

Identifying Microblade Function at EeRb-140 and EeRb-144, Kamloops, British Columbia

by

Ryan M. Dickie

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Approval

Name: Ryan Michael Dickie
Degree: Master of Arts
Title: *Identifying Microblade Function at EeRb-140 and EeRb-144, Kamloops, B.C.*
Examining Committee: Chair: Ross Jamieson
Professor

George Nicholas
Senior Supervisor
Professor

Robert J. Muir
Supervisor
Senior Lecturer

Stanley Copp
External Examiner
Professor and Department Chair
Sociology and Anthropology
Langara College

Date Defended/Approved:

March 6, 2015

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Abstract

The microblade industry of the Pacific Northwest represents a discrete artifact category that is often cited as temporal and/or cultural markers, yet their precise function is poorly understood. The research presented here explored microblade function through use-wear analyses of assemblages collected from two Middle Period-aged sites (7,500-4,000 years BP) on the Kamloops Indian Reserve, EeRb-140 and EeRb-144. These two sites, related closely in terms of space and time, offer a good opportunity to explore some of the assumptions about microblade and their potential functions. Microblades are considered important indicators of Middle Period components. When encountered they are often presumed to reflect either elements of composite hunting weapons or implements utilized for a suite of specialized activities. However the results of the use-wear analysis indicate that, at least at EeRb-140 and EeRb-144, microblades served many purposes. The functional inferences observed in the Kamloops microblade assemblages indicate a degree of multifunctionality consistent with previous functional studies.

Keywords: microblades; use-wear analysis; Interior Plateau; Middle Period; experimental archaeology

Dedication

To my children, Isla, Henry, and Rheo, who perhaps sacrificed the most.

Now it's time to play!

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Chapter 1. Introduction: Big Questions About a Small Artifact

The microblade industry of the Pacific Northwest represents a discrete artifact category that has been the focus of much archaeological investigation. These small, parallel-sided, sharp-edged blades, lacking any modification, are considered a distinctive type of artifact in which form defines function, yet the actual function remains unknown. Often cited as temporal markers or cultural markers, microblades are ubiquitous across the landscape (e.g., Magne and Fedje 2007; Pokotylo and Mitchell 1998; Rousseau 2004; Strydom and Rousseau 1996; Yesner and Pearson 2002). Although there are broad indications that microblades have considerable antiquity, dating as early as 11,600 years BP at Swan Point in central Alaska (Magne and Fedje 2007:178), these artifacts have also been recovered from much more recent archaeological contexts, and thus span the entire prehistoric period in British Columbia (Copp 2006:139).

Microblades are the product of a distinctive core reduction trajectory in which multiple uniform flakes can be produced in bulk quantities (Flenniken 1987; Tabarev 1997; Waber 2011). Characteristically, the flakes removed from microblade cores are approximately 2.5 times longer than they are wide with parallel edges and have the distinctive fluted dorsal surface from previous flake scars (Waber 2011:32; Figure 1.1). These tiny, razor-sharp blades are broadly believed to have either been used as elements in composite tools, such as insets in slotted antler projectile points (Fladmark 1986:33) or as a specialized cutting tool used for a specific purpose (Pokotylo and Mitchell 1998:98).

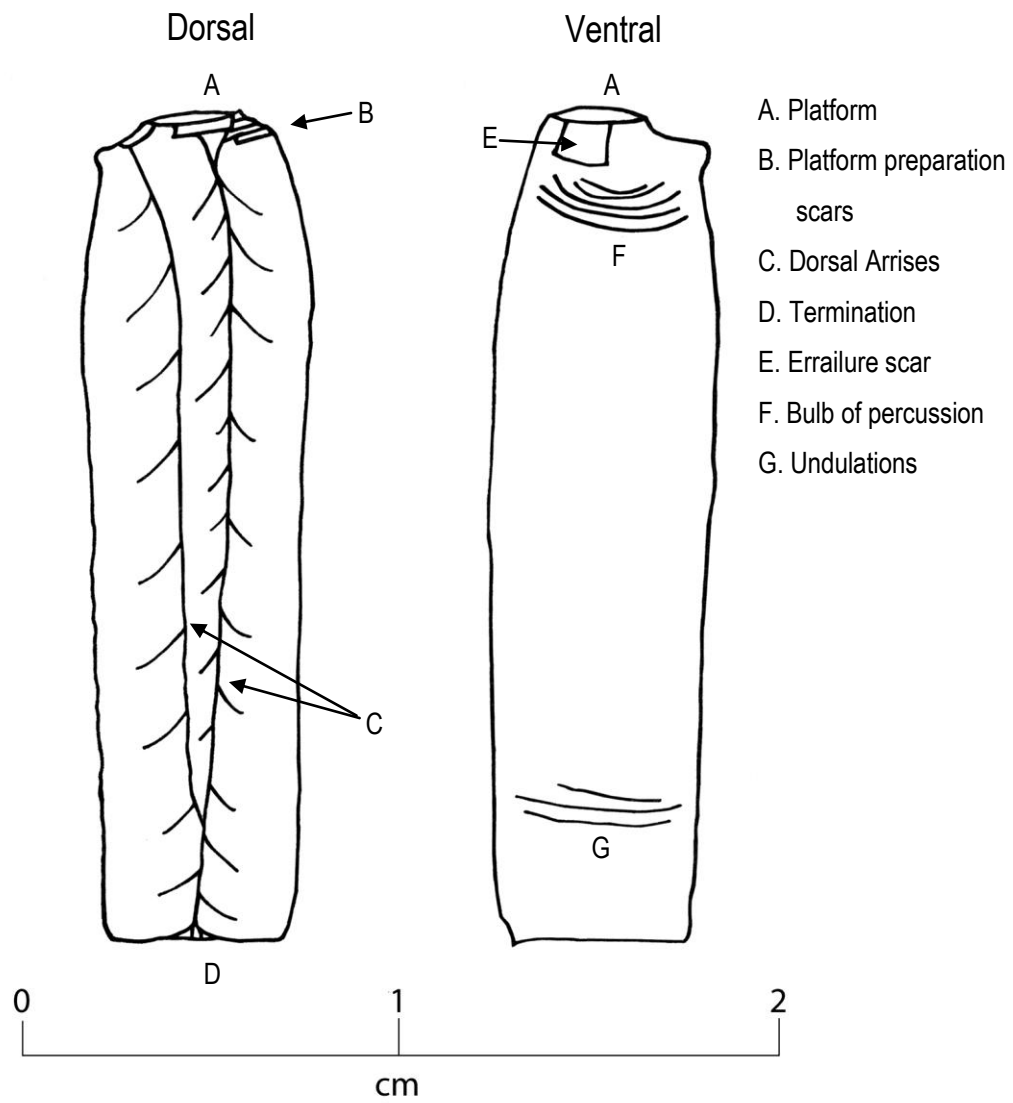


Figure 1.1. Diagram showing key microblade characteristics.

In northwestern North America, microblade technology is thought to have been introduced into the region as early as 12,000 years ago by people migrating out of northeastern Asia based on similarities in core reduction strategies (Ackermann 2007:149). The earliest microblade sites (i.e., pre-10,000 BP) are situated in the northern portion of this vast region with the oldest sites being found in Alaska, Yukon, and coastal British Columbia. Following this period of initial introduction, microblade technology spread throughout the region and beyond following a relatively uniform north-south gradient (Magne and Fedje 2007:187).

In British Columbia, microblades are a key feature of the archaeological sequence of the Early and Middle Prehistoric Periods (~11,000–4500 BP) in coastal areas, the interior and mountain regions (Carlson 1996; Stryd and Rousseau 1996), and the subarctic boreal forest (Fladmark 2009:588). Two distinct regional microblade traditions with different core preparation methods are recognized for this period: the wedge-shaped *Campus/Denali* style most common to the north coast and boreal forest regions; and the conical *Northwest Coast variant* typical in central and southern coastal assemblages as well as the Interior Plateau (Magne and Fedje 2007:171-172).

Previous microblade research has primarily focused on questions related to (a) understanding the temporal nature of this technological industry (Pokotylo and Mitchell 1998: 97), (b) discerning ethnicity and seeking links between microblades and Athapaskan-speaking people (Copp 2006; Fladmark 2009; Pokotylo and Mitchell 1998), (c) identifying the technological organization of microblades and cores (Greaves 1991, 1999), and (d) understanding the nature of or differences between upland and riverine microblade-bearing sites (Kelly 1984; Ludowicz 1983). Despite this significant body of research, too little attention has been paid to understanding the functional role played by microblade technology in the settlement and subsistence systems of Plateau inhabitants.

The research presented here addresses this lacuna by investigating microblade function at two sites on the Kamloops reserve, EeRb-140 and EeRb-144, in southcentral British Columbia. Excavations at these two open-air campsites resulted in the recovery of over 1,400 microblades combined and provide an excellent opportunity to explore microblade function in the Interior Plateau.

Given the unclear nature of the function of Plateau microblades, I began my research by designing a series of experiments aimed at replicating a diverse range of use-wear that may be represented in the Kamloops assemblages. Using low-powered microscopy, I was able to discern good evidence for utilization of the Kamloops microblade assemblages. The study of these two assemblages has the potential to contribute new insights into general microblade function, and possibly discern changes in the functional role of microblades overtime.

The primary goal of my research was to understand the function of microblades through the analysis of microscopic wear traces present on the Kamloops microblade assemblage. More specifically, the objectives of my thesis research were:

- To determine microblade function through use wear analysis;
- To document the range of activities at EeRb-140 and EeRb-144 associated with microblades; and
- To explore potential reasons for the adoption and use of microblade technology.

I also tested the hypothesis that microblades were multipurpose and generalized in their overall function as compared with the traditional models where microblades are insets in composite hunting weapons or represent a functionally specialized technology. Previous studies of microblade technology and function (e.g., Campbell 1985; Greaves 1991, 1999; Hicks 1997) proposed these artifacts to have served a multitude of purposes and are present in a range of settings. My research investigated microblade function through experimental replication of wear patterns and microscopic analysis of use-related edge damage. This analysis has allowed me to make inferences regarding microblade use as represented at EeRb-140 and EeRb-144 thus broadening the understanding of the function of these tools within the context of the Middle Period of the Interior Plateau.

1.1. Setting the Scene

The Interior Plateau of northwestern North America can largely be envisaged as the lands drained by the great Fraser and Columbia Rivers (Prentiss and Kuijt 2004a:vii). Encompassing the vast expanse of land between the Coast and Cascade Ranges in the

west to the Rocky Mountains to the east, the region is often divided into two subregions: the Canadian or Northern Plateau, and the Columbia or Southern Plateau (Prentiss and Kuijt 2004a:vii; also Ames et al 1998, Pokotylo and Mitchell 1998). While many similarities exist between the two areas, all usage here of the term *Interior Plateau* refers to the Canadian Plateau specifically.

For this study, microblade function was investigated through a use-wear analysis of the two assemblages recovered from EeRb-140 and EeRb-144. The following provides a brief overview of the environmental and ethnographic background to the area that were the focus of the field investigations conducted by George Nicholas and the Simon Fraser University-Secwepemc Cultural Education Society field schools, which identified and excavated these sites.

1.2. Study Area

Kamloops is situated at the confluence of the North and South Thompson Rivers within the ancestral territory of the Kamloops (Tk'emlups te Secwepemc) Indian Band. The Kamloops Indian Band is a division of the larger Secwepemc peoples whose traditional territory is the largest and most northern of the Interior Salish-speaking groups in British Columbia encompassing roughly 180,000 km² of the southern interior of the province (Ignace 1998:203-205; Teit 1909:455) (Figure 1.2). The Fraser and Thompson Rivers are the major drainages in the region and it is along these river valleys that Secwepemc villages and communities have been concentrated for most of the pre-contact period (Ignace 1998:203).

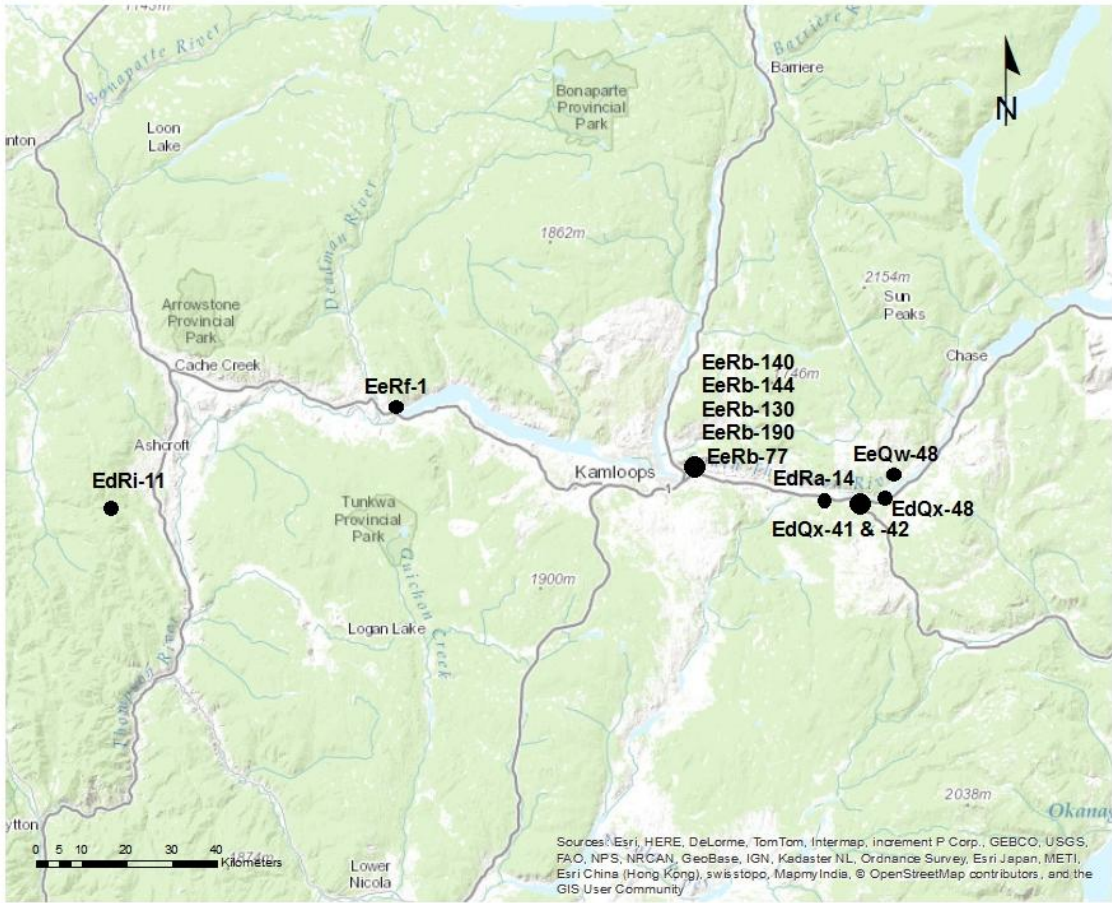


Figure 1.2. South Thompson River Valley and location of sites mentioned in the text.

1.2.1. The Sites

EeRb-140 and EeRb-144 occupy the forward margins of the lowest glaciolacustrine terrace overlooking the flood plain of the South Thompson River to the south (Figure 1.3). Located on the Kamloops Indian Reserve northeast of the confluence of the North and South Thompson Rivers in Kamloops, these sites were originally identified by George Nicholas and excavated over several field seasons between 1991 and 2000. This field program was part of the Indigenous Archaeology program developed by Nicholas as part of the collaborative, post-secondary education program developed by the Secwepemc Cultural Education Society (SCES) and Simon Fraser University (SFU) (see Nicholas and Markey 2014).

The primary goals of the field program were (1) to identify the pre-5,000 BP archaeological landscape through systematic survey and testing of high glacial lake terraces along the South Thompson River valley, and (2) to explore long-term land-use patterns (Nicholas 1997:90). Particular attention was directed to identifying and then investigating the archaeological record prior to the development of the Plateau pithouse tradition. Initial surveys of a portion of the north side of the South Thompson River valley were oriented towards identifying all archaeological sites on the terraces; those with indicators of Middle and Early Period occupations were then targeted for further testing and excavation.

Over the course of several field seasons, Nicholas and the field school students identified 60 sites on terrace locations in the Kamloops Reserve area. Of these archaeological sites, EeRb-140 and EeRb-144 were among those identified as having high potential for early occupations. Both of these sites are multi-component, open air camps containing a variety of artifacts and features including well-preserved organic artifacts, such as birch bark and other plant materials and faunal remains (Nicholas et al *forthcoming*; Wollstonecroft 2000:8). The total artifact assemblages indicate that a wide range of specialized activities took place at these locations, including plant and animal processing, food storage, and lithic and bone tool manufacturing (Wollstonecroft 2000:8; Nicholas et al. *forthcoming*).

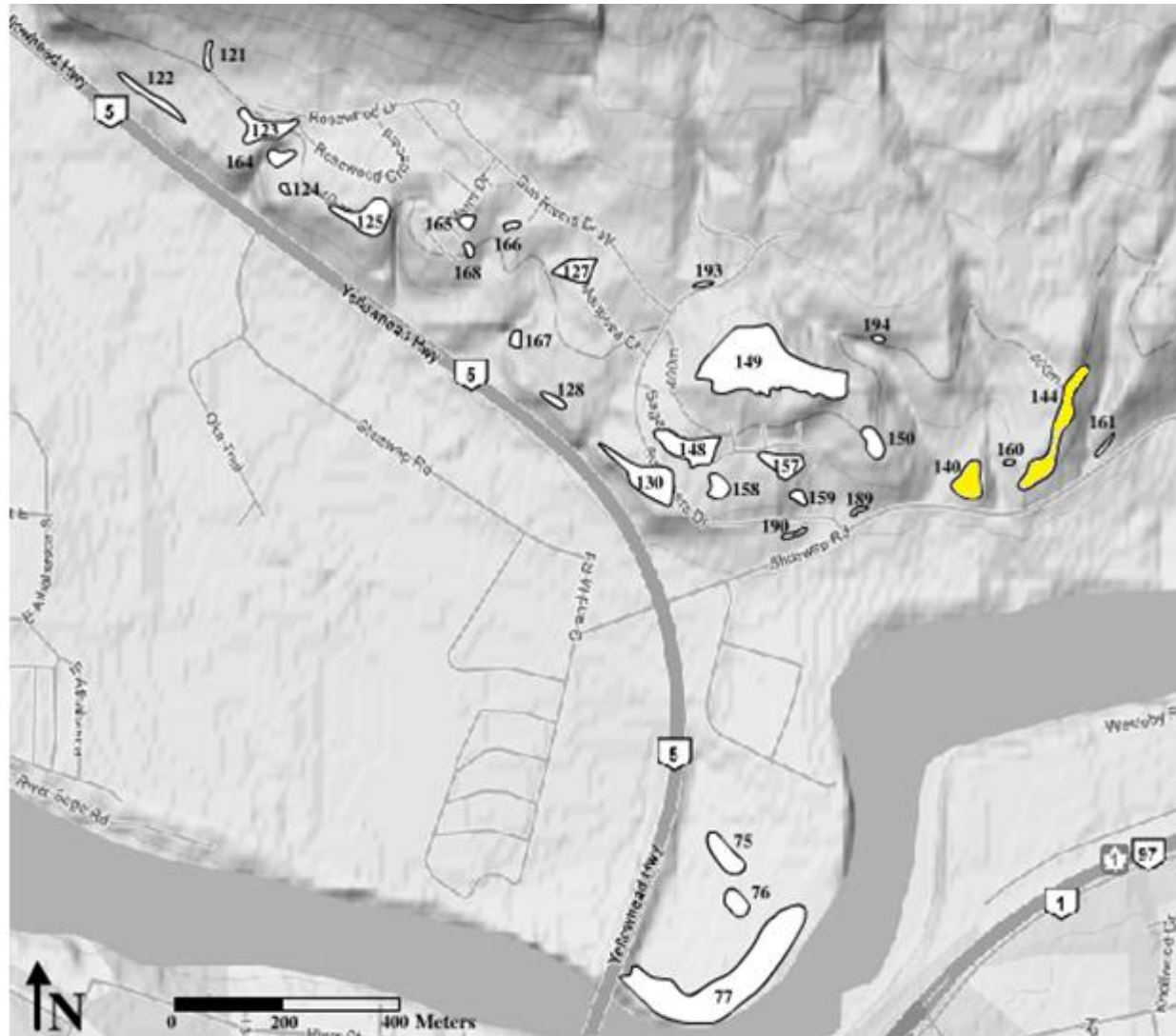


Figure 1.3. Archaeological sites on the Kamloops Indian Reserve No. 1.

1.3. Approaches to Functional Analysis

The majority of stone tool research has tended to focus on questions related to morphology, manufacture (including sourcing studies), and technology (Odell 2004:135). Historically, stone tool function has largely been the subject of speculation based on ethnographic analogies, rather than determinations made through scientific approaches (Odell 2004:135). Over the fifty years since the publication of *Prehistoric Technology* (1964), Sergei Semenov's pioneering experimental research on use-wear traces, two distinct approaches to the functional analysis of stone tools have been developed: use-wear and residue analyses (Odell 2004:135). Studies of lithic technology have benefited greatly with the addition of functional analyses by contributing important information regarding how and for what stone tools were used.

Use-wear analysis attempts to document and compare indicators of wear (e.g., microfractures, striations, polish) that are related to the specific materials worked (e.g., hide, bone, wood) and the manner in which these items were processed (e.g., cutting, sawing, shaving). Most functional analyses rely on experimentation on the effects of tool use on various materials in order to replicate the wear traces found on ancient stone tools. Using different types of microscopy and levels of magnification, the analyst compares the experimental wear patterns with the archaeological specimens, which allows for interpretations of tool and, by extension, site function to be made.

The two main approaches to use-wear analysis are based on the level of magnification used to document and compare microscopic wear traces. Commonly referred to as the *high-powered* and *low-powered* approaches, these methods attempt to document slightly different, but related types of use-wear on tool surfaces, such as polish, striations, and microchipping, and using different types of microscopy. For example, the low-powered approach uses magnifications between 10X and 100X to assess the presence or absence of microfracturing, striations, and polish, as well as the intensity and orientation of the microfractures. The high-powered approach also uses surface polishes and striation to make functional determinations, but in a more quantitative manner than the presence/absence method used in most low-power studies. Both approaches have their strong points and their limitations, and there are a number of

interesting functional studies employing these methods that have been successful in determining tool function (e.g., Evans and Donahue 2008; Odell 1996; Robertson et al 2009).

For this study, I relied primarily on low-powered microscopy to identify use-related damage. This approach allows for larger assemblages to be processed in a more expedient fashion as compared to using high-power microscopes. In addition, high magnification images were taken of a sample of the utilized microblades from the Kamloops sites using a laser scanning confocal microscope. These images allowed for observations on the development and orientation of abrasive polish to be made that were not possible or identifiable using regular stereomicroscopy.

1.4. **Organization of Thesis**

This thesis is organized into six chapters. The present chapter introduces my research question and the context, materials, and methods for this project.

Chapter 2 provides the environmental and archaeological background of the study area, the Interior Plateau. In addition to a review of the culture history, the traditional models of microblade function in the culture history of the broader Pacific Northwest region are discussed. Important microblades sites in the South Thompson River valley and other sites with Middle Period components identified on the Kamloops Indian Reserve No.1 are also described.

The background for the SFU-SCES archaeology field school program and the results of the survey and testing program on the Kamloops I.R. No.1 directed by George Nicholas are presented in Chapter 3. The primary research conducted during these field schools has produced substantial evidence for long-term occupation of the lower terrace locations and the results of this research are presented in this section. The focus then shifts to a more detailed discussion of EeRb-140 and EeRb-144, which includes a description of the artifact assemblages (bone, shell, and organic), as well as the variety of features identified.

Chapter 4 presents the background to use-wear analysis and the methods adopted for this study. My use-wear analysis follows two stages common to most functional analyses, first experimental replication followed by the comparative analysis. In this chapter, I describe the methods employed for this study, the experimental design, and the results of the experimental stage of this project.

The results of the use-wear analysis of the EeRb-140 and EeRb-144 microblade assemblages are presented in Chapter 5. I discuss the functional patterns evident in the utilized microblade assemblages from the two sites. I also explore the spatial patterning of the microblades within each site in an effort to discern possible associations between these artifacts and other flaked stone tools that may support or provide further insight on the microblade use.

In the concluding chapter, I explore the potential activities associated with microblade use in the South Thompson valley. Here, I evaluate the two traditional models for microblade function in light of my use-wear results. The thesis concludes by offering suggestions for future research, including work on relevant topics not explored in this study.

Chapter 2. The Context for the Investigation of the Kamloops Microblade Assemblages

Microblade technology is represented at many sites dating to the late terminal Pleistocene-mid Holocene throughout northwestern North America (Carlson 1996; Stryd and Rousseau 1996). Developing an understanding of the broader settlement and subsistence adaptations during these times will provide background to microblade technology and its use as manifested at EeRb-140 and -144. I thus begin with a brief overview of the postglacial environmental history of the Interior Plateau. Following this, I present current knowledge regarding the culture history of the region and explore the various theories surrounding microblade technology. Other microblade sites in the South Thompson valley, all dating to the Middle Period, are described in terms of the settings, contexts, and contents represented. In addition to these sites, the non-microblade Middle Period sites identified on the Kamloops Indian Reserve are described. Together, this background discussion provides the broader context for the investigation of microblade function at EeRb-140 and EeRb-144.

The South Thompson River valley has proven to be productive in terms of the number of microblade-bearing sites identified along its banks. In the roughly 30 km between the city of Kamloops and the Monte Creek area, there have been at least six sites with large microblade assemblages recorded in the valley, including EeRb-140 and -144. Brief summaries of four of these microblade sites in the South Thompson River valley and one from the outlet of Kamloops Lake west of town are presented below. In addition to the microblade sites in the region, several Middle Period sites are identified on the Kamloops Indian Reserve as well as EeRb-140 and EeRb-144. These include EeRb-77, -130, -149, and -190, which are described below. The results of investigations at these sites are helpful for two reasons. First, exploring particular site types and/or functions from which microblades are recovered aids in developing an understanding of

microblade usage in the broader region. Second, information gathered from Middle Period sites that do not contain microblades will provide further indications of any potential patterning with respect to microblade usage and related land-use practices during this period.

2.1. Paleoenvironmental History

The environment and landscape of the Interior Plateau of British Columbia has undergone substantial changes over the last 15,000 years. The purpose of this summary is to provide the background on the nature of environmental conditions inferred for the postglacial period of the Interior Plateau.

2.1.1. The Late Pleistocene to Early Holocene (~13,000–9,000 BP)

Deglaciation of the Canadian Cordillera was under way by at least 13,000 BP¹ (Fulton *et al.* 2004: 42) and many of the deep valleys across the region were occupied by large postglacial lakes as a result of the melting ice masses (Fulton *et al.* 2004:39; Johnsen and Brennand 2004:1367; see also Fulton 1969). When the massive ice sheets of the Fraser glaciation covering the region began to melt in the late Pleistocene, huge lakes of glacial meltwater formed behind ice dams (Mathews and Monger 2005:21).

Once these lakes drained, river systems became established in the emptied valleys and began to downcut through glacial sediments etching their present courses into landscape. Overall, this period is marked by cool, early-successional conditions common to recently deglaciated landscapes (Bennett *et al.* 2001: 340). Early pollen assemblages from the Interior Plateau are indicative of pioneering grasslands, characterized by sedges, grasses, and sage that had become established under cooler, drier climatic conditions (Hebda 1995:175).

¹ Carlson and Klein (1996) reported on fossil salmon remains collected from the banks of Kamloops Lake. These fossils have been dated to between 18,000-16,000 years old suggesting that conditions in the lake during this time were favorable to salmon populations.

2.1.2. The Early to Mid-Holocene (9,000–5,000)

The period between 9,000 and 5,000 BP represents the warmest and driest conditions for the entire Holocene based on the diatom data from Big Lake in south-central British Columbia (Bennett *et al.* 2001:340). Following the eruption of Mt. Mazama around 6,700 BP, the vegetation of the interior shifted from pioneering open grasslands with limited stands of conifers to increases in pine, spruce, and Douglas fir and a contraction of the grassland areas (Mathewes 1985:414). After this event, significant changes in regional climate are apparent in lake and pond sediment cores from throughout the southern interior, which suggests significant increases in precipitation during this period (Mathewes 1985:414). This would have resulted in higher lake and pond levels, forest expansion into previously open terrain, and the expansion of tree species adapted to more moist environments (e.g., Engelmann spruce, black cottonwood, and paper birch).

2.1.3. The Mid-Holocene (~5,000 BP) to Present

The latter half of the Holocene has generally been interpreted as the period of the development and stabilization of the modern climate and extent of forests and grasslands (Rousseau 2004). Overall, the climatic changes evident for the Interior Plateau can be characterized by a transition from warm, dry post-glacial conditions to a climate pattern that is slightly cooler and wetter during the mid-Holocene (Rousseau 2004:10). Following this period of increased precipitation, the climate of the late Holocene begins to stabilize and modern conditions develop. The effects of the shifts in climate on the resource base of the Interior Plateau (i.e., deer and moose populations, salmon runs) would have had varying outcomes on human populations in the region. It is believed the climate change during the mid Holocene led to a reduction in ungulate populations with a concomitant increase in salmon stocks. The change in abundance of important subsistence resources resulted in a shift in cultural adaptations from foraging to collecting amongst the human populations residing in the region (Prentiss and Kuijt 2004b:62).

The Thompson Basin is today divided into three vertically distributed biogeoclimatic zones: the Bunchgrass, Ponderosa Pine, and Interior Douglas-Fir zones.

The Bunchgrass zone occupies the valley bottoms and is dominated by open grasslands. Higher in elevation are the Ponderosa Pine and the Interior Douglas-Fir zones are the hottest and driest forests in the province (Krajina 1975). Overall, today the climate of this region zone is characterized by hot, dry summers and moderately cold winters with relatively little precipitation (Nicholson *et al.* 1991: 126). The dry winters and open range provide important spring and winter forage areas for big horn sheep, elk, white-tailed and mule deer (Krajina 1975). Stabilization of the climate of the Interior Plateau also had positive effects on the size of the yearly salmon runs. As discussed below, this correlates with a major shift in adaptive strategies amongst Plateau inhabitants, specifically the move to the semi-sedentary settlement pattern associated with the Plateau Pithouse Tradition (Pokotylo and Mitchell 1998:86).

2.2. The Culture History of the Interior Plateau of British Columbia

The culture history of the region has been described in detail by many, including Chatters and Pokotylo (1998), Pokotylo and Mitchell (1998), Prentiss and Kuijt (2012), Prentiss *et al.* (2011), Richards and Rousseau (1987), Rousseau (2004), Rousseau and Richards (1985), Sanger (1967), Stryd and Rousseau (1995), and Wilson and Carlson (1980). The following discussion introduces some of the broad settlement, subsistence, and technological patterns recognized for the three major cultural historical units of the Interior Plateau: the Early, Middle, and Late Prehistoric Periods.

2.2.1. The Early Period (~11,000–7,500 BP)

The archaeological record for the Early Period is scant and is intriguingly represented by the presence of the five regional traditions: the Western Fluted-Point, Intermontane Stemmed-Point, Plano, Old Cordilleran, and Northwest Coast Microblade traditions (Carlson 1996:4-9; Rousseau 2008:222-228). Land-use patterns at this time suggest an orientation to a broad subsistence base that focused on terrestrial resources (e.g., ungulates and small game) with moderate reliance on fishing (Stryd and Rousseau

1996:198). At present, there are only three² securely dated Early Period sites recorded for the Mid-Fraser-Thompson region of the Interior Plateau, the Landels site (EdRi 11), the Gore Creek site (EeQw 48), and the Drynoch Slide site (EcRi 1 [Stryd and Rousseau 1996:184-185]). Unfortunately, many of the diagnostic artifact types associated with these early cultural traditions are surface finds without secure provenience, and are in museums and private collections.

2.2.2. The Middle Period (7,500–3,500 BP)

The Middle Period is believed to represent the settlement of the interior by Salish-speaking peoples following the stabilization of the climate and establishment of modern conditions (Stryd and Rousseau 1996:187). The subsistence economy during this period is characterized by a focus on large game animals, such as elk and deer, with anadromous fish, birds, and freshwater mussels increasing in importance (Rousseau 2004:6). The lithic toolkit of this period is characterized by distinctive, well-made, medium to large lanceolate bifaces, corner-notched bifaces, formed unifaces (including tabular round and oval scrapers), microblades and wedge-shaped microblade cores (Rousseau 2004:5-6; Pokotylo and Mitchell 1998:83-84). There is also a well-developed bone, tooth, and antler industry at this time, including antler wedges, bone points and needles, and ground rodent incisors (Rousseau 2004:6).

Middle Period sites have been found located on the leese side of major river valleys or near confluences of rivers and creeks, in areas offering good vantage over the surrounding area, and especially near good salmon fisheries (Rousseau 2004:5). Residential base camps and field camps³ are the most common site types associated with Middle Period and typically represent relatively small, short-term or ephemeral occupations (Rousseau 2004:5). The settlement-subsistence pattern changes significantly near the end of the Middle Period as the climate began to shift to cooler,

² Now a fourth, EdQw-45, located in the South Thompson Valley approximately 50 km east of Kamloops, which provided radiocarbon estimates older than 9,000 years BP in addition to a possible Plano Tradition component. The consultant's report has yet to be released.

³ Here *field camps* are defined as a temporary encampment for a task group (Binford 1980:10). For example, a field camp is the location where a hunting or fishing group resides while away from the primary residential base.

wetter conditions and forests expanded (Rousseau 2004:11). People began to utilize more abundant resources, notably salmon, which were abundant in most of the river drainages throughout the Interior Plateau. Salmon is also a very reliable resource given the annual migrations up the Fraser and into various tributaries that were no doubt well-known and exploited to the fullest (Fladmark 2009:559; Kuijt 1989:106-107)⁴.

2.2.3. The Late Period (3500–200 BP)

The Late Period represents the shift from what has been characterized as the mobile foraging settlement and subsistence adaptation of the Middle Period to a logistically organized collector behaviour of more recent times (Prentiss et al 2005:57). This period is further broken down into the Shuswap (ca. 3500–2400 BP), Plateau (2400-1200 BP), and Kamloops (1200–200 BP) horizons based on distinct, yet connected cultural adaptations (i.e., technology, settlement, subsistence). Together these horizons form the Plateau Pithouse tradition defined by Richards and Rousseau (1987). The archaeological record of this period generally appears to reflect the rich ethnographic records provided by Franz Boas (1891), James Teit (1900, 1909), Verne Ray (1939), and other early observers (e.g., Dawson 1891; Smith 1900), as well as by modern ethnobotanists (e.g., Turner 1997, 2007) and ethnographers (e.g., Ignace 1998; Palmer 2005).

Plateau Pithouse Tradition settlement patterns were closely tied to seasonally structured patterns of subsistence. By 3500 BP, groups were markedly semi-sedentary and logistically organized (Pokotylo and Mitchell 1998). The seasonal settlement pattern amongst Plateau groups over at least the last 3,500 years is characterized as largely

⁴ The increase in importance of salmon is supported not only by the faunal record from Middle Period sites but also by more direct means, such as stable carbon isotope analysis. For example, the individual recovered from a Middle Period burial at Big Bar Lake, northwest of Clinton, B.C., was found to have relied upon marine protein for roughly 24% to 36% of the dietary intake, while terrestrial protein represented upwards of 64% to 76% of the total diet based on the ¹³C ratios (Cybulski et al. 2007:68). Interestingly, the ¹⁵N ratio provided a value (+19.4%) similar to that found amongst coastal salmon fishers of Alaska and other maritime-adapted Northwest Coast groups (Cybulski et al. 2007:68). This result is surprising given the presumed non-coastal origin of this individual is consistent with the ¹³C data, but not the ¹⁵N results.

marked by periods of dispersal and aggregation following seasonal rhythms, as well as by periods of high and low mobility (Morin et al. 2008). During the winter months, settlement was aggregated and essentially sedentary; families lived close together in clusters of pithouses (Teit 1906:213-215). Summer months were generally marked by residential dispersal and mobility as groups of families travelled about the landscape targeting varied resources as they became available in different locations. Summer months could also be marked by aggregations of many hundreds of individuals at particularly productive root harvesting locations (such as in the Upper Hat Creek Valley) or at salmon fishing stations (such as the Fountain/6-Mile fishery [Morin et al. 2008:12]).

The subsistence-economy of the prehistoric inhabitants of the Interior Plateau region during the Late Period showed an emphasis on salmon, deer, roots and berries, although many other foodstuffs of lesser importance were also utilized (Lepofsky and Peacock 2004; Pokotylo and Mitchell 1998; Richards and Rousseau 1987) While the current understanding of the use of upland resources during the Middle Period and early part of the Late Period is limited, there is secure evidence that by 2,000 BP roots, such as balsamroot and glacier lily, were being harvested and processed in earth ovens (Lepofsky and Peacock 2004; Pokotylo and Froese 1983). Subsistence during the winter, when people lived in pithouse villages, was overwhelmingly based on stored or cached food, primarily dried salmon, dried Saskatoon berries, and salmon oil.

In terms of technology, Late Period lithic assemblages are characterized by a higher ratio of small, informal or expedient flake tools to more formalized bifaces and unifaces (Prentiss et al. 2005:58). Projectile points become smaller in size, a change that is believed to be associated with the introduction of the bow and arrow and a move away from, but not a complete replacement of the use of the atlatl (Fladmark 2009:590). Overall, the lithic economy of the Late Period represents an evolution in technological organization from a strategy based on the highly curated bifacial and standardized core technologies as represented in Middle Period assemblages to one where expedient, unretouched or unformed flake tools and unstandardized cores are most common. Such changes in technological organization have been linked to the development of a more sedentary settlement pattern and a decreased need for high mobility, such as the situation described above (Parry and Kelly 1987).

2.3. Microblade Technology in Interior Plateau Prehistory

Microblade technology has long been recognised as an important feature of the archaeological record of the Pacific Northwest and the Interior Plateau (Borden 1952). These artifacts are often cited as temporal indicators of early cultures (Carlson 1996), as evidence for the presence of Athapaskan-speaking people (Sanger 1967), and as a functionally specific technology (Fladmark 1986). These themes are at the centre of much of the research that has explored questions surrounding the spatio-temporal, cultural, and functional aspects of these tools. The following discussion summarizes some of this research and helps to situate my central research question, namely - What were microblades actually used for?

2.3.1. The Spatial and Temporal Aspects of Microblade Technology

There is sufficient evidence that microblade technology was introduced into northwestern North America by at least 10,500 BP (Magne and Fedje 2007:171). As one of the five early cultural traditions⁵ in British Columbia (Carlson 1996:9), microblade technology has been shown to occur earliest in northern regions and then spread to southern areas in a relatively even north-south time gradient (Magne and Fedje 2007:171). Various interpretations have been put forth to explain the spatial and temporal patterning evident in the archaeological record of microblades in Interior Plateau contexts. Deanna Ludowicz (1983), for example, examined inter-ensemble variability between riverine and upland microblade sites in the Mid-Fraser and Thompson region and found that higher frequencies of expedient tools (e.g., microblades, utilized flakes, unifacially retouched flake tools) occur in upland sites than in riverine settings (cf. Pokotylo and Mitchell 1998:98). She suggested that the presence of microblade technology in upland locations was a reflection of the existence of a collector settlement-subsistence strategy that was in place prior to the shift to the semi-sedentary pattern of the Late Period (Pokotylo and Mitchell 1998:98).

⁵ The other four regional traditions are the Western Fluted-Point, Intermontane Stemmed-Point, Plano, and the Old Cordilleran Culture (Carlson 1996)

Sheila Greaves (1991) compared lithic assemblages from sites in the Upper Hat Creek and Highland Valleys, finding that microblades and microblade core rejuvenation flakes were most common in assemblages from field camps (temporary locations utilized for short time periods for specific purposes). This is in contrast to residential camps or locations of longer periods of occupation where core preparation flakes tended to occur in higher frequencies. This pattern may be a reflection of “gearing up” activities where microblade cores were prepared at residential camps before departing for short-term resource procurement locales where microblades could be made either on an as-needed basis or *en masse*.

Greaves (1999) later revisited her doctoral research on the Plateau microblade industry to explore the organizational goals and distribution of microcore technology in upland locations. She concluded that microcore technology was both designed to contribute to a maintainable tool kit that was flexible, versatile, and adaptive in the context of continuous need and unpredictable scheduling, as well as representing a highly transportable tool kit (Greaves 1999: 201-207; also Kelly 1984). Thus, according to Greaves, microblades are more likely to be found temporary upland campsites contexts where light, portable lithic technologies were desired over more cumbersome, curated tool forms, such as large cores or bifaces (cf. Copp 2006:176).

Although microblade technology is primarily associated with Middle Period archaeological sites (Rousseau 2004), there have been recent discoveries of microblades in later prehistoric contexts. Magne and Fedje (2007:178) present radiocarbon dates for 119 microblade sites in northwestern North America, 46 of which pre-date 4,000 BP. With almost 40% of all dated microblade sites (i.e., sites for which radiocarbon dates have been obtained) occurring in the Late Period, this suggests that this technology may have persisted longer than previously believed, at least in certain locales (Copp 2006:163; Pokotylo and Mitchell 1998:97). While component mixing or other external contamination could be a mitigating factor in creating this pattern, other extraneous factors cannot be held to account for each late occurrence.

2.3.2. Microblades and Athapaskans

The correlation between microblades and Athapaskan linguistic groups in northwestern North America is intriguing and somewhat tentative. It was originally argued by Charles Borden that microblades reflected the southern movement of proto-Athapaskans through interior British Columbia (Fladmark 2009:589). Magne and Fedje (2007:185) plotted microblade sites in northwestern North America, including the eastern slope of the Rocky Mountains, against the distribution of Athapaskan linguistic groups to demonstrate a distinct correlation between the two. However, despite this correlation, Fladmark (2009:589) points out microblades are simply a technological class similar to a biface or uniface. Therefore, the decision to adopt this technology may in fact be more connected to external factors, such as raw material considerations, that are unrelated to culture or ethnicity.

2.3.3. Current Theories on Microblade Function in the Pacific Northwest

Despite the considerable amount of research oriented towards the chronology of microblade technology in Pacific Northwest, very little work has been directed at defining the function of these flake tools (Pokotylo and Mitchell 1998:97). Suggested uses for microblades have included hafted engraving tools (Sanger 1968) and cutting tools (Pokotylo 1978). However, microblades are most often presumed to have been used as elements in composite projectile points (Fladmark 2009). Analogs of this type of hunting weapon have been found in Siberia and Alaska where slotted antler arrow heads have been found in association with microblades (Ackermann 2007:168-169; Pitul'ko 2013). Despite the frequent occurrence of microblades in the Interior Plateau, similar slotted antler or bone points have not yet been found in the region.

The only examples of hafted microblades in the Pacific Northwest were recovered from the Hoko River site on the Olympic Peninsula of Washington State (Croes 1995). Twelve side-hafted and three end-hafted knives were identified, along with three other hafts missing blade elements (Croes 1995:180). Microblades of quartz crystal and green chert were found still securely in place in the haft. Residue analysis of a sample of these blades found the presence of red blood cells attributed to needlefish and also quite likely salmon (Croes 1995:186). Microscopic analysis of the quartz crystal

microliths found no trace of utilization, which was attributed to the fact that blades rarely came into contact with bone or other hard material during fish processing. The lack of any perceptible use-wear on these blades may also be attributed to the hardness of quartz crystal, which rates 7 on the Mohs hardness scale.

To date, only two studies have examined the function of microblades in the broader Plateau culture area: Sheila Greaves (1991) conducted a low-powered use-wear analysis on microblades from the Upper Hat Creek and Highland valleys in south-central British Columbia, and Sarah Campbell (1985) analyzed site-specific function for microblade sites in the Columbia River valley, central Washington. In addition to these, Brent Hicks (1991, 1997) performed a functional analysis for microblade sites in the Gulf of Georgia region in southwestern British Columbia, the results of which are certainly relevant to the current study of microblade function. All three studies are summarized below.

Greaves' (1991:210) functional study used low-powered use-wear analysis to explore the role of microcore technology in an upland setting. Her study examined microblade assemblages from two upland root procurement locations sites in the Upper Hat Creek and Highland Valleys in the southern interior of the province, the results of which indicated microblades were used for multiple purposes. Her analysis concluded that microblades were more commonly used for a range of tasks related to food processing and tool manufacture rather than during the food procurement process (Pokotylo and Mitchell 1998:98). In terms of materials worked, the scraping of soft materials, in particular animal hide, was by far the most common function interpreted represented at either location (Pokotylo and Mitchell 1998:98). The results of this study led Greaves to conclude that microcore technology represents an important element in a multifunctional toolkit suited for a variety of purposes in a variety of environmental contexts.

Working with data collected from the Chief Joseph Dam flood zone on the Columbia River, Campbell (1985:301) used inter-site distributions to infer microblade function, rather than analyzing microscopic wear patterns directly. Campbell (1985:310) found that microblades were most common at short-term camps and hunting stations

and possibly field camps⁶ and were not associated with longer-term settlements. This led her to conclude that the activities at sites where microblades are recovered were relatively specialized (Campbell 1985:310). Campbell (1985:310-311) proposed that the reason microblades are commonly found at transitory camps is because microblade production is a very efficient and portable means of obtaining numerous expedient, generalized tools, a conclusion that is supported by other analyses of microblade technology (Bleed 2002; Greaves 1999; Hicks 1997)

Finally, Hicks' (1991, 1997) analysis of assemblage variability from several microblade sites in the Gulf of Georgia region is similar in many respects to Campbell's (1985) study. Rather than examine function from a microscopic perspective, Hicks' (1997:46) use-wear analysis only recorded the presence or absence of wear and its location on the tool. This analysis found that microblade technology in the Gulf of Georgia region is associated with multiple site types, including residential bases and field camps. In addition, this study concluded microblades occur in greater densities primarily in field camp locations (Hicks 1997:48). The occurrence of microblades at a diverse array of site types and the assumed multifunctional role of these tools led Hicks (1997:48) to conclude that microblades were employed for generalized tasks.

2.3.4. Discussion

There appears to be some uncertainty amongst archaeologists in terms of where microblades fit into the archaeological record of the Interior Plateau and the broader Pacific Northwest. Some employ this technology as a temporal indicator, yet microblades have been found to occur throughout the entire prehistoric period (cf. Copp 2006; Magne and Fedje 2007). Microblades have also been found in a diverse range of environmental settings across the Interior Plateau landscape, from upland locations to riverine settings (Pokotylo and Mitchell 1998). Functional explanations usually describe microblades as either elements of composite hunting weaponry or as functionally specific technology. Overall, however, the spatial, temporal, and functional data for

⁶ The assemblages were all derived from similar-aged components.

microblade technology for this region indicate that microblades likely served a range of functions under a variety of conditions.

EeRb-140 and EeRb-144 are only two of six microblade sites identified on the 30-km stretch of the South Thompson River between the city of Kamloops and the Monte Creek locality. The relatively frequent occurrence of microblades in this discreet locale is often linked with Middle Period occupations of the lower terraces overlooking the river. Each of these sites have securely dated Middle Period components and contained several hundred to several thousand microblades, along with numerous microblade cores. Radiocarbon estimates of the microblade-bearing component at EeRb-140 likely indicate the persistence of this technology well into protohistoric times as well. These sites are important and not only because they provide an excellent record of microblade technology in the region, but because they offer insight into long-term land-use strategies. The study of microblades from these two sites provides an opportunity to test the idea that there were multifunctional versus task-specific tools.

2.4. Microblade Sites in the South Thompson River Valley

Excavations in the South Thompson Valley have uncovered several sites with significant Plateau Microblade tradition components. In particular, significant numbers of microblades and microblade cores have been recovered from seven sites in the South Thompson Valley, EdRa-14, EdQx-41, 42, and 48, EeRb-140 and -144, and EeRf-1 (see Figure 1.1). Often occurring in similar environmental settings (e.g., low terraces, or along terrace edges with good vantage overlooking the valley), these sites provide much of the knowledge of Middle Period cultural adaptations for the southern interior of British Columbia. Building understanding of these variations (e.g., subsistence, technology, settlement) will help frame the investigation of microblade technology at EeRb-140 and -144 and provide a broader picture of microblade technology in the Interior Plateau.

While there are other equally important microblade sites in other parts of the Interior Plateau, such as the Mid Fraser-Thompson region, only those identified in the South Thompson are discussed here. The rationale for this is primarily based upon the environmental settings represented in both areas, which suggest potentially very different site functions. Several of the microblade sites in the Mid Fraser-Thompson

region are found in upland locations, such as the Upper Hat Creek and Highland valleys, which are much higher in elevation than the South Thompson valley and therefore would have been used at different times of the year and likely for different purposes. These upland valleys are both well-documented root-gathering locations. While microblades are present in lithic assemblages from these areas, it is likely they served different functions than evident in the lower river valleys where hunting and fishing were more common.

The following is a brief description of the five microblade sites cited above. For each I describe the environmental setting, temporal periods, contents (i.e., artifact classes represented, including any diagnostic artifacts), and the cultural components identified. This information allows me to situate EeRb-140 and -144 in the broader archaeological record of human adaptations and land-use patterns in the South Thompson River valley in particular and the Interior Plateau in general.

2.4.1. **EdRa-14**

Situated on a raised alluvial terrace on the south bank of the South Thompson River, excavations at EdRa-14 recovered dense concentrations of lithic debitage, artifacts, and faunal remains dating from the Early Nesikep period through to the Late Period. Lithic artifacts identified include formed unifaces and bifaces, microblades and microblade cores, utilized flakes, multidirectional flake cores, and various bone tools (Robinson and Eldridge 1998:44). In addition to the microblade assemblage, diagnostic artifacts recovered from the site include thin, well-made bifaces with expanding stems, stem grinding, and concave bases similar to those found in Early Nesikep tradition components (Robinson and Eldridge 1998). Two radiocarbon dates obtained from bone produced dates of $4,940 \pm 50$ BP and $5,750 \pm 60$ BP, thus confirming a Lochnore/Lehman Phase occupation of the site (Robinson and Eldridge 1998:16). The faunal record from the site indicates a strong focus on deer hunting with minor amounts of bird, fish, reptile, amphibian, and freshwater mussel also represented (Robinson and Eldridge 1998:43).

Of the 831 microblades recovered, seven microblades (two made from vitric tuff, five from dacite) exhibited macroscopically visible use-wear, any edge damage or other

modifications absent on the remaining microblades. However, the authors suggest that rather than representing unused, discarded flake tools, the unmodified microblades may in fact have been used, but were discarded prior to developing any significant edge wear (Robinson and Eldridge 1998:31). The authors conclude that the microblade tradition present at EdRa-14 is different than that evident in the lower Fraser Canyon and upper Fraser Valley where microblades tend to cluster at sites situated on riverbanks and are often associated with fishing technology (Robinson and Eldridge 1998:46). Based on the analytical results, it is the authors' contention that, given the distance to good fishing locations and the wide-scale distribution of microblades within the site, microblades functioned as expedient tools used at primarily at base camp type sites.

2.4.2. EdQx 41 and 42

These two sites are located on the lower terrace above the South Thompson River near the community of Pritchard, approximately 20 km east of the city of Kamloops. Excavation of these sites took place in advance of the widening of the TransCanada highway. Diagnostic artifacts from the sites include 272 microblades and a microblade core, as well as bifaces common to the Lochnore Phase and Plateau Horizon. Overall, a wide variety of faunal remains were recovered, but most species were only minimally represented. As a whole, the assemblages are dominated by the remains of large mammals, such as deer and elk and are indicative of a spring occupation of the location (Wilson 1991:117). Radiocarbon dates of $5,920 \pm 131$ BP and $6,290 \pm 100$ BP were obtained from freshwater mussel shell, placing the occupation of EdQx 42 during the latter part of the Early Nesikep and early Lochnore phase.

The microblade assemblages from EdQx-41 and -42 are mainly from the lower Lochnore-aged levels and occur in different frequencies between the two sites. Microblades comprise only about 18% of the tool assemblage at EdQx-41 while at EdQx-42 they make up roughly 35% of the entire lithic tool assemblage (Wilson 1991: 120). Part of the research program for these sites was to perform several residue analyses on certain stone tools to test for the presence of blood or starch. A total of nine artifacts were analyzed, including three microblades. The test results found two of the three microblades to have blood and starch residues preserved in fracture scars, while

the third tested positive for blood residue only (Wilson 1991:183). The residues were not identified further. The authors suggest that this pattern is the result of hafting residues remaining on a composite tool using the blades for butchery. The authors contend that the starch residues may possibly be the result of lashing or binding from hafting coming in contact with the blade and the residue tests are only picking up the remains of a hafting element.

2.4.3. **EdQx-48**

Located in the Pritchard-Monte Creek locality roughly 20 km east of Kamloops, EdQx-48 is situated on a high isolated bluff overlooking the South Thompson River to the north. Excavations at the site recovered over 90,000 lithic artifacts, including flaked stone items diagnostic of the Early Nesikep tradition, Lochnore and Lehman Phases, and Shuswap Horizon. In addition to the projectile point assemblage from this site, over 4,200 microblades and 15 microblade cores manufactured almost exclusively from Ducks Meadow vitric tuff were identified (Franck 2012). A Middle Period age for the site is further confirmed by a series of radiocarbon dates obtained from charcoal placing the occupation to between 5,210 and 3,980 BP. These dates span the latter part of the Middle Period to the beginning of the Plateau Pithouse tradition while the projectile point styles present at the site indicate a much older occupation (Franck 2012).

The distinct lack of archaeological features, as well as the presence of small amounts of burnt or calcined bone, indicates that food preparation and consumption was not a common activity at this site (Franck 2012:47). Instead, the setting upon which the site is located offers excellent sightlines up and down the valley which people likely took advantage of (Franck 2012). Based on these patterns, as well as the results of lithic analysis, Franck (2012) suggests the site possibly represents a lithic workshop situated to allow for monitoring of the movements of people and game through the region. This interpretation was based on the patterns described above, in addition to the distance and steepness to water resources and the exposed nature of landform. Given the relatively large microblade and core assemblages, it is likely that the site is associated primarily with the production of microblades and general retooling or maintenance of hunting and other personal equipment (Franck 2012:47).

2.4.4. EeRf-1

Situated on a relic river terrace at the mouth of the Thompson River overlooking Kamloops Lake to the east, EeRf-1 was identified in 1994 when highway construction destroyed a significant portion of the site (Bussey 1995). A program of systematic data recovery and salvage excavation was initiated in the disturbed western portion of the site, followed by excavations in the undisturbed areas of the site (Huculak 2004:104). These excavations recovered over 80,000 lithic artifacts, including 722 unused and 118 used microblades, two microblade cores, macroblades, and projectile points characteristic of the Early Nesikep tradition, and the Lochnore and Lehman Phases (Huculak 2004:104). Radiocarbon dates obtained from bone collagen samples associated with Middle Period deposits produced dates ranging from $4,220 \pm 70$ BP to $5,670 \pm 50$ (Bussey 1994:153).

Overall, a variety of activities are represented at the site, reflecting repeated intensive but seasonal occupation of the site. While the general spatial distribution of tool types across the site was relatively even, microblade recovery was concentrated in the western part of EeRf-1. This pattern was interpreted as reflecting a specialized activity area (Bussey 1994:163).

2.5. Middle Period Sites on the Kamloops Indian Reserve No.1

The Kamloops region has long been the focus of archaeological investigation, beginning with Harlan Smith's excavations in the area and continuing to this day. As part of the Jesup North Pacific expedition (1897–1902), Franz Boas included Harlan Smith as the project archaeologist in charge of investigating the prehistoric cultural remains of the people living on the Northwest Coast (Thom 2000:3). Smith embarked on the journey to British Columbia in 1897 and carried out several excavations in the interior and made

collections at Spences Bridge, Kamloops, and Lytton, as well as in the Fraser lowland and Puget Sound area (Smith 1899, 1900, 1903, 1907)⁷.

Smith's monograph *Archaeology of the Thompson River Region, British Columbia* (1900) describes the results of his excavations of several burials in the Kamloops area. Mohs (1981:22) provides a brief description of the three burial sites excavated by Smith, which he named the Fort, Hill, Government, and Large sites. The Fort site is the only post-Contact burial location investigated by Smith where several individuals all interred in coffins were discovered.

Most of the recent archaeological investigations undertaken in the Kamloops area are the result of cultural resource management projects (e.g., Bussey 1994; Franck 2012; Robinson and Eldridge 1998; Wilson 1991), but there have also been several academic research projects (e.g., Carlson 2006; Nicholas and Markey 2014; Wilson and Carlson 1980). These studies have contributed greatly to the understanding of the prehistory of the Secwepemc people in particular and the southern interior of British Columbia as a whole.

Archaeological investigations directed by George Nicholas on the Kamloops Reserve identified five sites with secure Middle Period components, EeRb-77, -84, -130, -140, -144, -159, and -190 (Figure 1.2). Summaries of the results of archaeological investigations at EeRb-77, -130, and -190 are presented below. EeRb-140 and -144, the focus of this thesis, are described in detail later.

2.5.1. **EeRb-130**

Located at the edge of a terrace southwest of Government Hill (Figure 1.1), this multiple-component site has produced clear evidence of occupations spanning the Middle and Late Periods based on the presence of several diagnostic projectile point styles (Nicholas et al. *forthcoming*:19). The site extends 200 m along the terrace edge

⁷ In addition to his work in British Columbia, Smith made significant early contributions to the archaeology of Washington State, working in the Yakima and lower Columbia valleys (Smith 1906, 1910).

between two gullies and stretches roughly 40 m back from the edge. Highway construction destroyed an unknown portion of this site when material was removed from the front part of the terrace (Nicholas et al. *forthcoming*: 20).

Initial testing at EeRb-130 consisted of 15 shovel test pits and eight 1-m² evaluative units that were used to determine site boundaries and cultural chronology and to assess whether early component were present. Numerous lithic artifacts were recovered, including a Lochnore Phase projectile point and several Late Period projectile points, and medium-sized notched cobbles similar to those found in other Middle Period sites in the region (Huculak 2004; Nicholas et al. *forthcoming*:20). In addition to these artifacts, dacite, chert, and chalcedony debitage, large amounts of fire-cracked rocks, bone fragments, charcoal, and freshwater mussel shell were recovered. The faunal remains, which are predominately mammal with lesser amounts of fish and bird, provide indications that this location was used for food preparation as well as extensive evidence for tool manufacture and repair (Nicholas et al. *forthcoming*:20). While two microblades were originally identified during testing, these artifacts have since been re-classified as unmodified flake debitage.

Several features were also identified across the site, none of which are clearly associated with the Middle Period component. Most features consist of small depressions originally lined with or containing fire-cracked rock, with charcoal and/or charcoal staining of the soil, burnt bone, and various artifacts. A date of 1,490 ± 80 years BP was obtained from a feature near the south-central portion of the site in association with Late Period artifacts and choke cherry and saskatoon seeds recovered by floatation (Nicholas et al. *forthcoming*:20).

2.5.2. **EeRb-190**

This is a small 10 by 8 m site situated on a slumped glaciolacustrine terrace approximately 300m west of EeRb-140 (Figure 1.1; Nicholas et al. *forthcoming*). The site was originally identified in 1991 and was later excavated in 1996 prior to construction activities related to the Sun Rivers development that subsequently destroyed a portion of the site. These excavations led to the recovery of a Plateau Horizon projectile point, a leaf-shaped point associated with Middle Period assemblages, debitage, burnt bone,

and freshwater mussel shell. A sample of freshwater mussel shell collected from approximately 55 cm below surface was submitted for radiocarbon dating and produced a date of 6,590 ± 80 years BP suggesting the presence of an Early Nesikep occupation of the site. The site has since been destroyed by road widening.

2.5.3. **EeRb-77**

Located on the flood plain of the South Thompson River to the south of the remnant glaciolacustrine terraces (Figure 1.2), this large, multiple component site has evidence of relatively continuous occupation over at least 6,000 years (Nicholas 1999:1). Since the original recording of the site in 1978 by Gordon Mohs and Brian Chisholm as part of their survey of the South Thompson River (Mohs 1981), several professional and academic testing and excavation programs have been undertaken at EeRb-77 (Huculak 2004; Nicholas 1999; Rousseau 1986; Rousseau and Muir 1991). Together, these investigations have succeeded in documenting the extent, depth, and overall significance of the lengthy occupation of this site (Nicholas 1999:9).

The site can be generally divided into two distinct areas: the housepit village located in the southwestern portion of the floodplain, and the remainder of lands within the central and northern boundaries of the site (Nicholas 1999:10). Rousseau (1986) recorded 74 cultural depressions ranging in size from 1 to 9 minimum diameter. Of these, 20 features are likely the remains of collapsed pithouses, while the remaining 54 cultural depressions are liable to be storage or earth oven features (Nicholas 1999:10). The cultural remains collected from the housepit village are indicative of Plateau and Kamloops Horizon occupations (2,400–200 years BP).

Further excavations were carried out in the northern and central portion of the site in 1991, 1999, 2002, and 2004 under the auspices of the Secwepemc Cultural Education Society-Simon Fraser University Archaeology Field Schools directed by George Nicholas. These excavations identified cultural deposits extending to over 4 m below ground surface (Huculak 2004:99). Despite the fact no diagnostic Middle Period artifacts recovered during excavation, three radiocarbon dates were obtained from charcoal recovered from between 2.5 and 2.9 m below surface and produced dates ranging from 6,560 +/- 60 and 5,590 +/-100 years BP, which places the occupation of

the lower levels of the site within the Middle Period (Huculak 2004:100; Nicholas 1999:12).

Other cultural materials recovered from excavations at EeRb-77 include copious amounts of lithic debitage, utilized and retouched flakes, leaf-shaped bifaces, unifacial scrapers, and a single side-notched projectile point that Nicholas (1999:12) initially suggested was associated with Shuswap Horizon point styles. However, the point was re-evaluated by Huculak (2004:100) who believed it to be more characteristic of points from the Lehman and/or Lochnore Phases. In addition to the lithic artifacts, bone artifacts, such as awls, needles, and points were common throughout the cultural deposits (Huculak 2004:100).

One artifact type conspicuously absent from the EeRb-77 lithic assemblage is microblades. Given the presumed Middle Period occupation of the lower levels of the site and the proximity to EeRb-140 and EeRb-144 roughly 1 km away, it is rather surprising that not a single microblade was identified despite the intensive excavations undertaken. While the precise cause for this pattern is currently unknown, it is likely that the absence of microblade technology at this floodplain site indicates a different suite of activities—and therefore tool assemblages—on the floodplain as compared to the lower terraces immediately north of the site.

2.6. Discussion

Archaeological research in the region has produced solid evidence for an early and prolonged occupation of the Thompson River Basin (e.g., Bussey 1995; Franck 2011; Huculak 2004; Nicholas 1999; Nicholas and Tryon 1999; Robinson and Eldridge 1998). While there are only two sites in the South Thompson Valley that pre-date 7,500 BP (e.g., EeQw-48 [Cybulski et al 1981]), there are others in the general region, such as the Landels site (EdRi 11) and the Drynoch Slide site (EcRi-1), that provide further evidence of early occupations.

What little is known of the cultural adaptations at this time suggests the region was populated by small groups of highly mobile hunter-gatherers moving about the region targeting large game. The archaeological record for the Middle Prehistoric Period

of the region is slightly more robust, but the general cultural patterns remain. Ungulates continue to be the primary food species and people were on the move often (i.e., high residential mobility), but fish were increasing in importance. Following this period, the climate began to shift to more modern conditions causing deer numbers to drop and salmon stocks to increase. People were attracted to these important resource locations and began settling down in small villages near productive salmon streams where they caught, dried and stored their catch for later consumption. Over time, some of these villages increased in size, providing evidence of a significant population base residing in the region (Hayden 2000; Morin et al. 2008; Prentiss et al. 2011). It is the highly visible aspects of these housepit villages that originally caught the attention of archaeologists. This aspect of the archaeological record of the Late Period and the connection of this record to ethnographic lifeways, whether direct or inferred has resulted in the establishment of a solid knowledge base surrounding Late Prehistoric Period cultural adaptations.

The shift from high mobility to a semi-sedentary residential pattern resulted in changes to the lithic economy as well. Middle Period lithic assemblages are often characterized as reflecting the need for highly mobile groups to maintain a flexible and versatile lithic toolkit (Rousseau 2004:6). Microblade technology, a key feature of Middle Period assemblages, is often cited as a means to conserve material in situations where good flakeable stone is absent (Rousseau 2004:7). In fact, the effectiveness and flexibility of microblade technology given the small core size, not to mention the abundant cutting edge produced with little raw material expenditure, makes this technological tradition well suited to a settlement-subsistence strategy based on high mobility (Torrence 2002:183; Waber 2011:35; Whittaker 2005:221).

There are several areas in the southern interior where clusters of microblade sites are located. A significant number of the microblade sites are recorded for the Upper Hat Creek, Highland, and Similkameen Valleys, a few of which have been dated to the Middle Period and others with later dates (cf. Copp 2006 and Magne and Fedje 2007 for site specific details). The South Thompson Valley also has a significant number of microblade sites recorded in the 60 km between Kamloops and Chase to the east. Each of the sites discussed above have provided a record of microblade technology as represented in the South Thompson Valley. There are further similarities between these

sites beyond geographical location: large densities of microblades collected from each site; they all occupy the lower elevation glacial lake terraces overlooking the river to the north; and all four sites in the South Thompson Valley have occupations securely dated to the Middle Period. The relatively recent radiocarbon estimates for microblades at EeRb-140 that extend into the protohistoric period is a significant addition to understanding of this techno-complex (S. Copp, pers. comm. 2015).

2.7. Chapter Summary

In this chapter, I have provided a summary of the environmental and archaeological background of the broader study area, the Interior Plateau. My intention was to outline the general cultural and technological adaptations present across this vast and varied landscape and where microblades fit in to the overall picture. Microblades are commonly associated with the Middle and now Late Periods and traditional models have described these artifacts functioning either as insets in composite hunting weapons or as a functionally specific technology. The few previous functional analyses of microblades however have all indicated that these artifacts were used for a variety of tasks and in a range of locations (i.e., residential base, field camp).

Summaries were provided for five additional microblade sites from the South Thompson Valley, with a focus on settlement and subsistence patterns present at each site. This information has helped give context to microblade technology in the region and provided an indication of the variation present in the South Thompson Valley. In addition to these microblade sites, three Middle Period-aged sites on the Kamloops Indian Reserve were described. These sites, EeRb-77, EeRb-130, and EeRb-190, along with EeRb-140 and EeRb-144, are all located within 1 km of one another providing a good opportunity for exploring different land-use patterns during the Middle Period and potentially the Late Period as well.

Chapter 3. Shovels and Dirt, Rocks and Bone: The Results of Excavations at EeRb-140 and EeRb-144

The archaeology of the Kamloops area has revealed a prolonged human presence in this region dating to the early Holocene Period. While the archaeological record is dominated by the remains of Late Period occupations and land use, Middle Period sites are present throughout the area in addition to smaller number of Early Period sites. Archaeological investigations at EeRb-140 and EeRb-144 have produced secure evidence for repeated occupations over thousands of years, including Middle Period occupations. Almost 1,500 microblades were recovered from excavations at both of these sites and provide an opportunity to explore questions about the function of this tool form and their role in the lithic economy of EeRb-140 and -144.

This chapter summarizes the results of the survey and testing program, including excavations at these two sites, and describes the lithic artifact assemblages, microlithic and non-microlithic, and bone, shell, and organic artifacts. A number of archaeological features, such as hearths and storage pits, were also identified throughout the several phases of excavations, some of which were in association with large numbers of microblades. These data provide the background to microblade function at the lower terrace sites, as well as guide the experimental phase of the use-wear study.

3.1. Project Background and Locale

The Kamloops Indian Reserve has been the subject of archaeological investigations for over 100 years. This area consists of the broad floodplain at the confluence of the North and South Thompson Rivers, above which is a long, south-facing glaciolacustrine terrace immediately above Highway 5 and East Shuswap Road. Extending from the base of Mt. Peter and Mt. Paul, the lower terrace continues eastward

for just over a kilometer to the first of the high terraces. Large portions of this area are flat with some south-facing slopes. The highest relief was a large knoll known as Government Hill (until much of it now levelled as part of the housing development that currently occupies the area). The deep gullies were present in this area were also subsequently filled in with materials from the Government Hill excavation. In some portions, there originally was a relatively gentle slope up from the floodplain, but portions of East Shuswap Road and Highway 5 have truncated the original slope (in some cases exposing archaeological deposits).

Since Harlan I. Smith's initial excavations in the area, surveys of the terraces overlooking the rivers have produced substantial evidence for prolonged human occupation spanning several thousand years. Since the archaeological record of the Interior Plateau of British Columbia is strongly biased towards the Late Prehistoric Period and the characteristic housepits (Fladmark 1986:126), gaining a better understanding of cultural adaptations prior to 4,500 years ago is essential. Addressing that skewed state of knowledge was one of the primary research goals (see below) of the SCES-SFU field schools directed by Nicholas by systematically investigating the glacial lake terraces above the South Thompson River on the Kamloops Reserve (Nicholas et al. *forthcoming*:2). The results of these investigations between 1991 and 2004 are presented below.

3.1.1. The SCES-SFU Field School Program, 1991–2004

In 1991, George Nicholas directed the first of 12 archaeology field schools on the Kamloops Indian Reserve. These were a part of the larger collaborative education program initiated in 1989 between the Secwepemc Cultural Education Society and Simon Fraser University (Nicholas 1997:88, 90; Nicholas and Markey 2014). The primary research focus of this project was on gaining a fuller understanding of long-term land use in the South Thompson River valley with particular attention paid to the early Holocene period (Nicholas 1997:90). The specific research goals of this archaeological program were:

- the systematic survey and testing for early postglacial human occupation and use of the high glacial lake terraces along the Thompson River valley, dating

to between 11,000 and 6,000 years ago, research to contribute to a better understanding of the relatively unknown Early Prehistoric period in south central British Columbia;

- the investigation of long-term patterns of land use with the aim to document how ancestral Secwepemc utilized the different landscapes that developed in the Thompson Basin over the last 10,000 years; and
- the study of non-pithouse archaeological sites as much of the research in the southern interior has been centred on the pithouse villages of the late Holocene. Identifying other types of archaeological sites would help develop a more representative understanding of the range of human activities and adaptations in the region (Nicholas 1997:90).

Aspects of this research were also integrated into a SSHRC-funded study of Traditional and Prehistoric Secwepemc Plant Use and Ecology developed by Nancy Turner, with co-investigators Marianne Ignace, Harriet Kuhnlein, Chief Ron Ignace, and George Nicholas (Ignace et al. *forthcoming*). During the initial years of this program, systematic survey by field school students identified over 60 sites on the Kamloops Indian Reserve lands (Nicholas et al. *forthcoming*:19). About half of these sites are located on the lower terrace overlooking the floodplain to the south and the remainder are on or adjacent to the high terraces and terrace gullies to the east (Nicholas et al. *forthcoming*:19). Radiocarbon dates (Table 3.1) and the presence of temporally diagnostic artifact types (e.g., projectile points) indicate that the lower terrace area has been the focus of repeated human occupations for at least the last 6,000 years with indications of earlier occupations (Nicholas et al. *forthcoming*:19).

Table 3.1. Radiocarbon dates from EeRb-140 and -144.

EeRb-140

Sample	Lab no.	Unit	Level	Depth below datum (cm)	Radiocarbon age years BP	Calibrated radiocarbon years BP	Material/Association
1	Beta 90604	14	5	25-30	210 ± 50	200 ± 120	charcoal/fire-cracked rock
2	Beta 94309	30	14	70-80* ¹	140 ± 50	160 ± 100	bark/cache pit
3	Beta 94312	28	3	15	210 ± 40	190 ± 110	charcoal/fire-cracked rock
4	Beta 94200	19	13	65-70	860 ± 60	810 ± 80	birch bark in unlined feature
5	Beta 103585	32	3	15	160 ± 50	160 ± 100	charcoal/hearth feature above microblades

EeRb--144

Sample	Lab no.	Unit		Depth below datum (cm)	Radiocarbon age years BP	Calibrated radiocarbon years BP	Material/Association
1	Beta 116172	N12 E8	4	20-30*	5250 ± 50	6050 ± 90	charcoal
2	Beta 116173	N11 E8	12	60-70*	5170 ± 70	5910 ± 90	bird bone
3	Beta 149799	N10 E12	3	15-20	2310 ± 60	2310 ± 100	charcoal/hearth
4	Beta 149800	N30 E27	6	30-40*	6140 ± 50	7050 ± 80	shell
5	Beta 149801	N12 E8	3	15-20	2140 ± 60	2160 ± 110	charcoal/hearth
6	Beta 149802	N10 E11	7	35-45	4080 ± 80	4620 ± 140	charcoal/hearth with microblades

¹ * = Combined level samples; 5-cm excavation levels were standard; in some cases samples for radiocarbon dating were drawn from two levels.

3.1.2. Summary of Survey and Testing Program

In 1991 and 1992, Nicholas conducted systematic survey on the lower terraces due north of the present Kamloops Indian Band administrative center. Sites identified during range in size considerably, from small lithic scatters in the western portion of the terraces to the largest site in the survey area, EeRb-149, which covered most of Government Hill. Other large sites identified were EeRb-130, -140, and -144. These four sites show extensive evidence of long-term use as revealed by the abundance of cultural material present, especially debitage, and by the presence of diagnostic artifacts indicating repeated use of these locales over millennia.

Most of these sites had at least some cultural material exposed on the surface due to wind erosion. Subsurface testing in locations where there was no surface material apparent indicated the presence of additional sites. Once identified, shovel testing was initiated to define the extent and depth of cultural deposits at each site. More extensive testing utilizing 1-m² excavation units was restricted to those sites determined to have evidence of or potential for Middle and/or Early Period components, such as at EeRb-130, -140, -144, -159, and -190.

Beginning in 1993, additional survey was carried out on or adjacent to the high terraces and terrace gullies farther to the east. These terraces, representing the former glacial lake bed, tower above the lower terrace area rising quite steeply from the floodplain. Numerous gullies transect much of this area. Archaeological sites were identified on top of most of the terraces, primarily along the edges and corners, but with much lower frequency than encountered on the lower terraces. Sites were also found along some of the broad gullies that ran from the floodplain up into the mountains, a natural transportation route. The majority of the sites present are small, lithic scatters likely representing short-term camps, resource collecting sites, or observation stands.

3.2. EeRb-140

This large multiple component site is located primarily on the southern half of the terrace remnant and extends to the terrace edge. The landform upon which the site is situated is cut on both sides by gullies and is estimated to be at least 50-m long and 45-m wide running southwest to northeast. The site was identified and initially surveyed in 1991 with ten evaluative units and one shovel test pit. Extensive subsurface testing or excavation was conducted in 1993, 1994, and 1995. Further excavations were carried out in 2000 in order to recover more data pertaining to the Middle Period occupations represented here, as well as to recover additional evidence for the later occupations (Nicholas et al. *forthcoming*:22). In total, 56 1-m² units plus numerous shovel test pits were excavated to varying depths (Figure 3.1). Together, these excavations amounted to roughly 65-m² of this site being investigated prior to destruction by a housing development.

These excavations revealed secure evidence for the presence of multiple short-term occupations of the location over the course of several thousand years. Cultural materials collected from this site include lithics, faunal remains, birch and pine bark, fire-altered rock, formed tools and projectile point styles characteristic of the entire Middle and Late Periods, various untyped points, microblades, bifaces, unifaces, retouched flakes, modified cobbles, worked bone, and dentalium. The artifacts recovered from EeRb-140 are discussed below.

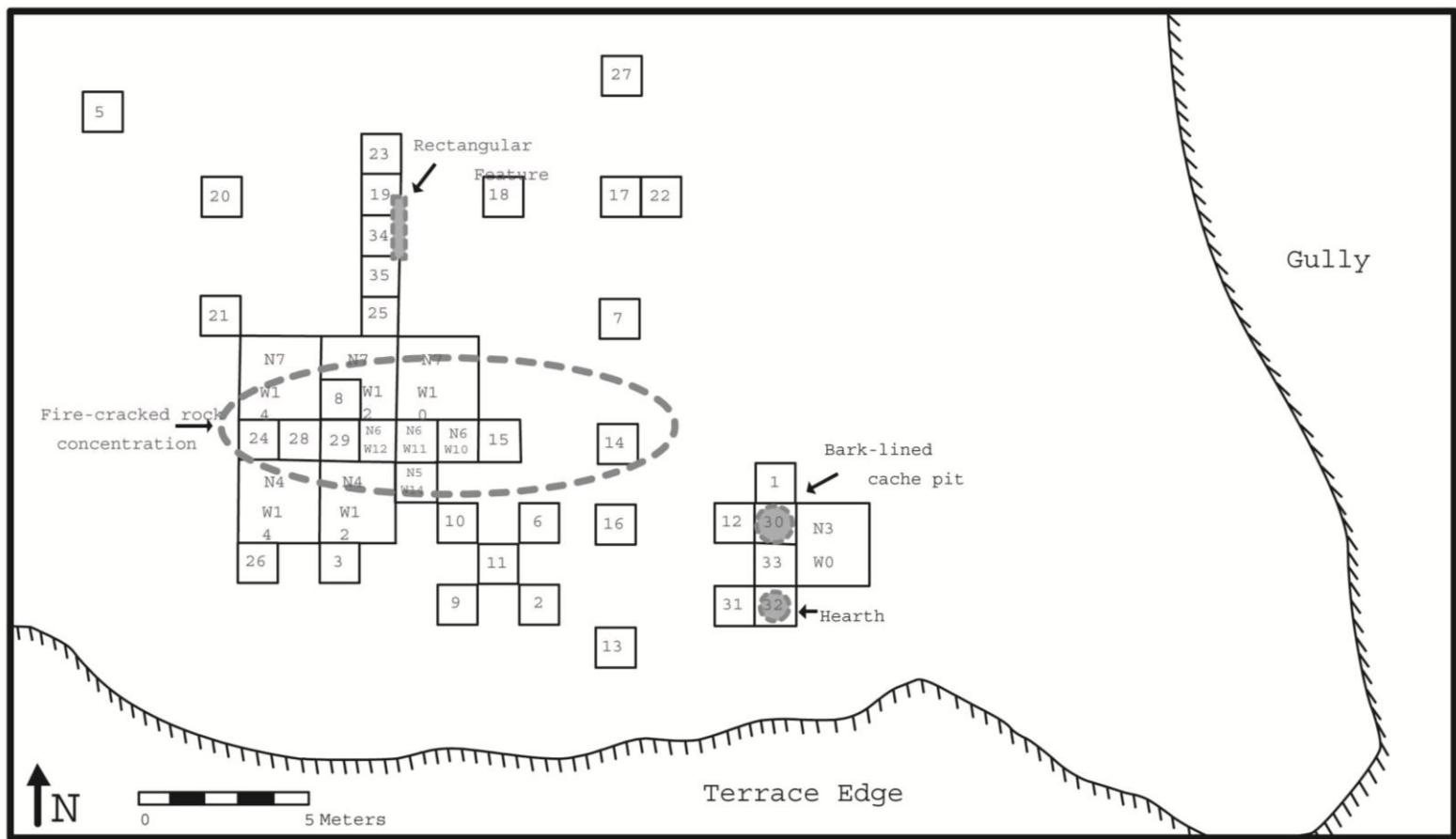


Figure 3.1. Plan view of EeRb-140 excavations.

Radiocarbon estimates for both EeRb-140 and EeRb-144 are presented in Table 3.1 above. While all of the estimates obtained from this site situate the most intensive occupations within the Late Period, the range of temporally diagnostic artifacts (i.e., projectile point styles) recovered from this work indicates that this site has been occupied for at least 6,000 years. Unfortunately, insufficient charcoal and faunal remains from the lower layers of EeRb-140 prevented dating the earliest components of the site (G. Nicholas, pers. comm. 2012).

3.2.1. The Artifact Assemblage

The excavations at EeRb-140 recovered numerous stone, bone, and shell artifacts, thousands of pieces of lithic debitage, substantial faunal remains, and features (Table 3.2). The following summary of the stone, bone, shell, and organic remains recovered focuses on the flaked stone tool assemblage, including microblades. Debitage was not included in my analysis.

3.2.2. Microblades

Excavations at EeRb-140 recovered 1,078 microblades from 46 excavation units, making these tools the single most common tool type encountered at the site. The sole microblade core recovered at EeRb-140 is morphologically similar to other Northwest Coast variant core types found in the Interior Plateau (Figure 3.2). Made from the Ducks Meadow vitric tuff, it is roughly conical in shape, 28cm long and 23cm wide with scars from at least 18 previous blade removals. There are a few step- and hinge-terminated fracture scars suggesting no further microblades could be removed and the core was discarded. The platform edge has evidence for grinding or buffeting, a technique used to remove excess stone to protect against flake propagation failure (Whittaker 2005:231).

Table 3.2. EeRb-140 artifact summary table.

Tool Type	Frequency	Relative Frequency (%)
Projectile Points	44	2.94
Early Nesikep Points	1	0.07
Lochnore Phase Points	3	0.20
Lehman Phase Points	1	0.07
Shuswap Horizon Points	2	0.13
Plateau Horizon Points	6	0.40
Kamloops Horizon Points	29	1.94
Leaf-Shaped Points	1	0.07
Triangular Points	1	0.07
Microblades	1,078	72.01
Microblade core	1	0.07
Unifaces	121	8.08
Key-shaped Unifaces	3	0.20
Endscrapers	7	0.47
Bifaces and bifacial retouch tools	108	7.21
Drills	2	0.13
Cores	48	3.27
Cobble tools	4	0.27
Spalls and spall tools	8	0.53
Utilized Flakes	22	1.47
Hammerstones	10	0.67
Bone tools	31	2.07
Dentalia shell artifacts	10	0.67
Grand Total	1,497	100.00

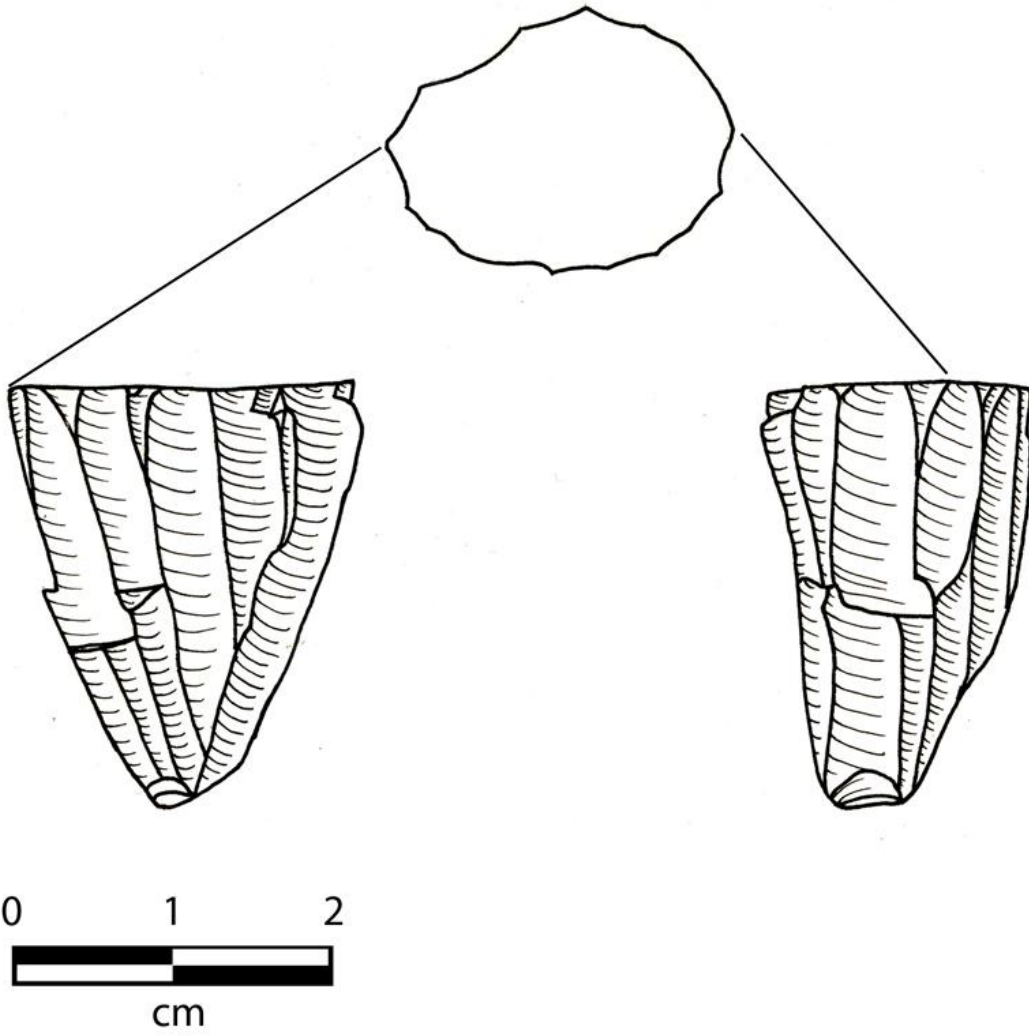


Figure 3.2. EeRb-140 microblade core illustration (Drawing by J. Morin).

Raw Material Composition

Two lithic raw material types dominated the microblade assemblage (Table 3.3): Duck's Meadow vitric tuff (n=555, 51.4%); and glassy black dacite (n=467, 43.2%). The next most common material type is an orange-brown chert (n=44, 4.1%) that resembles a material type originating from the Upper Hat Creek valley, a well-documented chert source. The remainder of the assemblage is made up of minor amounts of chalcedony (n=8), petrified wood (n=2), other cherts (n=2), and obsidian (n=2).

The two obsidian microblades were sent to Northwest Obsidian Research Laboratory for x-ray fluorescence analysis to determine the source flow of this material (see Appendix A). The results of this analysis indicate the source flow is the Anahim Peak locality, roughly about 400 km northwest of Kamloops. This is one of the most common obsidian sources in British Columbia, and has been documented in archaeological contexts throughout the North and Central coasts, the Chilcotin, Southern Interior, and Peace River region (Carlson 1994:314, 319).

Table 3.3. Frequency and relative frequency of material types in the EeRb-140 microblade assemblage.

Material type	Frequency	Relative frequency (%)
Ducks Meadow vitric tuff	555	51.4
Dacite	467	43.2
Hat Creek chert	44	4.1
Chalcedony	8	0.7
Obsidian	2	0.2
Petrified wood	2	0.2
Other cherts	2	0.2
Total	1,078	100.00

Edge Angle

Edge angles are perhaps the most important variable in the consideration of function since it is associated with the general efficiency and suitability of a particular stone tool in performing a certain task (Odell and Odell-Vereecken 1980:108). The edge angles for both the right and left margins of each microblade were measured to one degree of certainty using a plastic Ward’s contact goniometer. Edge angles were taken only for complete microblades and broken microblades measuring over 10 mm as obtaining measurements for specimens smaller than this were exceedingly difficult to obtain due to their small size.

Edge angles were measured for only 845 microblades; the remainder (n=233) were excluded due to small size. The edge angles of the right and left margins of the EeRb-140 microblade assemblage range between 18° and 82° with a mean of 33° and standard deviation of approximately 9.4°.

Spatial Patterning

Although these artifacts were found throughout the site, there are several discrete clusters of increased artifact densities in excavation units nearest the terrace edge (Tables 3.4 and 3.5). The distribution of microblades both horizontally and vertically across the site indicates what appears to be periodic and often intense manufacture of microblades. This interpretation is based on several occurrences of high

frequencies of microblades in an excavation unit over several 5cm arbitrary excavation levels¹. For example, of the 46 microblade-bearing excavation units, 14 contained more than 20 microblades. This is in contrast to the remaining 32 excavation units that produced only a few microblades each.

Of particular interest are Units 31 and 32 in the southeastern portion of the site. These units represent the densest cluster of microblades at the site, containing 247 and 110 microblades, respectively. In fact, level 3 (10-15 cm below ground surface) of Unit 31 contained 152 microblades, the greatest concentration at the entire site. In addition to the microblades, these units are directly associated with a hearth feature in Unit 32 and the bark-lined cache pit identified in Unit 30. Radiocarbon estimates obtained on charcoal derived from these units place the occupation of the site during latter stages of the Late Period (Table 3.1). Other adjacent excavation units in this area of the site and to the west a couple meters also produced significant densities of microblades, a pattern that may be attributed to manufacturing microblades in large quantities or batches. The microblade core was recovered from Unit 16, less than 4 meters away to the west, along with 88 microblades.

The consideration of spatial patterning in the distribution of microblades at EeRb-140 and EeRb-144 is important because discrete clusters of these artifacts can provide an indication for activity areas within the sites. In addition, the association between microblades and other artifact types (e.g., endscrapers or bifaces) may provide further support to functional interpretations.

¹ Since the stratigraphy of both sites was found to be relatively homogenous, the arbitrary 5-cm levels employed during excavation are used as a proxy for vertical provenience.

Table 3.4. Distribution of microblades in excavation units 1-35 at EeRb-140.

Unit																																				
Level ¹	1	2	3	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	23	24	25	26	30	31	32	33	34	35							
1		1					2																			8	1	1								
2	2		2	2						3	6		1	5				2	1		1			1	55	8	1									
3				2			16	1		1	10			6					1				4	6	152	47	5									
4	3	6	4	2			3		2	3	30			24					1	2				3	32	49	25									
5	5	29	8	3	2		14	9	8	7				26										2		5	5									
6		1	4	14		2	10	24	16				4	2																						
7			1	3	1		4	29	13	1			11	3					1	27			3													
8		1	3	5	1	3	4	11	8					10						9	2			3						2						
9				2		3	1	3	5			1	5		1	1	1	4					2							8	2					
10				7		2	1																													
11				1			2	1																												
12				3			2																													
13				2																																
14							1																													
15				2																					1											
16				1																																
17/18				1													1																			
21/22				2																																
Total	10	38	22	52	4	10	60	78	52	15	46	1	31	66	1	1	2	11	50	2	1	7	4	16	247	110	37	8	4							

¹ Each level is equivalent to 5 cm below site datum (e.g., Level 1 = 0-5 cm below datum)

Table 3.5. Distribution of microblades in the northwestern excavation units at EeRb-140.

Level	Unit																
	N3W0	N4W0	N4W13	N4W14	N4W15	N5W12	N5W15	N6W10	N6W11	N6W13	N7W10	N7W11	N7W14	N7W15	N8W10	N8W14	N8W15
1			2	1		2		1	2		1	2					
2	3						1					1	1	1	1		3
3	10		2				1					1				1	
4	12	2	1			3											
5	10		4		1	3				1							
6			2			3				1							
7										3							
8										2							
9										1							
10										5							
Total	35	2	11	1	1	11	2	1	2	13	1	4	1	1	1	1	3

3.2.3. Flaked Stone Tools

In addition to the microblades, chipped stone artifacts were also common in the artifact assemblage from EeRb-140. A total of 379 *formed* or retouched stone tools (i.e., tools made with special intent or effort [Andrefsky 2005:256]) were recovered from across the site. These are described below in terms of the types of artifacts present, as well as the material composition of the assemblage. The artifact typology employed throughout this analysis is derived from Magne (2004, 1985).

Stone Tool Classes

A total of 376 flaked stone artifacts were recovered from excavations at EeRb-140, in addition to the microblade assemblage discussed below (see Table 3.2). Of the 26 artifact classes present in the assemblage, the two most common are unifaces and uniaxially retouched flake tools (n=121) and bifaces (n=109), which together account for roughly 58.5% of the entire assemblage (Table 3.2). The next most common artifact type is flake cores (n=49), which include uni- and multidirectional cores in both exhausted and fragmentary condition. The remainder of the tool assemblage includes endscrapers, drills, key-shaped scrapers, spall tools, cobble tools (including notched cobbles characteristic of Middle Period components), hammerstones, and utilized flakes.

Projectile point types recovered from the site span the entire range of point styles for the Middle and Late Periods, a period of approximately 7,500 years. These include: Early Nesikep, Lehman, Lochnore, Shuswap, Plateau, and Kamloops point types. The most frequent point type recovered, Kamloops points (n=29) outnumber the other styles by a significant margin.

Raw Material Composition

The lithic raw material composition of the tool assemblage is dominated by the vitreous black dacite (n=301, 79.4%) common to most, if not all lithic assemblages from the Interior Plateau. This material is found in creek drainages throughout the southern interior, as well as at several known source locations in the region. The most well-known dacite source is in the aptly named Arrowstone Hills area, northeast of Cache Creek (Mallory-Greenough et al. 2002:44). The second most common material type is the

Ducks Meadow vitric tuff (n = 31), comprising roughly 8% of the entire tool assemblage. The only known source location for this material is roughly 30 km to the east of Kamloops near the community of Monte Creek (Rousseau and Muir 1992:4). The remainder of the material represented consists of various cherts, chalcedonies, obsidian, and quartzites. The cherts and chalcedonies are likely local in origin, eroding out of the glacial till deposits near the site. Chert from Upper Hat Creek is also present in the assemblage and is the only chert with a securely known source location. The obsidian artifacts were geochemically sourced by Northwest Obsidian Research Laboratories and were found to have come from the Anahim Peak source, roughly 430 km to the northwest of Kamloops (see Appendix A).

Overall, the raw materials represented at the site indicate a preference for local lithic materials. Trips to major source locations for good quality lithic materials (e.g., Arrowstone Hills dacite quarry approximately 75 km west [Ball 1997; Greenough et al. 2004]) were likely important facets of the seasonal round. The presence of Anahim obsidian provides an indication for some form of regional interaction in the past (see Carlson 1994:352).

3.2.4. Bone Artifacts

Thirty-one bone artifacts were identified including polished and incised pieces. Most of these artifacts have no discernible function, but the assemblage includes several possible needles and spear or harpoon tips. There is also one bone artifact recovered that has been cut at either end with signs of grinding and bears a resemblance to an unfinished drinking tube (Teit 1906:264). To date, the bone artifacts have not been identified to the species level or analyzed further.

3.2.5. Shell Artifacts

The shell artifacts consist of ten complete and fragmentary *dentalia* shells. *Dentalia* were a valuable trade item and are distributed widely throughout the Pacific Northwest and beyond. Strings of these shells were often worn as personal adornments or were sewn onto articles of clothing such as caps, head-bands, and women's shirts

(Teit 1906:220). In addition to their high value as trade items, when incised with geometric designs *dentalia* shells value as a prestige item increased (Hayden and Schulting 1997:58). Dentalium shell artifacts are often associated with Middle Period components at sites in the Interior Plateau (Huculak 2004:103)

3.2.6. **Organic Remains**

Numerous birch bark sheets and rolls were recovered from excavation units across the site often associated with storage pits and other features (Nicholas et al. *forthcoming*). Other organic remains recovered from EeRb-140 are discussed below. The semi-arid conditions in the region have created an environment favourable to the preservation of organic remains, whether microbotanical, such as seeds, or macrobotanical, like charcoal, needles, and vegetative tissues. Wollstonecroft (2000) analyzed the floral remains recovered from several features and identified at least 24 plant taxa present at the site. The plant species identified (Wollstonecroft 2002:64-65) were all ethnographically economically important either as foods, medicines, or technology and many had multiple uses, such as sage (*Artemisia* spp.).

Comparing the ethnographic record to the range of plants and plant-related processing activities, Wollstonecroft (2002:69) interpreted this site as the locus of women's specialized task group activities, supporting Nicholas' interpretation of women present at the site, in addition to men and children. The ethnographic record for the Interior Plateau depicts the harvesting of plant resources, preparation for storage via drying, and pit-oven cooking as the responsibility of female task groups that would move to the river terraces during the mid-summer months (Wollstonecroft 2002:69). The floral remains suggest a mid- to late-summer occupation of the site likely for the harvesting and processing of berries prior to taking the dried food off site.

3.2.7. **Features**

A variety of features were identified during testing and excavation (see Figure 3.1). These include several hearths, concentrations of fire-cracked rock, charcoal and animal bone, and an interesting birch bark-lined storage pit feature with several possible

superimposed elements (described below). While the hearths are straightforward in their interpretation, the concentrations of fire-cracked rock and charcoal are more intriguing. A “pavement” of fire-cracked rock was identified in the southeastern portion of the site, extending over an area of about 30 m² (see Figure 3.1; Nicholas et al. *forthcoming*:24). Despite expose the greater portion of this feature, the function of such a dense concentration of fire-cracked rock is unknown, but likely represents a specialized activity area (Nicholas et al. *forthcoming*:24). Copp (2006:306) reported a similar pavement (25 m² by 10 cm deep) in a Late Period site in the Similkameen Valley (DhRa-20), the function of which remains unknown at this time.

The bark-lined storage pit feature was identified 1993 in the soil profile of Unit 30 and was left intact until 1995. The pit measured approximately 75 cm in diameter and extended 75 cm below ground surface. Excavation of this feature revealed two discreet components or portions superimposed over one another. The upper portion of the feature is characteristic of a hearth situated in a small depression and contained fire-cracked rock, faunal remains, birch bark rolls, several long pieces of wood, and lithic artifacts, including microblades and debitage (Nicholas et al. *forthcoming*:25). The floral remains later identified by Wollstonecroft (2000) included charred Saskatoon and choke cherry seeds, Douglas fir needles, raspberry or thimbleberry seeds, and possibly gooseberry or currant seed, as well as several grass species (Nicholas et al. *forthcoming*:25-26).

The lower portion of the storage pit, capped by a small amount of fire-cracked rock, contained more birch bark rolls and sheets of birch bark. Under the bark were the remains of a single articulated salmon resting on and between more birch and slabs of ponderosa pine bark. Floral remains from the lower portion were analyzed by Wollstonecroft (2000) and found to included stoneseed, pine, chenopod, red-osier dogwood, Saskatoon, raspberry or thimbleberry, chokecherry, and numerous unidentified species (Nicholas et al. *forthcoming*:26). The presence of numerous long, thin wood fragments arranged in a mat-like fashion in one portion of this feature may represent the remains of a berry cake-drying frame, an interpretation supported by the archaeobotanical analysis by Wollstonecroft (2002:69).

A second hearth feature was identified in Unit 32, approximately one meter south of the hearth-storage pit feature in Unit 30. Excavations found the hearth to contain numerous well-preserved botanical and faunal remains and lithic artifacts, including 110 microblades recovered from the upper 25 cm of the unit. This excavation unit and Unit 31 immediately adjacent produced the single largest assemblage of microblades (n=357) recovered from the site. A charcoal sample, recovered from near the bottom of this hearth feature and below the microblade layer, was submitted to Beta Analytic for radiometric analysis and returned a date of 160 ± 50 BP (Nicholas et al. *forthcoming*:27). If this date is accurate, it suggests that the microblades recovered from overlying deposits are associated with a historic period occupation. Although no contamination was detected at the time of excavation, it is possible component mixing may be responsible for these extraordinary results.

3.3. EeRb-144

This site was originally identified in 1991 and intensive archaeological investigations commenced that year in order to determine the potential for the presence of early archaeological components (Figure 3.6; Nicholas and Tryon 1999). A large, leaf-shaped projectile point similar to those associated with the Old Cordilleran tradition (>9000 BP, see Fladmark 1986:29, 36; Stryd and Rousseau 1996:185; Jim Chatters pers. comm. to GN, 2011) confirmed Nicholas' suspicions about the early nature of this site. Unfortunately, the point was found on the surface of the front slope of a road cut that had destroyed the original stratigraphic context and prevented further investigation of that portion of the site. Further excavations continued at the site in 1997 and 2000 and excavated 2,000 m² or roughly 20% of the site (Nicholas et al. *forthcoming*:30). The total estimated size of the site is approximately 40 m by 250 m, making this one of the largest known terrace sites in the Kamloops area (see Figure 3.6; Nicholas and Tryon 1999:11).

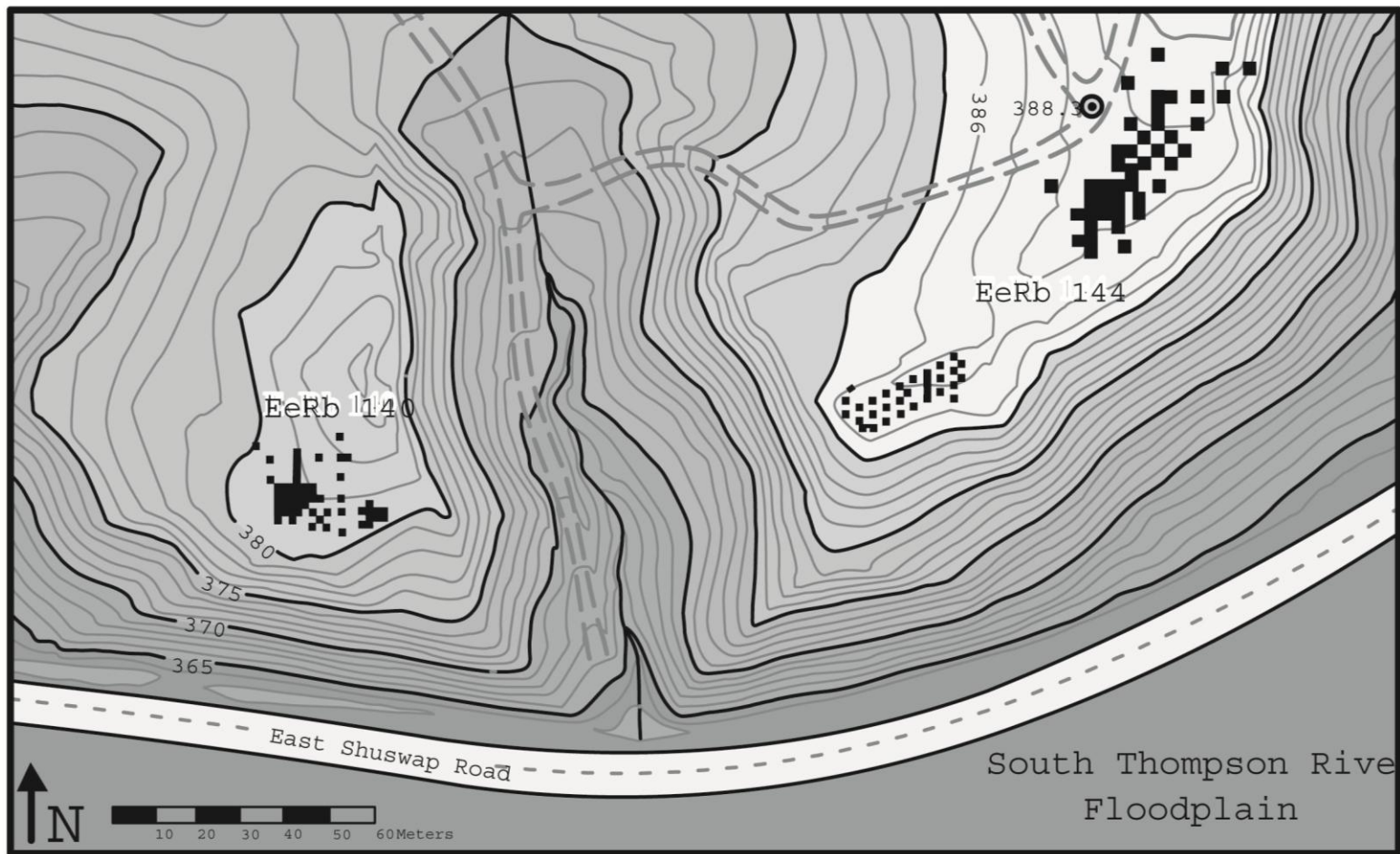


Figure 3.6. Plan view of excavation layout at EeRb-140 and EeRb-144.

Six radiocarbon dates were obtained from charcoal, shell, and bone from several different levels throughout the site (Table 3.1). Three of the six radiocarbon samples submitted returned dates securely within the Middle Prehistoric Period and one (Sample 6) dates to the transitional period between the Lochnore Phase and Shuswap Horizon. Two Plateau Horizon dates were obtained from samples taken roughly 15 to 20 cm below ground surface immediately above Lehman Phase deposits, which suggests relatively intact sediments at least in that area.

3.3.1. **The Artifact Assemblage**

A total of 1,317 stone, bone, and shell artifacts were recovered from excavations at EeRb-144 (Table 3.7). In addition to these artifacts, over 400 pieces of birch bark were identified, some of which have signs of burning or other forms of human modification. The analysis of the birch bark artifacts is presented in Nicholas et al. (*forthcoming*) and is not discussed here.

3.3.2. **Microblades**

The microblade assemblage from EeRb-144 collection was significantly smaller than that from EeRb-140. A total of 357 microblades were recovered, comprising roughly 34% of the total tool assemblage from the site (Table 3.7). In addition, two dacite macroblades were recognized in the flake tool assemblage; these may represent the leading flakes removed along the guiding ridge on what will become the fluted face of the microblade core (Flenniken 1987; Waber 2011:51). Although still significant in terms of exploring potential correlates of microblade technology, these two artifacts were excluded from the microblade assemblage analysis as they do not conform to the standard length:width ratio defined for microblades (Waber 2011:32).

Table 3.7. EeRb-144 artifact summary table.

Tool Class	Frequency	Relative Frequency (%)
Projectile Points	44	3.34
Early Nesikep Points	1	0.08
Lochnore Phase Points	3	0.23
Lehman Phase Points	2	0.15
Shuswap Horizon Points	4	0.30
Plateau Horizon Points	19	1.44
Kamloops Horizon Points	8	0.61
Leaf-Shaped Points	6	0.46
Curved Point	1	0.08
Microblades	357	27.03
Bifaces and bifacial retouch tools	291	22.10
Hook-shaped biface	2	0.15
Pendant	1	0.08
Drills/Gravers	15	1.14
Unifaces and unilaterally retouched flake tools	283	21.49
Key-shaped Unifaces	5	0.38
Endscrapers	13	0.99
Cores	30	2.28
Cobble tools	5	0.38
Utilized Flakes	82	6.23
Hammerstones	22	1.67
Abraders	2	0.15
Beads	56	4.25
Bead performs	2	0.15
Bone artifacts	82	6.22
Needles	2	0.15
Points	21	1.59
Pendant	1	0.08
Beaver incisor	1	0.08
Shell artifacts	25	1.90
Dentalia shells	9	0.68
Olivella shells	3	0.23
Total	1,317	100

Raw Material Composition

Comprising roughly 66% of the microblade assemblage, Duck's Meadow vitric tuff (n=235) is by far the most common material used for microblade manufacture at EeRb-144 (Table 3.8). Dacite is the next most common material present (n=113), accounting for 32% of the total assemblage. The remainder of the microblade assemblage (n=8) is made from various coloured cherts and chalcedonies.

Table 3.8. Frequency and relative frequency of raw materials presented in the EeRb-144 microblade assemblage.

Material type	Frequency	Relative frequency (%)
Ducks Meadow vitric tuff	235	65.8
Dacite	114	31.9
Chalcedony	8	2.2
Total	357	100

Edge Angle

Angle measurements were taken on 256 microblades with 102 excluded due to size. Edge angles for the right margins ranged from 18° to 75° with a mean of 32° and a standard deviation of 9°. Left margin edge angles ranged from 18° to 72°, with a mean of 32° and a standard deviation of 8°.

Spatial Patterning

In contrast to the distinct clustering evident at EeRb-140, excavations at EeRb-144 identified microblades present in a much more diffuse spatial distribution (Table 3.9). Of the 83 microblade-bearing excavation units, only nine contained more than ten of these artifacts. This pattern may reflect a specialized task area involving the production or use of microblades. The remainder of microblades are fairly evenly distributed across the site in smaller numbers.

Table 3.9. Spatial distribution of microblades at EeRb-144.

Unit																								
Level	1	3	N3E4	N3E5	N6E4	N7E5	N8E11	N8E12	N8E2	N8E8	N8E9	N9E2	N9E3	N9E7	N9E8	N9E11	N9E12	N10E4	N10E5	N10E6	N10E8	N10E9	N10E11	
1	1																							
2			1	1			1	1			1						2							
3		1					1	1				1					1						1	
4		2						1				1												
5							1			3	1				1		3					1		
6					1	1								1		4								2
7					2		1							1									2	7
8									1				2										1	4
9																	1	2	1	1				1
10									1															1
11																								
Total	1	3	1	1	3	1	4	3	2	3	2	2	2	2	1	4	7	2	1	1	1	1	6	13

Table 3.9. Spatial distribution of microblades at EeRb-144 *continued*.

Level	Unit																					
	N10E12	N11E5	N11E6	N11E7	N11E8	N11E9	N11E11	N11E12	N12E10	N12E11	N12E14	N12E15	N12E4	N12E5	N12E6	N12E7	N12E8	N12E9	N13E4	N13E5	N13E7	N13E8
1																						
2																						
3																						
4																						
5	1					1				1	2											
6	1		1		1	1																
7	2				2	1	3									1						
8	4				3	10	1	5	1		1											1
9			1	3	22	7	5	12		10	3	1				1	3					1
10				1			10	9	12	5			14		3	4	4	1	2	3		3
11	1	1							2	1			4	1					2	3		
12									1													
Total	9	1	2	4	28	20	19	26	16	17	6	1	18	1	3	6	7	1	4	6	1	4

Table 3.9. Spatial distribution of microblades at EeRb-144 *continued*

Unit																						
Level	N13E9	N13E10	N13E11	N13E14	N13E15	N15E17	N15E8	N15E9	N16E8	N16E9	N16E13	N17E5	N17E10	N18E11	N19E12	N19E13	N20E13	N23E15	N24E15	N25E21	N25E23	N25E24
1										1							1					
2			1				1	4	1		1											
3				1				2		1				2	3	3		1	1			2
4							1				1	1								1	1	2
5					1																	
7					1		1						2									
8	1																					
9	1			2							1											
10		3	2																			
11		1		1																		
12				1		1																
Total	2	4	3	5	2	1	3	6	1	2	3	1	2	2	3	3	1	1	1	1	1	4

Table 3.9. Spatial distribution of microblades at EeRb-144 *continued*

Level	Unit								
	N26E20	N26E24	N29E28	N31E15	N38E34	S11W17	S13W17	S15W25	S17W25
1					1			1	
2									1
3	2	1		1		1	1		
4		1					1		1
5			10						
7									
9									
Total	2	2	10	1	1	1	2	1	2

3.3.3. Flaked Stone Tools

Flaked stone artifacts are the most common objects collected from EeRb-144, comprising roughly 92% of the entire artifact assemblage. Microblades (n=357) do not dominate the lithic artifact assemblage from this site as they do at EeRb-140. Rather, unifacial and bifacial tools (n=610), excluding projectile points, outnumber microblades at a ratio of almost 1.5:1.

Stone Tool Classes

As mentioned, unifacially (n=288) and bifacially retouched tools (n=294) are the most common tool types identified in the EeRb-144 lithic tool assemblage. Together these two artifact types comprise roughly 60% of the entire lithic tool assemblage. The next most common stone tool type are utilized flakes (n=82), with the remainder of the assemblage consists of smaller numbers of cores, hammerstones, drills, and then other artifact types (see Table 3.7).

The projectile point assemblage from this site is impressive. All projectile point styles characteristic of the Middle and Late Periods are represented. The distribution of point styles does not show the pronounced bias towards the Late Period as seen at EeRb-140. The relatively even distribution of point styles recovered from EeRb-144 perhaps provides an indication of the persistent importance of this location over the last 7,000-plus years, a conclusion that is supported by the radiocarbon dates.

Three unique “single-hook” and a single “double-hook” bifaces were also recovered in deposits associated with two well-defined Plateau Horizon hearth features (Nicholas et al. *forthcoming*:30-31). Also found in these deposits is a distinctive chalcedony projectile point, notched at both the base and lateral margins, for which no similar point style is currently known (Nicholas and Tryon 1999:11).

Raw Material Composition

Dacite is the most common material type in the assemblage, with over 80% of the artifacts being made from this material. The remainder of the assemblage is

comprised of smaller amounts of cherts, chalcedony, Duck's Meadow vitric tuff, obsidian, and other assorted cryptocrystalline silicates. The source locations for the dacite and Duck's Meadow material were discussed above. Although the obsidian artifacts were not geochemically sourced, it is likely these are also made from Anahim Peak obsidian based on the similarities in colour and texture.

3.3.4. **Bone Artifacts**

A total of 84 bone and tooth artifacts were recovered from EeRb-144, including needles, awls, leisters, bi-points, fish hooks, and a single beaver incisor. The majority of these items are recognizable as aspects of composite fishing gear, such as leisters or fish hooks. Other bone tools appear to have been used as needles or awls for the preparation of hides or baskets. A large bone point was also recovered, broken in two with only the medial and distal portions present. This artifact has parallel lines engraved along the margins near the point and two holes drilled along the centre line. It also appears to be stained with red ochre.

3.3.5. **Shell Artifacts**

Twenty-two *dentalia* and three *olivella* shell artifacts were identified at EeRb-144. The three *olivella* shells were recovered from a Middle Period component at the site. In addition to these items, 58 ground shell beads were also found and were likely made from fresh water mussels that were once abundant in the South Thompson River (Lindsay 2003).

3.3.6. **Organic Remains**

Over 400 pieces of birch bark have been recovered from various locations across the site (Nicholas et al. *forthcoming*:40). Many of these remains show evidence of burning (e.g., for starting fires, for fuel, or as "matches" [see Hayden 2000:329]) and possibly cut marks; none appear to have once been a part of a complete manufactured birch bark item (e.g., basketry, other containers). While there is ample support the burnt birch bark rolls being used as fuel, it is likely that some of the material collected

represent scraps from the production of birch bark items, such as baskets (Nicholas et al. *forthcoming*:42). In addition to the birch bark remains, other types of plant macrofossils collected include significant amounts of charcoal, usually in association with hearth features and a small number of large seeds (Nicholas et al. *forthcoming*:31).

3.3.7. Features

Many of the features identified at EeRb-144 are identified as hearths, often consisting of large amounts of fire-cracked rock, charcoal, burned bone, and fire-reddened soils (Nicholas and Tryon 1999:16). A well-defined Plateau-component horizon hearth feature was identified in close association with another smaller hearth feature located about a meter away (Nicholas et al. *forthcoming*:30). While it appears that these hearths are contemporaneous, the reason for their close spatial association is unclear (Nicholas et al. *forthcoming*:30). One possibility is that these hearths were used simultaneously for heating and drying hides during the initial stages of hide preparation. Using two fires for this purpose set on either side of a tanning frame has been documented for the Okanagan people of the Columbia Plateau (Mourning Dove 1996:81). The three “single-hook,” the single “double-hook” artifacts, and a Plateau point were found in direct association with these hearth features (Nicholas et al. *forthcoming*:31; Nicholas and Tryon 1999:16).

3.4. Site Comparison and Discussion

Sitting immediately adjacent to one another only roughly 130 m apart, these terrace edge sites contain significant evidence for at least 6,000 years of use and potentially earlier. Very seldom are sites found with such rich archaeological records and with evidence for almost continual occupation over more than 7,000 years. The artifacts collected from EeRb-140 and EeRb-144 represent all cultural and lithic traditions for the entire Middle and Late Prehistoric periods. In addition, the high degree of preservation of organic remains at these sites is ideal for paleoethnobotanical analysis and provides valuable insight into plant utilization in the past, an often-invisible aspect of the archaeological record (e.g., Nicholas et al. *forthcoming*; Wollstonecroft 2002).

Overall, these two open-air campsites are largely similar in terms of the artifacts recovered, the features identified and appear to be relatively contemporaneous. However, the difference in the overall abundance of certain artifact types at these two sites is interesting. The greater number of microblades at EeRb-140 may reflect functionally specific tasks being performed at this location for which microblades were the preferred flake tool. On the other hand, neighboring EeRb-144 contained a much larger chipped stone tool assemblage. The lithic economy at EeRb-144 appears to be more oriented towards retouched and expedient flake tools. It is thus possible that the suite of activities at EeRb-144 were different from those at EeRb-140, where retouched tools were best suited for the given tasks at hand in addition to microblades.

There are also differences in the raw material composition of the microblade assemblages. The microblade assemblages from EeRb-140 and -144 show a prevalence of Ducks Meadow vitric tuff rather than the ubiquitous black dacite common to most lithic assemblages in the region. The distinct material preference is especially noteworthy at EeRb-144 where more than 60% of the microblade assemblage is made from vitric tuff. This pattern is contrasted with the high frequency of tools made from dacite where approximately 80% of the assemblage is made from this material. The greater abundance of this material in the microblade assemblages suggests that people were opting for the vitric tuff over dacite or other material type for making microblades¹.

The artifacts and features identified at EeRb-140 and EeRb-144 are indicative of a diverse range of activities related to the workings of everyday life. Overall, the lithic tool assemblages are characteristic of a base camp where a wide range of activities likely took place at different times of the year. There is sufficient evidence to suggest that such tasks as food procurement and processing, tool manufacture and maintenance, and hide preparation and processing were common activities at these two sites.

¹ The vitric tuff occurs geologically as tablets or plates with broad, often concave surfaces that immediately provide ample platform for flaking. It is possible this material and the natural tabular form of the vitric tuff nodules, as it is found in its geological context, was a prime factor in the choice to use it for microblades. With very little effort, a leading flake can be removed from a corner of the tablet created two long linear ridges. The next flakes will follow these ridges and the pattern continued often times in a circular fashion around the stone nodule.

The association of microblades with the hearth features in Units 30 and 32 at EeRb-140 is intriguing. These areas were interpreted as areas representing of food processing activities, tasks that were known ethnographically to have been women's work (Teit 1900, 1909; Turner 1997; Turner *et al.* 1990). The abundance of microblades recovered from Units 31 and 32 in the southeastern area of the site is remarkable, not only because of their number, but also because of the relative absence of any other artifacts in the deposits. The presence of an endscraper in the lithic assemblage, a tool type presumed to have primarily been used for hide scraping (e.g., Scheiber 2005:59), provides an indication of potential activities that took place at this location.

3.5. Chapter Summary

Excavations at EeRb-140 and EeRb-144 over several field seasons have resulted in the recovery of hundreds of stone, bone and antler tools, exotic shell artifacts, tens of thousands of pieces of flake debitage, faunal and organic remains, in addition to the numerous features identified across both sites. These results are indicative of a wide range of activities having taken place at these two terrace locations over many millennia. Many similarities between these two sites are apparent in the artifact assemblages, especially in terms of the tool types and materials represented, the features and the environmental setting. Given the proximity of these sites to one another and their many comparable attributes, EeRb-140 and EeRb-144 are good candidates for exploring the functional role of microblades and any changes apparent in their use over time.

Chapter 4. Use-Wear Methods and Experiments

One of the most fundamental questions addressed of any stone tools from archaeological contexts is “what were they used for.” Over the years, archaeologists have developed a variety of approaches to this question, ranging from ethnographic analogy to experimental archaeology. Use-wear analysis, the study of microscopic damage to stone tools resulting from use, has emerged as a principal means for assessing the function of lithic artifacts.

This chapter describes the experimental program designed for this study and present the results of the experiments undertaken. I begin with a brief discussion of the two primary methods employed by use-wear analysts, commonly referred to as the high- and low-power approaches, advocated by Lawrence Keeley (1980) and George Odell (2004), respectively. Here I explore the advantages and limitations of these methods. I then introduce both the analytical methods adopted for this study of microblade function and the experimental component of the study. My presentation of the experimental program is divided into two phases by which the work was undertaken: 1) manufacturing experimental flake tools and all relevant considerations; and 2) the experiments themselves. In the final section I describe the results of the use-wear experiments on a variety of contact materials.

The experiments developed for this study were designed to replicate the range of wear patterns likely to be represented in the Kamloops microblade assemblage. Because there are no descriptions of microblade usage in the ethnographic literature, the experimental phase of this study was largely exploratory and intended as an initial step towards gaining a more precise understanding of the functional role played by microblade technology in the Interior Plateau.

4.1. Use-Wear Analysis

The study of use-related wear on stone tools came to the foreground in archaeology with the publication of the English translation of Sergei Semenov's seminal volume *Prehistoric Technology* in 1964. While not the first academic expression of interest in the function of stone tools (Evans 1872; Warren 1914; see also Odell 2004:136), it was nevertheless the first comprehensive attempt to use experimentation in the analysis of lithic and bone tool use-wear patterns. The volume was influential in the emergence of the field of microwear analysis and provided the methodological and theoretical foundation for use-wear research (e.g., Evans and Donahue 2008; Grace 1989; Hayden 1977; Kamminga 1982; Keeley 1980; Newcomer and Keeley 1979; Odell 1981, 1996; Odell and Odell-Vereecken 1980; Tringham *et al.* 1974; Vaughan 1985). Such studies attempted to refine and standardize use-wear methodology so that functional analyses can be incorporated with greater frequency and accuracy into stone tool research.

4.1.1. Methods of Use-Wear Analysis

Use-wear analysis is the study of macro- and microscopic modification of the working edges or surface of stone, bone, and antler tools as the result of use, from which the function of a particular tool may be inferred (Hayden 1977). Use-wear studies are typically divided into two distinct approaches based on the type of microscopy used to investigate use-wear traces: low-power and high-power (Kooyman 2000:154; see also Odell 1996, 2004). I describe each below.

Low-Power Approach

The low-power approach makes use of stereomicroscopes with magnification levels ranging from 10X–100X and reflective lighting that hits the object obliquely. Such lighting enhances shadow effects and depth of field, which facilitates the interpretation of topographic features on a stone tool (Odell 2004:143). This method focuses on the more highly visible signs of use, such as microfractures or microchipping, striations, edge rounding, and surface polish (Odell 2004:144; Semenov 1964). These observations are

then compared with edge wear patterns on a set of experimentally replicated stone tools. This comparison allows the analyst to make inferences regarding tool function and mode of use, such as cutting, scraping, drilling, or chopping.

The greatest asset of low-power use-wear studies is the ability to identify function for large assemblages (Andrefsky 2005:195). This approach significantly reduces the time and resources necessary for the analysis of tool function, thus allowing for more functional data to be collected from across a site or location. The broad scale of the low-power approach has produced some interesting site-specific research of tool function (e.g., Lewenstein 1987; Odell 1996), contributing important corollary information to the archaeological records of these locations. For example, George Odell (1994) employed use-wear analyses to discern the role of bladelets in Middle Woodland societies. By examining bladelet assemblages from three different Middle Woodland components at two different sites in the Illinois Valley, the Smiling Dan settlement and Napoleon Hollow site, Odell was able to discern two different patterns of bladelet function. At the Smiling Dan settlement, the bladelets were inferred to have been used for a variety of tasks in much the same pattern as found at other Middle Woodland sites (Yerkes 1990). In contrast, the analysis of bladelets recovered from mortuary contexts at the Napoleon Hollow site indicated these tools were used for a more specialized purpose, cutting and scraping soft materials. Odell interpreted the differences in the functional patterns as being a reflection of the importance of bladelets in Hopewell ceremonial contexts.

The low-power approach is not without its limitations. For example, retouch and other intentional and unintentional modifications to tools edges, such as grinding or trampling, have the tendency to obscure or mimic use-related damage, making functional interpretations of formed tools more challenging (Odell and Odell-Vereecken 1980:96). Other sources of post-depositional surface modification (PDSM) that can complicate use-wear analyses include soil chemistry, wind and water action, trampling (McBrearty et al. 1998; Shea and Klenck 1993), and artifact handling (Odell 2004:138). While formed tools are an important part of lithic traditions, unmodified flake tools, such as utilized flakes and microblades are better suited to use-wear analysis given edge damage patterns can either be attributed to utilization or post-depositional modifications. This limitation can be mitigated through experimentation into various post-depositional

effects, such as trampling, as well as careful collection and handling of artifacts during excavation and curation.

High-Power Approach

The high-power approach is characterized by the use of high magnification optical devices (200X and greater), such as mineralogical microscopes employing incident lighting and scanning electron microscopes (Odell 2004:148). This approach seeks to detect use-related polish remaining on the use surface of artifacts (Keeley 1980) and is most effective for the investigation of items with relatively flat topography (Odell 1996:33). This method has been successful in discerning between different types of polishes and associating them with specific contact materials, such as antler, bone, wood, meat or fish, or plants (Evans and Donahue 2008; Keeley 1980; Lemorini et al. 2006; Levi Sala 1996; Vaughan 1985). The overall ability of high-power magnification to distinguish between different types of use polish and striations has made this approach the most effective approach to functional analyses of small assemblages or in situations where time and money are not factors (Odell 2004:149).

While high-power use-wear analyses have been successful at determining precise contact materials a tool was used on, this method is also not without its limitations. Since polish and striations are often subtle forms of use-wear, artifact-cleaning procedures using strong chemicals or other manual means to remove foreign materials from the object has the potential to alter the tool surface and any wear traces present (Odell 2004:151). While documenting the effects of cleaning and handling has proven difficult, avoidance of harsh chemical cleaners has started to become the norm amongst lithic analysts (Odell 2004:151).

Characteristics of the microscopes used for high-power analyses can also cause problems interpreting use-wear traces. Metallurgical microscopes, for example, have such a restricted field of view that difficulties arise when attempting to interpret use-wear as observations move away from the tool edge (Odell 2004:151). The narrow field of view of these microscopes also makes it difficult to make observations on an object that is curved or has an undulating topography. Despite these limitations, recent use-wear research employing alternative types of microscopes, such as laser-scanning confocal

microscopes, has vastly improved the quantification of polishes and have produced encouraging results (see Evans and Donahue 2008; González-Urquijo and Ibáñez-Estévez 2003; Stemp and Stemp 2001).

Use-Wear Analysis and Blind Tests

The results of experimental and archaeological investigations into use-wear traces were, and largely still are primarily descriptive in nature and depend a great deal on the experience and judgment of the researcher (Odell 1996:37). In an effort to address the subjectivity of use-wear analyses, many researchers instituted blind testing into their studies (Odell and Odell-Vereecken 1980). This would usually involve giving an assemblage of experimental stone tools to an independent researcher to use on a variety of materials. After use, the tools were returned to the principal use-wear researcher for analysis. The results of these analyses were then used as a measure of the analyst's ability to interpret wear patterns. Odell (2004:142) suggests that it is good practice to perform at least one blind test on experimental stone tools to gauge the ability to interpret wear patterns and to not move on to archaeological assemblages until satisfactory results are obtained.

4.2. Experimental Program

My use-wear analysis involved three phases: 1) replicative experiments; 2) the microscopic analysis of the experimental tools; and 3) analysis of the microblade assemblages from EeRb-140 and EeRb-144. Below I present the experimental design and procedures employed for this study, as well as the results of the microblade experiments representing the first two phases of the use-wear analysis.

The first phase of the program involved building and using an experimental tool assemblage in an effort to recreate a range of use-wear patterns that may be represented in the Kamloops microblades. This work would provide the comparative collection for the use-wear analysis of the archaeological specimens. Since the range of possible worked materials at the Kamloops sites is rather broad, a relatively conservative collection of economically important resources had to be used in this

experimental program. Six material types were chosen: meat (ungulate and fish), hide, bone, antler, wood, and plants. This selection was based on ethnographic accounts (e.g., Teit 1900, 1906; 1909; Turner 2007) and archaeological sources, such as Wollstonecroft's (2000) paleoethnobotanical study, but also corresponds to the suite of standard materials common to most use-wear studies (e.g., bone, antler, and leather). Table 4.1 provides a summary of the functions and tasks employed in this study.

The second phase of the experimental program involved observing and documenting the edge wear patterns evident on the experimental flake tools. Given the relatively large size of the Kamloops microblade assemblage (n=1,435) and the microscopic equipment available to me at the onset of this study, I chose to adopt the low-power approach to use-wear analysis. All microblades and experimental tools were examined using a Heerbrugg Wild M5 stereoscopic microscope with single-source oblique lighting capable of 6.4X–80X magnification was used for observing and documenting the presence or absence of use-wear on the Kamloops microblade assemblage. The functional variables chosen were adopted from the methodologies developed by Odell (1996) and Grace (1989). These included type of fracture (e.g., step, snap, flakes), number of fractures and their orientation to the tool edge, and the presence or absence of polish and striations (see Table 4.2).

Images of a sample of used microblades from both EeRb-140 and EeRb-144 were taken using an Olympus LEXT laser scanning confocal microscope (LSCM). This highly technical unit produces three types of high magnification images: a true-colour optical microscope image; a laser microscope image; and a height map. The first two image types, true-colour optical and laser microscope, were used to identify types of use-wear (e.g., polish and striations) that are more difficult to observe with stereoscopic microscopes and oblique reflected light. In many cases, the granular nature of the lithic raw material used for microblade manufacture at Kamloops acted to obscure polish when present. The laser microscope image is not produced using traditional reflected light, thus making it possible to identify polish that would otherwise go undetected². These images are presented in the following chapter with the use-wear analysis results.

² See manufacturer's website (www.olympus-ims.com) for further details on imaging.

Table 4.1. Summary of tasks and functions represented in experimental tool assemblage (H = hard, M = medium, SA = soft animal, SP = soft plant).

Motion	Function					
	Bone/Antler (H)	Wood/Bark (M)	Hide (SA)	Butchery (SA)	Fish (SA)	Plant (SP)
Cutting	1	6	3	3	2	2
Scraping	1	6	1	-	-	-
Boring/Graving	1	-	1	-	-	-
Total	3	12	5	3	2	2

Table 4.2. Use wear variables recorded for this study.

Location of edge wear	<ul style="list-style-type: none"> • Dorsal
	<ul style="list-style-type: none"> • Ventral
	<ul style="list-style-type: none"> • Both
	<ul style="list-style-type: none"> • Absent
Fractures	<ul style="list-style-type: none"> • Absent
	<ul style="list-style-type: none"> • <5 per 5mm
	<ul style="list-style-type: none"> • >5 per 5mm
Fracture type	<ul style="list-style-type: none"> • Flakes
	<ul style="list-style-type: none"> • Snaps
	<ul style="list-style-type: none"> • Steps
	<ul style="list-style-type: none"> • Flakes and snaps
	<ul style="list-style-type: none"> • Flakes and steps
	<ul style="list-style-type: none"> • Snaps and steps
	<ul style="list-style-type: none"> • All types
	<ul style="list-style-type: none"> • Absent
Fracture orientation	<ul style="list-style-type: none"> • Perpendicular
	<ul style="list-style-type: none"> • Diagonal
	<ul style="list-style-type: none"> • Absent
Polish	<ul style="list-style-type: none"> • Present
	<ul style="list-style-type: none"> • Absent
Striations	<ul style="list-style-type: none"> • Present
	<ul style="list-style-type: none"> • Absent

4.2.1. **Experimental Design: Considerations and Controls**

In designing use-wear experiments, a variety of considerations and controls are required to avoid confounding the results (Quinn and Keough 2002:157). There are several well-documented aspects of stone tool use known to directly influence the accrual of use-wear damage. These factors include (a) lithic material; (b) edge profile; (c) edge angle; (d) motion of use; and (e) duration of use. Below I outline the considerations made and controls put in place to ensure the experimental program produces a representative range of use-wear patterns that may be expected in the Kamloops microblade assemblages. In addition, I also experiment with different modes of hafting microblades in an attempt to replicate damage patterns associated with using microblades set into wooden handles.

Lithic Material

One of the primary considerations when creating a set of experimental flake tools is the type lithic raw material represented in the archaeological assemblage. Previous research has demonstrated that different lithic raw materials accrue use-wear traces at different rates and patterns (Lerner 2007; Semenov 1964). It is then necessary to utilize the same material(s) represented in the archaeological assemblage to ensure comparability of the experimental assemblage with the archaeological specimens.

As shown in the previous chapter, the Kamloops microblade assemblage is dominated by two material types, Ducks Meadow vitric tuff (or trachydacite) and vitreous black dacite. One interesting trend noticed in the material composition of the stone tool assemblages from both Kamloops sites is the overwhelming trend towards preferential selection of the Ducks meadow material for microblade manufacture. For example, only 31 of the 816 stone tools recovered from EeRb-144 were made from vitric tuff representing only 3.8% of the total tool assemblage. This is in contrast to the material composition of the microblade assemblage from EeRb-144 where almost two thirds of the microblades are made of vitric tuff (See Table 3.8). Thus, it is clear that the Ducks Meadow material was the preferred material for microblade manufacture at Kamloops and will be the sole material used for the use-wear experiments.

Flake Profile and Edge Angle

Since the goal of this aspect of my research was understanding microblade function and not precisely replicating microblades, unmodified microliths or blade-like flakes¹ were used for the experimental flake tool assemblage. Here, I assumed that as long as (a) the edge angles of the experimental flake tools (see sections 3.2.2 and 3.3.2) are within the range of those measured in the Kamloops microblade assemblage and (b) the flake edge profile is straight and not curvate, then use wear will accrue in a similar fashion.

An assemblage of linear, blade-like flakes was made from the vitric tuff using direct freehand soft-hammer percussion with relative ease. These experimentally produced blade-like flakes have most, if not all of the diagnostic criteria of attributed to microblades, such platform preparation in the form of buffeting or grinding, presence of previous blade removal scars, and parallel margins. Some even resemble microblades present in the Kamloops assemblage. The experimental tools have a edge angles ranging from 20° to 50° with a mean of 35.3° and a standard deviation of 6°.

Hafting

It was also necessary to consider how the tool was actually held during use, whether directly in the hand or hafted in some fashion. Doing this would allow me to discern between wear related to use and wear resulting from hafting in the Kamloops microblade assemblage. The flake tools employed in this experiment were thus held in three different fashions: a) side hafted into a piece of split cedar secured with pine resin; b) end hafted into a piece of split cedar also secured in place with pine resin; and (c) held in hand.

¹ Here, *microliths* and *blade-like flakes* are defined as parallel-sided, linear flakes resulting from the fortuitous removal of a flake with a blade form without the *intention* of removing such a flake (Waber 2011:33; Campbell 1985). Detailed analyses of the organization of microblade technology from the greater Pacific Northwest can be found in Greaves (1991) and Waber (2011).

Tool Motion and Duration of Use

Two factors are generally understood to influence both the patterning of microchipping and striations, and the degree of development of polish and microscarring on the use edge of a tool: duration and motion (Lewenstein 1987:71-74; Odell 1996: 37-39). *Duration* is defined as the amount of time a particular tool was used for and is measured commonly measured in strokes (Odell 1996:39). Experimental tools were used on a particular material, such as leather or wood, for approximately 1,000 strokes and put aside. On reaching that number, a second identical tool would then be used for the same experiment, but for 2,000 strokes or until the tool was no longer capable of performing the task (i.e., became too dull). *Motion* refers to the manner in which a tool was used, an important aspect of use-wear studies. Often referred to as tool function, the motion of use, such as sawing, cutting, or boring, directly influences patterns of edge damage. For example, it is expected that on a tool used for scraping, where the working edge is perpendicular to the direction of use, use-wear is most likely to form on the dorsal surface. Also, flake scarring on scraping tools used tends to be oriented perpendicular to the blade edge. In contrast, on a flake tool used for cutting, where the edge is held parallel to the direction of use, edge damage is expected to form on both the dorsal and ventral surfaces. On flakes used for cutting, flake scars have a tendency to be oriented at an angle to the working edge. Throughout each experiment, care was thus taken to ensure tool function (e.g., cutting, scraping, shaving, boring) was kept constant.

4.3. Descriptions of Individual Experiments

In this section, I describe the individual experiments performed for this analysis. These experiments include grass cutting, butchery, hide working, antler working, wood and bark working and finally bone working. For each of these, I define the goals of the experiment, the materials used, the methods employed and the general results including the types of wear observed for each set of experimental tools. These results represent the comparative collection that will form the basis of my use-wear analysis of the Kamloops microblade assemblage.

4.3.1. Grass cutting

Goal: The experiments on soft vegetal materials were designed to replicate wear associated with the cutting of grasses. Grasses were used for a variety of purposes by Plateau people, such as woven into split cedar-root baskets and for bedding or matting that was spread around a camp to keep the dust or other debris down (Turner 2007:121). Grasses were among the most abundant archaeobotanical remains identified in a hearth feature at EeRb-140 and may reflect the use of grass matting to control dust while camping on the lower terrace (Turner 2007: 119-121).

Materials: Two experimental tools (ET 9 and 10) were side hafted into a split cedar haft and held in place with pine resin and sinew binding.

Methods: A bunch of grass approximately 1–2 cm in diameter was held steady with one hand while a hafted flake tool was used to cut the stalks near to the ground. When the bunch was cut clear, another handful of grass was gathered and cut away. This process was continued until the tool had been used for the predetermined experiment duration (e.g., 1,000 strokes).

Results: The use-wear on these tools is bifacial on the use edge with distinctive bright polish on the ventral surface. Scarring is relatively slight on ET 10, used for 1,000 strokes, with the majority of wear confined to feather-terminated flake scars on the dorsal aspect and a few snap flake scars on the ventral surface. On this tool, polish developed only on the ventral surface, but is bright and concentrated to the working edge margin. The second grass cutting tool, ET 9, was used for 2,000 strokes and developed slightly more significant use-wear, but is still similar to the other experimental implement. Feather-terminated flakes and snap fractures were concentrated to the dorsal surface and did not occur ventrally. However, polish developed on both the dorsal and ventral surfaces and intruded slightly beyond the working margin as observed on ET 10. No striations were evident on either flake tools.

4.3.2. Animal butchering

Goal: To replicate use-wear related to animal butchery.

Materials: Three butchery experiments were conducted using a deer leg². Three flake tools made from vitric tuff were used

Methods: This experiment involved holding flake tools in hand and cutting away at the meat in a slicing fashion. The tools came in frequent contact with meat, connective tissues such as tendons and cartilage, and fresh bone in the latter stages of butchering.

Results: Three experimental flake tools were used for incrementally longer durations to remove deer meat from the leg bones. All three tools exhibit minimal bifacial scarring with less than 5 flakes per 5 mm of edge. Microscars present on these tools were predominately feather-terminated flake scars oriented perpendicular to the working edge. The only abrasive damage present was a dull matte polish on the ventral surface of each tool. Only the second tool (ET 19) in the series, used for 1,500 strokes, exhibited more substantial edge damage in the form of plentiful (>5 per 5 mm) step fractures on the ventral surface, likely the result of coming in contact with fresh bone.

The softness or light resistance of the deer flesh is apparent in the small amount of edge damage present on this set of experimental tools. The placement and orientation of the flaking is also indicative of a unidirectional tool motion expected for the type of cutting and slicing that was performed in over the course of butchering the deer meat. The presence of polish only on the ventral surface is surprising given that other use-wear experiments of this sort (e.g., Odell 1996:43) produced polish on both dorsal and ventral surfaces. The results of these tests suggest that archaeological specimens utilized for butchering animals such as deer, elk, or bear should result in similar patterns.

²Commercially available farmed Fallow deer (*Dama dama*) leg was used in this experiment.

4.3.3. **Salmon cutting**

Goal: Two experiments were undertaken on salmon in an effort to replicate wear associated with cutting salmon.

Material: Two flake tools were used, one side hafted in a length of split cedar and one hand held, to cut a whole salmon into fillets similar to ethnographically documented processing methods (Romanoff 1992). A store-bought pink salmon (*Onchorhynchus gorbusha*) was used for these experiments.

Methods: Both tools were used to cut through salmon skin and flesh around the entire fish. This task involved using the flake tools in a sawing motion in order to cut through tough salmon skin.

Results: Use-wear on these blades was very slight, similar in many respects to the wear observed on the animal butchery tools. Edge modification observed was solely in the form of small concentrations of minimally invasive feather-terminated flake scars. Given the soft texture and light resistance of salmon skin and flesh, it is likely that the use-wear was the result of the blades coming in contact with spines and the cleithrum. The hafted tool required periodic cleaning to remove built up flesh and scales that obstructed the blade from coming into direct contact with the fish. Overall, these tools were adequate for the task, but required considerable effort to cut through the skin, which suggests microblades may not have been the preferred tool for butchering salmon.

4.3.4. **Hide working**

Goal: Four experiments were carried out using commercially tanned deer leather to simulate the effects of working buckskin (Odell 1996:45).

Material: Two experimental tools were used to cut the leather into strips, another to scrape the rough underside of the leather, and a fourth to drill holes in the hide.

Methods: All of the flake tools used were hand held, not hafted. For the cutting experiment, the hide was held taut while the flake tools were used to cut the leather into thin strips. This task involved using each tool in a sawing motion to cut through the leather. For the scraping experiment, the tool was again held in hand and drawn perpendicular against the soft underside of the leather to simulate the effects of scraping hide. The final experiment involved piercing holes the hide with the flake tool. The tool was held perpendicular to the hide and was used in a twisting motion to bore a small hole.

Results: Each of the four leather-working tools exhibited considerable polish development on either the ventral or dorsal surfaces. These experiments demonstrated that polish development increased with prolonged use. Striations were not observed on the leather working tools at the magnifications used (32X–80X), a result that differs somewhat from the pattern observed in similar experiments by Odell (1996:45). While the precise cause or causes of this difference are unknown, it may be related to differences in lithic raw materials employed or the type of hide used.

The cutting tools ETs 11 and 16 exhibited different patterns of use-wear. The tool used for 1,000 strokes, ET 16, has very few fractures on the dorsal surface, but numerous feather and snap fractures on the ventral surface. The second tool used for 2,000 strokes, ET 11, showed no dorsal fractures, but did have a small amount of ventral fractures and polish on both the ventral and dorsal surfaces. ET 11 was originally end hafted in a cedar haft, but came loose rather quickly; the remainder of the experiment was subsequently carried out holding this tool in hand.

The tool used for the scraping experiment, ET 2, had little edge damage compared with the cutting tools described above. Most of the use-wear present on this tool is in the form of polish, predominately on the ventral surface. The dorsal surface had numerous snap fractures oriented perpendicular to the working edge, which is to be expected as the motions associated with scraping involve the tool moving across the contact material at roughly right angles.

The final tool in this series was used to pierce holes in a piece of leather. It was assumed that microblades, which occasionally taper to a fine, sharp point, would have

been well-suited to piercing holes in hide. However, this experiment was stopped after approximately 500 strokes as the tip of the flake tool broke off during use. Despite the truncated experiment, some use-wear was observed on the experimental tools in the form of small feather-terminated flakes present on both the dorsal and ventral surfaces. Polish was present only on the ventral surface. It is likely that more damage would have occurred if the experiment had continued; again, it seems unlikely that microblades would be used for such tasks as this given the thinness and relative fragility of these flake tools.

4.3.5. **Antler working**

Goal: Two experiments were carried out in an effort to replicate the effects of working antler.

Material: Two flake tools made from vitric tuff, E.T. 8 and 17 were used to grave elk antler that had been soaked in water overnight.

Methods: In this series of experiments, two handheld flakes were used to carve several grooves into an elk antler that was soaked overnight in an effort to reproduce the texture and relative hardness of fresh antler. The flake tools were oriented perpendicular to the antler with the worked area focused at the distal tip of the tools. The flakes were drawn down the antler to create a slot similar to that seen in bone and antler points from Alaska and Siberia (Waber 2011: 30).

Results: Overall, these tools performed very well at this task despite the significant amount of damage that occurred on the working edges. Edge modification in the form of numerous feather, snap, and step fractures was concentrated on the distal end of both tools—and only on the dorsal surface. No polish or striations were present.

4.3.6. Woodworking

Goal: Wood is known to be an important material for a whole host of implements, such as bows, arrow, dart, and spear shafts. Eight different experiments were carried out that were designed to replicate a variety of tasks, associated with woodworking, such as shaving (n=6) and cutting (n=2).

Material: Seven tools were used to shave and prune fresh and seasoned wood from three different, but economically important tree species: lodge pole pine (*Pinus contorta*), Saskatoon bush (*Amelanchier alnifolia*), and Rocky Mountain maple (*Acer glabrum*). One experimental flake tool was used to shave and split cedar-root (*Thuja plicata*).

Methods: The flake tools were used in two different ways: shaving and pruning or whittling. Shaving effectively removes the outer layers or portion of the branch or piece of wood. For this experiment, the act of pruning aims to remove small branches and nodes for the purpose of making a smooth, straight branch that can be used to make other items (e.g., bows, arrow shafts, digging sticks).

Results: The two pine shaving experiments were of equal duration, 1,000 strokes, because the tool edges deteriorated rather quickly, becoming quite ineffective at the task. For these series, one tool was used hand-held and the other side-hafted into the end of a piece of split cedar similar to the Hoko River specimens (Croes 1995:181). Hafted tool ET 7 was not very effective for this task as the thickness of the cedar haft often prevented the flake tool from fully contacting the pine and biting into the wood. Hand-held tool ET 5 was by far more useful for shaving pine. Overall, the wear on the working edges of both tools was dramatic with many step, snap, and flake scars occurring on both dorsal and ventral surfaces, along with very pronounced edge rounding. A slight amount of polish on the ventral surface of ET 5 was macroscopically

visible after approximately 500 strokes, with striations also present within the ventral flake scars. A similar type of polish was observed on ET 7¹.

A single flake tool, ET 14, was used to prune small branches and twigs approximately 0.5–1.5 cm in diameter off a fresh maple bough using a cutting/sawing motion. This task resulted in significant wear on the thin working edge of the flake tool, which deteriorated very quickly, making it difficult to use the tool for the desired duration. Despite the rapid deterioration of this tool, it was relatively effective for this task. Using the tool for this task produced all types of flake scars on both the ventral and dorsal surfaces, with step fractures being the most common. Polish and striations were not identified on either tool surface.

Four experiments were performed on Saskatoon boughs: two shaving (ETs 25 and 26); and two pruning (ETs 24 and 27). While the edge damage was bifacial, the majority of wear was concentrated on the dorsal surface. Dorsal edge damage on these tools is characterized by contiguous rows of feather-terminated flake scars with the occasional step fracture. Prolonged use produced similar wear patterns, but with numerous, more pronounced flake scars intruding deeper into the interior of the flake. In fact, on ET 26, which was used for 2,000 strokes, the extent of the edge damage was readily visible without the aid of microscopes. The pattern of flake scarring is similar to that produced by other use-wear experiments on wood (Odell 1996:47), but notably no polish was identified on either of the working edges as expected for woodworking tasks. The reason for this is unknown: it may relate to the degree of magnification used to observe the flake tools or possibly to the granular nature of the vitric tuff used for these experiments². The pruning experiments with Saskatoon boughs resulted in slight wear

¹ Unfortunately most of the surface of ET 7 was obscured by a build-up of carbon and pine pitch that resulted from attempts to remove the flake from the haft. Nonetheless, the wear patterns reflected in the type and frequency of flake scars is consistent with the other flake tool in this experimental series, ET 5.

² For the most part the vitric tuff generally has a sugary appearance when viewed under magnifications greater than 20X, which act to prevent the development of abrasive polish on working surfaces.

that was limited to feather-terminated flakes and the occasional step fracture widely distributed along the dorsal surface. No polish or striations were observed.

4.3.7. **Birch bark working**

Goal: These experiments were designed to replicate wear related to the removal of bark from a birch tree.

Material: Four flake tools made of vitric tuff were used to cut or saw birch bark.

Methods: Four experiments were performed on Birch bark (*Betula papyrifera*): ETs 12 and 13 were used for cutting fresh bark off a section of trunk, and ETs 22 and 23 were used to cut and saw bark slabs that had already been removed from the branch.

Results: The flake tools worked very well at this task and did not develop much in the way of use-wear. In fact, ET 12 was used for 1,000 strokes and did not exhibit *any* signs of edge damage despite breaking in the haft during use. The tool used for the longer duration developed some slight edge wear in the form of small flake scars with the occasional step fracture. A minute amount of polish developed along the margin of the ventral working edge of this tool but not the former.

Cutting and sawing produced similar wear patterns on the flake tools. Feather-terminated and hinge fractures occurred in considerable densities on a single surface, either dorsal or ventral (the tools were held differently, causing wear to develop differentially). Polish was seen in small amounts within dorsal flake scars on ET 22, but not on the ventral surface of either flake tool. Striations were not observed on either experimental flake tool. The orientation of the flake scars was perpendicular to the working edge, which was a pattern not anticipated for a tool used in a sawing motion. It was expected that the flake orientation for this type of tool motion would be more diagonal to the working edge.

4.3.8. **Bone working**

Goal: Along with antler, bone served as raw material for the manufacture of an assortment of items, in particular as elements of fishing implements such as barbs and harpoon points. In addition, bone was used to manufacture such utilitarian items as awls and needles, and was also an excellent art medium (Stryd 1983:169). This set of experiments was aimed at replicating edge wear associated with working bone.

Material: Two experimental flake tools made from vitric tuff were used on a deer mandible and tibia.

Methods: The experiment on the mandible involved using the hafted flake tool in a planing or shaving motion with the tool held at an angle roughly 45° to the bone. The other experiment involved scraping meat off the fresh deer bone using a hand-held flake tool oriented at a 45° angle to the bone.

Results: Two flake tools were used to work animal bone, the only hard material included in this experiment. One tool (ET 6) was used to scrape a dry deer mandible and the other (ET 21) was used to scrape meat off of fresh deer bone. As expected, working bone with these relatively thin flake tools proved rather inefficient as the tool edge dulled quickly. Both tools did not last beyond 750 strokes, rapidly becoming dull with pronounced edge rounding. Wear patterns on the tool edges are dominated by hinge- and step-terminated fractures with fewer numbers of feather terminated flake scars and snap fractures all on the dorsal surface. While the majority of use-wear was present on the dorsal surface only, ET 6 exhibited some slight use-related damage on the ventral surface. Surprisingly, no polish developed on either the dorsal or ventral surface. Except for the absence of polish, the microwear patterns described here are similar to other use-wear experiments on bone (Odell 1996:45).

4.4. Discussion

Overall, the experimental flake tools performed adequately at all tasks and functions employed in this study. Table 4.3 summarizes the use-wear observed on the experimental tools and outlines the expectations for the analysis of the archaeological specimens. It was expected that the flake tools would be most proficient at working soft materials, such as grasses, hide, and meat. However, the sharp, thin blades were able to process all of the materials in each of the relative hardness categories with little to no issues. In particular, the flake tools were very adept at woodworking functions, including working birch bark, even though the blade edges dulled at a moderate rate. Having many microblades on hand would have served to mitigate this characteristic of microblade technology. When one blade became too dull to use, another could be substituted quite quickly and the task continued.

There were a few exceptions to the good performance of the experimental flake tool assemblage, in particular drilling or boring leather and bone working. The flake tool used for perforating hide snapped near the working end after only approximately 500 strokes, suggesting that microblades are not well suited to tasks where the blade is used in a rotating motion as expected at the outset of this experimental program. Also, the two flake tools used for working hard bone, both fresh and dry, dulled very rapidly with significant rounding of the working edge becoming readily apparent to the naked eye after roughly 500 to 750 strokes. These results suggest it is likely microblades were not used for manufacturing bone items, but rather some other more resilient flake tools, with a less acute edge angle, were employed for this purpose.

In addition, there were a few occasions when the hafting elements themselves impeded the blades from coming into direct contact with the materials being worked. For example, when ET 7 was side hafted into a length of split cedar, the angle at which the tool had to be held for the blade to simply contact the wood piece was so great that the blade edge was not able to bite into the wood. In that instance, holding the blade in hand was better from a functional perspective than hafting the stone tool.

Edge wear patterns largely conformed to expectations. Working hard materials, such as bone and antler, resulted in more substantial use-wear, which was represented

by numerous hinge and step terminated flake scars, as well as by significant edge rounding in some instances. The same is true for tools used for bark and woodworking. In contrast, cutting grasses and meat produced only slight amounts of edge wear where the majority of use-wear was characterized by feather-terminated flake scars and snap fractures. Again, polish and striations were difficult to positively identify on most of the experimental flake tools due primarily to the granular or sugary texture of the vitric tuff.

As noted at the beginning of this chapter, each of the experimental tools were used for a minimum of 1,000 strokes or until the tool became ineffective. However, expedient tools such as microblades may not have had such long use lives. Rather these tools may have only been used for short periods of time or for small tasks instead, thus affecting the rate of use-wear accrual. Future research may consider adopting shorter periods of use (e.g., 250 strokes) in order to make observations on the type(s) and abundance of edge modification present on expedient tools. Truncated experiments of this sort may provide further insight into microblade uses; however doing so was not practical for this study.

Table 4.3. Use-wear correlates derived from the experimental program.

Activity	Relative hardness	Use-wear analysis
Grass Cutting	Soft	Feather-terminated flake scars concentrated on dorsal surface Occasional snap fracture on ventral surface Bright polish along cutting edge No striations evident
Animal butchering	Soft	Slight amount of bifacial microscarring Primarily feather terminated flake scars oriented perpendicular to cutting edge A few step fractures present on tools used during latter stages of butchery, likely resulting from contact with fresh bone Dull matte polish on ventral surface
Salmon cutting	Soft	Very slight amount of unifacial microscarring Primarily feather terminated flake scars with occasional snap fracture; scarring orientated perpendicular to cutting edge No polish observed No striations observed
Hide cutting	Soft	Numerous feather and snap fractures on ventral surface Slight dorsal wear Bright polish development along both surfaces of the cutting edges
Hide scraping	Soft	Numerous snap fractures on dorsal surface Microscarring perpendicular to working edge Bright polish development on ventral surface
Hide drilling/boring	Soft	Small feather terminated flakes present on ventral and dorsal surfaces Polish development only on ventral surface
Antler graving	Medium	Numerous feather, snap, and step fractures isolated at the tip of flake tool Unifacial microscarring present (dorsal) No polish observed No striations observed

Wood scraping	Medium	<p>Microchipping forming along leading edge of blade. Fractures occur primarily on one face (i.e., dorsal) with smaller amounts of chipping to opposite face</p> <p>Hinge terminated flake scars most common. Occasional flake scars intruding well into the body of the flake tool</p> <p>Flake scars extending deeper into the flake tool with prolonged use</p> <p>Rounding of working edge</p> <p>Polish development along working edge</p> <p>Microchipping perpendicular to working edge</p>
Wood cutting	Medium	<p>Slight microchipping at first represented by contiguous rows of numerous feather terminated flake scars</p> <p>Increased snap and hinge terminated flake scars with prolonged use</p> <p>Microwear occurring bifacially</p> <p>Polish evident on along cutting edge; also polish observed in flake scars</p> <p>Striations absent</p>
Birch Bark Cutting	Medium	<p>Very slight microchipping represented by small feather terminated flake scars and snap fractures</p> <p>Wear developed on both ventral and dorsal surfaces</p> <p>Microscarring perpendicular to working edge</p> <p>Small amounts of polish</p> <p>Striations absent</p>
Bone scraping	Hard	<p>Microchipping represented by primarily hinge and step terminated flake scars. Occasional feather terminated flake scars also present</p> <p>Pronounced edge rounding</p> <p>Wear concentrated along dorsal surface of flake tools</p> <p>Polish absent</p> <p>Striations absent</p>

4.5. Chapter Summary

In this chapter I outlined the experimental use-wear program that provided the comparative sample for the microscopic analysis of the Kamloops microblade assemblages. I began by presenting a brief overview of the two predominate methods of use-wear analyses, the low- and high-power approaches. While both approaches have their strong points and their disadvantages, I chose to adopt the low-power approach for my study of microblade use-wear. This was followed by a description of the experimental design employed for this study. Here, I defined the procedures and controls that framed and guided the experiments. Over the course of the experimental stage, a broad range of use-wear was replicated using several different tool functions (e.g., cutting, sawing, drilling, graving) for a variety of tasks (i.e., butchery, grass cutting, woodworking). The results of these experiments provide the framework by which inferences can be made about the utilized microblade assemblages from EeRb-140 and EeRb-144. While the experimentation undertaken here is by no means exhaustive, it does provide a starting point for the use-wear analysis of the Kamloops microblade collection.

Chapter 5. Use-Wear Results

This chapter presents the results of the use-wear analysis for EeRb-140 and EeRb-144. The functional inferences from each site are presented individually. Following this, I discuss site-wide distribution of utilized microblades and their associated functional interpretations. I conclude the chapter with a discussion of the patterns of function inferred from the analysis of the Kamloops microblade assemblages.

Microblade function was determined via comparison with the experimental reference collection described in Chapter 4. The archaeological specimens were recorded and described using the same approach and variables for the experimental phase. The abundance, orientation, and type of microfractures were the primary variables recorded for this analysis. In addition, the analysis of the utilized microblades resulted in the classification of specific *task* (i.e., working wood, hide, or bone) and *function* (i.e., scraping, cutting, or shaving). The data were combined to generate a more complete picture of microblade use that directly references these flake tools by a functionally specific term, such as wood scraper or hide drill (e.g., Smith 2004:84). Combining task and function results in 14 distinct functional classes recognized in the utilized microblade assemblage and are discussed below.

5.1. EeRb-140 Use-Wear Results

Of the 1,080 microblades collected at EeRb-140, 227 were identified as being utilized, representing 21% of the entire microblade assemblage from EeRb-140. Most of the evidence of utilization was in the form of microfractures and edge rounding, and, to a lesser degree polish and striations. In addition, 44 microblades were initially identified as having use-related edge damage, but upon further inspection the wear traces were attributed to post-depositional modifications (i.e., trampling) and classed as indeterminate.

5.1.1. Task and functions represented

Microblades appear to have been used for a wide range of functions at EeRb-140 (Figure 5.1). Fourteen functional classes were identified in the utilized microblade assemblage from this site (Table 5.1). While all tasks were represented in the use-wear data, wood and bone/antler working were the most frequently encountered.

Table 5.1. Frequencies and relative frequencies of microblades functions represented at EeRb-140.

Microblade Functions	Frequency	Relative frequency (%)
Plant cutting	31	11.4
Plant scraping	1	0.4
Hide cutting	29	10.7
Hide scraping	27	9.9
Hide drilling	2	0.7
Hide graving	2	0.7
Wood scraping	58	21.4
Wood cutting	24	8.8
Wood graving	4	1.4
Wood drilling	1	0.4
Wood scraping and graving	1	0.4
Bone/Antler scraping	43	15.9
Bone/Antler cutting	3	1.1
Bone/Antler graving	1	0.4
Indeterminate	44	16.2
Total	271	100

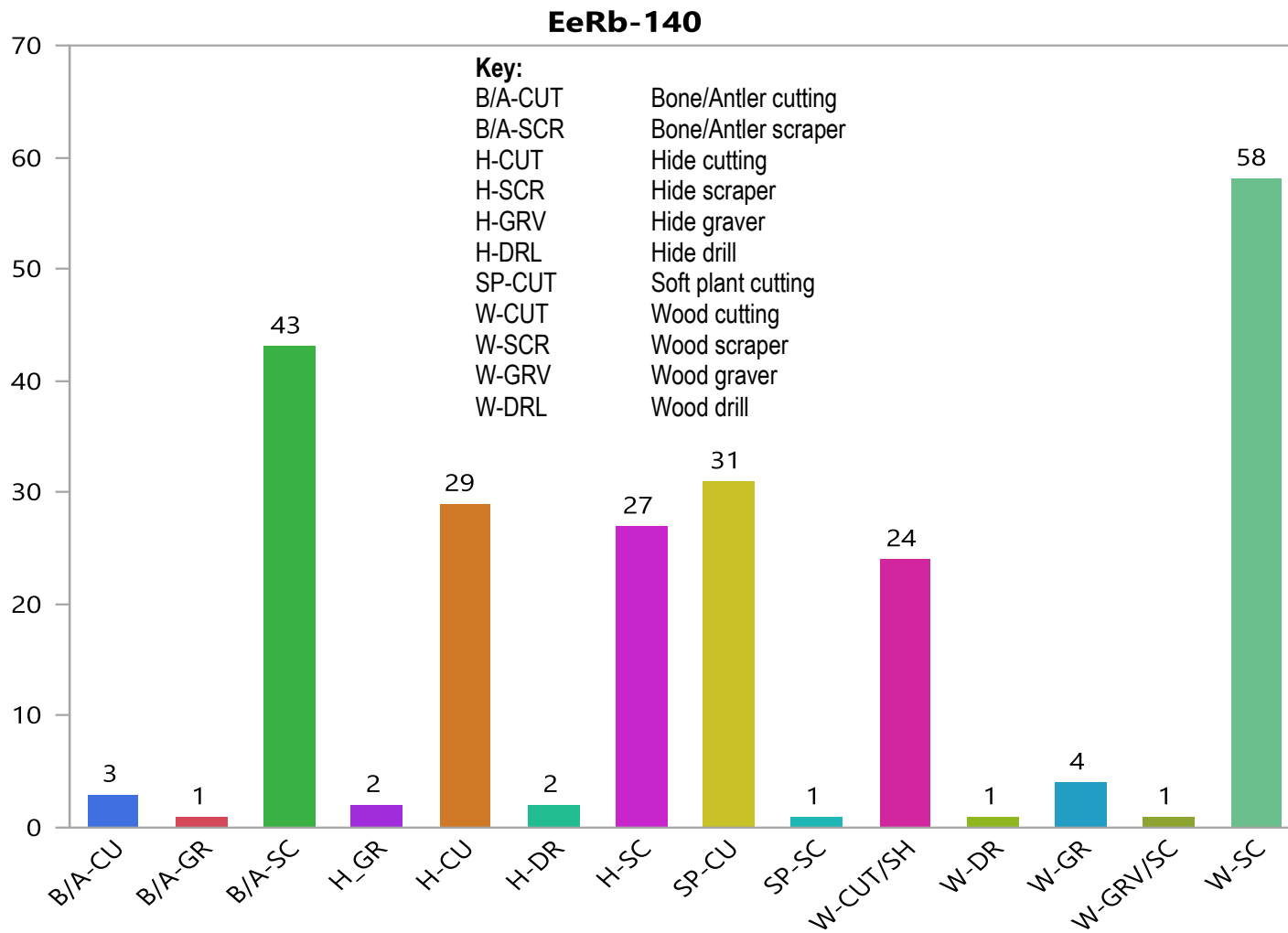


Figure 5.1. EeRb-140 use-wear determinations.

Plant cutting (n=31) and scraping (n=1)

Those microblades inferred to have been used for cutting soft plant materials exhibited very slight use wear, a pattern expected based on the experimental data. Plant-cutting tools were identified based on low frequencies of feather-terminated flake scars on one face, usually the dorsal surface. The presence of bright polish on the cutting edge is also characteristic of plant-working use wear. A single microblade (EeRb-140:608¹) was interpreted as having been used for scraping soft plant material. This inference was based on the presence very few feather-terminated microfractures on the ventral surface near the distal tip.

The general use-wear patterns observed on the 31 specimens are primarily characterized by contiguous feather-terminated small microfractures, with a few microblades bearing the occasional snap and step fracture. Two microblades were observed to have edge damage associated with side hafting the blades. Striations were absent and polish was observed on six specimens. One microblade (EeRb-140:1056; Figure 5.2) has relatively bright polish development on the dorsal surface. The polish is irregular in its distribution along the tool surface with what appears to be two distinct clusters of increased abrasive wear linked by a thin band of polish running parallel to the blade edge.

¹Note: the number to the right of the colon represents the artifact accession number.

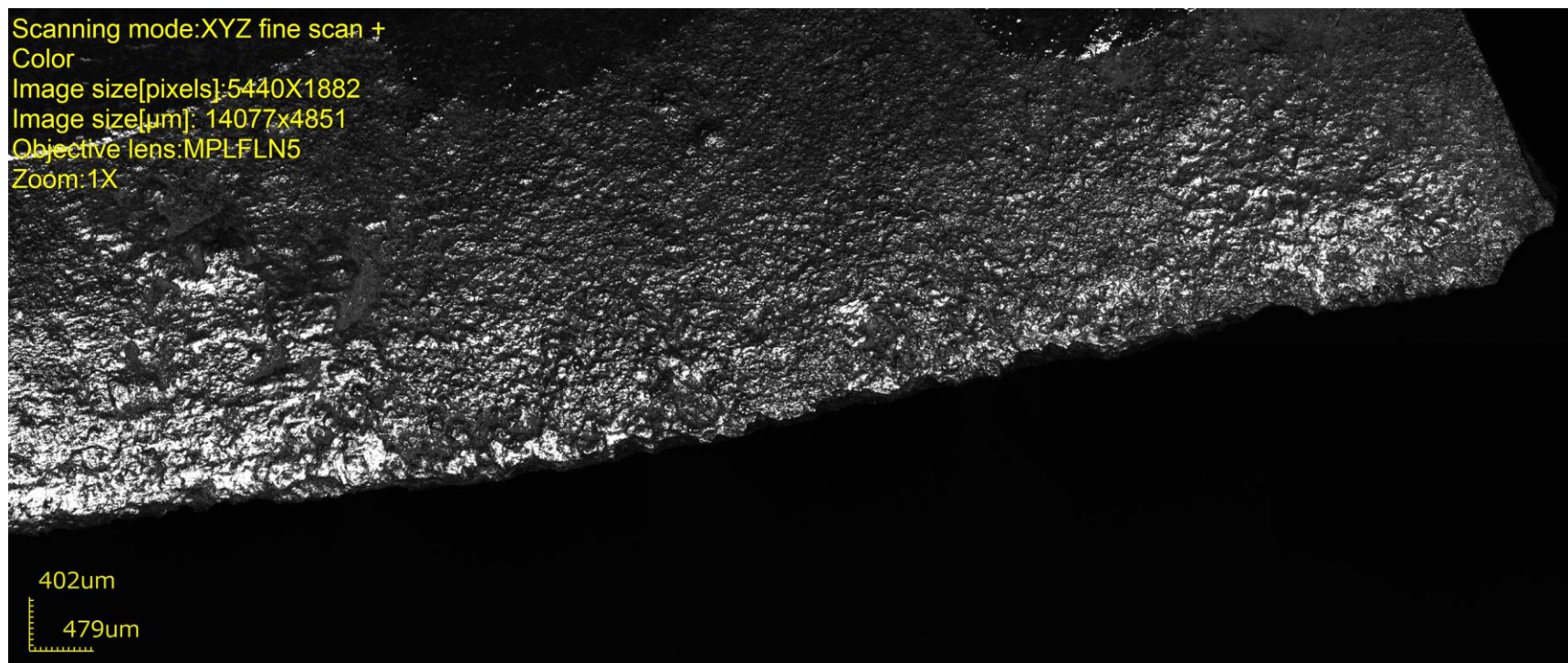


Figure 5.2. The ventral surface showing use-wear attributed to grass-cutting (EeRb-140:1056).

Hide cutting (n=29)

Use wear attributed to cutting hide or other soft animal tissue is similar in many respects to plant cutting damage, but with more abundant and larger flake scars. Hide cutting tools were defined by the presence of predominately bifacial edge damage with numerous feather- and step-terminated flake scars and the occasional snap fracture. The presence of bright polish along both dorsal and ventral surfaces was also indicative of hide-cutting activities. Some slight polish development was observed on six of the hide-cutting microblades, but was not as distinctive or bright as grass-cutting polish. A dull polish can be seen on the dorsal surface of a microblade (EeRb-140:1238; Figure 5.3) concentrated at the working edge and extending into the middle of the blade at an approximate 30° angle. There also appears to be a section of slightly brighter polish in between the two concentrations of microfractures.

Evidence for side hafting was recognized on three microblades; a fourth exhibited signs of being hafted in an entirely different manner, what I refer to as the bayonet method. Using this technique, microblades are placed into the end of a haft, but with one blade margin fully exposed to the contact material in such a manner that the complete hafted tool resembled a bayonet. The portion of the blade protruding from the haft opposite the working edge is supported or backed by the user's finger. Such positioning results in the development of substantial amounts of step fractures concentrated in a small section of the blade margin.

Hide scraping (n=27)

Microblades inferred as hide scraping tools exhibit similar use-wear as observed on hide cutting tools, in terms of the types of microfractures, their densities and orientation to the working edge. However, hide scrapers are differentiated from cutting tools by the predominance of unifacial edge wear in contrast to the bifacial wear present on cutting implements. For example, while four hide-cutting microblades were observed to have bifacial edge wear, the use-wear pattern on the remaining microblades was concentrated on either the dorsal or ventral surfaces. Evidence for hafting was not present on these tools. Polish was observed on only two microblades and was a similar dull polish to that described on hide-cutting microblades.

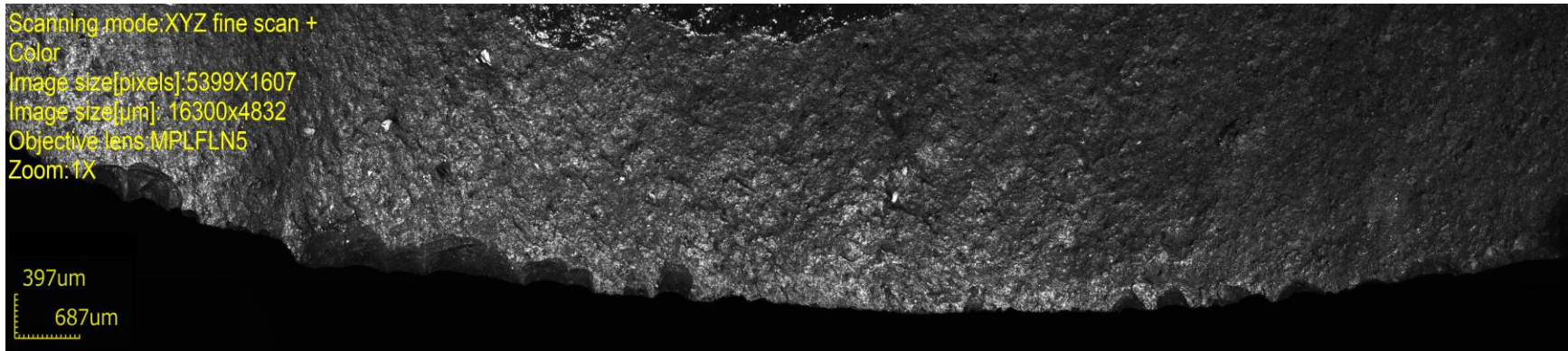


Figure 5.3. Use-wear attributed to hide cutting (EeRb-140:1238).

Hide drilling (n=2) and graving (n=2)

The rotary motion employed in drilling results in a distinctive bifacial wear pattern represented by a concentration of feather- and step-terminated at the distal tip of the tool. Tools used for drilling typically have alternating surficial wear patterns with flake scars along both margins. The tools interpreted as hide gravers are intriguing. Use-wear is concentrated at the distal tips and is represented by feather-terminated flake scars and snap fractures. While the wear pattern is consistent with graving functions, the purpose behind such behaviour is odd to say the least when considering the act of graving is more common for tasks related to wood, bone, or antler working.

The identification of microblades used for drilling or perforating is surprising given the poor results of the hide-boring experiments. However, since very few microblades were inferred to have been used as drills, it seems plausible that microblades were not the preferred tool for this task. Rather, it is far more likely that other, more suitable tool types were used for perforating hides, such as bone and antler awls, which are present in the Kamloops artifact assemblages.

Wood scraping (n=58)

Microblades attributed to scraping wood are the most common functional type represented in the utilized microblade assemblage from EeRb-140. As with hide scrapers, microblades used to scrape wood exhibit predominately unifacial edge wear with high densities of step and feather-terminated microscarring with the occasional snap fracture (e.g., Figure 5.4). Prolonged use results in increased numbers of step- and hinge-terminated flake scars that often extend deep into the body of the flake tool. Edge rounding was pronounced and microscars tend to be oriented perpendicular to the working edge. Polish occurred on some and was often slight. When present, polish development was focused close to the working edge.

Roughly a third of the wood scraping tools (n=19) had significant amounts of edge damage due to heavy use. These heavily used tools all had overlapping flake scarring and pronounced edge rounding (e.g., Figure 5.5). Slight amounts of polish were observed on nine wood scrapers concentrated nearest the working edge (e.g., Figure

5.6), as well as a few occurrences where polish was identified in the flake scars. Overall, polish development was slight and did not extend into the body of the tools.

Traces of hafting were detected on nine wood-scraping microblades, representing two different approaches to holding blades for use. Five microblades appear to have been side hafted based on differential wear patterns on opposing margins. The remaining four microblades all appear to have been used handheld. This interpretation is based on the presence of identical use-wear on both blade margins, but opposing faces (i.e., dorsal and ventral). The pattern of alternating marginal edge wear on these microblades is suggested as the result of holding the blade in both hands with the dorsal surface facing up and using it to scrape a wooded item in a manner similar to a spokeshave. In this scenario, when the original working edge becomes dulled, the user flips the blade over so that the ventral surface is facing up and continues to use the blade for the same scraping or planing task. The presence of the same type of edge damage along the entire lengths of both margins precludes the use of a haft as described above as the blade margin set into the haft would be protected from contact with the various materials being worked and would create a pattern similar to that seen in the side hafted specimens.

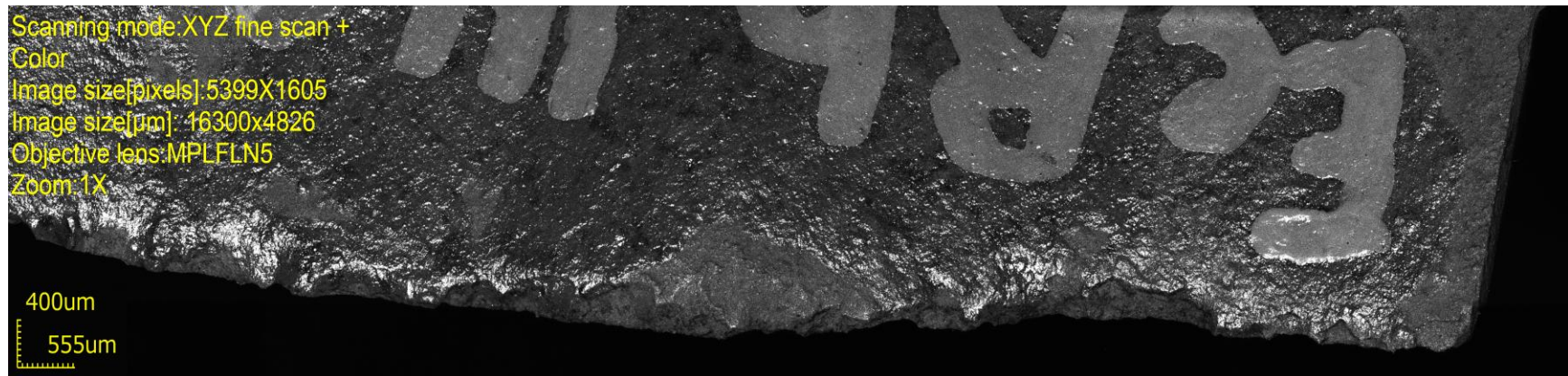


Figure 5.4. Edge damage attributed to wood scraping (EeRb-140:1484).



Figure 5.5. Damage attributed to scraping wood (EeRb-140:1675).

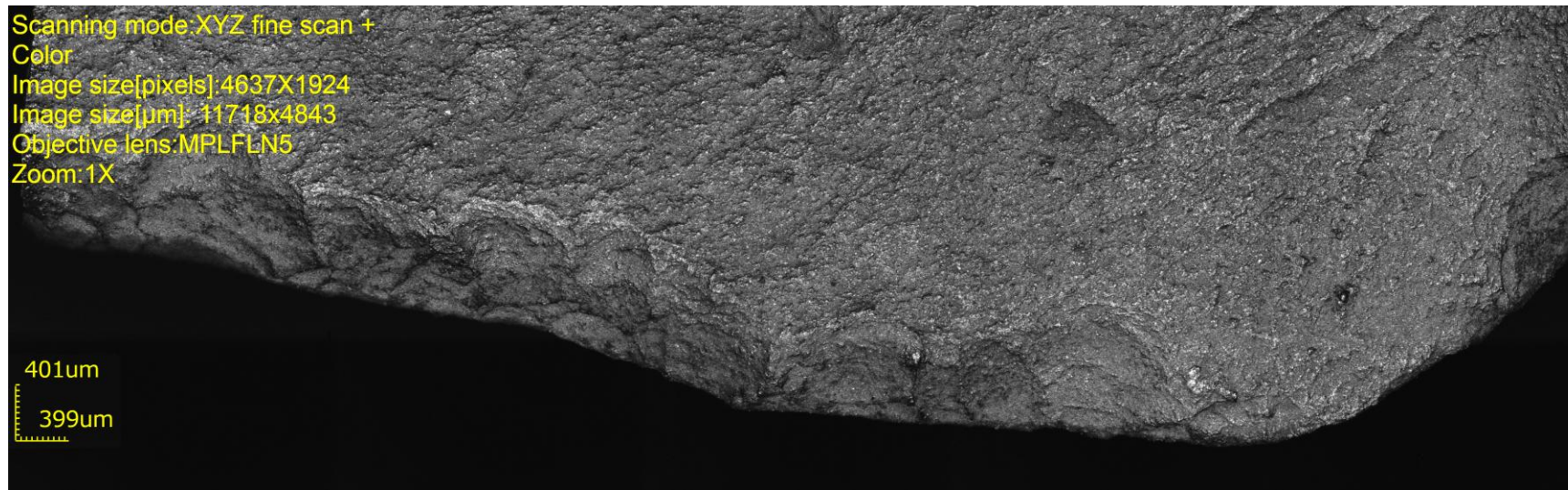


Figure 5.6. Laser image showing minute amounts of polish attributed to scraping wood (EeRb-140:1675).

Woodcutting and shaving (n=24)

The microblades interpreted as woodcutting and shaving implements exhibit wear similar to the experimental flake tools used for pruning small branches. Edge damage is primarily bifacial and is characterized by greater numbers of invasive step-terminated microscars and considerable edge rounding (e.g., Figure 5.7). Nine microblades exhibited polish that is bright, but not as glossy as evident on the grass-cutting and hide-working tools and not very invasive, concentrated nearest the blade edge (e.g., Figure 5.8). Striations were identified on three microblades all running roughly parallel to the working edge, a wear pattern expected for cutting functions (Martindale and Juracic 2006:420). Wear traces attributed to side hafting was observed on two only microblades

Wood graving (n=5) and drilling (n=1)

The wear patterns on these graving tools is characteristic of repeated, at times heavy incising of a material less dense than bone or dry antler, but more resistant than softer materials, such as hide. The patterns evident on these tools are similar in most respects to that observed on the experimental tools used for graving soaked antler. Wear is solely unifacial with feather, step, and snap fractures concentrated the distal tip and neighbouring blade margins. The wood drill has a pattern of unifacial use-wear on alternating margins. The wear is similar in terms of the location of use-wear to the hide drills, but microfracturing is more characteristic of contact with a harder material than hide (i.e., more step- and hinge-terminated flakes than feather terminations).

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Image size[μm]: 11759x4853
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Zoom:1X

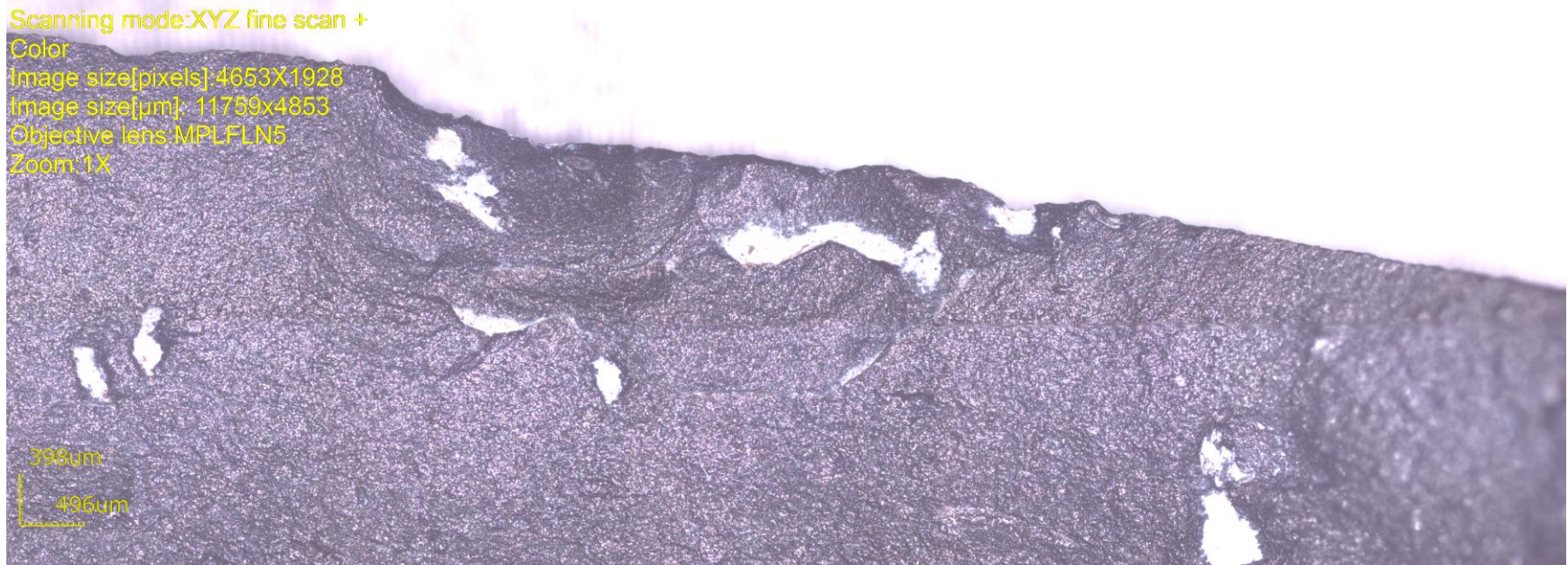


Figure 5.7. Edge damage attributed to cutting and/or shaving wood (EeRb-140:563).

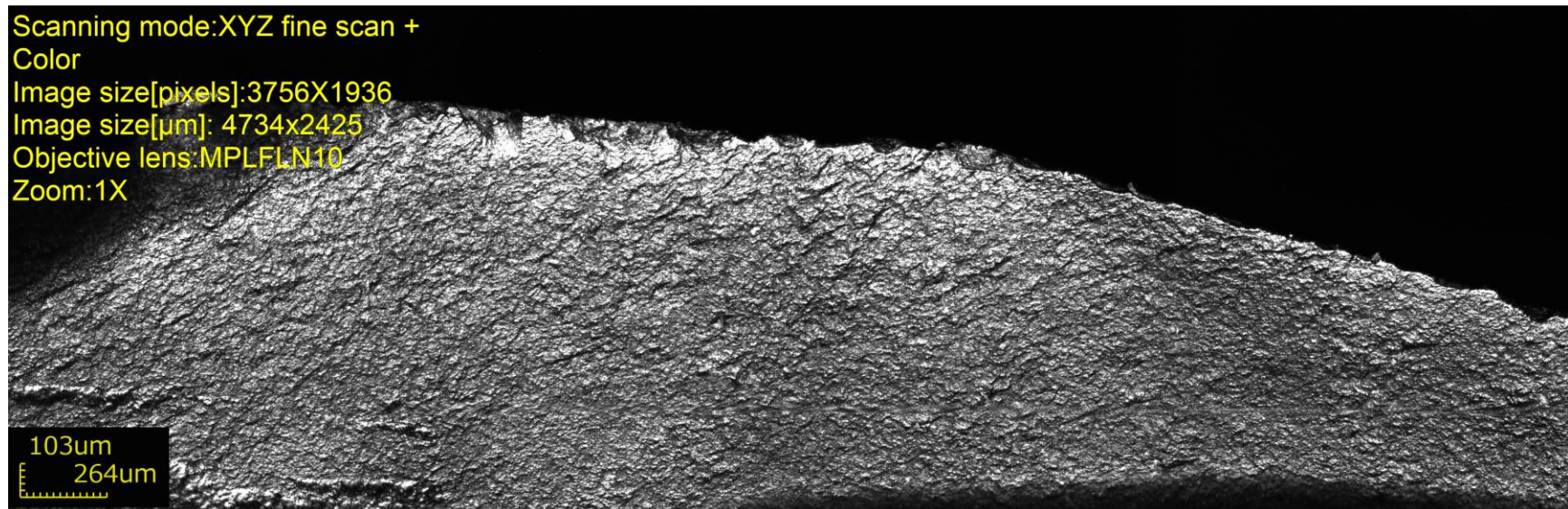


Figure 5.8. Laser image showing polish development on a microblade inferred as a wood shaving tool (EeRb-140:79).

Bone/Antler scraping (n=43)

Bone scraping tools are characterized by an overabundance of step and hinge terminated flake scars concentrated on one surface only (i.e., dorsal or ventral only) and, pronounced edge rounding. The size of flake scars, their abundance and the degree of invasiveness are generally greater in all respects when compared with those tools used for working less hard materials, such as wood. Edge rounding is more pronounced in microblades used to work hard objects such as bone and dry antler.

Bone and/or antler scraping was the second most common function of microblades at EeRb-140. Use-wear patterning on these tools indicated heavy use on a very hard contact material, represented by a preponderance of overlapping step-terminated flake scars. Many of the working edges exhibited considerable edge rounding and invasive flake scarring, at times extending almost into the middle of the blade body and clearly visible without magnification (e.g., Figure 5.9). Three microblades were so heavily used that the margins became denticulate in profile and at least two appear to have broken as a result of utilization. A bright polish was present on seven microblades and striations were observed on only one specimen. Fourteen microblades were assessed as bearing hafting related edge damage, representing three different modes: side hafting (n=7), bayonet-style (n=4), and hand held (n=3). Each of the microblades hafted in the bayonet style exhibit the same wear pattern described above. In addition, all of the hand-held microblades bear the same pattern of use-wear on alternating margins.

As mentioned above, this pattern of microblade function was surprising given the relative ineffectiveness of the experimental flake tools at working bone or antler, results supported by other experimental use-wear studies (e.g., Smith 2004). The effects of working hard materials were readily apparent and similar to those replicated in the experimental phase of this study: prominent edge rounding developing quickly coeval with numerous step-terminated flake scars. There is even evidence for use-related breakage of these tools, yet people apparently still chose to use microblades for bone/antler working functions given the demonstrated short use-life. This departure from expectations for microblade function, in terms of working bone/antler, must be related to other factors not accounted for in the experimental design.

Bone/Antler cutting (n=3)

The wear patterns described for bone/antler scrapers is repeated here, but with a few differences. Pronounced invasive overlapping flake scarring is still present, but is demonstrably more bifacial than evident on scrapers and flake scarring tends to be more oriented diagonal to the working edge (e.g., Figure 5.10). A bright polish was also identified on two of the three specimens. It is more likely that these microblades were used to create grooves in bone or antler items rather than for cutting through an object.

Bone/Antler graving (n=1)

A single bone/antler graving tool was identified in the microblades from EeRb-140. Like the other graving tools, wear is unifacial and isolated near the distal tip and the degree of edge rounding is significant. Given the fairly good performance of the experimental flake tools at graving antler, it is surprising that more microblades used for this purpose were not encountered.

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Color
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Image size[μm]: 11748x4850
Objective lens:MPLFLN5
Zoom:1X

479μm
343μm

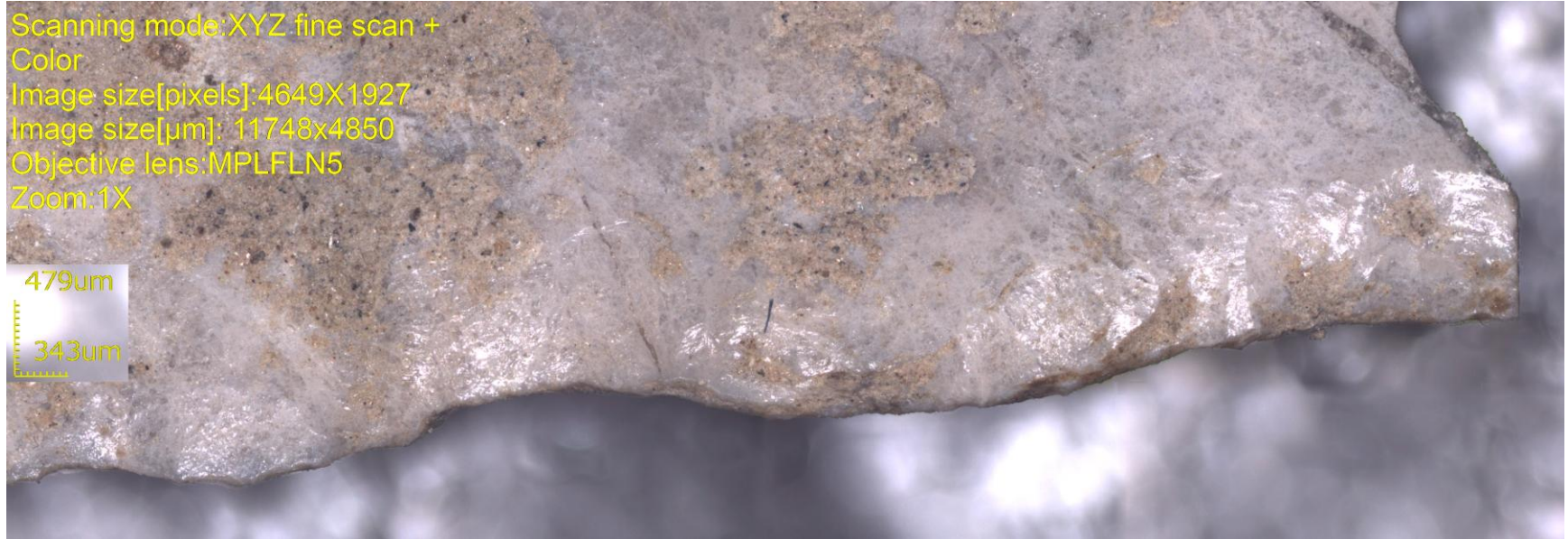


Figure 5.9. Edge damage attributed to scraping bone/antler (EeRb-140:1772).

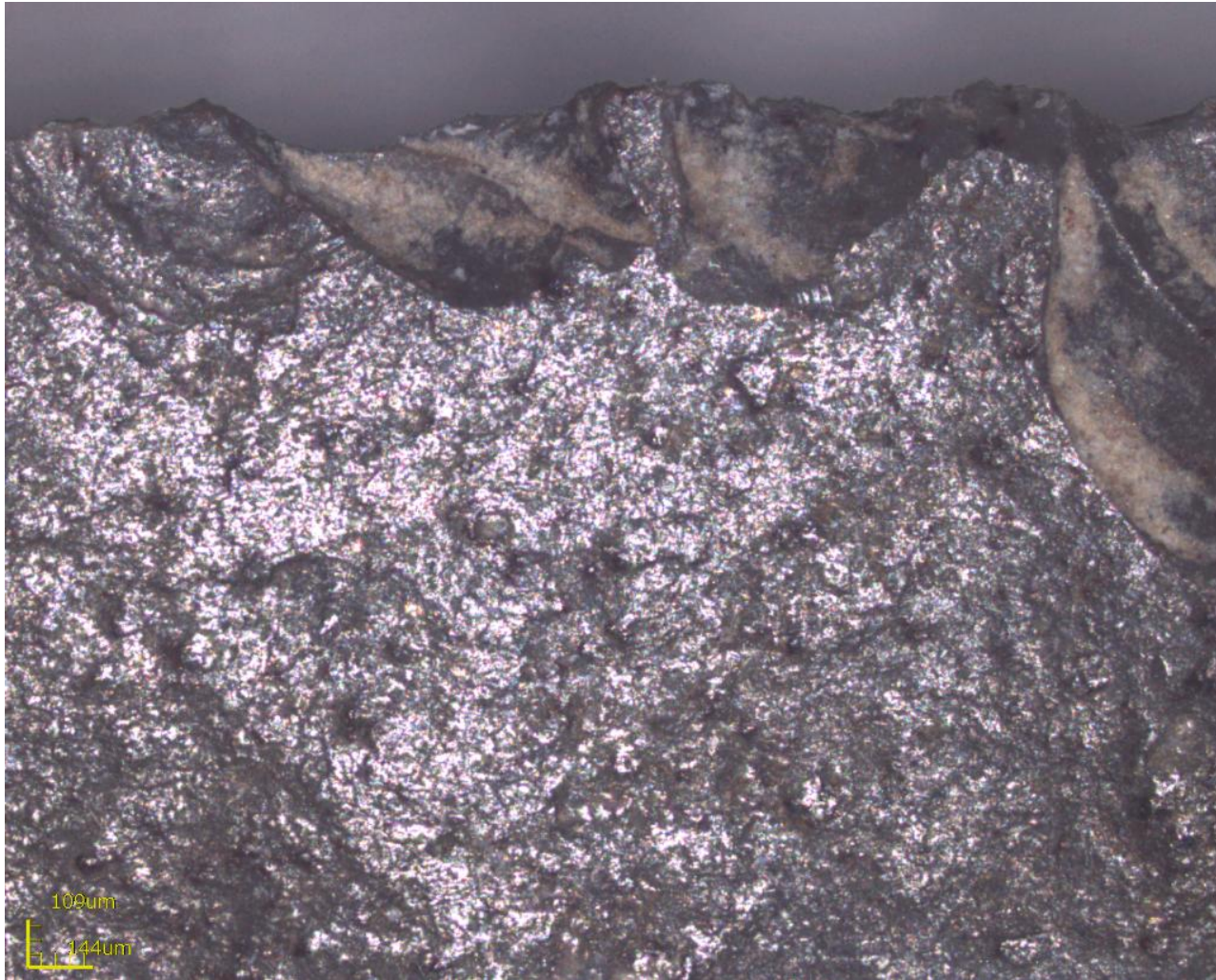


Figure 5.10. Colour image of edge damage attributed to cutting or shaving bone/antler (EeRb-140:1392).

5.1.2. **Site-Wide Distribution of Utilized Microblades and Associated Artifacts**

As mentioned in Chapter 3, microblades were encountered in the highest densities in excavation units nearest the terrace edge. The 19 excavation units placed parallel to the terrace edge produced 887 microblades, which represent 82% of the entire microblade assemblage from EeRb-140 (Table 5.2). Of these, Units 31 and 32 have the highest abundances of microblades containing a total of 357 microblades concentrated in the upper 25 cm of the cultural deposits. Microscopic analysis of these microblades found 99 specimens with evidence for utilization. Increased numbers of microblades in these units is suggestive of a single event in which these flake tools were produced *en masse* and utilized at this location.

Table 5.2. Distribution of utilized microblades across all excavation units at EeRb-140.

Unit																										
Level	1	2	3	6	8	9	10	11	13	15	16	17	20	21	25	26	30	31	32	33	34	N3W0	N4W13	N5W12	N6W13	N7W15
1	1	1																1					1			
2																		20	3			1				1
3				1		1					2					1	4	48	5	1		3				
4	1	1				2			12		3							6	15	5		2				
5	2	3	1			2		2			3									1	1				1	
6			1	3		1	5	2						4											1	
7				1		1	6	1		6				6	1											1
8			3	1		2				1				3			1									
9				1			1			2		1	1									2				
10				2	1																					2
11													1													
12				2																						
15				1													1									
Total	4	5	5	12	1	9	12	5	12	9	8	1	2	13	1	1	6	75	24	7	2	6	1	2	3	1

Unit 31 Utilized Microblade Assemblage

Of the 247 microblades recovered from the top 20 cm of Unit 31, 75 bear signs of use (Figure 5.11). The pattern of microblade functions evident in the Unit 31 assemblage is similar to that seen for the entire EeRb-140 utilized microblade assemblage where hide cutting and wood scraping are among the most common activities. In general, microblade use wear attributed to hideworking (n=27) and woodworking (n=25) indicates these to be the most common activities identified at this location (Table 5.3). Activities related to plant processing are also well represented. Bone/antler scrapers were identified in the utilized microblade assemblage, but in considerably smaller numbers than for EeRb-140 in general.

Only six other lithic artifacts were recovered from the microblade levels of Unit 31: four uniaxially and one biaxially retouched flake tools and an endscraper. The presence of an endscraper is interesting given the number of microblades used for working leather. The ethnographic, experimental, and use-wear data provide strong indications endscrapers were used for hide processing. Ethnographically, endscrapers were often used to remove the epidermis and endodermis of animal skins, as well as to thin the hide as necessary (Hayden *et al*, 2000: 197; also Ignace 1998:211). The association between the microblades used for hide scraping and cutting and the endscraper is intriguing and may provide good evidence for the presence of skin processing and preparation activities at this location.

Paleobotanical analysis of plant remains from the hearth features identified in Units 30 and 32 have provided evidence for the presence of open-pit cooking and plant processing at this location (Wollstonecroft 2002: 63). While the floral remains from Unit 31 are not as dense as neighbouring excavation units, the analysis found remains of Saskatoon berries, grass seeds, rushes, sedges, and Douglas-fir needles in the upper layers of the unit that correspond to the microblade-bearing levels (Wollstonecroft 2002: 63). Whether the microblades recovered from Unit 31 were used to process these plants at EeRb-140 is not known; however, given more than half of the microblades from Unit 31 were found to have been used to work soft plant materials and wood items, the possibility remains.

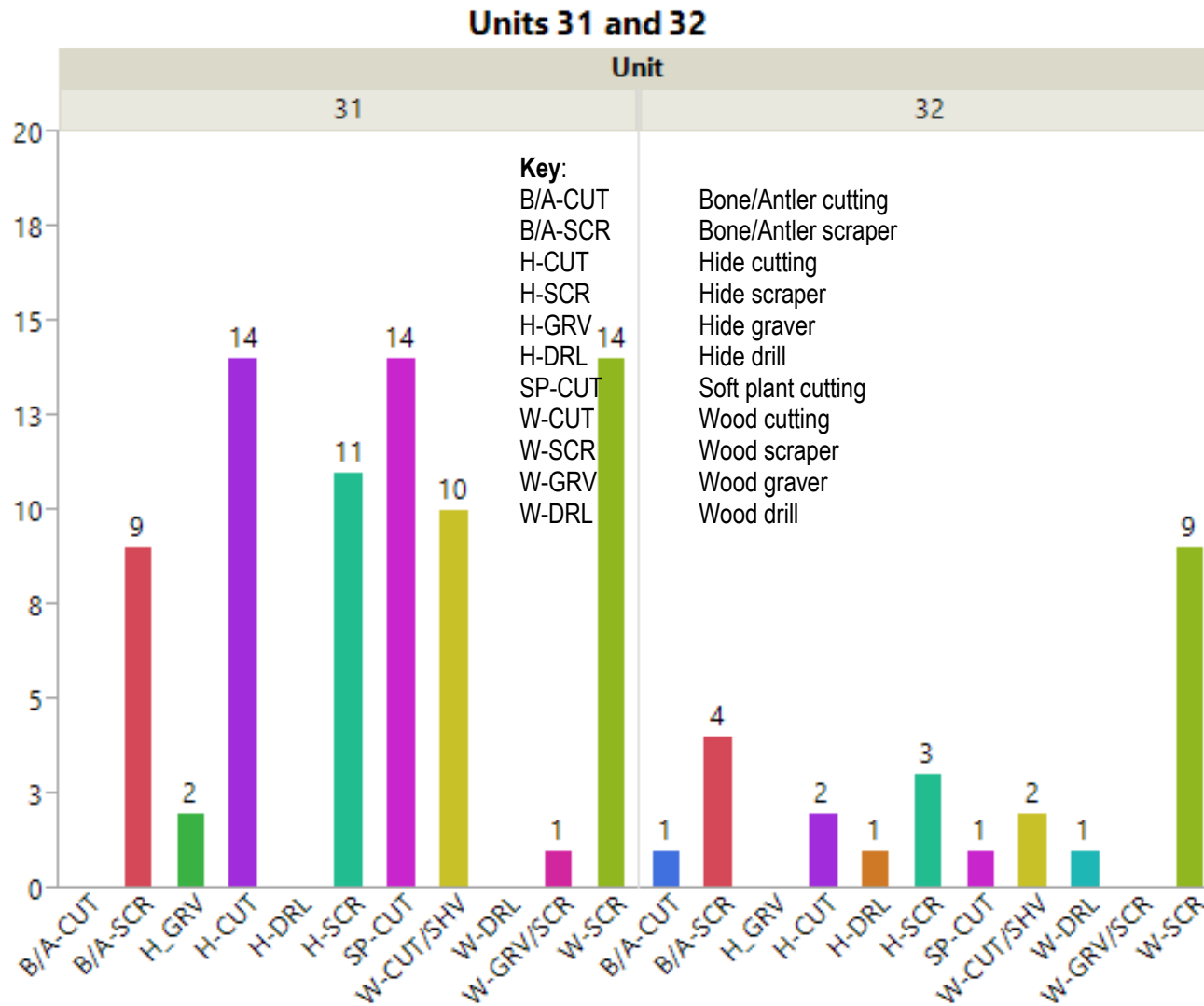


Figure 5.11. Use-wear determinations for microblades from Units 31 and 32 at EeRb-140.

Table 5.3. Frequencies and relative frequencies of microblade functions represented in Units 31 and 32 at EeRb-140.

Microblade functions	Unit 31		Unit 32	
	Frequency	Relative Frequency	Frequency	Relative Frequency
Plant cutting	14	18.4	1	4.3
Hide cutting	14	18.4	2	8.7
Hide scrapers	11	14.5	3	13.0
Hide drills	-	-	1	4.3
Hide gravers	2	2.6	-	-
Wood scrapers	14	18.4	9	39.2
Wood cutting	10	13.2	2	8.7
Wood drills	-	-	1	4.3
Wood gravers	1	1.3	-	-
Bone/Antler scrapers	9	11.9	4	17.5
Bone/Antler cutting	1	1.3	-	-
Total	76	100	23	100

Unit 32 Utilized Microblade Assemblage

Immediately adjacent to Unit 31, another 110 microblades were recovered from Unit 32. These artifacts were found in the upper 30 cm of the unit and are associated with a possible living floor superimposed over a hearth-like feature dated to 160 ± 50 years BP (Nicholas et al. *forthcoming*:27). Only 24 microblades from this unit exhibit use-wear, with three classed as indeterminate (Table 5.3). Woodworking, hide processing, and bone/antler working were identified in the utilized microblade assemblage, but plant processing was almost completely absent. Only one microblade was determined to have been used for cutting soft plant material. Wood scrapers (n=9) were the most common functional class identified, followed by bone (n=4) and hide scrapers (n=3).

Four other lithic artifacts were recovered from the microblade-bearing levels in this excavation unit: a formed uniface, a bifacially retouched flake tool fragment, a core fragment, and a hammerstone. The small unifacial tool recovered from this site is one of the few artifacts outside of the microblade assemblage made from the vitric tuff and may

be related to microblade technology. This artifact resembles a reworked, exhausted microblade core and appears to have been used as a wood scraper or shaver.

As previously noted, a hearth feature was identified below the living floor from which the majority of microblades were found (Nicholas et al. *forthcoming*:27). The analysis of archaeobotanical remains from this hearth feature identified sage, various grasses, herbs, and sedges, strawberry blight, chokecherry, raspberry or thimbleberry, Saskatoon, and wild onion, as well as Douglas-fir needles (Wollstonecroft 2002:63). In contrast to the abundance of plant remains represented at this location, only one microblade (level 3, 10–15 cm below surface) was found to have been used for plant processing. In contrast, the majority of utilized microblades from this location were identified as having been used for bone, woodworking, and hide scraping.

5.2. EeRb-144 Use-Wear Results

Only 55 (15.4%) of the 357 microblades from EeRb-144 were utilized (Table 5.4). Nine microblades were classed as indeterminate. The types of functions are similar in many respects to the pattern evident at EeRb-140, but with the limited range expected for a relatively small assemblage. Generally, microblades from EeRb-144 were most commonly used for wood cutting and scraping, followed by bone/antler scraping. Plant and hide working were the next most common functions (Figure 5.12).

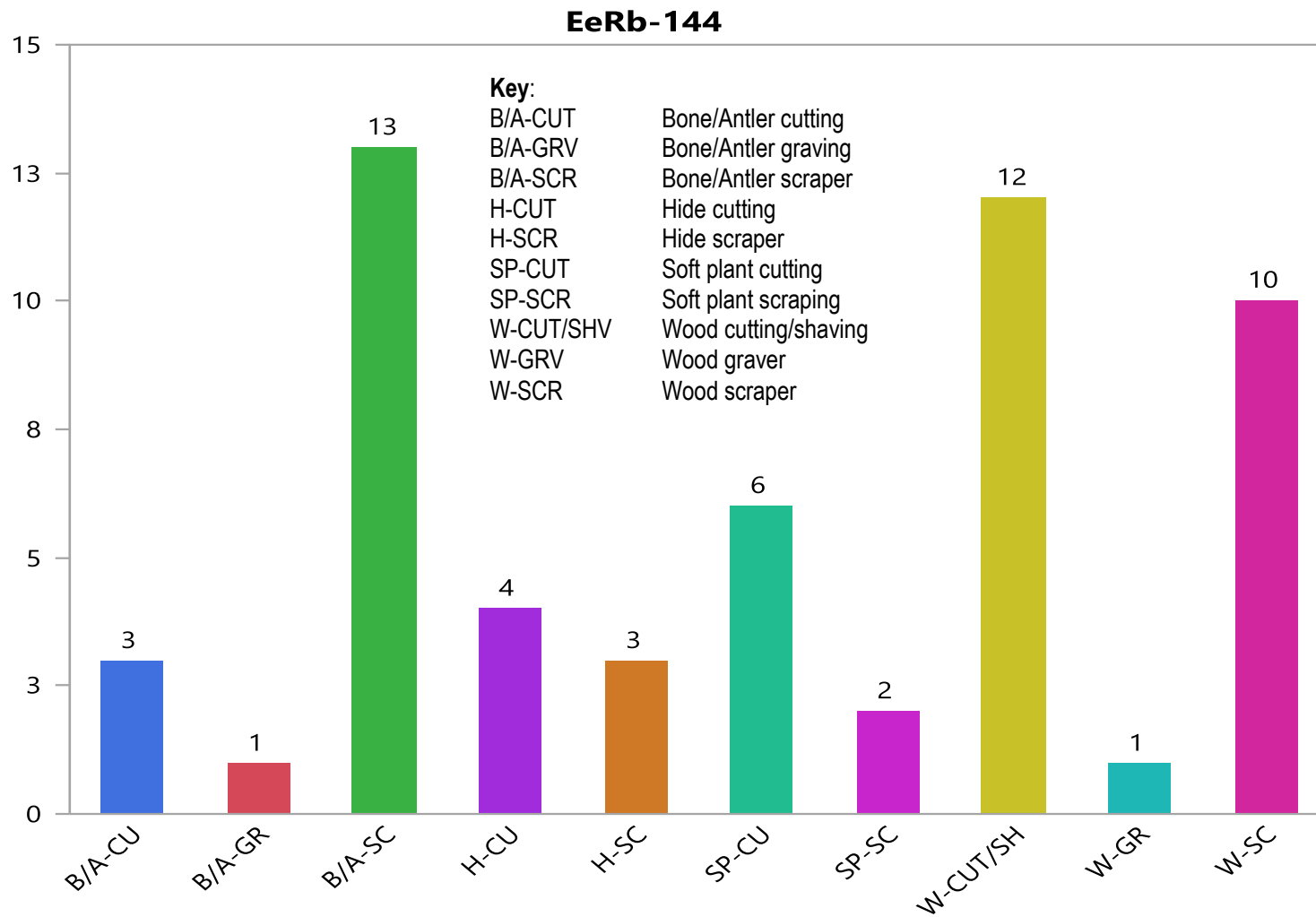


Figure 5.12. EeRb-144 use-wear determinations.

Table 5.4. Frequencies and relative frequencies of microblades functions represented at EeRb-144.

Microblade Function	Frequency	Relative frequency (%)
Plant cutting	6	9.3
Plant scraping	2	3.1
Hide cutting	4	6.3
Hide scraping	3	4.7
Wood cutting	12	18.8
Wood scraping	10	15.6
Wood graving	1	1.6
Bone/Antler scraping	13	20.3
Bone/Antler cutting	3	4.7
Bone/Antler graving	1	1.6
Indeterminate	9	14.1
Total	64	100

5.2.1. Task and functions represented

The range of functions represented in the utilized microblade assemblage from EeRb-144 is similar to those represented at EeRb-140. Ten distinct functional classes, shown in Table 5.4, were identified in the tools from EeRb-144 again showing a predilection towards working bone, antler and wood. Hide working was not as commonly identified in this assemblage as at EeRb-140.

Plant cutting (n=6) and scraping (n=2)

Use-wear patterns on the grass cutting microblades from EeRb-144 are identical to the tools identified at EeRb-140. Edge damage is slight, characterized by low to moderate amounts of feather-terminated flakes scars. The two microblades attributed to scraping soft plant materials also bear slight amounts of unifacial edge damage similar to the cutting implements, except for the occasional snap fracture present on the scrapers.

Hide cutting (n=4)

Microblades inferred as hide cutting tools at EeRb-144 all have the same wear pattern as observed for the EeRb-140 tools. Each microblade has increased amounts of the three types of microscars (feather, snap, and step fractures) as compared with plant cutting tools. Interestingly, unlike their counterparts at EeRb-140, polish was not observed on these tools. Striations were also absent.

Hide scraping (n=3)

Use wear on the scraping tools is unifacial and dominated by snap and feather-terminated microfractures with only a few step fractures observed. Wear patterns on these tools did not differ in any appreciable way to that observed on hide scrapers at EeRb-140.

Wood scraping (n=10)

Wood scrapers are the third most common functional class in the utilized microblade assemblage from EeRb-144. All but two of these tools exhibited unifacial

edge damage with use-wear similar in form to the wood scrapers from EeRb-140: larger, more abundant microscarring with increases in numbers of step fractures and snap fractures, to a lesser degree (Figure 5.13). Unlike the wood-scraping microblades at EeRb-140, only one tool was observed to have any polish development. No striations were apparent.

Woodcutting and shaving (n=12)

Woodcutting and shaving were the second most common uses for microblades at EeRb-144. These tools all display moderate to heavy use with bifacial edge damage in the form of numerous step- and feather-terminated microscars. Two microblades were interpreted as being side-hafted, while a third tool may have been end-hafted. Polish development, observed on only four specimens, was slight, concentrated nearest the working edge and somewhat dull in appearance (Figure 5.14). One of these utilized microblades (EeRb-144:405) was observed to have use wear most similar to experimental ET 13, which was used to cut birch bark—an interpretation supported by the numerous birch bark artifacts and remains collected from this site.

Wood graving (n=1)

The single wood graving microblade was found to have significant unifacial edge damage with high numbers of step- and feather-terminated microfractures concentrated on the distal tip. No polish or striations were observed on this specimen.

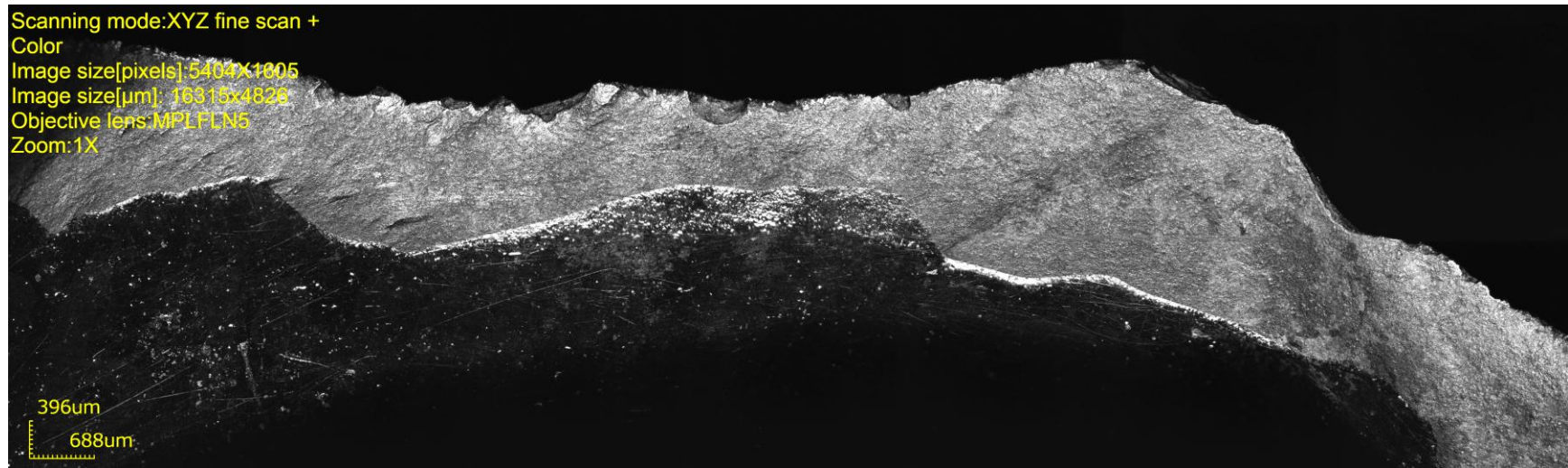


Figure 5.13. Use wear attributed to wood scraping (EeRb-144:1127).

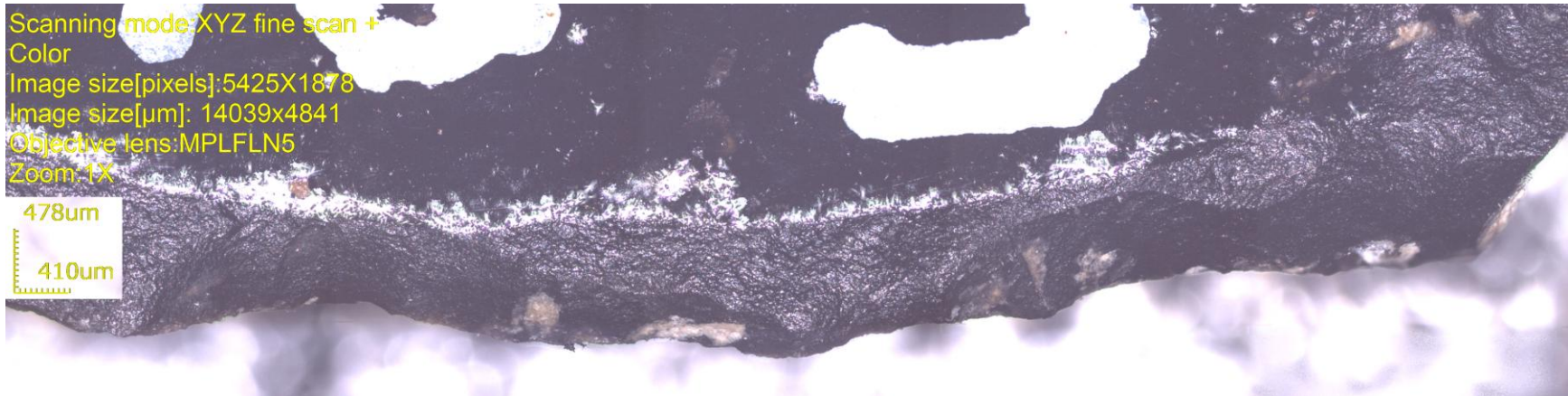


Figure 5.14. Use wear damage attributed to wood scraping/shaving (EeRb-144:1127)

Bone/Antler scraping (n=13)

Interestingly, bone/antler scraping was the most common function interpreted among the EeRb-144 utilized microblade assemblage. Scraping hard materials such as bone or antler results in the heaviest edge damage observed on the microblades. Microscarring is invasive with many step-terminated flake scars extending into the middle of the blade body and prominent edge rounding (e.g., Figure 5.15). Polish and striations were not observed on any of the bone/antler scrapers.

Bone/Antler cutting (n=3)

These microblades all exhibit significant bifacial edge damage with high abundances of step-terminated fractures and pronounced edge rounding. The working edges of these tools were often so heavily damaged from use that the blade margins often become distinctly irregular or denticulate in profile (e.g., Figure 5.16). Only one of these tools was identified as having been side-hafted. Polish or striations were not present on these specimens.

Bone/Antler graving (n=1)

This tool displayed unifacial microscarring solely to the distal tip as expected for graving implements. The wear patterns on this tool are identical to the damage observed on the bone/antler graving tool from EeRb-140 (i.e., unifacial use wear concentrated at the distal tip with significant edge rounding).



Figure 5.15. Edge rounding attributed to bone/antler scraping (EeRb-144:562).

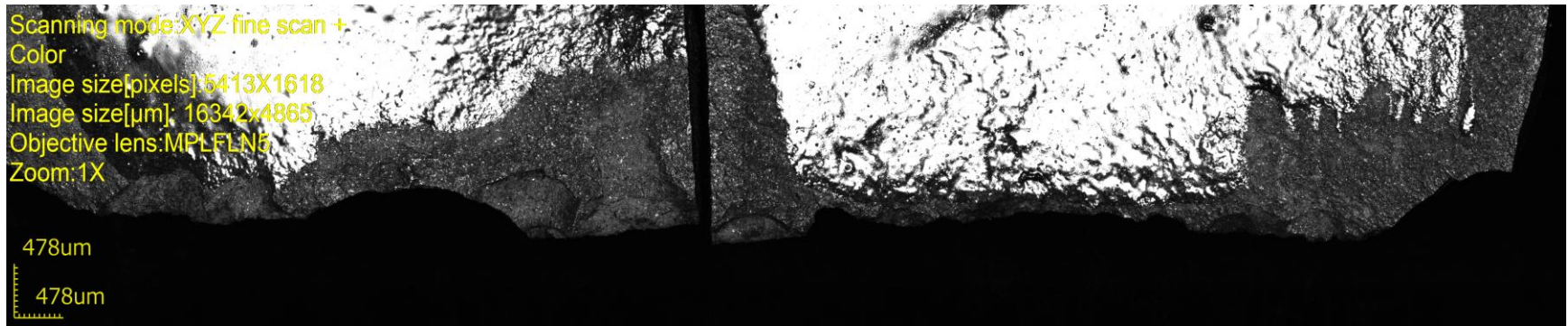


Figure 5.16. Use wear attributed to bone/antler cutting. Microblade appears to have broken during use (EeRb-144:996).

5.2.2. Site-Wide Distributions of Utilized Microblades and Associated Artifacts

Table 5.5 shows the horizontal and vertical distribution of microblades at EeRb-144. Although microblades were identified in more excavation units at the site compared with EeRb-140, the overall abundances at EeRb-144 are significantly lower. Of the 36 microblade-bearing units, only five have more than two utilized microblades. The densest concentrations of utilized microblades are found in Units N12E4 (n=8) and N11E8 (n=5).

The microblades from Unit N12E4 were recovered from levels 10 and 11 (45–55 cm below surface) above a component dated to $5,170 \pm 70$ years BP. These microblades display a functional pattern oriented towards bone/antler working with minor occurrences of hide scrapers, wood scrapers, and plant-processing tools. No other lithic artifacts were recovered in association with the microblades, but two unifacially and one bifacially retouched flake tools were found in levels 7 and 8 (30–40 cm), as well as a single *olivella* shell artifact.

This functional pattern, where microblades are preferentially selected for use in bone/antler and wood processing tasks, is also evident in Unit N11E8. This unit produced the second highest concentration of microblades at EeRb-144 (n=5) the majority of which were determined to have served as bone/antler scrapers (n=3). The remaining two microblades were used for wood-cutting and -scraping functions. The only other lithic artifact recovered from this unit was a unifacially retouched flake tool from level 4 (15–20 cm below surface) immediately above the microblade component of the unit.

Table 5.5. Distribution of utilized microblades across all excavation units at EeRb-144.

Level	Unit																	
	N10E8	N10E9	N11E11	N11E12	N11E5	N11E6	N11E7	N11E8	N11E9	N12E10	N12E11	N12E4	N12E6	N12E8	N13E15	N13E9	N15E11	N15E12
1																		
2																	1	
3																	1	1
4																		1
5	1							1			1				1			
6		2						1										
7		1		1														
8			1					3	1									
9			3			1	2									1		
10							1			2	1	4	1	1				
11					1							4						
Total	1	3	4	1	1	1	3	5	1	2	2	8	1	1	1	1	2	2

Table 5.6. Distribution of utilized microblades across all excavation units at EeRb-144 cont'd.

Level	Unit															
	N15E11	N15E12	N15E9	N17E5	N24E15	N25E21	N25E24	N8E12	N8E8	N8W0	N8W1	N9E12	N9E3	S11W17	S11W9	S15W25
1																1
2	1															
3	1	1	1		1			1						1	1	
4		1		1		1	1									
5									1			2				
6																
7										1						
8													1			
9											1					
Total	2	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1

5.3. Discussion: Patterns of Function in the Kamloops Utilized Microblade Assemblages

Microscopic analysis of the microblade assemblages from EeRb-140 and EeRb-144 revealed clear evidence of utilization oriented towards working a range of different contact materials. The microblade functions identified in this analysis indicate that these flake tools were used for a range of tasks. It was expected that the thin sharp blades would not be very effective at working harder materials, such as wood, antler, or bone, an assumption supported by the experimental data. However, my results indicate that microblades were more commonly used for working more resistant, hard materials, such as bone, antler, and wood, than they were for hide working or plant processing. In fact, wood and bone/antler working were the most common activities associated with microblades at the two lower terrace sites. This pattern is a significant departure from the assumed function of microblades as specialized tools made for specific tasks (Pokotylo and Mitchell 1998:97) or as elements in composite hunting weapons (Fladmark 1986).

Microblade technology at EeRb-140 and EeRb-144 appears to have served a multitude of functions, from plant processing to working hard bone or antler. The patterns evident in the use-wear data presented here departs somewhat from the expectations for the presumed uses for microblades at the Kamloops sites, namely that microblades, given their thin, yet very sharp edges, were assumed to have been best suited for functions, such as leather or hide working, and processing of other soft materials. While microblades from both sites appear to have been used to cut and scrape soft materials, these functions were not as common as anticipated; they accounted for only 35% of the utilized assemblage. Rather, almost 55% of the microblades from EeRb-140 and -144 were found to have been used for scraping, shaving or cutting hard materials, such as wood, bark, bone, and antler.

Many of these microblades were used on harder materials based on signs of heavy use in the form of contiguous, invasive step- and hinge-terminated microfractures, and significant edge rounding. Several specimens exhibited extremely heavy use-wear resulting in denticulated blade margins, invasive flake scars extending to the dorsal ridge, and breakage attributed to use. Such evidence of heavy usage was not

anticipated at the outset of this study as it was believed the thin edges of microblades would not perform well working hard materials.

Polish, while present on a sample of the utilized microblades, was often difficult to observe using low-power microscopy due to issues related to lighting, to raw material texture, grain, or sheen, and to other factors. The texture of the Ducks Meadow vitric tuff can have a very grainy, almost sugary appearance under 10X–80X magnifications, which made assessments of polish development on the experimental tools. The laser microscope images taken using the LSCM eliminated this problem and were a very effective method for observing the patterning and extent of polish development on a sample of the utilized microblades from EeRb-140 and EeRb-144. While polish was observed in the Kamloops microblade assemblage, it was never in great frequency or assigned with confidence given the limitations of the equipment and lighting and the limited data obtained from the experiments. Polish observed on the Kamloops microblades was thus recorded according to presence or absence, and features such as invasiveness, orientation to the working edge, and association with other wear were noted when possible. Striations were rarely identified, but when present their orientation to the working wedge was recorded.

Damage related to hafting was discernible in the Kamloops microblade assemblages and was identified on the basis of distinctive use-wear patterns. End- and side-hafted microblades were present in the Kamloops microblade assemblages. Despite the relative inefficiency of the experimental hafted blade-like flakes, the first two methods of hafting were anticipated based on the occurrences of hafted microblades at the Hoko River site (Croes 1995:182) and microblades found inset into a section of slotted bone or antler (Ackermann 2007:168-169; Waber 2011:58).

In addition to these methods of hafting, two alternative methods were also observed. First, a proportion of microblades appear to have been simply held in hand. Indeed the occurrences of alternating marginal use-wear on these blades can only be explained by grasping the microblade in hand during use. Once the blade margin became too dull to be effective, the blade could then be rotated 180° crosswise and work is continued. Although using a small blade while held in the hand is not necessarily

efficient for all tasks, as demonstrated in the experiments it does have certain advantages. For example, one of the problems noted with using side-hafted microblades is the tendency for the tool to become clogged with tissues requiring frequent cleaning of the blade (Hutchings 1996:172). End hafting or simply holding the blade in hand mitigates this issue by keeping the haft away from the contact material (Hutchings 1996:173).

The second hafting method identified in the Kamloops microblade assemblages is the “bayonet method,” which can be viewed as an extension or hybridization of end- and side-hafting. This technique appears to be based on inseting a microblade into the end of a wood or other haft in a manner similar to a bayonet such that one entire blade margin is exposed. The opposing margin is partially embedded into the haft leaving only a small portion of the blade exposed. The presence of numerous overlapping step fractures in a confined area of the small exposed portion of the blade is indicative of backing the blade during use with a finger perhaps. Using a microblade in this manner would have been an effective means to improve the cutting ability of the flake tool while decreasing the likelihood of breakage.

5.4. Chapter Summary

Deviating somewhat from expectations, the results presented here indicate microblade utilization was not oriented towards a specific or narrow suite of activities, such as hunting (Fladmark 1985:49); rather microblades were used for a wide range of activities on an array of contact materials (e.g., wood, bone, antler, hide). Based on poor test results during the experimental stage of this study, it was expected that microblades would not have been used for working hard materials, such as wood and bone. However, such was not the case—damage patterns on the microblades were frequently attributed to working harder materials.

Four distinct hafting methods were also inferred from the utilized microblades: end and side hafting, bayonet style, and hand held. The former two manners of using microblades have been previously identified in archaeological contexts (e.g., Hoko River [Ames and Maschner 1999; Croes 1995]). The latter two hafting methods, bayonet style

and hand held, have been noted by other researchers (Odell 1994), but have not been recognized in microblades from the Interior Plateau.

Finally, the spatial patterning evident in the distribution of microblades at EeRb-140 is suggestive of discrete microblade production areas within the site concentrated nearest the terrace edge. In these locations, microblades were recovered in the highest densities suggesting a pattern of mass production of these flake tools likely for immediate use. It is interesting to note that relatively few other tool types were found in association with these clusters of microblades and those tools that were appear to be related to functionally-specific tasks inferred for the utilized blades (i.e., endscrapers and hide working microblades). These associations, where present, further support the functional inferences derived from my use-wear analysis.

Chapter 6. Conclusions

The goal of this research was to explore the function of microblades as represented in the assemblages from EeRb-140 and EeRb-144. Informed by the results of the experimental program, an analysis of microscopic use-related edge damage was used to infer the general task and function for each utilized microblade. Traditional models for microblade function in Interior Plateau contexts often describe these small, sharp blades as armatures on composite hunting implements (cf. Fladmark 2009) or as specialized tools designed for specialized purposes (cf. Pokotylo and Mitchell 1998). Other functional studies, however have suggested that microblades were ideal for a multitude of purposes and a wide range of tasks. The results presented here have offered a test of and confirmed the hypothesis that microblades, at least as represented at EeRb-140 and EeRb-144 were in fact multifunctional in nature.

In this chapter, I compare my use-wear results with these traditional models and explore possible activities for which microblades may have been employed. While the activities I suggest are associated with microblades are based on ethnographic analogy, they serve as starting points for exploring questions of why microblade technology was selected for over unmodified or modified flake tools. Given that this study was not exhaustive in terms of the materials used in the experimental phase, I provide several suggestions for future use-wear research. I conclude the chapter with a brief discussion on the role risk is assumed to play in structuring human behaviour (i.e., Bleed 2002; Elston and Brantingham 2002).

6.1. Testing the Hypotheses

The use-wear evidence presented in the last chapter differs considerably from the expectations for microblade use in the Interior Plateau in which these artifacts had a single purpose—either as armatures on composite hunting weapons or as specialized

tools used for specialized task. If used as armatures on composite hunting weapons, then it is reasonable to assume the microblades collected from the two Kamloops sites represent the leftovers of composite projectile point manufacture and maintenance. Following this theory, if their intended function (i.e., hunting) was elsewhere on the landscape, it would be expected that the microblades from EeRb-140 and EeRb-144 represent the residues of the gearing up process and would not bear any use-related edge damage. This, however, was not the case as suggested by the results of my use-wear analysis. Rather, microblades appear to have served as cutting and scraping tools.

Microblades also do not appear to have been specialized in terms of their function. If microblades were a specialized technology designed for a specific task (e.g., Pokotylo and Mitchell 1998:87), then it is expected that use-wear patterns would demonstrate a strong tendency towards a more limited range of functional types identified in the utilized microblade assemblage. What the results of my analysis reveal, however, is that the microblades recovered from EeRb-140 and -144 appear to have served a variety of functions, from bone and antler working to woodworking to plant processing. Thus, the hypothesis that microblades specific in purpose is not supported by the Kamloops use-wear results.

While the use-wear data are not consistent with previous theories of microblade function, the patterns observed here—in particular the multifunctional nature of microblades—have been noted by other researchers (e.g., Campbell 1985; Greaves 1999; Hicks 1997). These studies describe microblades as being used for cutting and scraping plants, hide, and meat. However, the functional interpretations from EeRb-140 and -144 indicates that while some microblades were used to cut and scrape soft materials (e.g., hide, soft plants), the primary use seems to be for scraping, shaving or cutting hard materials, such as wood, bark, bone, and antler. In fact, many of the microblades bore signs of intense use on hard materials significant macroscopically visible edge rounding and denticulated blade margins, as well as obvious use-related breakage. This type of heavy usage pattern was not anticipated at the outset of the use-wear analysis component, given how poorly the experimental tools performed at bone and antler working tasks. In addition, microblades most likely were used during the finishing stages of manufacture for fine carving and finishing, or even decorating various items. Hilary Stewart (1981:77) suggests that microblades would have been ideal for

incising, scraping, and very fine whittling. As such, these small blades would have acted as a prehistoric analog to a modern razor blade or utility knife used for fine work.

6.2. Activities Associated with the Kamloops Microblades

What do these results tell us about the various activities microblades were employed in? There is good evidence they were used in the manufacture and maintenance of hunting, fishing, and gathering implements. The multifunctional nature of microblades at both EeRb-140 and EeRb-144 would suggest that these flake tools were used for a wide range of activities at these locations, while being notably absent from comparably aged components at EeRb-77, less than a kilometer away. However, I suggest that microblades were likely not used during primary shaping or reduction of an item, whether wood, bone, antler, or hide. Instead, they would have been better suited to the finishing stages of manufacture or for fine carving and decorating of various items such as antler digging stick handles, arrow shafts, and bone tools.

Birch bark was an important resource for the Secwepemc and was used for a host of purposes, such as fire starters, for lining storage pits, wrapping salmon, and for making baskets, cradles, and canoes (Nicholas et al. *forthcoming*:39). In fact, Teit (1909: 477) notes that the Secwepemc were well known for the great quantity and fine quality of birch bark manufactures. The abundant birch bark remains recovered from both sites attest to the importance of this material in pre-contact times. While no manufactured items (i.e., baskets) were identified at either EeRb-140 or EeRb-144, nine specimens from the same general area in EeRb-144 show signs of possible cut marks with the remainder of the bark remains likely representing production debris (Nicholas et al. *forthcoming*: 40). Based on the use-wear data, microblades were likely used to work birch bark at the lower terrace sites and may have been important tools in the procurement and manufacture of these various birch bark items.

Leather working was also prevalent in the use-wear analysis and, experimentally, microblades have proved to be efficient and effective tools for this task. Teit (1906, 1909) provides many illustrations of hide items for which microblades could have been used, including clothing, bags, and pouches. For many such items, hides had to be cut into the patterns or forms that then were sewn into various articles (Teit 1900:206-211)

or were cut into strips for lacing, belts, or decoration (Teit 1900:207-209; 1909:499-500). Many of the ethnographic examples of traditional Secwepemc clothing are decorated with fringed borders (Teit 1909:502). It is possible that the microblades from EeRb-140 and EeRb-144 were used for such activities as these

Plant processing was the least common activity represented in the utilized microblade assemblages from EeRb-140 and EeRb-144. Grasses served many purposes for the Secwepemc and were often woven into mats for open-hearth food processing (Wollstonecroft 2002:66), but may also have been used as ground cover. Teit (1909:493) reports that woven grass mats were occasionally used for siding summer lodgings and pieces of woven grass mats would sometimes be folded in half and sewn up along the sides to make a bag or wallet (Teit 1909:497-498). The use of grass matting for the purpose of processing berries and other economically important plant species at EeRb-140 is hinted at a concentration of grass seeds in the Unit 30 hearth feature (Wollstonecroft 2002:65).

Finally, it is important to note the activities that do not seem to be associated with microblades, in particular cutting fish and meat. Given the association of microblades with salmon processing as represented at the Hoko River site in Washington (Croes 1995), it was presumed that these tools would have acting in similar capacities. My use-wear analysis, however, did not identify any microblades as having been used for such tasks. This pattern may be a reflection of the soft texture or resistance of ungulate and salmon flesh, which is not conducive to the development of any recognizable use-wear as demonstrated in the experimental program. It may be entirely possible that microblades were in fact used for such tasks, but are not easily identified due to the near complete absence of edge modification. Further high-powered use-wear analyses may be needed to answer the question of whether microblades were employed for butchering ungulates or fish.

6.3. Why Microblades?

The results of the use-wear analysis of the microblade assemblages from the two Kamloops sites presented here indicate that microblade technology played a variety of functional roles. The documented range of subsistence activities at EeRb-140 (Nicholas et al. *forthcoming*; Wollstonecroft 2002) and the frequent association of these activities with microblades provide a hint of the potential role of these tools in food processing tasks. However, the majority of microblades from EeRb-140 and EeRb-144 appear to have been used for working wood, bone, and antler, which suggests that these flake tools served as fine finishing implements as Hilary Stewart suggests (1981) for the coastal microblades. If microblades were used for a variety of purposes as the use-wear data suggest, then the question remains as to why did people choose to make and use microblades rather than simple, expedient flake tools, especially given the increased level of effort in microblade core preparation?

A common theory for the appearance and proliferation of microblade technology suggests these tools reflect a lithic economy oriented towards minimizing risk (Bleed 1986; Elston and Brantingham 2002; Torrence 1989, 2002). In this case, microblades could be viewed as a technological response to the perceived risks related to provisioning through long, harsh winters when resources, both lithic and subsistence, are scarce or difficult to access and when failure to procure sufficient resources has dire consequences (Elston and Brantingham 2002:112). To deal with the uncertainty of the hunt or unequal access to resources, it is advantageous for people to organize their tool technologies in such a manner that procuring, making, using, transporting, and discarding tools lessens these risks (Nelson 1991:57; Torrence 1989:59). The adoption of microblade technology is viewed as one such means of risk minimization for people moving into new, unfamiliar environments, for example, or responding to shifts in the distribution and abundance of economically important resources (Torrence 2002:183).

Microblade technology is viewed as a means to mitigate risk because of two key characteristics. First, microblade cores are very efficient in terms of the ratio between material used and amount of cutting edge produced when compared with other flake production technologies (Waber 2011:35; Whittaker 2005:221). The economical nature of microblade production no doubt made them well suited to a settlement-subsistence

strategy based on high mobility where people no doubt had to cope with risky circumstances, such as a patchy resource base (Torrence 2002:183). The conservation of lithic raw material was likely a primary concern where the locations of suitable tool stone are variable, unknown or inaccessible due to seasonal constraints (i.e., frozen ground [Rousseau 2004:7]).

Second, microblades offer relative flexibility with respect to their function. As demonstrated in the results of this study, microblades were used for a wide range of tasks and functions. In fact, the effectiveness and flexibility of microblade technology given the small core size, not to mention the abundant cutting edge produced with little waste, makes this technological tradition well suited to a settlement-subsistence strategy based on high mobility (Torrence 2002:183; Waber 2011:35; Whittaker 2005:221). While the archaeological record of the Middle Period of the Interior Plateau is not as well understood when compared with the Late Period, the available evidence indicates people were practising a settlement and subsistence strategy oriented towards high residential mobility and a focus on large game (Prentiss and Kuijt 2004a:xi). In such cultural adaptations, microblades and cores would have been an important aspect of a risk-minimizing technological strategy. There are likely a host of extraneous factors, such as environmental shifts, movement of people across the landscape, or even the time of year that played a role in structuring the decision to employ microblades for a particular task rather than using simple flake tools.

One such factor that may have influenced the decision to adopt microblade technology is the original shape of raw material available. Microblade cores all have characteristic flat to concave platforms. A flat platform can either be created through bipolar percussion or one can take advantage of a stone's natural tabular form or planar surface. The Ducks Meadow vitric tuff occurs in natural tabular forms at the primary source location and can be quickly turned into microblade cores through simple freehand percussion as described in Chapter 4. Given the strong tendency towards the preferential selection of the vitric tuff for microblades at the Kamloops sites (see Chapter 3), it is possible that the natural form was a key factor in the decision to use this material for blade manufacture. In addition to this, the vitric tuff flakes well and predictably with a minimum of hinge and step fractures and produces very sharp flakes. It follows then that

the availability, abundance and nature of local lithic raw materials had a structuring effect on the lithic economy of the ancient inhabitants of the South Thompson Valley.

6.4. Conclusion

This study has shown that the microblade assemblages from the Kamloops sites served a diverse range of functions from bone/antler working to plant processing. These results do not conform to expectations for microblade use as suggested by the two theories outlined at the beginning of this study. The microblades recovered from EeRb-140 and EeRb-144 do not appear to have acted as elements in composite hunting implements nor were they specialized in terms of function. While these two theories permeate much of the speculation on microblade function, the few studies that have explored potential uses of these tools have all suggest that microblades were indeed used for a variety of purposes (e.g., Campbell 1985, Greaves 1991; Hicks 1997). My study has revealed that microblades were most commonly used for processing wood, bark, bone, and antler at EeRb-140 and EeRb-144. The functional inferences observed in the Kamloops microblade assemblages indicate a degree of multifunctionality consistent with these previous studies. Further experiments using different stone types on other contact materials in combination with both low- and high-power magnification use-wear analyses of microblades from other sites in the Interior Plateau and elsewhere will only serve to increase the knowledge base around microblade function.

My study provides additional insight into the use of this tool type within a particular setting over time. Whether or not it helps to resolve the microblade question regionally is uncertain. This study does, however, provide new insights into their use at two multi-component sites and sets the stage to pursue additional research questions. The South Thompson Valley has proven to be a key locus of microblade technology in the Interior Plateau and thus is well suited for further research into microblade function. With more solid information regarding the uses of these unmodified flake tools, it may be possible to develop a clearer understanding of the question "Why microblades?"

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Appendix

EeRb-140 XRF Results

**X-Ray Fluorescence Analysis of Artifact Obsidian from the
Kamloops Reserve Site (EeRb-140), British Columbia, Canada**

Craig E. Skinner and Jennifer J. Thatcher
Northwest Research Obsidian Studies Laboratory

Two obsidian artifacts from the Kamloops Reserve Site (EeRb-140), British Columbia, Canada, were submitted for energy dispersive X-ray fluorescence trace element provenance analysis. The samples were prepared and analyzed at the Northwest Research Obsidian Studies Laboratory under the accession number 2010-116.

Analytical Methods

X-Ray Fluorescence Analysis. Nondestructive trace element analysis of the samples was completed using a Spectrace 5000 energy dispersive X-ray fluorescence spectrometer. The system is equipped with a Si(Li) detector with a resolution of 155 eV FWHM for 5.9 keV X-rays (at 1000 counts per second) in an area 30 mm². Signals from the spectrometer are amplified and filtered by a time variant pulse processor and sent to a 100 MHz Wilkinson type analog-to-digital converter. The X-ray tube employed is a Bremsstrahlung type, with a rhodium target, and 5 mil Be window. The tube is driven by a 50 kV 1 mA high voltage power supply, providing a voltage range of 4 to 50 kV. For the elements Zn, Rb, Sr, Y, Zr, Nb, and Pb that are reported in Table A-1, we analyzed the collection with a collimator installed and used a 45 kV tube voltage setting and 0.60 mA tube current setting.

The diagnostic trace element values used to characterize the samples are compared directly to those for known obsidian sources reported in the literature and with unpublished trace element data collected through analysis of geologic source samples (Northwest Research 2010a). Artifacts are correlated to a parent obsidian source (or geochemical source group) if diagnostic trace element values fall within about two standard deviations of the analytical uncertainty of the known upper and lower limits of chemical variability recorded for the source. Occasionally, visual attributes are used to corroborate the source assignments although sources are never assigned solely on the basis of megascopic characteristics.

Additional details about specific analytical methods and procedures used for the analysis of the elements reported in Table A-1 are available at the Northwest Research Obsidian Studies Laboratory World Wide Web site at www.obsidianlab.com.

Results of Analysis

X-Ray Fluorescence Analysis. The trace element composition of the two obsidian artifacts that were characterized by X-ray fluorescence analysis indicates that they both originated from Anahim (also known as Obsidian Creek), a well-known prehistoric source of obsidian located in British Columbia, Canada. The locations of the site and the obsidian source are shown in Figure 1. Analytical results are presented in Table A-1 in the Appendix and are summarized in Table 1 and Figure 2.



Figure 1. Locations of the project site and the source of the artifacts.

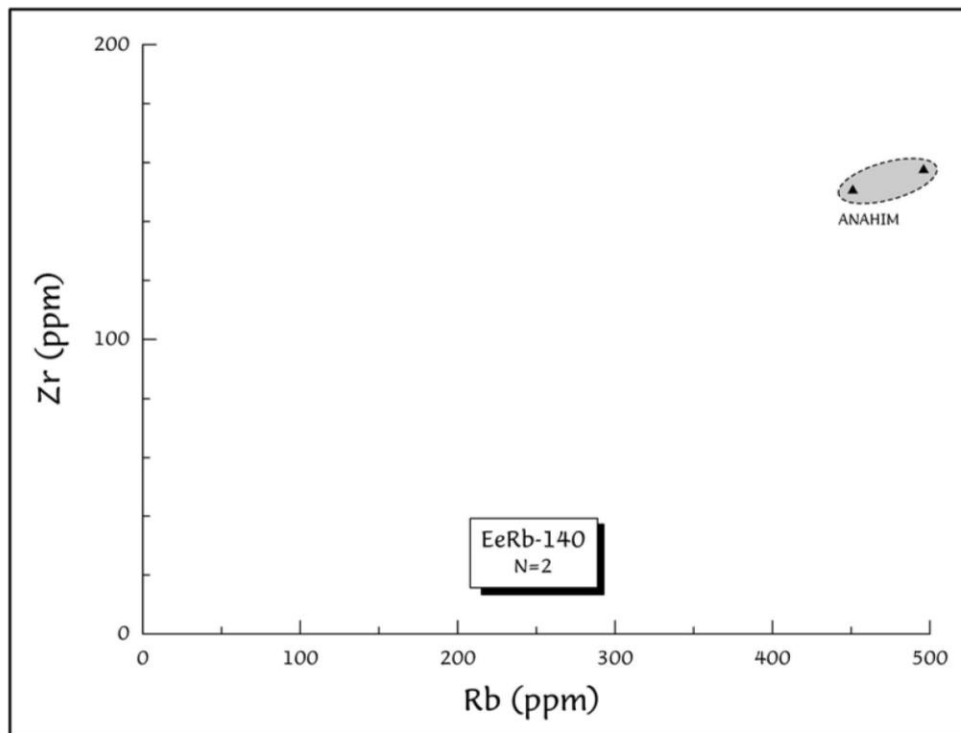


Figure 2. Scatterplot of rubidium (Rb) plotted versus zirconium (Zr) for the analyzed artifacts.

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Information about the geologic setting and prehistoric use of the Anahim obsidian source identified in the current investigation may be found in Carlson (1994), D'Auria et al. (1992), Nelson et al. (1975), Nelson and Will (1976), and Reimer (2000).

Additional information about the obsidian source identified in the current investigation may also be found at www.sourcecatalog.com (Northwest Research 2010b).

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2010a Northwest Research Obsidian Studies Laboratory World Wide Web Site (www.obsidianlab.com).
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Table A-1. Results of XRF Studies: Kamloops Reserve Site (EeRb-140), British Columbia, Canada

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ²⁺ O ³⁺ T	Fe:Mn	Fe:Ti	
EeRb-140	1	348	248 ± 15	59 5	496 5	14 9	127 4	158 7	148 2	NM NM	NM NM	NM NM	NM NM	21.1	65.0	Anahim *
EeRb-140	2	1498	226 ± 15	61 4	451 5	15 9	119 4	151 7	146 2	NM NM	NM NM	31 30	NM NM	22.6	94.5	Anahim *
NA	RGM-1	RGM-1	44 ± 15	22 5	147 4	99 9	23 4	211 7	9 2	NM NM	NM NM	753 25	NM NM	49.7	36.0	RGM-1 Reference Standard