper
73= Utilized Flake on a Strong Flake Edge

**Expedient Knives**
71= Utilized Flake on a Break
157= Miscellaneous Uniface
70= Expedient Knife, Inversely Retouched
74= Lightly Retouched Expedient Knife
159= Unifacial Knife
170= Expedient Knife, Normally Retouched
72= Utilized Flake on a Thin Flake Edge

**Piercers, Borers and Notches**
151= Unifacial Perforater
154= Notch
54= Small Notch
152= Unifacial Borer
153= Small Piercer

**Light Scrapers**
180= Utilized Flake
150= Single Scraper
EMPLOYABLE UNITS (EU’s)

It is important to note that a number of these associated tools have more than one location of use-wear, these individual locations on the flake are called employable units (EU) (Knudson 1983). For the purpose of this report, each tool is classified on the level of the EU to ensure that every function of the tool is assessed. For ease in writing, all EU’s have been called tools throughout this section.
LITHIC RAW MATERIALS

Vitreous trachydacite was the most common lithic material associated with the Keatley Creek Site (77%). Other lithic materials including: jasper, pisolite, quartzite, coarse grained basalt, chalcedony, rhyolite, vesicular basalt, obsidian, sandstone, granite, gneiss, steatite, siltstone, a green extrusive, an intrusive, quartz, and vitric tuff, were also associated with Keatley Creek assemblage (Appendix A). The classification of these lithic raw material types was aided through the use of a type-collection previously put together by Simon Fraser University. The heavy reliance on vitreous trachydacite is most likely due to its ease in acquisition, its durability, and its ease in workability. Jasper, pisolite, chalcedony, quartzite, and coarse grained basalt were the next most frequently used lithic raw materials. The source for Hat Creek Chert, a jasper with yellow to red to green coloring, is considered to be local and is located about 30 miles to the northeast of the Keatley Creek site. Other forms of jasper, pisolite, chalcedony, quartzite, and coarse grained basalt are considered to be non-local in nature.

CHRONOLOGY AND INTERASSEMBLAGE VARIABILITY

Lithic artifacts recovered during the UM 1999 excavations at Keatley Creek are used to examine chronology and technological organization. The first objective is to determine whether or not the lithic assemblages recovered during the 1999 UM Keatley Creek investigations are similar to the other lithic assemblages recovered within the Mid-Fraser Canyon region (Richards and Rousseau 1987; Stryd and Rousseau 1996). The second objective is to determine whether or not there is significant temporal variability in lithic assemblages at Keatley Creek.
A total of four distinct cultural components were uncovered during the 1999 UM investigations, including the Lochnore phase, the Plateau horizon, the Initial Housepit 7 construction phase, and the Post Housepit 7 construction phase. The Kamloops horizon was split into two cultural components, since a distinction could be made between the construction sediments (Initial Housepit 7 construction phase) and the refuse, rim, rim-slump, and roof deposits (Post Housepit 7 construction phase) of Housepit 7.

The lithic assemblages recovered during the 1999 UM investigations are well within the range of published cultural chronologies from all four of these cultural components (Richards and Rousseau 1987; Stryd and Rousseau 1996). The Lochnore phase is represented by artifacts that are considered typical of the cultural horizon, and include: Lochnore projectile points, microblades, and a crescent scraper. The Plateau horizon is marked by an increasing number of non-diagnostic expedient flake tools, as a result, less is known about this cultural horizon. This increase in expedient tool types during the Plateau horizon is typical among the Mid-Fraser Canyon region. The Kamloops horizon is marked by the presence of chipped stone Kamloops projectile points, different kinds of scrapers, and knives. Artifacts such as: a pipe mouthpiece, beads, and a mica ornament fragment demonstrate that there is an increase in the number of groundstone and ornamental objects associated with the Kamloops horizon (Hayden 1997a; Richard and Rousseau 1987).

Since the 1999 Keatley Creek lithic assemblages are well within the range of other published assemblages in the Mid-Fraser Canyon region, temporal variation in lithic technological organization will be the focus of the remainder of this section. Temporal variability between tool types will be examined first, followed by debitage.
TOOL ANALYSIS

A total of ten lithic raw material types were used to make the tools recovered during the UM 1999 investigations. These lithic raw materials include: vitreous trachydacite, jasper, pisolite, quartzite, coarse grained basalt, a green extrusive, vesicular basalt, steatite, sandstone, and granite. Vitreous Trachydacite was the most common lithic material used to make tools (77%). This focus on vitreous trachydacite is expected since it is locally available and it is a high quality lithic material.

A total of 368 tools were recovered from Keatley Creek during the 1999 field season, 62 were associated with the Lochnore phase, 28 with the Plateau horizon, 26 with the initial Housepit 7 component, and 148 with the post Housepit 7 component. The Kamloops horizon was split up into two distinct units because there appeared to be a significant difference between Kamloops materials associated with the initial building of Housepit 7 and the rim deposits accumulated after the building of Housepit 7. One hundred and three tools were recovered from strata that are considered to be culturally ambiguous. These 103 tools have been omitted from the statistical analysis since they could not be linked to a specific cultural component.

The Lochnore phase has a total of 64 tools associated with it, and is represented by 8 of the 11 tool types. Abraders, pieces esquillees, and ornaments are absent. Microblades make up 48.4% of the assemblage. The other tool types are found in relatively low frequencies. Vitreous trachydacite is the most common lithic material used, represented by 77% of the total associated artifacts. Other raw materials include: jasper, coarse grained basalt, granite, and vesicular basalt.

The Plateau horizon is represented by a total 28 tools, representing 9 of the 11 tool types. Abraders and microblades are absent. Light scrapers are the most
common tool type (35.7%). Vitreous trachydacite is the dominant material type (82.1%). Other raw materials include gneiss, jasper, nephrite, and pisolite.

The Initial Housepit 7 construction phase is represented by a total of 26 tools, representing 7 out of the 11 tool types. Expedient knives, abraders, pieces esquillees, and ornaments are lacking from this cultural component. Heavy scrapers, light scrapers, and lithic reduction artifacts make up 73.1% of this collection. Vitreous trachydacite is the abundant raw material, making up 77% of the represented tool classes. Jasper, quartzite, coarse grained basalt, and vesicular basalt are also present, but in small quantities.

The Post Housepit 7 construction phase is represented by a total of 148 tools, representing all 11 tool types. Heavy scrapers and light scrapers are most common (44.6%). As in all other components, vitreous trachydacite is the dominant raw material (76%). Coarse grained basalt, granite, a green extrusive, jasper, pisolite, quartzite, sandstone, steatite, and vesicular basalt are also present in low quantities.

Statistical analysis was not necessary to recognize that vitreous trachydacite was the most dominant material type used throughout the different cultural components. Raw materials such as jasper, pisolite, various volcanics, quartzite, sandstone, and a green extrusive were also used, but to a lesser extent.

An initial assessment of assemblage content variability was undertaken using chi-squared tests (with Yates Correction for continuity). The goal was to determine if significant differences between components could be recognized from the perspective of the 11 major tool classes (Tables 1-6).
Table 1. Chi-squared analysis of the tool types found in the Initial and Post Housepit 7 construction phases.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expedient Knives</th>
<th>Projectile Points/Preforms</th>
<th>Abraders</th>
<th>Pieces Equilces</th>
<th>Ornamentals</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Plicers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microblades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post HP7</td>
<td>34</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>17</td>
<td>32</td>
<td>8</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Initial HP7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>17</td>
<td>10</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>23</td>
<td>39</td>
<td>10</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2. Chi-squared analysis of the tool types found in the Initial Housepit 7 construction phase and the Plateau Horizon.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expedient Knives</th>
<th>Projectile Points/Preforms</th>
<th>Abraders</th>
<th>Pieces Equilces</th>
<th>Ornamentals</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Plicers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microblades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plateau</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Initial HP7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3. Chi-squared analysis of the tool types found in the Initial Housepit 7 construction phase and the Lochnore Phase.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expedient Knives</th>
<th>Projectile Points/Preforms</th>
<th>Abraders</th>
<th>Pieces Equilces</th>
<th>Ornamentals</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Plicers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microblades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial HP7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lochnor e</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 4. Chi-squared analysis of the tool types found in the Post Housepit 7 construction phase and the Plateau Horizon.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expedient Knives</th>
<th>Projectile Points/Preforms</th>
<th>Abraders</th>
<th>Pieces Equilces</th>
<th>Ornamentals</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Plicers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microblades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post HP7</td>
<td>34</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>17</td>
<td>32</td>
<td>8</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Plateau</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>18</td>
<td>11</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>20</td>
<td>33</td>
<td>11</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 6. Chi-squared analysis of the tool types found in the Post Housepit 7 construction phase and the Lochnore Phase.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expended Knives</th>
<th>Projectile Points</th>
<th>Abraders</th>
<th>Pieces Esquillees</th>
<th>Ornament</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Piercers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microliths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post HP 7</td>
<td>34</td>
<td>16</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>17</td>
<td>32</td>
<td>8</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Lochnore</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>20</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>25</td>
<td>36</td>
<td>10</td>
<td>17</td>
<td>39</td>
</tr>
</tbody>
</table>

Table 6. Chi-squared analysis of the tool types found in the Plateau Horizon and the Lochnore Phase.

<table>
<thead>
<tr>
<th></th>
<th>Light Scrapers</th>
<th>Expended Knives</th>
<th>Projectile Points</th>
<th>Abraders</th>
<th>Pieces Esquillees</th>
<th>Ornament</th>
<th>Lithic Reduction Artifacts</th>
<th>Heavy Scrapers</th>
<th>Piercers, Borers, and Notches</th>
<th>Generalized Bifaces</th>
<th>Microliths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plateau</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Lochnore</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>31</td>
</tr>
</tbody>
</table>

No significant difference between tool type frequencies could be found between the Initial Housepit 7 construction phase and the post Housepit 7 construction phase ($x^2=13.3$, df=10, $p<.25$) (Table 1). There was a significant difference in tool type frequencies between the Initial Housepit 7 construction phase, and the Plateau horizon ($x^2=16.88$, df=10, $p<.001$) (Table 2). There was also a significant difference in tool type frequencies between the Initial Housepit 7 construction phase and the Lochnore phase ($x^2=18.88$, df=10, $p<.05$) (Table 3). No significant difference in tool type frequencies could be found between the Post Housepit 7 construction phase and the Plateau horizon ($x^2=13.46$, df=10, $p<.25$) (Table 4). There was a significant difference in tool type frequencies between the Post 7 construction phase and the Lochnore phase ($x^2=65.52$, df=10, $p<.001$) (Table 5). There was also a significant difference in tool type frequencies between the Plateau horizon and the Lochnore phase ($x^2=31.67$, df=10, $p<.001$) (Table 6).
The chi-squared analysis demonstrates that the Lochnore phase is significantly different from all other components. This suggests that a temporal shift in tool type frequencies occurred sometime between the Lochnore phase and the Plateau horizon. Previous studies have suggested that the Lochnore phase represents a highly mobile, seasonally resource specific group, who relied on curated lithic tools. Later, when populations became increasingly sedentary, more expedient tools were deposited.

Curated tools are most frequently represented by implements with formal shaping (projectile points, bifaces and formal scrapers) (Anderson and Hanson 1988) and by components in complex, multi-component tools (microblades used as side-blades) (Dumond 1987). Expedient tools are represented by all of the other tool-types recovered at Keatley Creek. A chi-squared test (with Yates Correction) was completed to determine the amount of variation within the 4 cultural components between curated and non-curated technologies (Table 7). The results ($x^2=19.861$, df=$3$, $p<.001$) indicate that there is a significant difference in the use of curated technologies between the Lochnore phase and the other cultural components. The Lochnore phase is dominated by curated technologies, and the Kamloops and the Plateau horizons are dominated by expedient technologies.

<table>
<thead>
<tr>
<th>Artifact Class</th>
<th>Post Housepit 7 Construction</th>
<th>Initial Housepit 7 Construction</th>
<th>Plateau</th>
<th>Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expedient</td>
<td>58</td>
<td>8</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Curated</td>
<td>53</td>
<td>12</td>
<td>7</td>
<td>44</td>
</tr>
</tbody>
</table>

Rousseau et al. (1991) have demonstrated that the inhabitants of the Lochnore phase were oriented towards specialized food procurement and processing activities, most often deer hunting. The lithic assemblages associated
with the Lochnore phase are project specific, and are designed to be curated. Another chi-squared test (with Yates Correction) was completed to point out differences in tool assemblages between the Lochnore phase and the other cultural components (Table 8). The presence of kill/butchery artifacts (knives, knife-like flake tools, projectile points, and microblades) within the Lochnore phase suggest that they used specialized food procurement and processing technologies. Kill/butchery tools tend to have smaller edge angles, and as a result are very sharp. The results ($x^2=27.02$, df=3, $p<.001$) demonstrate that there is a significant change in the use of kill/butchery tools over time at Keatley Creek. The inhabitants of the Lochnore phase were more dependent on using specialized food procurement and processing technologies. Inhabitants of the other cultural components were less dependent on the same procurement and processing technologies as the Lochnore phase.

<table>
<thead>
<tr>
<th>Artifact Class</th>
<th>Post Housepit 7 Construction</th>
<th>Initial Housepit 7 Construction</th>
<th>Plateau</th>
<th>Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>kill/butchery</td>
<td>45</td>
<td>6</td>
<td>8</td>
<td>44</td>
</tr>
<tr>
<td>other</td>
<td>66</td>
<td>14</td>
<td>14</td>
<td>12</td>
</tr>
</tbody>
</table>

The various chi-squared tests demonstrated that there was a distinct difference in the lithic technological organization over time at the Keatley Creek site. The difference in the types of tools used suggest a shift in curation, processing, and food procuring technologies.

Since the microblade is the dominant tool type of the Lochnore assemblage, and is almost completely absent from the other components, it makes sense that it is separated out. The Lochnore phase has been characterized as a transitional time period within the Mid-Fraser Canyon region. The first half of the Lochnore phase is a non-pithouse using cultural adaptation based on obtaining
terrestrial fauna, while at the end of the second half, a shift towards the use of marine resources and pithouses is observed (Wilson Consultants Ltd. 1992). The Plateau and the Kamloops horizons are considered to be pithouse-using cultural components with a marine resource focus. The fact that there are two different lithic tool type assemblages associated with the Lochnore phase as compared to the Plateau and the Kamloops horizons makes a lot of sense, different tool types were needed for different types of tasks.

The goal of the chi-squared tests was to demonstrate the temporal variability in lithic technological organization at Keatley Creek. These tests proved that lithic technological variation did occur sometime between the Lochnore phase and the Plateau horizon. Since we did not find an intact Shuswap horizon, it is hard to tell exactly when this technological shift occurred. Other sites in the Mid-Fraser Canyon Region show a marked difference in lithic technological organization after the onset of cooler and moister conditions that began about 3,500 B. P. (Richards and Rousseau 1987). It is likely that the technological shift occurred at around this time at Keatley Creek as well.

DEBITAGE ANALYSIS

A total of 5,819 pieces of debitage were recovered during the 1999 field season, 425 were associated with the Initial Phase of Housepit 7 construction, 2,292 with the Post Housepit 7 construction phase, 394 with the Plateau horizon, and 973 with the Lochnore phase. There were 1,735 pieces of debitage associated with strata that were considered to be culturally ambiguous.

The analysis of debitage recovered from the 1999 UM Keatley Creek investigations provide additional insight into the temporal variability of lithic technology. It is well known that inhabitants of Lochnore occupations placed a
significant amount of emphasis on biface and core reduction, particularly on microbladecore reduction (Fladmark 1986, Stryd and Rousseau 1996). The other occupations found at Keatley Creek (Kamloops and Plateau) also focused on core reduction, but biface reduction and tool resharpening techniques were also utilized. The types of cores that were utilized during the different time periods also changed. The Lochnore inhabitants focused on using microblade cores, while the Plateau and the Kamloops horizons focused on using uni-directional and multi-directional cores. The types of bifaces also changed between the Lochnore phase and the Plateau and the Kamloops horizons. The Lochnore phase bifaces were used as cores, and as task-specific tools. The bifaces from the Plateau and the Kamloops horizons are directed at more generalized tasks.

There are two ways in which to explore this shift in technological organization at Keatley Creek. The first method is to look at the amount of dorsal cortex cover found on each of the individual flakes. The amount of dorsal cortex demonstrates that change in the amount of reliance on decortication activities throughout the different cultural components did occur. Decortication is associated with the earliest stages of lithic reduction and is found most often at lithic quarry sites. The presence of cortex can suggest that minimally reduced nodules were being transported from original quarry stones. A chi-squared test was performed to examine the number of cortex bearing flakes versus non-cortex bearing flakes during each cultural component (Table 9). The results ($\chi^2=16.15$, df=3, $p<.005$) indicate significant variety. The data suggest that the greatest amount of cortex bearing flakes were found during the Lochnore phase. This was perhaps related to the preparation of microblade cores. There are significantly lower numbers of cortex bearing flakes within the other cultural components. This may represent a combination of tool production and reduction of curated cores, where the cortex was removed elsewhere.
In order to understand variation in organization of lithic technology, it is also important to examine different forms of tool production and tool reduction and core reduction. The SFU-Keatley Creek Typology was created to examine these issues. Hayden’s typology combines tool-utility and technology attributes (see Appendix A) in order to explore the role of billet flaking versus core reduction. Billet flakes are associated with biface reduction, and secondary and bipolar flakes are associated with core reduction. By examining the interassemblage differences between billet and secondary/bipolar flakes inferences about lithic technology may be made (Table 10). The results ($x^2=13.38$, df=3, $p<.005$) suggest that billet flaking is relatively even within the Lochnore phase and the Kamloops horizon, but very little billet flaking is occurring during the Plateau horizon.

<table>
<thead>
<tr>
<th>Artifact Class</th>
<th>Post Housepit 7 Construction</th>
<th>Initial Housepit 7 Construction</th>
<th>Plateau</th>
<th>Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billet</td>
<td>34</td>
<td>17</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Secondary/Bipolar</td>
<td>1978</td>
<td>365</td>
<td>360</td>
<td>863</td>
</tr>
</tbody>
</table>

The final chi-squared test also examines component variability through using the SFU-Keatley Creek typology. The relative importance of primary flakes versus all other types of flakes explored in order to provide some scale of lithic reduction. Most primary flakes represent the reduction of larger implements, and
are rarely indicative of sharpening or edge preparation. By examining primary flakes in relation to all other kinds of flakes, a better understanding of tool production is achieved (Table 11). The results ($x^2=25.84$, df=3, p<.001) suggests that the inhabitants of the Plateau horizon produced very few primary flakes as compared to the other components.

<table>
<thead>
<tr>
<th>Artifact Class</th>
<th>Post Housepit 7 Construction</th>
<th>Initial Housepit 7 Construction</th>
<th>Plateau</th>
<th>Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>275</td>
<td>39</td>
<td>16</td>
<td>88</td>
</tr>
<tr>
<td>Other</td>
<td>2019</td>
<td>386</td>
<td>376</td>
<td>885</td>
</tr>
</tbody>
</table>

From the perspective of the debitage analysis, the Plateau horizon is most unique. It has the lowest numbers of cortex flakes, with few primary and billet flakes. This suggests that the reduction strategy most often used was hard hammer. There is no significance placed on biface production. The reduction activities are linked to the occasional production of flake tools from curated cores, and the resharpening of previously made tools.

The Kamloops debitage is represented by the frequent occurrence of cortex bearing flakes, primary flakes, and billet flakes. The reduction of cores and tool production are the dominant activities during this cultural component. The debitage suggests that knappers used stockpiled cores to produce flake tools.

The debitage of the Lochnore phase is considerably similar to that of the Kamloops horizon. There are numerous cortex bearing flakes, and frequent billet and primary flakes. It is believed that the Lochnore knappers worked with cores that were used as portable sources of toolstone for expedient tools and microblades, suggesting a greater degree of mobility.
CONCLUSION

It is evident that there is a distinction in lithic technology between the cultural components found at the Keatley Creek site. This pattern of change is demonstrated through the use of chi-squared analysis tests on both tool categories and debitage categories. The Lochnore phase is likely oriented towards a more narrow range hunting pattern focused on deer. The artifacts associated with this cultural component are mostly curated, and the lithic reduction methods are focused on the production and maintenance of gear. The gear is primarily transportable, which most likely reflects a relatively high degree of mobility. The Lochnore occupation at Keatley Creek is either a residential base camp, a logistical site, or both. The presence of similar debitage patterns suggests that the Lochnore phase is more closely linked with the later occupations at Keatley Creek, but more research is necessary in order to better understand the nature of this Lochnore occupation.

The Plateau horizon is represented by a lithic assemblage with few cores and a high number of expedient flake tools. The functional variation in tools is high and is considered to be very similar to the Kamloops horizon materials. The reduction activities are centered around the limited production of flake tools and on tool maintenance. These tools are likely made out of curated or stockpiled cores. The patterns of tool use, discard and reduction are quite similar to those of the Kamloops horizon, except for the increased focus on tool maintenance. This increased focus on tool maintenance may indicate a shorter residential stay at the Keatley Creek site during the Plateau horizon.

The patterns of the Kamloops horizon strongly suggest that core reduction is the dominant lithic technology. The production of bifaces and other tools are also quite common during this cultural component. Large number of flakes and
tools are being manufactured, and represent a residential pattern connected with Hayden’s (1997a) inference of the utilization of large winter houses where a wide array of activities were completed.
CHAPTER FIVE

CONCLUSIONS

One purpose of the 1999 UM Keatley Creek investigations was to examine and identify the range of processes that were responsible for the variability in lithic technology over time at the Keatley Creek site. With this information, anthropologically broader questions of foraging and mobility strategies were addressed. A model of variability in lithic technological organization and mobility was outlined for the Mid-Fraser Canyon region. This model was then compared with the recovered lithic materials from the Keatley Creek site in order to determine the range of lithic technological variation. Through the use of statistical analysis of lithic assemblages recovered from the four cultural components found at Keatley Creek, a pattern of increased socio-economic complexity coupled with the inception of logistical organization was observed.

The earliest recovered lithic materials date to the Lochnore phase (5,500 to 3,500 B.P.), and are represented by a wide array of finely made artifacts. These artifacts are similar to those found elsewhere in the Mid-Fraser Canyon region and include, Lochnore Side-Notched, Bipointed Projectile Points; microblades; flake scrapers; and a crescent scraper (Stryd and Rousseau 1996). The technological organization of the Lochnore period is based on the production of economically efficient, highly portable, and curated tools. Since house features and advanced fishing technologies are present towards the end of the Lochnore phase, it may be necessary to include it with the other logistically organized, complex hunter-gatherer groups (Shuswap, Plateau, and Kamloops) within the Mid-Fraser Canyon region. More research is needed to fully understand this shift in mobility and social organization.
The artifacts recovered from the Plateau horizon (2,400 to 1,200 B.P.) are also considered to be similar to the artifacts recovered from other sites within the Mid-Fraser Canyon region (Richards and Rousseau 1987). No Plateau points were found within the specific Plateau strata, but Plateau type projectile points were recovered from the rim material of Housepit 7. The Plateau horizon is associated with an increase in the production of expedient flake tools, and the standardization of projectile points, scrapers, and ornamental items. This increase in the production of expedient flake tools combined with the presence of pithouses and storage features suggest the presence of logistical organization.

The lithic materials recovered from the Kamloops strata (1,200 to 200 B.P.) are similar to other Kamloops horizon materials recovered elsewhere in the Mid-Fraser Canyon region (Richards and Rousseau 1987). Lithic materials dating to this horizon have been associated with dumping episodes, rim deposits, and midden deposits. Chipped stone tools associated with the Kamloops horizon suggest a greater degree of technological expediency and include knives, many kinds of scrapers, pieces esquillees, piercers, and borers. Groundstone tools include abraders and ornaments (beads, a pipe mouthpiece, and a piece of drilled mica). The presence of large housepits, and multiple storage features indicate that a logistical mobility pattern was utilized during this time period.

Through the statistical analysis of the recovered tools and debitage from these cultural components, differential patterns of technological organization emerged. A shift from residentially organized general hunter-gatherers to logistically organized complex hunter-gatherers occurred sometime towards the end of the Lochnore phase or during the subsequent Shuswap horizon. This shift in mobility, foraging and socio-economic patterns at Keatley Creek is consistent with the shift in patterns found elsewhere in the Mid-Fraser Canyon region and the Canadian Plateau (Hayden 1997a; Pokotylo and Mitchell 1998; Richards and
Rousseau 1987; Stryd and Rousseau 1996). This demonstrates the need to re-examine the role that the Lochnore phase played in the development of logistically-organized hunter-gatherers in the Mid-Fraser Canyon region.

**FUTURE RESEARCH**

The 1999 UM Keatley Creek investigations has generated a lot of information concerning the variability of lithic technological organization in the Mid-Fraser Canyon region. Further research is necessary to fully understand the entire range of lithic technology throughout the entire history of the region. Shuswap horizon materials were not examined in this project because no strata dating to that time period was recovered during our 1999 investigations. Further excavations at the Keatley Creek site and within the Mid-Fraser Canyon region are needed to further understand this cultural complex.

Further research is also necessary to better understand the patterns of mobility and subsistence during the Lochnore phase. A comprehensive look at Lochnore assemblages within the Mid-Fraser Canyon region is needed. A large block excavation exposing the entire occupation at the Keatley Creek site is necessary in order to be able to ascertain the range of occupations during this time period. Determining whether or not Keatley Creek was a residential base camp or a logistical site will aid researchers in understanding mobility patterns during this time period. With this better understanding of mobility patterns dating to the Lochnore phase, a more complete picture of the range of occupations at Keatley Creek can be obtained.
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APPENDIX A: LITHIC ARTIFACT TYPOLOGY
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>LABELS</th>
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<tbody>
<tr>
<td>MAKER</td>
<td>Artifact Number</td>
</tr>
<tr>
<td>HP</td>
<td>Housepit or Extra-housepit excavation</td>
</tr>
<tr>
<td>SQUARE</td>
<td>Square</td>
</tr>
<tr>
<td>SUBSQUARE</td>
<td>Subsquare</td>
</tr>
<tr>
<td>STRATYP</td>
<td>Stratum type</td>
</tr>
<tr>
<td>STRATA#</td>
<td>Stratum Number</td>
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<td>LEVEL</td>
<td>Level</td>
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<tr>
<td>FEATYPE</td>
<td>Feature type</td>
</tr>
<tr>
<td>FEATURE #</td>
<td>Feature no</td>
</tr>
<tr>
<td>TYPE</td>
<td>Artifact type</td>
</tr>
<tr>
<td>TYPE2</td>
<td>2nd artifact type</td>
</tr>
<tr>
<td>FLAKE</td>
<td>Flake type</td>
</tr>
<tr>
<td>MAXDIM</td>
<td>Maximum dimension</td>
</tr>
<tr>
<td>WEAR</td>
<td>Wear state</td>
</tr>
<tr>
<td>FRAGMENT</td>
<td>Fragmentation state</td>
</tr>
<tr>
<td>WEATHER</td>
<td>Weathering state</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>Raw material</td>
</tr>
<tr>
<td>FIRESPAL</td>
<td>Fire-spailing</td>
</tr>
<tr>
<td>POLISH</td>
<td>Hide-polish</td>
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<td>1</td>
<td>Surface</td>
</tr>
<tr>
<td>2</td>
<td>Roof surface</td>
</tr>
<tr>
<td>3</td>
<td>Roof</td>
</tr>
<tr>
<td>4</td>
<td>Floor</td>
</tr>
<tr>
<td>5</td>
<td>Subfloor (cultural deposit under floor)</td>
</tr>
<tr>
<td>6</td>
<td>Hearth</td>
</tr>
<tr>
<td>7</td>
<td>Feature</td>
</tr>
<tr>
<td>8</td>
<td>Rim</td>
</tr>
<tr>
<td>9</td>
<td>Pot</td>
</tr>
<tr>
<td>10</td>
<td>Dump on floor (cultural deposit on top of floor)</td>
</tr>
<tr>
<td>11</td>
<td>Filtered collapse</td>
</tr>
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<td>12</td>
<td>Post-occupational infilling</td>
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<th>FEATURE TYPE</th>
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<td>1</td>
<td>Hearth</td>
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<td>Pit</td>
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<tr>
<td>3</td>
<td>Bench top</td>
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<tr>
<td>4</td>
<td>Posthole</td>
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<td>5</td>
<td>Lithic cache</td>
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<td>SHORT CODE</td>
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<tr>
<td><strong>UNIFACIALLY RETOUCHED ARTIFACTS</strong></td>
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<td>Scraper 1</td>
<td>143</td>
</tr>
<tr>
<td>Scraper 2</td>
<td>150</td>
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<tr>
<td>Scraper 3</td>
<td>155</td>
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<td>Scraper 4</td>
<td>156</td>
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<td>Scraper 5</td>
<td>158</td>
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<td>Scraper 6</td>
<td>163</td>
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<td>Scraper 7</td>
<td>164</td>
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<td>Scraper 8</td>
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<tr>
<td>Flake 1</td>
<td>70</td>
</tr>
<tr>
<td>Flake 2</td>
<td>74</td>
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<tr>
<td>Flake 3</td>
<td>148</td>
</tr>
<tr>
<td>Flake 4</td>
<td>170</td>
</tr>
<tr>
<td>Flake 5</td>
<td>171</td>
</tr>
<tr>
<td>Ut.flk 1</td>
<td>180</td>
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<tr>
<td>Ut.flk 2</td>
<td>71</td>
</tr>
<tr>
<td>Ut.flk 3</td>
<td>72</td>
</tr>
<tr>
<td>Ut.flk 4</td>
<td>73</td>
</tr>
<tr>
<td>Misc.Unf</td>
<td>157</td>
</tr>
<tr>
<td>Thumb scraper</td>
<td>161</td>
</tr>
<tr>
<td>End scraper</td>
<td>162</td>
</tr>
<tr>
<td>Piercer</td>
<td>153</td>
</tr>
<tr>
<td>Unit borer</td>
<td>152</td>
</tr>
<tr>
<td>Unit dentic.</td>
<td>160</td>
</tr>
<tr>
<td>Unit knife</td>
<td>159</td>
</tr>
<tr>
<td>Unit perfor</td>
<td>151</td>
</tr>
</tbody>
</table>
| Keatley Creek EeR7 | Lithic Key
|-------------------|------------------|
| **Uniface** | **Blade**
| 5 0 | 1 8 8 |
| **Blade** | **Retouched backed blade**
| 1 8 8 | 1 3 1 |
| **Notch** | **Notch**
| 1 5 4 | 1 3 1 |
| **Small notch** | **Small notch**
| 5 4 | 6 4 |
| **Dufour** | **Dufour bladelet**
| 8 8 | 1 3 1 |
| **Spall 1** | **Spall tool**
| 1 8 3 | 1 8 3 |
| **Spall 2** | **Retouched spall tool**
| 1 8 4 | 1 3 1 |
| **Misc.** | **Miscellaneous**
| 1 8 | 1 8 3 |

### BIFACIAL ARTIFACTS

| Bilace 2 | 1 9 2 | Stage 2 bilace
| Bilace 3 | 1 9 3 | Stage 3 bilace
| Bilace 4 | 1 3 1 | Bilace Stage 4
| Bilace 5 | 1 3 9 | Fan-tailed bilace
| Bilace 6 | 1 4 0 | Knife-like bilace
| Bilace 7 | 1 4 1 | Scraper-like bilace
| Bilace 8 | 1 4 4 | Convergent knife-like bilace
| Bil.frag. | 6 | Bilacial fragment
| Bil tip | 1 3 5 | Distal tip of bilace
| Bil retch flake | 4 | Bilace retch flake with hide polish
| Bil knife | 1 3 0 | Bilacial knife
| Bil. flake | 8 | Large bilace reduction flake
| Bil perforo. | 1 3 2 | Bilacial perforator
| Bil drill | 1 3 3 | Bilacial drill

- **Stage 2 bilace**: Edged piece. Callahan's (1979) Stage 2 (Initial edging) bilace or fragment.
- **Stage 3 bilace**: Bilacally worked, circumferential, roughly centered edge-angles (550s-750s) on bilace with width/thickness ratio * 2.00.
- **Stage 4 bilace**: Callahan's (1979) Stage 4 (Secondary thinning) bilace or fragment.
- **Fan-tailed bilace**: Flattened cross-section; aligned, centered edge-angles 250s-450s; flake scars cross center line and may undercut scars from opposing edge.
- **Knife-like bilace**: Roughly triangular bilace, flared at base, base convex. Wt ratio of examples observed to date is > 4.00.
- **Scraper-like bilace**: Lightly retouched "scraper-like" bilace/fragment: flake or fragment with one or more bifacially retouched edges with an edge angle greater than 550s. No bifacially reduced surfaces and no retouch extending more than 5mm from edge.
- **Convergent knife-like bilace**: Lightly retouched "scraper-like" bilace/fragment: flake or fragment with one or more bifacially retouched edges with an edge angle greater than 550s. No bifacially reduced surfaces and mainly retouch extending less than 5mm from edge.
- **Bifacial fragment**: Convergent "knife-like" bilace: similar to 140 but with two converging retouched edges. Typically retouch is more extensive and invasive on one edge than on the other. RARE & OBSOLETE.
- **Small bifacial fragment**: Distal tip of bilace (triangular). Self explanatory. However, it may be difficult to distinguish the distal tips of large bilaces from projectile point preforms.
- **Bilaces with either a cutting edge backed by a thick edge, or two bilacial cutting edges**: Narrow, elongated, bifacially chipped point with sharp tip.

Page 3
### Kealley Creek Excavation

<table>
<thead>
<tr>
<th>Lithic Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piece esquille</td>
<td>Flake with ventral scar, crushed at ends but without primary flake scars or scars extending full length of flake, usually thinner than bipolar core (see type 145).</td>
</tr>
<tr>
<td>Miscellaneous biface</td>
<td>Miscellaneous biface: bifacially worked artifacts which cannot be assigned to any other category.</td>
</tr>
<tr>
<td>Points</td>
<td>Flakes, nodule or chunk suitable for bifacial reduction. Spalls which might be assigned to this category will be counted as spalls in the lithic sample coding and will not be assigned artifact numbers.</td>
</tr>
</tbody>
</table>

#### Points

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>Blank</td>
</tr>
<tr>
<td>Small blank</td>
<td>Small blank</td>
</tr>
<tr>
<td>Preform</td>
<td>Preform</td>
</tr>
<tr>
<td>Pt frag</td>
<td>Point fragment</td>
</tr>
<tr>
<td>Pt frag</td>
<td>Point fragment</td>
</tr>
<tr>
<td>Pt tip</td>
<td>Point tip</td>
</tr>
<tr>
<td>Misc Pts</td>
<td>Miscellaneous points</td>
</tr>
<tr>
<td>Side-notch</td>
<td>Side-notched point no base</td>
</tr>
<tr>
<td>Lehman</td>
<td>Lehman point</td>
</tr>
<tr>
<td>Late Plat.</td>
<td>Late Plateau point</td>
</tr>
<tr>
<td>Kamloops</td>
<td>Kamloops point: Side-notched point, base missing. Lehman point: thin, pentagonal with obliquely-oriented, V-shaped corner or side notches. Lehman point: side notch, leaf shaped, convex basal margin, edge grinding at base.</td>
</tr>
<tr>
<td>Plateau</td>
<td>Plateau point</td>
</tr>
<tr>
<td>Plateau</td>
<td>Plateau point</td>
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<tr>
<td>Plateau</td>
<td>Plateau point</td>
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<td>Plateau point</td>
</tr>
<tr>
<td>Plateau</td>
<td>Plateau point</td>
</tr>
<tr>
<td>Late Plat.</td>
<td>Late Plateau point</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap base</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Contracting stem slight shoulders.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Contracting stem pronounced shoulders.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Parallel stem slight shoulders.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Parallel stem pronounced shoulders.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Corner removed concave base.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Corner removed &quot;eared&quot;.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Stemmed single basal notch.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Shallow side notched straight basal margin.</td>
</tr>
<tr>
<td>Shuswap</td>
<td>Shuswap Shallow side notched concave basal margin.</td>
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#### Cores

<table>
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<tr>
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<tbody>
<tr>
<td>Core</td>
<td>Multidirectional core</td>
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### Lithic Key

- Kamloops 0
- Kamloops 1
- Kamloops 2
- Kamloops 3
- Kamloops 4
- Kamloops 5
- Plateau 0
- Plateau 1
- Plateau 2
- Plateau 3
- Plateau 4
- Plateau 5
- Late Plat.
- Shuswap 1
- Shuswap 2
- Shuswap 3
- Shuswap 4
- Shuswap 5
- Shuswap 6
- Shuswap 7
- Shuswap 8
- Shuswap 9
- Shuswap X
- Core 1
### Lithic Key

<table>
<thead>
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<th>Core Type</th>
<th>Description</th>
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<tr>
<td>Small flake core</td>
<td>Flake, blade, etc. which has been used as a core but which is not identifiable as a bipolar core.</td>
</tr>
<tr>
<td>Unidirectional core</td>
<td>Undirectional (pyramidal) core similar to microblade core but larger; tapered; single striking platform; regular, parallel flake scars around circumference; width of flake scars &gt; 7 mm.</td>
</tr>
<tr>
<td>Bipolar core</td>
<td>Core with crushing on both ends, usually thicker than pieces esquillee with no original ventral scar, primary flake scars on one or more faces may extend full length of core (see type 145). Microblade core/core fragment: unidirectional core with regular parallel ridges around circumference; width of flake scars &gt; 7 mm (see type 189). Straight, parallel edges; striking platform approximately at right angle to axis of blade, width &gt; 7 mm. Dorsal surface shows evidence of use as striking platform with beginnings of flake scars around circumference.</td>
</tr>
<tr>
<td>Microblade core</td>
<td>Microblade core/core fragment. Unidirectional core with regular parallel ridges around circumference; width of flake scars &gt; 7 mm (see type 169). Straight, parallel edges; striking platform approximately at right angle to axis of blade, width &gt; 7 mm.</td>
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<tr>
<td>Rejuvenition flake</td>
<td>Dorsal surface shows evidence of use as striking platform with beginnings of flake scars around circumference.</td>
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<table>
<thead>
<tr>
<th>Grounded Artifacts</th>
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<td>Cell</td>
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<tr>
<td>Ornamental ground nephrite</td>
<td>Ornamental ground nephrite</td>
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<tr>
<td>Ground state</td>
<td>Ground state</td>
</tr>
<tr>
<td>Groundstone maul</td>
<td>Groundstone maul</td>
</tr>
<tr>
<td>Grinding stone mortar</td>
<td>Grinding stone mortar</td>
</tr>
<tr>
<td>Hammerstone</td>
<td>Hammerstone</td>
</tr>
<tr>
<td>Steatite tubular pipe</td>
<td>Steatite tubular pipe</td>
</tr>
<tr>
<td>Sandstone saw</td>
<td>Sandstone saw: wedge-shaped sandstone slab; narrow edge used for cutting stone by abrasion</td>
</tr>
<tr>
<td>Miscellaneous ground stone</td>
<td>Miscellaneous ground stone: fragments with ground surfaces or edges</td>
</tr>
<tr>
<td>Abraded cobble or block</td>
<td>Abraded cobble or block: cobble with striations, polish, battering on edges or other evidence of cultural modification</td>
</tr>
<tr>
<td>Abraded cobble spill</td>
<td>Abraded cobble spill</td>
</tr>
<tr>
<td>Abrader</td>
<td>Abrader</td>
</tr>
<tr>
<td>Abrader/saw</td>
<td>Abrader/saw OBSOLETE</td>
</tr>
<tr>
<td>Wedge-shaped bilateral adze</td>
<td>Wedge-shaped bilateral adze</td>
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<tr>
<td>Anvil stone</td>
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<table>
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<th>Ornaments</th>
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<tr>
<td>Copper artifact</td>
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<tr>
<td>Mica ornament</td>
<td>Mica ornament</td>
</tr>
<tr>
<td>Ground or sculpted ornament</td>
<td>Ground or sculpted ornament</td>
</tr>
<tr>
<td>Stone bead</td>
<td>Stone bead</td>
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<tr>
<td>Ochre</td>
<td>Ochre</td>
</tr>
<tr>
<td>Stone pendant</td>
<td>Stone pendant: or eccentric: including bilateral denticulate pendant (oval to leaf shaped blade with shallow notches at one or both extremities suitable for attachment of thong)</td>
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</table>

<table>
<thead>
<tr>
<th>Other</th>
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<tr>
<td>Metal artifact</td>
<td>Metal artifact</td>
</tr>
<tr>
<td>Glass artifact</td>
<td>Glass; includes modified artifacts and debitage. Indicate artifact type in comments.</td>
</tr>
<tr>
<td>Ochre palette</td>
<td>Ochre palette</td>
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</tbody>
</table>

Artifact items that are made from "historic" metals such as iron and lead include iron projectile points. Does not include copper artifacts which may derive from prehistoric sources.
### BASIC DEFINITIONS

**Backing:** in general refers to a thick, blunt edge opposite a cutting edge; may be manufactured by unifacial or bifacial retouch.

**Use retouch:** regular but non-intrusive retouch, extending at least 10mm; edge angle < 40°

**Billet flake:** pronounced lip, broad fracture front (absence of point impact features), small platform area in relation to flake size, little crushing of platform, possible evidence of platform preparation

**Bipolar flake:** crushing at both ends; crushing of platform, ventral scarring, relatively straight ventral surface.

**Primary flake:** flake suitable for use as tool; maximum dimension > 2cm, at least 1cm of edge robust enough for retouch (edge angle < 45°)

**Secondary flake:** flakes with recognizable ventral surface not classified as bifacial, bipolar, or primary.

**Shatter debitage:** flakes with recognizable ventral surface not classified as bifacial, bipolar, or primary.

### MATERIAL

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APPENDIX B: FIGURES
Figure 1. Keatley Creek site location (from Prentiss 1993)
Figure 2. Map of Keatley Creek core area showing location of Housepit 7 (after Hayden 1997a)
Figure 3  1999 UM excavation grid at Housepit 7.
Figure 4. Housepit 7 floor map and original grid system (from Prentiss 1993).
APPENDIX C: PHOTOGRAPHS
Photograph 1. Microblades

Photograph 2. Lochmore phase hafted multifunction scraper (BBB-16, XVIII, Level 1).
Photograph 3. Plateau horizon projectile points.

Photograph 4. Kamloops horizon projectile points.
Photograph 5. Groundstone pipe fragment (NN-10, XIX-3-1, Level 2).

Photograph 6. Stone beads (all stratum XIII, except bead on right (stratum I)).