Determination of Site Use as Inferred From the Lithics Data of the Post Abandonment Occupation of Housepit 7 at the Keatley Creek Site: Comparing Winter Village and Short-term Camp Models

Andreï B. Jendresen

The University of Montana

Follow this and additional works at: https://scholarworks.umt.edu/etd

Let us know how access to this document benefits you.

Recommended Citation
Jendresen, Andreï B., "Determination of Site Use as Inferred From the Lithics Data of the Post Abandonment Occupation of Housepit 7 at the Keatley Creek Site: Comparing Winter Village and Short-term Camp Models" (2004). Graduate Student Theses, Dissertations, & Professional Papers. 9339. https://scholarworks.umt.edu/etd/9339

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.
Permission is granted by the author to reproduce this material in its entirety, provided that this material is used for scholarly purposes and is properly cited in published works and reports.

**Please check "Yes" or "No" and provide signature**

Yes, I grant permission  
No, I do not grant permission

Author’s Signature: André Andersen

Date: 5/13/04

Any copying for commercial purposes or financial gain may be undertaken only with the author’s explicit consent.
Determination of Site Use as Inferred from the Lithics Data of
the Post Abandonment Occupation of Housepit 7 at the Keatley Creek Site:
Comparing Winter Village and Short-term Camp Models.

by

Andre' B. Jendresen

B.A. The University of Montana, 2001

presented in partial fulfillment of the requirements

for the degree of

Master of Arts

The University of Montana

2004

Approved by:

[Signatures]

Chairperson

Dean, Graduate School

Date

5-13-04
Abstract

Jendresen, Andre’ B., M.A., May 2004

Determination of Site Use as Inferred from the Lithics Data of the Post Abandonment Occupation of Housepit 7 at the Keatley Creek Site: Comparing Winter Village and Short-term Camp Models (103 pp.)

Chair: Dr. William C. Prentiss

The Keatley Creek site is located on the Canadian Plateau, in the Middle-Fraser Canyon region of south central British Columbia. It is perhaps the largest winter pithouse village in the region, and it has been occupied from the Middle Prehistoric through the Late Prehistoric Periods ca. 5000-200 B.P. During the late prehistoric it was occupied by semi-sedentary hunter-gatherers utilizing intensive resource harvesting and storage techniques, mainly focusing on salmon. The social organization was likely ranked, with hereditary ascribed status, similar to that of the Northwest Coast cultures. Most of the archaeological record of the Keatley Creek site is associated with housepit occupations, but the first and last occupations of the site included open camps. This analysis deals with the last occupation of Housepit 7, or rather the Post-Abandonment Occupation, 300-400 years after the last occupants of the pithouse had left.

The research problem that is addressed involves determining the pattern of site use associated with the Post-Abandonment Occupation of Housepit 7 at the Keatley Creek site. Hunter-gatherers utilizing sites for different purposes and lengths of time are likely to organize their technologies accordingly, and thus leave behind different lithic patterns. Two ethnoarchaeological models of site use will be discussed and compared; the winter village pattern, and the short-term camp pattern. The models of site use will be used as a point of reference to interpret a Lochnore phase, short-term camp and a Kamloops horizon winter village. The main focus of the analysis is a comparison of lithics data between the Post-Abandonment Occupation (PAO), and the Pre-housepit Lochnore Occupation (PLO), and the Housepit 7 floor (HP 7 floor).

This research will help refine the occupation chronology of Housepit 7, and sort out variation in occupation patterns. It will also aid in the understanding of mobility patterns of late prehistoric hunter-gatherers in the Mid-Fraser region, since the two ethnoarchaeological models of site use that are compared to the PAO employ very different mobility strategies.
# Table of Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>List of Tables</td>
<td>v</td>
</tr>
<tr>
<td>List of Figures</td>
<td>vi</td>
</tr>
<tr>
<td><strong>Chapter 1: Introduction</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Research Problem</td>
</tr>
<tr>
<td></td>
<td>Significance of Research</td>
</tr>
<tr>
<td></td>
<td>Thesis Outline</td>
</tr>
<tr>
<td><strong>Chapter 2: Research Background</strong></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Environmental Context</td>
</tr>
<tr>
<td></td>
<td>Site Setting</td>
</tr>
<tr>
<td></td>
<td>Physiography and Topography</td>
</tr>
<tr>
<td></td>
<td>Post-Glacial Landform Development</td>
</tr>
<tr>
<td></td>
<td>Paleoenvironmental Summary: Climate, Fauna, and Flora</td>
</tr>
<tr>
<td></td>
<td>Culture Chronology</td>
</tr>
<tr>
<td></td>
<td>Canadian Plateau culture area</td>
</tr>
<tr>
<td></td>
<td>Mid-Fraser Region Culture Chronology</td>
</tr>
<tr>
<td></td>
<td>Early Period</td>
</tr>
<tr>
<td></td>
<td>Middle Period</td>
</tr>
<tr>
<td></td>
<td>Late Period</td>
</tr>
<tr>
<td></td>
<td>Mid-Fraser Regional Ethnography</td>
</tr>
<tr>
<td></td>
<td>Lillooet</td>
</tr>
<tr>
<td></td>
<td>Shuswap</td>
</tr>
<tr>
<td></td>
<td>Thompson</td>
</tr>
<tr>
<td></td>
<td>Ethnographic Accounts of Lithic Technology on the Interior Canadian Plateau</td>
</tr>
<tr>
<td></td>
<td>Cultural Comparison of the Lillooet, Shuswap, and Thompson</td>
</tr>
<tr>
<td><strong>Chapter 3: Research Methods</strong></td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Theoretical Background</td>
</tr>
<tr>
<td></td>
<td>Comparison of Lochnore Phase and Kamloops Horizon</td>
</tr>
<tr>
<td></td>
<td>Technological Organization</td>
</tr>
<tr>
<td></td>
<td>Determining Site Use</td>
</tr>
<tr>
<td><strong>Chapter 4: Analysis and Results</strong></td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Debitage and Stone Tool Analysis</td>
</tr>
<tr>
<td></td>
<td>Debitage Analysis</td>
</tr>
<tr>
<td></td>
<td>Stone Tool Analysis</td>
</tr>
<tr>
<td></td>
<td>Lithic Analysis Used at the Keatley Creek site for the 1999 and 2002 Excavations</td>
</tr>
<tr>
<td>Chapter</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Post-Abandonment Occupation Analysis</td>
<td>63</td>
</tr>
<tr>
<td>Functional Classification</td>
<td>64</td>
</tr>
<tr>
<td>PAO Stone Tool Analysis and Results</td>
<td></td>
</tr>
<tr>
<td>Comparison of Lithic Tools by Organizational Strategies</td>
<td>67</td>
</tr>
<tr>
<td>Comparison of Lithic Tools by Functional Classification</td>
<td>70</td>
</tr>
<tr>
<td>Comparison of Curated and Non-curated Lithic Tools</td>
<td>73</td>
</tr>
<tr>
<td>PAO Lithic Debitage Analysis and Results</td>
<td>74</td>
</tr>
<tr>
<td>Component variability in Billet Flakes</td>
<td>76</td>
</tr>
<tr>
<td>Component variability in Primary Flakes</td>
<td>78</td>
</tr>
<tr>
<td>Summary of Results</td>
<td>80</td>
</tr>
<tr>
<td><strong>Chapter 5: Discussion and Conclusions</strong></td>
<td>83</td>
</tr>
<tr>
<td>References Cited</td>
<td>89</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2-1. Cultural Comparison of the Lilooet, Shuswap, and Thompson</td>
<td>43</td>
</tr>
<tr>
<td>Table 4-1. Comparison of Lithic Tools by Organizational Strategies</td>
<td>67</td>
</tr>
<tr>
<td>Table 4-2. Euclidean Distance Measures of Similarity: Organizational Strategies</td>
<td>69</td>
</tr>
<tr>
<td>Table 4-3. Comparison of Lithic Tools by Functional Classification</td>
<td>70</td>
</tr>
<tr>
<td>Table 4-4. Euclidean Distance Measures of Similarity: Functional Classifications</td>
<td>72</td>
</tr>
<tr>
<td>Table 4-5. Comparison of Curated and Non-curated Lithic Tools</td>
<td>73</td>
</tr>
<tr>
<td>Table 4-6. Euclidean Distance Measures of Similarity: Curated and Non-curated Lithic Tool Use</td>
<td>74</td>
</tr>
<tr>
<td>Table 4-7. Component variability in Billet Flakes</td>
<td>76</td>
</tr>
<tr>
<td>Table 4-8. Euclidean Distance Measures of Similarity: Billet Flaking</td>
<td>77</td>
</tr>
<tr>
<td>Table 4-9. Component variability in Primary Flakes</td>
<td>78</td>
</tr>
<tr>
<td>Table 4-10. Euclidean Distance Measures of Similarity: Primary Flake Production</td>
<td>79</td>
</tr>
<tr>
<td><strong>Figure</strong></td>
<td><strong>Page</strong></td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Figure 1-1. Map showing Keatley Creek site location in the Northwest Plateau area of northwest North America (from Hayden 2000a)</td>
<td>6</td>
</tr>
<tr>
<td>Figure 1-2. Map showing Keatley Creek site in Mid-Fraser Context (from Prentiss et al. 2003)</td>
<td>7</td>
</tr>
<tr>
<td>Figure 1-3. Map of Keatley Creek site core area showing location of Housepit 7 (from Prentiss et al. 2003)</td>
<td>8</td>
</tr>
<tr>
<td>Figure 1-4. Contour map of Housepit 7 at Keatley Creek (Prentiss et al. 2003)</td>
<td>9</td>
</tr>
<tr>
<td>Figure 4-1. Comparison of Lithic Tools by Organizational Strategies: PAO Stratum XVII</td>
<td>68</td>
</tr>
<tr>
<td>Figure 4-2. Comparison of Lithic Tools by Organizational Strategies: HP 7 Floor</td>
<td>68</td>
</tr>
<tr>
<td>Figure 4-3. Comparison of Lithic Tools by Organizational Strategies: PLO Lochnore</td>
<td>69</td>
</tr>
<tr>
<td>Figure 4-4. Comparison of Lithic Tools by Functional Classification: Emphasis on Hunting and Butchering</td>
<td>71</td>
</tr>
<tr>
<td>Figure 4-5. Comparison of Lithic Tools by Functional Classification: Emphasis on Hideworking and Basketry (light duty)</td>
<td>71</td>
</tr>
<tr>
<td>Figure 4-6. Comparison of Lithic Tools by Functional Classification: Emphasis on Woodworking (heavy duty)</td>
<td>72</td>
</tr>
<tr>
<td>Figure 4-7. Comparison of Curated and Non-curated Lithic Tools</td>
<td>73</td>
</tr>
<tr>
<td>Figure 4-8. Component variability in Billet Flakes</td>
<td>75</td>
</tr>
<tr>
<td>Figure 4-9. Component variability in Primary Flake Production</td>
<td>75</td>
</tr>
<tr>
<td>Figure 4-10. Post-Abandonment Occupation Stratum XVII Debitage Flake Type Summary</td>
<td>76</td>
</tr>
<tr>
<td>Figure 4-11. Post-Abandonment Occupation Stratum XVII Debitage Cortex Cover Summary</td>
<td>79</td>
</tr>
</tbody>
</table>
CHAPTER ONE
INTRODUCTION

The Keatley Creek site is located on the Canadian Plateau (Figure 1-1), in the Middle-Fraser Canyon region of south central British Columbia (Figure 1-2). It is in Kroeber's (1939) northern Columbia-Fraser culture area. It is perhaps the largest of several big winter pithouse villages in the region (Figure 1-2), and it has been occupied from the Middle Prehistoric through the Late Prehistoric Periods ca. 5000-200 B.P. (Stryd and Rousseau 1996). The Mid-Fraser Canyon region was a prehistoric trade center similar to The Dalles area of the lower Columbia Plateau (Hayden and Schulting 1997). The Mid-Fraser Canyon and The Dalles were both located at optimal salmon fishing and trading areas of the river, and this allowed for the development of larger, richer, and more powerful and socio-economically complex villages than any other area on the interior Northwest Plateau of North America (Hayden and Spafford 1993). During the late prehistoric these villages were occupied by semi-sedentary hunter-gatherers utilizing intensive resource harvesting and storage techniques, mainly focusing on salmon (Chatters and Pokotylo 1998; Hayden 2000a). The social organization in the larger villages was most likely ranked, with hereditary ascribed status, similar to that of the Northwest Coast cultures (Chatters and Pokotylo 1998; Hayden 1997, 2000a; Hayden and Spafford 1993). Studying the emergence of complex hunter-gatherer communities on the interior Plateau can lead to a better general understanding of the evolution of collector systems, and social inequality (Price and Feinman 1995). The Keatley Creek site offers one of the best opportunities to study these communities on the Plateau (Prentiss et al. 2003). It contains housepit deposits stratified into distinct roof, rim, floor, and pit feature
deposits. The site’s preservation of organic materials including bone and plant remains is very good.

Hayden with the help of other researchers (Hayden 1997; Hayden et al. 1996; Hayden and Ryder 1991; Hayden and Spafford 1993; Lepofsky et al. 1996; Prentiss 1993, 2000a, 2000b, Spafford 1991) has made a thorough and convincing argument for the existence of a cultural system which at its height had the following characteristics, as summarized in Prentiss et al. (2003):

“(1) A pattern of biseasonal mobility and sedentism with housepit villages occupied during winter months; (2) a village population size of up to 1000-1400 persons; (3) an economic system best described as “collector” following Binford’s (1980) definition, emphasizing logistical organization of task groups, mass harvesting of key resources (particularly salmon), and a delayed-return subsistence strategy based on extensive use of storage facilities within and between houses; (4) a socio-economic hierarchy of families and corporate groups, the most powerful of which lived in large multi-family households, likely maintained elite trade partnerships with elite of other villages, and owned or controlled access to key resource collection locales including hunting, fishing, and lithic quarry areas; and (5) a pattern of feasting and other ceremonies indicated by specialized houses and treatment of dog remains.”

The culture of the community that occupied the Keatley Creek site at its height appears to have been complex in the sense of Arnold’s (1996:78) definition of a complex hunter-gatherer society as one which possesses “social and labor relationships in which leaders have a sustained or on-demand control over nonkin labor and social differentiation is hereditary.”

Most of the archaeological record of the Keatley Creek site (Figure 1-3) is associated with housepit occupations, but the first and last occupations of the site included open camps (Prentiss et al. 2003). This analysis deals with the last occupation
of Housepit 7 (Figure 1-4), or rather the Post-Abandonment Occupation, 300-400 years after the last occupants of the pithouse had left.

**RESEARCH PROBLEM**

The research problem that is addressed involves determining the pattern of site use associated with the Post-Abandonment Occupation of Housepit 7 at the Keatley Creek site. Hunter-gatherers utilizing sites for different purposes and lengths of time are likely to organize their technologies accordingly, and thus leave behind different lithic patterns. Two ethnoarchaeological models of site use will be discussed and compared; the winter village pattern, and the short-term camp pattern. The models of site use will be used as a point of reference to interpret a Lochnore phase, short-term camp and a Kamloops horizon winter village. The main focus of the analysis is a comparison of lithics data between the Post-Abandonment Occupation (PAO), and the Pre-housepit Lochnore Occupation (PLO), and the Housepit 7 floor (HP 7 floor).

**SIGNIFICANCE OF RESEARCH**

The evolution of social complexity is a major topic of archaeological research interest in the interior Plateau region (Hayden 1997). It is important to develop an accurate range of occupation dates of housepit floors and other occupations, and to explain their cultural patterns based on the deposited material remains. The recognition of variation in social organization relies on several analytical tactics. A useful tactic employed at the Keatley Creek site has been to use the distribution of activities on housepit floors as an indicator of residential and occupation organization (Prentiss et al. 2000). Repeated redundant domestic activities indicate differentiated multi-family
domestic units within a single pithouse, while communal activity organization indicates undifferentiated domestic units. When the organization of domestic labor is identified using spatial analysis of housepit floor debris, then differentiated discard and caching of prestige versus non-prestige items can be examined. Hayden (1997) has successfully examined distributions of elite trade items like lithic eccentrics, ground stone nephrite adzes, carved digging stick handles, marine shells, and hide processing tools as indicators of differential status of domestic units on housepit floors and between houses.

This research will help refine the occupation chronology of Housepit 7, and sort out variation in occupation patterns. It will also aid in the understanding of mobility patterns of late prehistoric hunter-gatherers in the Mid-Fraser region, since the two ethnoarchaeological models of site use that are compared to the Post-Abandonment Occupation are very different.

**THESIS OUTLINE**

Chapter 1, Introduction is dedicated to the introduction of the research problem. Chapter 2, Research Background provides the context for the research problem by discussing the environmental setting, culture history, and ethnography for the region in which the Keatley Creek site is located. The interior Plateau paleoenvironments are discussed, as well as the current local environment of the site. The culture history is then linked to the environmental history as the current local environment and the past paleoenvironments serve as the backdrop for the cultural chronology.

Chapter 3, Research Methods discusses how the lithics data from the Post-Abandonment Occupation (PAO) of housepit 7 at the Keatley Creek site were collected and analyzed, to
determine the pattern of site use. Two models of site use will be discussed and compared, the winter village pattern, and the short-term camp pattern. This chapter will also review the theoretical background for the interpretation of lithic-assemblage formation, and how it aids in the understanding of lithic technological change over time. Further discussions involve changes in lithic reduction, tool use, and discard strategies, and how these changes relate to questions of mobility and foraging strategies, and lithic technological organization. Chapter 4, Analysis and Results discusses the lithic debitage and tool analyses and the results. Chapter 5, Discussion and Conclusions discusses and summarizes the research. It outlines the occupation patterns of the Post-Abandonment and Lochnore occupations of housepit 7 at the Keatley Creek site, and the socioeconomic systems behind those patterns.
Figure 1-1. Map showing Keatley Creek site location in the Northwest Plateau area of northwest North America (from Hayden 2000a)
Figure 1-2. Map showing Keatley Creek site in Mid-Fraser Context (from Prentiss et al. 2003)
Figure 1-3. Map of Keatley Creek site core area showing location of Housepit 7 (from Prentiss et al. 2003).
Figure 1-4. Contour map of Housepit 7 at Keatley Creek (Prentiss et al. 2003)
CHAPTER TWO

RESEARCH BACKGROUND

This chapter provides the context for the research problem by discussing the environmental setting, culture history, and ethnography for the region in which the Keatley Creek site is located. A review of the interior Plateau paleoenvironments will be discussed, as well as the current local environment of the site. The culture history will then be linked to the environmental history as the current local environment and the past paleoenvironments serve as the backdrop for the culture chronology.

ENVIRONMENTAL CONTEXT

The Keatley Creek site (EeR17) is located on the Canadian Plateau, in Kroeber’s (1939) northern Columbia-Fraser culture area. Climate, topography, and drainage have greatly affected the demography and economy of human populations in the interior Canadian Plateau region throughout the human occupation of the area (Nelson 1973).

The topography, altitude, climate, precipitation, and temperature fluctuations influence economically important faunal and botanical communities in the region. The Canadian Plateau is continually changing, and it contains a variety of different habitats and resources, which were utilized for clothing, medicine, food, shelter, and tools (Pokotylo and Mitchell 1998; Chatters 1998).

SITE SETTING

The Keatley Creek site is located in the mid-Fraser Canyon region of south-central British Columbia. It sits at the bottom of the foothills of Mt. Cole, in a small, protected basin at the back edge of a moraine terrace, about 370 meters above the Fraser...
River (Hayden et al. 1997; Lepofsky et al. 1996). The site reaches heights of 550-640 meters above sea level at its maximum, and it is about 800 meters long (Hayden 2000a). The site lies about 25 km upstream from the modern town of Lillooet, and approximately 350 km upstream from the mouth of the Fraser River (Hayden 2000a).

The Keatley Creek site is close to the upper limit of the Fraser River Piedmont, which is a basal glacial till covered by steppe-like flora, which includes cactus, sagebrush, rabbit bush, bunch grass, and some scattered Ponderosa pine (Baker 1970). Keatley Creek has cut through the glacial till deposits on the southern edge of the site (Lenert 2000; Prentiss et al. 2000). Sagebrush (*Artemisia tridentata*) and different other grasses are the dominant site vegetation today. The tree covered slopes that surround the Keatley Creek site today consist of Douglas fir (*Pseudotsuga menziesii*), and Ponderosa pine (*Pinus ponderosa*). The forested slopes extend upwards and gradually change into sub-alpine meadows (Lepofsky et al. 1996). The biogeoclimatic zones following the slopes upward are the Ponderosa pine zone, the Interior-Douglas fir zone, the sub-alpine and alpine zones (Meidinger and Pojar 1991). The Keatley Creek site was in a prime location to take advantage of the floral and faunal resources of the various biotic zones. The faunal resources included deer (*Odocoileus* spp.), salmon (*Oncorhyncus* spp.), lake trout (*Salvelinus namaykush*), bighorn sheep (*Ovis canadensis*), beaver (*Castor* spp.), moose (*Alces alces*), black bear (*Ursus americanus*), rabbit (*Lepus* spp.), sage grouse (*Centrocerus urophasianus*), California quail (*Callipepla californica*), and waterfowl. Plants used included fruits and berries like saskatoons (*Amelanchier alnifolia*), kinnikinik (*Arctostaphylos uva-ursi*), red-osier dogwood (*Cornus stolonifera*), cherries (*Prunus* spp.), currants (*Ribes* spp.), rosehipps (*Rosa* spp.), Soloman’s seal (*Smilacina* spp.) and
roots like balsamroot (*Balsamorhiza sagittana*) and lomatium (*Lomatium* spp.), and green vegetables like prickly pear cactus (*Opuntia* spp.), seeds like chenopods (*Chenopodium* spp.) and cambium from pine trees (Lepofsky et al. 1996; Lepofsky 2000; Lepofsky and Peacock 2004). The area immediately surrounding the site is composed of woodlands, grass-covered valleys and several forested ridges.

**PHYSIOGRAPHY AND TOPOGRAPHY**

The Keatley Creek site is located in the mid-Fraser Valley. It is bordered both to the east and west by several mountain ranges, the Clear Range to the east, the Camelsfoot Range and the Coast Mountains to the west. There is a 1500-1800 meter elevation change from the Fraser River to the peaks of the surrounding mountains. The Clear and Camelsfoot ranges are plateaus that are crosscut by rolling slopes, culminating in rounded, wide summits and ridges, separated by shallow valleys (Ryder 1978). The Coast Mountains are very rugged, with alpine glacial features, and peaks 2700 meters above the Fraser River (Ryder 1978). Along the edges of Plateaus, tributary valleys and steep gullies plunge 1000 meters down to the Fraser River below. The Fraser River is approximately 1500 km long, as it stretches from its source in the Rocky Mountains westward onto the Interior Plateau of British Columbia and towards the coast (Hayden 1997). The Fraser River still cuts through glacial outwash gravels and the bedrock sills along a major geologic fault line that separates two geological terranes, it undercuts cliffs, and causes rock slides (Hayden 1997). The Middle Fraser River Canyon stretches north-south about 75 km (Hayden 1997). Before 13,000 B.P. the entire canyon was covered in ice up to 2000 meters deep (Hebda 1982). When the ice melted the Mid-Fraser Valley was covered in silt, sand, gravel, and boulders that were deposited in a flat
layer of outwash and till with each layer covered by a thin layer of loess in thousands of alternating layers (Hayden 1997). When the glaciers were melted, the Fraser River began cutting through the glacial deposits, leaving terraces and steep canyon walls (Hayden 1997). There are benchlands comprised of alluvial fans, river terraces, and kame terraces, that are made up of till, ground moraine, and bedrock. These benchlands sit from 10-250 meters above the Fraser River, and are crossed by ravines, and halted by steep mountain slopes. (Ryder 1978). The benchlands near the Keatley Creek site overlooks a steep and deep inner-gorge which the Fraser River runs through. The Keatley Creek site is located on the eastern side of the Mid-Fraser River, in between Black Hill Creek and Gibbs Creek. About 7 km south of the Keatley Creek site, there is an S-Bend in the Mid-Fraser River where it crosses faulted bands of sandstone, argillites, and conglomerates below the northern edge of Fountain Ridge, and the southern edge of the Camelsfoot Range. Some parts of the Clear Range are made up of volcanic lava, vitric tuff, and breccias, while others consist of granodiorite (Ryder 1978). The Keatley Creek site sits on ground moraine that sits on older drift (Ryder 1978; Ryder and Church 1986). The site area is fairly flat with a slightly rolling surface, but some places are filled in by aeolian deposits and loess (Ryder and Church 1986). The compact till is comprised of a fine silt and clay matrix probably linked to slow draining water. The slopes above the site are covered by colluvium/ground moraine made up of stony and silty till with pockets of stratified fluvio-glacial gravels, or outcrops of bedrock (Ryder 1978). The top layers of the colluvium are not as compact as the deeper levels, and as a result they are moved downslope by slopewash, soil creep, and pedological processes (Ryder 1978). This
downslope movement of the till creates long, parallel gullies, like the ones near the Keatley Creek site.

**POST-GLACIAL LANDFORM DEVELOPMENT**

The Highland Valley and the Thompson Plateau, which are next to the Mid-Fraser Valley and the Keatley Creek site, were ice-free by 13,000 B.P., and could sustain human and animal populations after 12,000 B.P. (Hebda 1982). These are the closest dates for deglaciation available, since no data currently exist on deglaciation at the Keatley Creek site itself. The processes of erosion and deposition that have altered the post-glacial landscape were controlled by geologic as opposed to climatic factors (Ryder 1978). There was a susceptibility of glacial drift to redistribution under non-glacial conditions, as shown by the underlying substrate of ground moraine below the site, since housepits had originally been excavated into the upper, less compact layer of colluvium. Fluvial aggradation was a usual paraglacial activity since the unconsolidated glacial sediment was available to be reworked by the flowing water (Ryder 1978). Slopes were made steeper by glacial erosion and drift caused by landslides and soil creep during post-glacial times (Hebda 1982; Ryder 1978). A reduction of sediments from glacial runoff caused a down-cutting of the Mid-Fraser River as well as Keatley Creek in post-glacial times (Ryder 1978). Keatley Creek cut down through the glacial drift and caused the steep scarp south and west of the Keatley Creek village.

**PALEOENVIRONMENTAL SUMMARY: CLIMATE, FAUNA, AND FLORA**

Climatic transitions happened contemporaneously all over the Canadian Plateau at 9500-9000 B.P., 6500-6300 B.P., 4500 B.P., and 2800-2000 B.P. (Chatters 1998). The general climate changed gradually, while the flora and fauna changed in a more
punctuated way (Lenert 2000; Prentiss et al. 2000). Since very little paleoecological study has been performed at the Keatley Creek site, the following paleoenvironmental summary is based on information summarized for the surrounding Canadian Plateau by Chatters (1998), Chatters and Pokotylo (1998), and Hebda (1982).

12,000 B.P.

There is very little data concerning the environment and humans in this time period. Based on the possible relationship between human and mastodon at Sequim on the Olympic Peninsula, extinct late-Pleistocene megafauna is believed to have inhabited the Canadian Plateau about 12,000 B.P. (Hebda 1982). The Holocene climate before 11,000 B.P. was cold and dry (Hebda 1982).

11,000-9,500 B.P.

The climate was cool and moist, and lake levels were low, while the Fraser River continually eroded through the deposits of glacial outwash during this period (Hebda 1982). Treeless vegetation was very limited, and was dominated by aspen (Populus tremuloides), lodgepole pine (Pinus cortata), and white pine (Pinus monticola) (Hebda 1982). Parkland and closed forests in wetter areas were comprised of sagebrush and aspen (Hebda 1982). Pine grew on the upper slopes of mountains, and it arrived relatively late in this period, while the lower slopes and valley bottom were covered by grass and shrubs like Artemisia spp. and Shepherdia spp. (Hebda 1982). The faunal remains indicate that the humans living on the Plateau at this time were hunting large game like elk and deer, and using some fish (Hebda 1982; Stryd and Rousseau 1996). The dynamic nature of the mountains and landscapes, that were destabilized by deglaciation, could be the cause for the lack of data regarding human activity during this
period, but lack of data does not necessarily mean a lack of human activity (Chatters and Pokotylo 1998; Stryd and Rousseau 1996).

9,500-6,400 B.P.

Stands of Douglas fir punctuated the landscape in the beginning of the period, and as forests merged together, forest-edge habitat grew at first, but then declined (Chatters 1998; Stryd and Rousseau 1996). The precipitation in the uplands of the Northern Plateau increased from 9,500-6,400 B.P. (Chatters 1998; Stryd and Rousseau 1996). Lower elevation forest boundaries like the boundary between transitional woodland and sage-grasslands, shifted downslope (Hebda 1982; Stryd and Rousseau 1996). The human populations living in the area had a varied diet that consisted of deer, rabbits, beaver, waterfowl, muskrats, marmots, carnivores, salmon, freshwater fish, small birds, turtles, and assorted plant foods (Chatters and Pokotylo 1998; Stryd and Rousseau 1996). Once the maritime climates were in place after 8,000 B.P., the climate became cooler and more moist, but at the end of this period the winters became generally warm and dry (Chatters 1998; Stryd and Rousseau 1996). The climatic change increased ungulate populations like deer, as well as root plants like biscuit root, and balsam root (Chatters and Pokotylo 1998; Stryd and Rousseau 1996). Lakes were smaller and seasonally dried up. Cedar appeared, Douglas fir decreased, while hemlock, grass, and *Artemisia* spp. increased according to pollen counts (Hebda 1982; Chatters 1998; Stryd and Rousseau 1996).

6,400-4,500 B.P.

The first part of this interval was warm and moist, but eventual cooling caused grasslands to disappear, and forests to grow and consolidate (Chatters 1998; Hebda 1982; Stryd and Rousseau 1996). Late spring runoff and cooler river temperatures increased
salmon productivity in the Fraser river around 5,500 B.P., and made salmon and freshwater mollusks more important to the human diet (Chatters 1998; Chatters and Pokotylo 1998; Stryd and Rousseau 1996). There was an increase in the diversity of fauna, and ungulates, small game, and plants continued to be the major sources of food for humans (Chatters and Pokotylo 1998; Stryd and Rousseau 1996). At the end of this period poorly drained wetlands started to develop, and lakes increased in size (Hebda 1982; Stryd and Rousseau 1996).

4,500-2,800 B.P.

Precipitation levels were still very high, and glaciers grew larger, river temperatures declined, and sub-alpine conifers moved downslope to lower elevations as the temperatures cooled down on the Plateau around 4,500 B.P. (Chatters and Pokotylo 1998; Hebda 1982; Stryd and Rousseau 1996). The colder climate shortened the season for resource gathering (Hebda 1982; Stryd and Rousseau 1996). Hemlock spread to the east side of the Fraser River, Douglas fir forests were the densest ever, and forests generally came to be the way they are today during this period (Hebda 1982; Stryd and Rousseau 1996). The dense forests and the longer duration of snowpacks caused the Fraser River to become more clear and cool (Hebda 1982; Stryd and Rousseau 1996). This in turn shortened the season but increased the salmon productivity, making the salmon runs short and intense (Chatters and Pokotylo 1998; Stryd and Rousseau 1996). On the downside, the dense forests decreased the ungulate populations like deer and elk (Kuijt 1989; Stryd and Rousseau 1996). Although mountain sheep and goats, and caribou increased because of the lower alpine zone, and this might have made up for the decrease in deer and elk (Chatters 1998; Stryd and Rousseau 1996). An effective storage
technology is very important for winter survival, and groups without one would have been at a disadvantage because of the low diversity of faunal resources (Chatters 1998; Prentiss and Chatters 2003). Modern floral and faunal assemblages show up towards the end of this interval (Hebda 1982). Root harvesting and processing shows up archaeologically around 4,500 B.P. (Lepofsky and Peacock 2004). The faunal assemblages seem to be dominated by salmon, and small lagomorphs and rodents appear as well (Hebda 1982). Modern biotic assemblages first appear towards the end of this period (Hebda 1982).

2,800-1,500 B.P.

The beginning of this period is marked by a drier and warmer climate, which made glaciers retreat, and allowed vegetation zones to reach their modern extent (Chatters 1998; Chatters and Pokotylo 1998; Stryd and Rousseau 1996). As forests opened up and moved upslope, the people living on the Plateau increased their hunting and gathering ranges into the uplands (Pokotylo and Froese 1983; Stryd and Rousseau 1996). Root harvesting and processing became important, as evidenced by the root processing ovens in the uplands (Lepofsky and Peacock 2004; Pokotylo and Froese 1983; Stryd and Rousseau 1996). Salmon remained an important faunal resource (Chatters and Pokotylo 1998; Stryd and Rousseau 1996).

1,500-200 B.P.

The major biotic zones were at the current range and makeup during this interval, in other words only minor environmental changes have occurred in the last 2000 years (Chatters 1998; Stryd and Rousseau 1996). The largest of these environmental fluctuations was The Little Ice Age, which caused the advance of glaciers worldwide
about 550 B.P., but it only had a small effect on the Plateau’s floral and faunal resources (Chatters 1998; Stryd and Rousseau 1996).

**CULTURE CHRONOLOGY**

This section will review the entire cultural chronology of the Canadian Plateau from 12,000 B.P.-200 B.P. This review will summarize the archaeological and ethnographic data for the Plateau, focusing on the Mid-Fraser Canyon where the Keatley Creek site is located.

**CANADIAN PLATEAU CULTURE AREA**

The Canadian Plateau culture area is located between the British Columbia coast and the Rocky Mountains, south of the curve in the Fraser River near Prince George, and 50 miles north of the U.S and Canadian border (Richards and Rousseau 1987; Rousseau 2004). The Canadian Plateau has been sub-divided into micro-regions, and the focus will be on the Mid-Fraser Canyon micro-region. It is made up of the Fraser River valley and its drainages, and it reaches from Big Bar to Lytton, British Columbia (Richards and Rousseau 1987). The climate is semi-arid, and since it sits in the rain shadow of the Coast Range, it only gets 25-35 cm of precipitation a year (Pokotylo and Mitchell 1998; Richards and Rousseau 1987).

**MID-FRASER REGION CULTURE CHRONOLOGY**

The first cultural chronology of the Mid-Fraser Region was developed by David Sanger (1970), and it organized the archaeological record into the Early Period, Lower Middle Period, Upper Middle Period, and Late Period. Sanger’s work was later refined by Richards and Rousseau (1987) and Stryd and Rousseau (1996), and the cultural chronology was divided into the Early Period (11,000-7,000 B.P.), Middle Period (7,000-
3,500 B.P.), and Late Period (3,500-200 B.P.). There are cultural traditions, phases, and horizons within each period.

**EARLY PERIOD: 11,000-7,000 B.P.**

This period begins after the Plateau is de-glaciated, and it ends during the Hypsithermal Period (Pielou 1966; Pokotylo and Mitchell 1998). There is currently little archaeological evidence of human occupation of this region until 7000 B.P., even though the environment could have supported people after 11,000 B.P. (Rousseau 1991, 1993; Rousseau et al. 1991; Sanger 1967; Stryd and Rousseau 1996). However the neighboring Thompson River drainage region was occupied by at least 8,500 B.P., and their diet was dominated by terrestrial fauna, with some use of marine fauna (Pokotylo and Mitchell 1998). Most archaeological testing has been performed along the Fraser River system, which is one reason few Early Period sites have been encountered, since they are expected to be in the uplands where the terrestrial fauna they relied on resided (Pokotylo and Mitchell 1998). There is no archaeological evidence of human occupation of the Keatley Creek site during the Early Period (Hayden 1997).

**MIDDLE PERIOD: 7,000-3,500 B.P.**

The Middle Period begins during the Hypsithermal Period (7,000-5,000 B.P.), as a wetter and warmer-than-present climate sets in and grasslands expand in high and low floral zones (Hebda 1982; Stryd and Rousseau 1996; Rousseau 2004). The Middle Period is comprised of one cultural tradition and three cultural phases (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). The Nesikep Tradition consists of the Early Nesikep Phase, which lasts from 7,000 B.P. to 6,000 B.P., and the Lehman Phase, which
lasts from 6,000 B.P. to 4,500 B.P. The Lochnore Phase lasts from 5,500 B.P. to 3,500 B.P. (Pokotylo and Mitchell 1998; Rousseau 2004).

**Nesikep Tradition: 7,000-4,500 B.P.**

The Nesikep tradition is divided into the Early Nesikep Phase (7,000-6,000 B.P.), and the Lehman Phase (6,000-4,500 B.P.) (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). The Nesikep tradition resulted from the human need to adapt to the warmer and drier climatic conditions of the late Hypsithermal (Pielou 1966; Stryd and Rousseau 1996). The cultural origin of the Nesikep tradition is unknown, but the earliest dated component is 6650 ± 110 B.P., from the Lehman site (EdRk 8) (Rousseau 2004). It may have begun as early as 8,500-8,000 B.P. in the Fraser and Thompson River drainages (Rousseau et al. 1991; Rousseau 2004). The human diet was primarily focused on deer and elk, but was supplemented by salmon, freshwater fish, mollusks, rabbits, small birds, rodents, and floral resources (Lenert 2000; Prentiss et al. 2000; Sanger 1969, 1970).

**Early Nesikep Phase: 7,000-6,000 B.P.**

Residential base-camps were usually small, located in sandy areas that were protected from the wind, and occupied for a few days to a few weeks (Rousseau 2004). They were typically located on valley sides and thus had a good overview of the surrounding area (Rousseau 2004). The base camps were often next to river and creek confluences, for fishing and easy access to potable water (Rousseau 2004). Field camps were small, numerous, short term, and located in all environmental zones (Rousseau 2004). The projectile point that is characteristic of this phase is thin, well made, corner-notched, lanceolate, barbed in outline, and has curved or straight margins with a
lenticular cross-section (Rousseau 2004; Stryd and Rousseau 1996). The projectile points show great technical skill, and follow a specific formal theme (Rousseau 2004). The Early Nesikep points are found as isolates in most environmental zones, indicating high mobility and frequent loss during hunting activities (Rousseau 2004). The points were used as knives to process the animals once they had been killed (Rousseau 2004). Some other characteristics of the Early Nesikep Phase include microblades, unifacial circular and oval scrapers, wedge-shaped cores, antler wedges, ground rodent incisor tools, bone needles and points, and red ochre (Rousseau 2004; Stryd 1973; Stryd and Rousseau 1996). The people of the Mid-Fraser Region used a opportunistic foraging subsistence and settlement strategy (Binford 1980), and they focused their subsistence resource gathering on deer, but they supplemented it with elk, salmon, trout, birds, and freshwater mussels (Pokotylo and Mitchell 1998; Rousseau 2004). Although plant resources were likely used, there are a lack of data showing what plants were used (Rousseau 2004). The small size and few numbers of base camps indicate that population densities were low during the Early Nesikep phase (Rousseau 2004).

**Lehman Phase: 6,000-4,500 B.P.**

There is a gradual, seamless continuation of technology, lithic tools, and subsistence strategies from Early Nesikep to Lehman phase (Rousseau 2004). The projectile point that is characteristic of the Lehman phase is pentagonally shaped and obliquely oriented with v-shaped corner or side notches (Pokotylo and Mitchell 1998; Stryd and Rousseau 1996). These obliquely-notched bifaces probably also functioned as knives (Rousseau 2004). Other parts of the Lehman lithic assemblage include lanceolate, and leaf shaped knives; circular, oval and horseshoe shaped scrapers; multi-directional
cores; microblades; large, thin flake blanks; simple flake tools; and steeply backed, unifacially retouched flakes (Rousseau 2004). Lehman saw a slight decline in lithic technological skill and organization compared to Early Nesikep phase (Rousseau 2004).

The regional occupants were mobile, broad-spectrum, opportunistic foragers, that lived in groups of 20-30 people (Rousseau 2004). They focused their subsistence habits on terrestrial fauna like deer, elk, rabbits, birds, and small mammals, but their use of marine resources like salmon, trout, suckers, and freshwater mussels increased after 5,000 B.P. (Rousseau 2004). Floral resources were used to supplement the heavy reliance on faunal resources, and served as backup if faunal resources were scarce (Lepofsky and Peacock 2004; Rousseau 2004). By the end of Lehman, the people were more familiar with their local lithic, floral, and faunal resources than they had been in the preceding Early Nesikep phase (Rousseau 2004).

Lehman sites are small, short term, and often located on flat ground in protected areas, near rivers or creeks, much like Early Nesikep sites (Rousseau 2004). The Lehman sites are more numerous than Early Nesikep sites, indicating a slow, but steady population increase during the Nesikep Tradition (Rousseau 2004).

**Lochnore Phase: 5,500-3,500 B.P.**

The gradual change from warm and dry to the cooler and wetter climate of the late period, began sometime during the Lochnore phase (Hebda 1982; Mathewes 1985; Mathews and King 1989; Rousseau 2004). Both residential and field camps are small and short term (Rousseau 2004). Sites are often located on flat terraces along the sides of major river valley bottoms, near junctions of creeks and rivers, much like the preceding Early Nesikep and Lehman phase sites (Rousseau 2004). There are also field camps
located at small lakes or streams at higher elevations (Rousseau 2004). Most sites are only used once, but some of the larger ones are reused (Rousseau 2004).

Typical Lochnore projectile points were wide, side-notched, and had pointed convex bases with heavy basal edge grinding (Rousseau 2004). Other lithic technology of the Lochnore phase included crescents; flake scrapers; end scrapers; side scrapers; macroblades; microblades; large and medium-sized lanceolate, leaf-shaped, and Lochnore side-notched projectile points; un-notched leaf-shaped, foliate with straight or slightly convex basal margins, bipointed, and oval bifaces; abraded cobbles; unifacial pebble tools/choppers; and net sinkers (Pokotylo and Mitchell 1998; Rousseau 2004; Stryd and Rousseau 1996; Wilson et al. 1992). Jewelry and ornaments include shell beads, animal tooth pendants, eagle claw pendants, and different shades of ochre (Lenert 2000; Pokotylo and Mitchell 1998; Prentiss et al. 2000; Rousseau 2004; Stryd and Rousseau 1996; Wilson et al. 1992).

The faunal remains of the Lochnore phase show a varied diet, as it was comprised of deer, elk, rabbit, beaver, salmon, freshwater fish, mollusks, bear, porcupine, turtle, duck, and goose (Lenert 2000; Prentiss et al. 2000; Rousseau 2004).

The data from this phase has been interpreted in different ways by various archaeologists. One possibility is that the cultural behavior representative of the Lochnore phase is a riverine and forest oriented adaptive pattern developed by Salishan speakers as they moved up the Fraser River to the Canadian Plateau from the Northwest Coast (Stryd and Rousseau 1996). The migration of Lochnore people from the Coast to the Interior could have largely been due to the increase in salmon productivity in the
Fraser River, as a result of the colder, wetter, Neoglacial climate (Pokotylo and Mitchell 1998). The end of the Lehman phase overlapped with the beginning of the Lochnore phase, as the two coexisted on the Plateau from about 5,500-4,500 B.P. (Lenert 2000; Pokotylo and Mitchell 1998; Prentiss et al. 2000). Stryd and Rousseau (1996) believe that the Lochnore groups were Salish speakers, while the Lehman groups were Non-Salishan speakers. Sanger (1969) hypothesizes that the Lochnore phase people had some relation to the Old Cordilleran phase, which was a marine adapted pattern from the Northwest Coast near the mouth of the Fraser River. The Lehman and Lochnore groups might have combined around 5,000 B.P., founding the Plateau Pithouse Tradition (Richards and Rousseau 1987; Stryd and Rousseau 1996). The Lochnore groups employed two residential patterns (Lenert 2000; Prentiss et al. 2000). One is the pithouse pattern which employed at least occasional storage, like at the Baker site, and the other is non-pithouse short term occupation residence camps and game processing sites (Wilson et al. 1992; Stryd and Rousseau 1996).

Hayden (2000a) has a different theory on Lochnore phase, as he theorizes that it was caused by mass harvesting and storage of salmon. He goes on to argue that the technology that allowed for this mass harvesting and storage was refined on the Interior Plateau during the Plateau Pithouse Tradition in the Late Period, and spread from there to the Northwest Coast (Hayden 2000a).

Prentiss and Kuijt (2004) and Prentiss and Chatters (2003) argue that Lochnore is the final phase of the Nesikep tradition, and has no relationship to either the interior or the coastal pithouse using cultural patterns.
LATE PERIOD: 3,500-200 B.P.

This period consists of the Plateau Pithouse Tradition, which is divided into three cultural horizons; Shuswap, Plateau, and Kamloops (Lenert 2000; Prentiss et al. 2000; Richards and Rousseau 1987). The Plateau Pithouse Tradition is characterized by hunter-gatherers that were logistically-organized collectors, living semi-sedentary lifestyles in pithouses. The Keatley Creek site contains the Plateau Pithouse Tradition and all three of its horizons (Hayden 1997). Salmon from the Fraser river system was not only a crucial part of the subsistence economy, but also a very important tool for gaining political power, and it is likely that it was a catalyst to the development of complex hunter-gatherers in the Mid-Fraser Region (Hayden 1997). The Neoglacial maximum (around 3,000 B.P.) and its accompanying environmental changes forced the people of the Mid-Fraser region to adopt a semi-sedentary lifestyle with a heavy focus on salmon (Kuijt 1989; Stryd 1973). The colder and wetter climate of the Neoglacial decreased ungulate populations, but this was offset by the increase in the number of salmon which people focused on instead (Kuijt 1989).

Shuswap Horizon: 3,500-2,400 B.P.

The cool and wet environment of the Neoglacial reached its maximum during the beginning of the Shuswap horizon, which resulted in a shift from Lochnore’s mobile foraging strategy, to a more logistically organized collector (Binford 1980) strategy with storage and winter pithouses (Rousseau 2004). The winter pithouses are circular or oval, averaging 11 meters in diameter, with steep walls, side entrances, and flat, rectangular floors (Rousseau 2004). They had a post-support and beam superstructure covered by mats and earth. The pithouses contained hearths, cooking and storage pits, and during the
last 500 years of the horizon there were external cooking and storage pits (Richards and Rousseau 1987).

The lithic technology of the Shuswap horizon is simpler than that of the later Plateau and Kamloops horizons. There are few curated tools, groundstone or artwork in Shuswap assemblages, which suggests an expedient lithic technology (Richards and Rousseau 1987). There was a well-developed antler and bone technology (Richards and Rousseau 1982, 1987; Rousseau 2004). The people of the Shuswap horizon had a strong preference for local, fair to good quality, lithic raw materials (Richards and Rousseau 1982, 1987; Rousseau and Richards 1985; Rousseau 1992; Rousseau 2004). Shuswap assemblages include a variety of stemmed, basally-notched, and corner-notched projectile points; microblades; key-shaped unifaces; thumbnail scrapers; convex edged hide scrapers; cores; and unformed utilized, and unifacially retouched flake tools (Richards and Rousseau 1982, 1987; Rousseau and Richards 1985; Rousseau 1992; Rousseau 2004). The projectile points were large atl-atl or spear points similar to Duncan, Hanna, McKean, and Oxbow points from the Northern Plains, which could suggest direct or indirect interaction and exchange of ideas (Reeves 1969, 1983; Vickers 1986; Richards and Rousseau 1987; Rousseau 2004). Interaction with the Northwest Coast is evident from the trade of such items as nephrite from the interior to the coast, and *Dentalium* and *Olivella* shell from the coast to the interior, as well as the stylistic similarities between Locarno Beach phase and Shuswap projectile points (Borden 1970; Richards and Rousseau 1987).

The Shuswap horizon was a resource rich period, and small groups occupied winter villages on valley floors where resources were particularly abundant and varied.
(Rousseau 2004). The faunal resources utilized during the Shuswap horizon included a wide spectrum of local species like ungulates, salmon, bears, birds, small terrestrial mammals, trout, and mollusks; and food storage was less important than in later horizons (Richards and Rousseau 1987; Rousseau 2004; Wyatt 1972). Salmon was used more in the Shuswap horizon than during the Lochnore phase, but it was not the major staple until later in the Plateau and Kamloops horizons, according to limited bone chemistry studies (Chisholm 1986). Populations increased slightly from Lochnore times, and the greatest growth occurred from 3,000-2,400 B.P.

**Plateau Horizon: 2,400-1,200 B.P.**

According to Hebda (1982) the Plateau horizon is marked by a shift from a cold and wet to a warm and dry environment. Rousseau (2004) states that during this horizon pithouse villages expand in size, more exotic trade items occur, and there is a heavy reliance on salmon.

The people living in the Mid-Fraser Region during the Plateau horizon used a collector (Binford 1980) mobility and subsistence strategy. They located themselves on the landscape in an optimal position to access several different patches of resources while using a delayed-return consumption and storage strategy. The most commonly used resources consisted of ungulates, salmon, birds, and plants; with a heavier increase in salmon and root use than previous periods. According to a stable carbon isotope analysis of human bone from the Plateau horizon, 60% of the protein consumed came from marine resources (Pokotylo and Froese 1983; Richards and Rousseau 1987).
The trade network that existed in the earlier Shuswap horizon between the Interior Canadian Plateau groups, and the Northwest Coast and Rocky Mountain groups, still flourished; as *Dentalium* and *Olivella* shells from the coast, as well as non-local chert and argilite are found in the Mid-Fraser Canyon region (Richards and Rousseau 1987).

The Plateau horizon groups’ skilled production of lithic, bone, and antler tools, as well as their development of an Interior Plateau art tradition, points toward craft specialization (Rousseau 2004; Stryd 1983). Key shaped unifacial scrapers, convex-edged endscrapers, and projectile points are the most common lithic artifacts from this horizon (Rousseau 1992). The most common projectile points were barbed, and corner-notched or basally-notched; with corner-notched the most common from 2,000-1,200 B.P., and basally-notched from 2,400-2,000 (Rousseau 1992, 2004). There are occasional leaf-shaped and stemmed points (Rousseau 1992, 2004). The size of the Plateau horizon points decreased over time as the bow and arrow was introduced around 1,500 B.P., towards the end of the horizon (Hayden 2000b; Richards and Rousseau 1987; Rousseau 1992, 2004). The efficiency achieved through the use of the bow and arrow reduced the time needed to harvest the same amount of fauna, allowing more time to be spent on activities relating to art, ceremonialism, and social elaboration (Rousseau 2004).

The mat-lodge pithouses built during the Plateau horizon were smaller than the previous Shuswap horizon pithouses and the later Kamloops horizon pithouses (Hayden 1997, 2000b; Rousseau 2004). The semi-subterranean pithouses were oval or circular, with steep walls, and flat floors. They ranged from 8 to 20 meters, and averaged 10 meters in diameter (Rousseau 2004). They contained centralized hearths, few storage
pits, and lacked raised earthen rims (Hayden 1997; Richards and Rousseau 1987; Wilson 1980).

Populations were the greatest in the Mid-Fraser region during the Plateau horizon, as indicated by the large winter villages and high frequency of sites, and the extensive and intensive use of upland plant resources. The population reached its maximum from 2000 B.P. to 1600 B.P. (Rousseau 2004).

Medium sized dogs appear in the archaeological record of the Plateau horizon. They were used for hunting, protection, as pack animals, and garbage disposal. They carried heavy loads of salmon up steep valley sides from fishing sites to the winter villages, and goods on trade routes (Crellin and Heffner 2000).

Hayden (1997) argues that increasing village sizes, variable pithouse sizes, exotic trade goods, and increased salmon intensification all point towards a high level of social complexity in the Mid-Fraser Canyon region during the Plateau horizon.

Kamloops Horizon: 1,200-200 B.P.

During the Kamloops horizon many crucial parts of subsistence and settlement stayed the same or similar to what they were during the Plateau horizon (Rousseau 2004). The hunter-gatherers of Kamloops horizon were still collectors using a delayed return and storage strategy (Lenert 2000; Prentiss et al. 2000; Rousseau 2004). Salmon, deer and small terrestrial fauna, as well as mid-altitude and upland plant resources were utilized (Alexander 2000; Rousseau 2004). The use of medium and large winter pithouse villages continued, as well as upland base camps near concentrated food resources during warmer months (Alexander 2000; Rousseau 2004). The distinctive Plateau art tradition continued
into Kamloops times, and became more elaborate (Rousseau 2004). The inhabitants of the Keatley Creek site continued to engage in inter-regional trade networks with the Northwest Coast and the Interior (Hayden and Schulting 1997; Lenert 2000; Prentiss et al. 2000; Rousseau 2004). Surplus salmon and other material goods were used to demonstrate wealth and power, gain followers, and indebted people, in the increasingly complex village pattern that began during the Plateau horizon (Hayden 1997; Prentiss et al. 2003; Rousseau 2004).

There were also some marked changes from Plateau to Kamloops horizon like: the use of medium and large pithouses with differing floor plans during Kamloops; an increase in mobile art and decorated utilitarian objects; a significant decline in the frequency and intensity of the use of upland plant resources, indicated by smaller and fewer field camps and root processing oven sites; a shift from small corner-notched points to Kamloops side-notched projectile points; and a regional population reduction after 1000 B.P. (Hayden and Ryder 1991; Prentiss and Kuijt 2004; Rousseau 2004).

Groundstone tools, trade objects, and prestige items; as well as chipped stone projectile points are some of the common lithic artifacts from the Kamloops horizon (Kuijt 2001; Prentiss et al. 2003; Richards and Rousseau 1987). Lithic technology using bifacial reduction was dominated by finely pressure flaked points and knives (Goodale 2001). The most common projectile point was the “Kamloops side-notched” (Rousseau 2004). It is small and triangular, averaging 2.04 cm long and 1.32 cm wide, with narrow opposing side notches with straight to convex or concave basal margins (Sanger 1970). Large side notched points, and multi-notched variants were present in the last 400 years of the horizon (Richards and Rousseau 1987; Rousseau 2004). The Kamloops Multi-
Notched point has up to four additional notches along one lateral blade margin (Richards and Rousseau 1987; Rousseau 2004). Chipped stone tools included formed scrapers; gravers; perforators; pentagonal formed bifaces; and key-shaped unifaces up to about 1000 B.P. (Rousseau 2004). The quality, quantity, and variety of ground stone objects increased during the Kamloops horizon. They were made from slate, nephrite, and steatite, and usually carved to resemble anthropomorphic and zoomorphic shapes, and were probably made for trade or display purposes (Hayden and Schulting 1997; Sanger 1968). Antler, bone and tooth technology was prevalent; as were birch bark containers and woven baskets (Richards and Rousseau 1987; Teit 1909). Geometric patterns like lines, circles, and dots were used to decorate these items (Richards and Rousseau 1987).

Their most common burial practice was flexed interments in unmarked shallow pits, but cobbled cairn, multiple tomb, talus slope, and graves marked by fires were also used (Dawson 1891; Pokotylo et al. 1987; Sanger 1968a, 1968b; Skinner and Copp 1986; Smith 1900; Richards and Rousseau 1987; Rousseau 2004).

Pithouses had several different floor plans including: oval; round; square; or rectangular; often with raised earthen rims around the perimeter (Rousseau 2004). They had central hearths, storage pits, and roof and side entrances were used (Richards and Rousseau 1987; Rousseau 2004). Pithouses varied from 5-22 meters, with an average of 8.5 meters (Rousseau 2004). The variation in pithouse size could be a result of the number of occupants, duration of use, and availability of building materials and manpower to build them (Rousseau 2004). The largest pithouses were in use during the beginning of the Kamloops horizon, then large villages broke up and smaller pithouses were used until the end of the horizon, when large pithouses made a comeback (Lenert 32...
The return to large pithouses might indicate extended family groups sharing a single residence, or elite corporate groups (Alexander 2000; Hayden 1992, 1997, 2000; Rousseau 2004; Teit 1900, 1909). The temporary matlodges that were used at upland base camps during warmer months ranged from 4-7 meters in diameter (Alexander 2000; Rousseau 2004; Teit 1900, 1909). An excavated matlodge depression at Botanie Lake near Lytton B.C. contained an assemblage of flake tools for plant food processing (Rousseau 2004; Turner et al. 1990). Matlodges were in use from Lochnore phase through the Plateau Pithouse Tradition up until Euro-Canadian contact (Rousseau 2004).

There has been disagreement about what happened to the populations of the Mid-Fraser Region after 1200 B.P. (Goodale 2001; Rousseau 2004). Hayden and Ryder (1991) theorize that there was a cultural collapse, and a subsequent dispersion of pithouse communities, resulting from the Texas Creek landslide 16 km south of Lillooet that blocked the Fraser river at around 1200-1000 B.P., and thus reduced the salmon runs. The Kamloops occupation of Keatley Creek was abandoned at around 1000 B.P. and 800 B.P. (Prentiss et al. 2003). The people living at Keatley Creek and the surrounding villages in the valley could not sustain themselves when the salmon disappeared, and were forced to move (Hayden and Ryder 1991). The regeneration of salmon was so slow in the Mid-Fraser River that the Keatley Creek site was never reoccupied to the same population density it had been before the landslides (Pokotylo and Mitchell 1998; Prentiss et al. 2000). Based on excavations at site EeR1 171, Kuijt (2001) argues that the slide events occur before 4200 B.P., and so refutes the claims that landslides caused the cultural collapse at Keatley Creek (Rousseau 2004). Richards and Rousseau (1987) postulate that pithouses continued to be used after 1000 B.P. Population reductions
occurred throughout the Canadian Plateau (Rousseau 2004). Goodale (2001) argues that the pinnacle of population density and social complexity began during the Plateau horizon and ended during the Kamloops horizon around 800 B.P., when large pithouses were abandoned and people returned to a more egalitarian society with small to medium sized pithouses. Lepofsky and Peacock (2004), and Prentiss and Kuijt (2004) argue that the people of the Plateau horizon were so dependent on mid-altitude and upland plant and animal resources that the severe harvesting stress from 2000-800 B.P. caused a significant reduction in their distribution and quantity. The bow and arrow also played a role in reducing animal populations between 1500-1200 B.P. (Rousseau 2004). The reduction of plant and animal resources caused the human carrying capacity of the Canadian Plateau to be exceeded, and thus the population declined (Rousseau 2004).

Rousseau (2004) suggests that a disease epidemic spreading across the Canadian Plateau could have reduced populations between 1200-1000 B.P., like the smallpox epidemic of the 1860's did (Teit 1900), although there is currently no ethnographic or archaeological evidence to support that.

MID-FRASER REGIONAL ETHNOGRAPHY

The Mid-Fraser River Area of the Interior Plateau of British Columbia was historically occupied by the Lillooet, Shuswap, and Thompson, three linguistic and territorial divisions of the Interior Salish peoples (Magne 1985). This regional ethnography will describe the settlement patterns and subsistence practices of these three tribes primarily as it was recorded in the late 19th century. Most of the information on the Lillooet, Shuswap, and Thompson come from the observations of James Teit (1900, 1906,1909), who under the guidance of Franz Boas, recorded the information for the
Jesup North Pacific Expedition (Magne 1985). Teit made comparisons of similarities and differences in material culture, beliefs, shelter, and resource gathering between the three groups (Magne 1985). Additional information on the Shuswap was recorded by Dawson (1891), while performing reconnaissance for the Geological Survey of Canada (Magne 1985).

**Lillooet**

The Fraser River band of the Lillooet’s territory encompassed the east and west sides of the Fraser River from Seton Lake and the modern town of Lillooet north to Pavilion Creek and the Fraser River (Magne 1985; Teit 1906). The Lillooet used two kinds of food caches; one was carefully built to store food until spring; and the other for the winter food supply to be used as needed, and located close by the winter pithouse (Magne 1985; Teit 1906). The Lillooet culture was very similar to the Shuswap and Thompson cultures (Magne 1985; Teit 1906). The mammals they hunted included mule deer, mountain goat, mountain sheep, hoary marmot, black bear, and caribou (Magne 1985; Teit 1906).

**Shuswap**

The Shuswap were a hunting and fishing tribe, with focus on hunting (Magne 1985; Teit 1909). The Fraser River and Canyon bands were the most sedentary among the Shuswap, although overall the Shuswap had a very mobile settlement pattern (Magne 1985; Teit 1909). Mobility varied from family to family within bands, and people would often change villages from year to year (Magne 1985; Teit 1909). The populations greatly decreased during the 1860’s because of smallpox epidemics, but Teit (1909)
estimated that there were about 1,400 Shuswap around 1850, living in seven bands. The Shuswap used the following structures: Conical matlodges; semi-subterranean winter pithouses; long, multi-family, double lodges at fishing sites; trapping lodges near deer fences; menstrual huts for women; and sweat houses (Magne 1985; Teit 1909). The Thompson used the same kinds of shelters (Magne 1985; Teit 1909). Fishing was more important to the Shuswap than to the Thompson (Magne 1985; Teit 1909). The Shuswap use: 18 kinds of roots; 18 different berries; nuts and cambium from 8 tree species; different mosses, various lichens, a variety of cacti, and 15 different mammals (Magne 1985; Teit 1909; Turner 1977).

**Thompson**

The western boundary of the Thompson Indians’ territory included most of the Upper Hat Creek Valley, but the northern part of the valley and the part by the Bonaparte River, belonged to the Shuswap (Magne 1985; Teit 1900, 1909). The Thompson and Shuswap were very similar in their subsistence practices, social organization, and material culture, as is indicated by Teit’s frequent references to the Thompson (1900) in his volume on the Shuswap (1909) (Magne 1985). Jorgensen (1969) grouped the Thompson and Shuswap into one cultural group that shared 70% of their social organization, ideological beliefs, and technological characteristics (Magne 1985). Most Thompson and Shuswap people lived in pithouses, and a few in mat-lodges, in major river valleys during the winter (Teit 1909; Magne 1985). A group of 20-30 people could build a pithouse in one day (Magne 1985; Teit 1900). The greatest population densities among the Thompson and Shuswap occurred during the winter months from December to March (Magne 1985; Teit 1900). The inhabitants of the pithouse villages mainly lived on
salmon, roots, and berries that had been stored during the spring and summer months, but occasionally hunted large game, and trapped smaller mammals using snares, deadfalls, pit traps, and deer fences (Magne 1985; Teit 1900). In the spring people left the pithouses and moved to plant resource locations to gather roots, cambium and shoots, or near lakes and streams for fishing (Magne 1985; Teit 1900). The exact makeup of the groups is not well known, but during the summer 20-30 people might gather at a resource gathering location (Magne 1985; Teit 1900). Men did the hunting and trapping, while women collected and processed plant resources (Dawson 1891; Magne 1985; Teit 1900). Roots were an important part of the early summer diet, and they were acquired using digging sticks (Magne 1985; Teit 1900). The roots were then processed for immediate use or storage by steaming or root baking in earth ovens (Magne 1985; Teit 1900). The earth ovens were constructed by both males and females, and they were also used to cook meat (Dawson 1891; Magne 1985; Ray 1942). Long term use camps had lodges covered with mats, skins, and bark (Magne 1985; Teit 1900, 1909). Towards the end of summer groups of people gathered along the major rivers and prepared for the salmon runs (Magne 1985; Teit 1900). People set up large camps along narrow parts of the Fraser and Thompson Rivers (Magne 1985; Teit 1900). Spears, nets, and weirs were used to catch the salmon, which were then dried and smoked for winter storage (Magne 1985; Teit 1900). Storage consisted of bark lined pits located near winter villages (Magne 1985; Teit 1900). Once the salmon runs were over, the rest of the year was spent hunting, trapping, and gathering plant resources like nutlets from ponderosa and white-bark pine (Dawson 1891; Magne 1985).
Ethnographic Accounts of Lithic Technology on the Interior Canadian Plateau

This is not a comprehensive compilation of ethnographic accounts of lithic technology on the Interior Canadian Plateau, but rather a sample showing the nature of the ethnographic data available about lithic technology. The examples are from Teit (1900,1909) and Morice’s (1893) accounts.

Teit describes quarries; functional characteristics of stone tools and weapons; ground and chipped stone tool production; and bipolar and core reduction (Magne 1985).

"Arrowheads were made of glassy basalt, which was obtained at a certain place north of Thompson River. The Lower Thompson found stone for their arrowheads near the head waters of Skagit River. Many were made out of large chipped heads, which are found in great numbers in the valleys...The points of war-arrows were generally barbed; those of hunting-arrows, leaf shaped” (Teit 1900: 241).

“The spearheads were similar in shape and material to the arrowheads except that they were larger...Iron spear-heads, and knives attached to shafts, beame common in later days” (Teit 1900: 263).

“A kind of war-club, consisting of a round stone enclosed firmly in thick hide, and fastened to a handle...Another kind differed only in having the stone loose in the skin” (Teit 1900: 263).

“Another weapon was made of a polished greenish stone. Its blade, sharpened on each edge, was from three inches to three and a half inches wide, terminating at
one end in a long point for stabbing. The other end was small, and finished with a
knob for grasping in the hand. The whole weapon was about two feet long...It
was evidently similar to the stone daggers found by Harlan I. Smith in the shell-
heap of Eburne on the delta of Fraser River. Shorter stone clubs of this kind, of
square cross-section, were often concealed about the person, and used in sudden
attacks...Into a wooden handle a foot and a half in length, stone heads, often axe
or tomahawk shaped, or spike shaped, were fastened with thongs. Some of these
had back spikes. Sometimes horn or bone was substituted for stone”

(Teit 1900: 264).

“Stones were battered into shape, cut, and flaked. Jade and serpentine bowlders
were cut by means of gritstones or beaver-teeth. But few polished implements are
found. Steatite pipes were polished with stems of Equisetum and a mixture of
grease and pitch of the black pine. Stone skin-scrapers and hand-hammers are
used up to this day. The Indians are still familiar with this art of making arrow-
heads. When these were to be made from a bowlder, the following method was
employed. The bowlder was split by being laid on a stone and struck with a hand-
hammer, generally a pebble of handy size. When a suitable piece had been
obtained, its edges were trimmed off with a hard stone. Then it was wrapped in
grass or hay, placed on edge on a stone, and large flakes were split off with a
hand-hammer. After a suitable piece had been obtained, it was placed on a pad in
the left hand and held in position with the fingers. It was given its final shape by
means of a flaker made of antler, which was used with forward and downward
pressure. The blunt point served for flaking off larger chips, while the smaller
one was used for the final stages of the work. In later times iron flakers were often used“ (Teit 1900: 182).

“The lower Thompson often imported stone hand-hammers from the Lillooet...stone clubs with flat sides were used for driving wedges...Adzes and axes of jade and serpentine were in common use...Stone chisels were fastened into handles with sockets, in which the stone was inserted...For cutting or carving, chipped stone knives or beaver-tooth knives were used...Drilling was done by means of stone points” (Teit 1900: 183).

Keeley (1982) argues that the efforts of re-hafting blunt tools are large enough to warrant extensive re-sharpening prior to discard (Magne 1985). Morice’s (1893) ethnographic account, of cobble spall hide scrapers, disputes this argument:

“This hafting is temporary as the stone part only of the implement is usually kept among the family chattels.”

The Thompson and Shuswap employed identical stone working techniques (Magne 1985; Teit 1909). Rough spall scrapers were usually used to scrape hides, but fine basalt scrapers were also occasionally used (Magne 1985; Teit 1909).

This last ethnographic sample by Morice (1893) describes ownership of individual quarries.

“The material chosen in preference to fashion arrow or spear heads with was loose, broken pieces of rock such as were found on the surface. Of course, these were confined to a few localities only wherein were situated sorts of quarries which were very jealously guarded against any person, even of the same tribe,
whose right to share in their contents was not fully established. A violation of this traditional law was often considered a *casus belli* between the co-clansmen of the trespassers and those of the proprietors of the quarry” (Morice 1893:65).

**Cultural Comparison of the Lillooet, Shuswap, and Thompson**

All three groups were very similar, and table 2-1 based on Alexander’s (2000) and Magne’s (1985) tables, shows an ethnographic comparison (Dawson 1892; Teit 1900, 1906, 1909;) of the seasonal activities that were performed at each month of the year, and thus demonstrates the similarity of their subsistence and settlement patterns throughout the year.

The Lillooet and Shuswap enter their winter pithouses in November, while the Thompson wait until the deer rut is over in December (Alexander 2000; Magne 1985; Teit 1900, 1906, 1909). Abandoned pithouses were occasionally used as workshops to manufacture implements (Kennedy and Bouchard 1978; Magne 1985). Deer, and in later times horses, were tossed into pithouses during potlatches to be butchered by guests (Kennedy and Bouchard 1978; Magne 1985). Pithouses were occasionally occupied by the elderly during the summer months, and ants nests were placed around them to keep snakes away (Kennedy and Bouchard 1978; Magne 1985). Roots were very important to all three groups, and there was a heavy focus on gathering and processing them from March through May (Alexander 2000; Magne 1985; Lepofsky and Peacock 2004; Peacock 1998; Teit 1900, 1906, 1909). The Hat Creek valley had really good root grounds, and therefore the Thompson might have spent a little longer time than the Lillooet and Shuswap on processing them (Alexander 2000; Magne 1985; Lepofsky and
Peacock 2004; Peacock 1998; Teit 1900, 1906, 1909). All three tribes engaged in a variety of foraging activities in June and July, until the salmon runs began in August (Alexander 2000; Magne 1985; Teit 1900, 1906, 1909). Berry picking was a primary activity in June and July, with emphasis placed on service berries (Alexander 2000; Magne 1985; Teit 1900, 1906, 1909). August and September was spent catching, processing, and storing, salmon (Alexander 2000; Magne 1985; Teit 1900, 1906, 1909). October and November were spent hunting large mammals as they were in rut, and descending to lower elevations (Alexander 2000; Magne 1985; Teit 1900, 1906, 1909).

The Lillooet, Shuswap, and Thompson lived under similar climatic conditions, and utilized similar resources (Jorgensen 1980; Magne 1985). All three groups had very similar economies, technologies, material culture, social organization, ceremonialism, and spiritualism (Jorgensen 1980; Magne 1985).
Table 2-1. Cultural Comparison of the Lillooet, Shuswap, and Thompson.

<table>
<thead>
<tr>
<th>Month</th>
<th><strong>Lillooet</strong> (Teit 1906)</th>
<th><strong>Shuswap</strong> (Teit 1909)</th>
<th><strong>Thompson</strong> (Teit 1900)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>coldest weather, ice on rivers</td>
<td>midwinter, sun turns</td>
<td>bucks shed antlers, does lean, all enter pithouses</td>
</tr>
<tr>
<td>February</td>
<td>people come out of houses</td>
<td>chinook winds, snow goes</td>
<td>some people leave houses, some camp out in lodges, chinook winds, snow goes, plants sprouts</td>
</tr>
<tr>
<td>March</td>
<td>grass grows, some fishing and hunting, chinook winds</td>
<td>leave pithouses, dig roots, snow leaves low ground, many leave winter houses</td>
<td>all people leave houses, last cold, grass grows</td>
</tr>
<tr>
<td>April</td>
<td>trees and bushes leaf</td>
<td>snow leaves high ground, dig roots, grass grows fast</td>
<td>fish trout with dip nets, trap lake fish, trees leaf, water increases</td>
</tr>
<tr>
<td>May</td>
<td>first salmon, small fish, strawberries ripe</td>
<td>people fish trout at lakes, root digging</td>
<td>root digging, short hunts</td>
</tr>
<tr>
<td>June</td>
<td>service and most other berries ripen</td>
<td>service berries ripen, strawberry</td>
<td>young deer born, service berries ripen, pick berries</td>
</tr>
<tr>
<td>July</td>
<td>berry picking, warmest</td>
<td>salmon arrive, berry</td>
<td>some hunt, summer solstice, all berries ripen, salmon fishing</td>
</tr>
<tr>
<td>August</td>
<td>salmon run</td>
<td>fish salmon all month</td>
<td>sockeye run, fish and cure salmon</td>
</tr>
<tr>
<td>September</td>
<td>boil salmon, make oil</td>
<td>salmon get bad, cache fish, leave rivers to hunt</td>
<td>cohoes run, salmon runs get poor, prepare fish oil</td>
</tr>
<tr>
<td>October</td>
<td>hunt and trap game</td>
<td>hunt and trap in mountains, deer travel</td>
<td>trap, hunt large game, bucks begin to run</td>
</tr>
<tr>
<td>November</td>
<td>gets cold, going in time</td>
<td>some enter winter houses, deer rut, return from hunt</td>
<td>deer rut, hunt</td>
</tr>
<tr>
<td>December</td>
<td>winter solstice, sun turns</td>
<td>first real cold, remain home</td>
<td>gets cold, enter pithouses</td>
</tr>
</tbody>
</table>
CHAPTER THREE
RESEARCH METHODS

This chapter discusses how the lithics data from the Post-Abandonment Occupation (PAO) of housepit 7 at the Keatley Creek site were collected and analyzed, to determine the pattern of site use. Two models of site use will be discussed and compared, the winter village pattern, and the short-term camp pattern. This chapter will also review the theoretical background for the interpretation of lithic-assemblage formation, and how it aids in the understanding of lithic technological change over time. Then changes in lithic reduction, tool use, and discard strategies are discussed; and how these changes relate to questions of mobility and foraging strategies, and lithic technological organization.

THEORETICAL BACKGROUND

Lithic artifact assemblages form as a result of the utilization of specific strategies for raw material procurement, tool production, use, and discard; and more specifically as a result of different activities undertaken during a single or multiple occupation events, and the taphonomic processes like erosion and trampling, acting on the remaining artifacts (Camilli and Ebert 1992).

Lithic technological organization is a component of larger economic systems whose functions include: (1) safeguarding against risks resulting from resource shortages, (2) reducing the costs of large scale foraging tactics, and (3) assisting in economic activities like exchange (Amick 1994; Hayden and Schulting 1997; Torrence 1989). This theoretical section will discuss connections between lithic assemblages, land-use patterns,
and lithic technological organization. Binford’s (1977, 1981) middle range theory is one way to address these connections.

Middle range theory explains how archaeological patterning is related to prehistoric land use patterns, using “actualistic” research (Binford 1981:26). The goal of actualistic research (experimental, ethnographic and historical research) is to discover patterns in the archaeological record, and show that it is redundant, explicit, and diagnostically unique (Binford 1981). This is achieved by analyzing the material effects of behavior in specific economic and social contexts. Binford’s (1978) Nunamiut Eskimo study is a good example. He observed that the Eskimos butchered the caribou in a predictable fashion, according to immediate and long-term meat, fat, and tool needs. Binford (1978) recognized important connections between the economic principles that had been used during the butchering and the resulting material remains.

New research concentrating on technological organization has resulted from Binford’s Nunamiut study; with most focused on economic factors such as resource distributions, foraging, mobility, and technology; and some research focused on risk theory (Binford 1979; Nelson 1991; Torrence 1989; Wiessner 1982). From the perspective of technological organization, lithic technology is used for problem solving, key elements include the acquisition and processing of raw materials, and the production, use, and maintenance of tools and facilities (Koldehoff 1987). Technological organization is the way in which technology is utilized to reduce risk, and assist in or improve resource acquisition, processing, and storage (Binford 1977, 1978, 1979; Koldehoff 1987; Nelson 1991; Torrence 1989).
A useful method of determining the technological organization behind lithic economies and production is analyzing the connections between lithic technology, mobility, foraging strategies, and resource availability and accessibility. Some of the specific factors a society needs to consider when organizing its technology include: (1) lithic raw material types available, (2) distance to lithic raw material sources, (3) food resource availability and accessibility, (4) resource gathering strategies, (5) group mobility, (6) and trade and interaction with neighboring groups (Koldehoff 1987).

Mobility and scheduling are two of the most important factors influencing technological organization among hunter-gatherers (Binford 1977, 1978, 1979, 1980; Koldehoff 1987 Torrence 1983). Hunter-gatherers have to weigh logistical concerns against tool effectiveness; and consider such things as tool portability, raw material type, time and effort spent on tool production, flexibility in tool function, and reuse and recycling potential (Koldehoff 1987).

There are three strategies of technological organization that deal with mobility, raw material transport, and anticipation of raw material needs, and they are: the curated strategy, the expedient strategy, and the opportunistic/encounter based strategy (Nelson 1991; Thacker 1996).

The curated strategy includes tool reworking and transport of both tools and prepared cores to a site (Nelson 1991; Thacker 1996). Bifaces and other formal tools produced by standardized core reduction are examples of curated tools (Parry and Kelly 1987). Formal tools like bifaces require more skill and effort to produce, but they can be resharpened and reused over a long period of time (Parry and Kelly 1987).
The expedient strategy is differentiated from the curated strategy by raw material availability and time stress (Thacker 1996; Torrence 1983). Hunter-gatherers utilizing the expedient strategy plan activities near lithic raw material sources, or travel to raw material caches (Thacker 1996). Little time and effort are put into the production of expedient tools (Parry and Kelly 1987). The expedient tools are created for a specific task, and once it is completed, they are thrown away (Parry and Kelly 1987).

The opportunistic/encounter based strategy is unplanned and takes advantage of whatever local raw material is available, and tools are only made for immediate use (Thacker 1996). The opportunistic/encounter based strategy frequently does not use a prepared core technique if a site is used for a short time (Nelson 1991; Thacker 1996).

If a society changes from utilizing standardized core reduction to unstandardized core reduction, it is an indication of a shift in technological organization from curated to expedient technology (Parry and Kelly 1987). The change usually does not involve the complete replacement of curated with expedient technology, but rather a shift in emphasis towards expedient informal tools, while still retaining some curated formal tools (Parry and Kelly 1987). The shift from curated to expedient technology does not appear to be linked to local lithic raw material availability, the introduction of new technology, nor the advent of horticulture or agriculture, but rather a shift in settlement patterns (Parry and Kelly 1987). The largest decrease in the use of formal tools co-occurs with the occupation of large, nucleated permanent villages (Parry and Kelly 1987). The increased emphasis of expedient technology is a logical result of decreased residential mobility (Parry and Kelly 1987). The greatest advantage of the curated strategy is the portability of formal tools (Andrefsky 1991, 1998; Kelly 1988; Parry and Kelly 1987).
Formal tools like bifaces are multiuse and multifunctional (Parry and Kelly 1987; Sollberger 1971). Multiuse tools can be resharpened and reused repeatedly for the same activity (Parry and Kelly 1987; Sollberger 1971). Multifunctional tools have a generalized form that allows them to adapt to a variety of activities (Parry and Kelly 1987; Sollberger 1971). Expedient flake tools are only used for one task. A formal tool can perform the tasks of several expedient tools, so fewer formal tools are needed to anticipate future tool needs (Parry and Kelly 1987). A curated strategy produces more cutting edge per unit mass, as exemplified by the high edge-to-weight ratio achieved through the use of a biface as a core for flake tools (Andrefsky 1998; Goodyear 1989; MacDonald 1968; Parry and Kelly 1987). In other words, a curated technology is more portable since it can perform a variety of tasks with a lesser number of tools that are more lightweight (Parry and Kelly 1987). Some of the disadvantages to using a curated strategy include the high cost of manufacture, use, and maintenance (Parry and Kelly 1987). Curated formal tools have to be made from good quality raw material of a certain size; which might require travelling farther, or spending more time and effort procuring it (Parry and Kelly 1987). Formal tools are more difficult to make, and the skill required takes a long time, and a lot of raw material to perfect (Parry and Kelly 1987). Expedient flake tools can be made from smaller or flawed pieces of raw material that are more readily available; and they can be produced very quickly with very little skill (Parry and Kelly 1987). Curated formal tools can be less effective than expedient flake tools, since their retouched edges have been crushed by pressure-flakers, and are therefore duller than the unretouched edges of expedient tools (Parry and Kelly 1987). Curated formal tools might also be less precise because of their generalized form, while expedient flake tools
are highly variable and might have an edge perfectly suited for a particular job (Parry and Kelly 1987). The tradeoffs between the two strategies are that the transport costs for lithic raw materials and tools are high for the expedient strategy, and low for the curated strategy; while the manufacturing costs are low for the expedient strategy, and high for the curated strategy (Parry and Kelly 1987). The strategy that is chosen depends on residential mobility. For hunter-gatherers utilizing a high mobility settlement pattern, the benefits of portability outweigh the high manufacturing costs of formal tools (Parry and Kelly 1987). Hunter-gatherers utilizing a low mobility settlement pattern have less of an incentive to spend a lot of time and effort on manufacturing, and maintaining curated formal tools (Parry and Kelly 1987). To fully comprehend the role of stone tools in the grander scheme of lithic technological organization, the spatial and temporal relationships between their manufacturing techniques, use, and discard all have to be examined (Binford 1977, 1979; Parry and Kelly 1987). The main role of stone tools is to bridge the spatial and temporal gaps between the location of the lithic raw material, and the location of lithic tool use, while at the same time satisfying the functional needs of a specific task (Camilli and Cordell 1983; Parry and Kelly 1987). For highly mobile hunter-gatherers it is worthwhile to spend the extra time and effort to produce curated formal tools that are highly portable, thus allowing for easier transport of sufficient amounts of lithic raw materials to the location of tool use (Andrefsky 1998; Parry and Kelly 1987). If lithic raw material is accessible close to the hunter-gatherers’ camp, or if it can be regularly imported to sedentary residential sites, then there is no spatial or temporal gap between the location of the lithic raw material and the location of lithic tool use, as they are both at the residential site (Parry and Kelly 1987). When the spatial and
temporal gaps disappear, there is no longer a need for curated formal tools, since they are
designed to reduce the risks of future raw material limitations, and expedient tools are
used instead (Andrefsky 1998; Parry and Kelly 1987). The time and effort that was spent
on producing and repairing formal tools can then be spent somewhere else (Parry and
Kelly 1987). The expedient technology is wasteful, so in situations where lithic raw
materials are scarce, exhausted cores and tools are utilized more intensively through
processes such as bipolar reduction (Andrefsky 1998; Parry and Kelly 1987). Raw
material abundance and quality are important factors in lithic core production (Andrefsky
1994). In instances when lithic raw material quality is poor, an informal core technology
like multidirectional core reduction is used, whether the abundance of raw material is
high or low (Andrefsky 1994, 1998). In instances when lithic raw material quality is high
and the abundance of raw material is low, a formal core technology like bifacial core
reduction is used (Andrefsky 1994, 1998). The toolmaker becomes familiar with the
quality and consistency of the raw material by shaping the piece of stone into a biface
(Andrefsky 1998). If high quality lithic raw material occurs in great abundance, then
both formal and informal core technology is used (Andrefsky 1994, 1998).

There are two basic mobility strategies: logistical and residential (Binford 1980;
Kelly 1983). Logistical mobility involves the movement of small task groups to specific
resources, while residential mobility involves the movement of the entire residential unit
to the resources (Binford 1980; Kelly 1983; Prentiss et al. 2000). A group of hunter-
gatherers that primarily employ logistical mobility are considered collectors, while
groups that primarily employ residential mobility are considered foragers (Binford 1980).
However, depending on a group’s needs, and shifting seasonal resource focus, the
amount of time it spends employing logistical or residential mobility may vary (Prentiss and Chatters 2003). The group employs a collector strategy when resources are clustered, and occur over short periods of time; while it employs a forager strategy when resources are widely dispersed across the landscape, and occur over long periods of time. Lithic assemblages should reflect the economic strategies used by the occupants of different sites, depending upon the occupational history of the site’s use and reuse patterns (Prentiss et al. 2000).

By studying theories of risk and technological organization, the cultural behaviors causing particular archaeological patterns can be discovered. Technology needs to respond to risk timing and severity (Torrence 1989). Risk timing is closely linked to the spatial distribution and seasonal availability of particular resources, and as those resources spatially and seasonally cluster more and more, the people utilizing them will prefer increasingly diverse, and complex technologies (Torrence 1989). Risk severity also affects technological organization and tool design, because as risk severity increases and there is an increased chance of resource procurement failure, the tools become more resource specific and complex (Bleed 1986). Hunter-gatherers that reside at low latitudes with reduced risk timing and severity frequently utilize a simpler and more flexible technology, like digging sticks and the bow and arrow, to procure resources. Hunter-gatherers living at higher latitudes with increased risk timing and severity frequently utilize a more complex technology, including facilities like nets, deer fences, and deadfalls, and specialized weapons and tools like beaver spears and salmon dip nets (Bleed 1986; Teit 1906; Torrence 1989). Hunter-gatherers reduce risk by anticipating lithic raw material shortages, through the use of different lithic raw material acquisition
strategies (Francis 1983). These strategies vary, and range from encounter based to quarrying; based on food, shelter, clothing, and tool needs, seasonality, and mobility strategies (Francis 1983).

There are several factors that limit lithic raw material procurement and tool production; including current and predicted future access to lithic sources, and familiarity with the local territory (Binford 1979; Goodyear 1989; Hayden 1988; Parry and Kelly 1987).

Hunter-gatherers, utilizing a collector strategy, reduce lithic cores and tools in specific production stages that are linked to specific locations (Binford 1977, 1979; Kelly 1988; Prentiss et al. 2000). Collectors use their tools for long periods of time, and then usually discard them at residential camps, rather than specific use locations (Binford 1977, 1979; Kelly 1988). Hunter-gatherers utilizing a foraging resource strategy are less specific in their lithic tool production strategies, and more flexible in their tool designs (Binford 1977, 1979). Foragers usually discard their exhausted tools in their primary use locations (Binford 1977, 1979). Design constraints and use requirements also influence lithic tool production and use (Hayden 1987, Hayden et al. 1996). The more intense or economically important an activity is, the more time the hunter-gatherers are likely to spend on tool production strategies to aid in those activities.

**Comparison of Lochnore Phase and Kamloops Horizon Technological Organization**

This study will examine patterns of site occupation associated with the Lochnore phase and late Kamloops horizon at Keatley Creek.

**Lochnore Phase**

Lochnore foragers had a high frequency of residential moves, with the possibility of some longer occupations (Stryd and Rousseau 1986). Archaeological sites containing
a narrow range of lithics, and little variation in the faunal assemblage indicate specialized activity residential camps or short term logistical sites. Lochnore employed an economically efficient portable technology for transporting lithic raw material without wasting much of it during tool production and retouch (Stryd and Rousseau 1986). This technology was designed for long term use, and it mainly consisted of curated formally shaped tools and blades; with lithic reduction oriented towards maintenance and production of gear. The Lochnore assemblage consisted primarily of transported personal gear (Binford 1979), and contained microblades, bifaces, and scrapers, but few bipolar cores, abraders, or expedient flake tools (Prentiss et al. 2000, 2003; Stryd and Rousseau 1986). The technology was resource specific, geared toward the procurement of medium mammals, deer, and to a limited degree birds (Prentiss et al. 2003). There is a lack of evidence supporting woodworking activities, or intensive food processing (Prentiss et al. 2000; Stryd and Rousseau 1986). The technology utilized by Lochnore phase groups was ideally suited for their mobile game-oriented strategy.

Kamloops Horizon

The Kamloops horizon consists of semi-sedentary collectors that are sedentary in the winter and more mobile in the summer (Prentiss et al. 2000). They employ logistical mobility with different groups targeting different resources like salmon, trout, berries, roots, and deer (Prentiss et al. 2000). The Kamloops villages' social organization is complex, and not unlike that of the Northwest Coast villages. The lithic technological organization at the Kamloops winter villages was geared towards the production of task specific expedient tools, and curated tools like hide scrapers, wood working tools, and projectile points (Parry and Kelly 1987; Prentiss 2000). They produced woodworking
tools, hide working tools, and antler and bone working tools (Hayden et al. 2000). The Kamloops horizon produced many lithic tools that were “tools to make tools”, rather than Lochnore’s directly useable processing tools (Prentiss et al. 2003).

**Determining Site Use**

Hunter-gatherers utilizing sites for different purposes and lengths of time are likely to organize their technologies differently, and to leave behind different lithic patterns. I will compare two models of site use to determine whether the Post-Abandonment occupation of housepit 7 at the Keatley Creek site, is a winter residential site or a short-term camp.

Short-term camps were specialized for the procurement and processing of salmon, deer, or plants. Based on the assumption that tools were usually discarded at the location at which they were most intensively used, specialized tool assemblages should be found at short-term camps, while winter villages should contain a more varied lithic assemblage due to gearing up, and tool storage (Alexander 1992; Binford 1980). The short-term camp should have used a curated technology that was reliable, like bifaces that can be used for cores and tools. The bifaces should be made from a high quality non-local material. A bifacial strategy is very useful for high mobility situations where there are constraints on the amount of raw material that can be carried, and where availability of raw material is uncertain (Andrefsky 1998; Bamforth 1991). Bifaces are also maintainable, as they can be resharpened, altered and reworked, to perform different tasks (Bleed 1986; Kelly 1988). Another advantage is multifunctionality achieved through a variety of flake forms, and easy metamorphosis of the biface into different forms (Odell 1981a). Economic use of raw material results from the high edge-to-weight ratio on flakes, and
the biface can easily be resharpened with little loss of stone (Nelson 1991; Parry and Kelly 1987). There might be some broken tools like projectile points, bifaces, unifaces, and utilized flakes for butchering, or processing knives and flakes for plant resources depending on the use of the site (Alexander 1992). Hearths may have been a common feature at butchering sites, and at fishing camps (Alexander 1992).

Debitage is relatively abundant; it is generally not curated; and it indicates reduction activities (Carr 1994; Magne 1985). There are early, middle, and late stages of reduction. The early stage includes all core reduction. The middle stage includes the primary trimming of unifacial and bifacial tools. The late stage of reduction includes the last half of tool manufacture (Carr 1994). The manufacture of tools from bifacial cores should result in middle and late stage debitage, while tool maintenance should result in a majority of late stage debitage (Carr 1994).

Lithic tool use and production in winter village sites were geared toward the production of more complex tools, clothing, and shelter (Prentiss 2000). Tools and equipment included arrows, spears, traps, nets, digging sticks, baskets, and hide bags (Prentiss 2000; Teit 1900,1906,1909). A variety of tasks are performed at winter villages, with a focus towards wood-working and hide-working (Prentiss 2000). Adzes, chisels, carving-knives, scrapers, and arrow-smoothers are used for wood-working, while scrapers and knives are used for hide-working (Prentiss 2000). Specialized tools for spring hunting and gathering activities included bifacial projectile points, processing knives and scrapers (Prentiss 2000). Lithic reduction strategies for winter villages were primarily influenced by three factors; economic decisions concerning raw material conservation, and immediate, and future tool needs (Prentiss 2000). If lithic resources
were reduced or hard to access, a trend toward more economical use of the raw material would be expected (Parry and Kelly 1987; Prentiss 2000). Lithic raw material was difficult to access in the winter due to snow and ice, so it was conserved by stockpiling it in the form of different sized spheroid or prepared platform block cores (Prentiss 2000). Expedient block cores are kept at the residential site, and flakes are removed and modified according to immediate needs (Hayden et al. 1996). Tools produced from the block cores included: expedient knives, scrapers, utilized flakes, notches, denticulates, borers, piercers, and perforators (Hayden et al. 1996). Raw material conservation was practiced through bipolar reduction, intensive reuse of tools, scavenging and reuse of discarded tools, as well as using higher degrees of edge preparation during core reduction (Prentiss 2000). The assemblage resulting from these economical practices would contain a range of heavily retouched and broken tools, but minimally retouched flake tools. Both biface and core reduction were practiced at winter villages. Biface reduction created small, specialized, flake tools, as well as bifacial tools like knives and projectile points (Prentiss 2000). The selection and use of flakes worked in three ways: First, by scavenging flakes from previous occupations; second, by focusing lithic production on primary flakes with high or acute edge angles, depending on use; and third, specialized tool needs and material conservation led to the use of byproducts of the reduction process like broken primary and platform preparation flakes (Prentiss 2000). The ratio of flakes to tools is expected to contain a high number of tools, since the lithic tools were mainly used to create organic tools, equipment, and clothing. The extreme recycling of lithic material is not expected to leave many useful tools or flakes that might be exported from the winter village site; except for the ones specifically created for spring hunting and
gathering activities, including bifaces like projectile points, and some unifacial tools like end-scrapers (Prentiss 2000). Spatially discrete activity areas can be expected in a winter village site.
CHAPTER FOUR

ANALYSIS AND RESULTS

This chapter discusses the analyses and the results from the study of the Post-Abandonment Occupation’s lithic debitage and tools. It provides some general background on lithic studies, followed by a more specific explanation of the lithic analysis used at the Keatley Creek site.

DEBITAGE AND STONE TOOL ANALYSIS

Debitage Analysis

Non-tool debitage is often categorized by cortical variation, and divided into primary, secondary, and tertiary flake categories. The cortical variation of an assemblage results from a variety of independent technological and non-technological factors like: raw material type and availability; nodule or core size; intensity of reduction; the nature of regional procurement and reduction systems; and stylistic and functional factors. As a result it is misleading to only use cortex cover to analyze non-tool debitage (Sullivan & Rozen 1985). Tool debitage is defined by attributes like: shape, platform characteristics, thickness, curvature, size, and retouch.

A debitage comparison will be made between primary flake production and all other flakes. This comparison will provide a measure of the scale of lithic reduction. High numbers of primary flakes indicates the reduction of larger tools, while low numbers of primary flakes indicates resharpening and edge preparation, or earlier stage reduction followed by intensive flake culling (Prentiss 1993, 2000; Prentiss et al. 2000). A debitage comparison will also be made between billet flakes and all other flakes to compare biface reduction to core reduction.
Stone Tool Analysis

Collins (1975) developed a general model of stone tool production. The first step to making stone tools is acquiring raw material (Collins 1975; Magne 1985). Raw material acquisition is often embedded in other subsistence activities, but sometimes specific lithic-resource gathering trips are undertaken (Binford 1979; Magne 1985). The next step to making stone tools is preparing and reducing cores (Collins 1975; Magne 1985). Primary trimming can produce tools, or preforms (Collins 1975; Magne 1985). Flakes removed from cores can be used as expedient tools, or blanks can be created for the production of formal tools (Collins 1975; Magne 1985). The next step in the process is secondary trimming, which creates complex tools, and things like notches for hafting, serrated edges, fluting and flake scars (Collins 1975; Magne 1985). Tool use, repair, and reworking are additional steps in the process; while the final step would be discard or bipolar reduction at the end of its use life or, disposal in graves or caches (Collins 1975; Magne 1985).

A more specific lithic reduction model of biface production is Callahan’s (1979) and Whittaker’s (1994) five stage models (Andrefsky 1998). Both models are essentially the same with a few variations. Stage 1 is the Blank, which consists of a cobble or spall with the probability of some cortex. Stage 2 is the Edged Biface, which has had small chips removed from around the edges with few flake scars extending across the face. Stage 3 is the Thinned Biface, where flakes have been removed to the center of the biface, and most of the cortex is removed. Stage 4 is the Preform, which has large, flat
flake scars extending across the face, and it has a flat cross section. Stage 5 is the Finished Biface, which has had refined trimming of its edges, and might be hafted.

Stone tools are categorized into types or classes, which are groups of specimens found in a population (Andrefsky 1998). Tools are classified to determine diagnostic markers of prehistoric cultures and to determine the function or history of use (Andrefsky 1998). Stone tool types are characterized as cultural traits of particular societies or groups of people and given chronological meaning, when they are used as diagnostic markers (Andrefsky 1998). When stone tool types are used as functional or behavioral indicators, they describe the tasks undertaken at a site by its occupants (Andrefsky 1998). For example, scrapers might indicate hide working or woodworking, while high numbers of projectile points could indicate a hunting camp (Andrefsky 1998). There are a variety of tool shapes and sizes, stemming from three main sources: (1) functional requirements, (2) tool uselife, and (3) raw material differences (Andrefsky 1998). Functional requirements involve the relationship between tool shape and the activity the tool performs (Andrefsky 1998). For example, the tool’s edge angle determines its function; with an acute edge angle being more effective at cutting, and a high edge angle being more effective at scraping (Andrefsky 1998). Tool uselife refers to the changes in tool shape due to use, maintenance, and reworking (Andrefsky 1998). Raw material differences deals with the fact that the shape, size, quality and availability of raw materials, all affect the morphology of the final tool (Andrefsky 1998).

Microchipping analysis can be useful for determining the use of a lithic tool (Odell and Odell-Vereecken 1980). The acuteness of the edge angle, combined with an assessment of the bifacial distribution and angle of the scars can indicate what a tool was
used for (Kooyman 2000; Odell 1981). Acute edged tools with bifacial scars tending
towards a diagonal angle to the length of the edge, were used for cutting (Kooyman 2000;
Odell 1981). Steep angled tools with unifacial scarring oriented transversely to the edge
length were used for scraping (Kooyman 2000; Odell 1981). Tools used on hard
materials show edge rows, step terminations, and large scars (Kooyman 2000; Odell
1981). Tools used on soft materials show small scars, have feather terminations, but no
edge rows (Kooyman 2000; Odell 1981).

**Lithic Analysis Used at the Keatley Creek site for the 1999 and 2002 Excavations**

Debitage from the 1999 and 2002 UM excavations at the Keatley Creek site were
sorted based on the SFU-Keatley Creek Typology; in other words by material type,
thermal alteration, flake size, percentage of dorsal cortex, flake breakage, platform wear,
dorsal platform angle, fracture initiation, and the possibility of being used as a tool

Vitreous trachydacite was by far the most dominate lithic raw material utilized at
the Keatley Creek site during all occupations, followed by jasper to a much lesser degree.
Others included, pisolite, quartzite, coarse grained basalt, chalcedony, rhyolite, vesicular
basalt, obsidian, sandstone, granite, gneiss, steatite, siltstone, green extrusive and
intrusive quartz, and vitric tuff (Prentiss et al. 2000, 2003).

The percentage of dorsal cortex was determined by examining each individual
flake, and classifying it as primary (75-100% cortex cover), secondary (1-75% cortex
cover), and tertiary (0% cortex cover) (Prentiss et al. 2000, 2003). The amount of cortex
cover is useful in assessing the involvement of decortication activities in the production
Reduction flakes from early reduction stages have more cortex, while flakes from later stages have progressively less cortex (Prentiss et al. 2000, 2003).

The type of percussor (hard hammer or soft hammer) that was used can be determined by studying the fracture initiation (Cotterell et al. 1985; Hayden and Hutchings 1989; Prentiss et al. 2000). Hard hammers made of stone usually create cone initiations; while soft hammers made of wood, antler, or bone, create bend initiations; bipolar reduction creates wedge initiations; and pressure flaking can create cone and bend initiations. The SFU-Keatley Creek typology allows for the determination of whether flakes could potentially be used as tools, based on size and fracture initiation (Prentiss et al. 2000, 2003).

There are five categories of flake types including primary flakes, secondary flakes, billet flakes, bipolar flakes, and shatter (Prentiss et al. 2000, 2003). Any flake can have both functional and technological designations (Prentiss et al. 2003).

Primary flakes have a maximum dimension of >2cm, a minimum of 1cm of edge length that can be retouched, and an edge angle less than 45 degrees, and they can be used as tools (Prentiss et al. 2000; Spafford 1991). Prentiss (2000) suggests that the presence of primary flakes indicates a strategy where large flakes were saved for later use as expedient tools.

Secondary flakes are small proximal, medial, and distal fragments, or cone initiation complete flakes. They have a distinguishable ventral surface, but do not belong in the primary, bipolar, or bifacial categories, and they are not used as tools (Prentiss et al. 2000; Spafford 1991).
Billet flakes have bend initiations, pronounced lips, small platform areas compared to flake size, absence of platform crushing, and occasionally platform preparation. They are usually the biproduct of soft hammer biface thinning (Prentiss et al. 2000; Spafford 1991).

Bipolar flakes have fairly straight ventral surfaces with scarring, and crushing on the platform and ends. They are usually made from exhausted cores or tools, and therefore their presence suggests conservation of raw materials, which was important in times of raw material shortage, like the winter months at the Keatley Creek village. Tools that are manufactured through bipolar reduction are usually expedient.

Shatter does not have a ventral surface that can be recognized and is not used as a tool (Prentiss et al. 2000; Spafford 1991).

Tools were classified according to the Keatley Creek site tool typology developed by Spafford and Hayden (Prentiss et al. 2000). Tools with more than one edge, that could be defined as a different tool, were classified using each edge as an employable unit (EU), to ensure that every function of the tool was assessed (Knudson 1983; Prentiss et al. 2000).

**Post-Abandonment Occupation Analysis**

In order to draw some conclusions about the Post-Abandonment Occupation (PAO) pattern and the socio-economic systems responsible for the occupation pattern, different tool and debitage comparisons have been utilized. The PAO occupation pattern has been compared to the Pre-housepit Lochnore Occupation (PLO) pattern, and the Housepit 7 floor occupation pattern.
Lithic tools were compared by organizational strategies using Prentiss’ modified version of Hayden et al.’s (1996) strategy sets, which compares six different tool strategies (Prentiss et al. 2003). The Expedient tool strategy consists of a wide variety of flake tools. The Biface strategy consists of all formally shaped bifacial tools including projectile points, but does not include drills. The Long Term Use tool strategy (LTU) consist of formally shaped unifacial tools like end scrapers, and bifacial drills/boring tools. The Bipolar strategy includes bipolar cores, but does not include large spalls. The Abrader strategy includes all formed, and unformed abraders of all material types. The Blade strategy includes microblades and microblade cores.

Lithic tools were also compared by function. Out of the 113 artifact types in the Keatley Creek site typology, Godin (2004) organized 58 of the tool types according to tool function. They were classified into three groups: Hunting and Butchering, Hideworking and Basketry (light duty), and Woodworking (heavy duty).

The Functional Classification consists of the following groups and tool types:

**Hunting and Butchering:**

- All Projectile points and Preforms (Alexander 2000:60; Hayden 2000:188)
  (Type 19,35,99,100,101,110,111,112,118,119,126,127,134,136,137)
- Expedient Knives (Hayden 2000:189) (Type 70,74,170)
- Unifacial Knife (Alexander 2000:61; Hayden 2000:189) (Type 159)
- Knife-Like Biface (Hayden 2000:140) (Type 140)
- Microblade (per Prentiss) (Type 147)
- Bifaces (per Prentiss) (Type 131,192,193)
- Scraper-Like Biface (Type 141)
• Bifacial Fragment (Type 6)
• Biface Tip (Type 135)
• Bifacial Knife (Type 130)
• Miscellaneous Biface (Type 2)

Hideworking and Basketry (light duty):
• Spall Tools (Hayden 2000:188; Spafford 1991:45, 141) (Type 183,184)
• End Scraper (Hayden 2000:188; Spafford 1991:44-45) (Type 162)
• Scraper Retouch Flake with Hide Polish (Alexander 2000:61) (Type 143)
• Hide Scraper Retouch Flake or Flake with Polish Sheen (Alexander 2000:61) (Type 148)
• Utilized Flakes (Hayden 2000:189, 191) (Type 71,72,73,180)
• Piercer (Hayden 2000:193) (Type 153)
• Unifacial Perforator (Hayden 2000:193) (Type 151)
• Bifacial Perforator (Hayden 2000:193) (Type 132)

Woodworking (heavy duty):
• Pieces Esquillees (Spafford 1991:43) (Type 145)
• Adze (Alexander 2000:61; Hayden 2000:188; Teit 1900:183) (Type 185)
• Scrapers (Alexander 2000:61; Hayden 2000:192) (Type 150,156, 163,164,165)
• Crescent Scraper/ Miscellaneous Artifact (Type 1)
• Notches (Hayden 2000:192) (Type 54,154)
• Denticulate (Hayden 2000:192-193) (Type 160)
• Unifacial Borer (Hayden 2000:193) (Type 152)
• Bifacial Drill (Alexander 2000:60; Hayden 2000:188) (Type 133)
• Key-Shaped Scraper (Rousseau 1998) (Type 158)
• Abraded Cobble (Type 207)
• Abrader (Type 201)

A comparison was also made between curated, and non-curated tools. Curated tools include formally shaped tools like those in the Biface, LTU, and Blade strategies; while non-curated tools included all others (Prentiss et al. 2003).

A debitage comparison was made between primary flake production and all other flakes. This comparison provides a measure of the scale of lithic reduction (Prentiss et al. 2000). High numbers of primary flakes indicates the reduction of larger tools, while low numbers of primary flakes indicates resharpening and edge preparation, or earlier stage reduction followed by intensive flake culling (Prentiss 1993, 2000; Prentiss et al. 2000).

Finally a debitage comparison was made between billet flakes (biface reduction) and all other flakes (core reduction).

All comparisons were undertaken using chi-squared tests (with Yates Correction for continuity), and euclidean distance measures of similarity. The goal of the comparisons was to determine if significant differences could be recognized between the components of the various (PAO, PLO, HP7) occupations. The chi-squared tests were performed first, but due to the big differences in tool and flake counts between the three (PAO, PLO, HP7) occupations, it was difficult to get a clear picture of which occupations were the most similar. The euclidean distance measure of similarity uses percentages rather than raw tool and flake counts to calculate the similarity between the three occupations, and is therefore more suitable for determining the similarity between units.
with large differences in component counts (Foor 2004). The smaller the euclidean distance is, the more similar the units are. The larger the euclidean distance is, the more different the units are. A euclidean distance of zero means the units are identical, and therefore a unit has a euclidean distance of zero to itself. Distance is seen to be the complement of similarity (Sneath and Sokal 1973).

**PAO Stone Tool Analysis and Results**

The data from the comparison of organizational strategies indicates a similar pattern of tool use between PAO and the HP 7 floor (Table 4-1, Figure 4-1, Figure 4-2, and Figure 4-3). They are both dominated by block core reduction and expedient tool use and discard. Both PAO and the HP 7 floor contain far less formally shaped curated tools than PLO. PAO has a higher frequency of abraders and bipolar cores than both PLO and the HP 7 floor, but it is more similar to the HP 7 floor. Based on the comparison of organizational strategies, PAO is more similar to the winter village pattern, than it is to the Lochnore short term camp pattern which is dominated by more specialized tools (Alexander 1992; Hayden 1996).

**Table 4-1. Comparison of Lithic Tools by Organizational Strategies**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>PAO Stratum XVII</th>
<th>HP 7 Floor</th>
<th>PLO Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrader</td>
<td>1 (2.3%)</td>
<td>8 (1.1%)</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Biface</td>
<td>4 (9.1%)</td>
<td>75 (10.3%)</td>
<td>12 (8.7%)</td>
</tr>
<tr>
<td>Bipolar</td>
<td>10 (22.7%)</td>
<td>40 (5.5%)</td>
<td>3 (2.2%)</td>
</tr>
<tr>
<td>Blade</td>
<td>3 (6.8%)</td>
<td>0 (0%)</td>
<td>87 (63.0%)</td>
</tr>
<tr>
<td>Expedient</td>
<td>23 (52.3%)</td>
<td>574 (78.7%)</td>
<td>27 (19.6%)</td>
</tr>
<tr>
<td>LTU</td>
<td>3 (6.8%)</td>
<td>32 (4.4%)</td>
<td>8 (5.8%)</td>
</tr>
</tbody>
</table>
Figure 4-1. Comparison of Lithic Tools by Organizational Strategies: PAO Stratum XVII

Figure 4-2. Comparison of Lithic Tools by Organizational Strategies: HP 7 Floor
Chi-squared Tests of Organizational Strategies

**PAO Stratum XVII vs. PLO Lochnore:**

\[ \chi^2 = 59.11, \, df = 5, \, p < 0.001, \, \text{distribution is significant} \]

**PAO Stratum XVII vs. HP 7 Floor:**

\[ \chi^2 = 53.70, \, df = 5, \, p < 0.001, \, \text{distribution is significant} \]

**Table 4-2. Euclidean Distance Measures of Similarity: Organizational Strategies**

<table>
<thead>
<tr>
<th></th>
<th>PAO Stratum XVII</th>
<th>PLO Lochnore</th>
<th>HP 7 Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAO Stratum XVII</td>
<td>0</td>
<td>.682</td>
<td>.324</td>
</tr>
<tr>
<td>PLO Lochnore</td>
<td>.682</td>
<td>0</td>
<td>.865</td>
</tr>
<tr>
<td>HP 7 Floor</td>
<td>.324</td>
<td>.865</td>
<td>0</td>
</tr>
</tbody>
</table>

The chi-squared tests comparing the organizational strategies indicates that there is a significant difference between both the PAO and PLO occupations, and between the PAO
and HP7 floor occupations. When the euclidean distance measure of similarity was used to compare the percentages, rather than the raw tool counts, of each organizational strategy, it showed that the Post-Abandonment Occupation was more similar to the Housepit 7 floor occupation, than it was to the Prehousepit Lochnore Occupation (Table 4-2). The PLO is more similar to the PAO, than it is to the HP 7 floor occupation however (Table 4-2).

A functional distinction was made between hunting and butchering tools, hideworking and basketry tools (light duty), and woodworking tools (heavy duty) from the PAO. The PAO lithics data was then compared to PLO and the HP 7 floor. The data from the comparison of functional classifications (Table 4-3, Figure 4-4, Figure 4-5, and Figure 4-6) also indicates a similar pattern of tool use between PAO and the HP 7 floor. They are both generalized assemblages with the greatest focus on hideworking and basketry, followed by woodworking for PAO, and hunting and butchering for the HP 7 floor. PLO on the other hand was heavily focused on hunting and butchering, followed by woodworking, and then hideworking and basketry, but both to a much lesser extent than PAO.

Table 4-3. Comparison of Lithic Tools by Functional Classification

<table>
<thead>
<tr>
<th>Tool Class</th>
<th>PAO Stratum XVII</th>
<th>HP 7 Floor</th>
<th>PLO Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunting &amp; Butchering</td>
<td>8 (26.7%)</td>
<td>180 (26.3%)</td>
<td>98 (74.2%)</td>
</tr>
<tr>
<td>Hideworking &amp; Basketry (light duty)</td>
<td>12 (40.0%)</td>
<td>352 (51.5%)</td>
<td>14 (10.6%)</td>
</tr>
<tr>
<td>Woodworking (heavy duty)</td>
<td>10 (33.3%)</td>
<td>152 (22.2%)</td>
<td>20 (15.2%)</td>
</tr>
</tbody>
</table>
Figure 4-4. Comparison of Lithic Tools by Functional Classification: Emphasis on Hunting and Butchering

![Comparison of Lithic Tools by Functional Classification: Emphasis on Hunting and Butchering](image)

Figure 4-5. Comparison of Lithic Tools by Functional Classification: Emphasis on Hideworking and Basketry (light duty)

![Comparison of Lithic Tools by Functional Classification: Emphasis on Hideworking and Basketry (light duty)](image)
Figure 4-6. Comparison of Lithic Tools by Functional Classification:
Emphasis on Woodworking (heavy duty)

Chi-squared Tests of Functional Classifications

**PAO Stratum XVII vs. PLO Lochnore:**
\(X^2=16.33,\ df=2,\ p\leq 0.001,\) distribution is significant

**PAO Stratum XVII vs. HP 7 Floor:**
\(X^2=1.67,\ df=2,\ p\leq 0.001,\) distribution is not significant

Table 4-4. Euclidean Distance Measures of Similarity: Functional Classifications

<table>
<thead>
<tr>
<th></th>
<th>PAO Stratum XVII</th>
<th>PLO Lochnore</th>
<th>HP 7 Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAO Stratum XVII</td>
<td>0</td>
<td>.587</td>
<td>.160</td>
</tr>
<tr>
<td>PLO Lochnore</td>
<td>.587</td>
<td>0</td>
<td>.634</td>
</tr>
<tr>
<td>HP 7 Floor</td>
<td>.160</td>
<td>.634</td>
<td>0</td>
</tr>
</tbody>
</table>

The chi-squared tests comparing the functional classifications indicates that there is a significant difference between the PAO and PLO occupations, but not between the PAO and HP7 floor occupations. The euclidean distance measures of similarity indicate that the PAO was more similar to the Housepit 7 floor occupation, than it was to the PLO.
(Table 4-4). The PLO is more similar to the PAO, than it is to the HP 7 floor occupation (Table 4-4).

The data from the comparison of curated and non-curated lithic tools also indicates a similar pattern of tool use between PAO and the HP 7 floor (Table 4-5, and Figure 4-7). Both PAO and the HP 7 floor are heavily focused on non-curated expedient tools, while PLO is heavily focused on curated lithic tools (Table 4-5, and Figure 4-7).

**Table 4-5. Comparison of Curated and Non-curated Lithic Tools**

<table>
<thead>
<tr>
<th>Tool Class</th>
<th>PAO Stratum XVII</th>
<th>HP 7Floor</th>
<th>PLO Lochnore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curated</td>
<td>10 (22.7%)</td>
<td>107 (14.7%)</td>
<td>107 (77.5%)</td>
</tr>
<tr>
<td>Non-curated</td>
<td>34 (77.3%)</td>
<td>623 (85.3%)</td>
<td>31 (22.5%)</td>
</tr>
</tbody>
</table>

**Figure 4-7. Comparison of Curated and Non-curated Lithic Tools**

Chi-squared Tests of Curated and Non-curated Lithic Tools

**PAO Stratum XVII vs. PLO Lochnore:**

$X^2 = 41.30$, df=1, $p \leq 0.001$, distribution is significant
**PAO Stratum XVII vs. HP 7 Floor:**

$X^2=1.52$, df=1, $p \leq 0.001$, distribution is not significant

Table 4-6. Euclidean Distance Measures of Similarity: Curated and Non-curated Lithic Tool Use

<table>
<thead>
<tr>
<th></th>
<th>PAO Stratum XVII</th>
<th>PLO Lochnore</th>
<th>HP 7 Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAO Stratum XVII</td>
<td>0</td>
<td>.775</td>
<td>.113</td>
</tr>
<tr>
<td>PLO Lochnore</td>
<td>.775</td>
<td>0</td>
<td>.888</td>
</tr>
<tr>
<td>HP 7 Floor</td>
<td>.113</td>
<td>.888</td>
<td>0</td>
</tr>
</tbody>
</table>

The chi-squared tests comparing curated and non-curated lithic tools indicates that there is a significant difference between the PAO and PLO occupations, but not between the PAO and HP7 floor occupations. The euclidean distance measures of similarity indicate that the PAO was more similar to the Housepit 7 floor occupation, than it was to the PLO (Table 4-6). The PLO is more similar to the PAO, than it is to the HP 7 floor occupation (Table 4-6).

**PAO Lithic Debitage Analysis and Results**

Due to a lack of comparative data regarding cortex cover, only data for PAO was analyzed (Figure 4-8). The PAO component contained mostly tertiary flakes (96.6%), followed by secondary flakes (2.4%), and very few primary flakes (1.0%). Low frequencies of cortex flakes may reflect a combination of tool production, and reduction of curated cores where the cortex is removed somewhere else (Prentiss et al. 2000).

Figure 4-9 shows the PAO flake type summary. Two comparisons of debitage are then made. A comparison between billet flakes and all other flakes (Table 4-7, and Figure 4-10), and a comparison between primary flakes and all other flakes (Table 4-9, and Figure 4-11).
Figure 4-8. Post-Abandonment Occupation Stratum XVII

Debitage Cortex Cover Summary

Figure 4-9. Post-Abandonment Occupation Stratum XVII

Debitage Flake Type Summary
A comparison was made between billet flakes (biface reduction) and all other flakes (core reduction) (Table 4-7, and Figure 4-10). PAO was more similar to PLO, indicating that both occupations did similar amounts of billet flaking, while the Housepit 7 floor had a higher frequency of billet flaking than both PAO and PLO (Table 4-8). However there is not a big difference in billet flaking between the three occupations. The PAO is either conducting very little billet reduction activities, or it is removing most of the flakes for later use.

Table 4-7. Component variability in Billet Flakes

<table>
<thead>
<tr>
<th>Flake Type</th>
<th>Lochnore Flake Count</th>
<th>Housepit 7 Floor Flake Count</th>
<th>Stratum XVII Flake Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billet</td>
<td>20 (0.9%)</td>
<td>529 (10.1%)</td>
<td>19 (1.5%)</td>
</tr>
<tr>
<td>Other</td>
<td>2252 (99.1%)</td>
<td>4693 (89.9%)</td>
<td>1210 (98.5%)</td>
</tr>
</tbody>
</table>

Figure 4-10. Component variability in Billet Flakes
Chi-squared Tests of Component variability in Billet Flakes

**PAO Stratum XVII vs. PLO Lochnore:**
$X^2 = 2.63, \ df = 1, \ p \leq 0.1$, distribution is significant

**PAO Stratum XVII vs. HP 7 Floor:**
$X^2 = 93.21, \ df = 1, \ p \leq 0.001$, distribution is significant

Table 4-8. Euclidean Distance Measures of Similarity: Billet Flaking

<table>
<thead>
<tr>
<th></th>
<th>PAO Stratum XVII</th>
<th>PLO Lochnore</th>
<th>HP 7 Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAO Stratum XVII</strong></td>
<td>0</td>
<td>.008</td>
<td>.122</td>
</tr>
<tr>
<td><strong>PLO Lochnore</strong></td>
<td>.008</td>
<td>0</td>
<td>.130</td>
</tr>
<tr>
<td><strong>HP 7 Floor</strong></td>
<td>.122</td>
<td>.130</td>
<td>0</td>
</tr>
</tbody>
</table>

The chi-squared tests comparing billet flaking to other flake reduction indicates that there is a significant difference between both the PAO and PLO occupations, and the PAO and HP7 floor occupations. That is likely misleading due to the big differences in flake counts between the three (PAO, PLO, HP7) occupations, which made it difficult to get a clear picture of which occupations were the most similar. The euclidean distance measure of similarity uses percentages rather than raw flake counts to calculate the similarity between the three occupations, and is therefore more suitable for determining the similarity between these units with large differences in their component counts (Foer 2004). The euclidean distance measures of similarity indicate that the PAO was more similar to the PLO, than it was to the Housepit 7 floor occupation (Table 4-8). However there is not a big difference in billet flaking between the three occupations. The PAO is either conducting very little billet reduction activities, or it is removing most of the flakes for later use.
Primary flake production was compared to all other flakes (secondary, shatter, billet, bipolar), providing a measure of the scale of lithic reduction (Prentiss et al. 2000). High frequencies of primary flakes indicate the reduction of larger tools, while low frequencies indicate resharpening and edge preparation, or intensive reduction followed by intensive flake culling or removal (Prentiss 1993, 2000; Prentiss et al. 2000). PAO was more similar to PLO in terms of primary flake production (Table 4-10). The HP 7 floor had the highest frequency of primary flakes, followed by PLO, and PAO had the least primary flakes (Table 4-9, and Figure 4-11). However there is not a big difference in primary flake production between the three occupations. It seems likely that PAO was primarily involved with resharpening and edge preparation, or intensive reduction followed by intensive flake culling. Low frequencies of primary flakes due to intensive flake removal would seem to coincide with the intensive flake removal of billet flakes.

Table 4-9. Component variability in Primary Flakes

<table>
<thead>
<tr>
<th>Flake Type</th>
<th>Lochnore Flake Count</th>
<th>Housepit 7 Floor Flake Count</th>
<th>Stratum XVII Flake Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>146 (6.4%)</td>
<td>549 (10.5%)</td>
<td>49 (4.0%)</td>
</tr>
<tr>
<td>Other</td>
<td>2126 (93.6%)</td>
<td>4673 (89.5%)</td>
<td>1180 (96.0%)</td>
</tr>
</tbody>
</table>
Chi-squared Tests of Component variability in Primary Flake Production

**PAO Stratum XVII vs. PLO Lochnore:**
$X^2=8.56, \ df=1, \ p<0.01$, distribution is significant

**PAO Stratum XVII vs. HP 7 Floor:**
$X^2=49.61, \ df=1, \ p<0.001$, distribution is significant

**Table 4-10. Euclidean Distance Measures of Similarity: Primary Flake Production**

<table>
<thead>
<tr>
<th></th>
<th>PAO Stratum XVII</th>
<th>PLO Lochnore</th>
<th>HP 7 Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAO Stratum XVII</td>
<td>0</td>
<td>.034</td>
<td>.092</td>
</tr>
<tr>
<td>PLO Lochnore</td>
<td>.034</td>
<td>0</td>
<td>.058</td>
</tr>
<tr>
<td>HP 7 Floor</td>
<td>.092</td>
<td>.058</td>
<td>0</td>
</tr>
</tbody>
</table>

The chi-squared tests comparing primary flake production to other flake reduction indicates that there is a significant difference between both the PAO and PLO occupations, and the PAO and HP7 floor occupations. That is likely misleading due to the big differences in flake counts between the three (PAO, PLO, HP7) occupations, which made it difficult to get a clear picture of which occupations were the most similar.
The euclidean distance measure of similarity uses percentages rather than raw flake counts to calculate the similarity between the three occupations, and is therefore more suitable for determining the similarity between these units with large differences in their component counts (Foor 2004). The euclidean distance measures of similarity indicate that the PAO was more similar to the PLO, than it was to the Housepit 7 floor occupation (Table 4-10). However there is not a big difference in primary flake production between the three occupations, they are generally all the same.

**SUMMARY OF RESULTS**

The chi-squared tests are likely misleading due to the big differences in tool and flake counts between the three (PAO, PLO, HP7) occupations, which made it difficult to get a clear picture of which occupations were the most similar. The euclidean distance measure of similarity uses percentages rather than raw flake counts to calculate the similarity between the three occupations, and is therefore more suitable for determining the similarity between units with large differences in component counts (Foor 2004). The tables showing the euclidean distance measures of similarity (Tables: 4-2, 4-4, 4-6, 4-8, and 4-10) combined with the figures (Figures: 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-10, and 4-11) showing the percentages of tool and flake counts, provides a more accurate estimate of similarity and dissimilarity between the three occupations than the chi-squared tests do.

The data from the comparison of organizational strategies indicates a similar pattern of tool use between PAO and the HP 7 floor (Table 4-1, Figure 4-1, Figure 4-2, and Figure 4-3). They are both dominated by block core reduction and expedient tool use and discard. Both PAO and the HP 7 floor contain far less formally shaped curated tools
than PLO. PAO has a higher frequency of abraders and bipolar cores than both PLO and the HP 7 floor, but it is more similar to the HP 7 floor. Based on the comparison of organizational strategies, PAO is more similar to the winter village pattern, than it is to the Lochnore short term camp pattern which is dominated by more specialized tools (Alexander 1992; Hayden 1996).

The data from the comparison of functional classifications (Table 4-3, Figure 4-4, Figure 4-5, and Figure 4-6) also indicates a similar pattern of tool use between PAO and the HP 7 floor. They are both generalized assemblages with the greatest focus on hideworking and basketry, with HP7 to a slightly greater extent than PAO. PAO has a slightly greater focus than HP7 on woodworking, and they have the same focus on hunting and butchering. PLO on the other hand was heavily focused on hunting and butchering, followed by woodworking, and then hideworking and basketry, but both to a much lesser extent than PAO and HP7.

The data from the comparison of curated and non-curated lithic tools also indicates a similar pattern of tool use between PAO and the HP 7 floor (Table 4-5, and Figure 4-7). Both PAO and the HP 7 floor are heavily focused on non-curated expedient tools, while PLO is heavily focused on curated lithic tools (Table 4-5, and Figure 4-7).

Based on the debitage analysis, the Post-Abandonment Occupation contains a low frequency of cortex flakes, few billet flakes, and few primary flakes. Low frequencies of cortex flakes may reflect a combination of tool production, and reduction of curated cores where the cortex is removed somewhere else (Prentiss et al. 2000). Low frequencies of billet flakes indicates that reduction techniques are mainly hard hammer, or possibly pressure flaking, with little biface reduction; or intensive removal of billet flakes. Low
frequencies of primary flakes could indicate resharpening and edge preparation, or
intensive reduction followed by intensive removal of primary flakes (Prentiss 2000).
Reduction activities seem to be geared toward the production of flake tools from
expedient block cores, and the maintenance of different tools.
CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

This chapter will discuss and outline some conclusions concerning the occupation patterns of the Post-Abandonment and Lochnore Occupations, of housepit 7 at the Keatley Creek site, and the socioeconomic systems behind those patterns.

Two models of site use will be discussed and compared, the winter village pattern, and the short-term camp pattern. Both PAO stratum XVII and PLO Lochnore are open camps, while the HP7 floor is not. As discussed in chapter three, PLO represents a mobile foraging subsistence strategy, while the HP7 floor represents a semi-sedentary collector subsistence strategy. Lochnore employed an economically efficient portable lithic technology, designed for long term use. It primarily consisted of curated formally shaped tools and blades, and lithic reduction was geared towards the maintenance and production of transported personal gear (Binford 1979). The lithic technological organization of a pithouse winter village was mainly geared towards the production of task specific expedient tools, and some curated tools (Prentiss 2000).

The data from the comparison of organizational strategies indicates a similar pattern of tool use between PAO and the HP 7 floor (Table 4-1, Figure 4-1, Figure 4-2, and Figure 4-3). They are both dominated by block core reduction and expedient tool use and discard. Both PAO and the HP 7 floor contain far less formally shaped curated tools than PLO. PAO has a higher frequency of abraders and bipolar cores than both PLO and the HP 7 floor, but it is more similar to the HP 7 floor. Based on the comparison of organizational strategies, PAO is more similar to the winter village pattern, than it is to
the Lochnore short term camp pattern which is dominated by more specialized tools (Alexander 1992; Hayden 1996).

Lochnore sites were frequently geared towards specialized food procurement and processing activities, especially deer hunting and butchering (Prentiss et al. 2000; Rousseau et al. 1991). Winter village sites contained a more generalized tool assemblage, since they produced woodworking tools, hide working tools, and antler and bone working tools (Hayden et al. 2000). The Kamloops horizon produced many lithic tools that were “tools to make tools”, rather than the Lochnore phase’s directly useable processing tools (Prentiss et al. 2003). To further analyze the lithics from the Post-Abandonment Occupation, a functional distinction was made between hunting and butchering tools, hideworking and basketry tools (light duty), and woodworking tools (heavy duty). The PAO lithics data was then compared to PLO and the HP 7 floor.

The data from the comparison of functional classifications (Table 4-3, Figure 4-4, Figure 4-5, and Figure 4-6) also indicates a similar pattern of tool use between PAO and the HP 7 floor. They are both generalized assemblages with the greatest focus on hideworking and basketry, with HP7 to a slightly greater extent than PAO. PAO has a slightly greater focus than HP7 on woodworking, and they have the same focus on hunting and butchering. PLO on the other hand was heavily focused on hunting and butchering, followed by woodworking, and then hideworking and basketry, but both to a much lesser extent than PAO and HP7.

Lochnore components should have higher frequencies of curated tools than winter village components, because of their high mobility and seasonal resource specificity. The data from the comparison of curated and non-curated lithic tools also indicates a similar
pattern of tool use between PAO and the HP 7 floor (Table 4-5, and Figure 4-7). Both PAO and the HP 7 floor are heavily focused on non-curated expedient tools, while PLO is heavily focused on curated lithic tools (Table 4-5, and Figure 4-7).

Analysis of the debitage can lead to further insights into interassemblage variability and technological organization. Lochnore assemblages focus on both biface and microblade core reduction, while pithouse winter villages concentrate on expedient core reduction, with some biface reduction and tool resharpening (Prentiss et al. 2000).

Due to a lack of comparative data regarding cortex cover, only data for PAO was analyzed. The PAO component contained mostly tertiary flakes (96.6%), followed by secondary flakes (2.4%), and very few primary flakes (1.0%). Low frequencies of cortex flakes may reflect a combination of tool production, and reduction of curated cores where the cortex is removed somewhere else (Prentiss et al. 2000).

A comparison was made between billet flakes (biface reduction) and all other flakes (core reduction) (Table 4-7, and Figure 4-10). PAO was more similar to PLO, indicating that both occupations did similar amounts of billet flaking, while the Housepit 7 floor had a higher frequency of billet flaking than both PAO and PLO (Table 4-8). However there is not a big difference in billet flaking between the three occupations. The PAO is either conducting very little billet reduction activities, or it is removing most of the flakes for later use.

Primary flake production was compared to all other flakes (secondary, shatter, billet, bipolar), providing a measure of the scale of lithic reduction (Prentiss et al. 2000). High frequencies of primary flakes indicate the reduction of larger tools, while low frequencies indicate resharpening and edge preparation, or intensive reduction followed
by intensive flake culling or removal (Prentiss 1993, 2000; Prentiss et al. 2000). PAO was more similar to PLO in terms of primary flake production (Table 4-10). The HP 7 floor had the highest frequency of primary flakes, followed by PLO, and PAO had the least primary flakes (Table 4-9, and Figure 4-11). However there is not a big difference in primary flake production between the three occupations. It seems likely that PAO was primarily involved with resharpening and edge preparation, or intensive reduction followed by intensive flake culling. Low frequencies of primary flakes due to intensive flake removal would seem to coincide with the intensive flake removal of billet flakes.

Based on the debitage analysis, the Post-Abandonment Occupation contains a low frequency of cortex flakes, few billet flakes, and few primary flakes. Low frequencies of cortex flakes may reflect a combination of tool production, and reduction of curated cores where the cortex is removed somewhere else (Prentiss et al. 2000). Low frequencies of billet flakes indicates that reduction techniques are mainly hard hammer, or possibly pressure flaking, with little biface reduction; or intensive removal of billet flakes. Low frequencies of primary flakes could indicate resharpening and edge preparation, or intensive reduction followed by intensive removal of primary flakes (Prentiss 2000). Reduction activities seem to be geared toward the production of flake tools from expedient block cores, and the maintenance of different tools. The high frequency of bipolar cores and debitage during the Post-Abandonment Occupation (Figure 4-1), combined with the low frequencies of primary and billet flakes may indicate intensive raw material conservation, which is representative of the winter village pattern.
Feature 50 was a basin shaped hearth 11.0 cm deep with a diameter of 49.5 cm. The hearth was located at the base of Stratum XVII, and its fill consisted of charcoal and burnt bone. Thermally altered or oxidized sediment surrounds the hearth, and the top part of the reddened area contains high concentrations of FCR (Fire Cracked Rock) and burnt bone. The hearth was dated at 398±38 B.P., indicating that PAO Stratum XVII occurred about 300-400 years after the abandonment of Housepit 7 (Prentiss et al. 2003).

Faunal remains can offer additional insight into the PAO occupation pattern. The subsistence strategy of Lochnore is maximally specialized, indicating a narrow prey spectrum/pursuit mode predation strategy, and this strategy is especially true for hunting camps. The winter village on the other hand, should have a wide prey spectrum/pursuit mode predation strategy (Prentiss et al. 2000). The non-mammalian faunal remains of PLO are very few, and might have been introduced from other occupations by various site formation processes like bioturbation. The primary focus of the PLO faunal assemblage is mammals (99%), especially deer. There are also bird bones, but at a much lower frequency. The primary focus of the PAO faunal assemblage is also mammals (80%), but it also contains a high frequency of fish (20%), most of which (95%) is salmon (Prentiss et al. 2003). The lower frequency of mammal use and higher frequency of salmon use during the PAO might be due to better bone preservation than during previous occupations. The presence of fish and deer bone in good condition suggests a relatively recent date for the PAO, since bone, especially fish and unweathered mammal bone is uncommon in older roof deposits. The good bone preservation may be the result of a quick burial by colluvial deposition stimulated by historic livestock activity (Alexander 1989).
Evidence of the PAO found during the 1989 excavation of HP7 at Keatley Creek was found in the center and on the lower slopes of the housepit. It included: (1) relatively high frequencies (15-20%) of fire cracked rock (FCR), and lithics; (2) high frequencies of unburnt, broken and cut deer bone; (3) occasional fish vertebrae; (4) localized concentrations of FCR with charcoal staining and flecking; and (5) two pit/hearth features. The pit features contained large quantities of charcoal and FCR on top of fire reddened soil, suggesting they were used as hearths or roasting ovens (Alexander 1989).

A temporary lodge shelter could be expected at a basecamp like the PAO, and it might have been built near, or in the housepit depression. No postholes were found, and without a plan view of the cultural materials during the excavation of the PAO, it is unlikely that evidence of a lodge would be found (Alexander 1989). Matlodge dwellings ranging from 4-7 meters in diameter were erected in upland locations next to seasonal food resources and water during warmer months (Alexander 1992; Teit 1900). These temporary dwellings are difficult to identify since little or no soil displacement was involved in their construction. Matlodges have been in use from Lochnore times until Euro-Canadian contact in the mid-1800’s (Rousseau 2004).

Even though the Post-Abandonment Occupation appears to be an open camp, all the evidence points towards an occupation pattern most like that of a winter village. The occupants of HP7 during the PAO might have used a temporary lodge shelter over the housepit. The lithic tool and debitage data suggest a transported, curated, expedient block core and flake pattern similar to late Pre-historic base camps or winter pithouse villages. The faunal data support this as well, since the PAO Stratum XVII subsistence
economy is similar to that of earlier housepits with a collector strategy focusing on a broad array of resources (Stryd and Rousseau 1996).
References Cited

Ahler, S.A.

Alexander, Diana

Amick, D.S.

Amick, D.S. and R.P. Mauldin

Andrefsky, W.
Baker, J.

Bamforth, D.

Bleed, P.

Binford, L. R.

Camilli, E.L. and J.I. Ebert
Camilli, E.L. and L.S. Cordell

Callahan, E.

Carr, Philip J.

Chatters, J.C.

Chatters, J.C. and D.L Pokotylo

Chisholm, B. S.

Collins, M.B

Cotterell, B. and J. Kamminga

Cotterell, B., J. Kamminga and F.P. Dickson
Cormack, R.M.

Crelin, D. and T. Heffner

Dawson, G.M.

Eldridge, M. and A.H. Stryd

Ensor, H.B. & E. Roemer

Foor, T.A.
2004 Personal communication regarding Euclidean distance measures of similarity.

Fladmark, K.R.

Francis, J.E.

Godin, T.
2004 Unpublished M.A. Thesis in Archaeology, Department of Anthropology at the University of Montana, Missoula.

Goodale, N. B.
2001 Evolution of Hunter-Gatherer Socioeconomic Systems During the Middle to Late Holocene in the UpperColumbia and the Interior Northwest. M.A. Thesis in Archaeology, Department of Anthropology at the University of Montana, Missoula.
Goodyear, A.C.

Hayden, B.


2000a The Opening of Keatley Creek: Research Problems and Background. In *The Ancient Past of Keatley Creek, Volume I, Taphonomy*. Edited by B. Hayden. Archaeology Press, Simon Fraser University, Burnaby.


2000c *The Ancient Past of Keatley Creek, Volume II, Socioeconomy*. Edited by B. Hayden. Archaeology Press, Simon Fraser University, Burnaby.

Hayden, B., D. Alexander, K. Kusmer, D. Lepofsky, D. Martin, M. Rousseau, P. Friele

Hayden, B., N. Franco and J. Spafford

Hayden, B., N. Franco and J. Spafford

Hayden, B., and W.K. Hutchings
Hayden, B. and J.M. Ryder  

Hayden, B. and R. Schulting  

Hebda, R.J.  

Jorgensen, J. G.  


Keeley, L.H  


Keeley, L.H., and M. Newcomer  

Kennedy, D. and R. Bouchard  

Kelly, R.L  


Knudson, R.  
1983 Organizational Variability in Late Paleo-Indian Assemblages. Washington State University Laboratory of Anthropological Reports of Investigations no. 60, Pullman.

Koldehoff, B.  

Kooyman, B.P.  

Kroeber, A.L.  

Kuijt, I.  


Kuijt, I., W. C. Prentiss and D. L. Pokotylo  

Lenert, M.  
2000 A Chronology of Housepit Occupations at the Keatley Creek Site: An Analysis of Stratigraphy and Dating. M.A. Thesis in Archaeology, Department of Anthropology at the University of Montana, Missoula.

Lepofsky, D.

Lepofsky, D., K. Kusmer, B. Hayden, and K. Lertzman

Lepofsky, D. and N. Lyons.

Lepofsky, D., and S.L. Peacock

MacDonald, G. F.

Magne, M.

Mathews, R.W.

Mathews, R.W and M. King
Mauldin, R. P. and D. S. Amick

Meidinger, D. and J. Pojar

Morice, A.

Nelson, C.M.


Odell, G.H.


Odell, G.H. and F. Odell-Vereecken.
Parry, W.J., and R.L. Kelly

Peacock, S.

Pielou, E.

Pokotylo, D.L., M.E. Binkley, and A.J. Curtin

Pokotylo, D.L. and P.D. Froese

Pokotylo, D.L. and D. Mitchell

Prentiss, W. C.


Prentiss, W. C., M. Burns, N. Goodale, L. Harris, M. Lenert, T. Schlegel
Prentiss, W. C. and J.C. Chatters

Prentiss, William C., T. A. Foor, N. Goodale, M. Lenert, T. Schlegel

Prentiss, W.C. and I. Kuijt

Prentiss, W. C., M. Lenert, H. Stelton

Prentiss, W.C. and E. Romanski

Price, T.D. and G.M. Feinman (editors)

Ray, V.F.

Reeves, B. O. K

Richards, T.H. and M.K. Rousseau


1987 Late Prehistoric Cultural Horizons on the Canadian Plateau. Simon Fraser University, Department of Archaeology, Publication Number 16, Burnaby.

Rozen, K.C. and A.P. Sullivan


Rousseau, M.K.


Rousseau M.K. and T.H. Richards


Rousseau M., R. Muir, and D. Alexander

1991 1990 Archaeological Investigations Conducted at the Fraser Bay Site (EfQtl), Shuswap Lake, South-Central B.C. Unpublished report submitted to the British Columbia Archaeology Branch, Victoria.
Ryder, J.

Ryder, J. and M. Church

Sanger, D.


Shott, M.J.

Skinner, M. and S.S. Copp

Smith, H.I.
1900 Archaeology of the Thompson River Region. American Museum of Natural History Memoirs 2(6), New York.

Sneath, P.H.A. and R.R. Sokal

Sollberger, J.B.
Spafford, J.
1991 Artifact Distributions on Housepit Floors and Social Organization in Housepits at Keatley Creek. M.A. Thesis, Department of Archaeology, Simon Fraser University, Burnaby.

Stryd, A.H.


Stryd, A.H. and M. Rousseau

Sullivan, A.P. and K.C. Rozen

Teit, J.


Thacker, P.T.

Torrence, R.


Vickers, R.

Whittaker, J.C.

Wiessner, P.

Wilson, R.L.

Wilson, I.R, B. Smart, N. Heap, J. Warner, T. Ryals, S. Woods, and S. MacNab

Wyatt, D. J.