Lithic Design and Technological Organization in Housepit 1 of the S7istken Site, Middle Fraser Canyon, British Columbia

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LITHIC DESIGN AND TECHNOLOGICAL ORGANIZATION IN HOUSEPIT 1 OF THE S7ISTKEN SITE, MIDDLE FRASER CANYON, BRITISH COLUMBIA

By

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Abstract

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Archaeological research of Housepit 1 at the S7istken site in the Middle Fraser region of the British Columbia Plateau has been ongoing since the summer of 2010. Housepit 1 is one of eight housepits at the site, and to date it has been excavated in near entirety. This has provided a large faunal assemblage mostly comprised of stored salmon remains, and also a lithic assemblage that has proven to be a useful measure of late prehistoric lifeways from the perspective of technological organization and lithic design strategies. Housepit 1 was occupied twice between about 350-300 B.P., which is the protohistoric era in the Middle Fraser. This timeframe bridges the preceding abandonment of winter village seasonally sedentary and logistically mobile patterns, and then a later reemergence of that pattern carried into the historic Fur Trade era. The research presented here studies technological organization and lithic design to view lifeways during the transitional times of the proto-historic era, and establish knowledge of how sedentary or mobile people living in Housepit 1 were during their times at the S7istken site.
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Chapter 1

Introduction

1.1 Background Summary

The history and prehistory of hunter-gatherer activity on the British Columbia Plateau has been an important area of anthropological and archaeological research since the late 19th century when early ethnographic reports (Teit 1900, 1906, 1909, 1912) first began to document the experiences and worldviews of First Nations groups who had called the area home for approximately 11,500 years. From studies of the culture history in the region it has been established that sometime around 4500 years ago, bands of mobile hunter gatherers began to experiment with more sedentary village arrangements with logistical proximity to important resource catchment areas (Chatters and Pokotylo 1998; Fladmark 1982; Hayden 1992; Hayden et al. 1985; Prentiss and Kuijt 2012; Rousseau 2004). Over time, this pattern intensified and became embedded in the lifeways of indigenous groups who responded to an array of ecological, sociocultural, economic, and political circumstances. The research presented in this thesis focuses specifically on the two proto-historic occupations of Housepit 1 (HP1) of the Middle Fraser (Mid-Fraser) Canyon S7istken site, ca. 350-300 B.P. Archaeological research at the site is in its infancy, as it was first formally surveyed and excavated during the summer of 2010 by University of Montana archaeology student Lisa Smith (Smith and Carlson 2011). Many fascinating and important avenues of research have emerged since the initial stages of investigation at the site, and my contribution deals with the technological organization and lithic design strategies (Binford 1979; Hayden et al.
1996a, 2000; Shott 1986; Surovell 2009) employed by people in HP1 during their proto-historic era occupations of the house.

To frame this research, it is first necessary to summarize the particulars of the Mid-Fraser winter village pattern. Though a pattern of seasonal sedentism and logistical mobility (Binford 1980) based on terrestrial game hunting, plant and other inorganic resource collection, and fishing activities began developing 4500 years ago in the Mid-Fraser region of the interior Plateau (Rousseau 2004), a major cultural florescence began sometime around 2500 years ago (Hayden 1997, Prentiss and Kuijt 2012), in which seasonally sedentary and logistical mobile extended kin-groups housed together in pithouse villages and operated complex socioeconomic systems (Hayden and Spafford 1996), expansive trade networks (Hayden and Schulting 1997), and storage-based economies that targeted salmon, plant, and mammal resources (Alexander 1992, Kennedy and Bouchard 1978, 1998, Teit 1906) to sustain lifeways through winter months when climatic and ecological constraints limited access to important resources. Housing together during the winter was an adaptive strategy implemented by these hunter-gatherer groups that responded to resource and population dynamics, and the storage of preserved plant and animal resources as well as lithic materials was paramount.

Once people could again access resources catchment areas during the spring, summer, and fall, they spread out around the landscape and utilized resources for immediate needs and future wintertime needs (Kennedy and Bouchard 1998). This is the summarized concept of the Mid-Fraser winter village pattern. Many instances of diversity and more specific attributes of the winter village pattern are discussed
in the proceeding chapters of this thesis, but in the mean time, I point to the abandonment of the traditional winter village pattern around 1200 B.P (Hayden and Ryder 1991; Kuijt and Prentiss 2004; Rousseau 2004) and then the subsequent reintegration of the pattern around 600 B.P. (Hayden 1997; Prentiss and Kuijt 2012; Rousseau 2004) as a foundation for addressing changes in subsistence, residential, and technological systems before the onset of the historic Fur Trade era (Prentiss et al. 2013).

In between the abandonment period and the reemergence of the winter village pattern, the St’ístken site was a small village that was home to St’át’imc peoples. One house at the site, HP1 has been dated between 350-300 B.P., falling into the proto-historic era just before native and indigenous Fur Trade interactions, ca. 200 B.P. This transitional period is important in archaeological studies because it demonstrates many instances of adaptation both as a carryover from the more residentially mobile times of the abandonment period, and as functions of innovation relative to newly emergent circumstances. The proto-historic era fills in a gap in the archaeological record of Mid-Fraser prehistory. The focus of this research is on technological organization and lithic design strategies set into motion in response to the specific circumstances experienced in the region.

1.2 Research Questions

As mentioned above, the proto-historic occupation of HP1 marks a transition between abandonment times and the reemergence of the winter village pattern. It is a gap in the archaeological record of the region that is in need of further study.
Specifically, my question is, does the technological organization and lithic design strategy indicate a more mobile arrangement throughout the history of occupation in HP1 as a carryover from more mobile times after village abandonment (Goodale 2001), or do these facets of St’át’imc prehistory indicate a marked reemergence of seasonally sedentary and logistically mobile winter village patterns, perhaps with some gradual embedding of the pattern through time in the house? This question is addressed from the theoretical and methodological perspective of Design Theory (French 2013; Hayden et al. 1996a, 2000, Prentiss et al. 2013), which looks at lithic industries and design strategies in relation to constraints associated with technology, material use, technological needs, and socioeconomic systems.

For example, Hayden et al. (1996a) point to an array of winter village tasks, resource use parameters, and tool production criteria in discussing relative frequencies of mobile or household tool kits in lithic assemblages from the Mid-Fraser Keatley Creek site, finding that people relied on stores of high quality lithic raw materials that were used to produce tools in generally economic ways as a means of buffering material loss during the winter before stored stocks could be replenished during the spring, summer, and fall months. There are a number of variables to consider in their treatment of the topic, which will be discussed in detail later in this thesis, but one contribution that Hayden et al. (1996a, 2000) offer points to the socioeconomics of wealth and prestige (Hayden and Spafford 1996) before village abandonment times as one key element in tool design strategies, where wealthy and powerful households targeted preferred resources, such as deer, more intensively than households that were not as well off, and designed their tool
kits accordingly. At another Mid-Fraser village-Bridge River-technological organization and lithic design strategies in one housepit (HP54) appear to be related to Fur Trade economics (French 2013; Prentiss et al. 2013).

The S7istken site was occupied in between the occupations addressed in Keatley Creek and Bridge River lithic design studies, and therefore circumstances in HP1 suggest some instances of uniqueness and continuity in regional views. My research aims to contextualize the specifics of HP1’s lithic industry and design strategies amidst a regional backdrop, but further, also seeks to address causal variables associated with proto-historic era circumstances experienced in the prehistory of the site’s and house’s occupation periods. Did people design mobile tool kits comprised primarily of versatile, reliable, and maintainable bifaces and portable long-use cutting and scraping tools (Binford 1979, Bamforth and Bleed 1997; Bleed 1986, 2002; Kelly 1988; Nelson 1991) for hunting and plant collection tasks carried out around the landscape? In contrast, did lithic design at HP1 focus more on expedient household tools with an emphasis on residually sedentary cooking, clothing manufacturing, and dwelling preparation tasks where economizing stored toolstones and cores was a primary concern in the face of stored material loss over the winter (Hayden et al. 1996a)? A much more detailed treatment of these distinctions is provided in following chapters of this thesis, but in general, the degrees of mobility or sedentism in alignment or contrast with winter village pattern expectations are considered through analysis of technological organization and lithic design strategies represented in the lithic assemblage recovered from HP1.
1.3 Broader Impacts and Scientific Merit

Archaeological research that posits patterns and variation in material culture within and between related groups — in this case, as evidenced by lithic industries — illustrates behavior and the particulars of decision-making specific to a site and subgroup, while simultaneously casting findings against a larger cultural backdrop. It serves a fundamental goal of social scientific research to understand what it means to have a particular ethnic or cultural affiliation and how that affiliation is or was exercised. By design, such research accounts for the differences and similarities in experiences of people living amidst a set of values and norms. In the case of the Middle Fraser Canyon and the St’át’imc First Nations groups, elements of community, subsistence preferences, and land-resource perspectives characteristic of modern worldviews have prehistoric antecedents. The heritage St’át’imc people living in the Mid-Fraser today is largely underpinned by understandings of processes of change through time, and the archaeological research of the area contributes a piece of understanding of this process.

This research also impacts scientific research of complex hunter-gatherers. Not only is the Mid-Fraser an important area in its own regard, but it is also an area that has global significance in the scope of hunter-gatherer prehistory. The Mid-Fraser was home to large populations of culturally diverse people that participated in expansive, networked trade throughout the continent (Blake 2004; Hayden and Schulting 1997; Prentiss and Kuijt 2012: 190), practiced rituals and religious observance (Hayden and Adams 2004; Cail 2011), demonstrated an intimate relationship with their environment through subsistence activities and site
formation decisions, and dealt with the complexities of dynamic ecosystems, population trends, and inter-group relations in innovative and important ways. Case studies of Mid-Fraser sites add to the ever-expanding knowledge base of what the world and society was like in prehistory. However, to scale down the impacts of this particular research plan, understanding how the proto-historic occupation of HP1 at the S7istikn site was culturally situated in the Mid-Fraser, as evidenced by the subsistence, residential, and cultural ramifications of its lithic industry, further solidifies the foundation of knowledge about how people managed circumstances-some starkly familiar to what are experienced today-in this sample of time and space.

1.4 Thesis Outline

This thesis is presented in seven chapters. Following the Introduction in Chapter 1, I then discuss the Mid-Fraser environment and cultural chronology in Chapter 2, which is a foundation for viewing the particulars of design studies in HP1. Chapter 3 is comprised of discussions of the theoretical frameworks utilized this thesis, including Culture History, Evolutionary Archaeology, Human Behavioral Ecology, and Design Theory. Chapter 4 defines the Mid-Fraser winter village pattern to contextualize lithic design theory studies at the nearby Keatley Creek and Bridge River sites, which comprise the remainder of that chapter. Hypotheses and test expectations, then materials and methods are presented in Chapter 5. Chapter 6 presents the results of the analysis as organized by faunal, debitage, then tool and core tests. The final chapter, Chapter 7, presents conclusions and future directions.
Chapter 2

The Mid-Fraser Environment and Cultural Chronology

2.1 Geography

The Middle Fraser Canyon (Mid-Fraser) is one segment along the course of the Fraser River that has been a major artery of activity on the interior Canadian Plateau throughout prehistoric, historic, and modern times. The Mid-Fraser can be defined in terms of its culture-geographic area as extending 300km between the mouth of the Chilcotin River and the town of Lytton. St’át’imc First Nations prehistory in the Lillooet region of the Mid-Fraser is the locus of this research, and this area extends from Cache Creek, which is north of Keatley Creek, south through Six-Mile Rapids, the town of Lillooet, and to Texas Creek south of Seton Lake and the Seton river confluence with the Fraser River (Figure 2.1).

Figure 2.1 shows the pertinent subset of the cultural geographic Mid-Fraser area and three sites of especially important and extensive archaeological research that correspond with smaller tributary drainages into the Fraser River. These include Keatley Creek, Gibbs Creek- the location of the Bell site, and Bridge River. The region has dramatic topography that dips into riverine environs below 500m and elevates through a series of ecotones into alpine settings above 3500m. Extending up the steep hills and mountains from river-level (Figure 2.2) are grassy and sagebrush-laden terraces and slopes, woodlands, meadows, talus and scree slopes, sub-alpine valleys, and glaciated mountain tops.
Figure 2.1: The Mid-Fraser Region (From Prentiss and Kuijt 2012:4).
Figure 2.2: Photo of the Mid-Fraser Canyon North of Lillooet, taken by Ian Kuijt (Prentiss and Kuijt 2012:3).

2.2 Geology

Tectonic, volcanic, and glacial events have impacted the Mid-Fraser region’s topography and geological attributes. The Coastal Belt spanning from southern
Alaska to central Oregon was partially formed during the Cretaceous, as well as during events of uplifting along the Wrangellia Terrain’s and North American Continental Plate’s abutment (Carlson 2010:8; Mathews and Monger 2005). However, the topography is more extreme along the Pacific Coast Range as a result of its volcanic history (Carlson 2010:8). Cordilleran glaciation during the Pleistocene carved the deep river valleys and terraced terrain, which characterizes the Mid-Fraser environment during times of human habitation.

With the formation of the Coastal Belt is the presence of igneous and metamorphic minerals, such as granite and slate, and also sedimentary or metamorphosed sedimentary minerals such as limestone, chert, and jasper. Also, glacial activity has lead to the formation of sandstone and shale beds (Mathews and Monger 2005:95). With the volcanic activity in the region’s history, dacite and basalt are commonly found, and so too is nephrite jade, chalcedony, and pisolite (Mathews and Monger 2005). Access to dacite, basalt, chert, jasper, chalcedony, pisolite, ochres, sandstone, slate, and nephrite were important to human populations in the Mid-Fraser for a range of tasks, and these are indeed the primary tool materials found in many of the region’s archaeological assemblages (Hayden 2002; Prentiss et al. 2008; Wanzenreid 2010). Obsidian is also found in assemblages, though it is rare. For instance, obsidian found in the Bridge River site’s Late Period lithic assemblage comprises only .9% of the total material diversity (French 2013). Given the non-locality of obsidian in the Mid-Fraser area, it was likely acquired as a trade good through interactions with groups around the northern Canadian Plateau and the southward Columbian Plateau (c.f. Blake
2004:105-106), and served both utilitarian and prestige display purposes (Hayden 2002; Teit 1906). Similarly, nephrite jade is not abundantly found in Mid-Fraser archaeological assemblages, though this finding is likely attributable to socioeconomic factors and the difficulty in working with the very dense material, rather than geographic access constraints (Hayden and Schulting 1997; Rousseau 2004).

2.3 Climate

Being set in the rain-shadow of the Pacific Coastal Range, the Mid-Fraser experiences an extreme and semi-arid climate (Chatters 1998). To put the mountains’ rain-shadow into perspective, on the British Columbian coast west of the Pacific Coastal Range, an average of 345cm of precipitation falls annually, whereas on the Interior Plateau east of the mountains, precipitation averages 30cm-40cm annually (Chatters 1998; Matson and Coupland 1995). Temperatures on the Interior Plateau range from below -40°C during the winter to over 40°C in the summer (Goodale et al. 2008; Hayden 2002), in contrast to the relatively small temperature range experienced between mild seasons on the temperate coast. While climatic changes have occurred over the 11,500 year history of human activity on the Interior Plateau (Chatters 1980:9; Prentiss and Kuijt 2004:xii; Rousseau 2004:19), the focus of this research is on the Kamloops Horizon of the Late Period, ca. 1400-200 B.P., when the winter village pattern was in effect (Prentiss and Kuijt 2012:186-192; Teit 1906). Past research has indicated relatively little average environmental change over the last 2000 years (Chatters 1998).
Therefore, discussion of climatic circumstances focuses on the weather during the time immediately relevant to this research. It should be noted, however, that a period of dramatically warmer and drier conditions occurred at about 1200-800 B.P., and brought significant changes to human lifeways (Prentiss et al. 2005, 2008, Rousseau 2004), which will be discussed later in this chapter.

2.4 Flora and Fauna

The extreme climatic and topographic circumstances on the Interior Plateau enabled a diverse subsistence strategy among hunter-gather-fisher groups during the Late Period. These groups targeted an array of resources from different ecotones (Prentiss and Kuijt 2012:42-45; Walker 1998), fitting the model of a mobile collector strategy in which groups of people utilized seasonal residences and specialized hunting, fishing, and collection camps (Binford 1980; Kelly 2007). For instance, the Fraser River and its tributaries provided excellent habitats for a particularly important resource: anadromous salmon, which move through the area in spring and fall runs. Easy access to salmon runs from fishing camps facilitated the collection of abundant and storable fish to buffer the pressures of constrained access to terrestrial food resources during less productive winter months (Prentiss and Kuijt 2012:117-125) (Figure 2.3).

For reasons of nutritional, seasonal, and economic strategizing, and perhaps matters of preference as well, other resources were hunted and collected in associated environments too. Residing exclusively on riverside terraces would make hunting and collecting trips into terrestrial habitats a logistically taxing
endeavor. Further, given the dramatic seasonality in the Mid-Fraser, a collector subsistence strategy based on the storage of resources rather than daily collection of them, as in the case of a forager model (Binford 1980), would be the most effective strategy. By centralizing residential areas between the areas of riverine and terrestrial resource procurement zones, the burdens of getting to areas and carrying goods home was lessened.

Above river level, and onto the sloped and terraced woodland areas, variably dense forests of primarily douglas fir trees, but also red cedar, birch, cottonwood, maple, alder, aspen, ponderosa, and lodgepole pine checker the topography. At lower and upper elevations, grassy terraces and meadows are found. Terrestrial animals such as deer, bears, hares, squirrels, beaver, and various fowl thrive in the habitat on range of animal prey, plants, roots, berries, and mushrooms, which provided human populations the opportunity to hunt and trap these animals, as well as the collection of the local vegetation (Alexander 1992; Lepofsky and Peacock 2004; Turner 1992). Birch bark, ponderosa, and cedar were especially utilized by human populations for utilitarian needs, such as tool production, house construction, fuel, and storage technologies (Alexander 1992; Teit 1906; Turner 1992).
Cultural Chronology

The human history on the Canadian Plateau is divided into Early, Middle, and Late Periods that are demarcated by emergent adaptive patterns (Chatters 1995; Prentiss and Kuijt 2004:x; Richards and Rousseau 1987). Early Period groups between 11,500 and 8000 B.P. were mobile foragers, per Binford’s (1980) classifications. Middle Period groups were also generally mobile foragers, though the first evidence of sedentism and pithouse village living occurs in the archaeological record around the Plateau after 4500 B.P. (Ames 1991; Chatters 1995; Prentiss and Kuijt 2004). The Late Period begins around 4000 B.P. with the increased utilization of pithouse villages and the development of a collector-based subsistence strategy that relied increasingly on the storage of salmon and roots.
After 3500 B.P., the Late Period is divided into the Shuswap, Plateau, and Kamloops Horizons, which are all distinguishable archaeologically in terms of the development of larger pithouse villages, dedicated reliance on collector subsistence strategies and the storage of salmon, technological diversity, and the formation of the Winter Village Pattern.

The concept of isolating horizons within general periods in which unique or new traditions become evident or intensified follows the work of Willey and Phillips (1958), who posited that the style and distribution of material artifacts in a region or set of related sites is an effective measure of major changes in cultural traditions through time. It is a concept under the broader tenets of Culture History that is especially useful in conceptualizing and understanding in fine detail the changes seen along a forager-collector continuum, and a trajectory of increasing socioeconomic and political complexity in hunter-gatherer groups where the overall patterns can be so starkly different. Despite concerns about the generalizations and therefore validity of Culture History as a theoretical framework, it has been a useful heuristic device in global contexts (e.g., Fagan 1991; Frison 1991; Willey et al. 1965), and perhaps most applicably in the archaeologies of the North American Plateau (e.g., Richards and Rousseau 1987), Northern Plains (e.g., Mitchell 2013), and Intermontane West (e.g., Leonhardy and Rice 1970).

Other theoretical positions employed in this discussion of the Plateau's cultural chronology follow the principles of cultural ecology (Hayden 1992; Steward 1938), which posit that the attributes of culture, particularly among early hunter-gatherers, are entwined with strategies for accessing and utilizing natural resources
and landscapes. Further, Hayden (1997) views later cultural and socioeconomic developments in the Mid-Fraser as being framed by political ecology, explaining the dynamics at play in the control of resources and landscape that structure wealth and power hierarchies in more complex, socially stratified and politically integrated societies. The adaptive strategies developed and transmitted within and between cultures, following evolutionary archaeology and cultural transmission theories (e.g., Eerkens and Lipo 2005; O’Brein and Lyman 2000; Prentiss and Chatters 2003b), are also fundamental in viewing the Mid-Fraser cultural chronology. Ecological, evolutionary, and cultural transmission theories underpin the generation of testable hypotheses necessary for scientifically addressing the adaptive strategies and fitness of Plateau groups observed under culture history explanations for socioeconomic, technological, residential, and subsistence trends found in the region’s prehistory.

As mentioned previously, the focus of this research on the Late Period, though some discussion about the development of the Late Period’s attributes through time is warranted. In a general sense, these attributes include demographic changes, changes in subsistence strategies, increasing social complexity and stratification, and the increasing sedentism within and consolidation of residential sites with logistical proximity to resources procurement zones (Prentiss and Kuijt 2012:186-192; Rousseau 2004:19-21).
2.5 The Early Period

Between 11,000 and 8000 B.P., following the retreat of the Cordilleran Ice Sheet and the succession of terrestrial and riverine habitats viable for human populations, bands of mobile foraging groups lived around the southern Canadian Plateau (Rousseau 2004). These hunter-gatherer groups remained mobile around a more tundra-like environment than what is currently found in the region (Fladmark et al. 1988), and their residential and subsistence systems classifications as mobile foragers (Binford 1980) is a precursory model that is relevant in comparison to the sedentary but logistically mobile collector systems developing or in place during the Middle (8000-4000 B.P) to Late Periods (4000-200 B.P) in the Mid-Fraser (Prentiss and Kuijt 2012; Richards and Rousseau 1987; Rousseau 2004; Teit 1900, 1906, 1909).

The relevance of the Early Period to Late Period lifeways is founded in terms of the targeting of game animals such as deer, elk, bear, bighorn sheep, rabbit, squirrel, and various fowl (Fladmark 1982), the tool technologies associated with the tasks, and the implications to residential strategies. The tools utilized for these tasks are typified by the interface of Clovis, Western Stemmed, and Old Cordilleran traditions, and as such, include large (≥ 64cm²) unifacial scrapers, flake tools, lancelet shaped bifaces, fluted and stemmed points, choppers, burins, wedge shaped micro blade cores, crescents and bola stones, wood and bone tools, and stone cooking slabs, which collectively have been found at the nearby Charlie Lake Cave and Vermillion Lakes sites (Fladmark et al. 1988; Fedje et al. 1995), and in other locales around the Canadian and Columbian Plateaus (Carlson 1996; Chatters et al.)
2012). Also, some informal storage of food occurred, with cache mounds of frozen meat being distributed in specific locales around the landscape (Fladmark et al. 1988).

During the Early Period, the influence the Old Cordilleran Tradition, ca. 9000-7500 B.P., is apparent primarily around Thompson River valley at the Glenrose Cannery and Bear Cove sites (Carlson 1979; Matson 1976), and extending northeast toward the mouth of the Fraser River Canyon at the Milliken site (Bordes 1979; Matson and Coupland 1995:77-79). Old Cordilleran tool technologies are dominated by an expedient pebble tool industry that included the production of leaf-shaped bifaces, retouched flakes, scrapers, knives, projectile points, choppers, and groundstone slabs and hammers made from raw cobbles and pebbles, as well as bone and antler tools. Old Cordilleran groups also sometimes produced microblades, which are thought to be telling of Paleo-Arctic and Coastal influences (Prentiss and Kuijt 2012:41). This complete toolkit is effective in the hunting and butchering of terrestrial game, woodworking, plant extraction and processing, as well as fish and shellfish preparation (Matson and Coupland 1995:68-81). The locations of Old Cordilleran sites in inland settings along river terraces with seasonal associations to salmon runs (Bordes 1968), and the broad spectrum faunal assemblages at Glenrose Cannery, Bear Cove, and Milliken (Matson and Coupland 1995) indicate a diversification of subsistence strategies, and the inclusion of fishing was particularly important influence on collector strategies in later times.
2.6 The Middle Period

Human populations during the Middle Period were mobile groups that initially lived in a warmer and dryer climate than what is present today, and carried on a tradition of terrestrial game hunting augmented to a relatively small degree by fishing (Rousseau 2004), insofar as it compares to Late Period fishing intensity. Given the frequency of residential moves, the archaeology of early Middle Period groups is sparse. However, the finding of human burials and associated lithics in between the modern towns of Lytton and Lillooet by Borden and Sanger (1961) led to the identification of a new cultural tradition called the Nesikep Tradition. These lithic assemblages were similar to Early Period ones, but with a more refined and less expedient chipped stone production method where tools were produced from cores and retouched into specific forms in stages by hammering and pressure flaking (Prentiss and Kuijt 2012:37; Rousseau 2004). Early Nesikep groups also began producing a wider range of scraper tools that were smaller and more specialized in use than the scrapers found in Early Period assemblages. Microblades were also utilized to a higher degree, probably because of the efficient multi-functionality they possess for cutting tasks in addition to their quality of being economically producible from limited raw material (Prentiss and Kuijt 2012:36-37).

During the Early Nesikep, ca. 8000-6000 B.P., there is no evidence of long term residential sites or food storage, thus archaeological sites are scarce. However, from the limited data at Plateau sites with Early to Middle Period occupations, such as Marmes Rockshelter (Rice 1972) and Lind Coulee (Daugherty 1956), and the climatic conditions favorable to terrestrial game hunting and plant foraging
(Chatters 1998; Hallet et al. 2003), it is inferred that Early Nesikep groups probably hunted deer and elk in mid-elevation settings where they would also encounter berries and roots. Around 6500 B.P., the Lochnore Tradition emerged, possibly as a splinter or descendent from Nesikep groups (Prentiss and Kuijt 2012:38), and lasted until 4000 B.P. Their tool technologies, residential patterns, and supposed social organization were very similar to the Early Nesikep, but projectile point and biface design from Lochnore assemblages is stylistically different in base shape and hafting design and more diverse among multiple forms, evidencing a unique cultural pattern. The diversity of bifaces and increasing use of specialized scrapers also reasonably reflects increased focus on a wider range of medium to large mammals as steadily increasing volumes of precipitation but warm temperatures on the Plateau created good habitats for terrestrial game in expanding ecological niches (Rousseau 2004). The Lochnore phase on the Plateau also includes a more abundant assemblage of fish and mollusk remains around the still temporarily occupied sites, relative to the Early Nesikpe assemblages (Prentiss and Kuijt 2012:39). After 5000 B.P., climatic conditions continued to be wetter, and eventually cooler, which favorably impacted riverine habitats, stressed the distribution of mammal habitats, and facilitated the increased reliance on fish by human groups (Rousseau 2004:10). The changing climatic conditions also made access to hunting and plant foraging areas difficult for highly mobile groups during snowier winter months as that trend gradually intensified, which is a factor in the development of semi-permanent winter residences (Kuijt 1989).
The Lehman Phase is also part of the Nesikep Tradition, and occurred between 6000-4500 B.P, though its classification as a distinctive phase rather than a form of cultural diversity or technological adaptation within the Lochnore Phase is debated (Prentiss and Kuijt 2012:40-41; Rousseau 2004:11). Excavations at Oregon Jack Creek and Rattlesnake Hill around the Thompson River (Lawhead and Stryd 1985; Rousseau and Richards 1988) yielded some of the available evidence that the Lehman Phase is marked by the same sorts of tools found in Lochnore and Early Nesikep assemblages, but also distinctive side notched, convex base bifaces and long bifacial knives (Stryd and Rousseau 1996).

Lehman assemblages are found in the context of Lochnore assemblages, so delineating differences is an exercise in conceptualizing broader evolutionary trends in the Plateau prehistory. It invites the heurism of Culture Historical thinking- among other theoretical modes of thought- to piece together how humans on the Plateau adapted to a range of changing circumstance. To this end, an important consideration is that Lehman-Lochnore sites are found on river terraces and along further upland tributaries with proximity to freshwater fish, terrestrial game, and food plant habitats, and appear to have been logistical camps of mat lodges similar to the style used by semi-sedentary collectors in later times (Rousseau 2004:8-12). People during the Lehman Phase also utilized higher quality lithic raw materials found in particular locales, such as dacite and jasper, to make their tools. Rousseau (2004:11) interprets the use and extraction of these high quality and isolated minerals to be evident of an increased knowledge of raw material locations and the general landscape.
Considering an increasing presence over time of both Lochnore and Lehman components around the Thompson river south of the Fraser River, the appearance of the first known pithouses around 4500 B.P. (Chatters 1995; Rousseau 2004: 11), and the first collector-like subsistence strategies developing after 4000 B.P. (Prentiss and Chatters 2004), one can infer that human populations were experimenting with new residential strategies and ways of life during the late Middle Period, and probably also growing in numbers. The replacement of the seasonal logistical foraging strategies employed by Lochnore-Lehman groups by groups with a more sedentary collector organization who are thought to have been influenced by groups on the Coast that practiced that strategy since 5000 B.P. (Ames and Maschner 1999; Matson and Coupland 1995) is another explanation for the processes of change observed in this segment of prehistory. This ideas offers a strong line of evolutionary archaeological reasoning for explaining the patterns apparent in following Shuswap Horizon times (Prentiss and Chatters 2003b), which are discussed in the next section.

All of the aforementioned lines of data available from the Middle Period show a pattern that relates changes in population levels, technology, subsistence strategies, mobility, and ecology in a way that frames the emergence of the Mid-Fraser’s Late Period. It is from the foundations laid during the Middle Period that we understand the following period’s dramatic cultural florescence, which persisted into historic times.
2.7 The Late Period

As the Plateau became cooler and wetter with pronounced seasonality after 5000 B.P., the possibilities for predictably targeting resources concentrated in various but narrowing ecotones became possible for mobile foraging groups. This allowed experimentation with collection-based subsistence strategies, as higher concentrations of plants and animals occurred in smaller catchment areas and therefore could be acquired in greater numbers (Kuijt 1989). As a result of seasonal weather variation and more extreme winters, longer-term residency in pithouses was beneficial (Chatters 1995; Prentiss and Kuijt 2003b; Prentiss and Chatters 2004). These patterns had been developing on the Coast since about 5,000 B.P. (Ames and Maschner 1999; Matson and Coupland 2005), and among Lochnore-Lehman groups after 4,500 B.P., as discussed previously. Prentiss and Chatters (2003b) propose that due to the changing climate on the Coast and Plateau, collector subsistence strategies and semi-sedentary residency capable of facilitating logistical mobility to hunting, fishing, and collecting areas were adaptive behaviors selected for in an evolutionary sense, and were probably brought onto the Plateau by Coast Salish incursions. The similarities in subsistence strategies, residential patterns, and heritable material artifact styles (per O'Brein and Lyman 2000) suggest that interactions between Coast, Southern Plateau, and Northern Plateau groups during the late Middle Period lead to the exchange of ideas and catalyzed the development of the Plateau Pit House Tradition (Rousseau and Richards 1998) on the interior of British Columbia.
The above discussion of the Middle to Late Period transition is a conceptual overview that summarizes general reasons for the development of the Plateau Pithouse Tradition (PPT), though much debate exists about the specifics of ancestry and timing in archaeological discourse (Prentiss and Kuijt 2004; Stryd and Rousseau 1996). Transitioning to the more immediately relevant times and cultural patterns addressed in my research, this discussion of Mid-Fraser cultural chronology moves now to the Shuswap, Plateau, and Kamloops Horizons.

2.7.1 The Shuswap Horizon

The peak of the climatic pattern of cooler and wetter conditions with pronounced seasonality impacted human mobility during the Shuswap Horizon, which dates 3500-2400 B.P. Richards and Rousseau (1987) identified and termed this cultural horizon in response to the presence of the first pithouse villages with winter occupations, the refinement of logistical mobility, and the development of storage-based collector strategies. Salmon thrived in cooler waters, but they ran in narrower and specific time frames under the constraints of seasonality. For humans who already utilized this resource and experimented with storage and logistical mobility, the seasonality of salmon runs allowed fish to be caught in large quantities (Chatters 1998; Kuijt 1989; Rousseau 2004). Cool and wet conditions also drove both forest growth into low elevations and grasslands recession, bringing forest dwelling plants and animals into areas around rivers and valley floors, which made access to multiple food sources in close proximity possible. Rousseau calls the
Shuswap Horizon a “time of plenty” (2004:15) because of the climatic impact on salmon, terrestrial game, and plant foods.

The ecological trends of the time made seasonal residency in pithouse villages an ideal arrangement. These villages were comprised of 3-10 small circular pithouses, generally with single occupations, and were situated around resource abundant small-sized catchment areas (Rousseau 2004). Given that resources were so plentiful and reliable between seasons, food storage was likely not a major concern, however faunal assemblages abundant in salmon, and especially mammal bones, are noted by Richards and Rousseau (1987:29). Additionally, isotopic analysis of human remains found interred in pithouse floors indicates an increase in salmon consumption through time (Chisholm 1986). With sedentism came population growth, and while there is no evidence of intensive food storage to support larger population numbers, it is suggested that food storage became more widely practiced beginning with the larger houses and villages during the middle and late years of the Shuswap Horizon (Rousseau 2004).

Technologically speaking, the Shuswap utilized a core and flake lithic industry mixed with antler, bone, and wood tool production. Cores of high quality raw materials like dacite and cryptosilicates were retrieved during logistical trips into the field, and coupled with the technological strategies of use and manufacture, Hayden et al. (1996a) recognize Shuswap assemblages as having a “winter village lithic organization.” Stone tools were also more expediently produced in general comparison to those from Lochnore-Lehman times (Richards and Rousseau 1987). The diagnostic Shuswap point is a stemmed, indented base, side notched arrowhead
or dart (Richards and Rousseau 1987:26) that is stylistically similar to some found on the Northern Plains (Richards and Rousseau 1987:30-31; Vickers 1986), suggesting some form of interaction with those groups. Other Shuswap tools include utilized and retouched flakes, ground stone, scrapers of the small “thumbnail”, convex-edged, and spall varieties (Rousseau 2004), plus bone needles, awls, and harpoons similar to what are found on the Coast.

Prentiss and Kuijt (2005) present the case that new technologies and socioeconomic organization on the Plateau resulted from interactions with coastal groups, namely late Charles or early Locarno Beach groups, either through cultural transmission or displacement of more mobile groups. Excavations at the Locarno Beach site (Steifel 1985) yielded a large quantity of salmon remains with removed heads, suggesting mass harvesting and storage. In addition to evidence for salmon storage, status differentiation among Locarno Beach Phase groups is exhibited by the differential presence of prestige goods, such as labrets and beads, found in burial contexts (Carlson 1991; Matson and Coupland 1995). A popular perspective held about the development of the PPT during the later years of the Shuswap Horizon and through subsequent horizons is that the coalescence of groups in villages and the later demarcation of social ranking are framed by the introduction and operation of fundamentally different socioeconomic strategies. In later times, control over catchment areas as groups became more populous and occupied the same areas during seasonal rounds afforded some groups or individuals an upper hand in power and wealth acquisition (Prentiss et al. 2005). This perspective is
especially elucidative when viewing the characteristics of the subsequent Plateau Horizon.

2.7.2 The Plateau Horizon

Leading up to the Plateau Horizon, ca. 2400-1200 B.P., the geographic plateau became warmer and dryer to an extent that is akin to what is experienced today. The Mid-Fraser’s habitats became more “patchy” since woodland environments began to dry out and grasslands expanded (Kuijt 1989). The effects of soil erosion and increased sedimentation in smaller streams stifled salmon spawning grounds, forcing fish into smaller catchment areas in larger bodies of water where the signal to spawn was delayed (Lepofsky et al. 1996). A smaller and highly predictable timeframe for targeting salmon affected collector systems (Shalk 1977). Terrestrial game and food plants that had moved into close proximities to fishing grounds during the early Late Period were driven into new habitats less clustered with river environments, but remained important resources for Plateau Horizon groups. These groups began manipulating their environment with prescribed burns (Hallet et al. 2003; Lepofsky and Peacock 2004) in efforts generate favorable habitats to maintain the predictability of accessing terrestrial resources that had been embedded in subsistence strategies during the Shuswap Horizon. Additionally, groups organized hunting and plant collecting parties that would travel from villages into the patchy habitats further away from residential centers (Rousseau 2004).
These adaptive strategies mark an important development in Plateau prehistory. Despite conditions similar to those before the early days of the Late Period, the strategies employed for managing resource access and utilization did not revert to more mobile forms, but rather the semi-sedentary and logistical mobility strategies developed during the Shuswap became solidified through manipulation and highly strategized use of habitats. A number of factors were at play, including the need to support higher populations generated as a result of sedentism, the socioeconomic control of important though patchy catchment areas (Prentiss et al. 2005), the buffering of threats from encroaching groups by means of "safety in numbers" tactics, to borrow a phrase from Chatters (2004), and the management of social hierarchies and power dynamics (Hayden 1997). These strategies are coincident with the formation of larger permanent winter villages of up to 100 pithouses, in-ground storage pit technologies, labor specialization, and later status differentiation (Prentiss et al. 2005; Prentiss and Kuijt 2012; Rousseau 2004).

During the Plateau Horizon, the flake-core lithic industry persisted, but ground slate technologies associated with intensive fish processing (Hayden et al. 1996a), and noted in Teit’s ethnographic work (1906:204), developed in response to increased reliance on salmon. However, ground slate tools are not found uniformly among all Mid-Fraser residential site lithic assemblages (French 2013; Harris 2012; Hayden et al. 1996a; Prentiss et al. 2005), and the processing of salmon for wind drying at fishing camps is a logical explanation for variable ground slate tool distribution (Hayden 2000:327; Teit 1906). Another technological development was the arrival of bow and arrow technology, likely from the Southern
Plateau (Chatters 2004). This technology resulted in changes to hunting and
defensive strategies in that the bow and arrow allows higher volumes of weaponry
to be carried on an individual, and can be utilized rapidly on larger numbers of prey
(Bettinger and Eerkens 1999). Late Plateau Horizon projectile points are relatively
smaller than earlier ones, and are therefore effective as arrowheads, and they are
stemmed with expanding bases and corner or side notches to provide a secure and
stylized hafting element (Rousseau 2004). Other tools in the Plateau Horizon kit
include medium-small length leaf-shaped or stemmed bifaces, “key-shaped”
unifaces and bifaces, piercers and gravers, bone and antler wedges and knives,
grinders and hammers, and different scrapers, in addition to wooden digging sticks
used for root harvesting (Lepofsky and Peacock 2004; Prentiss and Kuijt 2012;
Rousseau 2004). Plateau Horizon tool technologies are indicative of a broad-
spectrum subsistence strategies and the logistics of carrying out diverse tasks
nearby and away from a home base or specialized camp (Hayden et al. 1996a;
Rousseau 2004).

By 1300 B.P., the semi-residential mobility, population growth, and
technological reorganizations laid out in earlier years of the Plateau Horizon
became affixed in the socioeconomics of groups. Co-residing people interacted with
their neighbors amidst formally managed fishing, hunting, and collecting territories,
leading to differential access and wealth acquisition enacted in the Plateau
Interaction Sphere (Hayden and Schulting 1997). The concept of the Plateau
Interaction Sphere was devised to define interaction between corporate groups
(Feinman 1998; Hayden et al. 1996b) who sought to ensure the welfare of their
autonomous populations and socioeconomic systems by participating in trade networks and land-resource use arrangements. Pronounced social stratification resulted, further impacting Plateau hunter-gatherer lifeways into the following times of the Kamloops Horizon.

2.7.3 The Kamloops Horizon

The Kamloops Horizon is the last of the PPT subdivisions, and lasted from 1200 B.P. until European contact, ca. 200 B.P. Highly logistically organized subsistence and residential strategies in winter villages and upland basecamps carried over and intensified from Plateau Horizon times. During this time, pithouses grew in size, sometimes up to 25m in diameter, and were circular, oval, or rectangular in shape (Rousseau 2004). Inside the houses, activity areas and public/private space was maintained, which is evidenced by multiple hearths and cache pits distributed around the floors (Hayden 1997; Prentiss et al. 2008; Prentiss and Kuijt 2012). Population growth, diversifying household spacial arrangements, and a strategy of extended kin-group cohabitation are inferred from changes in house design (Alexander 2000; Hayden 1997; Prentiss and Kuijt 2012; Rousseau 2004) (Figure 2.4).
Villages themselves also grew, with large sites such as Keatley Creek, Bell, and Bridge River containing up to 25 simultaneously occupied houses (Kuijt 2001) (Figure 2.5). As population levels reached their apex during this time in Plateau prehistory, so too did the patterns of intensive salmon processing and storage augmented by terrestrial plant and animal foods, longer and repetitive stays in villages, and complex socioeconomic dynamics within and between groups and regions. Household and village size disparities suggest that differing degrees of wealth and power may have had an influence on what a group could have negotiated in the Plateau Interaction Sphere or through forms of social contracts relating to labor and resource exchanges (Hayden 1995 Hayden and Schulting 1997; Prentiss et al. 2008). Hayden (2001) argues that the then present act of feasting signaled the wealth and affluence of a group or individual, thereby elevating their degree of affluence and power in society. Hayden and Adams (2004) also point to lines of evidence during the later times of the Kamloops Horizon for religious or
secret society activities at Keatley Creek to make the case that this new cultural phenomenon in the Mid-Fraser also facilitated a differential access to power.

Figure 2.5: Distribution and sizes of existing and non-extant Mid-Fraser villages (from Prentiss and Kuijt 2012:87).

Kamloops Horizon tool technologies are similar to Plateau Horizon ones in terms of toolkit and raw material diversity, as well as flake-core and grinding production methods, however diversity in Kamloops assemblages is more extreme. For example, the tool typology developed by Hayden et al. (1996a), which has been utilized and added to in subsequent Mid-Fraser archaeological investigations (French 2013; Prentiss et al. 2008, 2009, 2013) includes over 100 distinctive tool types. Granted, some differences in tool types on the list are subtle, which is part of the typology's design aimed at addressing the subtleties of inter-assemblage variability (Hayden and Spafford 1996). Nevertheless, Kamloops Horizon people
used a range of bifaces, scrapers, choppers, saws, knives, flakes, grinders, abraders, piercers, drills, hammers, pipes, pendants, beads, and ochres, all made from stone, bone, and wood. One particularly diagnostic tool of the time is the small side or corner-notched and often basally indented Kamloops projectile point. Some variation in Kamloops point design is found, but the main difference between them and their preceding designs is their small size, further evidencing the reliance on bow and arrow technology (cf. Bettinger and Eerkens 1999; Rousseau 2004).

After 200 years of the early Kamloops Horizon’s dramatic florescence, a sudden increase in temperatures and decrease in precipitation occurred (Kuijt and Prentiss 2004). This climatic event lasted from 1200-800 B.P. and is known as the Medieval Warm Period. A decrease in plant availability and utilization in the diet coincides with the climatic changes after 1200 B.P. (Kuijt and Prentiss 2004; Lepofsky and Peacock 2004; Rousseau 2004). Then between 1000-800 B.P. the large villages of the Mid-Fraser experienced a collapse and abandonment.

Some different perspectives on village abandonment have been offered. Hayden and Ryder (1991, 2003) suggest a cataclysmic landslide blocked salmon runs near Texas Creek and depleted the availability of this resource upstream while also drowning some sites under a resultant lake. Kuijt (2001) points out that the cataclysmic landslide explanation for abandonment is not supported according to dates from cache pits covered by the lake sediments, and that the impact of the Texas Creek landslide, or landslides, was localized and does not support a region-wide abandonment phenomenon. This in mind, Prentiss and Kuijt (2004) argue that climatic changes drove broader scale subsistence and residential reorganizations as
resources—particularly roots—became more scarce and subject to competition for access while dietary needs for carbohydrates along with protein sources (salmon and deer) persisted. Additionally, with fewer available plant resources available for storage through the winter, the time it took to recover from low food stores during the spring increased and potentially made the settling in populace and cooperative winter villages an unreliable residential strategy (Kuijt and Prentiss 2004:157). Rousseau (2004) sees the abandonment of large villages as a result of resource depletion in upland settings due to overuse by the opportunistic logistical mobility practiced by Mid-Fraser groups. Whatever the reasons for the abandonment of large villages during the Kamloops Horizon might be, it is apparent that people left, perhaps spreading out into smaller villages or moving in with other small groups in other areas (Kuijt and Prentiss 2004; Pokotylo and Mitchell 1998).

Toward the end and after the Medieval Warm Period, large Mid-Fraser sites like Keatley Creek and Bridge River were repopulated in smaller numbers relative to prior times. Dates at Bridge River reflect the stages of its development from later Plateau Horizon times through Kamloops (Figure 2.6). The same general patterns of pre-abandonment times of the Kamloops Horizon are found after the return. This event coincides with the early times of the Little Ice Age, when the climate was once again cooler and wetter (Chatters 1998). Salmon supplies were once again abundant, wealth was displayed with prestige goods and social interactions, people housed together, and participated in large-scale networked trade (Hayden and Schulting 1997; Prentiss and Kuijt 2012:190). One change in technology that occurs varyingly between sites (Harris 2012:271) was the increased use of ground slate.
and nephrite knives and adzes useful for salmon processing and woodworking (Harris 2012; Hayden and Schulting 1997; Teit 1906:203), highlighting the importance and intensity of those activities. At Bridge River, the slate tool industry includes chipped slate scrapers in addition to knives, and appears to be designed with meat cutting and hide working in mind (French 2013:63; Prentiss et al. 2013). These patterns continued until European contact; a time when early ethnographers recorded indigenous views and histories that are immensely helpful to modern archaeologists.

Figure 2.6: Bridge River pithouses developing from 1800-1600 B.P., 1600-1300 B.P., 1300-1100 B.P., and after 800 B.P. (From Prentiss and Kuijt 2012:108).
2.7.4 The Kamloops Horizon Historic Fur Trade Era

At the start of the 19th century, Euro-American groups became active on the northern Plateau, seeking to explore new territories for settlement and resource acquisitions. Some contact had occurred previously between Euro-American explorers and settlers, but fur trade, then later gold prospecting and missionary work brought Euro-America populations in larger numbers than encountered previously. With them came eventual integration of First Nations groups into the more centralized Pacific Fur Company and Hudson Bay Company around 1820 (Walker and Sprague 1998:142). A range of mammal pelts (Teit 1906:227) were traded by indigenous groups for items like glass beads and metal tools, however also “traded” was disease, which wreaked havoc on the formerly unexposed indigenous population (Kennedy and Bouchard 1978). The ways in which the stresses and opportunities resulting from the Fur Trade Era impacted the St’át’imc cultural and socioeconomic patterns recorded by ethnographers between the late 19th and 20th centuries have been the subject of recent archaeological research (Harris 2012; Smith, personal communication 2014).

James Teit’s work as the ethnographer on the Jesup Expedition has provided important ethnographic data for modern archaeologists working in the Mid-Fraser. Teit wrote of his interactions with the Thompson (1900), Lillooet (1906), and Shuswap (1909) First Nations, noting in an overall sense, the continuation and reinvention of Kamloops lifeways in light of contact period dynamics and adaptation.
He wrote about everything from kinship organization, networked trade, seasonal logistic mobility and residency, house and household organization, the continuation of traditional technological strategies augmented by modern technologies, linguistic traditions, cosmology, art, and social stratification. Teit also mapped culture areas around the Northern Plateau (Figure 2.7).
Of particular relevance to this project, each tribe and their subdivided bands and clans had designated areas for hunting, plant food harvesting, and fishing which provided reliable access to resources that could be consumed immediately or
processed for storage or trade (Teit 1906:222-228). Further, these catchment areas radiated out from villages of people related along lines of extended kinship (Teit 1906:253). Social stratification included chief, commoner, and slave classes (Teit 1906:252), and it was social stratification and the differential access to resources, material wealth, and power that granted some households and individuals greater influence in Fur Trade economics. Teit also noted, “Salmon-fishing was the most important industry of the tribe (the Lillooet), and occupied a more prominent position than among the other interior tribes” (Teit 1906:227). However, extensive planning and effort also went into the procurement and processing of mammal and plant resources in many of the traditional ways seen before contact (Teit 1906:222-227).

These lines of ethnographic data inform the ways archaeologists view tool assemblages and their relationships to mobility patterns (Hayden et al. 1996a). For instance, do pithouse lithic assemblage indicate an industry that focused on mammal processing with high frequencies of heavy duty and meticulously made butchering and skinning tools? To another end, does an assemblage include high frequencies of ground slate knives and lighter duty small blades for intensive fish processing? In fact, to step away from the particulars of Lillooet ethnographic data for a moment of theory, it should be noted that at the time James Teit was writing, the indigenous groups he studied had already been pushed onto reservations and they participated in the Euro-American introduced wage labor economy. Meanwhile, logging and engineering projects, such dam construction, impacted many of the choicest resource settings targeted in pre-contact times (Prentiss and Kuijt 2012:199). With this in mind, we must acknowledge that archaeological
support for ethnographic data is paramount in deciphering what, specifically, life was like during the final years of the Kamloops Horizon, since the perspectives recorded by Teit actually reflect views of traditional life framed by modern values. Archaeological data and robust ethnographic records (when available) must be used in conjunction to reach beyond the sometimes subjective nature of history and memory and into prehistoric times so that our understandings of people and their lifeways are accurate and capable of predictive modeling for further scientific refinement. My reasons for studying technological strategies at the S7istken site are largely underpinned by this concept, as much is to be learned about the diverse ways people acted within broader cultural contexts within the Mid-Fraser.

2.8 The S7istken Site

The S7istken site is a cluster of 8 pithouses and 14 external roasting pit features on a terraced wooded slope approximately 3km. northwest the Bridge River site, which is situated near the western rim of the Fraser River Canyon, near the confluence of the Bridge and Fraser Rivers (Figure 2.8). Keatley Creek lies roughly 15km to the northeast near the eastern rim of the canyon. The clustered pithouse style (Figure 2.9) and abundance of salmon remains exhibited at the S7istken site are reflections of the Mid-Fraser winter village pattern developed over thousands of years, but dates collected from charcoal in situ with two hearth features in one extensively excavated pithouse, HP1, relate the known occupation of the residence to the late period at 343± 23 cal. B.P. for the first occupation (stratum IIa) and 305 ± 26 cal. B.P. for the last occupation (stratum II) (Smith and Mattes, in
preparation) (Table 2.1). Prior occupations in other housepits have been dated, but archaeological testing of the site has targeted late period occupation of HP1 for reasons of research interest (Smith, personal communication 2013), as the late Kamloops Horizon is a time with many pressing research avenues. Smith's research has taken place since the 2010 field season.

![Map of the Middle Fraser Canyon and large archaeological sites showing proximity. The S717stkn site is located just northeast of Bridge River (map modified from Prentiss et al. 2008).](image)

Figure 2.8: Map of the Middle Fraser Canyon and large archaeological sites showing proximity. The S717stkn site is located just northeast of Bridge River (map modified from Prentiss et al. 2008).
Figure 2.9: S7i7stkn site overview. HP1 is the largest housepit outlined in the cluster (From Smith and Carlson 2011).

Table 2.1: S7istkn pithouse radiometric dates from HP1, calibrated at 2 sigma using Calib 6.0 (Struiver et al 2010) (From Smith and Mattes, in preparation).

<table>
<thead>
<tr>
<th>Sample ID#</th>
<th>Housepit</th>
<th>Stratum</th>
<th>Feature</th>
<th>Date</th>
<th>Cal. Date BP¹ (Mean)+Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP1STIIIF17</td>
<td>I</td>
<td>II</td>
<td>17</td>
<td>305±26</td>
<td>389 (301-458)</td>
</tr>
<tr>
<td>HP1STIIlaF3(2)</td>
<td>I</td>
<td>IIa</td>
<td>3</td>
<td>343±23</td>
<td>388 (315-481)</td>
</tr>
</tbody>
</table>
Fieldwork in 2010 determined site and housepit boundaries, which led to a sampling plan in efforts to attain dates from all of the housepits. Intra-site house size disparities have been an interest of prior research in the region (Hayden 2002; Prentiss et al. 2008) and this disparity is present at S7istken as well, with housepit diameters ranging from 10.5m to 5.2m. The interest in the Late Period and the relatively large size of HP1 (Figure 2.9) led to a trench excavation through HP1 in 2011, and then a nearly full excavation in 2012. This excavation yielded a lithic assemblage with seemingly high frequencies of small, expediently produced tools. Interestingly, despite cultural relatedness of people living at the different sites of the Mid-Fraser, the lithic and faunal assemblages at the S7istken site seem convey a heavier reliance on salmon consumption and processing tools than those retrieved from Bridge River and Keatley Creek housepits with late period occupations (Berry 2000; Prentiss et al. 2013; Smith, personal 2013). Another important attribute of HP1 is that not prevalent in other housepits is that the cache pits inside the house were not turned into middens over time, so a pristine view of storage strategies is made possible. These disparities between HP1 and other housepits from Bridge River and Keatley Creek will serve as a frame for addressing how the lithic assemblage demonstrates the nature of winter village lifeways practiced by the site’s inhabitants. Findings from HP1’s lithic assemblage will also influence how we can perceive the site’s prehistory within broader regional cultural contexts.
Chapter 3

Theoretical Frameworks

*The archaeological record is the product or derivative of a cultural system such that it is symptomatic of the past.* - Binford 1980

Archaeologists working in the Mid-Fraser today benefit from a well-informed culture history, ethnographic record, and decades-old history of scientific research from many different angles. The Binford (1980:5) quote provided above captures a core principle of the archaeological discipline, and serves as a basis for studying how materials and behaviors correspond with the circumstance of times we cannot see with our own eyes, but can conceptualize and piece together with proper methodologies and theoretical frames. Some discussion of the theoretical frameworks utilized in this research was provided in the cultural chronology section of Chapter 2. In this chapter, I will go into further detail about Design Theory (Bleed 2002; Hayden et al. 1996a; Horsfall 1987; Nelson 1991; Pye 1964; Shott 1986; Surovell 2009), and dissect the influence other theoretical modes of thought have in conceptualizing lithic industries, as designed relative to the subsistence behaviors and residential or mobility decisions made by people in Housepit 1 (HP1) at the S7istken Site. These other influential theoretical lenses include Culture History and Human Behavior Ecology.
3.1 Culture History

In its modern forms, cultural-historical thinking in archaeology provides a useful lens for viewing lineages and the patterns seen in material culture through time and space. Given a robust set of artifact typologies and an extensive region-wide sample of materials, one can begin to understand where, and maybe how, design considerations originate, and how they spread and changed in prehistoric times. With the inclusion of reliable radiocarbon dates, tracing the spread of material culture and understanding the mechanism at play in the process is scientifically reinforced. In relation to this research, the cultural chronology available for the prehistory of Mid-Fraser allows archaeologist working in the region to consider how the particulars of lithic industries fit into the broader picture of past life in the region.

Culture History is perhaps an intuitive way of studying human prehistory on a regional level, which I find to be implicit in the ethnographies James Teit (1900, 1906, 1909) provided from his experiences with Shuswap, Thompson, and Lilooet groups during the 19th and 20th centuries. Oral traditions and his observations of myriad tangible and intangible aspects of these groups’ cultures and societies influenced the ways in which he mapped their culture areas (see Figure 2.7), not only according to the modern political parameters at play during his time in the region, but also according to what the physical and conceptual boundaries meant to the folks he interviewed. Willey and Phillips (1958:61) state, “Culture-Historical
integration, as we have seen, is the descriptive process concerned with cultural forms, with plotting these forms in space and time, and with defining their relationship and
inferred functions.” It is routine for Mid-Fraser archaeologists to directly reference Teit’s work while keeping the broader concept behind Willey’s and Phillips’ statement in mind on a more obtuse, intellectual level (e.g., Borden 1968; Fladmark 1982; Hayden 1997; Hayden et al. 1985; Pokotylo and Mitchell 1998; Richards and Rousseau 1987; Rousseau 2004; Sanger 1969; Stryd and Rousseau 1996).

In the Willey’s and Phillips (1958) quotation provided above, the descriptive nature of Culture History is noted, but plenty of diversity is apparent within and between contemporaneous houses, villages, and lithic assemblages. Culture-historical thinking, without other theoretical frames of reference, leaves open the question of why diversity occurs in a given cultural context. The description of cultural patterns tells us what the late Kamloops Horizon’s material culture was, but not why it developed in certain contexts that enabled or necessitated instances of uniqueness or continuity. To this end, it is important to consider how technological, subsistence, and residential strategies practiced by Mid-Fraser groups were adaptive to particular contexts.

3.2 Evolutionary Archaeology

At its core, the theory behind Evolutionary Archaeology is that human lifeways can be understood by viewing materials and behaviors as adaptive strategies subject to processes of continuity, hybridization, reinvention, and selection that occur along a trajectory of descent from a common ancestor (Boyd and Richerson 1985; Eldredge 1989; O’Brein and Lyman 2000; Prentiss et al. 2009b). To a further degree, materials and behaviors that are selected for -or not-
in culture are contingent on whether those items and behaviors increase overall group fitness in the face of some given set of goals and constraints influencing the group's adaptive strategies (Bamforth and Bleed 1997). The broad tenets of evolutionary archaeological theory capture an array of processual measures of culture, including culture history, neo-evolutionism, Darwinian evolution, and behavioral ecology theories by looking at expressions of culture as phenotypes capable of and resulting from descent, but with the added complexity of the human capacity for deliberately modifying lifeways (Prentiss et al. 2009b; Spencer 1997).

Being of the processual mode of archaeological thought, evolutionary archaeology aims to synthesize a number of factors (e.g., climate change, resource availability, and socioeconomics) with what is apparent in descriptive cultural-historical reports of broad scale patterns in culture. An example of this multifaceted approach is found in a quotation from Prentiss et al. (2009b:4):

*Neo-evolutionists and processualists offer the influential idea that cultures can be defined as functioning systems (much like ecosystems) bounded from other such systems by differences in fundamental socioeconomic strategy.*

Evolutionary archaeology also addresses smaller scale instances of uniqueness in patterns within a cultural context (Bettinger and Eerkens 1999; Mason 2009; O'Brien et al. 2008; Rosenberg 1994). Following Shennan's concept of "cultural lineages" (2002:73), changes in stone tool designs, for instance, may indicate intensification of a specific task (i.e. specialization) within a given tradition. A long-standing or widespread pattern of that specialized tool's use may indicate that it is effective, and thus selected for and reproduced under ecological, socioeconomic, and cultural constraints. In finer detail, variations or mutations of
that tool’s design strategy may have to do with some assortment of circumstances; maybe during a time when ecological circumstance drove deer into low-lying habitats around fishing areas, people opportunistically diversified their tool kits for a range of tasks (Rousseau 2004; Hayden et al. 2000) - one cutting tool is better at getting into tiny contours of a deer’s muscles attachments, one is better for cutting away flesh, and one is better for delicate salmon processing. Similarly, perhaps participation in the Fur Trade was a foundation from which people specialized or intensified aspects of their tool kits for hide processing tasks, which appears to be the case at Bridge River (French 2013; Prentiss et al. 2013).

One important attribute of evolutionary theories in archaeology is the ability to facilitate the generation of testable hypotheses and work beyond purely descriptive analyses. By viewing tool design strategies as a phenotypic expression and casting their qualities against an ecological and socioeconomic backdrop, archaeologists can begin to understand why and how that phenotype was expressed - which is indeed the nature of my research design for the HP1 lithic assemblage. The relationship between Design Theory (Hayden et al. 1996a) and the broader concept of evolutionary archaeology is apparent in the examples provided above, but before addressing that subdivision, some discussion of Human Behavior Ecology is warranted.

3.3 Human Behavioral Ecology

Human behavioral ecology (HBE) is another theoretical framework that seeks to enable the generation of testable hypotheses for studying the interface
between behavioral and ecological variables in cultural and biological evolution. 

HBE is a response to some of the strict Darwinian underpinnings of early evolutionary theory, as well as the cultural foundations in Cultural Ecology, which in the mid-20th century was focused on the ways hunter-gatherers developed social and cultural systems in response to adaptive pressures faced in particular ecological niches (Binford 1968, 1973; Flannery 1972; Harris 1968; Steward 1938; Vayda and Rappaport 1968). Where HBE goes a step further is in considering particular variants of socioeconomic, political, or cultural systems in the face of ecological circumstances as evolutionary mechanisms subject to processes of selection that impact the fitness of the groups who devised such systems (Smith and Winterhalder 1992; Surovell 2009; Winterhalder and Smith 2000). There is a loose application of Darwinian evolutionary principles, as noted by Cronk (1991:27), who says that evolutionary processes have “...endowed our species with psychological predispositions, mental capacities, and physical abilities the have tended to be adaptive in the environments of human evolution, with ‘environments’ understood to include individuals’ cultural and social situations.” This notion de-emphasizes strict genetic evolution, replacing that concept with one that posits that genetics and culture interact reflexively with ecology.

HBE is often cropped by the costs and benefits weighed by groups in deciding whether to pursue one resource over another, which implies some adaptation to potential risks. Risk has a few definitions in archaeology. Keene (1981) sees risk as a probability of failure or loss in a system, while Bamforth and Bleed (1997) view risk as a function of reliability and predictability. Unpredictable variation in
resource availability or access presents people with a set of circumstances that require some decisions to be made about how to lessen risk affecting residential, subsistence, and technological strategies in hopes of increasing or maintaining group fitness (Elston and Brantingham 2010; Winterhalder et al. 1999).

One arena of HBE-Optimal Foraging Theory (OFT) - applies the decisions people make for managing risk to the circumstances surrounding nutrition, energy expenditure, and resource availability (Bird and O’Connell 2006; Broughton 1994; Winterhalder and Smith 2000). OFT views subsistence and mobility or sedentism in relation to how people invest efforts for attaining and utilizing preferred foods, facilitating some degree of dietary diversity, and where or how far people go to access resources, in addition to how long they decide to stay there (Ingbar 1994; Frison 1978; Schott 1986). Considering the dynamic history of terrestrial and riverine productivity discussed in Chapter 2, the application of OFT offers a useful lens for considering the intensification in Mid-Fraser people’s diets of food from those niches. For instance, Rousseau (2004) discusses gradual resource depletion in mammal hunting and plant harvesting areas, and how trips further into a patchy field became less attractive than a strategy of increased reliance on salmon, which could be acquired in large numbers in a setting relatively local to villages. Another method for lessening the effort required for accessing and carrying plant and mammal resources back to camp might be butchering or removing extraneous or less preferred elements of the resources in the field (Winterhalder and Smith 2000), which may be reflected in technological strategies, as well as subsistence and residential ones (Binford 1980; Bleed 1986; Harris 1968; Surovell 2009).
HBE in its modern form views any number of behaviors amidst a set of environmental circumstance, whether they are risks associated with subsistence and mobility, or some socioeconomic mechanism, like participation in the Plateau Interaction Sphere (Hayden and Schulting 1997) or the fur trade industry (Prentiss et al. 2013). Ecologically deterministic pitfalls once attached to an over-generalized understanding of HBE are avoidable with a well-informed culture history and ethnographic record used to devise a program of pointed and testable hypotheses. Returning to HBE’s relationship with cultural ecology paradigms, Binford (1962) suggests based on his study of the “sociotechnic” prestige goods and “technomic” utilitarian functions of copper projectile points and knives during the Upper Great Lakes Old Copper complex, within a cultural system many subsystems exist and contribute to what we perceive as an integrated whole, or a dependent variable; in the case of this research, the broad scope of St’át’ímc culture is a dependent variable.

In terms of anthropological thought, St’át’ímc Culture is an immense and complex emic concept, particularly when considering prehistoric times. An etic approach, using culture history and ethnography as a figurative “laboratory” (Binford 1962:224) for generating tests of how independent variables (e.g., technological strategies) influenced broader patterns in human behavior and decision-making in specific contexts, allows archaeologists to reach back in time and address anthropological questions. Further, subsystems integrated into the broader patterns of St’át’ímc culture occur on regional, site, and household scales, presenting a means for calibrating findings according to variation and continuity within a multi-scalar view of cultural patterns (Binford 1962, 1977). In other words, the
nature of material culture, “such that it is symptomatic of the past” (Binford 1980:5), informs a detailed, holistic understanding of what life was like in prehistoric times beyond whatever independent mechanisms or constraints (e.g., technological strategies, climatic conditions, resource availability, or socioeconomic systems) were experienced and foundational to St’át’imc culture.

As data will show later in this thesis, the HP1 lithic and faunal assemblages are different in certain ways from other housepit assemblages at different sites. To understand HP1’s assemblages and their implications to subsistence and residential strategies embedded and reproduced in society, a technological design-based theory operates on a more specific level. Design Theory offers a lens that increases resolution in views of the different technological strategies employed in Mid-Fraser prehistory, and what these strategies tell us about subsistence, mobility, and residential strategies in St’át’imc culture.

3.4 Design Theory

Lithic industries are a useful proxy for viewing decisions pertaining to sedentary life, mobility, storage, and subsistence methods. Therefore, it is possible to use the information provided by lithic assemblages to understand the dimensions of a particular residential pattern. Design Theory looks at a set of constraints factored into technological strategies that are implemented in different circumstance (Hayden et al. 1996a, 2000; Horsfall 1987; Pye 1964). In some schools of thought (e.g., Bleed 1996; Nelson 1991; Schott 1986), these constraints include:
**Reliability** - The dependability of the tool in the face of some risk of malfunction. Tools are stronger than necessary (overdesigned), have modular parts, and demonstrate good craftsmanship (Bleed 1986:739).

**Maintainability** - The capacity for the tool to be resharpened or fixed in some way, especially when away from raw material sources or residential/camp areas. Maintainable designs are also good for continuous tasks (Bleed 1986; Nelson 1991).

**Versatility** - The capability of a tool to be used in a number of different ways. The tool may have multiple employable units (Schott 1986:35,38), have different types of retouch (Hayden et al. 1996a), and suit maintainability needs.

**Flexibility** - The ability for a tool to be used multi-functionally in a “wider range of tasks” (Nelson 1991:70). The tool's employable unit(s) is capable of being changed into another tool as tasks may change unexpectedly (Schott 1986:35).

**Curation** - How much time and effort is invested in designing a tool that will last for a long time. Originally, the concept of curation dealt with mobility in areas away from raw tool-making material sources (Binford 1979); it also includes aspects of future-use anticipation, recycling, and heightened economy (Odell 1981; Shott 1986).

Hayden et al. (1996a) find that all of these constraints may have overlapping or contradictory attributes, they construct a piecemeal view of lithic design criteria, and they are not strategies as much as they are design attributes. Instead, Hayden et al. (1996a:11) propose that tool design is subject to task, material, technological, and socioeconomic constraints (Figure 3. 1). Hayden et al. also include prestige and
ideological constraints in their model, though their research goals with Keatley Creek lithic assemblages (Hayden et al. 1996a, 2000) deal in part with those topics, and my research does not, so I omitted them.

<table>
<thead>
<tr>
<th>CONSIDERATIONS</th>
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<tbody>
<tr>
<td>Size and Weight</td>
</tr>
<tr>
<td>Edge Angle and Form</td>
</tr>
<tr>
<td>Prehension and Hafting</td>
</tr>
<tr>
<td>Length of Use (Use-life)</td>
</tr>
<tr>
<td>Specialization</td>
</tr>
<tr>
<td>Reliability</td>
</tr>
<tr>
<td>(robustness and &quot;overdesign&quot;)</td>
</tr>
<tr>
<td>Ease of repair</td>
</tr>
<tr>
<td>Multifunctionality (versatility)</td>
</tr>
</tbody>
</table>

**Figure 3.1:** Design Theory constraints (Image modified from Hayden et al. 1996a:11)

Hayden et al.'s (1996a) model of design constraints offers a more refined version of Design Theory in that it integrates reliable, maintainable versatile, and flexible design attributes along with production methods into a more generalized set of constraints central to a given cultural pattern. Rather than focusing on attributes of particular tools in a descriptive manner, and making inferences about
subsistence and mobility from those data without contextualizing the decisions behind designing those attributes, Hayden et al. leave analytical space for figuring how tool design is a function of broader constraints experienced in a cultural system, including among other things mobility, storage, resource availability and quality, labor investment, etc. This is a tenant of “middle range theory” (Binford 1977), where material artifacts are used to answer anthropological questions viewed as the basis for studying human prehistory. Within this analytical space, it is possible to make predictions about how a lithic industry may appear relative to a subsistence or mobility strategy, and then test these predictions with specific case studies.

Bleed’s (2002) study of variation in microblade industries between hunter-gatherer groups on the Japanese Archipelago during the terminal Pleistocene is an example of the case Hayden et al. (1996a) make for diversity in tool design strategies. Bleed finds that the subsistence strategies and microblade technologies that facilitated them varied as a function of variable ecological circumstances and socioeconomic behaviors between northern and southern cultural-geographical settings, and that microblade industries among these groups are part of a cultural package on site and regional scales. Subsistence and mobility decisions influenced microblade industries, and diversity in microblade industries is a proxy measure of cultural patterns.

Returning to the concepts presented by Binford (1978, 1980), knowledge gathered from culture historical and ethnographic data about the circumstances at play in a cultural pattern is foundational in tool design studies. In the case of the
Keatley Creek tool design study, culture historical and ethnographic information was utilized in conjunction with use-wear analysis and experimentation with similar tool designs (Hayden et al. 2000:186) to epistemologically and holistically treat the topic. My study of the HP1 assemblage from the S7istken site follows Hayden et al. (1996a, 2000). More specifically, my question is, what kind of technological strategy is evidenced by the S7istken lithic assemblage, and what does this indicate about life at the site during the dynamic times of the Mid-Fraser proto-historic era?

Under the constraints presented above and the design criteria factoring in raw material quality, availability, and labor investment in tool production and materials transportation, in addition to attributes of resource processing frequency and intensity, Hayden et al. (1996a, 2000) recognize that assemblages predominantly composed of curated bifacial tools made from good materials are considered to be representative of both mobile and highly economized subsistence and tool design strategies, because bifaces are versatile, reusable, and portable tools that function relatively well for a range of cutting and scraping tasks that may be presented in the field (Binford 1979; Kelly 1988; Nelson 1991), or in winter camps when materials are scarce and robust tools can be repurposed or used multi-functionally (Goodyear 1993; Kuijt et al. 1995; Prentiss 2000). Bifaces are also capable of being utilized as tool cores should the production of another tool be required while away or blocked from a store or natural source of raw material (Kelly 1988, Nelson 1991). Conversely, assemblages that are predominantly composed of expedient, though typically single-use tools, such as light-duty cutting
tools and utilized flakes removed from cores of raw material, are considered to be indicative of a sedentary organization, where needs to be economical with material are buffered by a supply of stored supplies (Hayden et al. 1996a), though in highly mobile arrangements, regular access to raw materials can lessen economic risks in expedient tool production and material use. These tools are well suited for tasks such as preparing stored foods for day-to-day meals, or making baskets in prep for berry collection during summer months (Alexander 1992; Hayden et al. 2000). These hypotheticals illustrate that accessibility to the material types represented in lithic assemblages, along with the kinds of tasks carried out at the habitation site must be comprehensively weighed, and that no one aspect of design strategies explains in totality the nature of a tool kit and the decisions behind it. Rather, Design Theory should be viewed as a continuum in studies of technological organization.

In addition to dealing with tool types and the strategies behind their designs, the model Hayden et al. (1996a) offer also considers the production side of a lithic industry, and therefore enables debitage to be used as a very informative line of data in analyses. The following summarizes six production strategies observed by Hayden et al. (1996a:17-36) in their Keatley Creek studies:

**Expedient Block Core**- Cores of raw material are stored at the habitation site for expedient tool making as needed for immediate tasks. A flake is removed and sometimes retouched, but is typically discarded after use. Bipolar reduction is one style of core reduction in this category, and produces shatter debitage and many small flakes capable of expedient utilization while also effectively reducing small,
hard to handle blanks (Kuijt et al. 1995) and extending nearly exhausted core use-lives. Multidirectional core reduction and utilizing sufficiently large flakes as cores are other strategies for extending the use-life of block cores. Material quality and economic core reduction are not concerns given material abundance and locality. This strategy is associated with sedentary living arrangements when raw materials are stored in abundance or accessible throughout the year. However, the strategy also economizes raw material supplies when procurement of new materials is constrained (Hayden et al. 1996a; 2000).

**Biface**—“Biface” used specifically to define typically larger bifacially retouched tools (as opposed to projectiles, drills, or specialized flake tools) (Hayden et al. 1996a:22). These are durable, maintainable, flexible, multifunctional tools ideal for trips into the field. Materials must be of good quality for reliability constraints. Production includes hammer stone reduction and subsequent billet flaking for economic retouching and edge maintenance (Andrefsky 2005:22). This strategy is often associated with high mobility (Binford 1979; Torrence 1983), but also sedentism when materials are scarce and must be used economically, or when tools are recycled to buffer the depletion of stored raw materials similar to block core strategies in the face of stored material depletion (Kelly 1988; Nelson 1991).

**Portable Long-Use**—Specialized flake tools used in the field that are durable and maintainable (e.g., end and “key-shaped” scrapers, drills, and projectile points). The most durable raw materials are ideal. Production includes reduction from a sufficiently large core with enough workable body to allow high degrees of meticulous retouch. This strategy is associated with mobility, but tool specialization
also speaks to varying extents of logistical mobility and overall assemblage variability in terms of designing tools for specific tasks that may require a portable tool kit (Binford 1979). Tools under this strategy are typically small enough to be carried into the field, but reliable and maintainable enough to lessen the risks of failure.

**Quarried Bipolar** - This strategy is used to make spall scrapers from medium to large cores of course materials (quartzite and granite) for heavy-duty hide scraping and stretching. The obtuse edges satisfactorily process fibrous and membrane tissues without cutting the hide. These are typically larger tools, and are either kept at residential sites and used vigorously but infrequently, or left at hunting camps (Hayden 1996a:31).

**Scavenged Bipolar** - This strategy can be hard to identify archaeologically but includes the recycling of tools intentionally or unintentionally broken during prior tasks. Typically larger tools (e.g., bifaces) are thought to have the highest potential for recycling or reworking into new tools (Kuijt et al. 1995; Prentiss 2000). This implies an economical use of materials, and therefore may speak to the occurrence of stored tool material depletion in seasonally occupied residences, since otherwise broken or exhausted tools could be discarded and a new tool could be made.

**Ground Stone Cutting** - Ideal for high-volume processing needs where tool edges must remain sharp for long periods of time. Grinding materials (e.g. nephrite and slate) into tools is extremely labor intensive, but the payoff is a high degree of durability and infrequent trips to retrieve more raw material. Very durable materials are used (Hayden et al. 1996). This strategy appears in the late prehistory
of the Mid-Fraser when people were seasonally sedentary in villages (Harris 2012; Teit 1906).

Design Theory allows me to weigh scenarios like those above with instances of inter-site lithic assemblage variation amidst a broader cultural backdrop, and thereby contribute acutely focused knowledge to anthropology Mid-Fraser. The idea of “Archaeology as Anthropology” (Binford 1962; Willey and Phillips 1958) brings me to further stress that Design Theory, HBE, and Culture History all convey notions of selection, borrowing, and mutation, which are principles of evolutionary archaeology, and that these multiple theoretical frames are all paramount in holistically understanding lithic assemblages as a part of a cultural pattern. To understand the nature of the HP1 lithic assemblage, design attributes must be compared on site and regional scales so that the subsystems enmeshed in the bigger cultural pattern can be dissected epistemologically and then synthesized in anthropological knowledge of St’át’imc prehistory.
Chapter 4

The Mid-Fraser Winter Village and Tool Design Studies at Keatley Creek and Bridge River

Chapter 2 discussed the late Kamloops Horizon and the winter village pattern. This chapter provides some further discussion of the topic based on ethnographic information (Alexander 1992; Kennedy and Bouchard 1978; Teit 1900, 1906, 1909), but specifically as a foundation of tool design case studies at Keatley Creek (Hayden et al. 1996a, 2000) and Bridge River (French 2013; Prentiss et al. 2013). Much of my research builds upon the theoretical work of Hayden et al. (1996a), though that literature is specific to Keatley Creek in certain ways. For instance, Hayden et al. did not factor in certain tool classes found elsewhere in the Mid-Fraser (e.g., abraders and slate tools), so Hayden et al.’s theoretical work serves as a frame of reference. Case studies at these Keatley Creek and Bridge River contextualize my similar research at the nearby S7istken site.

4.1 Mid-Fraser Winter Villages

Seasonality is, of course, a driving factor in winter village patterns (Figure 4.1). In the Mid-Fraser, people typically moved into their winter residences and villages around November, and after the late summer and fall salmon run (Teit 1906:224). Some hunting occurred during this time of the year, as the relatively mild weather allowed hunting parties to target mammals fattened over the summer and winterized with thick coats as they came into lower elevations in proximity to
villages (Lane in Alexander 1992). Wind dried Chinook salmon caught and processed in the late summer and early fall was stored in below and above-ground caches both for consumption throughout the winter, and as a trade good (Kennedy and Bouchard 1992:290-298; Romanoff 1985; Teit 1906). By December, people sheltered in subterranean pithouses as the snow, ice, and cold temperatures impeded resource productivity and access around the Mid-Fraser, and this relative "downtime" (Prentiss 2000) was used in part to "gear-up" for the spring, summer, and fall. In short, activities in the house during the winter included tool, basket, and clothes making, preparation of stored foods for daily meals, and general maintenance of house beams, beds, shelves, and storage pits (Hayden et al. 2000; Kennedy and Bouchard 1998). When weather permitted, hunting of hare and grouse around village areas was possible (Kennedy and Bouchard 1992).

By March and the onset of spring, when plants and animals began to rejuvenate, people emerged from their winter village arrangements and carried out hunting and collecting tasks around the landscape, moving out into mat lodges with logistical proximity to resource areas. During this era of Mid-Fraser prehistory, winter villages were typically permanently situated around river terraces, grasslands, and lower woodlands (Alexander 1992). While many people would move away for the spring, summer, and fall months, some others including the elderly, children, or infirm, presumably remained in their winter village homes (Kennedy and Bouchard 1978). Kennedy and Bouchard (1978) and Alexander (1992) also document that winter villages were used for storage, or as bases for
berry collecting. It was also during these months that fishing camps spread along riverbanks and low terraces became vibrant centers of harvesting and processing.

![Image of a seasonal chronology chart showing months and associated activities.]

Figure 4.1: Seasonal chronology of the Lilooet (From Teit 106:224).

### 4.2 Tasks, Tools, and Strategies

Hayden et al. (2000:186-187) lay out a summary of technological strategies associated with the Mid-Fraser winter village pattern on the basis of tasks undertaken that are evidenced in the ethnographic record. The following paraphrases the aspects of their summary that are relevant to my research:

**Hunting** - With plenty of time for tool-making during the winter months, the early winter hunting efforts, and the occasion hunting trip throughout the winter, hunting tools such as bifaces, curated knives and scrapers, and projectile points were
manufactured in the winter residences. Hayden et al. (2000:186) expect broken and unfinished tools in winter village lithic assemblages for repairing, repurposing, and reuse, in efforts to avoid trips to procure more of the high quality and often non-local materials used for these tools.

**Hide Preparation**- Winter would have been a good time for hide working and making clothing. Also, during the summer, hides were likely brought to winter villages for future needs and processing. Winter village lithic assemblages should therefore include cobble and other specialized scrapers, awls, and needles, along with tool production lithics like piece esquille for bone splitting for awl and needle manufacturing (Hayden et al. 1996a, 2000).

**Plant Gathering**- Since stored plant foods were part of the winter diet, and some plant gathering may have occurred during the winter if food supplies were low (Teit 1906:222; 1909), light duty scrapers and utilized flakes, metates, and mauls are expected in lithic assemblages. These would have been useful for basket making and food preparation.

**Dwelling Preparation**- The tasks presented in building and maintaining houses included wood working activities and storage pit maintenance. Teit (1906:203-215) notes that tools for these tasks include adzes, chisels, saws, choppers, celts hammers, drills, and digging sticks.

**Storage**- Winter needs necessitated storage of food and a range of other raw materials for a number of tasks, including maw lithic materials. Storage in below and above ground caches was the method employed in the Mid-Fraser (Teit 1906:214; 1900:199). In terms of lithics, cores, curated tools, site furniture (e.g.
metates), and useable flakes of non-local or otherwise hard to come by materials would have been stored.

The above aspects of the winter village pattern in the Mid-Fraser are encompassed in the Design Theory model devised by Hayden et al. (1996a) (Figure 3.1). Task, material, technological, and socioeconomic constraints influencing design considerations and production strategies are therefore open to assessment from a detailed understanding of general Mid-Fraser technological organization. The remainder of this chapter discusses tool design research at Keatley Creek and Bridge River.

4.3 Tool Design at Keatley Creek (EeRl7)

With many of the observations of Keatley Creek (Figure 4.2) technological organization provided in Chapter 2, this section will expand on some of the specifics and findings of the research. To reiterate, Hayden et al. (2000) find that six general strategies are found in lithic assemblages from seven Kamloops Horizon pithouses at Keatley Creek, including:

- Expedient block core reduction and tool manufacturing strategies
- Bifacial strategies
- Portable flake tool strategies
- Quarried bipolar strategies
- Scavenged bipolar strategies
- Groundstone strategies
Hayden et al. assign tool types to the strategies listed above, and then record the frequency of those tools in the assemblage, their sizes, multifunctionality, production-side labor investment, use intensity and exhaustion, and material types. The materials they used are a sample of the entire lithic assemblage, since only tools that were complete enough to be reliably classified were included. One important aspect to consider is the location of raw material sources, which speaks to the economics of tool production and transportation costs. Rousseau (2000) provides lithic source information from surveys around the general Keatley Creek area, finding that the dominant materials were collected and transported from four
sources, including Fountain Valley pisolite, Upper Hat Creek basalt (dacite), Upper Hat Creek jasper and chert, and Maiden Creek basalt, jaspers, and cherts, which cumulatively range 8-25km from the village. These procurement sites are noted by Rousseau (2000) as being visited in hunting rounds, thus collection of blanks, perhaps with some varying degrees of reduction in the field for easier transport back to the Keatley Creek village likely occurred. Dacite is the most dominant material type in the assemblage, particularly in terms of block core materials (79.4%), and since Rousseau (2000) finds that the preferred higher quality dacites are found in non-local mountain settings that were likely inaccessible during the winter, Hayden et al. (2000) suggest that expedient reduction of block cores was performed to maximize materials. Hayden et al. also find that expedient block core strategies were the primary strategies employed at the site, therefore economizing raw materials was a fundamental objective in Keatley Creek technological organization. The summarized details of their findings are as follows:

**Block Cores** - Hayden et al. (2000) find the expedient production of tools from multi-directional block cores to be the dominant strategy at Keatley Creek (35% of the entire assemblage). They report that the majority of these tools and cores are dacite (79.4%), which indicates that based on the high transport costs associated with dacite procurement occurring up to 25 long, mountainous kilometers away from the village, expedient block core strategies economically maximized materials, insofar as this strategy produces a wide array of useable flakes of different sizes without requiring intensive fine retouching (e.g. pressure flaking), which produces flakes that are too small for utilization. This means fewer trips to retrieve more
material. Larger block core flakes (> 2cm) and tools made using this strategy are also capable of being produced and retouched by billet flaking, which Hayden et al. (2000) find to be the most effective means of producing different expedient cutting tools with highly acute edge angles.

**Bifaces**. This is the second most prevalent strategy in Keatley Creek assemblages, though bifacial tools represent only 3.4% of the total lithic assemblage. 83% of bifaces are made from high quality, fine-grained dacite (Hayden et al. 2000:194). The biface strategy is a highly economic use of materials due to the capacity for maintainability, reliability, versatility, flexibility, and long use-lives (Kelly 1988; Nelson 1991), and they also have an ideal ratio of acute edge angles to size, making them suitable for portability and hunting tasks (Nelson 1991). Bifaces were stored at the residential site for future uses of these curated tools, and were also returned from the field for repurposing and repair. Hayden et al. (1996a; 2000) utilized Callahan’s (1979) biface production stages to sort manufacturing investments, finding that 52.8% of bifaces in the assemblage were manufactured to completion, and therefore the majority of these tools were highly curated for future uses or repurposing, as well as butchering tasks during winter residency.

**Portable Flake Tools**. Tools produced with this strategy include end scrapers, drills, and key-shaped scrapers at Keatley Creek, and comprise 2.5% of the lithic assemblage. These are highly curated tools ideal for hunting and hide processing, as manufacturing them is labor intensive and exhaustive of high quality materials (typically chert or chalcedony), but they are portable and maintain reliable edges for cutting, scraping, and boring tasks. Rousseau (1992) discusses the use of key-
shaped scrapers for wood and antler working, and Hayden et al. (2000:199) find from use-wear analysis that 8% of them have signs of multifunctional use. However, in general, these are very specialized tools that would have been ideal to use for a long time. Further, these tools are most ergonomic and effective when hafted (Hayden et al. 2000:199), which implies another degree of labor investment.

**Quarried Bipolar Cores** - At Keatley Creek, quarried bipolar tools are quartzite spall tools produced from river cobbles (Hayden et al. 2000), and used for hide scraping. The Keatley Creek site had easy access to river cobbles, and these tools have long use lives. They represent .7% of the total lithic assemblage, and they are all complete tools (not broken). Given the long use-life and occasional use of these specialized tools, there would be little need to keep many around, hence their low frequency.

**Scavenged Bipolar** - No data is provided for the frequency of tools that correspond to this strategy, but Hayden et al. (2000:203) suggest that culling of sufficiently large or high quality flakes removed in field processing surely occurred to some degree to maximize abundance of good materials for any number of tasks in winter residences. High quality, reliable materials would have been used to make tools that could be scavenged and retuned to the village for repurposing (Prentiss 2000), however tools associated with this strategy are not necessarily distinguishable from similar tools and materials in line with other strategies.

**Groundstone Cutting Tools** - Producing these tools was highly labor intensive, but they were very strong and reliable tools with long use-lives. Though Teit (1906) talks about ground slate knives, at Keatley Creek, groundstone tools treated in
design research are made of non-local nephrite (Hayden et al. 1996a; 2000:203). The primary functions of these tools are for woodworking and intensive mammal processing where edges must maintain integrity for continuous and heavy-duty tasks. Based on Hayden et al.’s report, it is unclear what percentage of the assemblage these tools comprise, but given long use-lives and labor investments in procurement and manufacturing, these tools are rare in terms of frequency of occurrence in the lithic assemblage.

With the observation of a predominantly expedient block core strategy augmented by a relatively well represented biface strategy, the nature of Keatley Creek technological organization speaks to the economic use of high quality and non-local raw materials for tools associated with hunting and butchering, hide preparing, plant gathering, dwelling preparation, and storage tasks. The small average sizes of bipolar, multidirectional, and flake cores (3.2cm, 5.2cm, and 4.5cm, respectively) and high percentage of exhausted block cores (91.1% of total cores) (Hayden et al. 2000:206) further supports the finding that economizing materials was an important method for buffering raw material depletion in the winter residences. Hayden and Spafford (1996) discuss the socio-economic implications of the relative abundances of salmon and mammal remains in faunal assemblages between houses, and Kusmer (2000:125) reports that from two contemporaneously occupied houses (HP3 and HP7), HP3 has a faunal assemblage of n=2758, where fish remains comprise a majority of the total (n=2043) and mammal remains comprise 715 elements. In HP7, and the total faunal assemblage (n=11,353) includes a majority in mammal taxa (n=6285), and for fish n=5071. There is a clear reliance
on a range of food sources at the site, following ethnographic reports (Teit 1906). Additionally, the lithic and faunal data illustrate that sedentism in winter residences was extensive enough to necessitate food storage and conservative use of raw materials.

4.4 Tool Design at Bridge River (EeRL4)

Excavation of Housepit 54 (HP54) in 2012 targeted the late occupation of the house ca. 200-150 B.P., which was coincident with the Fur Trade Era (Prentiss et al. 2013). In the case of Hayden et al.’s tool design research at Keatley Creek, their team sought to utilize a “middle range theory” approach (Binford 1977) to understand lithic technological organization as a proxy measure of winter village lifeways and human behavior. In contrast, tool design studies at Bridge River respond to a specific need to understand the impact participation in the Fur Trade had on the HP54 lithic industry (French 2013; Prentiss et al. 2013). Prentiss et al. (2013) note that Keatley Creek has better proximity to outcrops of fine silicate materials (chert, jasper, and chalcedony), while Bridge River is more isolated from many of these outcrops (Figure 4.3). However, Bridge River is closer to sources of slate, nephrite, and steatite, and other materials such as dacite and some silicates, which can be found around rivers in cobble form as a result of fluvial processes (Prentiss et al. 2013). Like Keatley Creek, dacite is well represented at Bridge River (approximately 80% of all lithic materials) (French 2013), but Prentiss et al. (2013) suggest that high quality dacite from non-local settings would have been traded for
or transported to the site. Teit (1906:231) mentions that the Lillooet area was a vibrant trade hub with connections to groups around the Plateau and to the Coast.

The winter village pattern at Bridge River is similar to Keatley Creeks, and as such, storage of food and raw materials was important. Bridge River is also close to high volume salmon run areas and low to mid-elevation terrestrial habitats, so a diverse diet and subsistence strategy for targeting different resources would have been possible. Some differences in Bridge River and Keatley Creek lithic
assemblages are apparent, though. For instance, slate and silicified shale tools and flakes are found in HP54, where they comprise about 10% of the lithic assemblage, but are not found at Keatley Creek (Prentiss et al. 2013). The HP54 slate industry served cutting, scraping, chopping, and grinding needs in butchering, hide processing, and wood working tasks (French 2013). In terms of the Bridge River lithic analysis, sandstone, granite, and slate grinding slabs and anvils are included, though are not a part of Hayden et al.’s research. Another significant difference is that bipolar cores are more common than freehand multidirectional and flake cores in HP54, and they comprise 91.3% of all cores (French 2013:51). This large disparity in core types is suggestive of scavenged bipolar strategies designed to extend the use-life of raw materials and previously manufactured tools, especially given the patchy occurrence of secondarily deposited materials around river banks (Hayden et al. 1996, 2000; Prentiss 2000; Prentiss et al. 2013), and it is certainly indicative of efforts to maximize materials.

As part of the broader research question of how lithic technological organization related to the socioeconomic dynamics of the Fur Trade, tool design research compares changes through time in HP54 from the perspective of the house’s last occupation (BR 4) to calibrate findings relative to pre-Fur Trade times (BR 2-3), though these earlier occupations were not fully excavated in 2012. The 2012 field season was the first time a Bridge River pithouse had been excavated in near entirety, rather than in strategic trenches and test pits (Prentiss et al. 2008). Data collected in previous excavations (Prentiss et al. 2008; 2009a) informed the 2012 HP54 study, and some methods of measuring lithic industries were held
constant, such as debitage analysis using cortex cover, flake size, type, and the Modified Sullivan Rozen typology (Sullivan and Rozen 1985; Prentiss 1998, 2001) as lines of data to understand the implications of core reduction and tool making strategies. Additionally, tools were classified according to the Simon Fraser University Keatley Creek investigations and the typologies constructed in response (Hayden 1997; Hayden et al. 2000; Hayden and Spafford 1996) (Appendix A), which have been utilized in previous Bridge River investigations (Prentiss et al. 2009a) (Appendix A).

Charts, graphs, and tables of the HP54 lithic design study are available in French’s University of Montana thesis (2013), and in summation they report findings along the lines of tool, core, and debitage styles, types, and frequencies. Statistical tests to determine trends in the relations of the large data set (debitage: n= 10,505, tools and cores: n= 1402) were conducted, however, in the case of HP1 at the S7istken site, the lithic assemblage is much smaller and statistical testing was decided to be non-essential for handling the data, except for a couple of lines of analysis which are discussed in Chapter 5. French (2013) and Prentiss et al. (2013) conclude that block core strategies were most prevalent in HP54, and that this strategy was employed to buffer material loss and inaccessibility during winter occupations. Another conclusion was that the HP54 groundstone and chipped slate industry during the Fur Trade era was perhaps the most extensive of all Mid-Fraser housepit lithic assemblages, which indicates that specialization occurred to meet the needs of hide processing beyond household subsistence (Prentiss et al. 2013). Faunal analysis also demonstrates that of the total faunal assemblage (n=8848), fish
remains comprise 2431 elements, while mammal remains comprise 6417 elements (Prentiss et al. 2013:91). As data will show later in this thesis, this is a marked difference from S7istken HP1 assemblages.

Chapter 5

Hypotheses, Materials, and Methods

This chapter presents the hypotheses this research tests before laying out the data sets and methods of analysis utilized in HP1 lithic design study. In general, similar research at Keatley Creek (Hayden et al. 1996a, 2000) and Bridge River (French 2013; Prentiss et al. 2013) discussed in Chapter 4 was used to inform methodologies in my research of HP1 materials. Some of the specifics of the test expectations for two hypotheses receive detailed descriptions in the materials and methods sections of this chapter.

5.1 Hypotheses and Test Expectations

Previous chapters in this document discuss a winter village pattern during the late Kamloops Horizon, proto-historic era, and historic era in which people resided in seasonal camps logistically situated around hunting and fishing sites, during the spring, summer, and fall seasons, and then moved into their pithouse village residences during the cold and relatively unproductive winter months,
where they relied on stored resources and made occasional trips into the field when possible to replenish depleted supplies of food and raw materials (Alexander 1992; Kennedy and Bouchard 1978, 1992; Rousseau 2004; Teit 1906). During their times in winter village housepits, people carried out tasks for their wintertime welfare such as food preparation, hide working, and household maintenance. They also made new tools and repaired old ones for future uses during the spring, summer, and fall months when hunting, butchering, plant collection, fish processing, and storage stocking occurred.

Anticipating that the necessary lithic raw materials for wintertime needs and non-wintertime toolkit preparation were not going to be locally or immediately available around the winter village site, people collected and stored these materials (Hayden et al. 1996a, 2000; Rousseau 2000). Economizing lithic raw materials has proven to be an important strategy in the technological organization of houses at Keatley Creek during the late Kamloops Horizon (Hayden et al. 1996a, 2000) and at Bridge River during the historic Fur Trade era (French 2013, Prentiss et al. 2013). Although there are some differences in how people economized lithic materials and designed their tool kits between the two sites that implicate factors such as material accessibility and subsistence strategies, as well as the socioeconomics of trade (Prentiss et al 2013) or wealth accumulation and demonstration (Hayden and Spafford 1996) in the shaping of technological organization, the hypotheses discussed above account for other factors specific to HP1 that are associated with resettling into the winter village pattern after the abandonment phenomenon or carryover from those more mobile times.
At Keatley Creek, which lies in closer proximity to high quality silicate outcrops and mid-elevation hunting grounds, expedient block core tools removed from multidirectional cores dominate the lithic industry (35% of the entire assemblage), followed by curated biface tools (3.4%) and portable long-use tools (2.5%) (Hayden et al. 2000). Also, ground and chipped slate tools are not found, likely as a function of the non-locality or undesirability of the material relative to dacite, cherts, jaspers, and chalcedonies. Interestingly, the relative concentrations of salmon and mammal remains in the faunal assemblages from two houses (HP3 and HP7) vary. In HP3, 74% of the faunal assemblage is comprised of salmon remains, and the remaining 26% is comprised of mammal remains (Kusmer 2000). In contrast, HP7’s faunal assemblage exhibits slightly more mammal remains (55%) than salmon remains (45%) (Kusmer 2000), which Hayden and Spafford (1996) suggest is related to material wealth and heightened social standing.

HP54 at Bridge River also features a lithic assemblage with primary reliance on expedient block core tools, but 91.3% of the cores are bipolar cores (French 2013). Also, unlike the case at Keatley Creek, ground and chipped slate tools are found in HP54, and comprise 10% of the total tool assemblage. Bridge River is closer to sources of slate, so it is a fair assessment that proximity to the material explains its occurrence in the lithic assemblage, as well as the disparity in comparison Keatley Creek assemblages. Similar to HP7 at Keatley Creek, the faunal assemblage from HP54 is dominated by mammal remains (72.5%) while salmon remains comprise the remaining 27.5% of the assemblage (Prentiss et al. 2013). Prentiss et al. (2013) present the case that technological organization and tool
design at Bridge River responded in part to hide processing needs during the Fur Trade, which also elucidates a potential reason for the relative abundance of mammalian remains.

Again, dates from HP1 at the S7istken site place its occupation between the houses included in Hayden et al.’s (1996a, 2000) tool design research and HP54 at Bridge River (Prentiss et al. 2013). The opportunity to study technological organization and lithic design strategies in HP1 at the S7istken site between late prehistoric times at Keatley Creek and historic times at Bridge River underpins my research, even though the sites operated under some different circumstances. Despite the different time frames, locations, and circumstances at play between the sites and houses, it is important that diversity within the region and general cultural patterns through time are studied so that a more comprehensive understanding of Mid-Fraser lifeways is made possible. Some temporal depth between the two HP1 occupations is analyzed in my research to address intra-house dynamics over time.

Based on the proto-historic dates obtained in HP1 (Smith and Mattes, in preparation; Table 2.1), knowledge of the natural settings and circumstance under which the house was occupied (Chapter 2), understandings of winter village lifeways (Chapter 2 and 4), and findings from the Keatley Creek (Hayden et al. 1996a, 2000) and Bridge River (French 2013; Prentiss et al. 2013) lithic design studies, I present first a null hypothesis ($H_0$), that lithic design and technological organization do not represent a typical winter village arrangement, and that in both occupation periods of HP1, some mixture of mobile strategies is found with sedentary ones to a degree that is atypical of the winter village pattern that has been
discussed so far. Further, the null hypothesis opens up additional avenues of research than could consider factors such as site specialization (Odell 2003; Torrence 2001), or the socioeconomics of prestige or trade (Hayden and Spafford 1996; Prentiss et al. 2013). The null is followed by the alternative \( (H_1) \), that lithic design and technological organization in HP1 demonstrate a typical winter village pattern right from the onset of small village repopulating. Some variation of winter village pattern technological organization is surely expected, which should be treated by future research to understand the dynamics of human lifeways under broader cultural patterns. These hypotheses are provided with sets of expectations that frame the results of my analysis.

\( (H_0) \): Lithic design and technological organization are atypical of the winter village pattern. This is found in both occupation periods, and illustrates an instance of carry-over from less sedentary times after late Kamloops Horizon village abandonment event (Kuijt and Prentiss 2004). Some expectations include:

**Fauna**

- A mixture of subsistence resources in the faunal assemblage, or wide diet breadth, as hunting would be more prevalent and salmon storage would be less so.

**Debitage**

- Materials: High material diversity and an abundance of high quality non-local materials that were capable of being made into reliable and maintainable tools ideal for mobile hunting (Andrefsky 1994; Bamforth and Bleed 1986; Binford 1979; Bleed 1986, 2002).
• Cortex cover: A mixture of cortex classes, since different stages of tool production would have been found as formalized curated tools were at least equally important to expedient ones produced from previously processed and stored materials (Mauldin and Amick 1989; Odell 1989).

• Flake sizes: Flake sizes would be diverse, since all stages of tool production would have been carried out in producing formalized tools (Ahler 1989), rather than the later stage retouching of formalized tools and expedient tool production from cores. Further, regular access to materials during movements around the landscape would make utilization of Med-Lrg pieces less of a concern in material economizing.

• Modified Sullivan and Rozen Typology (MSRT): MSRT flake completeness measures indicate more tool production than core reduction, since formalized tools would be more important for a mobile tool kit (Binford 1979). This is evidence by high percentages of split flakes and proximal fragments associated with tool production (Prentiss 1998; Sullivan and Rozen 1985).

• Flake type: Flake types will mostly point to tool production with high percentages of early stage, R-billet, retouch, and thinning flakes (Raab et al. 1979).

Tools and Cores

• Materials: Raw material diversity would be high for tools and cores, though cores would be less common, and this would be a function of access to
different high quality materials (Andrefsky 1994; Bamforth and Bleed 1986; Binford 1979; Bleed 1986, 2002).

- Cores: Cores would be found in lower percentages of the assemblage compared to formalized tools (Binford 1979) and would be mostly of the versatile and flexible flake or transportable biface varieties (Kelly 1988; Nelson 1991), as these types would indicate the use of hunting tools for making other tools.

- Tool size: Tools are expected to fall into the small (10-20mm at largest dimension) to medium (20-50mm) size ranges because these would be ideal sizes for handling, but also, medium sized tools would provide enough surface area for repair in the field. This is a component of reliable and maintainable tool designs (Bleed 1986).

- Tool class: The most common tool classes would be those associated with hunting rather than household tasks (e.g., bifaces, projectile points, and multiuse tools) (Hayden et al. 1996a).

- Tool task/function: The most abundantly represented tools would be associated hunting and butchering tasks, rather than light duty, heavy duty, tool production, and generalized classes that are associated more with household tasks (Hayden et al. 1996a, 2000).

- Storage of utilized flakes and cores: Utilized flakes and cores would not be found in association with storage features in the house because regular forays around the field would have provided access to materials that could be made into formalized tools. The storage of utilized flakes speaks to the
concept of serial expediency (French 2013; Prentiss 2000), where expedient tools are not necessarily discarded after one use if capable of further applications, which is a way of economizing materials. Also, the storage of cores would be rare as more formalized tools and few expedient tools removed from cores are expected in a more mobile arrangement.

- Multifunction/expediency/curation: Multifunctional and curated tools would be more common than expedient tools, given reliable, maintainable, and versatile design strategies needed in more mobile toolkits (Bamforth and Bleed 1997; Bleed 1986, 2002; Hayden et al. 1996a).

(H1): Lithic design and technological organization indicate a typical winter village arrangement, where tasks associated with winter household maintenance, cooking, basket making, clothing production and maintenance, storage, and preparation for the hunting/fishing/collecting season were most commonly performed in HP1 (Hayden et al. 1996). Some embedding of sedentary winter technological organization is expected between the two occupation periods through time. Some expectations include:

Fauna

- High percentage of salmon remains relative to mammal and bird remains are found in the faunal assemblages, following ethnographic reports of winter village subsistence (Alexander 1992; Kennedy and Bouchard 1978; Teit 1906).
Debitage

- Materials: Debitage materials would be less diverse and higher percentages of locally available but lower quality materials (e.g., slate) would be found (Andrefsky 1994).

- Cortex: Flakes will be mostly tertiary since previously processed material would be used for tool manufacturing and core reduction and in late stage or expedient forms (Mauldin and Amick 1989).

- Flake size: Few, if any, Med-Lrg flakes would be found since these would have been further reduced in tool production (Prentiss 2000, 2001).

- MSRT: More core reduction than formalized tool production occurred, as evidenced by an abundance of non-orientable, complete, and proximal flakes (Prentiss 1998, 2000, 2001; Sullivan and Rozen 1985).

- Flake type: Most flake types will be of the core reduction varieties (e.g., bipolar and core rejuvenation), though retouch and thinning flakes often resulting from tool production and retouching are expected since some tool retouching likely occurred for repairing tools for future uses, and these flakes can result from multidirectional core reduction (Prentiss 1998; Raab et al. 1979).

Tools and Cores

- Materials: Raw material diversity will be low since regular access to different materials would be constrained by climatic factors. People would have instead procured and stored suitable materials for storage and augmented those material supplies with local and lower quality materials (slate) (Andrefsky 1994).
• Cores: A higher percentage of bipolar and/or multidirectional cores are expected, rather than repurposed bifaces used as cores (Kelly 1988), as a function of economic and expedient tool production or material use (French 2013; Goodyear 1993; Hayden et al. 2000; Prentiss et al. 2013). I also expect that cores would be used exhaustively to maximize materials.

• Tool size: Tools are expected to be mostly small (10-20mm at largest dimension) as a function of smaller tool blank sizes. Small tools would be sufficiently large in this size range for handling but less material would be used to make them, evidencing a balancing of task and material constraints (Hayden et al. 1996a, 2000). Extra small tools (<10mm) are also expected to occur in the assemblage, evidencing discard of exhausted tools and ones that cannot be repurposed. A small percentage of large tools (>100mm) should be found, and these would be site furniture tools (e.g., metates) or non-portable long-use tools (e.g., saws and hand mauls).

• Tool class: The most abundantly represented tool classes will be of the core, minimally retouched uniface, tool production, and utilized flake varieties associated with household activities and expediency (Hayden et al. 1996a, 2000), though some more curated types will be found in lower concentrations and in late or damaged forms for maintenance and repurposing (Torrence 1989).

• Task/function: The most abundantly represented tool task/function categories will be of the light duty, general purpose, heavy duty wood/bone/antler, and tool production varieties associated with household activities (Hayden et al. 1996a, 2000).
• Storage of utilized flakes and cores: Cores and utilized flakes will be found in association with storage features as a function of serial expediency (Prentiss 2000) and material conservation. Storage would be a routine strategy in wintertime lifeways, and keeping toolstones available would be important.

• Multiuse/expedient/curated: Expedient tools are expected in high percentages since this would be an economic use of stored material, particularly cores, and reliable and maintainable designs would be needed less in sedentary arrangements (Bamforth and Bleed 1997; Bleed 1986, 2002).

Some of the expectations of both hypotheses suggest that certain attributes of the sedentary or mobile classifications are less discrete than others. For instance, it may be that expedient flake tools were not always discarded after one use if they were capable of further uses or retouching (Prentiss 2000), and these tools complicate the notion of strict expediency vs. curation. Another issue could be raised with the relative frequency of cortex cover classes if materials were initially decorticated in the field or occurred without cortex in the first place (Mauldin and Amick 1989). Further, maybe some field tools were kept at hunting camps or fishing sites, which would positively skew the relative abundance of household tools in the assemblage. In a general sense, it seems commonplace that systems enacted by groups of people tend to be diverse and often not strictly dichotomous. However, through the multi-factor approach written into these hypotheses, I hope to find general trends in the data that will contrast the scenarios implied in either hypothesis.
5.2 Materials

From excavations at HP1 of the S7istken site during the summers of 2010, 2011, and 2012, a debitage assemblage of n=1394 and a tool and core assemblage of n=329 were retrieved from two occupation phases and house rim contexts (Smith and Carlson 2011; Smith and Mattes, in preparation). A general representation of the tool assemblage is shown in Figure 5.1. The faunal assemblage is comprised of 28,717 elements from occupations 1, 2, and rim contexts, in which salmon bones are the most prevalent specimens (n=24,621). All data are grouped into occupation and rim contexts where stratum IIa is the first floor, stratum Va is the first roof, stratum II is the second floor, stratum V is the second roof, stratum III is rim, and stratum I is the subsurface component. These strata are combined by occupation sequences (Occupation 1, 2, and rim) in this analysis for organizational purposes, and a view of change through time spanning about 50 years between Occupation 1 (305 ± 26 cal. B.P.) and Occupation 2 (343 ± 23 cal. B.P.) (Table 2.1). Dates were obtained from burned wood in situ with hearth features in stratum IIa (Occupation 1) and II (Occupation 2) (Smith and Mattes, in preparation).
Figure 5.1: A general overview of tools represented in the HP1 lithic assemblage. A: igneous intrusive spall scraper; B: ground sandstone tool; C: igneous intrusive handmaul; D: dacite utilized flake scraper; E: chipped slate scraper; F: sandstone saw; G: hafted dacite drill repurposed from a unifacial knife; H: convergent bifacial dacite knife; I: dacite microblade; J: slate adze fragment; K: dacite stage 4 biface (Callahan 1979); L: dacite stage 3 biface fragment; M: sandstone metate; N: dacite Kamloops projectile point; O: dacite Kamloops projectile point; P: chert multidirectional core.
Lithics

*Occupation 1*: The lithic assemblage from this occupation period yielded a small amount of debitage (n=501) relative to the assemblage from Occupation 2. Excluding ornaments and unclassifiable tools, the tool and core assemblage from Occupation 1 yielded 65 specimens. Of the 65 tools and cores, 16 were considered complete enough for measurements of multifunctionality, expediency, and curation, which will be discussed in the methods section of this chapter.

*Rim*: The rim of HP1 yielded 82 pieces of debitage. Excluding ornaments and unclassifiable tools, the tool assemblage had a quantity of n=11, with no tools being complete enough for multifunctionality, expediency, or curation measures.

*Occupation 2*: The lithic assemblage from this occupation period yielded a large amount of debitage (n=1394) relative to the assemblage from Occupation 1. Excluding ornaments and unclassifiable tools, the tool and core assemblage yielded 249 specimens. Of the 249 tools and cores, 54 were considered complete enough for measurements of multifunctionality, expediency, and curation.

**Fauna**

Since studying subsistence from the perspective of species diversity and dietary breadth is not a component of this research, the HP1 faunal assemblage is presented in the basic terms of salmon versus birds and mammals by occupation and rim contexts. More diversity within those taxonomic categories exists (Smith
and Carlson 2011; Smith and Mattes, in preparation), but the goal in my treatment of faunal analysis at HP1 is to present a heuristic case in which tools and strategies are associated with tasks related to the procurement and processing of animals in those general salmon/not fish categories.

*Occupation 1:* For all specimens, n=3749. Salmon bones comprise 72.1% (n=2703) of the total faunal assemblage. Bird and mammal bones comprise the remaining 27.9% (n=1045) of the assemblage.

*Rim:* For all specimens, n=178. Salmon bones comprise 61.2% (n=109) of the total faunal assemblage. Bird and mammal bones comprise the remaining 38.8% (n=69) of the assemblage.

*Occupation 2:* For all specimens, n= 24,790. Salmon bones comprise 88% (n=21,815) of the total assemblage. Bird and Mammal bones comprise the remaining 12% (n=2975) of the assemblage.

### 5.2 Methods

As stated previously, excavations at HP1 have taken place in 2010, 2011, and 2012. Laboratory analysis and cataloguing work have been ongoing following the return from the field in 2010.

**Field Methods** - Lisa Smith lead the first site survey and test excavations of the 8 housepits (Figure 2.9) in the summer of 2010 in conjunction with the Bridge River
Band (*Xwisten*) and ongoing University of Montana investigations of the nearby (3km) Bridge River Village site led by Prof. Anna Prentiss (Prentiss et al. 2008, 2009a, 2010, 2013). During the 2010 season, all houses were excavated with singular 50cm x 50cm units, and the largest housepit (HP1) was tested with a .5m x 1m unit in the center of the house. Additionally, 1 of 14 external pit features was sampled with a 50 x 50cm unit, and proved to be a cache pit. The test unit in HP1 revealed a surface stratum (I) 0cm-5cm below ground cover, a roof (stratum V) 5cm-8cm below the surface, and a floor (stratum II) 8-10cm below surface. These strata are of varying thickness (Appendix B), so the depths mentioned above are approximate based on the center of the house. Charcoal from a feature inside HP1 thought to be a posthole (Smith, personal communication 2014) was dated to 540 cal. B.P. While dates from HP2 indicated occupation around 1100 B.P. and a 4500 B.P. occupation in HP4 (Smith and Carlson 2011), the late prehistoric date of HP1 influenced 2011 and 2012 HP1 excavations for reasons of late prehistoric Mid-Fraser research interests (Smith, personal communication 2014) as knowledge of this timeframe in the Mid-Fraser is in need of improvement, particularly in terms of contrasting findings with Fur Trade times.

During the 2011 field season, HP1 was targeted for more extensive excavation, and a 1m x 6m trench was dug from the middle of the house to the south rim. This revealed another roof (stratum Va) and floor (IIa) 10-20cm and 20cm below the surface, respectively. Within the trench dug in 2011, a central roasting feature associated with stratum II and a cache pit associated with Ila were identified, and what appeared to be a glass trade bead fragment found in stratum II suggested
a proto-historic occupation (Smith and Carlson 2011). The bead proved to be a simple shard of glass once analyzed in the laboratory and it is also now considered by Smith to have been out of context (Smith, personal communication 2014), but nonetheless, was a compelling find at the time that spurred interest in the possible contact period occupation in HP1.

Smith and team returned during the 2012 field season to excavate HP1 in north, south, east, and west quadrants gridded from the southwest corner of the site (Smith and Mattes, in preparation). 1m x 1m units were subdivided into .50m x .50m quadrants and excavated in 5cm levels, which excavated 70% of the house. Artifacts were point plotted in centimeters below the datum relative to the grid. Trowels, wooden picks, and brushes were used for digging, and excavated material was sifted through 1/8in mesh screens. Artifacts were bagged with provenience information and returned to the University of Montana for analysis.

In totality, 5 cache pits, 6 hearth features, and 2 postholes have been identified around the house (Appendix D). Dates established from charcoal retrieved in two of the hearths features put the floor occupations in the between 343 cal. B.P. and 305 cal. B.P. (Table 2.1), as mentioned previously, and these were considered to be more reliable and representative of the entire house than the 540 B.P. date from 2010 given the context of that dated charcoal retrieved from the possible posthole (Smith and Mattes, in preparation). This supports a proto-historic timeframe of occupation in HP1, and no other supposed European trade goods were found subsequent to the finding of the trade bead-like glass fragment in 2010, and
this coupled with the reliable dates obtained in 2012 indicate that HP1 was not occupied during European contact times.

**Laboratory Methods**

*Debitage*

Artifacts from HP1 are housed in Prof. Anna Marie Prentiss’ archaeology laboratory at the University of Montana. Analysis and cataloguing have been ongoing since 2010, and my laboratory participation with the project began in 2013 with lithic analysis of the excavated materials from the 2012 field season. The lithic analysis methodology was similar to what has been employed in the Bridge River HP54 project (Prentiss et al. 2009a, 2013). Debitage analysis was the first part of my research, and was carried out to measure what strategies of raw material use, tool production and maintenance, and core utilization were conducted in HP1. While working through bags of excavated lithic materials, tools were measured in a variety of ways to infer their functions, use intensity, and production attributes. The faunal assemblage was then analyzed in brief to frame the subsistence implications of the lithic assemblage’s design. Debitage laboratory methods follow below.

*Raw material type*—Material types were identified according to the Bridge River HP54 lithic typology (Prentiss et al. 2013), which has been modified from the SFU-Keatley Creek lithic typology (Hayden et al. 1996a; 2000). Material types are considered representative of storage and transportation constraints (Andrefsky
Andrefsky (1994, 2005) discusses the implications of raw material use in light of mobility or sedentism, finding in his own research that mobile groups tend to utilize diverse and high quality materials procured in different locations around a landscape that are capable of producing reliable and maintainable tools. In contrast, sedentary groups tend to focus on few materials, which are suitable for a range of tasks, and these materials are collected and stored. Sedentary groups also utilize locally available materials to offset procurement costs.

_Cortex cover:_ 99-100% cortex- Primary; 1-98% cortex- Secondary; 0% cortex- Tertiary.

Cortex cover is one indication of production stages (Andrefsky 2005:104; Johnson 1989; Magne 1989:17, Mauldin and Amick 1989:70; Odell1989:185; Shott 1994a:80) because it demonstrates the sequence of reducing toolstones from unworked to highly worked forms; unworked stones presumably have more cortex than highly worked ones. However, tertiary debitage can be produced in the primary stages of reduction due to shatter or unintentional breaks on interior (ventral) facets, which precludes definitive evidence of production stages (Sullivan and Rozen 1985), and further, it is likely some raw materials were reduced in the field before returning to the habitation site (Hayden et al. 1996a. 2000). The form in which a raw material occurs (e.g., cobble, flake, bedrock, etc.) also has bearing over how much cortex coverage there is on a toolstone when it is initially procured or reduced. With some of these assumptions in mind, Ahler (1989:90) suggests that cortex cover information is useful in debitage analysis when coupled with measures of size.
because flake size can be telling of varying production strategies. For instance, early stage through late stage biface production from a cortical stone may result in all classes of size and cortex cover being present in the assemblage, however, if only later stages of production are carried out at a site, more small tertiary pieces are expected (Andrefsky 1994; Raab et al. 1979). In a similar regard, production of tools from flake cores or well used multidirectional cores is suggested by an assemblage with many small tertiary flakes, since the original core had little to no cortex cover even in the earliest stages of production (Tomka 1989).

*Size:* $XSm-< .64cm^2; Sm-.64-4cm^2; Med- 4-16cm^2; Lrg- 16-64cm^2; XL- >64cm^2$.

These size classes are congruent with the Bridge River and Keatley Creek tool typologies (Hayden et al. 2000; Prentiss et al. 2013), and measurements were obtained by placing the largest dimension of individual debitage into measured size-class squares on a template. Flake size is considered to be representative of production stages, strategies, and tool and core economizing (Ahler 1989; Prentiss 1998, 2000). Also, following Raab et al. (1979), a range of debitage sizes in a lithic assemblage can imply all stages of tool production were carried out at a site, while an abundance of XSm-Sm pieces suggests that only late stage production or processing of small blanks occurred. Raab et al. suggest that making tools from large blanks is inefficient in managing material use or transportation costs in sedentary arrangements.
Depending on the materials used, tool production and core reduction strategies, and stages of tool manufacturing carried out at a site, different kinds ofdebitage will appear in varying frequencies in an assemblage. For example, bipolar reduction of cores produces shatter at the distal and proximal ends of the core as a result of crushing between a hammerstone and an anvil, but also variable and more intact flakes in between the crushed ends of the core (Cotterel and Kamminga 1987). Conversely, manufacturing of flake tools tends to produce an abundance of small and fragmentary debitage as a result of retouching (Sullivan and Rozen 1985).

Sullivan and Rozen (1985, 1987) conducted experimental studies in which they analyzed the completeness of individual pieces of debitage removed in tool versus core reduction and came up with the debitage categories, complete flake, broken flake, flake fragment, and debris (Sullivan and Rozen 1985). Prentiss (1998, 2000, 2001) has refined the Sullivan and Rozen Typology in a couple ways, but before discussing that more, her categories include:

- **Complete flake**- a single interior face (ventral) of the flake is observed, the striking platform is intact, and the flake edges (margins) are unbroken;  
- **Proximal fragment**- a single ventral surface and the striking platform are intact, but margins are broken;  
- **Split flake**- a single ventral face and striking platform are present but the flake is snapped longitudinally along the fracture plane;  
- **Medial/Distal fragments**- A single ventral face is observed and there is no striking platform;  
- **Non-orientable flakes**- no single ventral surface or striking platform is present.

In their studies, Sullivan and Rozen (1985, 1987) determined that core reduction results in a debitage assemblage featuring what Prentiss terms complete,
proximal fragments, and non-orientable flakes, while tool manufacturing, being performed in finer detail results in thinner flakes that are more prone to breakage, but fewer complete and non-orientable flakes and more proximal fragments, split flakes, and medial/distal flakes. It should be noted, though, that medial/distal flakes are always expected in abundance, and regardless of the types of lithic reduction performed at a site (Prentiss 1993, 1998). Since there is some overlap of the categories, and material factors (Amick and Mauldin 1997), the type of percussor (Prentiss 1998), the ability of the manufacturer (Shelly 1990), taphonomic effects like trampling (Prentiss and Romansky 1998), the discarding of non-orientable debris (Prentiss 2000), or the culling of flakes suitable for use (Prentiss 2000) are possible issues in Sullivan and Rozen typological studies, there are potential problems with the validity of the model. Other lithic analysts performed similar experimental studies to test Sullivan and Rozen’s typology, and came up with varying results (Ahler 1989; Mauldin and Amick 1998; Prentiss 1998, 2001; Prentiss and Romansky 1989; Tomka 1989).

Prentiss (1998) demonstrated that there is reliability to Sullivan and Rozen typology, or that the results of performing that style of analysis are replicable, but incorporating debitage size classes increased the validity of the analysis in terms of interpreting whether the patterns leaned more in the direction of core or tool production. Prentiss experimented with different materials and percussion techniques (hardhammer, billet, and pressure flaking) while making bifaces, flake tools, and reducing different kinds of prepared and unprepared cores, then ran
statistics on the resulting debitage that identified patterns in the relationships of the different factors to explain the variance in each lithic processing activity.

In summation, Prentiss (1998:647) reports that medial/distal flakes were produced in each activity, but are especially abundant in small sizes when reducing amorphous unprepared cores with hardhammers, and that Sm-Med proximal fragments also resulted from this activity. The reduction of cores on which platforms and edges have been prepared resulted in the common small medial/distal debitage, as well as Sm-Med complete flakes as a function of the dorsal regularity of the core. Non-orientable flakes were produced by all kinds of core reduction. On the other hand, Prentiss found that the production of flake tools lead to high percentages of medial/distal and split flakes, but few medium proximal fragments and non-orientable flakes. In hardhammer biface production, small complete flakes were produced in addition to small proximal fragments, along with the common medial/distal flakes. Prentiss’ (1993) hierarchical scheme (Figure 5.2) for Sullivan and Rozen-style debitage analysis is a modified measuring instrument that couples flake completeness with flake size to establish patterns in tool manufacturing methods and assemblage variability, and it is called the Modified Sullivan and Rozen Typology (MSRT).

Evidently, interpreting MSRT data can be complex, and not all assemblages are capable of yielding valid results. Fine grain materials always produce XSm-Sm non-orientable and medial distal flakes (Prentiss 1993, 1998), plus some assemblages do not include a range of size classes, so a potential evidence of absence/absence of evidence paradox can complicate matters. By simple
observation, as well as some data to the effect provided in Chapter 6, debitage from the HP1 assemblage is generally XSm-Sm in size and often fragmentary, and it was decided that statistical testing similar to what Prentiss utilized would have been difficult without a larger data set. Nevertheless, these data are included in my analysis to heuristically weigh in terms of other debitage measurements.

Fracture initiations were also recorded when possible. The fracture initiations from hardhammer reduction include cone fractures, billet flaking results in bend initiations, and bipolar hammering results in wedge initiations (Cotterell and Kamminga 1987).

Figure 5.2: The Modified Sullivan and Rozen Typology hierarchical analysis chart (From Prentiss 1993).

*Flake Type: Bipolar; Early Stage Reduction; R-Billet; Retouch; Thinning; Core Rejuvenation; Notch.* These 6 flake types were recorded in my analysis to view
patterns in how tools were produced and maintained, and how cores were utilized. One issue with flake type analysis is that not all debitage can be used. By MSRT flake completeness standards, the pieces unclassifiable by type are the medial/distal and non-orientable flakes. This information can still be utilized in the analysis as general debris, which informs production intensity, style, and material use in its own regard (Morrow 1997). The subsets of the assemblage included 35.5% of Occupation 1 debitage (n=178/501), 40.4% of Rim debitage (n=21/82), and 30.1% of Occupation 2 debitage (n=419/1394).

The first on the debitage type classes, bipolar flakes, can vary in size and often show crushing at the proximal and distal ends. Next are early stage reduction flakes, which are thick, high dorsal angle flakes with few, if any, dorsal scars. R-billet flakes are long and thin with distinctive bend initiations and raised platforms that look like the letter “J” tipped horizontally, where the hook of the “J” shape is the striking platform. Retouch flakes are Xsm-Sm in size and feature small platforms and low dorsal edge angles. Thinning flakes are long, narrow, and thin flakes (Sm-Lrg) with small striking platforms and low dorsal angles. Core reduction flakes have many dorsal flake scars, and are produced from removing a platform of a core to attain a less multifaceted surface for easier subsequent reductions. Notch flakes are Xsm with a distinctive raised platform that results from pressure flaking notches into tools to produce hafting elements, though these were not identified in the HP1 assemblage.

Core reduction typically results in bipolar, and core rejuvenation flakes, and sometimes, early stage reduction flakes if cores have not seen much prior use. On
the other hand, tool production, particularly in terms of more formalized tools, results in thinning and r-billet flakes in early stages of production and retouch flakes in later stages (Parry and Kelly 1987; Prentiss 2001). It can therefore be possible to infer how much core reduction and/or tool production versus maintenance occurred at a site. A relative abundance of bipolar, and core rejuvenation flakes in a debitage assemblage is considered to be indicative of a technological strategy that focuses on producing expedient tools from cores, while an abundance of R-billet, thinning, and retouch flakes indicates the production and resharpening of more curated formalized tools (Hayden et al. 1996a, 2000; Parry and Kelly 1987). One complexity is that reducing small multidirectional or flake cores also produces thinning and retouch flakes, but these are expected to be on the smaller end of the size spectrum (Andrefsky 2005:158-159) since they came from a small blank in the first place.

Tools and Cores

To analyze tools and cores, material types were recorded following the Bridge River and Keatley Creek typology, metric data of maximum length, width, and thickness was recorded with sliding calipers in millimeters, and edges angles were measured using a Wards goniometer. Tools were drawn in proximal, distal, ventral, and dorsal views, and sometimes margins were drawn if they featured important retouch or use-wear attributes. Also recorded was the number of working edges, or employable units (EU’s) for each tool (Knudson 1983), which
informs tool multiuse considerations in response to alleviating portable tool kit weight (Kelly 1988), or the economizing of materials used to make tools.

Retouch of tools was recorded in terms of scalar, step, and grinding reductions on edges during the final stages of production or maintenance of tools. Use-wear also informs considerations of tool function, and visual inspection sometimes aided by microscopy was conducted to record striation patterns, edge crushing, grinding, chipping, blunting, rounding, and polishing. Based on use-wear analysis and tool form, tools were also placed into the task/functional categories, Hunting/Butchering, Light Duty: hide/fiber, Heavy Duty: wood/bone/antler, Tool Production, and General Purpose (Appendix C). Tools were also organized by the tool class categories: Cores (bipolar, multidirectional, and fragment/unclassifiable), Bifaces, Unifaces, Projectile Points, Groundstone, Tool Production (hammerstones, abraidors, and sharpeners), Utilized Flakes, and Multiuse. Cores are included in the tool production category of the task/functional grouping, as well as the tool production category of tool classes, though they are assigned their own tool class category in my analysis so that their specific frequencies and design diversity can be separated from the class and viewed in finer detail. Multiuse tools classified according to the number of EU’s (Knudson 1983) on the tool are counted independently despite falling into other tool class categories as well. Not all tools were classifiable under the tool class categories because conservative assignments were not possible for fragmentary pieces even if they had obvious signs of being tools, such as retouching and usewear. In Occupation 1, 55 out of 65 (84.6%) tools
were classified, 72.7% of the 11 tools in the rim were classified, and 200 out of 249 (80.3%) of tools in Occupation 2 were classified.

One measure of tools that is important in my research is classification of expedient and curated tools (Andrefsky 2005; Binford 1979: Hayden et al. 1996a, 2000; Kelly 1988; Nelson 1991; Prentiss 2000; Torrence 1983, 2001). I define expedient tools as tools that feature minimal or no retouch (e.g., utilized flakes) in addition to their uses for immediate tasks and use-life potential. Curated tools are tools that require a high degree of retouching to achieve a formal end product capable of long use-lives that will be beneficial for future tasks (e.g., bifaces and site furniture such as metates). The 70 tools that were complete enough to definitively categorize in terms of form, function, use-intensity, production-side labor investment, and manufacturing strategy were identified by occupation period provenience (Occupation 1: n=16, Occupation 2: n=54) and assigned to multifunctional, curated, or expedient classes. This was a somewhat interpretive exercise following treatment by Hayden et al. (1996a, 2000) of expediency and curation measures in which materials, labor investment, and task or functional characteristics are weighed. Expediency and curation, particularly when coupled with multifunctional design strategies, are used to analyze the degree to which people designed versatile, maintainable, and reliable tools for field and household tasks (Binford 1979; Bamforth and Bleed 1987) and in the face of task, material, technological, and socioeconomic constraints (Hayden et al 1996a, 2000).

Also measured were the relative percentages of bipolar, multidirectional, and core fragments to address both how cores were used, and how exhaustively
according to the concentrations of fragments relative to more complete cores (Goodyear 1993; Hayden et al. 2000). Cores and utilized flakes were also measured in terms of their association with cache pits. Given the opportunity to investigate storage from pristine cache pit contexts (Smith and Carlson 2011), this is an important element in illustrating the nature of lithic design and technological organization in terms of serial expediency or other methods of material conservation.

**Organization**

The multiple lines of data discussed above were recorded and then transposed into Microsoft Excel and Microsoft Access databases. Microsoft Access allowed me to query various data sets according to any variety of filters. For example, all the lines of data discussed above were recorded with provenience information, so looking at the number of EU’s on tools excavated from a stratigraphic or occupation subset made it possible for me to establish the degree of multifunctional design strategies between occupations 1, 2, and rim deposits. This sort of querying strategy was used to compare patterns within and between occupation sequences and rim deposits for a number of lines of data. Floor plans of Occupations 1 and 2 were made by Carlson (Smith and Carlson 2011), and are used in my research to see how HP1 changed between its two occupation periods. In brief, the data measured included:

- Debitage raw materials, cortex cover, size, MSRT, and flake type
• Tool materials, sizes, classes, functions, multifunctionality, expediency vs. curation, and association with cache pit storage features

• Faunal remains (salmon vs. bird and mammal)

Upon attaining the various data sets these data were entered into a Microsoft Excel spread sheet where percentages of samples or raw counts were calculated and used to produce histograms and tables. Chi-square tests were run in Microsoft Excel for debitage flake size analyses and curated versus expediency measures as these data sets presented some ambiguous findings that warranted statistical support to assess whether a random sample of each occupation period would yield similar results, or if disparities in sample sizes are causal factors in some of the resultant ambiguity.
Chapter 6

Results

The results of the analysis discussed in Chapter 5 are presented in this chapter. The first tables and histograms presented show the abundances of raw materials, and then salmon versus mammal and bird remains to establish a foundation in material constraints and subsistence strategies from which tool design and production can be informed. Following those data sets, I then present the debitage analysis findings in histograms of debitage cortex cover, debitage flake size, MSRT flake completeness, and flake type to address some of the constraints people of HP1 factored into the production and material-use strategies in their technological organization. The tool and core analysis is shown in the final sets of tables and histograms, which report the raw counts of materials from a sample of the tool assemblage and a raw count of core types by occupation and rim contexts, followed by percentages of tool size, tool classes, task/function categories, the association of utilized flakes and cores with storage features, and multiuse and expediency/curation percentages. When viewed comprehensively, these findings demonstrate the particulars of tool design and technological organization in the HP1 lithic assemblage from the perspective of two occupation periods, and rim deposits where debitage and retired tools were discarded.
6.1 Debitage Raw Materials

The percentages of debitage raw material types is the first line of data presented, and is important in understanding how material constraints (Hayden et al. 1996a, 2000) shaped the organization of tool production, since the access to and availability of materials in storage-based wintertime subsistence has bearing on how people economized their lithic industry (Andrefsky 1994; Bamforth and Bleed 1997; Hayden et al. 2000). Table 6.1 reports the findings:

Table 6.1: Debitage raw materials by percentage total debitage in occupation and rim contexts. Occ1: n=504, Rim: n=82, Occ2: n=1394.

<table>
<thead>
<tr>
<th>Material</th>
<th>Occ1 (%)</th>
<th>Rim (%)</th>
<th>Occ2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basalt</td>
<td>5.9</td>
<td>2.4</td>
<td>6.0</td>
</tr>
<tr>
<td>Chalcedony</td>
<td>1.5</td>
<td>1.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Chert</td>
<td>3.1</td>
<td>0.0</td>
<td>2.2</td>
</tr>
<tr>
<td>Dacite</td>
<td>79.6</td>
<td>82.9</td>
<td>73.3</td>
</tr>
<tr>
<td>Granite</td>
<td>0.0</td>
<td>0.0</td>
<td>0.07</td>
</tr>
<tr>
<td>Greenstone</td>
<td>0.1</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Igneous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrusive</td>
<td>0.1</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Jasper</td>
<td>0.1</td>
<td>0.0</td>
<td>0.07</td>
</tr>
<tr>
<td>Nephrite</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Obsidian</td>
<td>1.1</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Ochre</td>
<td>0.1</td>
<td>0.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Pisolite</td>
<td>0.5</td>
<td>0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Quartz</td>
<td>0.1</td>
<td>0.9</td>
<td>0.07</td>
</tr>
<tr>
<td>Quartzite</td>
<td>0.9</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Sandstone</td>
<td>0.0</td>
<td>0.0</td>
<td>0.07</td>
</tr>
<tr>
<td>Schist</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Shale</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Siltstone</td>
<td>0.0</td>
<td>0.0</td>
<td>0.07</td>
</tr>
<tr>
<td>Slate</td>
<td>6.1</td>
<td>10.9</td>
<td>10.8</td>
</tr>
</tbody>
</table>

Being in close proximity to the Bridge River village, I expected some degree of comparability between HP1 and Bridge River HP54 material constraints. As mentioned previously, the HP54 lithic assemblage from the Fur Trade era is comprised mostly of dacite (80%), but also includes a well represented slate tool.
industry (10% of the total assemblage) associated mostly with hide processing (French 2013; Prentiss et al. 2013). Dacite occurs in secondary deposits along riverbanks where slate is also found, however the dacite that is locally available is not as high of quality as some found in non-local settings closer to Keatley Creek (Rousseau 2000; Wanzenried 2010; and see Figure 4.3). The secondary dacite deposits occur in smaller nodules that would be difficult to reduce unless bipolar techniques were used (Goodyear 1993). In the HP1 assemblage, dacite comprises 79.6% of all debitage during Occupation 1 (stratum IIA: floor and Va: roof), 82.9% of rim deposits (stratum III), and then decreases to 73.3% in Occupation 2 (stratum II: floor, V: roof, and I: subsurface). While dacite use reflected in the debitage subset of the lithic assemblage decreases during the Occupation 2, slate increases by 4.7% between Occupation 1 and Occupation 2.

In fact, material diversity and lithic reduction increases in general during the second occupation of the site. During Occupation 1, n=504 for all debitage, and during Occupation 2 n=1394, and more materials are represented. When compared with the spatial organization of HP1 between both occupations (Appendix D), it makes sense that tool production increased over time, because during Occupation 1, a single hearth feature is found in the center of the house, while during Occupation 2, 6 hearth or thermal features are found distributed around the house, indicating population growth and divisions of living quarters around the house’s indoor circumference (Hayden 1997; Prentiss et al. 2008).

The relative infrequency of silicate materials, including chalcedony, chert, jasper, and obsidian, is likely attributable to both the inaccessibility and economic
use of these materials. The fact that chert and jasper are not found in the rim, where presumably, unusable debris would have been dumped, furthers the idea that people were careful with these precious materials. Dacite is a fine material for tool making, and it is starkly apparent that this material was important to the people of HP1. The finding that slate represents 10.8% of the Occupation 2 debitage assemblage is comparable to HP54, though for reasons other than intensive Fur Trade era hide processing, since this era began after the 343 ± 23 cal. B.P. date of Occupation 2 in HP1. I suspect accessibility to slate is a reason for its frequency, especially in light of its absence at Keatley Creek (Prentiss 2000; Rousseau 2000), which is not as close to the lower elevation river settings where it occurs. In general, materials use in HP1 fits the pattern of economic management of higher quality transported or occasionally scavenged toolstones, complimented with local slate usage, and that these materials were stored in the house or procured nearby (Hayden et al. 1996a, 2000). This observation offers support of the alternative hypothesis, that a typical winter village style pattern of material use is found in the assemblage, since people relied mostly on stored dacite augmented by use of local slate (Andrefsky 1994).

6.2 Faunal Analysis

The Faunal assemblage from HP1 is highly abundant in salmon remains (Table 6.2), in keeping with simple observations made during lab and fieldwork. In Occupation 1 contexts salmon comprise 72.1% of the assemblage, whereas mammals and birds comprise 27.9%. In the rim, the ratio is 61.2% salmon to 38.8%
mammals and birds. This fits winter village expectations as inferred from HP3 at Keatley Creek (Kusmer 2000). Then during Occupation 2, the disparity increases greatly, with 88% of the faunal assemblage being represented by salmon and 12% represented by mammals and birds. In contrast, HP7 at Keatley Creek and HP4 at Bridge River have higher percentages of mammal taxa in the faunal assemblage, with HP7 demonstrating 55.3% mammal taxa (Kusmer 2000) and HP54 demonstrating 72.5% mammal taxa (Prentiss et al. 2013).

![Faunal comparisons by percentage of occupation and rim contexts.](image)

Ethnographic reports indicate that the consumption of stored salmon during the winter was a common and necessary means of buffering the problem of plant and game scarcity until the season changed and hunting, gathering, and fishing tasks could begin again (Alexander 1992; Kennedy and Bouchard 1992; Teit 1906). To a further degree, Teit (1906:227) notes, *Salmon-fishing was the most important industry of the tribe, and occupied a more prominent position than among the other interior tribes*. Therefore high percentages of salmon are expected in the winter village pithouse assemblages from the area. These data meet the expectations of
faunal assemblages discussed under the tenets of the alternative, typical winter village hypothesis.

6.3 Debitage Analysis

To return to the findings of the lithic analysis, the next measurement reported is the distribution of debitage cortex classes within the HP1 assemblage (Figure 6.2). Cortex cover was measured to study what stages of lithic reduction occurred at the site (Andrefsky 2005; Johnson 1989; Mauldin and Amick 1989), and how that conveys information about toolstone storage strategies (Magne 1989) and socioeconomic transportation constraints. The plotted concentration of cortex classes in Figure 6.2 show that only secondary and tertiary flakes are found in the debitage assemblage. It also shows that tertiary flakes comprise the vast majority in all contexts to the order of about 95% of all debitage. This could mean three things; First, perhaps the materials utilized did not occur naturally with cortex cover. Second, perhaps only the latest stages of production occurred at the site (Andrefsky 1994; Johnson 1989; Raab et al. 1979). Third, maybe tool production and core reduction were performed on materials that had been previously decorticated in the field (Tomka 1989).
Some secondary flakes are present in all contexts, about 5% of the assemblages, so some cortical fragments were removed from cores or tool blanks at the site, but I interpret these findings to mean early stage tool production was not carried out at the site, and that core reduction and tool production was done mostly in finer detail on late stage or highly worked blanks. Also, when compared with the abundance of dacite and slate materials, the high degree of tertiary flakes makes sense, since these materials possess little cortex cover naturally. At any rate, I find these data to be mostly indicative of a of winter village organization as discussed under the alternative hypothesis, though field processing strategies complicate this assessment.

Following Ahler’s (1989) advice, cortex cover should be considered in relation to debitage flake size (Figure 6.3). On one end of the spectrum, tertiary flakes are expected to be Xsm-Sm in size, and on the other end, primary flakes are
expected to be mostly Med-Lrg. The abundance of Xsm-Sm flakes and tertiary flakes supports the notion that late stage and fine detail tool working and core reduction were the most dominant strategies at HP1 during all occupations (Prentiss 1998, 2000; Raab et al. 1979), which further supports the alternative hypothesis where winter storage and tool and core use were carried out economically.

![Debitage flake size by percentage of occupation and rim context totals.](image)

The high percentage of Smdebitage in rim deposits presents an interesting finding, as I would have expected more XSm pieces to be found in this context as a result of discarding unusable debitage (Prentiss 2000). I interpret this to mean that people were careful not to waste material and produce shatter while reducing cores, and that retouching of tools, which should produce XSm and unusable pieces when edges are pressure flaked, was not as routine as economic core reduction, or at least did not occur as frequently at the site. Despite nearly three times as much debitage
having been produced during Occupation 2 relative to Occupation 1, Occupation 1 shows a higher percentage of XSm debitage being produced than was during Occupation 2. The reverse is true of Sm debitage during Occupation 2, which is to say, there is more Sm debitage during this occupation. The results of the chi-squared test to determine if statistical support for the disparate distributions of XSm and Sm debitage in each context was found, supports my observations based on the plotted percentages, as $p = 0.0005$ at 95% confidence (Appendix E). In other words, a random sample of each of these size classes in each context produces results aligning with histogram’s display. Again, perhaps people were more careful not to waste material, or less tool retouching occurred during Occupation 2, but also, this indicates that material and socioeconomic constraints may have been more pronounced as HP1 populations increased.

Large debitage is almost entirely absent in occupation contexts and is unfounded in rim deposits. Suitable Med-Lrg pieces of debitage were presumably further reduced to maximize materials (Hayden et al. 1996a, 2000; Prentiss 2000). With some medium debitage being found in all contexts, I imagine there were times when debitage of this size class would have been in poor condition or less than ideal in shape and not capable of further utilization. The finding that XSm-Med size classes are represented also meets expectations of bipolar core reduction, where proximal and dorsal crushing occurs and flakes of different sizes and shapes break off in between the ends (Cotterell and Kamminga 1987; Goodyear 1993; Kuijt et al. 1995), and offers further support of the alternative hypothesis.
The next set of findings reported is the distribution of MSRT types (Prentiss 1993, 1998, 2000) by percentage in each occupation sequence (Figure 6.4.) High percentages of medial/distal flakes are found in all contexts, as anticipated in any kind of lithic production, especially when dacite is used, given its brittle nature (Prentiss 1993, 1998). Since medial/distal flakes can result from a number of different tool and core strategies, I point to the relation between medial/distal flakes and other classes with the size data provided above for interpreting the MSRT data more definitively. Assuming core reduction, particularly bipolar style, was carried out in HP1 in light French’s (2013) findings in HP54, the low percentages of non-orientable flakes are surprising, but insofar as the assumption is held that more bipolar than multidirectional or flakes core reduction occurred. If bipolar reduction was the most common core reduction strategy, there should be more non-orientabledebitage, but if a mixture of core types were used, then XSm debitage would occur less frequently than a diversity of flake sizes and MSRT types. However, core data presented later will show that while bipolar core reduction was common, most cores were fragmentary and incapable of specific classifications.
Split flakes, which Prentiss (1998) relates to tool retouching, occur in HP1 in low percentages (<5%) in Occupations 1 and 2, but according to Prentiss’ findings, the relatively more common proximal and complete flakes are not supportive of a strategy of intensive tool retouching. More telling is the percentage of complete, proximal, and medial/distal flake varieties coupled with the XSm-Sm size class abundances, which could suggest reduction of prepared cores (Prentiss 1998:647), though the scarcity of non-orientable flakes is potentially problematic in terms of expectations of any kind of core reduction, which should produce an abundance of these flakes. The flake type analysis that follows suggests the opposite, or that little core preparation is evidenced. The infrequency of non-orientable flakes is unexpected, but as discussed above, people were probably careful to avoid shattering toolstones and producing unusable debris, not to mention shatter-producing bipolar reduction may not have been as common as economical.
multidirectional and flake core reduction, or for that matter, tool retouching and the removal of XSm pressure flakes probably occurred to a lesser degree than meticulous expedient block core tool production. Further, with dacite being so commonly used in HP1, the high percentages of medial/distal flakes relative to other flake types aligns with Prentiss’ (1993) findings of winter village lithic strategies at Keatley Creek.

The results of the flake type analysis are shown in Figure 6.5. This analysis offers some less presumptuous findings, but comes with the price of only being able to classify a subset of the debitage assemblages, or about 30% of the HP1 total. Per context, 35.5% of debitage flake types were classifiable in the Occupation 1 assemblage (n=178/501), 40.4% was from the rim (n=21/82), and 30.1% was from Occupation 2 (n=419/1394).

![Figure 6.5: Flake types by percentage of occupation and rim context subsamples.](image-url)
The flake types most immediately identifiable as being associated with core reduction - bipolar and core rejuvenation flakes - are fairly scarce, except in the case of bipolar flakes from rim contexts. Since debitage is mostly Xsm-Sm in size, I infer that unusable flakes resulting from bipolar reduction were discarded in the rim, but the low percentages of bipolar and early stage reduction flakes in occupation contexts supports the idea that these flakes were utilized expediently or in tool production. This is further supported by the high percentages of retouch and thinning flakes, though consideration of core types and percentages reported in the tool analysis section will inform this interpretation. Before getting to the cores types and their relative percentages, though, it is also apparent that core rejuvenation was either not widely practiced at the site, since these flakes are only found during Occupation 1 and to the degree of less than 5% of the flake type sub-assemblage, or that core rejuvenation flakes were utilized as tools and counted as such in my analysis. Either scenario points to the economizing of materials; if a flake could be used, it was, and if expedient tools removed from unprepared cores were suitable for the tasks at hand, removing platforms from cores (core rejuvenation) would be wasteful.

Retouch and thinning flakes can occur in core reduction, particularly when multidirectional and flake cores are used more than bipolar cores (Andrefsky 2005:165) and the relative lack of core rejuvenation flakes indicates that core preparation was not common, or that these flakes were culled for tool production. However, when compared to the low percentage of split flakes reported in the MSRT findings, intensive formalized tool production more commonly practiced than
expedient block core reduction is not supported. The low percentages of non-orientable flakes, high percentages of medial/distal, retouch, and thinning flakes is considered to be evident of flake core and multidirectional core reduction in addition to later stage tool retouching. This is in keeping with the alternative hypothesis.

The high percentages of retouch and thinning flakes coupled with the low percentage of R-billet flakes suggests that tool retouching, rather than early stage production was carried out in HP1. However, Hayden et al. (2000) note the utilization of R-billet flakes for cutting tasks at Keatley Creek, so it is reasonable to assume that many of the R-billet flakes from HP1 were counted as utilized flakes in my analysis. Whether this was the case or not, it is clear that late stage tool production and perhaps, highly economical core reduction were the dominant lithic strategies, probably to some degree of comparable frequency. The abundance of Xsm-Sm medial/distal flakes and lack of non-orientable flakes, coupled with the low percentages of split flakes, as found in the MSRT analysis, support the idea that late stage tool retouching and expedient core flake utilization were more common than a strategy of producing formalized tools from early stage blanks. This means the materials stored at the site were smaller and previously worked to higher degrees, which is also evidence by the abundance of tertiary flakes, and that the tools kept at the site only required minimal retouching and were probably curated designs, or were expedient utilized flakes with little to no fine retouching. This supports the winter village technological organization hypothesis
6.4 Tool and Core Analysis

The use of materials for tools and cores is roughly analogous to the materials identified in the debitage segment of the lithic assemblages. The two tables presented below (Table 6.2 and Table 6.3) show the materials used for tools in each occupation period, and they are organized by tool classes. Rather than provide data for each material type identified in the tool typology in a cumbersome display, the most common materials were given their own columns, while the next most common materials—silicates and coarse stones—are groupings of cherts, chalcedonies, jaspers, and obsidian in the Silicate, misc. category, and igneous intrusive, sandstone, and quartzite in the Coarse, misc. category.

To reiterate, chert, chalcedony, jasper, and obsidian are non-local (Rousseau 2000; Wanzenried 2010), dacite and basalt are more accessible than the former materials but still considered non-local (Prentiss et al. 2013; Wanzenried 2000), and slate and the Coarse, misc. materials are local (French 2013; Prentiss et al. 2013). Materials that occur in especially low percentages were omitted from these tables, as they hold little significance in viewing the assemblage's broader patterns. Also, multiuse tools classified on the basis of their number of EU's (Knudson 1983) were counted in multiple tool classes as well as their own. One caveat is that many lithics recognized as tools based on retouch and usewear were too fragmentary to assign to tool classes. In Occupation 1 there are 69 total tools, and in Occupation 2 there are 249, and of these, the ones capable of classification comprise 84.6% of the Occupation 1 tool assemblage, and 80.3% of the Occupation 2 tool assemblage. The counting of multiuse tools independently and as part of the overall assemblage, and
the exclusion of some tools aside, my intent is not to show how many tools by class were made of different materials necessarily, but rather, to show the kinds of materials utilized for different types of tools and how commonly certain materials were utilized.

Table 6.2: Occupation 1 tool materials organized by tool class and listed in raw counts. The silicate, misc. category includes cherts, chalcedonies, jaspers, and obsidian. The coarse, misc. category includes igneous intrusives, sandstone, and quartzite.

<table>
<thead>
<tr>
<th>Tool Class</th>
<th>Dacite</th>
<th>Slate</th>
<th>Silicate, misc.</th>
<th>Coarse, misc.</th>
<th>Basalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Biface</td>
<td>7</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Uniface</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Projectile Pt.</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tool Production</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Groundstone</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Utilized Flake</td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Multiuse</td>
<td>6</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total percentages, sans multiuse</strong></td>
<td><strong>63.8</strong></td>
<td><strong>8.5</strong></td>
<td><strong>15</strong></td>
<td><strong>10.6</strong></td>
<td><strong>2.1</strong></td>
</tr>
</tbody>
</table>

Table 6.3: Occupation 2 tool materials organized by tool class and listed in raw counts. The silicate, misc. category includes cherts, chalcedonies, jaspers, and obsidian. The coarse, misc. category includes igneous intrusives, sandstone, and quartzite.

<table>
<thead>
<tr>
<th>Tool Class</th>
<th>Dacite</th>
<th>Slate</th>
<th>Silicate, misc.</th>
<th>Coarse, misc.</th>
<th>Basalt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>11</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biface</td>
<td>21</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Uniface</td>
<td>49</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Projectile Pt.</td>
<td>16</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Tool Production</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Groundstone</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Utilized Flake</td>
<td>37</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Multiuse</td>
<td>23</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total percentages, sans multiuse tools</strong></td>
<td><strong>70.1</strong></td>
<td><strong>9.3</strong></td>
<td><strong>7.7</strong></td>
<td><strong>9.3</strong></td>
<td><strong>3.6</strong></td>
</tr>
</tbody>
</table>

As shown in the debitage materials table (Table 6.1), dacite is the most common material used for tools and cores in the HP1 lithic assemblage. Of the
subset of classifiable tools provided in these tables, dacite tools comprise 63% of the total in Occupation 1, and 70.1% of the total in Occupation 2, though dacite tools comprise 57.5% of the full tool assemblage from HP1. Dacite also comprised 80% of the materials in the total debitage assemblage, which is comparable to French’s (2013) findings at HP54. Of the subset of lithics included in the above tables, dacite was used for 63.8% of all tools in during Occupation 1, and increases slightly to 70% during Occupation 2. Dacite is good for most cutting, scraping, and piercing tasks, and it can be easily retouched, not to mention its ability to produce acute edge angles when percussed without much, if any, subsequent retouching required, which makes it a good material for expedient flake tool technologies. The tables show that nearly all utilized flakes are dacite. The heavy reliance on dacite is apparent in both occupations, and since it can be used for a range of tools and procured in abundance around hunting and gathering areas, as well as in secondary contexts around waterways, its use implies a treatment of material and socioeconomic constraints (Hayden et al. 1996a, 2000) in storage-based winter economies. If people were more mobile, as proposed under the null hypothesis, they likely would have encountered and procured a greater diversity of materials. Dacite would have been a stored material, and Teit (1906:203) reports the use of a “dark grey or black” stone material being used for knives, likely in reference to dacite.

Silicate materials are the next most common materials used in tool production, but only during Occupation 1, where it represents 15% of the assemblage. This percentage decreases by about 50% in Occupation 2. When
considering the infrequency of silicate debitage, it is evident that these materials were not used to produce tools at the site, and instead, silicate tools were probably mostly manufactured or maintained in the field. Since silicate tools decrease through time and slate increases, support for the alternative hypothesis is found in alignment with Andrefsky’s (1994) findings that material availability was a more important basis for material use than material quality.

Slate is the next most abundant material type, with percentages of 8.5% of the assemblage subset from Occupation 1, and 9.3% of Occupation 2. My expectation that certain attributes of the HP54 lithic industry, namely the use of slate tools to augment wintertime material use strategies, would be found in the HP1 assemblage is met. The locality of this material in addition to its ability to be chipped or ground into different kinds of tools is a likely reason for its use in HP1. The implication here is that storage of higher quality materials occurred with the use of lesser quality materials with low transport costs. This does not mean that slate was only used for expedient tools, however. Consider the slate adze fragment shown in Figure 5.1 and the 4 slate groundstone tools shown in Table 6.3. Part of economizing the use of materials is using what is available and saving stores of other materials that will be needed for other tasks later. This is an instance of curated household tool technologies representing materials economizing.

The distribution of tool sizes is shown in Figure 6.6. Size classes were constructed specific to the HP1 lithic assemblage because this seemed to be the best
way to assess intra-assemblage variation, rather than assuming continuity between size measures from different site assemblages on a regional level.

The distribution of tool size classes shows that medium sized tools are the most common in all contexts, followed by small sized tools, which meet the expectations of the null hypothesis upon initial considerations. However, I interpret the scarcity of XSm tools to mean that this size class is probably too small for tools to be functional, aside from microblades, of which there are only two in the entire assemblage. That no XSm tools were found in the rim should be considered with the occurrence of XSm rim debitage, since it is likely that many tools in this size class may have been identified as debitage. Sm-Med expedient tools like unifacial knives and scrapers as well as utilized flakes were probably produced along with Med sized expedient and curated portable tools. Further, the abundance of Sm tools in the rim indicates that these tools were used to the point of exhaustion and subsequently
discarded. One expectation of the alternative hypothesis that is met is that there are a few extra-large tools, but only during Occupation 2, and again, these are site furniture or non-portable curated tools (a metate, a hand maul, and a saw, see figure 5.1). While there is some ambiguity in these results in relation to test expectations for either hypothesis, it is apparent that the percentage of Lrg-XL non-portable tools increases through time, and this aligns with expectations of the alternative hypothesis, insofar as a mixed mobile and sedentary organization is anticipated in winter village technological organization.

In terms of core types, like HP54 at Bridge River, and unlike Keatley Creek assemblages, bipolar cores are more common than multidirectional cores (French 2013; Hayden et al. 2000; Prentiss et al. 2013) (Figure 6.7). Core fragments are the most common core classes in the assemblage (approximately 61% of all cores). The fragment core category probably skewed the results of the core type analysis, but either way, their fragmentary nature supports the alternative hypothesis expectation that cores were used exhaustively to maximize materials. The fairly high percentage of bifaces and the abundance of thinning flakes suggest that bifaces were used along with cores as part of the HP1 lithic industry, and it is reasonable to assume bifaces would have been used as cores (Kelly 1988) at times, and are represented in the bipolar and fragment classes of cores. One thing that I did find was that 2 bipolar cores from Occupation 2 were repurposed as scrapers, and one bipolar core from Occupation 2 was made from a biface. These are 3 out of 22 cores
found in the assemblage. Repurposing of tools and cores fits the notion of economic material use under the tenets of the alternative hypothesis.

![Figure 6.7: Core type raw counts for occupation and rim contexts.]

The findings of the tool class analysis are reported in Table 6.4. This was one of the data sets that measured a subset of the tool assemblage since tools that were too fragmentary for definitive classification were omitted. Again, 84.6% of Occupation 1 tools, 72.7% of tools in the rim, and 80.3% of Occupation 2 tools were classified by tool class.

Table 6.4: Tool class percentages by occupation and rim contexts

<table>
<thead>
<tr>
<th>Tool Class</th>
<th>Occ1 (%)</th>
<th>Rim (%)</th>
<th>Occ2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>10.9</td>
<td>12.5</td>
<td>9</td>
</tr>
<tr>
<td>Biface</td>
<td>18.2</td>
<td>12.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Uniface</td>
<td>27.3</td>
<td>62.5</td>
<td>32</td>
</tr>
<tr>
<td>Projectile point</td>
<td>7.3</td>
<td>0</td>
<td>9.5</td>
</tr>
<tr>
<td>Ground stone</td>
<td>5.4</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Tool production</td>
<td>7.3</td>
<td>0</td>
<td>8.5</td>
</tr>
<tr>
<td>Utilized flake</td>
<td>23.6</td>
<td>12.5</td>
<td>19.5</td>
</tr>
<tr>
<td>Multi-use</td>
<td>11</td>
<td>25</td>
<td>14</td>
</tr>
</tbody>
</table>
These data indicate a mixed strategy of tool use and design. Cores decrease by percentage of the occupation periods, biface use decreases, projectile points increase, and utilized flakes decrease. One interesting find was that 62.5% of tools in the rim are unifaces, which I interpret to be supportive of this tool class being an expedient one, otherwise these tools would not have been discarded as frequently. Additionally, 25% of the tools in the rim are multiuse tools, which could be indicative of an economic material-use strategy where singular-use tools were less desirable if blanks were capable of being fashioned into multiuse tools. Bleed (2002) notes that multiuse tools are often associated with mobile tool kits because they are versatile tools, but with their presence increasing while bifaces decrease, perhaps multiuse tools in HP1 were made for household tasks as well. These data also show that there is some increase in tool production tools (e.g., hammerstones and pieces esquilles), as well as showing that groundstone tools increase through time. Among the groundstone tools are metates and hand mauls, which are curated non-portable tools associated with household cooking tasks.

The alternative hypothesis has seen the most support thus far in the discussion of results, but one expectation that is not met is that utilized flakes should increase through time as a function of material conservation in winter village technological organization. In fact, utilized flakes decrease by about 4% in Occupation 2. Also, I expected curated hunting tools, like bifaces and projectile points, would occur in similar concentration to expedient and household tools under the null hypothesis, and this is partially supported by these data. However, it is also apparent that some household tools associated with sedentism are found, and
increase through time. For example, unifaces increase and these tools may have been more reliable than unretouched utilized flakes for regular household tasks. Additionally, unifaces are the most common discarded rim tools, representing 62.5% of tools from that context, indicating that expedient tools with reliable designs would have conserved stores of materials.

It seems that the types of expedient tools used in HP1 changed through time as populations increased. Utilized flakes would have required more reduction of cores and resulted in the loss of stored materials, whereas unifaces required little retouching and would have had longer use-lives than utilized flakes, which represents a strategy of material conservation. In alignment with Alexander’s (1992) mention of some hunting occurring during winter occupations, as well as Prentiss’ (2000) predictions about “gearing up” for the hunting/fishing/chasing season, tools associated with mobile tool kits are expected in a winter village lithic assemblage, and the balance of them with expedient unifaces, increasing use of groundstone tools, and the increase of discarded multiuse tools leans more in the direction of the alternative hypothesis.

Tool class data implies some relation to task/functional tool classification data lines. The task/functional data are shown in Figure 6.8.
The most immediate observation in the task/function class data is the high percentage of light duty tools in the rim. Light duty tools are scrapers, piercers, and perforators used for hide and plant processing (Appendix D). It is reasonable to assume these tools would have relatively short use-lives, hence there prevalent discard. Light duty tools, and all tools in this data set for that matter, remain fairly consistent through time. In keeping with tool class data, there is a slight increase in production tools, and it is the projectile point increase shown in Table 6.3 that raised hunting/butchering tool percentage during Occupation 2 despite bifaces decreasing. General purpose tools, which include utilized flakes, chipped slate tools, and some groundstone tools increase during Occupation 2, likely attributable to the increased use of slate. For that reason, the alternative hypothesis may be supported, but there is still the higher percentage of hunting/butchering tools to consider, so my expectations of the comparable frequency of these tools tool types under the null
hypothesis are met. That said, heavy duty wood/bone/antler working tools are
found in both occupations and not in the rim, so these more sedentary arrangement
tasks were carried out in HP1. These results do not align with either hypothesis in
obvious terms, though a mixed strategy of tool design is apparent, so I suggest that
mobile tool kits are not represented more prevalently than sedentary household
tools, further supporting the alternative hypothesis in cumulative terms.

The results of the multipurpose/curated/expedient tool analysis are less
ambiguous (Figure 6.9). I should preface these results by saying that only 25% of
tools from Occupation 1 and 18.4% of tools from Occupation 2 are suitable for these
classifications on the basis of completeness. Also, the percentages of multiuse tools
per occupation period are provided on the basis of having multiple EU's (Knudson
1983) and independently of their percentage of the assemblage subsets noted above.
Instead, multiuse data shown in Figure 6.9 relate to the entire sub-assemblage
included in the tool class data set of tools complete enough for this analysis
(Occupation 1, n= 55; Occupation 2, n= 200). To reiterate, expediency was
measured in terms of minimal to no retouch and little labor investment in
production, while curation was measured in terms of high degrees of retouch and
production labor investment, and both of these divisions also factor in tool types
(e.g., utilized flakes are expedient tools and bifaces are curated tools) (Hayden et al.
2000).
Again, multiuse tools are more prevalent in Occupation 2 relative to Occupation 1. Despite a much smaller assemblage from Occupation 1 contexts, curated tools are almost as prevalent as expedient tools from Occupation 2 in terms of assemblage percentages. One implication here is that multiuse tools are probably not associated solely with curated portable tool kits. Instead, the production of multiuse tools was probably done to maximize materials in the face of wintertime material constraints (Hayden et al. 1996a, 2000). The production of curated tools was more common than the production of expedient tools during the first occupation of HP1. The percentages of curated versus expedient tools between the two occupations are nearly inverse. This means that initially, HP1 lithic design and technological organization was geared more towards mobile subsistence activities, as discussed by Binford (1979), but over time the people of HP1 began relying more on expedient technologies, like unifacial scrapers and utilized flakes.
The sizes of the assemblages are quite different between the occupation periods, so just to be sure, I tested these findings with a chi-squared test (Appendix E). The results of this test find that a random sample of expedient and curated tools from each occupation does not yield results that evidence a shift in expedient versus curated designs between occupations (p=.24 at 95% confidence) despite the percentages reported above. However, other data trends seem to support the finding that only certain expedient tools increased through time (unifaces), and moreso, curated but non-portable tools also increase. A source of error is that most of the unifaces were found in rim contexts and were not suitable for measures of expediency versus curation do to lack of completeness, so many unifaces are not represented in the chi-squared test. Qualitatively speaking, perhaps the number of tools in the expedient class is not as important as the quality of those tools. In sum, although the intent of measuring expedient tools versus curated ones per occupation was to understand winter village or mobile design strategies, other types of tools offer support of sedentary winter occupations. Despite the statistical findings not matching the observed trends, I interpret this analysis to represent a solidifying of sedentary winter village arrangements in keeping with the alternative hypothesis.

The last test of winter village lithic industries measures the association of utilized flakes and cores with storage features. To my knowledge, this sort of test has not been done in the Mid-Fraser, so I cannot provide a comparison, but it is rare
that this sort of test is possible since cache pits are typically retired and turned into middens at Mid-Fraser residential sites. The findings are reported in Figure 6.10.

![Figure 6.10: Raw counts of utilized flakes and cores in association with cache pits.](image)

These findings demonstrate that cores were rarely stored in cache pits, but some storage of utilized flakes did occur. There are 56 total utilized flakes in the HP1 lithic assemblage, and 11 of them were found in cache pits. Likewise, there are 22 total cores or core fragments in the HP1 lithic assemblage, and only 3 of them are found in cache pits. The storage of utilized flakes speaks to the concept of serial expedient tool use studied by Prentiss (2001) and French (2013). Utilized flakes at HP1 were clearly used but only occasionally stored, which would be an additional way to economize raw materials. Although the majority of utilized flakes and cores were not stored, I expected some degree of storage of these tools as part of wintertime subsistence methods and this is found, which supports the alternative hypothesis.
Chapter 7

Conclusions

The overall findings support the alternative hypothesis, that the design and organization of the HP1 lithic industry supports a typical winter village arrangement. This is based on nine tests indicating that first, there is a heavy reliance on dacite and slate for tool production, and that these materials were used economically to buffer socioeconomic and material constraints of transportation costs and resource depletion through the winter (Andrefsky 1994; Hayden et al. 1996a, Schott 1986, 1994, Torrence 1983, 2001). Second, the use of stored salmon is more prevalent in the faunal assemblage than birds and mammals, in keeping with ethnographic information (Alexander 1992, Kennedy and Bouchard 1978, 1992; Teit 1906), and further, this pattern intensified through time as a function of the embedding of salmon storage subsistence strategies as population or demographic change occurred as people settled back into the winter village pattern after the village abandonment phenomenon (Kuijt and Prentiss 2004; Prentiss and Kuijt 2012). A third line of support for the alternative hypothesis comes from the debitage size, MSRT, and flake type analyses, which indicate that tool maintenance rather than early stage production occurred in HP1, and that cores were used for expedient tools and some of the flakes were culled for expedient tool production (Prentiss 1998, 2000).

Similar to the debitage materials data, tools are shown to be mostly made from dacite and slate, with silicates use decreasing over time, in keeping with Andrefsky’s (1994) assessment that sedentary people tend to focus on a narrower
assortment of materials. Core data show that bipolar cores were utilized, and the majority of cores were fragmentary, suggesting exhaustive use (French 2013; Hayden et al. 2000). It is also apparent that certain expedient tools (unifaces) became more common than curated portable tools through time, and that a portion of the curated tools found in the HP1 assemblage are non-portable site furniture, which illustrates the execution of household tasks (Hayden et al. 1996a; Horsfall 1987). Multiuse tools are considered reflective of materials maximization, rather than as a versatile tool in mobile tool kits as suggested by Bleed (1986). It was also found that cores and utilized flakes were sometimes stored in cache pits, which suggests both the use of expedient tools for wintertime subsistence and the occurrence of serial expediency (Prentiss 2000) in tool design strategies.

There are instances of ambiguity in the results of my as far as the alternative hypothesis is concerned; namely in terms of tool size, task/function measures, and expedient versus curated measures. Most tools were of medium sizes, as expected under the null hypothesis. The size classes constructed for my studies that are relative to the HP1 tool assemblage as a unit distinctive from regional assemblages could be a source of error, and perhaps sizes should be measured consistently between site assemblages. The task/functional tool data met expectations of the alternative hypothesis in some regards, but not others. For instance, biface use decreases through time, but unexpectedly under the tenets of the alternative hypothesis, so does the use of utilized flakes, and meanwhile, projectile points increase through time. I propose that projectile points were manufactured at the site during the winter to prepare for the hunting season (Prentiss 2000), since there
would presumably be a high rate of loss of these tools in the field when archers missed their mark or their prey ran off with the arrow, thereby explaining their increase in the HP1 assemblage through time. The decreased use of utilized flakes through time is coincident with an increase in expedient knife and uniface use. Many of the knives were expediently produced, so perhaps they were used more abundantly than utilized flakes for cutting tasks. Unifaces were used more prevalently than other expedient tools presumably to meet reliability needs in buffering material loss, as short use-life utilized flakes were removed from cores that would hopefully last the winter.

There are always instances of diversity within and between lithic assemblages on a regional level, so I stress again that technological organization should not be expected show strictly dichotomous trends. Most data presented in my research support the alternative hypothesis. I reject the null that proto-historic village settlements carried over mobile subsistence and residential strategies in light of the HP1 lithic assemblage. Instead, it seems there was a re-emergence of winter village technological organization over about 50 years in HP1 that became more pronounced through time, likely framed by the population and demographic changes that partially drove the settling in winter villages during earlier times of the Kamloops Horizon (Prentiss et al. 2008, Prentiss and Kuijt 2012; Rousseau 2004).

The task, material, technological, and socioeconomic constraints posited by Hayden et al. (1996a; Figure 3.1) sufficiently captures the circumstances experienced by the people of HP1, and several clear examples of how lithic designs strategies built on those constraints are found. Task constraints were managed with
a technological organization that featured tools for a variety of household and field activities. With plenty of time during winter sedentism, people were able to produce reliable unifaces and expedient knives more commonly than utilized flakes, as utilized flake production would problematize material conservation in most circumstances where utilized flakes would have short use-lives. Failure of utilized flakes would mean tapping into stores of raw materials (Bamforth and Bleed 1997; Keene 1981; Surovell 2009). Since expedient knives and unifaces would be as effective for cutting and scraping tasks as utilized flakes, and there was plenty of time to produce those tools over the winter, it makes sense that they were favored over utilized flakes for buffering the risk of material loss. Also, portable curated tools are found, which illustrates that some winter field forays in addition to preparation hunting/fishing/collecting occurred, in keeping with ethnographic reports (Alexander 1992; Bouchard and Kennedy 1978).

Material constraints associated with being blocked from toolstone procurement areas during the winter were managed with a strategy of utilizing stored dacite and locally available slate. That silicate materials decrease by 50% between occupation periods as slate and dacite use increases meets expectations proposed by Andrefsky (1994) that sedentary groups tend to focus on a narrower array of materials than do mobile groups. Also, the means of using these materials demonstrates on multiple fronts that people were careful to not waste stored toolstones, whether through production of multiuse tools, the careful bipolar reduction of cores or exhausted tools (Goodyear 1993; Hayden et al. 2000; Kelly 1988; Kuijt et al. 1995) or the exhaustive use of cores themselves (Hayden et al.
1996a, 2000), which occur in the assemblage mostly as fragmentary bits. Clearly, highly economic use of stored materials was an import strategy in the HP1 winter village arrangement.

Technological constraints were handled by a design strategy that often focused on expedient tool production where minimal skill was needed to produce an effective tool, and this minimized the risk of error in manufacturing, thereby reducing stored material loss when a toolmaker would have to start over again (Hayden et al. 2000). The cost of producing portable curated tools was high given limited access to raw materials during the winter, and while these tools are found, other tools of the expedient and non-portable curated variety are especially common in the assemblage.

Socioeconomic constraints were clearly factored into the storage strategies devised by the people of HP1, as evidenced by the numerous cache pits and hearths associated with Occupation 2. In these cache pits, some tool storage occurred, but mostly a high percentage of salmon relative to mammal and bird remains are found, particularly in Occupation 2 as populations increased. Though dacite is considered to be non-local (Rousseau 2000; Wanzenried 2010), its abundance in the assemblage indicates that stores of the material were amassed during trips into the field before and after the sedentary winter village season, which reduced transport costs during any one trip (Andrefsky 1994; Binford 1979; Hayden et al. 2000; Kelly 1993). Also, dacite cobbles were probably scavenged from secondary deposits along rivers to some degree as people collected slate and certain plant foods or fished in those locales (Mathews and Monger 2005; Prentiss et al. 2013).
While I did not calculate percentages of block core, biface, portable long-use, quarried bipolar, scavenged bipolar, and groundstone tool production strategies in the same ways as Hayden et al. (2000), there appears to be a mixture of these strategies in the HP1 assemblage, and block core and biface tools are clearly well represented similarly to Keatley Creek (Hayden et al. 2000) and Bridge River (French 2013). A diversity of tasks for which tools of these sorts would be useful is demonstrated by the tool class and task/function analyses treated in my research. Additionally, this indicates that there is little basis for inferring some kind of task specialization under the tenets of the null hypothesis. I mentioned that the very large percentage of salmon in the faunal assemblage was a potentially important aspect of the nature of HP1 lifeways, however given tool diversity this phenomenon might have some other explanation. Smith suggests that the spike in salmon abundance during the second and final occupation of the house might be attributable to abandonment of salmon stores in cache pits (Smith personal communication, 2014). This will surely be an interesting avenue of research in future studies.

It will also be hugely beneficial to take a comparative approach to lithic design and technological organization studies from the perspective of other proto-historic housepit assemblages in the region to provide archaeological and anthropological depth to the understanding of Mid-Fraser prehistory. Such studies will ideally address similarities and differences in lithic assemblages within and between sites. Methods employed by Hayden et al. (1996a, 2000) and French (2013) are different in some ways from what was employed for treatment of the
HP1 assemblage in my research, but there are myriad ways to go about doing this sort of research. For example, a savvy statistics-minded archaeologist could find some innovative methods for studying MSRT data, debitage size distributions, or expedient versus curated tool relationships relative to subsistence and mobility variables, and these would be highly impactful studies in general Mid-Fraser lithic analysis. Fine detailed usewear analyses could be used to test assumptions tied to tool typologies in relation to task/function categories, particularly regarding multiuse tools, which in HP1 appear to not definitively support Bleed’s (1986) inference that multiuse tools are parts of mobile toolkits. A regional meta-analysis of tool size class divisions could provide a standardized instrument for measuring size data, which could offer a degree of analytical rigor to considerations of material transport costs and material economization. These are just a few suggestions, and it will be exciting to see what methodological and theoretical innovations surface in the archaeological discipline in future studies of lithic design and technological organization.

Future research avenues aside, it is important to keep a finger on the pulse of the classics, as well as the contemporary theoretical and methodological contributions to the archaeological discipline. Culture history and ethnographic reports were immensely helpful in framing my research. Without those contexts, it would have been quite difficult to develop expectations about subsistence strategies, mobility and sedentism decisions, resource selection decisions, or any number of other measures of technological organization and lithic design strategy. As Binford (1962:224) finds culture history and ethnography to be figurative “laboratories”
from which processual measures of anthropological archaeology can be devised and tested, I found this colorful abstraction to be a useful starting point for my research. Theoretically speaking, with the culture historical understanding of the development and embedding of the winter village pattern in Mid-Fraser prehistory (Fladmark 1982; Prentiss and Kuijt 2012; Rousseau 2004; Stryd and Rousseau 1992), coupled with the ethnographic accounts provided over the last century (Alexander 1992; Kennedy and Bouchard 1978, 1992, Teit 1906), it is apparent that the people of HP1 adapted to ecological and population changes by restructuring technological organization and subsistence and residential strategies in ways that incorporated storage based economy, seasonal logistical mobility and sedentism, and lithic material conservation methods. These methods and strategies were similar to other experiences in the Mid-Fraser before and after the times of HP1, but at the same time, were unique to the people who resided in the house. Once again, archaeology shows that within a broader cultural context, much diversity exists, and it is these instances of continuity and diversity that capture the essence of human lifeways in prehistory.
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Teit, James A.


Tomka, Steven A.

Torrence, Robin


Turner, Nancy

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Vickers, Roderick

Walker, D.E. Jr.

Wanzenried, M.T.

Willey, G.R. and P. Phillips
Willey, G.R. et al.

Winterhalder, B. P., F. Lu, and B. Tucker

Winterhalder, B. and E. A. Smith
**Appendix A: Keatley Creek and Bridge River Typology**

<table>
<thead>
<tr>
<th>Material</th>
<th>Unifacially Retouched Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dacite*</td>
<td>1 miscellaneous</td>
</tr>
<tr>
<td>2 Slate*</td>
<td>50 Unifacial blade tool</td>
</tr>
<tr>
<td>3 Silicified shale*</td>
<td>71 Used flake on a break</td>
</tr>
<tr>
<td>4 Coarse dacite*</td>
<td>88 Dufour bladelet</td>
</tr>
<tr>
<td>5 Obsidian*</td>
<td>143 Scraper retouch flake</td>
</tr>
<tr>
<td>6 Pisolite*</td>
<td>148 Flake with polish sheen</td>
</tr>
<tr>
<td>7 Coarse basalt*</td>
<td>150 Single scraper</td>
</tr>
<tr>
<td>8 Nephrite*</td>
<td>151 Unifacial perforator</td>
</tr>
<tr>
<td>9 Copper*</td>
<td>152 Unifacial borer/drill</td>
</tr>
<tr>
<td>10 Ortho-quartzite*</td>
<td>153 Small piercer</td>
</tr>
<tr>
<td>11 Basalt*</td>
<td>154 notch</td>
</tr>
<tr>
<td>12 Steatite/soapstone*</td>
<td>156 Alternate scraper</td>
</tr>
<tr>
<td>13 Chert (green)*</td>
<td>157 Miscellaneous uniface</td>
</tr>
<tr>
<td>14 Chert*</td>
<td>158 Key shaped uniface</td>
</tr>
<tr>
<td>15 Jasper*</td>
<td>159 Unifacial knife</td>
</tr>
<tr>
<td>16 Jasper (hat creek)*</td>
<td>160 Unifacial denticulate</td>
</tr>
<tr>
<td>17 Chalcedony*</td>
<td>162 End scraper</td>
</tr>
<tr>
<td>18 Chalcedony (yellow)*</td>
<td>163 Inverse scraper</td>
</tr>
<tr>
<td>19 Igneous intrusive*</td>
<td>164 Double scraper</td>
</tr>
<tr>
<td>20 Granite/diorite*</td>
<td>165 Convergent scraper</td>
</tr>
<tr>
<td>21 White marble</td>
<td>180 Used flake</td>
</tr>
<tr>
<td>22 Green siltstone</td>
<td>183 Spall tool</td>
</tr>
<tr>
<td>23 Sandstone*</td>
<td>184 Retouched spall tool</td>
</tr>
<tr>
<td>24 Graphite</td>
<td>188 Retouched backed tool</td>
</tr>
<tr>
<td>25 Conglomerate*</td>
<td>232 Stemmed scraper</td>
</tr>
<tr>
<td>26 Andesite*</td>
<td>255 Abruptly retouched truncation on a flake</td>
</tr>
<tr>
<td>27 Vesicular basalt</td>
<td></td>
</tr>
<tr>
<td>28 Phyolite</td>
<td>279 Hafted unifacial knife w/some</td>
</tr>
<tr>
<td>29 Limestone</td>
<td>bifacial chipping on haft</td>
</tr>
<tr>
<td>30 Mica- black</td>
<td></td>
</tr>
<tr>
<td>31 Porphyry</td>
<td></td>
</tr>
<tr>
<td>32 Silicified wood*</td>
<td></td>
</tr>
<tr>
<td>34 Schist*</td>
<td></td>
</tr>
<tr>
<td>35 Misc.*</td>
<td></td>
</tr>
<tr>
<td>36 Serpententite/serpentine*</td>
<td></td>
</tr>
<tr>
<td>37 Gray vitric tuff</td>
<td></td>
</tr>
<tr>
<td>38 Gypsum</td>
<td></td>
</tr>
<tr>
<td>39 Mudstone</td>
<td></td>
</tr>
<tr>
<td>40 Galena</td>
<td></td>
</tr>
<tr>
<td>41 Quartz crystal*</td>
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</tr>
<tr>
<td>42 Metal/iron</td>
<td></td>
</tr>
<tr>
<td>43 Glass</td>
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</tr>
</tbody>
</table>
Bifacial artifacts

2  Miscellaneous biface
4  Biface retouch flake with use-wear
6  Biface fragment
130 Bifacial knife
131 Stage 4 biface
132 Bifacial perforator
133 Bifacial borer/drill
135 Distal tip of a biface
139 Fan tailed biface

Points

19  Late plateau point
35  Point tip
36  Point fragment
99  Misc. point
101 Lochmore point
102 Lehman point
109 Side-notch point no base
110 Kamloops side-notched point concave base
111 Kamloops side-notched point straight base
112 Kamloops side-notched point convex base
113 Kamloops multi-notched point
114 Kamloops stemmed
115 Plateau corner-notched point concave base
116 Plateau corner-notched straight base
117 Plateau corner-notched point convex base
118 Plateau corner-notched point no base
119 Plateau basally-notched point straight base
120 Shuswap base
121 shuswap contracted stem slight shoulders
122 shuswap contracted stem pronounced shoulders
123 shuswap parallel stem slight shoulders

24 shuswap parallel stem pronounced shoulders
25 Shuswap corner removed concave base
26 Shuswap corner-removed eared
27 Shuswap stemmed single basal notch
28 Shuswap shallow side-notched straight basal margin
29 Shuswap shallow side-notched concave basal margin
34 Preform
36 Plateau preform
37 Kamloops preform
29 Shuswap 10: stem/earred with concave base
31 Ground/sawed slate projectile point
36 Limestone or marble projectile point
37 El khiam style point: side notched point on a triangular blade-like flake
44 Small triangular point
45 Large straight to concave base side-notch point
51 Slate side-notched point with a straight base
54 Large square stemmed dart point
56 Kamloops split base corner notched
85 Unifacial point preform
89 Lame a crete
92 Notched flake w/distal impact fracture
95 Plateau corner-notched point w/base missing
### Groundstone

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>185</td>
<td>Wedge-shaped bifacial adze</td>
</tr>
<tr>
<td>190</td>
<td>Hammerstone</td>
</tr>
<tr>
<td>200</td>
<td>Misc. groundstone</td>
</tr>
<tr>
<td>201</td>
<td>Abrador</td>
</tr>
<tr>
<td>202</td>
<td>Sandstone saw</td>
</tr>
<tr>
<td>203</td>
<td>Ground slate</td>
</tr>
<tr>
<td>204</td>
<td>Steatite tubular pipe</td>
</tr>
<tr>
<td>205</td>
<td>Abrader/saw</td>
</tr>
<tr>
<td>206</td>
<td>Anvil stone</td>
</tr>
<tr>
<td>207</td>
<td>Abraded cobble or block</td>
</tr>
<tr>
<td>208</td>
<td>Abraded cobble spall</td>
</tr>
<tr>
<td>209</td>
<td>Ornamental ground nephrite</td>
</tr>
<tr>
<td>211</td>
<td>Groundstone mortar</td>
</tr>
<tr>
<td>218</td>
<td>Celt</td>
</tr>
<tr>
<td>219</td>
<td>Groundstone maul</td>
</tr>
<tr>
<td>220</td>
<td>Ground slate piercer/borer with chipped edges</td>
</tr>
<tr>
<td>222</td>
<td>Slate scraper</td>
</tr>
<tr>
<td>226</td>
<td>Sawed gouge</td>
</tr>
<tr>
<td>228</td>
<td>Groundstone adze on a natural break</td>
</tr>
<tr>
<td>230</td>
<td>Slate knife</td>
</tr>
<tr>
<td>233</td>
<td>Nephrite adze</td>
</tr>
<tr>
<td>234</td>
<td>Burnishing/polishing stone</td>
</tr>
<tr>
<td>235</td>
<td>Metate</td>
</tr>
<tr>
<td>238</td>
<td>Groundstone spike</td>
</tr>
<tr>
<td>239</td>
<td>Small stone bowl</td>
</tr>
<tr>
<td>241</td>
<td>Sawed adze</td>
</tr>
<tr>
<td>242</td>
<td>Ochre grinding stone</td>
</tr>
<tr>
<td>246</td>
<td>Slate knife with bored hole</td>
</tr>
<tr>
<td>250</td>
<td>Ground nephrite scraper</td>
</tr>
<tr>
<td>257</td>
<td>Ground slate adze, without cutting/sawing</td>
</tr>
<tr>
<td>259</td>
<td>Groundstone cube</td>
</tr>
<tr>
<td>298</td>
<td>Polished steatite fragment</td>
</tr>
</tbody>
</table>

### Ornaments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>210</td>
<td>Ochre</td>
</tr>
<tr>
<td>212</td>
<td>Mica ornament</td>
</tr>
<tr>
<td>214</td>
<td>Stone bead</td>
</tr>
<tr>
<td>215</td>
<td>Stone pendant or eccentric</td>
</tr>
<tr>
<td>216</td>
<td>Ground or sculpted ornament</td>
</tr>
<tr>
<td>217</td>
<td>Copper artifact</td>
</tr>
<tr>
<td>243</td>
<td>Sawed/sliced bead</td>
</tr>
<tr>
<td>252</td>
<td>Copper bead</td>
</tr>
<tr>
<td>253</td>
<td>Copper pendant</td>
</tr>
<tr>
<td>287</td>
<td>Spindle whorl preform</td>
</tr>
<tr>
<td>288</td>
<td>Spindle whorl</td>
</tr>
<tr>
<td>290</td>
<td>Ornament/pendant blank</td>
</tr>
</tbody>
</table>

### Other

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>213</td>
<td>Misc. metal artifact</td>
</tr>
<tr>
<td>223</td>
<td>Burin spall tool</td>
</tr>
<tr>
<td>224</td>
<td>Burin</td>
</tr>
<tr>
<td>227</td>
<td>Sawed stone disk</td>
</tr>
<tr>
<td>247</td>
<td>Misc. drilled artifact</td>
</tr>
<tr>
<td>248</td>
<td>Misc. sawed stone</td>
</tr>
<tr>
<td>249</td>
<td>Painted stone tool</td>
</tr>
<tr>
<td>269</td>
<td>Glass beads</td>
</tr>
<tr>
<td>270</td>
<td>Misc. glass</td>
</tr>
<tr>
<td>271</td>
<td>Window glass</td>
</tr>
<tr>
<td>272</td>
<td>Iron projectile point</td>
</tr>
<tr>
<td>273</td>
<td>Other historic period beads</td>
</tr>
<tr>
<td>274</td>
<td>Horseshoe</td>
</tr>
<tr>
<td>275</td>
<td>Nail</td>
</tr>
</tbody>
</table>

### Cores

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>146</td>
<td>Bipolar core</td>
</tr>
<tr>
<td>147</td>
<td>Microblade</td>
</tr>
<tr>
<td>149</td>
<td>Microblade core</td>
</tr>
<tr>
<td>182</td>
<td>Core rejuvenation flake</td>
</tr>
<tr>
<td>186</td>
<td>Multidirectional core</td>
</tr>
<tr>
<td>187</td>
<td>Small flake core</td>
</tr>
<tr>
<td>189</td>
<td>Unidirectional core</td>
</tr>
<tr>
<td>221</td>
<td>Slate core</td>
</tr>
</tbody>
</table>
SRT
N/O Nonorientable
M/D Medial-distal
S Split
P Proximal
C Complete

Cortex
T Tertiary
S Secondary
P Primary

Flake types
ESR Early stage redaction
TF Thinning flake
RBF R billet flake
RF Retouch flake
BF Bipolar flake
NF Notching flake
B Blade
CRF Core rejuvenation flake

Retouch
0 Invasive
1 Semi-abrupt
2 Abrupt
3 Scalar
4 Step
5 Hinge
Appendix B

East wall profile from 2012.
Made by Eric Carlson.

(105E East Wall)
Hospit 1 Profile
Appendix C

Tool counts and types by tool class and occupation

<table>
<thead>
<tr>
<th>Hunting/Butchering</th>
<th>Occupation 1</th>
<th>Occupation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biface, misc.</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Knife, misc.</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Knife, bifacial</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Knife, bif. convergent</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Knife, unifacial</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>Knife, uni. convergent</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Projectile Point, misc.</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Projectile point, Kamloops</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Projectile point, Shuswap</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Projectile point, Plateau</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Chopper</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Spall</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
<td><strong>68</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Light Duty: Hide/Fiber</th>
<th>Occupation 1</th>
<th>Occupation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scraper, misc.</td>
<td>16</td>
<td>71</td>
</tr>
<tr>
<td>Scraper, bifacial</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Scraper, concave</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Scraper, convex</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Scraper, convergent</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Scraper, double</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Scraper, end</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Scraper, single</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Perforator</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Piercer</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21</strong></td>
<td><strong>88</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heavy Duty: Wood/Bone/Antler</th>
<th>Occupation 1</th>
<th>Occupation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adze</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Drill</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Notch</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Maul</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Piece esquilles</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Planning tool</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Occupation 1</td>
<td>Occupation 2</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Saw</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tool Production</th>
<th>Occupation 1</th>
<th>Occupation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core, fragment</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Core, bipolar</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Core, multidirectional</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Abraider</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hammerstone</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Sharpener on cobble</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9</td>
<td>32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Purpose</th>
<th>Occupation 1</th>
<th>Occupation 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilized flakes</td>
<td>15</td>
<td>41</td>
</tr>
<tr>
<td>Chipped slate</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Ground slate</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Blades</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Metate</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>20</td>
<td>62</td>
</tr>
</tbody>
</table>
Appendix D

HP1 floor plan of stratum II floor
HP1 floor plan of stratum IIa floor
Appendix E

Results of $\chi^2$ test of Xsm and Sm debitage flake sizes for all contexts.

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Rim</th>
<th>Occ2</th>
<th>Row Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsm</td>
<td>211</td>
<td>19</td>
<td>453</td>
<td>683</td>
</tr>
<tr>
<td>sm</td>
<td>222</td>
<td>48</td>
<td>656</td>
<td>926</td>
</tr>
<tr>
<td>unclass</td>
<td>68</td>
<td>15</td>
<td>285</td>
<td>368</td>
</tr>
<tr>
<td>Column Total</td>
<td>501</td>
<td>82</td>
<td>1394</td>
<td>1977</td>
</tr>
</tbody>
</table>

Expected Values

$$\text{Expected Value} = \frac{(\text{row total} \times \text{column total})}{\text{grand total}}$$

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Rim</th>
<th>Occ2</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsm</td>
<td>173.081942</td>
<td>28.328781</td>
<td>481.589277</td>
</tr>
<tr>
<td>sm</td>
<td>234.661608</td>
<td>38.4076884</td>
<td>652.930703</td>
</tr>
<tr>
<td>unclass</td>
<td>93.2564492</td>
<td>15.2635306</td>
<td>259.48002</td>
</tr>
</tbody>
</table>

X-squareds

$$\text{X-squared} = \frac{(\text{count} - \text{expected value})^2}{\text{expected value}}$$

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Rim</th>
<th>Occ2</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsm</td>
<td>8.30692721</td>
<td>3.07200492</td>
<td>1.69718634</td>
</tr>
<tr>
<td>sm</td>
<td>0.6831809</td>
<td>2.39567767</td>
<td>0.01442815</td>
</tr>
<tr>
<td>unclass</td>
<td>6.84015133</td>
<td>0.00454996</td>
<td>2.50960179</td>
</tr>
</tbody>
</table>

Sum all X-squareds 25.5240083

Degrees of Freedom = number of classes - 1 = 5

Critical value for X-squared 4.9175E-05

Is this less than .05? Yes Significant at 95% confidence

In writeup: There is a significant association between debitage size class and occupation level ($X^2$-squared, $p < .00005$).
Results of $X^2$ of expedient and curated tools by occupation contexts.

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Occ2</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curated</td>
<td>9</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>Expedient</td>
<td>7</td>
<td>32</td>
<td>39</td>
</tr>
<tr>
<td>Grand Total</td>
<td>16</td>
<td>54</td>
<td>70</td>
</tr>
</tbody>
</table>

$$X^2 = \frac{(\text{row total})(\text{Column total})}{\text{grand total}}$$

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Occ2</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curated</td>
<td>7.08571429</td>
<td>23.9142857</td>
<td>31</td>
</tr>
<tr>
<td>Expedient</td>
<td>8.91428571</td>
<td>30.0857143</td>
<td>39</td>
</tr>
<tr>
<td>Grand Total</td>
<td>16</td>
<td>54</td>
<td>70</td>
</tr>
</tbody>
</table>

**X-squareds**

<table>
<thead>
<tr>
<th></th>
<th>Occ1</th>
<th>Occ2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curated</td>
<td>0.5171659</td>
<td>0.15323434</td>
</tr>
<tr>
<td>Expedient</td>
<td>0.41108059</td>
<td>0.12180156</td>
</tr>
</tbody>
</table>

Sum of all X-squareds 0.73783318

Degrees of Freedom #NAME? 3

Critical value for X-square 0.23695764

<table>
<thead>
<tr>
<th>Is this less than .05?</th>
<th>Yes</th>
<th>Significance at 95%</th>
</tr>
</thead>
</table>

In writeup: There is not a significant associated between expedient and curated tools in each occupation p = .24