Interim Report

Grant RZ-51287-11

Collaborative Research

Household Archaeology at Bridge River, British Columbia

Anna Marie Prentiss, Ph.D.

Department of Anthropology, The University of Montana

April 30, 2014

Narrative

Goals of this performance period were to conduct field research and associated laboratory investigations of the occupation floors pre-dating 1000 years ago at Housepit 54 at the Bridge River archaeological site, located near Lillooet, British Columbia. As is detailed in the appendix, the site is a large village of 80 houses with occupation dates spanning the past 2000 years. Housepit 54 provides a remarkable opportunity to examine the history of a household that persisted through the critical period of 1000-1400 years ago, a time of significant growth and subsequent decline in the wider village. This research is possible because the archaeological strata within the housepit include at least 14 floors occupied at approximately 20 year intervals. Pacific Northwest archaeologists have long argued that it is of fundamental importance that scholars gain an understanding of the histories of these long lived houses if we are to truly understand the nature of aboriginal life in the region and to address the larger questions of household persistence, economic decision-making, and sociality. Housepit 54 provides the region's best opportunity to engage in this exciting process.

Specific goals of the 2013 field season were to apply our field excavation procedure to open, excavate and carefully record an upper series of these floors. This field season was expected to provide data on the upper six occupation floors and any associated roof deposits. Laboratory goals included radiocarbon dating, description of sediments, documentation of features, analysis of recovered artifacts and food remains, initiation of isotope studies, and continuation of ancient DNA research. Excavations have had a range of significant outcomes. First, we discovered a dense stratum of roof beams in a portion of the excavation block that provided rare insight into roof architecture dating to about 1100 years ago. Most exciting was the fact that the ethnographic descriptions of such structures from the early 20th century were very close to the patterns recovered archaeologically. Second, we confirmed that the Bridge River 3 period (1100-1300 years ago) floors are, so far, entirely intact. Each has what is likely the final distribution of discarded tools, tool-making debris, food, remains and cooking, storage and architectural features that were left by the original occupants before being covered with the next layer. Put differently, materials on each floor appear not to have been cleaned or otherwise disturbed prior to burial with sediments thus leaving direct evidence for the practice of cultural traditions within each occupation period. The arrangement of materials on these older floors is quite different from the Fur Trade floor excavated in 2012. Rather than a single central hearth and special activity areas, we see what appears to be a redundant series of domestic activity zones places around the perimeter of each floor. Evidence is emerging for inherited knowledge between generations regarding the proper positioning of cooking features, storage facilities, and even discarded food remains as illustrated by clusters of articulated salmon vertebrae in the northwest margin of several successive floors. Third, geochemical analysis has confirmed that our team will have the ability to reconstruct a range of potential activities with or without the presence of artifacts. Fourth, our partnership with the Bridge River Indian Band (Xwisten), owners of the site, and descendants of the site's original occupants continues to be highly productive both to our team and to the First Nations people. The Band hires two of their people to excavate full time with us and we maintain regular email contact regarding project developments and interpretations. Our project is an important part of Xwisten Heritage Tours providing us with the opportunity to engage with a variety of publics ranging from local school children to tourists from many countries regarding indigenous culture and history. Finally, to date we have contributed 17 posters and 6 verbal presentations at national conferences regarding the project. A major poster session is in planning for the 80th meeting of the Society for American Archaeology in San Francisco to be held in April 2015. We expect to submit an edited book manuscript to the University of Utah Press specifically covering the archaeology the Fur Trade occupation at Housepit 54 with the next three weeks (target date May 16, 2014). The latter is a project outcome over and above the expectations for publishing outlined in the original grant proposal. Discussions are under way regarding the development of book manuscripts associated with the more ancient floors. This grant has also facilitated completion of four MA theses and a Ph.D. dissertation. Two other doctoral students and three MA students are currently developing thesis/dissertation projects from the HP 54 project. We expect to add others over the coming one to two years. The project is now visible on the internet via our University of Montana web page (http://www.cas.umt.edu/grants/bridgeRiver/) and project Facebook page (https://www.facebook.com/BridgeRiverBC).

Excavations scheduled for 2014 will provide us with the necessary data from a wider range of floors to begin the process of creating distribution maps in GIS and pursuing spatial analyses. The spatial distributions of features, fauna, plant remains, and artifacts will be compared with the emerging geochemical maps to provide comprehensive insight into human traditions and interactions on each floor. This will permit us to explore a range of ideas regarding engagements between members of this household and the surrounding world. With a more complete sequence of floors we will also begin the process of examining diachronic change with a range of unique data sets. Expected research will focus on study of foraging behavior and local ecologies with isotopes on animal bones and pine needles; quantitative analyses of artifact manufacture traditions designed to tease out evidence for variation in household learning traditions versus the effects of outside influences; assessments of variability in the role of foraging mobility, food gathering, and processing for consumption; and exploration of the roles of technology in social engagements whether internal to the house or via interactions with other households and villages.

We do not plan to make changes in the methodological approach to field or laboratory research. We do look forward to applying a range of highly advanced quantitative procedures to our data sets. Consultant roles have not changed. We expect isotopes, ancient DNA and residues to provide essential data to the project over the coming year. We plan to submit several new radiocarbon dates. We have not encountered any significant problems with hardware or software in data management, manipulation, or analysis. This project does not involve federal matching funds.

Appendix

REPORT OF THE 2013 UNIVERSITY OF MONTANA INVESTIGATIONS AT THE BRIDGE RIVER SITE (EeRl4): HOUSEPIT 54 DURING THE BRIDGE RIVER 3 PERIOD

Edited By

Anna Marie Prentiss

Sponsored by the National Endowment for the Humanities (Grant RZ-51287-11) and The University of Montana, Missoula, MT

Conducted in Collaboration with the Bridge River Band (Xwisten) and the St'át'imc Nation

Anna Marie Prentiss, Ph.D.
Principal Investigator

Department of Anthropology
The University of Montana
Missoula, Montana 59812
April 2014

Acknowledgements

This research was generously funded by a grant from the National Endowment for the Humanities (Grant RZ-51287-11) and time and space for laboratory research was provided by The University of Montana. All research was conducted in an ongoing collaboration with Xwisten, the Bridge River Band. We especially thank Bradley Jack and Gerald Michel for their efforts in facilitating the project. Many people contributed towards the success of the project in the field and in the laboratory. Several members of the Bridge River Band participated in the field phase of the project. We thank everyone and especially Josh Jack and Everett Tom for their contributions. Excavations were also facilitated by an archaeological field school from The University of Montana. We thank students (order not significant), Megan Denis, Douglas Sullenberger, Rebekah Kneifel, James Verzuh, Matt McKee, Jacob Reynoso, Alex Swalling, and Lorena Craig. Nicole Hansen offered significant help in the field. Our University of Montana graduate student field team included Matthew Walsh, Kristen Barnett, and Alexandra Williams. Our lab team included Matthew Walsh, Matt McKee, James Verzuh, Tanner Marsh, Corey Johnson, Kristen Barnett, Andrew McElroy, Ethan Ryan, Ayme Swartz, Lorena Craig, Nasreen Broomandkoshbacht, Jessica Baird, and Brittney Radford. The latter group put in long hours in the laboratory and contributed significantly to the project. We thank funded laboratory collaborators, Dongya Yang (SFU Department of Archaeology), Naoko Endo (SFU Department of Archaeology), Michael Richards (UBC Department of Anthropology), and DirectAMS. We thanks Jim Chatters and DirectAMS for providing a free radiocarbon date as part of their program of research and development. Finally, we thank our unfunded collaborators for providing a variety of contributions including geochemical analysis (Nathan Goodale, Alissa Naumann, Kate Hill, and David Bailey, all Hamilton College), and consultation regarding spatial analysis and interpretation (Thomas Foor, U. Montana; Nathan Goodale, Hamilton College; Pei-Lin Yu, NPS and U. Montana; and Matthew Schmader, City of Albuquerque).

Table of Contents

Chapter One (Introduction) 8

Chapter Two (Archaeology of Bridge River and Housepit 54) . . 24

Chapter Three (Lithic Artifacts) 64

Chapter Four (Faunal Analysis) 81

Chapter Five (Conclusions) 103

Appendices 107

Chapter One
Introduction

(Anna Marie Prentiss)

The Bridge River project of The University of Montana, Department of Anthropology is a long term study of the development of socio-economic and political complexity among hunter-gatherer-fisher peoples in southern British Columbia. The Bridge River site (EeRl4 in the Canadian site numbering system) is a large and spectacularly well-preserved ancient village of approximately 80 semi-subterranean pithouses and over 100 extra-mural pit features consisting of storage pits and food-roasting ovens (Prentiss et al. 2008). Bridge River is one of several such villages (others include Keatley Creek, Bell, and McKay Creek) whose combined record provides an tremendous opportunity to refine our understanding of cultural and ecological processes associated with the development of sedentary communities featuring intensified foraging strategies, wide exchange networks, and social ranking (Hayden 1997; Prentiss et al. 2003, 2007, 2008, 2011, 2012, 2014). While previous investigations at Bridge River emphasized village wide mapping, test excavations, and radiocarbon dating, the current research focuses on the incredible occupational record of a single housepit (Housepit 54) to examine a host of questions associated with the experiences and roles of individual families and household groups within the wider processes of demographic, economic, political change that occurred within the village during the period of circa 1500-1000 years ago. The research is designed to significantly impact archaeological and anthropological discussions of the nature of early village life, emergent social inequality, and the complex dynamics of maintaining dense human settlements in the face of regional environmental change (e.g. Ames 2006, 2008; Arnold 1996; Kuijt 2000; Prentiss 2014; Prentiss and Kuijt 2004, 2012; Sassaman 2004). Excavations of Housepit 54 under the current grant was opened in 2012 and focused on the final occupation associated with the Canadian Fur Trade period. Excavations in 2013 permitted us to initiate the process of examining the deeper floors. As documented in this report we now believe the house accumulated at least 14 floors spanning the period of ca. 1000 to 1400 cal. B.P. This introduction reviews project background and goals and then provides an overview of report contents.

Housepit Archaeology in the Mid-Fraser Canyon

Field research at Bridger River began during the early 1970s by archaeologist Arnoud Stryd as a component in his larger Lillooet Archaeological Project (Stryd 1974, 1980). Stryd's critical early research identified many significant villages in the Middle Fraser (Mid-Fraser) Canyon area and eventually instigated more extensive research, particularly at the Keatley Creek and Bridge River villages, in subsequent decades. Brian Hayden's (1997, 2000a, 2000b; Hayden and Spafford 1993) research program at Keatley Creek emphasized socio-economic and political distinctions between households of different sizes and clearly placed the Mid-Fraser villages on the archaeological map as prime examples of complex hunter-gatherer societies. Anna Prentiss' (Prentiss et al. 2003, 2007, 2008, 2011, 2012, 2014) research at Keatley Creek and Bridge River refined the area's cultural chronology leading to an enhanced understanding of relationships between demographic growth, subsistence intensification, emergent social inequality, and regional effects of climate change.

The Mid-Fraser villages are characterized by groups of semi-subterranean pithouses and associated extra-mural features primarily resulting from cold season sedentary occupation. The remains of these pithouses, known to archaeologists as housepits, generally include floor layers derived from clay-rich sediments often transported from elsewhere, capped by collapsed roof deposits and surrounded by rim-middens consisting of household debris and old roof material. Housepit floors are marked by in situ activity areas that include cooking and storage features and clusters of well-preserved faunal and botanical remains as well as a variety of lithic, bone and botanical artifacts. Storage features generally consist of pits ("cache pits") excavated into subfloor sediments. When in use these pits were generally lined with birch bark and filled with layers of dried food such as salmon (Alexander 2000; Hayden 1997; Prentiss and Kuijt 2012; Teit 1906). Once abandoned as storage facilities these pits become refuse receptacles preserving a wide variety of household debris. Floors in typical Mid-Fraser houses provide the opportunity to examine variation in household and family subsistence activities, use of technologies, and social relationships (Hayden 1997; Lepofsky et al. 1996; Prentiss 2000; Prentiss et al. 2011). Ethnographic and archaeological evidence supports the fact that multiple family groups resided in Mid-Fraser pithouses, their domestic activity areas arranged around the perimeters of the floors (Alexander 2000; Hayden 1997; Prentiss and Kuijt 2012).

Floors are virtually always buried by collapsed roof deposits. Roofs were constructed using a framework of posts and beams covered by matting and then sediment for insulation purposes (Alexander 2000; Prentiss and Kuijt 2012; Teit 1900, 1906). Roofs provided shelter for household occupants but also were a context for dumping household refuse (accessed by an egress ladder from the floor through the center of the roof) and sometimes conducting outdoor activities. Mid-Fraser peoples typically resided under a house roof for an estimated 10-20 years between roof replacements made necessary by wood-rot, insect infestations and other problems (Alexander 2000). Roof replacements required salvage of still usable timbers and subsequent burning of the old roof. This was followed by cleanout of the collapsed roof and sometimes the old floor leading to the formation of a rim-midden or a ring of re-deposited roof and floor deposits around the margin of the housepit. Final house abandonment generally also included burning down the final roof. Roof deposits are quite different from those of floors in featuring a nearly random assortment of artifacts and other remains, little spatial patterning, and frequent evidence of burning. Rim sediments thus preserve a record of many household activities, but they remain in a mixed state.

In many Mid-Fraser villages such as Keatley Creek, housepits retain only their final floor due to post-roof collapse cleanout procedures that typically included excavation and re-deposition of the old floor. In contrast, many Bridge River occupants did not remove their old floors but simply covered them with new layers of floor material (Prentiss et al. 2008; 2012). This has led to an occupation record that preserves not only earlier occupational materials but those crucial spatial arrangements from housepit floors permitting reconstruction of variability in activity areas and potentially inter-family relationships. The record of Housepit 54 (12.5 m in diameter rim crest to rim crest) is the most spectacular in this regard, featuring an estimated 14 well preserved floors separated in part by up to seven burned roofs. Dating of these floors spans the critical period of ca. 1400-1100 years ago. Housepit 54 provides us with the opportunity to examine culture change from the standpoint of a long-lived individual household on the scale of inter-generational variability. While many investigators discuss the importance of researching household histories (e.g. Ames 2006), archaeologists almost never encounter a record that permits this to happen in such fine-grained detail. We are presented with this opportunity at Housepit 54.

Cultural Complexity in the Middle Fraser Canyon

Research in the Mid-Fraser villages to date has suggested a process of cultural change that began with the establishment of the villages after about 1800-1900 years ago (Harris 2012; Lenert 2001; Prentiss et al. 2003, 2008). The record from the Bridge River site indicates that earliest Mid-Fraser villages were small, characterized by no more than 5-7 housepits of a range of sizes (some over 15 m. in rim crest diameter). Highly productive fisheries (e.g. Chatters et al. 1995; Finney et al. 2002; Tunnicliffe et al. 2001) and apparently very good terrestrial foraging conditions favored population growth over the next several hundred years (Prentiss et al. 2008; 2014). Recent analysis of Bridge River radiocarbon dates (Prentiss et al. 2008, 2012) suggests that at approximately 1300 years ago the village population may have effectively doubled to at least 30 simultaneously occupied houses (and an estimated population of over 600 persons) coinciding with a similar peak in marine fisheries productivity (Hay et al. 2007; Patterson et al. 2005; Tunnicliffe et al. 2001). Harris (2012) and Lenert's (2001) analyses of radiocarbon dated housepits throughout the Mid-Fraser confirms a similar pattern. After this point we recognize the first signs of inter-household wealth distinctions as measured by variability in predation (deer remains for example), production of expensive to manufacture items like stone beads, pendants, and pipes, animal husbandry (dogs), acquisition of trade goods, and evidence for feasting practices in the form of associated large extra-mural roasting pits and discarded remains of special foods (dogs and fish at Bridge River; dogs, mountain goats and bighorn sheep at Keatley Creek). However, emergent wealth-based inequality also came at a time when populations in the Mid-Fraser had peaked and were in decline soon to be followed by abandonment of the aggregated villages by sometime around or shortly after 1000 years ago.

Developing an understanding of the processes of village growth and emergent inequality has been critical focus of the Bridge River project. The chronology at Bridge River and the wider Mid-Fraser implicates a variety of social and ecological processes considered critical by theorists to the development of complex human societies (Ames 2008; Boone 1992, 1998; Fitzhugh 2003; Henrich and Gil-White 2001; Maschner and Patton 1996; Prentiss 2011; Rosenberg 2009; Smith et al. 2010). Prentiss et al. (2012, 2014) argue that village growth may have occurred through relaxing of standard hunter-gatherer prohibitions against large family size under conditions that favored large groups for purposes of defense and mass-harvest and processing of food (e.g. Binford 2001; Chatters 2004). The region was likely also attractive for people in other drainages who may have been permitted to immigrate. Under benevolent conditions old social constructs prohibiting the development of wealth-based ranking systems (e.g. Bowles et al. 2010) may have originally prevailed. But these rule systems were broken as populations peaked and terrestrial resources (Carlson 2010) and regional fisheries (Chatters et al. 1995) declined. Current evidence at Bridge River and Keatley Creek suggests that competition between houses developed and quickly led to status differentiation at least as measured from the standpoint of accumulated prestige (per Hayden 1998) goods, consumption of rare foods, and development of feasting in select houses. This was probably the first step towards the breakdown of the Mid-Fraser villages since within no more than two centuries all of the dated large villages were apparently abandoned (Kuijt and Prentiss 2004; Prentiss et al. 2003, 2008; 2014). Inter-household status differentiation and competition likely provided the initial conditions for the first abandonments of households as some families may have been simply forced out by more powerful groups potentially denying them first access to crucial food sources (assuming that as in the ethnographies [Kennedy and Bouchard 1992; Romanoff 1992] wealth and status also include control of optimal berry collecting, hunting, and fishing places). Taken to its logical extreme, the famous Mid-Fraser abandonment (Hayden and Ryder 1991; Kuijt 2001; Kuijt and Prentiss 2004) may have been a logical outcome of this process as access to regional food resources became increasingly uncertain.

All things considered, the rise and fall of the Mid-Fraser villages and of Bridge River in particular, was the result of a complex interaction between variation in natural resources and decisions made by the human groups that sometimes had unanticipated consequences. The history of population growth, subsistence intensification, and emergent inequality offers important implications for theoretical modeling of the processes by which social inequality develops. In particular, this suggests that variation in access to resources was important (e.g. Fitzhugh 2003; Mulder et al. 2009), as was the formation of competitive kin-groups (e.g. Maschner and Patton 1996) and their uses of feasting for social purposes (e.g. Boone 1998). It has been possible to recognize and develop an initial understanding of these processes on the scale of general inter-household and inter-village patterns but to date research has not demonstrated a detailed understanding of the cumulative effects of decisions made across generations within individual houses. New research at Housepit 54 offers the opportunity to address this deficiency. Several lines of inquiry guide our multi-disciplinary studies.

Research Goals for the Housepit 54 Project

Demographic History of Housepit 54

While the general pattern of village growth at Bridge River is relatively well known, we know virtually nothing here or elsewhere in the region about specific means by which households maintained adequate numbers to remain viable. Ames (2006) documents a variety of tactics undertaken by traditional Pacific Northwest households to prevent demographic collapse including simple economic success and reproductive health and recruitment of outside persons via marriage arrangements or simple permissions to “move-in.” We will never fully understand the processes of village growth and decline without directly engaging this difficult issue and it is rarely possible either due to inadequate excavations or, more typically, floor matrices that simply do not preserve a record detailed enough to permit direct evaluation of variation in household demographics over time. Study of Housepit 54 permits a number of lines of investigation drawing from several critical questions about demography (where demography is concerned with estimated numbers of families and extrapolated numbers of persons).

The first set of questions concern change over time. Was there significant variation in numbers of occupants in Housepit 54 over time? If change is evident did it fluctuate or was it directional through time? Was demographic change correlated in any way with subsistence change (see below) or some other potentially explanatory factor? Prentiss et al. (2012) suggest that household numbers likely increased under optimal resource conditions leading to frequent fissioning and formation of new households; this process could have been reversed during the final century or so of occupation as access to resources turned suboptimal. Variation in housepit demography has been measured indirectly at the Keatley Creek site by examining variability in activity areas (Hayden 1997; Hayden and Spafford 1993). In brief, single family households tend to be organized in activity specific zones around house floors while multi-family households are arranged in family specific areas characterized by multiple activities. To date the only evidence for activities conducted outside of households comes from late dating (BR 3 and 4) roasting ovens and cache pits placed on or adjacent to housepit rims. Some activities may have been conducted on house roofs but this is difficult to recover in situ due to roof collapse processes. Roof data are used to enhance interpretation of select floors at Housepit 54. Careful data recording and spatial analysis of house floor materials will be critical for demographic studies. On a household scale it is also possible to measure rates of storage and cooking as indicated by cache pit volume, cooking features and fire-cracked rock as indirect indicators of relative variation in numbers of occupants per floor (Prentiss et al. 2007, 2012).

The second set of questions concern tactics by which the house was maintained. Was the house occupied by descendants of the first families throughout its lifespan leading up to village-wide abandonment (excluding the contact period floor)? How did occupants maintain their numbers – in situ growth or significant recruitment from external sources? Answering these questions is considerably more difficult than those of the first set. Archaeological indicators of household demographic continuity could include persistence of artifact manufacturing styles and traditions of household spatial organization. This however could be biased since cultural traditions can be inherited independent of biological heritage (e.g. Richerson and Boyd 2005). Therefore we have initiated a study of paleo-DNA focused on extraction of ancient human and faunal DNA from skeletal remains and floor sediments (e.g. Yang et al. 2003; Yang and Speller 2006). In a recently completed pilot project, ancient dog DNA was successfully extracted and analyzed from dog bone and dog coprolite samples from the Bridge River site. We apply this approach to analyze more DNA samples from bone and coprolite materials to investigate the continuity of dog DNA sequences, following a model established by Lisa Matisoo-Smith to use faunal DNA as proxy to trace human movements (Matisoo-Smith 2009). In this study, we use dog DNA to establish continuity of the same group of people. Effort has also be made to attempt to recover human and dog DNA from soil samples from the floor sediments. New studies have demonstrated that faunal and plant DNA can be recovered from sediment samples as well (Hebsgaard, et al. 2009). "Sterile" sampling of soils was conducted during excavation to avoid any contamination to increase the chance of success.

Subsistence Change in Housepit 54

Analysis of site-wide faunal assemblages from Bridge River to date suggest that during the period of peak occupation known as BR 3 (ca. 1300-1100 years ago) access to salmon dropped as relative numbers of salmon remains declined. There is also evidence for local depression in deer populations causing human hunters to search more widely before making kills. This is indicated by a decline in head parts and a simultaneous rise in lower limb bones between BR 2 (1300-1600 years ago) and BR 3 suggesting that hunters had to conduct more extensive field butchery (presumably due to greater transport requirements) prior to returning kills to the village (Prentiss et al. 2014). Preliminary analysis of botanical remains also supports indicators of subsistence diversification after 1300 years ago, particularly with the inclusion of more frequent berries from dry environments (in contrast to the earlier BR 2 signature dominated by plants adapted to wetter environments as is typical of montane environments). Virtually nothing is known about the uses of root foods at Bridge River. We lack knowledge of many details particularly as related to changing use of food resources by individual families and specific households.

Two sets of questions guide subsistence studies. First, research is required into the relationships between subsistence and variation in village demography and regional ecology. More specifically, how were subsistence tactics impacted by village-wide population growth? How were they affected by wider scale climate change and resource variability? Did some of these shifts in subsistence pursuits entail related changes in food storage practices? Research into these questions will emphasize floor-wide and family activity area-specific studies of faunal and botanical remains. Zooarchaeological and paleoethnobotanical analyses have been initiated to address variation in the roles of prey choice, predation strategy, and food processing and transport (e.g. Broughton 1994; Chatters 1987; Lepofsky and Peacock 2004; Prentiss et al. 2012). Gaining a complete understanding of ecosystems requires extra attention to measurement of ecosystem variables using botanical, isotopic, and other paleoecological studies (see methods). Isotopic research focuses on dog remains as these provide proxy markers of variability in human consumption practices. Results of isotope studies from Housepit 54 are compared to patterns derived from other housepits at the site during 2008 and 2009 field seasons. An additional facet to our subsistence research is the study of residues and starches on lithic artifacts and fire-cracked rock. One important payoff of this research is to initiate a first (for the Canadian Plateau) analysis of starchy plant food preparation in housepits, especially roots or geophytes like balsamroot and spring beauty. Residues research was initiated for the 2012 field season but not for 2013. We are waiting for a more complete sample of housepit floor materials from 2014 before further engagement with this process.

A second set of questions concern the interactions between subsistence activities and social change as reflected in variation in family activity areas within and between floors. Did subsistence pursuits of individual families change during the period (BR 2 to BR 3 transition at about 1300 years ago) in which we recognize a shift from relatively egalitarian to distinctly non-egalitarian social relationships between houses? Foraging theorists suggest that we should expect to see some family and/or household specific changes in prey spectrum, acquisition tactics, and preparation and dispersal to consumers (Bowles et al. 2010; Smith et al. 2010). One facet of this could include the development of household feasting practices which has been identified at other houses at Bridge River during the post 1300 years Before Present (BP) period. If so, how were feasts constructed and what could their payoffs have been? Identification of feasting can be a challenge though scholars point to a range of potential archaeological indicators (e.g. Hayden 2001). Studies of Mid-Fraser feasting are aided by a well-developed ethnographic record from the wider Pacific Northwest pointing to a range of specific characteristics including construction of unique cooking features, use of particular foods (e.g. dogs, and other items), and discard of feasting remains in spatially specific contexts (Kennedy and Bouchard 1978; Perodie 2001).

Technology in Housepit 54

The study of Housepit 54 technological variation has wide implications for other areas of study, particularly subsistence and sociality. Technology clearly played a critical role in processes of subsistence intensification and dis-intensification in the Mid-Fraser Canyon (Prentiss and Clarke 2008; Prentiss et al. 2007). To date we have a relatively poor understanding of variation in technological organization (meaning tactics for tool production, use, transport, recycling, and discard as well as processing feature construction, procurement of raw materials such as heating elements and fuel, use, clean-up, refurbishment, re-use, and abandonment in their social and ecological contexts) measured on inter-individual, inter-family and inter-generational scales. However, it was on these scales that technological knowledge was most typically transmitted and technological decisions made.

We cannot fully understand household subsistence strategies without an examination of associated technological organization (e.g. Nelson 1991). There are a range of questions linking technological systems to family and household food acquisition centering on the ability of these groups to gain access to critical tool-stone and other raw material sources (e.g. antler, bone, etc.) and convert the raw material to implements. Did these production and use systems correlate with particular approaches to foraging and how did that vary over time in relation to socio-ecological processes on the wider scale (e.g. Prentiss and Clarke 2008; Prentiss et al. 2007)? In these contexts, did families on each house floor act independently or more in unison as a corporate unit? Did household organizational tactics change across the BR 2 to 3 transition period? Three areas of analysis are necessary to address these questions. First, continuation of ongoing studies of lithic raw material sourcing is essential. A critical part of this is an expanded geochemical assessment of variability in the dominant raw material source, dacite, made possible through x-ray fluorescence analysis to be conducted by Dr. Nathan Goodale. Sourcing will be conducted with an Innov-X Delta portable XRF instrument and control samples will be analyzed at the Washington State University XRF laboratory. We expect to initiate this research after the 2014 field season once a more complete sample of house floor materials comes available. Second, technological and functional analysis of lithic and bone/antler tools have been undertaken with the goal of identifying raw material specific variation in tool production and use. Third, cooking features are being assessed for construction and use histories, particularly in reference to selection and use of cooking stones. These studies permit us to examine how technological organization varied within and between floors.

The second critical analysis of technology focuses on social questions, specifically linking tool production systems to variability in the formation of social groups, networks, and systems of social ranking. An important focus of lithic artifact analysis is on the structure of cultural transmission systems (e.g. O'Brien 2008; Prentiss et al. 2015a, 2015b) as indicators of cultural inheritance. Research at the Bridge River site to date has suggested that artifact manufacture traditions were widely shared on an inter-household basis during BR 2 times (prior to 1300 years ago). However, this appears to have changed after this point with the advent of house-specific trends favoring particular artifact designs (Prentiss et al. 2015b). Despite these provocative results, it has not been possible to investigate in any detail the complex relationships that would be expected within a household during a particular period of occupation or across the life of that house. The proposed research offers the opportunity to investigate some crucial forces necessary for maintenance of coherent house-groups, particularly learning traditions.

Technological analysis provides a critical dimension to the study of emergent social complexity at Bridge River. While there are clear relationships in the village between production and consumption of prestige artifacts and raw materials (definitions per Hayden 1998), we do not have an adequate understanding of inter-family and inter-generational variability in production and consumption of these goods, particularly as related to changing demographics and socio-economic and political relationships within the village. Of particular importance is the question of how Housepit 54 participated in the shift towards more explicit inter-household competition for resources after 1300 years ago (Prentiss et al. 2012, 2014). Did they increase their rates of production of prestige goods for exchange? Is this marked by a reciprocal return on non-local products? Is there evidence for intensification of select subsistence resources associated with development of feasting events? If present, were these processes driven by one or more families? How were these practices impacted by generational fluctuations in access to food and other resources as well as contacts with other households and villages? Studies of production and consumption of prestige goods is integrated into other research including technological analyses of lithic, bone and shell artifacts, site structural/spatial studies, sourcing analyses, and application of statistical approaches particularly associated with phylogenetic research (Prentiss et al. 2015a, 2015c).

Sociality of Housepit 54

The Bridge River village grew by at least 300% between 1800 and 1250 years ago expanding from a maximum of 7 simultaneously occupied houses to 30 or more. During this time it is likely that many social groups and a range of occupational specialties developed (Prentiss et al. 2008). On the most dramatic scale it is evident that by about 1500 years ago there may have been two clan-like social units present in the village as indicated by the presence of two independent circular arrangements of houses. Then, new research demonstrates that by 1250-1300 years ago a pattern of material-wealth based (definition per Bowles et al. 2010) inter-household inequality developed. In this context greatest wealth (measured in ratios of prestige goods, raw materials, non-local raw materials, and mammal remains to excavated sediment) is evident in newly constructed houses. Older households such as Housepit 54 do not appear to have been quite as successful. However, even Housepit 54 participated in this process increasing its accumulations of these items, in some cases significantly, between BR 2 and BR 3 (pre- and post-1300 years ago).

Prentiss et al. (2012) argue that if new households were the wealthiest then rights to material wealth were unlikely to have been inherited within particular houses at least prior to BR 3 times. The implication is that wealth based inequality developed in situ at Bridge River through some form of competitive process that included establishment of new houses able to develop wealth through new social connections and control of foraging landscapes or immigration of new groups bringing with them new sources of wealth and instigating practices such as unconstrained accumulation of goods that had not been present before. Evidence for competitive economic conditions is present in the form of developing resource depression (per Broughton 1994) in deer populations and declining numbers of salmon likely associated with shifts in global weather patterns (Chatters et al. 1995; Prentiss et al. 2007, 2012, 2014). The effects of competition are evident in patterns of inter-household variation in deer and salmon remains in which BR 2 (before 1300 years ago) households show relatively little variability whereas BR 3 contexts are highly variable.

While the emergence of inter-household competition for food and non-food resources is evident at Bridger River many questions remain regarding how this was manifested within particular households and how it manifested over short time intervals. More specifically, did inequality manifest itself on an inter-family basis? If it did happen – when did it occur? Did incipient social relationships evident on earlier (BR 2) house floors affect later (BR 3) social arrangements? What currencies were used by emerging household elites (if any) to mark status distinctions? What was the effect of this process on other household members? Did the household develop or maintain ritual space(s)? What was the nature of inter-family relationships? Were there changes in inter-family sharing and provisioning across the many floors of HP 54? Studies of sociality at Housepit 54 will depend upon the integration of many lines of data. An important research tactic is site structural (e.g. Binford 1978, 1983) analysis with the critical goal of defining variability in activity areas and determining if these represent places where household families resided as opposed to special activity areas (e.g. Hayden 1997; Lepofsky et al. 1996; Schmader 1994; Spafford 2000). Once floor activity arrangements are defined then analyses of artifact, feature, and organic materials can be used to reveal variability in household socio-economic and political practices (as outlined above).

Report Contents

This report includes chapters reviewing outcomes of several facets of project research stemming from the 2013 excavations at Housepit 54. Chapter Two reviews excavation methods, stratigraphy, fire-cracked rock research, feature characteristics, dating, and spatial arrangements of house floor features. Chapter Three provides basic data and preliminary analyses of lithic artifacts. Chapter Four covers faunal analyses. Chapter five provides general conclusions. The report concludes with the following appendices: Appendix A (Maps and Photographs), Appendix B (Lithic Artifact Typology), Appendix C (Paleoethnobotanical report), Appendix D (Geochemical analysis report), and Appendix E (Ancient DNA report). Study of artifact and feature distributions on the BR 2 and 3 floors using GIS technology and other analytical systems is ongoing and will be a prominent part of the final report following the 2014 field season. The ancient DNA report covers attempts to extract ancient DNA from Fur Trade period sediments. This research is ongoing. Isotopes analysis of faunal remains is ongoing but reporting has been delayed as of spring 2014 due to equipment malfunctions and repair. Isotopes results will be reported in the final report in 2015.

References Cited

Alexander, Diana

2000 Pithouses on the Interior Plateau of British Columbia: Ethnographic Evidence and Interpretation of the Keatley Creek Site. In The Ancient Past of Keatley Creek Vol. II Socioeconomy, edited by B. Hayden, pp. 29-66. Archaeology Press, Burnaby.

Ames, Kenneth M.

2006 Thinking about Household Archaeology on the Northwest Coast. In *Household Archaeology on the Northwest Coast*, edited by Elizabeth A. Sobel, D. Ann Trieu Gahr, and Kenneth M. Ames, pp. 16-36. International Monographs in Prehistory Archaeological Series 16, Ann Arbor.

2008 The Archaeology of Rank. In *Handbook of Archaeological Theories*, edited by R. Alexander Bentley, Hebert D.G. Maschner, and Christopher Chippindale, pp. 487-514. Altamira Press, Lanham.

Andrefsky, William

2005 *Lithics: Macroscopic Approaches to Analysis*, Second ed. Cambridge University Press, Cambridge.

Arnold, Jeanne E.
1996 The Archaeology of Complex Hunter-Gatherers. *Journal of Archaeological Method and Theory* 3, 77-126.

Binford, Lewis R.
1983 *In Pursuit of the Past*. Thames and Hudson, London.

2001 *Constructing Frames of Reference*. University of California Press, Berkeley.

Boone, James L.
1992 Competition, Conflict, and the Development of Social Hierarchies. In *Evolutionary Ecology and Human Behavior*, edited by Eric Alden Smith and Bruce Winterhalder, pp. 301-338. Aldine de Gruyter, New York

1998 The Evolution of Magnanimity: When it is Better to Give Than to Receive? *Human Nature* 9:1-21.

Bowles, Samuel, Eric A. Smith, and Monique Borgerhoff Mulder
2010 The Emergence and Persistence of Inequality in Premodern Societies: An Introduction to the Special Section. *Current Anthropology* 51:7-18.

Broughton, J.M.
1994 Late Holocene Resource Intensification in the Sacramento River Valley: The Vertebrate Evidence. *Journal of Archaeological Science* 21:501-514.

Carlson, Catherine
2006 Indigenous Historic Archaeology of the 19th Century Secwepemc Village at Thompson's River Post, Kamloops, British Columbia. *Canadian Journal of Archaeology* 30:193-250.

Carlson, Eric
2010 Subsistence Change and Emergent Social Inequality in an Early Complex Hunter-Gatherer Winter Village: A Zooarchaeological Assessment of the Bridge River Site (EeRl4), Middle Fraser, B.C. M.A. thesis, Department of Anthropology, The University of Montana, Missoula.

Chatters, James C.
1987 Hunter-Gatherer Adaptations and Assemblage Structure. *Journal of Anthropological Archaeology* 6:336-375.

2004 Safety in Numbers: The Influence of the Bow and Arrow on Village Formation on the Columbia Plateau. In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North*

America, edited by William C. Prentiss and Ian Kuijt, pp. 67-83. University of Utah Press, Salt Lake City.

Chatters, James C., Virginia L. Butler, M.J. Scott, D.M. Anderson, and D.A. Neitzel
1995 A Paleoscience Approach to Estimating the Effects of Climatic Warming on Salmonid Fisheries of the Columbia Basin. *Canadian Special Publication in Fisheries and Aquatic Sciences* 21:489-496.

Finney, Bruce P., Irene. Gregory-Eaves, Marianne S.V. Douglas, and John P. Smol
2002 Fisheries Productivity in the Northeastern Pacific Ocean over the Past 2,200 Years. *Nature,* 416:729-733.

Fitzhugh, Ben
2003 *The Evolution of Complex Hunter-Gatherers: Archaeological Evidence from the North Pacific*. Kluwer/Plenum, New York.

Harris, Lucille
2012 Heterarchy and Hierarchy in the Formation and Dissolution of Complex Hunter-Gatherer Communities on the Northern Plateau of Northwestern North America, ca. 2000-300 B.P. Ph.D. thesis, Department of Anthropology, University of Toronto.

Hay, Murray B., Audrey Dallimore, Richard E. Thomson, Stephen E. Calvert, and Reinhard Pienetz
2007 Siliceous Microfossil Record of late Holocene Oceanography and Climate along the West Coast of Vancouver Island, British Columbia (Canada). *Quaternary Research* 67:33-49.

Hayden, Brian
1997 *The Pithouses of Keatley Creek*. Harcourt Brace College Publishers, Fort Worth.

1998 Practical and Prestige Technologies: The Evolution of Material Systems. *Journal of Archaeological Method and Theory* 5:1-55.

2000a *The Ancient Past of Keatley Creek Volume I: Taphonomy*. Archaeology Press, Simon Fraser University, Burnaby, B.C.

2000b *The Ancient Past of Keatley Creek Volume II: Socioeconomy*. Archaeology Press, Simon Fraser University, Burnaby, B.C.

2001 Fabulous Feasts: A Prolegomenon to the Importance of Feasting. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics and Power*, edited by Michael Dietler and Brian Hayden, pp. 23-64. Smithsonian Institution Press, Washington.

Hayden, Brian and June Ryder

1991 Prehistoric Cultural Collapse in the Lillooet Area. *American Antiquity* 56:50-65.

Hayden, Brian and James Spafford
1993 The Keatley Creek Site and Corporate Group Archaeology. *B.C. Studies* 99: 10-139.

Hebsgaard, M. B., et al.
2009 The Farm Beneath the Sand' - an archaeological case study on ancient 'dirt' DNA. *Antiquity* 83(320):430-444.

Henrich, Joseph and Francisco J. Gil-White
2001 The Evolution of Prestige Freely Conferred Deference as a Mechanism for Enhancing the Benefits of Cultural Transmission. *Evolution and Human Behavior* 22:165-196.

Kennedy, Dorothy I.D. and Randy Bouchard
1978 Fraser River Lillooet: An Ethnographic Summary. In *Reports of the Lillooet Archaeological Project. Number 1. Introduction and Setting*, edited by Arnoud H. Stryd and Stephen Lawhead, pp. 22-55. National Museum of Man, Mercury Series, Archaeological Survey of Canada paper No. 73, Ottawa.

Kuijt, Ian (editor)
2000 L*ife in Neolithic Farming Communities: Social Organization, Identity, and Differentiation.* Kluwer Academic/Plenum Press, New York.

Kuijt, Ian
2001 Reconsidering the Cause of Cultural Collapse in the Lillooet Area of British Columbia: A Geoarchaeological Perspective. *American Antiquity* 66, 692-703.

Kuijt, Ian and William C. Prentiss
2004 Villages on the Edge: Pithouses, Cultural Change, and the Abandonment of Aggregate Pithouse Villages. In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, edited by W.C. Prentiss and I Kuijt, pp. 155-170. University of Utah Press, Salt Lake City.

Lenert, Michael
2001 Calibrated Radiocarbon Dates and Culture Change: Implications for Socio-complexity in the Mid-Fraser Region, British Columbia. *Northwest Anthropological Research Notes* 35, 211-228.

Lepofsky, Dana, Karla Kusmer, Brian Hayden, and Ken Lertzman
1996 Reconstructing Prehistoric Socioeconomies from Paleoethnobotanical and Zooarchaeological Data: An Example from the British Columbia Plateau. *Journal of Ethnobiology* 16:31-62.

Lepofsky, Dana and Sandra L. Peacock
2004 A Question of Intensity: Exploring the Role of Plant Foods in Northern Plateau Prehistory. In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, edited by William C. Prentiss and Ian Kuijt, p. 115-139. University of Utah Press, Salt Lake City.

Maschner, Herbert D.G. and John Q. Patton
1996 Kin Selection and the Origins of Hereditary Social Inequality: A Case Study from the Northern Northwest Coast," In *Darwinian Archaeologies*, edited by Herbert Donald Graham Maschner, pp. 89-108. Plenum Press, New York.

Matisoo-Smith, Elizabeth
2009 The commensal model for human settlement of the Pacific 10 years on - what can we say and where to now? *The Journal of Island and Coastal Archaeology* 4(2):151 - 163.

Mulder, Monique Borgerhoff, Samuel Bowles, Tom Hertz, Adrian Bell. Jan Beise, Greg Clark, Ila Fazzio, Michael Gurven, Kim Hill, Paul L. Hooper, William Irons, Hillard Kaplan, Donna Leonetti, Bobbi Low, Frank Marlowe, Richard McElreath, Suresh Naidu, David Nolin, Patrizio Piraino, Rob Quinlan, Eric Schniter, Rebeccca Sear, Mary Schenk, Eric Alden Smith, Christopher von Rueden, and Polly Wiessner
2009 Intergenerational Wealth Transmission and the Dynamics of inequality in Small-Scale Societies. *Science* 326:682-688.

Nelson, Margaret C.
1991 The Study of Technological Organization. In *Archaeological Method and Theory, Vol. 3,* edited by M. Schiffer, pp. 57-100. University of Arizona Press, Tucson.

Patterson, R. Timothy, Andreas Prokoph, Arun Kumar, Alice S. Chang, and Helen M. Roe
2005 Late Holocene Variability in Pelagic Fish Scales and Dinoflagellate Cysts along the West Coast of Vancouver Island, NE Pacific Ocean. Marine Micropaleontology 55:183-204.

Perodie, James R.
2001 Feasting for Prosperity: A Study of Southern Northwest Coast Feasting. In *Feasts: Archaeological and Ethnographic Perspectives on Food, Politics and Power,* edited by Michael Dietler and Brian Hayden, pp. 185-214. Smithsonian Institution Press, Washington.

Prentiss, Anna Marie
2011 Social Histories of Complex Hunter-Gatherers: Pacific Northwest Prehistory in a

Macroevolutionary Framework. In *Hunter-Gatherer Archaeology as Historical Process*, edited by Kenneth Sassaman and Donald Holly. Amerind Foundation SAA Seminar Series, University of Arizona Press, Tucson (in press).

Prentiss, Anna Marie, Hannah S. Cail, and Lisa M. Smith*
2014 At the Malthusian Ceiling: Subsistence and Inequality at Bridge River, British Columbia. *Journal of Anthropological Archaeology* 33:34-48.

Prentiss, Anna Marie, James C. Chatters, Natasha Lyons, and Lucille E. Harris*
2011 Archaeology in the Middle Fraser Canyon, British Columbia: Changing Perspectives on Paleoecology and Emergent Cultural Complexity. *Canadian Journal of Archaeology* 35:143-174.

Prentiss, Anna Marie, James C. Chatters, Randall R. Skelton, and Matthew Walsh*
2015c The Evolution of Old Cordilleran Core Technology. In *Works in Stone: Contemporary Perspectives on Lithic Analysis*, edited by Michael Shott. University of Utah press, Salt Lake City (In Press).

Prentiss, Anna Marie and David S. Clarke
2008 Lithic Technological Organization in an Evolutionary Framework: Examples from North America's Pacific Northwest Region. In *Lithic Technology: Measures of Production, Use and Curation*, edited by W. Andrefsky, pp. 257-285. Cambridge University Press, Cambridge.

Prentiss, Anna Marie, Guy Cross, Thomas A. Foor, Dirk Markle, Mathew Hogan, and David S. Clarke
2008 Evolution of a Late Prehistoric Winter Village on the Interior Plateau of British Columbia: Geophysical Investigations, Radiocarbon Dating, and Spatial Analysis of the Bridge River Site. *American Antiquity* 73:59-82.

Prentiss, Anna Marie, Thomas Foor, Guy Cross, Lucille Harris, and Michael Wanzenried
2012 The Cultural Evolution of Material Wealth-Based Inequality at Bridge River, British Columbia. *American Antiquity*

Prentiss, Anna Marie, Nathan B. Goodale, Lucille E. Harris, and Nicole Crossland*
2015b The Evolution of the Ground Slate Tool Industry at the Bridge River Site, British Columbia. In *Lithic Technological Systems: Stone, Evolution, and Behavior*, edited by Nathan B. Goodale and William Andrefsky Jr. Cambridge University Press, Cambridge (In Press).

Prentiss, Anna Marie and Ian Kuijt
2012 *People of the Middle Fraser Canyon: An Archaeological History*. University of British Columbia Press, Vancouver.

Prentiss, Anna Marie, Natasha Lyons, Lucille E. Harris, Melisse R.P. Burns, and Terrence M. Godin

2007 The Emergence of Status Inequality in Intermediate Scale Societies: A Demographic and Socio-Economic History of the Keatley Creek Site, British Columbia. *Journal of Anthropological Archaeology* 26:299-327.

Prentiss, Anna Marie, Matthew J. Walsh, Randall R. Skelton, and Matt Mattes*
2015a Mosaic Evolution in Cultural Frameworks: Skateboard Decks and Projectile Points. In *Socio-Cultural Evolutionary Sciences* (tentative title), edited by Larissa Mendoza Straffon et al. Springer, New York (In Press).

Prentiss, William C.
2000 The Formation of Lithic Debitage and Flake Tool Assemblages in a Canadian Plateau Winter Housepit Village: Ethnographic and Archaeological Perspectives. In *The Ancient Past of Keatley Creek, Volume I: Taphonomy*, edited by Brian Hayden. Archaeology Press, Burnaby, B.C.

Prentiss, William C. and Ian Kuijt (editors)
2004 *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*. University of Utah Press, Salt Lake City.

Prentiss, William C., Michael Lenert, Thomas A. Foor, Nathan B. Goodale, and Trinity Schlegel
2003 Calibrated Radiocarbon Dating at Keatley Creek: The Chronology of Occupation at a Complex Hunter-Gatherer Community. *American Antiquity* 68:719-735.

Richerson, Peter J. and Robert Boyd
2005 *Not By Genes Alone: How Culture Transformed Human Evolution*. University of Chicago Press, Chicago.

Rosenberg, Michael
2009 Proximate Causation, Group Selection, and the Evolution of Hierarchical Human Societies: System, Process, and Pattern. In *Macroevolution in Human Prehistory: Evolutionary Theory and Processual Archaeology*, edited by Anna Marie Prentiss, Ian Kuijt, and James C. Chatters, pp. 23-50. Springer, New York.

Sassaman, Kenneth E.
2004 Complex Hunter-Gatherers in Evolution and History: A North American Perspective. *Journal of Archaeological Research* 12: 227-280.

Schmader, Matthew F.
1994 Early Puebloan Site Structure and Technological Organization in the Middle Rio Grande Valley, New Mexico. Unpublished Ph.D. Dissertation, Department of Anthropology, University of New Mexico, Albuquerque.

Smith, Eric A., Kim Hill, Frank W. Marlowe, David Nolin, Polly Wiessner, Michael Gurven, Samuel Bowles, Monique Borgerhoff Mulder, Tom Hertz, and Adrian Bell
2010 Wealth Transmission and Inequality among Hunter-Gatherers. *Current Anthropology* 51:19-34.

Spafford, Jim
2000 Socioeconomic Inferences from Floor Distributions of Lithics at Keatley Creek. In *The Ancient Past of Keatley Creek Volume II: Socioeconomy*, edited by Brian Hayden, pp. 167-178. Archaeology Press, Simon Fraser University, Burnaby, B.C.

Stryd, Arnoud
1973 *Lillooet Archaeological Project: 1974 Field Season*. Cariboo College Papers in Archaeology 1.

1980 A review of recent Activities Undertaken by the Lillooet Archaeological Project. *The Midden* 122:5-20.

Teit, James
1900 *The Thompson Indians of British Columbia*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 1: 63-392.

1906 *The Lillooet Indians*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 2, 193-300.

1909 *The Shuswap Indians*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 4:443-758.

Tunnicliffe, V., J.M. O'Connell, M.R. McQuoid
2001 A Holocene Record of Marine Fish Remains from the Northeastern Pacific. *Marine Geology* 174: 197-210.

Chapter Two

Archaeology of Housepit 54: Bridge River 3 Floors and Roofs Excavated in 2013

(Anna Marie Prentiss and Sarah L. Howerton)

This chapter seeks to accomplish several goals. First, it introduces the archaeology of Housepit 54 in its larger context of the Bridge River site and the Middle Fraser Canyon. Then it provides an overview of the 2013 excavations with a focus on excavation and data collection methods. Finally, the chapter reviews data on stratigraphy, features, dating, and spatial organization as measured by features and mapped fire-cracked rock from the late Bridge River 3 (BR 3) floors and roofs. Conclusions are drawn regarding occupation dating, relative population density, roof architecture, and household activities during these BR 3 occupations. Maps and photographs of floors IIa-IIe along with roofs Va, Vb1, and Vb2 can be found in Appendix A.

Archaeological Investigations at Bridge River

The Bridge River Archaeological project was initiated as collaboration between the Bridge River Band (Xwisten) and The University of Montana in 2003 and has developed in three phases. The Phase I (2003-2005) focus was on village-wide mapping and test excavations. The goal during this period was to conduct a first test of alternative models of Middle Fraser (Mid-Fraser) village establishment and growth. Drawing from data at the Keatley Creek site, Hayden (1997) and Hayden et al. (1996) had argued that the Mid-Fraser villages were established as early as 2600 cal. B.P. and had not undergone significant change since that period. Prentiss et al. (2003; 2007), also drawing from Keatley Creek data, argued that the villages were initiated later, around 1800-1600 cal. B.P. Research at Bridge River tested these hypotheses by mapping and testing most of the houses in the core village. A total of 67 houses were tested and 55 were radiocarbon-dated out of a total of 80 houses (Prentiss et al. 2008). Results indicated that the village developed during four periods: BR 1 (1800-1600 cal. B.P.), BR 2 (1600-1300 cal. B.P.), BR 3 (1300-1100 cal. B.P.), and BR 4 (600-100 cal. B.P.). The final period (BR 4) had evidence for both pre-Colonial and early Colonial period occupations. Housepit 54 to date is the only known has with definitive early Colonial period (Fur Trade) occupation (Prentiss 2013).

Phase 2 of the Bridge River project was focused primarily on examining inter-household variability during BR 2 and 3 with a goal of testing alternative models of emergent wealth-based inequality. Six housepits were examined using a combination of applied geophysics and limited excavations of activity areas. Results suggested that material wealth-based inequality emerged in the context of village growth and competition for access to key subsistence resources, especially salmon and deer (Prentiss et al. 2012). Excavations were conducted at Housepit (HP) 54 during 2008 permitting our team to develop the first occupation sequence for HP 54. Thirteen occupation floors and seven roof deposits spanning the BR 2-4 periods were identified at HP 54 at that time. The final floor and roof were created during the Colonial (Fur Trade) period and are the focus of this study.

The current research represents Phase 3 of the Bridge River project. Phase 3 focuses exclusively on HP 54 with the overarching goal of developing a detailed understanding of the history of this long-lived house. Field research in 2012 focused nearly exclusively on the Fur trade period occupation (Prentiss 2013). In contrast, the 2013 field season examined the upper series of more ancient floors at roofs dating to the BR 3 period. Excavations revealed six floors and two roofs capping what will likely be recognized in the 2014 field season as eight additional floors spanning the BR 2 and early BR 3 periods.

The 2013 Archaeological Investigations at Housepit 54: Excavation Methods

The 2013 excavations at HP 54 emphasized collection of a wide range of data in order to permit analyses of assemblage content and spatial organization. Excavations were organized by a superimposed grid system consisting of six blocks identified as A-D (see maps in Appendix A). Each block contained 16 1x1 m squares. The squares were further sub-divided into four quads each. The blocks were separated by 50 cm wide balks left in place to permit trans-housepit profile mapping and to preserve a sample of archaeological materials for future investigations. Excavations were conducted relying upon a combination of cultural and arbitrary levels. A number of cultural strata were identified (Table 1). Arbitrary levels were excavated when cultural strata were too thick for a single level. Excavators point provenience mapped all cultural items (artifacts and bones) greater in maximum diameter than one cm and other items including charcoal fragments and fire-cracked rock (FCR) greater than 3 cm. Point-provenienced FCR was collected if over 5 cm in maximum diameter. Soil samples were taken systematically. A one litre sample was taken from the SW and NE (1 and 4 respectively) quads on floors for flotation and paleoethnobotanical analysis at Simon Fraser University as directed by Dr. Dana Lepofsky. A .25 litre sample was taken in the SE (2) quad for geochemical analysis at Hamilton College, as directed by Dr. Nathan Goodale. Quad 3 (NW) in each square was reserved for collection of sediment for extraction of genetic materials in the laboratory of Dr. Dongya Yang. The soil samples used for genetic testing were sometimes also collected from other quads if sediments seemed appropriate. Features were either collected in their entirety for flotation or sampled systematically in stratified contexts with one litre samples. All un-collected sediments were screened with 1/8 inch hardware cloth and all cultural materials collected by provenience context for laboratory analysis. Excavators collected a variety of additional data including counts of birch bark rolls and sediment clast sizes. The latter were field-quantified using the Wentworth Scale as a guide using procedures outlined in Fladmark (1978). Data for each block are summarized as mean percentages from contributing squares. Floors were distinguished by the presence of a thin fine clay surface capping a clay and silt with gravels layer. Typically floors were also distinguished by the presence of features and artifacts and faunal remains lying flat on the clay surface. Roofs were recognized by excavators by the consistent presence of oxidized (red) sediments mixed with abundant charcoal and frequent larger sediment clasts. Unlike floors, artifacts are not consistently found on horizontal planes.

Table 2.1. Cultural strata at Housepit 54.

Stratum	Description
I	Surface
V	BR 4 (Fur Trade period) Roof
II	BR 4 (Fur Trade period) Floor
XVI	BR 3 Bench/Rim (as identified in 2012 field season)
III	BR 2 and 3 Rim
XVII	BR 3 Rim-like fill in depression within Block D
Va	Final BR 3 Roof
IIa	Final BR 3 Floor
IIb	BR 3 Floor
IIc	BR 3 Floor
Vb	BR 3 Roof (Vb/Blocks A/C and Vb/Block B represent two distinct roofs)
IId	Probable BR 3 Floor
IIe	Probable BR 3 Floor
IIf	Probable BR 3 Floor

Stratigraphy

BR 3 sediments consisted of multiple floors and roofs and are described by excavation block. Plan maps can be located in Appendix A. Profile maps were not drawn in 2013 and will be initiated during the 2014 field season. Blocks were excavated to a variety of depths. Block exposed the deepest floors, followed by Blocks C and B. No floor materials were excavated in Block D during the 2013 field season. All blocks are expected to contain a much deeper sequence of floors to be further revealed in 2014.

Block A

Block A sediments included six floor (IIa through IIf) and two roof (Va and Vb) deposits (Tables 2.2-2.4). The floor and roof sequence consisted of the Va roof deposit covering three floors (IIa – IIc), followed by the second roof (Vb), and three more floors (IId-IIf). The Vb roof in Block A is a deeper roof deposit than the one identified in Block B but appears to be stratigraphically the same as the Vb of Block C. Several patterns are evident from an examination of the data in Table 2.2. First, on a spatial basis the primary avenue of variation is in the larger clasts – particularly the cobble size. This is likely to do with cultural factors associated with spatial distributions of FCR (Table 2.3) but may also include larger rocks used to stabilize post holes and to demarcate space for activity areas on each floor. Second, from the standpoint of inter-floor/roof variability, we recognize a pattern of increasing clay with greater depth. This pattern is particularly distinction in comparison of the Va roof to all other deposits. Stratum Va has distinctly less clay and relatively high percentages of sand implying some differences in source sediments for this final roof compared to the floors or the Vb roof.

Table 2.2. Block A Sediment Summary (percentages).

Stratum Va	Unit 6	7	8	10	11	12	14	15	16
Cobbles	2	0	1	1	NA	NA	NA	NA	NA
Pebbles	12	11	8	5					
Gravels	16	20	15	8					
Sands	24	19	22	20					
Silts	24	29	28	32					
Clays	22	21	26	34					

Stratum IIa	Unit 6	7	8	10	11	12	14	15	16
Cobbles	1	4	0	0	0	0	0	0	0
Pebbles	11	10	10	2	5	4	4	4	2
Gravels	13	12	15	10	15	15	10	14	9
Sands	12	15	5	17	20	20	19	14	11
Silts	29	25	35	34	30	38	34	30	35
Clays	34	35	35	37	25	23	33	38	43

Stratum IIb	Unit 6	7	8	10	11	12	14	15	16
Cobbles	0	0	0	0	0	0	0	0	0
Pebbles	12	4	5	5	9	5	4	5	7
Gravels	14	20	10	10	11	12	8	10	12
Sands	8	20	30	15	15	23	18	15	20
Silts	30	30	25	35	33	30	33	30	42
Clays	36	25	30	35	36	30	37	40	19

Stratum IIc	Unit 6	7	8	10	11	12	14	15	16
Cobbles	4	2	0	3	1	0	0	1	0
Pebbles	13	9	5	6	10	0	10	6	4
Gravels	15	13	11	7	11	2	11	10	9
Sands	7	7	27	18	15	10	23	18	20
Silts	24	31	30	33	32	13	30	31	32
Clays	37	38	27	33	31	35	26	34	35

Stratum Vb	Unit								
	6	7	8	10	11	12	14	15	16
Cobbles	6	2	NA	0	NA	NA	0	NA	NA
Pebbles	12	8		5			5		
Gravels	7	12		10			10		
Sands	17	18		15			20		
Silts	26	30		30			30		
Clays	32	30		40			35		

Stratum IId	Unit								
	6	7	8	10	11	12	14	15	16
Cobbles	2	0	2	6	1	1	1	1	0
Pebbles	14	5	15	13	4	7	8	4	2
Gravels	11	15	10	10	8	6	13	11	8
Sands	7	10	13	10	15	15	18	15	25
Silts	29	25	25	29	32	35	27	34	30
Clays	37	45	35	32	40	36	33	35	35

Stratum IIe	Unit								
	6	7	8	10	11	12	14	15	16
Cobbles	5	0	1	1	4	1	6	2	0
Pebbles	13	2	3	12	13	13	12	13	10
Gravels	10	5	10	13	13	12	9	14	16
Sands	5	23	19	6	5	6	6	5	6
Silts	27	33	32	33	25	29	30	30	28
Clays	40	37	35	35	35	39	37	36	40

Stratum IIf	Unit								
	6	7	8	10	11	12	14	15	16
Cobbles	5	2	3	9	4	0	0	2	0
Pebbles	11	10	17	10	12	7	9	13	10
Gravels	13	15	17	13	11	10	14	13	16
Sands	7	10	17	5	5	13	6	6	6
Silts	27	33	23	30	29	34	34	27	28
Clays	37	30	21	33	39	36	37	39	40

Table 2.3. Block A fire-cracked rock data (1=SW, 2=SE, 3=NW, 4=NE Quads).

	Stratum							
	Va	IIa	Vb	IIb	IIc	IId	IIe	IIf
Unit								
6								
(1)	18	31	13	15	26	19		3
(2)	1	21	17	20	14	14	7	5
(3)	39	24	15	3	17	12	17	6
(4)	26	6	27	6		9		16
7								
(1)	10	5	10	4	1		6	
(2)	16	10	25	8		13	3	11
(3)	20	8	12	1	14			3
(4)	6	3		1	1			
8								
(1)	9	10	9	6		6		37
(2)	3			5	12	7		1
(3)								
(4)		2		2	6	2		
10								
(1)		6	9	16	5	5	11	8
(2)				1	1			
(3)	78	8		20	2	11	3	10
(4)		21			5	25	3	
11								
(1)								3
(2)		2						
(3)		25		2	8	7	7	15
(4)		16		10	14		5	
12								
(1)								
(2)		4		3	6	4	13	4
(3)		6		21	5	11	3	
(4)		1			2		3	4
14								
(1)	72	13	6	8	18	20		11
(2)	2	7		13	10	17	4	28
(3)	35	2	23	10	8		4	8
(4)	15	12		5	4	5	6	15
15								
(1)				8	15	14	16	12
(2)				1	17	23	3	15
(3)					8	7	1	13

(4)		3			7	4	9	3
16								
(1)				2	14		15	5
(2)		5			3	6	2	2
(3)		3		3	13	10	2	12
(4)		1		21				3

Table 2.4. Block A excavation volumes in cubic meters (1=SW, 2=SE, 3=NW, 4=NE Quads).

				Stratum				
	Va	IIa	Vb	IIb	IIc	IId	IIe	IIf
Unit								
6								
(1)	.05	.04	.01	.02	.01	.01	.004	.0006
(2)	.021	.02	.01	.01	.01	.02	.003	.01
(3)	.021	.02	.01	.01	.01	.001	.02	.01
(4)	.02	.01	.02	.02		.02	.01	.003
7								
(1)	.005	.02	.01	.003	.006	.01	.007	.002
(2)	.02	.0006	.003	.002	.01	.02	.01	.006
(3)	.007	.004		.003	.01	.008	.003	.002
(4)	.004	.05		.0003	.002	.001	.004	.003
8								
(1)	.02	.01	.009	.01	.005	.005	.004	.02
(2)	.003			.006	.003	.004	.004	.005
(3)								
(4)	.002	.01		.008	.003	.008	.002	.009
10								
(1)	.01	.03	.01	.009	.01	.003	.02	.016
(2)	.0006	.003	.002	.0005	.0008			
(3)	.02	.06		.006	.004	.003	.007	.002
(4)	.004	.02		.01	.01	.029	.006	.01
11								
(1)		.0009		.001	.002	.002	.0009	.0009
(2)		.0004					.0006	
(3)		.01		.01	.007	.003	.01	.01
(4)		.007		.01	.003	.003	.02	.004
12								
(1)								
(2)		.005		.002	.001	.006	.02	.0006
(3)		.004		.01	.01	.01	.007	.005
(4)		.007		.005	.007	.002	.01	.005
14								
(1)	.03	.01	.01	.01	.001	.03	.02	.014

(2)	.014	.004		.007		.02	.004	.01	.02
(3)	.024	.007	.011	.03		.01		.0006	.002
(4)	.007	.01		.01		.005	.005	.01	.012
15									
(1)		.003		.01		.02	.004	.01	.006
(2)		.01		.02		.01	.01	.01	.003
(3)		.002				.008	.003	.005	.003
(4)		.002		.006		.007	.01	.004	.005
16									
(1)		.02		.01		.02	.01	.004	.003
(2)		.01		.001		.0006	.004	.005	.001
(3)		.01		.007		.01	.004	.01	.003
(4)		.005		.003		.006	.004	.005	.0006

Block B

Block B sediments included the Va roof followed by a single relatively thick IIa floor, another roof designated Vb1, and two additional stratified floors (Tables 2.5-2.7). Excavation of Unit 13 was discontinued after Stratum Vb1 as it became obvious the root bioturbtation was making it practically impossible to distinguish distinct floors. The Vb1 roof is stratigraphically distinct from the Vb roof identified in Blocks A and C and thus represents an independent roof burning and collapse event. Sedimentary composition of the Block B floors and roofs follows a similar logic to that of Block A. The Va roof deposit has consistently low scores for clay, though sand is comparatively low as well. Similarly, there remains a fairly high degree of variation for larger clast size sediments, especially cobbles. Block B also includes limited data on rim deposits whose sediments reflect a similar pattern to the Va roof, a not unexpected result given the likelihood that rims probably derive at least in part from re-deposited roof sediments. Also similar to Block A, deeper floors have higher clay content.

Table 2.5. Block B sediment summary (percentages).

Stratum Va	Unit 5	6	7	8	9	10	11	12	13	14	15	16
Cob.	NA	3	0	0	NA	1	1	0	NA	NA	NA	NA
Peb.		11	15	10		18	15	17				
Gra.		20	20	20		17	20	13				
San.		12	15	15		7	12	10				
Silt.		34	27	32		30	33	35				
Cla.		22	26	22		30	25	25				

Stratum IIa	Unit 5	6	7	8	9	10	11	12	13	14	15	16
Cob.	0	0	0	NA	3	0	0	2	6	7	3	5
Peb.	10	10	8		13	16	17	20	14	18	17	10
Gra.	20	20	17		17	20	17	15	12	16	13	20
San.	10	12	11		10	10	10	8	5	8	12	10
Silt.	35	34	32		30	25	20	30	33	23	30	30
Cla.	25	22	27		27	31	27	25	30	28	28	25

Stratum Vb1	Unit 5	6	7	8	9	10	11	12	13	14	15	16
Cob.	0	2	0	NA	0	1	0	0	0	2	0	0
Peb.	15	15	7		15	18	15	10	15	14	20	6
Gra.	20	20	15		22	19	15	20	20	22	15	8
San.	10	13	13		9	6	10	10	20	11	10	10
Silt.	35	25	35		28	30	30	35	30	26	29	40
Cla.	25	25	35		26	26	30	25	15	25	26	36

Stratum IIb	Unit 5	6	7	8	9	10	11	12	13	14	15	16
Cob.	0	2	0	NA	2	0	0	0	NA	0	0	0
Peb.	15	13	15		8	10	5	5		10	10	5
Gra.	25	15	20		10	20	5	10		25	10	10
San.	10	10	7		5	10	5	5		10	5	5
Silt.	30	30	23		50	40	40	40		30	30	35
Cla.	20	20	35		25	20	45	40		25	45	45

Stratum IIc			Unit									
	5	6	7	8	9	10	11	12	13	14	15	16
Cob.	2	0	0	NA	2	0	0	0	NA	0	0	0
Peb.	20	10	8		18	10	5	5		10	5	5
Gra.	20	20	10		25	25	5	5		20	5	5
San.	8	5	5		10	10	5	5		20	10	5
Silt.	25	40	45		25	30	40	35		20	40	35
Cla.	25	30	32		25	25	45	50		30	40	50

Stratum Va/III			Unit									
	5	6	7	8	9	10	11	12	13	14	15	16
Cob.	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
Peb.				10								
Gra.				20								
San.				15								
Sil.				35								
Cla.				20								

Table 2.6. Block B fire-cracked rock data (1=SW, 2=SE, 3=NW, 4=NE Quads).

	Stratum						
	Va	IIa	Vb1	IIb	IIc	Va/III	III
Unit							
5							
(1)		18	52		4		
(2)		18	87	17	23		
(3)		15	62	2	16		
(4)		18	3	6	10		
6							
(1)		57	109	15			
(2)	12	38	41	7	43		
(3)	13	50	64	28	38		
(4)	19	56	34	28			
7							
(1)	42	9	11	21	15		
(2)	266	80	14				
(3)	4	6	6	18			
(4)	18	15	12		17		
8							
(1)	84						
(2)	37						
(3)	15					60	59
(4)	14						
9							
(1)		3	39	2	2		
(2)		69	37	15	31		
(3)			7	15	6		
(4)		14	65	22			
10							
(1)		8	35	11	7		
(2)	144		86	5	21		
(3)		167	90	12	10		
(4)	8	139	79	5	2		
11							
(1)		2	9				
(2)	19	31		16	9		
(3)							
(4)	3	71	12	8	7		
12							
(1)	45	192					
(2)	166	87					
(3)		111	12	16	12		
(4)		46		6			

13				
(1)	14	18		
(2)	106	42		
(3)	11	6		
(4)	52	15		
14				
(1)	199	44	17	4
(2)	197	129	8	7
(3)	105	26	22	8
(4)	109	63	11	
15				
(1)	8	28	5	
(2)	42	55	2	6
(3)	42	58	23	11
(4)	50	91		
16				
(1)	25	12	10	2
(2)	54	7	14	6
(3)	22	37	6	6
(4)	7	6	2	

Table 2.7. Block B excavated volume in cubic meters (1=SW, 2=SE, 3=NW, 4=NE Quads).

					Stratum		
	Va	IIa	Vb1	IIb	IIc	Va/III	III
Unit							
5							
(1)		.01	.015	.003	.001		
(2)		.03	.03	.005	.005		
(3)		.01	.02	.001	.002		
(4)		.01	.03	.005	.004		
6							
(1)		.02	.02	.006	.004		
(2)	.01	.015	.026	.005	.01		
(3)	.01	.006	.02	.008	.005		
(4)	.01	.02	.02	.007	.01		
7							
(1)	.01	.005	.01	.004	.009		
(2)	.026	.01	.01		.00009		
(3)	.001	.0002	.0005	.008			
(4)	.01	.003	.003		.0003		
8							
(1)	.03						
(2)	.01						
(3)	.007					.02	.004
(4)	.003						
9							
(1)		.004	.008	.001	.003		
(2)		.008	.013	.004	.02		
(3)			.006	.004	.002		
(4)		.009	.015	.004			
10							
(1)			.01	.007	.01		
(2)	.02	.01	.01	.005	.001		
(3)		.01	.01	.01	.004		
(4)	.002	.015	.01	.002	.001		
11							
(1)	.006	.006	.006				
(2)	.017	.006		.006	.004		
(3)							
(4)	.006	.03	.01	.005	.005		
12							
(1)	.02	.01		.01	.002		
(2)	.009	.01					
(3)		.02	.01	.01	.007		

(4)	.006	.01	.006	.002
13				
(1)	.004	.004		
(2)	.015	.01		
(3)	.004	.004		
(4)	.007	.01		
14				
(1)	.016	.02	.006	.003
(2)	.03	.02	.01	.002
(3)	.014	.01	.01	.001
(4)	.015	.005	.008	.001
15				
(1)	.01	.01	.006	.005
(2)	.006	.004	.004	.004
(3)	.007	.03	.003	.004
(4)	.013	.01	.005	.001
16				
(1)	.02	.02	.007	.03
(2)	.01	.01	.004	.002
(3)	.06	.01	.002	.002
(4)	.005	.005	.002	.001

Block C

Block C strata followed the same sequence as recognized in Block A including relatively thick Va roof (particularly in units 13 and 14), three floors (IIa – IIc), a sparsely distributed Vb2 roof, and an additional IId floor (Tables 2.8-2.10). Unit 8 was not excavated due to apparent root bioturbation. Likewise, unit 4 was discontinued after Stratum IIb and Unit 3 after Stratum IIc, both due to root bioturbation problems. As in Block A the Va roof was rocky and relatively sandy, but lower in clay content compared to deeper strata. Layers of burned Va roof beams offer the opportunity to explore house roof architecture and are further considered below. Rim (III) deposits were partially excavated in Units 13 and 14 with variable silt and clay scaled sediments and relatively abundant larger (cobble and pebble) sized clasts.

Table 2.8. Block C Sediment Summary (percentages).

Stratum Va

	1	2	3	4	5	6	7	9	10	11	12	13
Cob	NA	0	NA	NA	2	1	3	4	1	1	NA	2
Peb		10			10	9	13	9	7	3		10
Grav		16			23	12	17	23	17	16		17
Sand		20			8	23	20	9	10	31		17
Silt		28			21	28	20	31	30	29		28
Clay		26			36	27	27	24	35	20		26

Stratum Va continued

	14	15	16
Cob	2	2	2
Peb	7	5	5
Grav	14	12	10
Sand	22	30	25
Silt	27	31	36
Clay	28	20	22

Stratum IIa

	1	2	3	4	5	6	7	9	10	11	12	13
Cob	1	0	1	1	2	0	3	2	2	1	NA	NA
Peb	7	9	3	3	10	11	13	5	7	6		
Grav	9	13	11	9	23	13	17	16	11	10		
Sand	18	17	30	31	8	16	20	22	18	27		
Silt	26	27	27	26	21	20	20	31	26	23		
Clay	39	34	28	30	36	40	27	24	36	33		

Stratum IIa continued

	14	15	16
Cob	4	1	2
Peb	8	7	9
Grav	12	14	10
Sand	25	21	24
Silt	20	23	22
Clay	31	34	33

Stratum IIb

	1	2	3	4	5	6	7	9	10	11	12	13
Cob	NA	0	0	0	NA	0	1	1	5	3	0	1
Peb		8	5	6		20	7	2	10	9	7	4
Grav		15	5	5		18	8	16	10	13	15	19
Sand		19	10	15		12	12	30	15	26	25	13
Silt		28	34	30		20	33	25	20	24	25	24
Clay		30	46	44		30	39	26	40	25	28	39

Stratum IIa continued

	14	15	16
Cob	5	2	0
Peb	8	8	3
Grav	13	13	11
Sand	22	29	24
Silt	25	23	31
Clay	27	25	31

Stratum IIc

	1	2	3[a]	4	5	6	7	9	10	11	12	13
Cob	NA	2	0	NA	NA	1	3	5	0	1	0	0
Peb		6	6			9	11	10	7	8	1	3
Grav		11	7			12	17	20	9	11	10	20
Sand		16	30			22	23	30	23	15	17	17
Silt		19	40			24	25	20	27	36	27	30
Clay		47	17			32	21	15	34	29	45	30

[a]Small isolated (one quad) sample may not accurately reflect actual pattern.

Stratum IIc continued

	14	15	16
Cob	1	0	1
Peb	2	3	3
Grav	11	6	12
Sand	27	16	24
Silt	16	37	29
Clay	43	38	31

Stratum Vb2

	1	2	3	4	5	6	7	9	10	11	12	13
Cob	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA
Peb									7			
Grav									9			
Sand									20			
Silt									30			
Clay									33			

Stratum Vb2 continued

	14	15	16
Cob	3	0	NA
Peb	8	8	
Grav	7	15	
Sand	19	17	
Silt	35	40	
Clay	28	20	

Stratum IId

	1	2	3	4	5	6	7	9	10	11	12[a]	13
Cob	NA	0	NA	NA	NA	2	1	3	1	0	10	8
Peb		4				8	10	10	10	8	10	15
Grav		9				13	9	15	9	17	30	12
Sand		15				24	16	15	22	20	10	15
Silt		46				17	29	32	31	31	20	23
Clay		36				36	35	35	27	24	20	27

[a]Bioturbated and not likely an accurate reflection of IId sediment composition.

Stratum IId continued

	14	15	16
Cob	2	1	0
Peb	9	6	6
Grav	6	9	15
Sand	14	10	25
Silt	26	37	24
Clay	43	37	30

Stratum III

	1	2	3	4	5	6	7	9	10	11	12	13
Cob	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3
Peb	4											7
Grav	7											15
Sand	18											27
Silt	30											30
Clay	40											18

Stratum III continued

	14	15	16
Cob	9	NA	NA
Peb	6		
Grav	13		
Sand	39		
Silt	28		
Clay	5		

Table 2.9. Block C fire-cracked rock data (1=SW, 2=SE, 3=NW, 4=NE Quads).

				Stratum			
	Va	IIa	IIb	IIc	Vb2	IId	III
Unit							
1							
(1)							
(2)		7					21
(3)							
(4)		18					
2							
(1)		6	13	3		11	
(2)				2		18	
(3)		20	76	25		17	
(4)	13	25		39		29	
3							
(1)			5				
(2)							
(3)		8	30	7			
(4)		10	27				
4							
(1)		10					
(2)		16					
(3)		14	11				
(4)							
5							
(1)							
(2)							
(3)							
(4)							
6							
(1)	30	12	12	0		8	
(2)	13	15	29	19		17	
(3)							
(4)				22		3	
7							
(1)	30	5	47	16		10	
(2)	25	19	34	22		52	
(3)	45	24	29	50		70	
(4)	30	13	4	34		44	
9							
(1)							
(2)	17	17		17			
(3)							
(4)	60	26	7	25		14	

10							
(1)		26				12	
(2)	4	6	3[a]	1		7	
(3)	34	25	6	15	3	12	
(4)	28	3	50	11	19	10	
11							
(1)	19	7	32	18	14		
(2)	18	12	15	26	33		
(3)	10	11	9	9	11		
(4)		16	11	9	3		
12							
(1)							
(2)			8				
(3)			5	16			
(4)							
13							
(1)							
(2)	53	44	6	0		18	33
(4)	41						142
14							
(1)	82	22	9	0		2	
(2)	77	13	48	4	32	19	
(3)	61		16	0		4	90
(4)	45	17	45	2		23	
15							
(1)		26	22	0		3	
(2)		10	32	6		12	
(3)	12	26	10	0		12	
(4)		13		3		10	
16							
(1)	20		17	1		5	
(2)	6	29	1	0		7	
(3)	18	4	4	6		10	
(4)	30	13	HF	4		1	

[a]Point plot FCR count only
HF=see heavy fraction bag

Table 2.10. Block C excavated volume data (1=SW, 2=SE, 3=NW, 4=NE Quads).

				Stratum			
	Va	IIa	IIb	IIc	Vb2	IId	III
Unit							
1							
(1)							
(2)		.006					
(3)							
(4)		.01					
2							
(1)		.001	.01	.01		.005	
(2)				.005		.008	
(3)		.001	.02	.01		.01	
(4)	.01	.001		.01		.007	
3							
(1)			.001	.02			
(2)			.002				
(3)		.01	.004	.01			
(4)		.01	.01				
4							
(1)		.005	.005				
(2)		.004	.004				
(3)		.007	.01				
(4)			.005				
5							
(1)							
(2)							
(3)							
(4)							
6							
(1)	.01	.01	.005	.018		.01	
(2)	.004	.001	.004	.004		.003	
(3)							
(4)			.002	.01		.005	
7							
(1)	.02	.02	.003	.01		.01	
(2)	.02	.02	.002	.01		.01	
(3)	.01	.02	.004	.02		.01	
(4)	.005	.02	.004	.02		.01	
9							
(1)							
(2)	.034	.01	.002	.005			

(3)							
(4)	.04	.01	.004	.01		.006	
10							
(1)	.01	.008	.005	.01	.008	.003	
(2)	.008	.01	.005	.002		.007	
(3)	.04	.01	.004	.002	.008	.008	
(4)	.02	.008	.008	.008	.014	.004	
11							
(1)	.015	.01	.01	.004		.01	
(2)	.01	.006	.01	.003		.02	
(3)	.01	.01	.01	.006		.01	
(4)		.01	.01	.003		.01	
12							
(1)							
(2)							
(3)			.003	.005		.01	
(4)			.001	.003		.007	
13							
(1)							
(2)	.07	.01	.013	.02		.01	
(4)	.02						.033
14							
(1)	.066	.007	.01	.02		.01	
(2)	.043	.01	.02	.005	.007	.02	
(3)	.05		.016	.003		.003	.06
(4)	.08	.02	.023	.004		.013	
15							
(1)		.004	.02	.01	.003	.008	
(2)		.004	.01	.006		.003	
(3)	.02	.018	.01	.003		.01	
(4)	.006	.018	.01	.005		.01	
16							
(1)	.01	.004	.008	.01		.01	
(2)	.007	.01	.002	.004		.002	
(3)	.04	.007	.004	.006		.007	
(4)	.013	.01	.013	.007		.006	

Block D

Excavations in Block D during 2013 were relatively limited and resulted in partial exposure of the Va roof, a rim-like fill zone, and some rim in a single unit. The Va roof occupies the surface (below the Fur Trade floor [II]) on the east side of Block D (Units 7, 8, 11, 12, 15, 16). Stratum XVII, a sediment similar to rim, lies over a diving Stratum Va on the west side (Units, 7, 10, 11, 13, 14). This appears to reflect a depression in the deeper floors that will not be fully understood without further excavation in 2014. One possibility is that it represents a depressed central portion of the IIa and older floors, perhaps attached to an entrance on the north side of the house. If this is the case, the sunken area could reflect a "cold sink" similar to many house constructed in the western arctic (e.g. Spencer 1984). It is also possible that played some other role as perhaps similar to sunken activity areas in the centers of some Northwest Coast houses (e.g. Coupland 2006). Stratum XVII and Va sediments are relatively similar reflecting a common pattern at HP 54 of lower clay percentages for shallower roof sediments.

Table 2.11. Block D Sediment Summary (percentages).

Stratum Va	Unit								
	7	8	10	11	12	13	14	15	16
Cobbles	1	8	NA	1	6	NA	NA	2	5
Pebbles	7	14		6	10			8	11
Gravels	12	11		12	10			13	17
Sand	20	8		19	13			17	16
Silt	30	25		36	35			30	31
Clay	30	34		26	26			30	20

Stratum XVII	Unit								
	7	8	10	11	12	13	14	15	16
Cobbles	1	NA	2	0	NA	1	2	NA	NA
Pebbles	6		8	5		7	7		
Gravels	7		12	15		14	16		
Sand	13		13	20		12	17		
Silt	44		48	35		29	33		
Clay	29		17	20		37	25		

Stratum XVI	Unit								
	7	8	10	11	12	13	14	15	16
Cobbles	NA	NA	NA	NA	3				
Pebbles					13				
Gravels					20				
Sand					5				
Silt					25				
Clay					34				

Table 2.12. Block D fire-cracked rock data (1=SW, 2=SE, 3=NW, 4=NE Quads).

		Stratum	
Unit	Va	XVII	XVI
7			
(1)			
(2)			
(3)		35	
(4)	88		
8			
(1)	25		
(2)	26		
(3)	48		
(4)	29		
10			
(1)			
(2)		112	
(3)			
(4)		20	
11			
(1)	104	78	
(2)	6		
(3)	25		
(4)	8		
12			
(1)	11		
(2)	16		
(3)	13		36
(4)	18		12
13			
(1)		104	
(2)		21	
(3)		16	
(4)		42	
14			
(1)		39	
(2)		21	
(3)		121	
(4)		87	
15			
(1)	60		
(2)			
(3)	52		
(4)	97		
16			
(1)	113		

(2)	40
(3)	111
(4)	22

Table 2.13. Block D excavated volume data (1=SW, 2=SE, 3=NW, 4=NE Quads).

		Stratum	
	Va	XVII	XVI
Unit			
7			
(1)			
(2)			
(3)		.06	
(4)	.02		
8			
(1)	.01		
(2)	.01		
(3)	.01		
(4)	.008		
10			
(1)			
(2)		.03	
(3)			
(4)		.03	
11			
(1)	.008	.018	
(2)	.017		
(3)	.016		
(4)	.01		
12			
(1)	.008		
(2)	.008		
(3)	.001		.008
(4)	.005		.006
13			
(1)	.005	.017	
(2)	.01		
(3)		.02	
(4)	.016	.03	
14			
(1)		.02	
(2)		.018	
(3)		.034	
(4)		.036	
15			

(1)	.03
(2)	
(3)	.037
(4)	.029
16	
(1)	.025
(2)	.032
(3)	.036
(4)	.028

Fire-Cracked Rock Distributions

One of the primary goals of the project is to examine relationships between demographic change and social and economic organization in the HP 54 household. This of course requires that we be able to measure variation in the density of persons occupying the house on each floor. There are many ways to measure aspects of demography, many of which rely upon burial populations (Chamberlain 2006). Our study seeks to understand variability in population density drawing upon household artifact and feature data. Hayden (1997) develops predictions regarding population size at the Keatley Creek site using estimates of square meters per person. Prentiss et al. (2014) rely upon the same approach to examine variability in village populations throughout the Mid-Fraser area. However, this approach is less useful when floor space is held constant as in a single house with multiple floors like HP 54. Therefore we are required to adopt alternative approaches. Prentiss et al. (2012, 2014) made use of FCR density as a proxy measure of variation in the density of persons occupying various housepits at Bridge River. The major assumption in these studies was that numbers of people are reflected in frequency and intensity of food preparation. Since food was often prepared within households using stone boiling (Alexander 2000), FCR would be a byproduct that could be used as a proxy measure of population density. It does not, however, provide a direct count of persons per floor. Predictions generated from assessment of FCR density data can be further tested with examination of density of other artifact classes, faunal remains, cooking features and more broadly domestic activity areas on each floor.

In order to calculate FCR density I first summed FCR counts of all strata and all excavated sediment volumes (Table 2.14). I had some concern that exceptionally high FCR counts in Units 13 and 14 of Block B on Stratum VA and IIa could be the result of bioturbation drawing FCR from Fur Trade contexts on to these surfaces. For purposes of the analysis discussed below I transformed the Stratum IIa data into two variants by first cutting 100% of the FCR counts from these units and alternatively, cutting 50% of the FCR from units 13 and 14 in Block B (Table 2.14). Volume scores were also modified accordingly. Then, FCR summary counts were divided by volume per each stratum to acquire density scores (Table 2.14). These were then plotted in each of the three forms (baseline; 50% and 100% reduction of Units 13 and 14 Block B; Figures 2.1-2.3). Floors IIe and IIf were excluded as they are represented only from Block A raising the possibility of insufficient sampling. Results illustrate a pattern of rising density through time. If this holds up under further testing using more complete FCR samples (after the 2014 field season) and assessment of other independent data sets, it implies a pattern of rising population density within HP 54 through the final recognizable BR 3 floor (Stratum IIa).

Table 2.14. Summary FCR and Volume data

FCR

Block	VA	IIa	Vb1	IIb	IIc	Vb2	IId	IIe	IIf
A	350	255	NA	215	256	166	228	143	253
B	909	2363	1603	395	317				
C	821	588	NA	673	390	115	460		
D	912								
Total	2992	3206	1603	1283	963	281	688	143	253
Total[a]	2992	2093	1603	1283	963	281	688	143	253
Total[b]	2992	2650	1603	1283	963	281	688	143	253

[a]Total without 100% FCR from Block B Units 13 and 14 (all quads) and 9 and 10 (northern quads) in IIa

[b]Total without 50% of FCR from Block B Units 13 and 14 (all quads) and 9 and 10 (northern quads) in IIa

Volume Excavated

A	.2826	.4249		.2698	.2414	.105	.256	.2661	.2047
B	.207	.5192	.5045	.193	.171				
C	.688	.36		.318	.359	.04	.295		
D	.372								
Total	1.549	1.304	.5045	.781	.771	.145	.551	.2661	.2047

FCR/Volume excavated

Total	1931.6	2458.6	3177.4	1642.8	1249.0	1937.9	1248.6	537.4	1235.9
Total[c]	1931.6	1605.1	3177.4	1642.8	1249.0	1937.9	1248.6	537.4	1235.9
Total[d]	1931.6	2032.2	3177.4	1642.8	1249.0	1937.9	1248.6	537.4	1235.9

[c]IIa ratio calculated with 100% reduced FCR counts (see above)

[d]IIa ratio calculated with 50% reduced FCR count (see above)

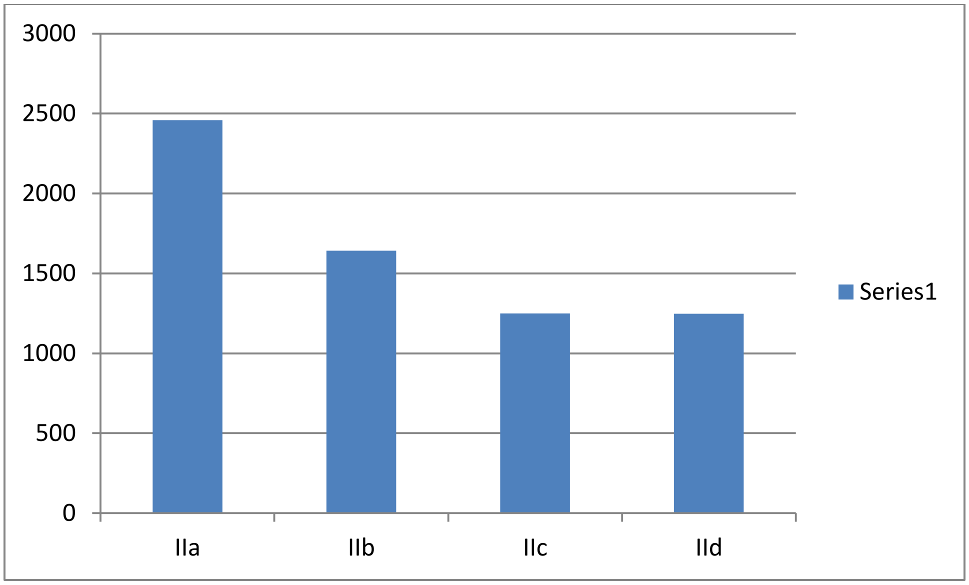


Figure 2.1 FCR density calculated with baseline data.

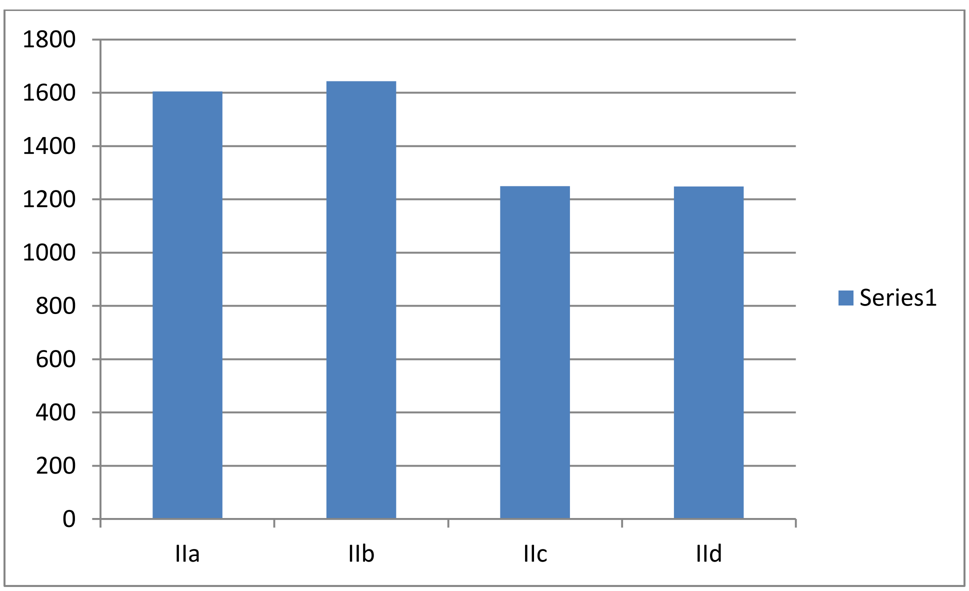


Figure 2.2 FCR density calculated with Block B IIa FCR data (Table 2.14) reduced by 100%.

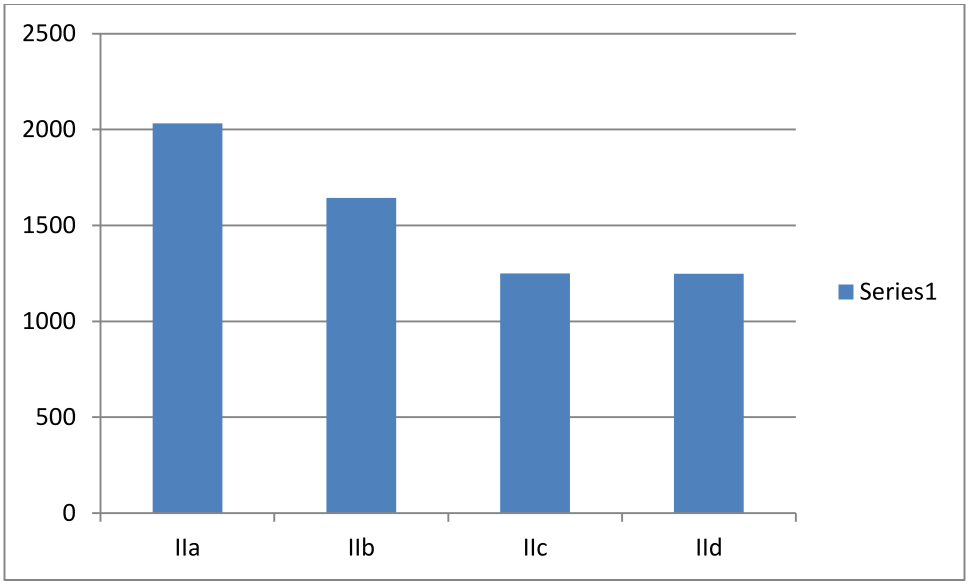


Figure 2.3. FCR density calculated with IIa Block B FCR count (Table 2.14) adjusted down by 50%.

Features

A total of 39 features were excavated during the 2013 field season (Table 2.15; Appendix A). Block A generated 18 features with contributions from all floors except IIc. Stratum IIa contained three features including two shallow bowl/basin-shaped hearths and one shallow bowl-shaped depression containing accumulated charcoal and FCR. Five features were excavated in IIb and included two post-holes (one of which was very narrow and included the base of a burned post), a shallow bowl containing charcoal stained sediment but no obvious oxidation, a shallow basin-shaped hearth, and a deep bell-shaped pit that likely served as a cache pit. The final use of this pit may have been storage or disposal of cooking rocks given the relatively high FCR count excavated. Floor IIc had no features, but IId produced three: two post-holes and a surface hearth. The surface hearth as a portion of the floor upon which a fire was lit and operated for some time leaving a typically thin layer of oxidized sediment and charcoal but no obvious pit. Floor IIe contained a collared (or rock lined) post hole, a post hole, a shallow bowl filled with rocky sediment and some loose charcoal along with a shallow basin-shaped hearth. Floor IIf had three features consisting of a small post-hole (sometimes called a "cup-hole" due to narrow width [<10 cm] and shallow depth [<5 cm]), a shallow hearth, and a deep bell-shaped pit. The latter is perhaps even a better candidate for a feature used, at least at the end of its use-life for storing FCR as indicated by the very high percentages of cobbles and the high FCR count. All told, each floor (with exception of IIC) contained at least one hearth feature and two produced cache pits.

Seven features were recovered from three floors in Block B. Floor IIa produced three surface hearths and one basin-shaped hearth. The basin-shaped hearth appears to have been carefully prepared and extensively used given its width, depth, and extensive quantity of charcoal, FCR, and associated artifacts and animal bones. Floor IIb contained a shallow hearth and a post-hole. Floor IIc contained a single surface hearth. Thus, all excavated floors in Block

B contained hearth features, sometimes in abundance (IIa). However, no deep pits were identified.

Fourteen features were excavated in Block C. Floor IIa contained two postholes, a surface hearth, and a rectangular pit filled with dense light colored sediment made up primarily of clay. This feature persists through IId and into deeper floors (and thus excavation is incomplete). Floor IIb had a shallow bowl-shaped pit, small post hole ("cup-hole"), two post-holes, and a shallow hearth. Floor IIc had a small post-hole and a surface hearth. The hearths on IIa, IIb, and IIC are superimposed in the vicinity of units 11, 12, 15, and 16 and suggest maintenance of activity space over extended periods of time. Floor IId contained a post hole and a distinctive collared post-hole. The latter is a post-hole capped and partially filled by cobbles originally used to stabilize the house post.

Table 2.15. Features excavated in 2013 at Housepit 54. (NA=Not applicable/data not collected [typically due to complete collection of sediments for flotation], ENC=Excavation Not Completed, SB=Shallow Bowl, BH=Basin shaped Hearth, DBS=Deep Bell-Shaped Pit, SPH=Shallow Post Hole, SHH=Shallow Hearth, SH=Surface Hearth [no depth], PH=Post hole, P=Post, SPH=Small Post Hole, CFP=Clay Filled Pit, CPH=Collared Post Hole)

Feature #	Type	Cob.	Peb.	Grav.	Sediments Sand	Silt	Clay	Estimated Vol. (cm^3)	FCR Count	Stratum
A1	SB/BH	NA						1272	NA	IIa
A2	SB	0	8	12	5	20	55	6162	2	IIa
A3	SB/BH	NA						4929	NA	IIa
A4	PH	NA						5307	NA	IIb
A5	DBS	12	8	10	15	30	25	130,011	74	IIb
A6	SB	NA						5546	NA	IIb
A7	P/PH	0	2	8	25	35	30	31	2	IIb
A8	SH	NA						3925	NA	IIb
A9	PH	2	15	13	10	25	35	1570	11	IId
A10	PH[a]	1	5	10	20	30	35	6029	7	IId
A11	SH	NA						1509	0	IId
A12	SB	3	12	13	7	30	35	3266	11	IIe
A13	BH	NA						1941	NA	IIe
A14	PH	NA						1017	0	IIe
A15	CPH	30	5	20	5	20	20	5307	7	IIe
A16	SPH	35	25	15	5	10	10	1356	NA	IIf
A17	DBS	16	21	10	9	21	22	ENC	266	IIf
A18	SHH	5	10	20	10	25	30	12,550	29	IIf
B1	SH	NA						2722	NA	IIa
B2	SH	NA						265	7	IIa
B3	SH	NA						308	0	IIa
B4	BH	1	12	11	10	38	28	60,181	105	IIa
B5	SHH	0	10	15	10	30	35	5652	2	IIb
B6	PH	0	5	5	5	40	45	804	0	IIb
B7	SH	0	15	20	10	25	30	3617	0	IIc
C1	PH	NA						6594	NA	IIa

C2	PH	NA						5426[c]	NA	IIa
C3	SH	NA						1378	NA	IIa
C4	SPH[b]	0	3	9	33	32	23	502	7	IIb
C5	SHH	NA						10,563	0	IIb
C6	PH	NA						9287	0	IIb
C7	PH	0	5	4	15	46	30	9118	7	IIb
C8	SH	NA						1539	0	IIc
C9	SPH	0	0	20	10	30	40	201	0	IIc
C10	CFP	0	4	15	16	27	38	ENC	0	IIa
C11	SPH[d]	2	6	6	40	30	16	1246	0	IIc
C12	SB	NA						763	0	IIb
C13	CPH	4	9	7	20	35	25	20,096	9	IId
C14	PH	NA						692	0	IId

[a]Pair of conjoined post holes. Volume of each is 3014.5.
[b]pair of conjoined very small post holes ("cup holes"). Volume of each is 251.
[c]calculated from estimated depth
[d]cluster of very small post holes ("cup holes")

Dating

I report on five new radiocarbon dates from the Bridge River site, specific to HP 54 (Table 2.16). Dates were derived from roof beams in Blocks A and B in an attempt to resolve the stratigraphy problem associated with the Vb1 roof in Block B. As noted above, this roof deposit seems to be uniquely present in Block B. This implies that it could reflect a roof-burning event between the IIa and IIb floors that is not visible in Blocks A and C. If that is the case then the Vb1 roof in Block B should post-date Va in both Blocks A and B. However, it should predate the IIc and IId floors (and all thereafter). Results in Table 2.16 clearly indicate that roof beams from Va whether in Block A or B date to effectively the same time (whether at 1 or 2 sigmas). The Vb1 date from Block B is clearly older that either of those from Va. These results suggest that the initial hypothesis is likely correct, that the Vb1 roof is a unique event pre-dating the Va roof collapse. This does not fully resolve the issue of its position between IIa and IIb in Block B whereas the next deeper roof in Blocks A and C falls between IIc and IId. Radiocarbon dates from earlier field seasons (Table 2.17) are not of great help for two reasons. Dates derived from the 2004 field season are difficult to position in the heavily revised stratigraphic sequence. We thought in 2008 that the 1219 BP and 1312 BP dates were on stratum Vb. More complete excavation of Block A now forces us to recognize that these dates more likely derive from upper BR 3 roof or floor deposits (likely Va or IIa). If that is the case then it does suggest that the new Vb1 roof date from Block B does help to support an argument that this is a unique and somewhat isolated roof deposit. Older dates from 2004 and 2008 reflect strata that are deeper than the maximum extent of excavations from 2013. Further work in 2014 will provide new access to these layers.

A date of 1047+/-31 was obtained for Feature D2 from 2012 (Table 2.16). This date did not come available until after the 2012 field season report (Prentiss 2013) had been submitted. This feature is a hearth located on rim/bench (Stratum III; also called XVI in the 2012 field season report) sediments in the northeast corner of Block D. At the time of writing the 2012 field season report we had assumed that this was a Fur Trade period feature since it was buried by the Fur Trade roof deposit. However, this date clearly demonstrates that the entire stratigraphic sequence of the rim is BR 3 (and likely BR 2 in deeper levels). It means that the Fur Trade roof did not provide a broad earthen bench for those occupants. Rather that roof sat directly on those older deposits directly at the edge of the Fur Trade occupation floor (Stratum II). The conclusion that the entire rim dates to BR 3 and likely 2 times is bolstered by an additional radiocarbon date run on a large house post collected from the west end of the Area 1 (now Block C) trench. This is a Douglas fir post, approximately one meter in length that was nearly entirely embedded in rim (Stratum III), its burned top projecting into Fur Trade period sediments. An outer piece of the post was dated to 1173+/-25 providing a statistically similar date to that of Feature D2 (2012). These dates do not overlap with the latest Va dates, even at 2 sigma distributions. This implies that the BR 3 occupations continued for possibly over 100 years after the Va roof burn and collapse event. The floors associated those final occupations were evidently removed by BR 4 (e.g. Fur Trade) period occupants in order to facilitate creation of their floor. The filling of the sunken depression in Block D (see above) clearly followed the Va roof collapse but perhaps preceded the final BR 3 floors subsequently excavated by early BR 4 occupants. The latter occupants obviously did not excavate into the fill zone (Stratum XVII) capping Va in western Block D.

Table 2.16. AMS radiocarbon dates (Calib 6.0). All in years before present (BP). AMS dating conducted by DirectAMS. (WC=wood charcoal, W=wood not burned)

Block	Stratum/Feat.	Sample Mat.	Sample ID	Radiocarbon Date	Calibrated Range 1 sigma	Calibrated Range 2 sigma
A	Va	WC	003431	1252+/-21	1256-1174	1272-1092
B	Va	WC	003429	1299+/-21	1281-1185	1287-1179
B	Vb1	WC	003430	1390+/-23	1311-1289	1338-1284
D	XVI/D2[a]	WC	002804	1047+/-31	971-929	1052-922
C	XVI/III[b]	W	2011-1[c]	1173+/-25	1173-1060	1178-1002

[a]Date from feature excavated in 2012 field season.
[b]Host post excavated in rim materials during 2008 field season. Excavation area now identified as Block C was then termed Area 1.
[c]AMS dating conducted by DirectAMS as experimentation with new laboratory equipment. Date courtesy James Chatters, Ugo Zoppi and DirectAMS.

Table 2.17. Prior radiocarbon dates from 2004 and 2008 testing phases at HP54 (see Prentiss et al. 2008, 2009). (NE=Not excavated in 2013)

Field Season	2008 Area/ 2013 Block	2008[a] Stratum	2013 Stratum	Radiocarbon Date	Calibrated Range 2 sigma
2004	3/A	Vb	Va-IIa	1219+/-35	1261-1061
2004	3/A	Vb	Va-IIa	1312+/-35	1295-1178
2008	1/C	IIf	NE	1222+/-37	1287-980
2004	3/A	Vc	NE	1258+/-35	1280-1083
2004	3/A	Vd	NE	1438+/-37	1389-1293
2008	1/C	IIk	NE	1380+/-37	1479-1089

[a]See Prentiss et al. (2005, 2009) for report of original stratigraphic interpretations of 2004 field season.

Roof Beams and Household Architecture

Alexander (2000) provides a detailed ethnographic overview of architectural characteristics of Northern Plateau housepits drawing from a wide range of essential sources including Boas (1891), Bouchard and Kennedy (1977), Dawson (1892), Duff (1952), Hill-Tout (1899, 1905), Kennedy and Bouchard 1978, 1998), Laforet and York (1981), Ray (1939), and Teit (1900, 1906, 1909, 1912). In brief, housepits were established by excavation of a foundation pit in the range of 1.2 to 1.8 m in depth (Alexander 2000). Deeper pits were possible where water table was not a significant concern, as on the Bridge River terraces. According to Teit (1900; see also Alexander 2000),wood for posts and beams was cut generally from Ponderosa (or Yellow) pine, stripped of bark, and sometimes shaped further (blocked, hollowed, etc.) depending upon needs. Ethnographies describe the use of posts to hold up a large roof superstructure. Smaller houses (e.g. less than 10 m diameter) could be constructed in what we might call "matlodge" style in a more conical shape (MacDonald 2000). Typically for larger houses, four central posts were sunken in the floor at about 2/3 the radius from the wall (Alexander 2000). These posts formed the basis for a square roof opening used for a household entrance and for ventilation. They had to be extremely sturdy to support the roof beams. Additional smaller posts could be established closer to housepit walls if needed to support the roof beams. Some of these could have been placed directly alongside the inner wall/bench of the house. Four large beams were attached to the posts that could support horizontal layers of additional beams. The wooden framework was then covered by bark, needles, matting, split wood (cedar, fir or tamarack, likely depending upon context), or other materials to prevent earthen insulation from falling through on to the floor (Alexander 2000). This is no agreement as to the preferred roof slope and ethnographies suggest that it could have ranged from 17 to well over 20 degrees (Alexander 2000). Entrance through the roof was facilitated by a ladder made from a single hollowed out log, notched with steps.

It is rare that architectural elements survive the re-roofing process given wood removal and burning processes. However, the Va roof deposits, particularly from Block C can provide some insight into construction of household superstructures (Appendix A). First, as outlined in Appendix E, all collected and tested roof beams were Douglas fir. We have no evidence for use of Ponderosa pine. This does not mean that the larger support posts could not have been made from the latter material as none of the tested items could be confidently determined to be posts given horizontal context within roof sediments covering house floors. Next, drawing from York and Laforet (1981; Teit (1900), and Bouchard and Kennedy (1987), Alexander (2000) describes the process of creating the superstructure in which (presumably narrower) horizontal poles are tied to wider roof beams. Layers of burned beams in the Va deposits of Block C may illustrate this layering process with burned timbers lying at right angles to one another. Although not depicted in our maps, there were also dense clusters of pine needles and possible fragments of woven pine needle mats directly associated with the concentrations of burned timbers in Block C. This could reflect the layers of vegetation or matting described in the ethnographies as material to prevent insulation sediments from falling through the roof. One complicating aspect of the Block C stratum Va deposit is the presence of two distinct layers of burned timbers separated by 10-15 cm of sediments. This raises two possibilities. One is that the roofs were constructed with multiple layers of wood and clay-rich sediment. This however, does not seem likely from a practical standpoint and certainly does not match ethnographic predictions. Therefore, a second scenario could be that the lower layer reflects an earlier burn event that was not cleared away at the roof margin, but rather built over during construction of the final version of the Va roof. Its presence covering the IIa floor on the northwest edge of the house could reflect a massive slump event associated with burning and collapse of that final roof.

Spatial Distributions of Features on Floors

Spatial analysis of floor materials is considered in greater depth in Chapter Five. Thus, I limit my discussion to reflections on the distribution of features. Middle Fraser Canyon housepits tend to be organized around two generally distinct patterns. The more common pattern associated with larger houses as recognized elsewhere from older contexts at Bridge River (BR 2 and 3) and Keatley Creek (Hayden 1997) is one of domestic activity areas distributed around the margins of the floor. This pattern is also more typical of the Lower Lillooet and adjacent Coast Salish groups (Teit 1906). Within this scenario, we recognize redundant features and associated tools that include hearths, cache pits, faunal and floral remains, and a variety of tools reflecting primarily food preparation related activities in the hearth zones and other work (e.g. tool production) closer to the walls and benches. Ethnographies (Teit 1900) describe a different pattern of organization associated with interior Plateau households whereby kitchen areas are generally on the water or river side of the floor and other rooms designated as “head room” and “lower room” were found, respectively, on the mountain and lower ladder portions of the house. Within this scenario space is portioned more by activity areas than family residences and sleeping areas divided into family areas (Alexander 2000; Nastich 1954). Similar to the first scenario, the central area of the house would be public space. The latter pattern was evident on the Fur Trade floor (Stratum II) where a large single hearth was placed in the center of the house. Midden deposit formed on its southwest side and extensive kitchen and tool production debris accumulated to its south and southeast (Prentiss 2013). The northern portions of the house tended to feature more open space and could have been associated with space for a roof entrance, communal space, and wooden benches for family sleeping, tool making and other activities.

The IIa floor is characterized by seven hearth features, all surface or shallow in nature, and spaced around the periphery of the housepit (Appendix A). Although formal analysis of point plotted items is not attempted here, an examination of the maps suggests clusters of artifacts and faunal remains occur in association with these features, thus implying activity areas. Beyond the anomalous rectangular clay-filled pit in Block C, no obvious cache pits are found so far on IIa, though there is one shallow depression in Block A. Post holes (two) are only found in Block C suggesting that similar to the Fur Trade occupation, some house posts may have rested on the floor surface. The distribution of cooking features and associated artifacts suggests that the IIa floor was organized in multiple distinct domestic unit/family activity spaces similar to that recognized by Hayden (1997) in the larger houses of Keatley Creek at similar dates. Lack of storage pits suggests that, as also in Fur Trade times, occupants stored food and other items in other contexts than pits. Some options could include baskets, bags, boxes, stored on racks in the house along with outdoor storage structures and features.

The IIb floor contains fewer hearth features than IIa (three). However, there was a single shallow hearth in each of Blocks A-C. There was also a shallow bowl-shaped depression containing ash in Block A. Block A also included one deep bell-shaped pit that was likely a storage feature. Clusters of point-provenienced artifacts are recognizable around the hearth and cache pit features, though they seem to be somewhat more diffuse compared to distributions in IIa. Relatively small/narrower post holes are found in the margins of Blocks A-C. These are likely secondary roof support posts and posts associated with benches and racks. Clusters of artifacts and faunal remains along the northwest edge of Block C could reflect storage of these items under a bench in this area (though this will require further testing). Lack of large central post holes could reflect sampling bias (e.g. not identified under balk sediments or within Block D – not excavated in 2013) or once again, placement of major support posts on the floor surface.

Floor IIc was relatively sparse in features, producing a hearth in each of Blocks B and C. I note however, that hearth features (1/2008 and 6A/2008; Prentiss et al. 2009) identified in the 2008 trench in what is now Block A could be associated with the IIc floor. This would make considerable sense given the dense associated cultural materials point provenienced on either side of the 2008 trench from IIc. Floor IIc lacks cache pits and only includes two shallow post holes from Block C. Clearly neither of those features reflects a major roof support post. One of those (Feature C9) is most likely associated with a bench feature on the northwest margin of the floor. Despite the lack of storage features, the arrangement of hearths and associated artifactual debris is similar to floors IIa and IIb and thus most likely again reflects the multiple domestic/family units model.

Floor IId was only excavated in Blocks A and C. Features included one hearth in Block A and one post-hole each in each Block. In addition each block contained very small "cup hole" post holes near their respective walls, which I believe could reflect supports for narrow bench or rack posts. The collared post hole in Block C and the relatively large posthole in Block A likely do reflect roof-support posts. Interestingly, we still lack larger post holes closer to the center of the floor where the four major roof support posts should be located (compare to post hole distributions on floors at Keatley Creek in Hayden [1997]). Floor IIe was exclusively excavated in Block A and contained four features. These consist of a small shallow bowl-shaped pit, which could be a remnant of a post hole, another shallow post hole, a shallow collared post hole, and a very small and shallow hearth feature near the southern wall. No cache pits were located. Floor IIf, also in Block A, contained three features. These included a large shallow hearth associated with a dense cluster of artifacts and faunal remains in the north central area. In addition there was a small post hole and a very large bell-shaped cache pit, located in the southwest corner of the block. Further excavation of these deeper floors in Blocks B, C, and D (planned for 2014) will be necessary to fully understand the spatial arrangement of features. However, current data suggest that the deeper floors are organized spatially much like those more fully excavated.

Conclusions

The 2013 excavations of Housepit 54 revealed the expected complex sequence of house floors and roofs. Excavations revealed six floors (IIa through IIf) and three roof deposits. The sequence of floors and roofs consists of the Va roof covering the IIa floor. This is followed by another roof (Vb1/Block B) manifesting only in Block B. Elsewhere the IIa floor also buries the IIb and IIC floors without intervening roof materials. Below IIc is the Vb/Blocks A and C roof. It remains to be seen if this roof is present in Block B. Below Vb2/Blocks A and C are the IId-IIf floors. Again we are not clear if this exact sequence will be present in Block B, though it is expected. As noted previously, excavations in Block D were limited and succeeded only in exposing a portion of the Va roof and XVII fill. Dating of Va and Vb1/Block B sediments demonstrated that roof Vb1 from Block B dates approximately 100 years earlier (mean two sigma calibrated date = 1311 BP) than Va (mean two sigma calibrated date = 1190 BP). Additional dates established the likely presence of very late BR 3 occupations at HP 54 (987+/-65 cal. BP at two sigmas). However, assessment of stratigraphic relationships between the rim context of these dates , the final BR 3 roof (Va), and the positions of the BR 4 roof and floor, establish that evidence for these final BR 3 period occupations is very ephemeral as those final floors and roofs appear to have been removed by the BR 4 (Fur Trade) occupants. Assessment of FCR density revealed a trend towards increasing density over time. If FCR density is an accurate proxy for human population density in HP 54, then the IIa floor was the most densely occupied of the six examined here. This is partially confirmed by the greater number of hearth features on IIa compared to earlier floors. A total of 39 features were excavated with evidence for cooking, storage and household architecture. Spatial arrangement of features was very consistent between floors suggesting that during BR 3 times, household members retained the same logic to their use of space between generations. Drawing entirely from the positions of features, it would appear that hearth-related activity areas were spaced around the perimeter of each floor. This could suggest that the house was used by multiple families each occupying a portion of the household and operating their own cooking and food storage facilities. This hypothesis will be further examined in the spatial analysis chapter.

References Cited

Alexander, Diana

2000 Pithouses on the Interior Plateau of British Columbia: Ethnographic Evidence and Interpretation of the Keatley Creek Site. In *The Ancient Past of Keatley Creek, Volume II: Socioeconomy*, edited by Brian Hayden, pp. 29-66. Archaeology Press, Simon Fraser University, Burnaby.

Boas, Franz

1891 The Shuswap. Second General Report on the Indians of British Columbia, Sixth Report of the Committee on the North-Western Tribes of Canada. *In Report of the 60th Meeting of the British Association for the Advancement of Science, Newcastkle upon Tyne, 1890*, Part IV:632-647.

Bouchard, Randy and Dorothy Kennedy

1977 Lillooet Stories. Sound Heritage 6(1):1-78. Provincial Archives of British Columbia, Victoria.

Chamberlain, Andrew

2006 *Demography in Archaeology*. Cambridge University Press, Cambridge.

Dawson, George W.

1892 Notes on the Shuswap people of British Columbia. In *Proceedings and Transactions of the Royal Society of Canada* 9(2):3-44.

Duff, Wilson

1952 The Upper Stalo Indians of the Fraser River of British Columbia. Memoir of the British Columbia Provincial Museum, Memoir No. 1, Victoria.

Fladmark, Knut R.

1978 *A Guide to Basic Archaeological Field Procedures*. Department of Archaeology, Simon Fraser University, Publication Number 4.

Hayden, Brian

1997 *The Pithouses of Keatley Creek*. Harcourt Brace College Publishers, Fort Worth.

Hayden, Brian, Edward Bakewell, and Robert Gargett

1996 The World's Longest Lived Corporate Group: Lithic Analysis Reveals Prehistoric Social Organization Near Lillooet, British Columbia. *American Antiquity* 61:341-356.

Hill-Tout, Charles

1899 Notes on the Ntlakapamuq (Thompson) of British Columbia, A Branch of the Great Salish Stock of North America. *Report of the British Association for the Advancement of Science, 69th Meeting*, pp. 500-584. Appendix II of the Third Report of the Ethnological Survey of Canada.

1905 Report on the Ethnology of the Stlatlumh (Lillooet) of British Columbia. Journal of the Royal Anthropological Institute 35:126-218.

Kennedy, Dorothy I.D. and Randy Bouchard

1978 Fraser River Lillooet: An Ethnographic Summary. In *Reports of the Lillooet Archaeological Project. Number 1. Introduction and Setting*, edited by Arnoud H. Stryd and Stephen Lawhead, pp. 22-55. National Museum of Man, Mercury Series, Archaeological Survey of Canada Paper No. 73, Ottawa.

1998 Lillooet. In *Handbook of North American Indians, Volume 12, Plateau*, edited by Deward E. Walker Jr., pp. 174-190. Smithsonian Institution, Washington.

Laforet, Andrea and Annie York

1981 Notes on the Thompson Winter Dwelling. In *The World is Sharp as a Knife: An Anthology in Honor of Wilson Duff*, edited by D. Abbott, pp. 115-122. British Columbia Provincial Museum, Victoria.

MacDonald, Richard

2000 Structural Strategies for Pithouses at the Keatley Creek Site. In *The Ancient Past of Keatley Creek, Volume II: Socioeconomy*, edited by Brian Hayden, pp. 221-238. Archaeology Press, Simon Fraser University, Burnaby.

Nastich, Milena

1954 The Lillooet: An account of the Basis of Individual Status. MA Thesis, Department of Economics, Political Science, and Sociology, University of British Columbia, Vancouver.

Prentiss, Anna Marie
2013 Report of the 2012 University of Montana Investigations at the Bridge River Site (EeRl4): Housepit 54 During the Canadian Fur Trade Period. Report on file, National Endowment for the Humanities and Bridge River Indian Band.

Prentiss, Anna Marie, Hannah S. Cail, and Lisa M. Smith
2014 At the Malthusian Ceiling: Subsistence and Inequality at Bridge River, British Columbia. *Journal of Anthropological Archaeology* 33:34-48.

Prentiss, Anna Marie Eric Carlson, Nicole Crossland, Hannah Schremser, and Lee Reininghaus
2009 Report of the 2008 University of Montana Investigations at the Bridge River Site (EeRl4). Report on file at the National Science Foundation and Bridge River Band Office, Lillooet, British Columbia.

Prentiss, Anna Marie, Guy Cross, Thomas A. Foor, Dirk Markle, Mathew Hogan, and David S. Clarke
2008 Evolution of a Late Prehistoric Winter Village on the Interior Plateau of British Columbia: Geophysical Investigations, Radiocarbon Dating, and Spatial Analysis of the Bridge River Site. *American Antiquity* 73:59-82.

Prentiss, Anna Marie, Thomas A. Foor, Guy Cross, Lucille E. Harris, and Michael Wanzenried
2012 The Cultural Evolution of Material Wealth Based Inequality at Bridge River, British Columbia. *American Antiquity* 77:542-564.

Prentiss, Anna Marie, Natasha Lyons, Lucille E. Harris, Melisse R.P. Burns, and Terrence M. Godin
2007 The Emergence of Status Inequality in Intermediate Scale Societies: A Demographic and Socio-Economic History of the Keatley Creek Site, British Columbia. *Journal of Anthropological Archaeology* 26:299-327.

Prentiss, W.C., Michael Lenert, Thomas A. Foor, Nathan B. Goodale, and Trinity Schlegel
2003 Calibrated Radiocarbon Dating at Keatley Creek: The Chronology of Occupation at a Complex Hunter-Gatherer Community. *American Antiquity* 68(4):719-735.

Ray, Verne
1939 Cultural Relations on the Plateau of Northwestern America. Southwest Museum, Los Angeles.

Teit, James
1895

1900 *The Thompson Indians of British Columbia*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 1: 63-392.

1906 *The Lillooet Indians*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 2: 193-300.

1909 *The Shuswap Indians*. Memoirs of the American Museum of Natural History, Jesup North Pacific Expedition 4:443-758.

1912 Traditions of the Lillooet Indians of British Columbia. *Journal of American Folklore* 25:287-371.

Chapter Three

Lithic Artifacts

(Anna Marie Prentiss, Andrew McElroy, and Ethan Ryan)

Introduction

This chapter describes the 5647 lithic artifacts (5263 flakes and 384 tools and cores) recovered from Housepit 54 during the 2013 field season at the Bridge River Site, British Columbia. The chapter also provides preliminary examination of tool assemblage variability between floor and roof deposits. The current goal is to assess the possibility that recognizable patterns exist that could reflect variability in household subsistence and goods production economies. We expect to conduct more exhaustive statistical analyses with more complete data sets (additional floors and opening of Block D portions) following the 2014 field season.

Debitage and Tool Analysis

Debitage were sorted by raw material, thermal alteration, size, technological type, cortex, and when feasible, fracture initiation (Appendix B). Thermal alteration was marked as present or absent, and defined by a suite of characteristics. Lithic artifacts that had flake scars with a smooth or soapy texture when compared to older surfaces with a grainier or duller texture were likely heat-treated (Whittaker 1994:73). Another defining characteristic for heat-treated lithics was color. Lithics that had a greasy luster, crazing, and or a pink to reddish color were likely to have been heat-treated. Debitage and tools were sorted by size into five categories, extra small (<.64 sq cm), small (.64 to 4 sq cm), medium (4 to 16 sq cm), large (16 to 64 sq cm), and extra large (>64 sq cm) (Prentiss 1998, 2001:148). Completeness-related types were defined and sorted using a modified Sullivan and Rozen typology (MSRT) (Prentiss 1998; Sullivan and Rozen 1985).

The MSRT typology initially sorted debitage by size, then the presence or absence of a single interior surface (ventral face). Debitage that did not have a single interior surface or ventral face was defined as non-orientable. The next step was to determine whether or not the debitage had a point of applied force (platform). If there was no point of applied force (platform), the debitage was defined as a Medial/Distal Fragment. Subsequently, the debitage was analyzed to determine if it had a sheared axis of flaking (split longitudinally). If the sheared axis of flaking (split longitudinally) was present the flake was defined as a Split Flake. Then, the margins of the flake were examined to determine whether or not they were intact. If the margins were not intact the flake was defined as a Proximal Fragment, if the margins were intact the flake was defined as a Complete Flake. Lastly any debitage that was sorted as a Complete Flake, Proximal Flake, or Split Flake, was analyzed to determine its fracture initiation. The fracture initiations were divided up into 3 categories, Cone, Bend, and Wedge. Cone initiations are typically associated with hard hammer percussion, while Bend initiations are typically associated with soft hammer percussion. Wedge initiations typically result from bipolar lithic reduction. Debitage cortex was measured on the dorsal face of the flake on a scale as follows: Primary (75-100% cortex cover), Secondary (1-74% cortex cover), Tertiary (0% cortex cover). Flakes with platforms and fracture initiations (Complete, Proximal, and Split) were also sorted into technological types include early stage reduction, thinning, R-billet, tool retouch, core retouch/preparation, notching, core rejuvenation, and bipolar reduction (Andrefsky 2005; Hayden and Hutchings 1989).

Tools recovered were sorted using a wide range of characteristics (Appendix B). Size on tools, was determined using metric calipers. All tools were drawn showing multiple faces and margins. Macroscopic as well as microscopic techniques were employed to determine use-wear on tools. Macroscopic techniques utilized the naked eye as well as hand lenses 4x, 8x, and 12x. Microscopic techniques utilized Motic SMZ-168-BP; .75x – 50x zoom microscopes. Use-wear analysis defined such things as polish, rounding, striations, crushing, etc. Measurements were taken on tools to determine edge angle. Edge angle measurements were determined using Wards Contact Goniometer. When tools had more than one distinctive retouched or used edge, the tool was termed as an employable unit or EU (Knudson 1983). Edge retouch characteristics were recorded including retouch face (normal, inverse, bifacial), retouch invasiveness (abrupt, semi-abrupt, invasive), and retouch form (scalar, step, hinge). Finally, all tools were identified by type (Appendix B). The typological classification provides a quick reference for tool morpho-functional types and is not intended to replace more focused attribute based approaches to analysis.

Summary of Lithic Artifacts by Stratum

Table 4.1 provides a summary of debitage and tool counts and densities by stratum. Plotting densities by stratum (Figure 4.1) suggests that roof and floor densities pattern approximately inverse to one another. Comparing these results to indicators of rising population density in the house (see Chapter Two); it appears that lithic reduction activities may have gradually shifted from floors to roof-tops. Alternatively, it could also mean that there was simply more cleanup of tool production and maintenance spaces on house floors as living spaces became more crowded. But plotting overall densities of lithic artifacts illustrates a decline in density in the upper strata (Figure 4.2). While this could imply fewer knappers and thus less material discarded, it could also be a reflection of thicker sedimentary strata in the Va/IIa and Vb1/IIb contexts compared to earlier floors and roofs. The latter seems more likely given other indicators of rising numbers of persons in the house (e.g. FCR and cooking features).

Table 4.1. Debitage and Tool (individual artifacts) Count by Stratum.

Stratum	Debitage Count	Tool Count	Total	Excavated Volume	Density
V	2		2		
Va	1868	159	2027	1.549	1308.6
IIa	331	15	346	1.304	265.3
Vb1	274	31	305	.5045	605.8
IIb	665	49	714	.781	914.2
IIc	869	79	948	.771	1229.6
Vb2	75	1	76	.145	524.1
IId	630	25	655	.551	1188.7
IIe	174	14	188	.2661	706.5
IIf	183	54	237	.2047	1157.8
XVII	69		69		
III	130		130		
XVI	31		31		
Cleanup	35		35		
Total	5263	384	5647		

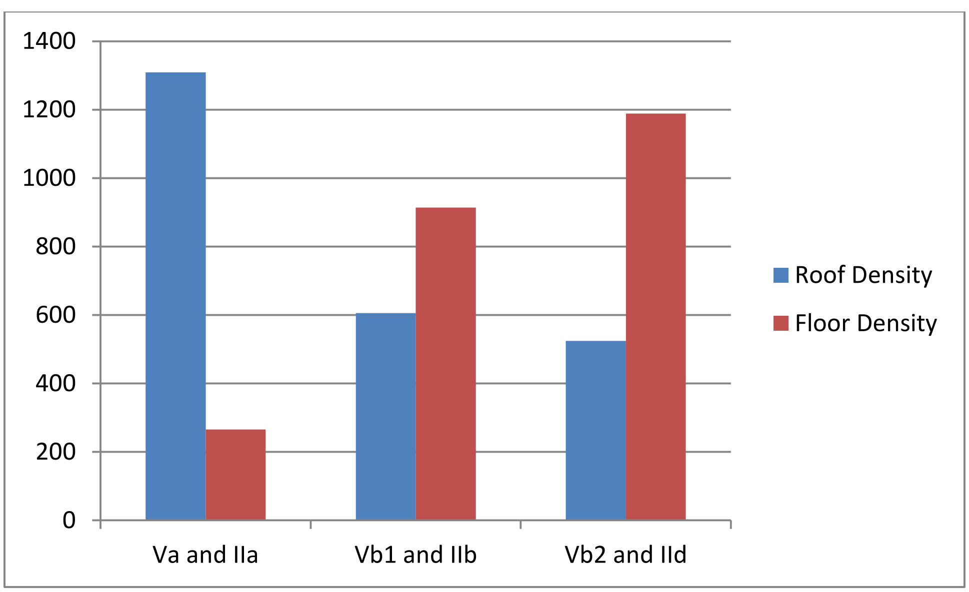


Figure 4.1. Variability in total lithic artifact density between roofs versus floors.

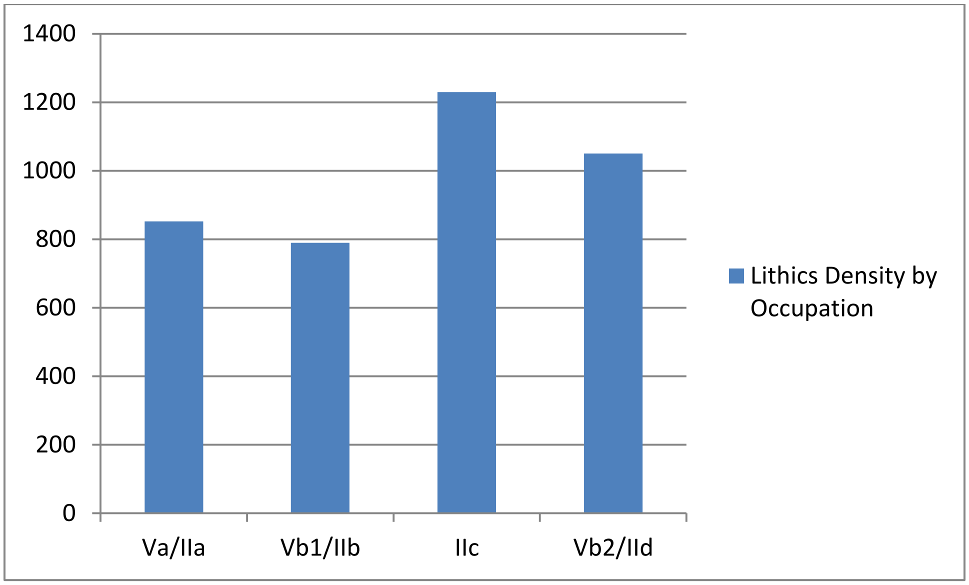


Figure 4.2. General lithic artifact density by occupation.

Stratum Va

Stratum Va, the final roof deposit evident from BR 3 times is dominated by bipolar cores, slate scrapers, and single scrapers (Table 4.2). However, a wide range of other tool types are present including a range of chipped knives, scrapers, drills, projectile points, groundstone tools, and groundstone ornaments. Confirmation of whether these materials are the result of roof-top versus dumping from activities inside the house will rely on analysis of spatial patterns once excavation of the Block D portion of Va is completed in 2014.

Table 4.2. Stratum Va tool counts (measured as employable units).

Tool Type	Stratum Va Count
Used Flake	9
Used Flake on a Truncation	1
Retouched Truncation	1
Single Scraper	15
Small piercer	2
Pieces Esquillee	4
Double Scraper	1
Unifacial borer/drill	1
Key-shaped scraper	1
Unifacial knife	8
Convergent Scraper	2

Notch	2
Denticulate	1
End Scraper	2
End Scraper on Snapped Kamloops Point	1
Stemmed scraper	1
Chipped Stone Chopper	1
Bipolar Core	28
Multi-directional core	3
Biface retouch flake with use-wear	1
Bifacial Knife	4
Bifacial Borer/drill	2
Biface Fragment	1
Knife-Like Biface	1
Kamloops Projectile Point (concave base)	5
Kamloops Projectile Point (convex base)	1
Kamloops Projectile Point (Stemmed)	1
Plateau Straight base projectile point	2
Shuswap Projectile Point (weak shoulders)	1
Projectile Point tip	1
Small Triangular Projectile Point	4
Slate Scraper	16
Slate Knife	3
Slate Core	1
Sawed slate	2
Miscellaneous Groundstone	1
Abrader	1
Chipped slate	5
Sawed cube	1
Abrader/Saw	1
Hammerstone	1
Steatite Tubular Pipe	1
Crude Point on a flake	1
Ornamental Ground Nephrite	2
Groundstone base	2
Incised slate	2
Stone Pendant	1
Sandstone saw	2
Microblade	1
Polished Nephrite Scraper	1
Stone Bead	3
Small stone bowl (fragment)	2

Stratum IIa

Stratum IIa has a relatively limited lithic tool assemblage, particularly compared to Va (Table 4.3). Common artifact types include used flakes, single scrapers, piercers and bipolar cores. These are generally typical household tools associated with manufacture of clothing and working of harder substances such as wood or antler. Bipolar cores reflect extension of use-life of lithic raw material in exhausted cores and tools.

Table 4.3. Stratum IIa tools (measured as employable units).

Tool Type	Count
Used flake	2
Single Scraper	4
Crude Point on a flake	1
Small Piercer	2
Pieces Esquillee	1
Bipolar Core	2
Plateau Projectile Point (Straight base)	1
Slate Knife retouch Flake	1
Slate Scraper	1
Chipped Adze	1

Strata Vb1 and IIb

Stratum Vb1 has a relatively wide array of tools though none truly dominate. With the exception of bipolar cores and, to a lesser degree, slate scrapers it is a similar pattern to that of IIb (Table 4.4). Activities reflect an even mix of likely hide working and clothing manufacture, cooking, wood/antler/bone working, and weapons manufacture and use.

Table 4.4. Stratum IIb and Vb tools (measured as employable units). Stratum Vb appears as two different stratigraphic layers. Vb1 sits below IIa in Block B. Vb2 sits below IIc in Blocks A and C.

Tool Type	IIb Count	Vb1 Count	Vb2 Count
Used Flake	3	4	
Single Scraper	2	3	
Small piercer	1	1	
Pieces Esquillee		2	
Unifacial Perforator	1	1	
Unifacial knife	1		
Used flake on break		1	
Bipolar Core	12	2	
Multi-directional core	1		
Stage 2 Biface		1	

Bifacial Knife		4	
Bifacial Borer/drill	1	1	
Biface Fragment	1		
Scraper-like biface	1		
Kamloops Projectile Point (concave base)	2	2	
Kamloops Projectile Point (convex base)	1		
Plateau Straight base projectile point	2		1
Plateau Projectile Point Preform		1	
Slate Piercer/borer	1		
Slate Scraper	4	1	
Sawed slate	1		
Abrader	2	1	
Chipped slate	2	1	
Sawed cube	2	2	
Ground slate	1	1	
Sawed adze	1		
Slate chopper	1		
Hammerstone	2		
Slate Scraper retouch flake		1	
Crude Projectile Point on a flake		1	
Incised image on groundstone		1	
Ornamental ground Nephrite		1	

Stratum IIc

Stratum IIc contains relatively frequent bipolar cores, followed by Kamloops side-notched projectile points, used flakes, pieces esquillees and various simple scrapers (Table 4.5). Pieces esquillees are stone wedges likely used during wood working or similar activities. These were very common in the Fur Trade deposits at HP 54 but remain far less common in the older strata. Otherwise, this assemblage represents a similar set of domestic tasks to that of floors IIb and IIa.

Table 4.5. Stratum IIc tools (measured as employable units).

Tool Type	Count
Used Flake	5
Single Scraper	4
Small piercer	4
Pieces Esquillee	5
Double Scraper	2
Unifacial Perforator	1
Key-shaped scraper	2

Stemmed Scraper	1
Unifacial knife	1
Used flake on break	1
Alternate scraper	1
Bipolar Core	11
Bifacial Knife	1
Bifacial Borer/drill	1
Bifacial Perforator	1
Biface Fragment	2
Knife-Like Biface	3
Kamloops Projectile Point (concave base)	6
Projectile Point tip	1
Small Triangular Projectile Point	2
Side-notch Projectile Point (no base)	1
Slate knife retouch flake	1
Slate Scraper	7
Sawed slate	2
Ochre	1
Abrader	2
Chipped slate	2
Sawed cube	1
Ground slate	3
Miscellaneous ground stone	1
Abrader/Saw	1
Hammerstone	2
Steatite Tubular Pipe	1

Strata Vb1 and IId

Stratum Vb1 was very sparse and contained very few lithic artifacts (Table 4.4). Its associated floor, IId has more frequent items with most frequent bipolar cores and single scrapers. There is relatively little evidence for maintenance of weapons or other hunting gear compared to other floors (e.g. IIc).

Table 4.6. Stratum IId tools (measured as employable units).

Tool Type	Count
Flake with Polish	1
Single Scraper	5
Pieces Esquillee	1
Double Scraper	1
Convergent Scraper	1
Unifacial Borer/Drill	1

Notch	1
Bipolar Core	6
Bifacial Knife	1
Biface Fragment	1
Kamloops Projectile Point (concave base)	1
Slate Scraper	2
Sawed slate	1
Abrader	1
Chipped slate	1
Steatite Tubular Pipe	1
Stone Bead	1

Strata IIe and IIf

Strata IIe and IIf were only excavated in Block A; thus limiting our sample of tools. But as in the other floors, bipolar cores are most frequent followed by slate scrapers and single scrapers.

Table 4.7. Stratum IIe tools (measured as employable units).

Tool Type	Count
Retouched Spall Tool	1
Crude Point on a flake	1
Small Piercer	2
Pieces Esquillee	1
Bipolar Core	6
Slate Scraper	2

Table 4.8. Stratum IIf tools (measured as employable units).

Tool Type	Count
Used Flake	3
Single Scraper	7
Retouched Truncation	1
Small piercer	2
Pieces Esquillee	4
Notch	1
End Scraper	1
Unifacial knife	1
Bipolar Core	9

Bifacial Knife	1
Biface Fragment	1
Knife-Like Biface	1
Large Square Stemmed Dart Point	1
Shuswap Corner-removed (Concave base)	1
Slate Scraper	5
Chipped adze	1
Abrader	1
Miscellaneous ground stone	1
Sandstone saw	1
Stone Bead	1
Incised image on groundstone	1
Incised slate	2

Strata XVI and III

Strata XVI and III represent rim deposits most likely resulting from re-deposited roof and kitchen debris. They are in essence a kind of midden deposit. Excavations are generally not focusing on these strata and thus our samples are relatively small. Tool types are little different from that of other floors and roofs.

Table 4.9. Stratum XVI and III tools (measured as employable units).

Tool Type	XVI Count	III Count
Bipolar Core	1	2
Hammer stone	1	
Single Scraper		1
Stemmed Scraper		1
Bifacial Knife		1
Crude Point on a flake		1
Kamloops Projectile Point (Straight Base)		1
Slate Scraper		1

Data Exploration

We conducted a preliminary analysis of using abundance indices to explore trends through time between floors drawing from summary data in Tables 4.10 and 4.11. Abundance indices are ratio measures designed to illustrate trends in human behavior. Zooarchaeologists have used them to illustrate prey choice decisions (e.g. Broughton 1994). This analysis developed abundance indices (AI) to examine change in hunting related activities and production and use of ground stone tools. Item frequency to excavated volume measure was used to assess intensity in production of bipolar cores between floors. Principal components analysis was used to assess more complex inter-assemblage relationships by looking at inter-correlations between all variables.

Table 4.10. Tool class data by stratum (BPC=Bipolar core; B=biface; HW=hide working; SS=simple scraper; HD= Heavy Duty; GST=groundstone production tools; GSP=groundstone products).

Stratum	BPC	B	HW	SS	HD	GST	GSP
Va	28	22	22	18	26	5	14
IIa	2	1	3	4	3	0	0
Vb1	2	8	1	3	3	3	1
IIb	12	6	5	2	4	4	0
IIc	11	12	12	7	7	7	1
Vb2	0	1	0	0	0	0	0
IId	6	2	2	7	3	1	2
IIe	6	0	4	0	1	1	2
IIf	9	4	8	7	6	1	1

Table 4.11. Statistics on lithic tools between strata.

Stratum	BPC/ Exc. Volume	BPC/ Debitage	B+HW/ B+HW+SS+HD	Tool Richness
Va	18.1	.0005	.5	52
IIa	1.53	.006	.36	10
Vb1	3.96	.007	.6	21
IIb	15.36	.02	.65	23
IIc	14.27	.01	.63	33
Vb2	0	0	N/A	1
IId	10.89	.01	.28	17
IIe	22.54	.03	.8	6
IIf	43.97	.05	.48	22

The ratio of bipolar cores to excavated volume for all occupations (Figure 4.3) implicates peak numbers during IIc from a low in Vb2/IId and a second highest score in Vb1/IIb. A similar pattern is reflected in the abundance index for hunting gear (bifaces and projectile points) where strongest scores are found in Vb1/IIb and IIc (Figure 4.4). Stratum IIc also has the strongest score for ground stone tools (GST+GSP) (Figure 4.5). Strata IIe and IIf were excluded from these calculations due to low sample sizes. Results so far imply a potential relationship between production and discard of hunting-related gear, bipolar reduction, and groundstone items. Most likely, however, higher frequencies of bipolar cores represent longer winter occupations under the assumption that longer cold-season stays in the house require more frequent recycling of toolstone. Groundstone tools in these calculations include a very wide array of items which could be complicating some interpretations. Thus it is also instructive to explore the data further in a multivariate framework.

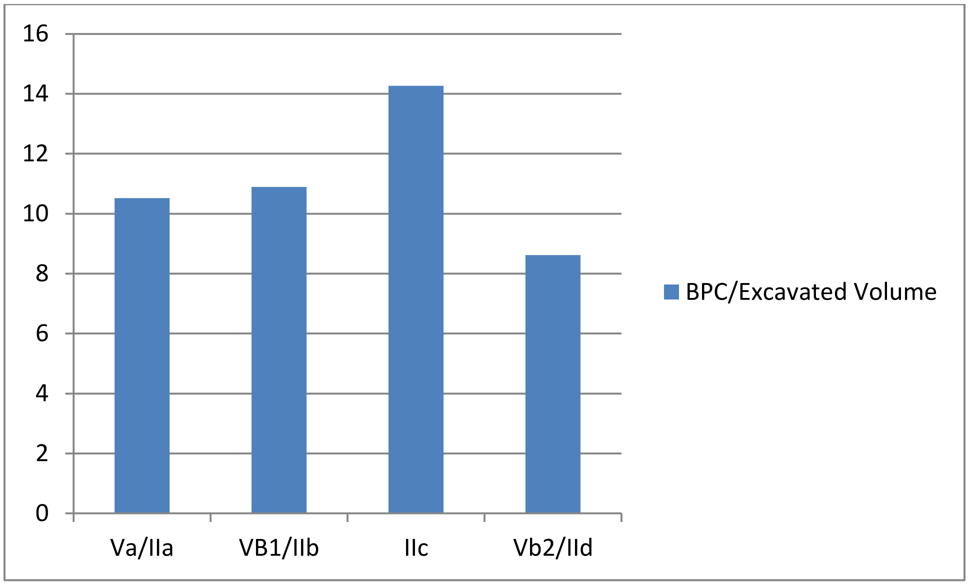


Figure 4.3. Ratio of bipolar cores to excavated volume.

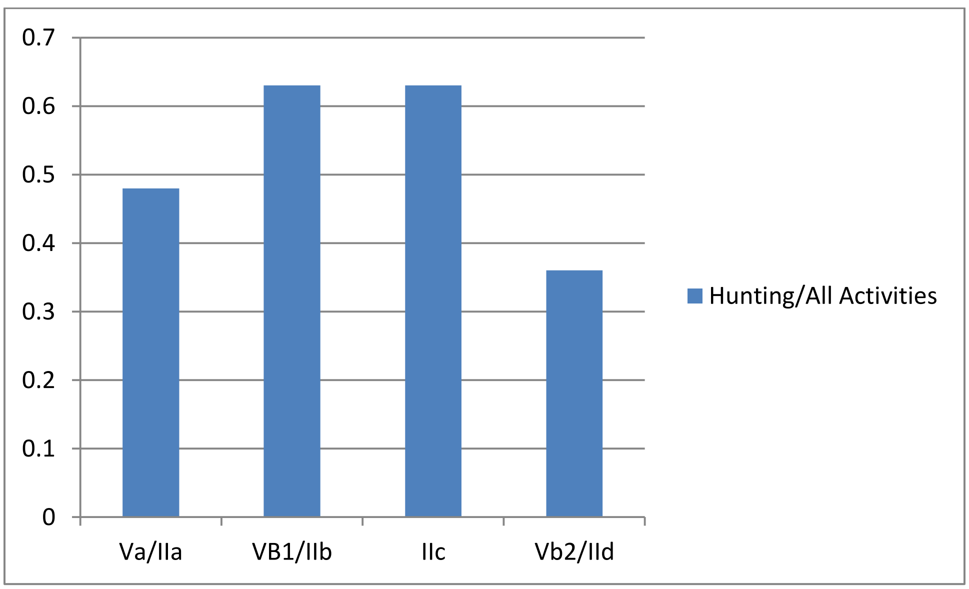


Figure 4.4. Ratio of hunting tools to all tools (hunting+simple scrapers+heavy duty tools).

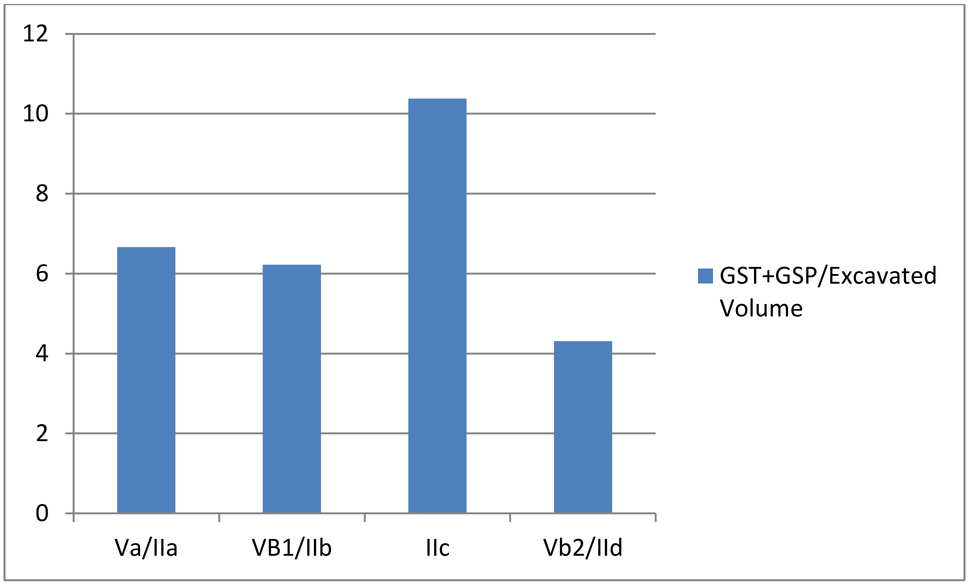


Figure 4.5. Ratio of ground stone tools (GST+GSP) to excavated volume.

A principal components analysis (PCA) was conducted by collapsing count data in Table 4.10 to five occupations and converting counts to proportions (Table 4.11). The IIe/IIf strata were combined to provide an additional sample for this exploratory analysis. Readers should recognize however, that these strata only reflect activities in one excavation block (out of four). The PCA was conducted by developing a correlation matrix from which three significant (at 1.0) components were extracted and rotated using a varimax rotation (Tables 4.12 and 4.13). Component scores were extracted and saved as variables (Table 4.11). Component one loads most heavily in the positive dimension on bipolar cores and to a lesser degree on simple scrapers (single, convergent, double scrapers) and groundstone products (abraders, ground and sawed slate tools, ornaments). It appears to reflect fairly routine core-flake tool production and use operations where hunting activities are not of great importance, particularly given that most simple scrapers were used in activities other than hide working. In the negative dimension, component one loads most strongly on bifaces reinforcing the conclusion that it is identifying assemblages associated or not with hunting gear. The groundstone tool production variable also receives a strong negative loading on component one. At this point it is not clear how this could be related to frequencies of bifaces. Component two loads in the positive dimension on heavy duty tools (pieces esquillees, borer/drills, key-shaped scrapers, adzes, notches and denticulates) and groundstone products. This component could be marking assemblages resulting from more extreme investment in production of wood, bone/antler, and stone products. Component three loads most significantly in the positive dimension on hide working tools (end scrapers and slate scrapers). Only single scrapers are significant as negative loadings. Component three appears to highlight assemblage level distinctions between hunting-focused assemblages and those assemblages emphasizing hide production. This is curious as one would expect hunting gear and hide working to be correlated.

Table 4.11. Proportions and principal component scores (1=Va/IIa; 2=Vb1/IIb; 3=IIc; 4=Vb2/IId; 5=IIe/IIf; BPC=Bipolar core; B=biface; HW=hide working; SS=simple scraper; HD= Heavy Duty; GST=groundstone production tools; GSP=groundstone products).

	Proportion data							Component Score Data		
	BP	B	HW	SS	HD	GST	GSP	Comp. 1	Comp.2	Comp.3
1.	.22	.17	.18	.16	.21	.04	.10	-.26669	1.73758	.12502
2.	.26	.26	.11	.09	.13	.13	.02	-.83927	-.83876	.23556
3.	.19	.21	.21	.12	.12	.12	.02	-.89130	-.36308	.34606
4.	.23	.12	.08	.27	.12	.04	.08	.53195	-.23665	-1.687
5.	.30	.08	.24	.14	.14	.02	.06	1.46531	-.29909	.98074

Table 4.12. Initial statistics for principal components analysis.

Initial statistics

		Initial Eigenvalues	
Component	Total	& of Variance	Cumulative
1	3.342	47.75	47.75
2	1.639	23.41	71.16
3	1.322	18.89	90.01

Table 4.13. Rotated principal component loadings matrix (Var 1=Bipolar core; Var 2=biface; Var 3=hide working; Var 4=simple scraper; Var 5= Heavy Duty; Var 6=groundstone production tools; Var 7=groundstone products).

Rotated Component Matrix[a]

	Component		
	1	2	3
VAR00001	.692	-.293	.362
VAR00002	-.947	-.180	.109
VAR00003	.248	.199	.823
VAR00004	.449	.193	-.856
VAR00005	-.020	.939	.220
VAR00006	-.864	-.483	.144
VAR00007	.484	.789	-.363

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 13 iterations.

Examining Figure 4.6 we see that there is trend in component one scores from IIe/IIf to lowest scores in Vb1/IIb and IIc. This confirms the abundance index output (Figure 4.4) that identifies hunting activity as particularly important on the latter two floors. As above the relationship with indicators of groundstone tool production (saws, ground and sawed slate fragments, cubes) requires further consideration. If hunting was more common on Vb1/IIb and IIC then it could mean that fishing and other forms of gathering were more important than hunting to occupants in the earlier floors (Vb2/IId and IIe/IIf). One possibility could be that when hunting was frequent, more groundstone tools were produced and transported elsewhere leaving relatively strong signs of production but few actual products. The inverse would be implied in contexts of reduced hunting: less production and equally less frequent transport. Component two scores isolate the Va/IIa occupation with its high counts on heavy duty tools and groundstone products. This could also reflect a stronger fishing and gathering focus if heavy duty stone tools were used in manufacture of fishing gear and facilities. Component three was interpreted as identifying assemblages with high frequency of hide working tools (end scrapers, and slate scrapers). Component three scores are significantly positive for strata IIe/IIf and very strongly negative on Vb2/IId. This outcome will require more research as we would theoretically expect hide working to correlate with investment in hunting. An examination of the raw data however does show a relatively strong hide-working tool score for IIc. However, if hides were imported via trade for fishing products or other items then they would not necessarily correlate with hunting tools as in IIe/IIf.

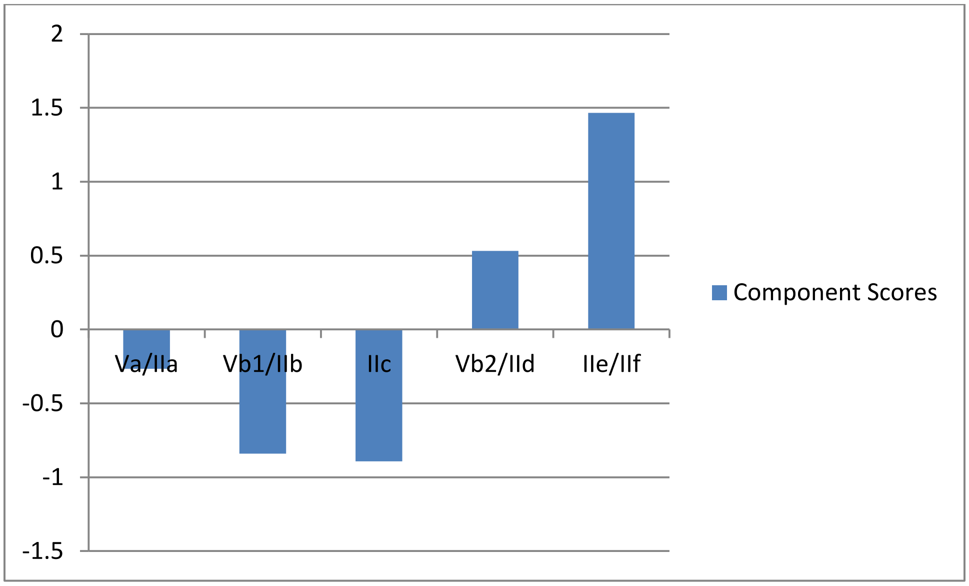


Figure 4.6. Plot of Component one scores.

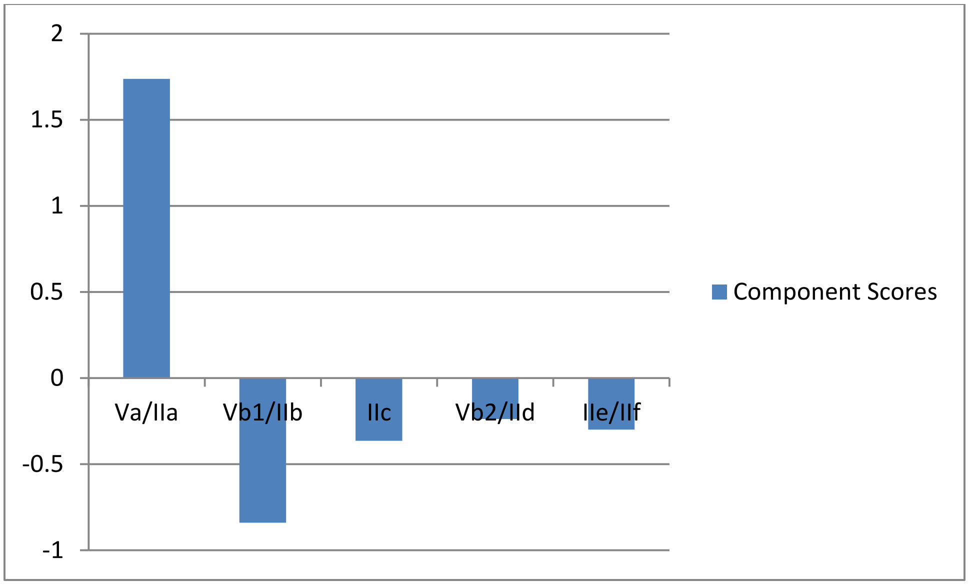


Figure 4.7. Plot of component two scores.

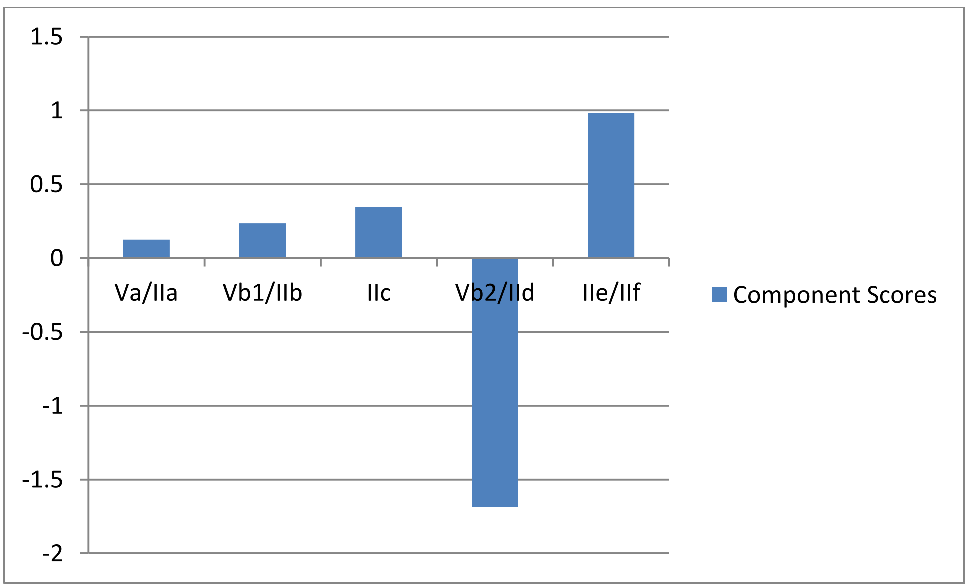


Figure 4.8. Plot of component three scores.

Conclusions

Excavations in 2013 at Housepit 54 generated 5647 lithic artifacts (5263 flakes and 384 tools and cores). These data provide provocative initial evidence for variability in household economies. While the IIe and IIf floor data derive uniquely from a single block (A), lithic tool patterns suggest that along with Stratum IId there was limited investment in production and use of tools typically associated with hunting (e.g. bifaces and projectile points). Given stronger simple scraper and groundstone scores these strata could reflect household economies centered on fishing and broader spectrum gathering. High hide scraper scores could in the context reflect trade activities more so than hunting prowess. In contrast, the Vb1/IIb and IIc occupations do demonstrate stronger markers of production and use of hunting gear and weaker indicators of intensive woodworking and hide-working. Hide working gear is present in both floors and actually fairly common in IIc. The reduction in woodworking gear could be interpreted as a reduced focus on production and refurbishing of manufacture-intensive wooden fishing and gathering items such as dip nets, racks, and traps. The artifacts of Va/IIa represent something of a conundrum given exceptionally high scores in many categories, particularly wood-working and groundstone products. It may be that this occupation was most densely packed with the household's most diversified economy and highest level of goods production. These results suggest that we have much to learn from further studies of household lithic tool economies and organization. Future research will focus on tool production and maintenance activities associated with raw material variability. Many of the conclusions drawn in these exploratory studies have implications that can be further examined with zooarchaeological and paleoethnobotanical data.

References Cited

Andrefsky, William, Jr.

2005 *Lithics: Macroscopic Approaches to Analysis*. Cambridge University Press, Cambridge.

Broughton, J. M.

1994 Late Holocene Resource Intensification in the Sacramento River Valley: The Vertebrate Evidence. *Journal of Archaeological Science* 21, 501-514.

Hayden, Brian and W. Karl Hutchings

1989 Whither the Billet Flake? In *Experiments in Lithic Technology*, edited by Daniel S. Amick and Raymond P. Mauldin, pp. 235-258. BAR International Series 528, Oxford.

Knudson, R.

1983 *Organizational variability in Late Paleo-Indian Assemblages*. WSU Laboratory of Anthropology Reports of Investigations No. 60, Pullman.

Prentiss, W. C.

1998 Reliability and Validity of a Lithic Debitage Typology: Implications for Archaeological Interpretation. *American Antiquity* 63(4):635-650.

2001 Reliability and Validity of a "Distinctive Assemblage" Debitage Typology: Integrating Flake Size and Completeness. In *Lithic Debitage Analysis: Studies in Context, Form and Meaning*, edited by W. Andrefsky, pp. 147-172. University of Utah Press, Salt Lake City.

Sullivan III, Alan P. and Kenneth C. Rozen

1985 Debitage Analysis and Archaeological Interpretation. *American Antiquity* 50:755-779.

Whittaker, John C.
1994 *Flintknapping: Making and Using Stone Tools*. University of Texas Press, Austin.

Chapter Four
Faunal Analysis

(Matthew J. Walsh, Corey Johnson, Tanner Marsh, Matthew McKee, James Verzuh)

Introduction

This chapter details the animal bone remains recovered during the 2013 excavations at Housepit 54 (HP54) of the Bridge River Site (EeRl4) in the Middle Fraser River Canyon of south-central British Columbia. These excavations revealed the remnants of multiple occupation and roof deposits, all of which contained assortments of faunal remains, the majority of which belonged to relatively large bony fishes (*Osteichthyes* sp.; i.e. salmon) and a collection of terrestrial mammals such as deer, mountain sheep, beaver, and canids, among some much-less-common others. This chapter will provide detailed description of those remains by strata, by excavation block, and by occupation (a series of strata consisting of adjacent floor and roof deposits denoting spans of probable occupations. Some occupation strata consist of multiple floors. These floors (or levels) will be detailed individually and as part of their associated occupational assemblage. All strata excavated during 2013 date to the Bridge River 3 (BR3) Period of occupations dating from roughly 1300 B.P. to 1000 B.P. and representative of a period when the winter pithouse village experienced a rapid phase of growth both in number of pithouses and associated features as well as overall human population (see Chapter Two).

As excavations at HP54 are ongoing, little analytical consideration is offered in this preliminary report, with the caveat that further and comprehensive assessment will be made as more complete data is obtained through further excavations in 2014. As certain sections of excavation remain partly and wholly incomplete (e.g. Block D; see Chapter Two), any current assessment would be lacking considerable data, and thus produce inconclusive and potentially spurious results. In the simplest term, what this initial examination of the faunal data may suggest is that BR3 occupations appear to follow trends indicative of a subsistence economy consisting mainly of salmon and medium- to large-mammals, likely deer and mountain sheep. Mammal bones are commonly highly fragmented and consistently represented by long bones of both fore- and hind- limbs, potentially indicating high degrees of bone processing and/or long distances of transport of high-utility parts.

Subsistence at Bridge River

Subsistence at Bridge River during the BR3 Period consisted of a transhumant cycle of relatively mobile, but localized, logistical foraging during warmer months for hunting and gaining access to plant foods, and sedentism from late fall to spring during periods when migrating salmon moved through the nearby Fraser Canyon and throughout the Fraser-Bridge River watershed. Salmon was the key stored food resource for much of the winter, while plant foods such as preserved berries, nuts, and dried geophytes, along with deer and other terrestrial mammal prey rounded out the diet. During times of stress, such as possible in late winter and early spring before the first spring run Chinook (*Oncorhynchus tshawytscha*) moved into the region, food sources may have expanded to include smaller terrestrial mammals and potentially less-desirable, but locally accessible foods, including domesticated dogs and the powdered spines of dried salmon. Such foods were often incorporated in to soups and mixed with dried meat, plants, and berries to extend their nutritional range (see Bouchard and Kennedy 1978: 71).

Late-Holocene subsistence in the Middle Fraser Canyon relied considerably on the acquisition and mass storage of salmon for much of the year, particularly for use during the winter. Salmonids in the area consist of Chinook, Sockeye (*O. nerka*), Pink (*O. gorbuscha*), and Coho (*O. kisutch*), as well as rainbow and cutthroat trout (*O. mykiss* and *O. clarki*), and a variety of char (*Salvelinus Malma*). Of these, Chinook and Sockeye are (and appear to have been in the past) by far the most abundant anadromous populations to make their way into the Canyon, while Pinks appear only every other year, but are relatively abundant when present, and Coho are by far the least common. Other anadromous fishes in the vicinity include the Pacific lamprey (*Lampetra tridentate*) and white sturgeon (*Acipensur transmontanus*). Resident freshwater fish include various suckerfish (*Catostomus* spp.), northern squawfish (*Ptychocheilus oregonensis*), peamouth (*Meilocheilus caurinus*), mountain whitefish (*Prosopium williamsoni*), burbot (*Lota lota*), lake trout (*Salvelinus namaycush*), and two sub-species of sculpin (*Cottus cognatus* and *C. alueticus).*

Salmon were acquired in numerous ways depending on the nature of the sub-species being sought and the prevailing river conditions. Dip nets (or, bag-nets), set-nets, and float nets were typical, as was the use of single, double, and even triple-pronged fishing-spears. Fishing hooks made from bone, wood, or the thorns of River Hawthorn (*Crataegus rivularis*) were also employed. The construction of dams and fish weirs was a common strategy for concentrating large numbers of fish in creeks and lake inlets/outlets (Teit 1906: 227). Wherever, and by whatever means possible, fish were collected throughout the year. For instance, in late winter large numbers of 15-25cm-long Kokanee (land-locked Sockeye salmon) referred to as “floaters”, die and float to the surface of local lakes where they were collected in great quantities (Bouchard and Kennedy 1978: 28).

A wide variety of terrestrial mammals inhabit the Bridge River watershed and surrounding areas. Teit (1909: 77) records that indigenous people in the Mid-Fraser exploited numerous animals, consisting principally of “deer, elk, caribou, marmot, sheep, hare, beaver, grouse, bear, moose, duck, goose, crane, squirrel, [and] porcupine.” Some members of this list are (and presumably were) specific to particular regions within the Upper Lillooet’s hunting grounds or where of greater- or lesser-importance within the subsistence strategy. For example, moose and caribou inhabit the far northern extents of traditional St’át’imc hunting ranges, and while mountain goat (*Oreamnos americana*) was available to some degree in many accessible areas, it was looked upon, for whatever reason, as a less-desirable food option (Teit 1909: 77). Particular to the Upper Lillooet hunting areas were mule deer (*Odocoileus hemionus*), mountain-goat, bighorn sheep (*Ovis canadensis*), and black bear (*Ursus americanus*), in addition to smaller prey like hoary marmot, beaver, rabbit, rock-rabbit, squirrel, and porcupine, and less-commonly sought prey such as panther, lynx, and coyote.

At HP54, the faunal assemblage reflects these observations and greater regional generalities. Both salmon and medium- to large-sized mammals (particularly artiodactyls) are ubiquitous at all levels of the assemblage. Smaller mammals are uncommon, as are the remains of shellfish – the presence of the former in the assemblages is most likely the result of introduction by burrowing and natural deposition and taphonomy, while the latter likely came into the pithouse as tools or raw materials rather than as contributions to the diet.

Salmon remains represented in the assemblage to date are nearly all of the vertebral variety. Though difficult to preserve due to greater fat content, elements from salmon heads are not uncommon in faunal assemblages from elsewhere in the area (Smith *et al*. 2014), and their nutritional utility should not be overlooked. Salmon heads were often boiled at or near the catch site and the abundant oil that resulted from the process was skimmed from the surface of this brew and stored in great quantities for later use (Bouchard and Kennedy 1978: 67; Teit 1906: 224). Further analysis of salmon cranial parts to sub-cranial parts may further elucidate differential part utility of salmon. Later faunal analyses of the (yet-to-be) completed HP54 assemblage may include such a study, which is beyond the scope of this preliminary report, as it represents an incomplete record of the total animal bone assemblage.

The vast majority of mammal bones are recovered are those of medium- to large-sized mammals and are fragmented to a high degree. Much of the evident fragmentation occurred prior to the original discard and deposition of the bones, usually an indication of purposeful breaking and crushing for the extraction of bone marrow and bone grease – both high in calories and excellent sources of fat. The greater frequency of cortical (outer) bone to cancellous (inner, spongy) bone is also an indicator of processing for fat extraction purposes, as spongy bone (common to the larger, thicker proximal and distal portions of long bones) is high in bone grease but must be considerably broken up in order to efficiently extract it through boiling (Binford 1978: 32; Church and Lyman 2003).

Faunal Analysis

The analysis of faunal materials recovered during the 2013 field season were undertaken following widely accepted methods outlined in the corpus of relevant literature (e.g. Cannon 1987; Gilbert 1980; Gilbert *et al*. 1981; Grayson 1984; Lyman 1994; 2008; Reitz and Wing 2008). Faunal materials were recorded and point-provenienced *in situ* whenever possible before collection. All other materials collected in the field were screened through 1/8th-inch mesh on-site. Additional materials were recovered from the heavy fractions of soil flotation samples collected in the field and processed in the lab. All analyses took place in laboratory facilities at the Department of Anthropology at University of Montana, Missoula. All materials were analyzed and identified with the aid of the vertebrate collection housed at the Phillip L. Wright Zoological Museum and Montana Comparative Skeletal Collection at the University of Montana. Wherever possible, specimens were identified to the most distinctive taxonomic level that could be positively ascertained. Specimens were appraised to determine taxon (generally to Class, Genus, and/or Species), element, side (right/left), end (proximal/distal), area (anterior/posterior; lateral/medial; epiphyseal; and particular element features if distinguishable), size range (small/medium/large/medium-large), age range of the individual at death (juvenile/sub-adult/adult/mature), and material type (cortical or cancellous bone/enamel/antler). Other observations were recorded regarding fracture type (irregular/transverse/spiral), (dis)coloration, natural or anthropogenic modification, presence or absence of heat alteration (blackened/burned/calcined). All specimens were recorded by relative size (in millimeters, e.g. 1-9mm, 10-19mm, 20-29mm, 30-39mm, and so on…) (Table 4.13). Size designations were based on the relative size of the animal to which a specimen could be attributed to, *not* the size of the specimen itself (which is recorded as "Size Range"). Size ranges include: small (rodents to rabbit-sized), medium (beaver/fisher- to dog-sized), and large (deer-sized and larger, such as mountain sheep or black bear). Due to the fragmentary nature of most of the specimens an accurate distinction could not be made between fragments belonging to medium- or large-sized animals, in which case the relative size is recorded as medium-large. Among fish specimens, relative size was determined differently than that of mammals, in that fish vertebrae were designated "small" if trout-sized, "medium" if Sockeye-sized, and "large" if Chinook-sized, or in the case of overly-fragmentary specimens, relative size was recorded as "indeterminate". Weight for all samples was recorded for identifiable specimens on a per-specimen basis and bulk weights were taken for all other specimens for each bag based on relative size categories of fragments (i.e. All unidentifiable fragmentary samples measuring 0-9mm from a particular bag would be weighed together, as would all unidentifiable fragmentary samples measuring 10-19mm, and so on).

Other characteristics recorded were anthropogenic modification, including: cut marks, chop marks, incising, polish, scraping/scratching and abrasion, as well as chipping and flaking resulting from percussion, and the effects of heat-alteration. Human modification of bone can be used to infer a variety of behaviors regarding the use of bone in food preparation and other everyday tasks (Reitz and Wing 2008). Cuts and chopping marks can be indicators of field dressing and butchery, and their position can provide insights into how animals were disarticulated. Polishing, scraping, and abrasion are often indicative of use as tools, and use-wear patterns can illustrate how bone tools were utilized for specific tasks such as grinding, abrasion, hide-scraping, or other such use. Chipping and flaking of bone is often the result of purposeful splintering by hard hammer percussion during the process of breakage involved in marrow extraction or reduction for rendering bone grease. In addition, spiral fractures are often the result of percussive force and the twisting of bone associated with marrow extraction (Binford 1978; 1981). Burned bone (and the severity of the heat-alteration present) can be an indicator of how food was prepared for consumption, how close it was to a heat source, and how hot the source may have been. For instance, partially blackened or charred bone may indicate close proximity to fire for a relatively short time, as in the roasting of meat on a spit, while bone that has been completely calcined (white or bluish-white) indicates that the bone was exposed to exceptionally high heat for an extended period of time, perhaps having been discarded directly into the embers of a cooking fire used repeatedly and/or for a lengthy cooking session (see Shipman *et al*. 1984) (see Table 14.13).

Animal modification, such as gnaw marks resulting from carnassial chewing and grinding and the puncture marks (often associated with canid dentition) are also recorded. Gnawing and puncture marks on specimens within the pithouse assemblage may indicate the presence of domesticated dogs. Natural and taphonomic processes such as root-etching, discoloration, and weathering/exfoliation were recorded based on observations of general attrition as compared to the overall condition of comparative specimens that have little or no damage. Taphonomic condition of specimens is based on Behrensmeyer's (1978) categories of weathering severity from 0 to 5, with "0" being virtually pristine, unweathered, osseous material, and "5" being severely deteriorated, crumbling remains. The results of the weathering analysis were highly consistent across the assemblage. While the majority of bone is fragmentary, the overall surface of cortical bone is generally well-preserved, with 99% of specimens falling within Stages 1 and 2, indicating that the overall assemblage had little to no exposure to drastic weathering conditions, likely the result of deposition inside the house.

Summary of Faunal Remains

The faunal assemblage for the 2013 field season consists of 5015 specimens from multiple strata from the BR3 occupation Period. Strata include: Va (the terminal BR3 roof deposit), IIa (terminal BR3 floor), IIb and IIc (distinctive BR3 floors), Vb (BR3 occupation roof), IId, IIe, and IIf (all respective of probable BR3 occupation floors). The Vb roof deposits represent two distinct roofs (designated as Vb1 and Vb2), Vb1 overlaying Stratum IIb in Block B, and Vb2 overlaying Stratum IId in Blocks A and C (see Chapter Two).

Table 4.1 provides a summary of animal taxonomic richness and bone specimen counts by stratum. In addition to counts from each particular stratum, occupation layers (immediately adjacent roof-floor combinations) are included. The faunal remains uncovered during the 2013 excavations are, for the most part, highly fragmentary. Plotting densities of particular taxa by stratum (e.g. bony fishes, various size classes of mammals, etc.) suggest that fish (most notably, salmon) and terrestrial mammals are nearly equally represented within the assemblage overall, but notable differences occur between some strata. This is perhaps best illustrated in the difference between the contents of the IIa and IIb floors, where the former consists of twice as many mammal bone specimens as fish bones, while the latter consists of nearly four times as many fish bones to mammal bone fragments. However, specimen counts must be assessed in light of the fact that significantly more complete fish bones are present as compared to mammal bones. For instance, for the entire 2013 faunal assemblage there are only 14 complete mammal bones. These consist of: (Stratum Va) one beaver (*Castor canadensis*) 1st phalange, and one beaver 2nd phalange; (Stratum IIa) one vestigial metapodial (dewclaw), one 2nd phalange, and two 3rd phalanges, all from mule deer (*O. hemionus*); (Stratum IIb) one mule deer left scapula, one deer tooth (molar), and one deer carpal; (IIc) one mountain sheep (*Ovis canadensis*) 1st phalange; (Vb2) one squirrel (*Sciuridae* spp.) tooth (lower incisor); (IId) one rodent (*Peromyscus maniculatus*) left mandible; and (IIe) one rodent tooth (incisor).

Table 4.1. Animal Taxa by Stratum and Total Numbers of Faunal Specimens by Strata.

Taxon	Strata										
	Stratum Va	Stratum IIa	Stratum IIb	Stratum IIc	Stratum Vb1&2	Stratum IId	Stratum IIe	Stratum IIf	Stratum IIg	Stratum III	Total
Osteichthyes	**239**	**211**	**1305**	**257**	**9**	**187**	**129**	**107**	**0**	**29**	**2473**
Salmonidae	83	140	681	11	9	13	0	0	0	9	946
c.f. *Oncorhynchus nerka*	89	26	511	172	0	139	69	43	0	1	1050
c.f. *Oncorhynchus tshawytscha*	4	23	1	0	0	1	0	0	0	0	29
c.f. *Salmonid* (trout-sized)	20	3	2	1	0	3	6	1	0	2	38
Indeterminate	43	19	110	73	0	31	54	63	0	17	410
Mammalia	**713**	**457**	**362**	**389**	**114**	**216**	**54**	**93**	**11**	**81**	**2490**
Small	6	4	5	0	2	12	2	0	0	0	31
Medium	58	5	56	50	5	100	29	2	0	0	305
Small-Medium	1	2	6	1	0	4	0	0	0	1	15
Large	234	59	110	283	70	64	16	90	11	55	992
Medium-Large	374	225	172	40	31	26	7	1	0	25	901
Undeterminate	40	162	13	15	6	10	0	0	0	0	246
Artiodactyla	**53**	**27**	**36**	**31**	**13**	**10**	**7**	**30**	**0**	**2**	**209**
Indeterminate *Artiodactyl*	3	0	0	0	1	1	0	21	0	0	26
Odocoileus hemionus	48	25	36	29	9	9	7	9	0	2	174
Ovis canadensis	2	2	0	2	3	0	0	0	0	0	9
Carnivora	**4**	**1**	**2**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**12**
Ursus americanus	1	0	0	0	0	0	0	0	0	0	1
U. arctos	0	0	0	0	0	1	0	0	0	0	1
***Canis* sp.**	3	1	2	1	0	3	0	0	0	0	10
Rodentia	**7**	**0**	**4**	**2**	**2**	**9**	**2**	**0**	**0**	**0**	**26**
Castor canadensis	5	**0**	3	**2**	**2**	**2**	0	0	0	0	14
Ondatra zibethicaus	0	**0**	0	**0**	**0**	**2**	0	0	0	0	2
Peromyscus maniculatus	0	**0**	0	**0**	**0**	**1**	0	0	0	0	1
Erethizon dorsatum	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**
Aves	**12**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	**17**
Falconiformes c.f. *Buteo* sp.	0	0	0	1	0	0	0	0	0	0	1
Phasianidae spp.	0	0	0	0	0	0	0	0	0	1	1
Bivalvia	**0**	**0**	**0**		**0**	**19**	**0**	**0**	**0**	**0**	**19**
Ostreidae spp.	0	0	0	0	0	19	0	0	0	0	19
Unidentifiable	**14**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**16**

Stratum Va (Table 4.2)

Stratum Va (the final BR3 roof deposit) contained a total of 918 specimens. Of these, 239 were fish bones, 713 were mammal bones, 12 were avian, and 14 were unidentifiable. Of significance, Va contains considerably more terrestrial mammal remains than fish remains – a substantial amount of which fall within the medium- to large-mammal and the large mammal categories. As this stratum also contains the highest number of identifiable deer bones (in particular) and artiodactyl bones (in general), it is highly likely that many of these medium and large mammal bone fragments belong to deer or other similarly-sized ungulates, most likely mountain sheep. This stratum also contained a proximal fragment of a black bear (*U. americanus*) humerus, displaying evidence of spiral fracture, which may indicate the purposeful shattering of the bone by anthropogenic means. Also of note, the presence of dog, beaver, and an assortment of highly fragmentary bird bones indicate at least some possible degree of widened diet breadth, although the numbers represent significantly low relative frequencies as compared to extant evidence of fish and medium-large mammals.

Table 4.2. Stratum Va Animal Taxa Distribution by Block.

Taxon		**Stratum Va Taxon by Block**			
	A	B	C	D	**Stratum Va Assemblage**
Osteichthyes	**37**	**1**	**67**	**134**	**239**
Salmonidae	32	1	47	3	**83**
c.f. *Oncorhynchus nerka*	0	0	19	70	**89**
c.f. *Oncorhynchus tshawytscha*	3	0	1	0	**4**
c.f. Salmonid (trout0sized)	0	0	0	20	**20**
Indeterminate	2	0	0	41	**43**
Mammalia	**63**	**9**	**320**	**321**	**713**
Small	1	0	3	2	**6**
Medium	3	0	7	48	**58**
Small0Medium	0	0	1	0	**1**
Large	4	2	76	152	**234**
Medium0Large	50	5	210	109	**374**
Undeterminate	5	2	23	10	**40**
Artiodactyla	**10**	**1**	**27**	**15**	**53**
Indeterminate *Artiodactyl*	0	0	0	3	**3**
Odocoileus hemionus	10	1	27	10	**48**
Ovis canadensis	0	0	0	2	**2**
Carnivora	**0**	**0**	**4**	**0**	**4**
Ursus americanus	**0**	**0**	**1**	**0**	**1**
U. arctos	**0**	**0**	**0**	**0**	
***Canis* sp.**	**0**	**0**	**3**	**0**	**3**
Rodentia	**0**	**0**	**4**	**3**	**7**
Castor canadensis	0	0	2	3	**5**
Ondatra zibethicaus	0	0	0	0	**0**
Peromyscus maniculatus	0	0	0	0	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**0**	**0**	**2**	**10**	**12**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**0**	**14**	**14**

Stratum IIa (Table 4.3)

Stratum IIa (the final BR3 floor deposit directly beneath the Va roof) contained a total of 669 specimens. Of these, 211 were fish bones, 457 were mammal bones, and 1 was unidentifiable. Similar to its associated roof deposit (Va), IIa contains considerably more terrestrial mammal remains than those of fish. Also, as with Va, IIa contains a substantial amount bone fragments of medium-large and large-sized mammals, likely those of deer or mountain sheep. This stratum also contained mid-shaft fragment of a dog (*Canis* spp.) tibia, indicating the presence of either coyote (*C. latrans*) or the possibility of similar-sized domestic dog during this occupation.

Table 4.3. Stratum IIa Animal Taxa Distribution by Block.

Taxon		Stratum IIa Taxon by Block			
	A	B	C	D	Stratum IIa Assembalge
Osteichthyes	**33**	**9**	**157**	**12**	**211**
Salmonidae	33	7	100	0	**140**
c.f. *Oncorhynchus nerka*	0	0	25	1	**26**
c.f. *Oncorhynchus tshawytscha*	0	0	23	0	**23**
c.f. *Salmonid* (trout-sized)	0	1	1	1	**3**
Indeterminate	0	1	8	10	**19**
Mammalia	**64**	**236**	**140**	**17**	**457**
Small	0	1	3	0	**4**
Medium	1	0	4	0	**5**
Small-Medium	2	0	0	0	**2**
Large	15	17	18	9	**59**
Medium-Large	44	80	93	8	**225**
Undeterminate	2	138	22	0	**162**
Artiodactyla	**13**	**4**	**10**	**0**	**27**
Indeterminate *Artiodactyl*	0	0	0	0	**0**
Odocoileus hemionus	12	4	9	0	**25**
Ovis canadensis	1	0	1	0	**2**
Carnivora	**0**	**0**	**1**	**0**	**1**
Ursus americanus	**0**	**0**	**0**	**0**	**0**
U. arctos	**0**	**0**	**0**	**0**	**0**
***Canis* sp.**	**0**	**0**	**1**	**0**	**1**
Rodentia	**0**	**0**	**0**	**0**	**0**
Castor canadensis	**0**	**0**	**0**	**0**	**0**
Ondatra zibethicaus	**0**	**0**	**0**	**0**	**0**
Peromyscus maniculatus	**0**	**0**	**0**	**0**	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**0**	**0**	**0**	**0**	**0**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**1**	**0**	**1**

Strata Vb1 and IIb (Table 4.4)

Strata Vb1 and IIb (representing a roof-floor occupation sequence) contained a collective total of 669 specimens. Of these, 1305 were fish bones, 459 were mammal bones, and 1 specimen was unidentifiable. The Vb1-IIb sequence shows a significant increase in the amount of fish bones deposited on the IIb floor, but absent among the roof deposit. Mammal bones are not uncommon, and appear in both the roof and floor, but are considerably less frequent relative to those of fish. Other animals present in the occupation sequence consist of dog, beaver, porcupine (*Erethizon dorsatum*), and a small assortment of highly fragmented bird remains.

Table 4.4. Strata Vb-IIb Animal Taxa Distribution by Block* (*Block B only).

Taxon	Vb1-IIb Occupation Faunal Distribution		
	Stratum Vb1	Stratum IIb	Vb1-IIb Occupatior
Osteichthyes	**0**	**1305**	**1305**
Salmonidae	**0**	681	681
c.f. *Oncorhynchus nerka*	**0**	511	511
c.f. *Oncorhynchus tshawytscha*	**0**	1	1
c.f. *Salmonid* (trout-sized)	**0**	2	2
Indeterminate	**0**	110	110
Mammalia	**97**	**362**	**459**
Small	**1**	5	6
Medium	**5**	56	61
Small-Medium	**0**	6	6
Large	**63**	110	173
Medium-Large	**22**	172	194
Undeterminate	**6**	13	19
			0
Artiodactyla	**11**	**36**	**47**
Indeterminate *Artiodactyl*	**0**	0	0
Odocoileus hemionus	**8**	36	44
Ovis canadensis	**3**	0	3
			0
Carnivora	**0**	**2**	**2**
Ursus americanus	**0**	0	0
U. arctos	**0**	0	0
***Canis* sp.**	**0**	2	2
			0
Rodentia	**2**	**4**	**6**
Castor canadensis	**2**	3	5
Ondatra zibethicaus	**0**	0	0
Peromyscus maniculatus	**0**	0	0
			0
Erethizon dorsatum	**1**	**0**	**1**
			0
***Scuriudae* sp.**	**0**	**0**	**0**
			0
Aves	**0**	**2**	**2**
Falconiformes c.f. *Buteo* sp.		0	0
Phasianidae spp.	**0**	0	0
	0		0
Bivalvia		**0**	**0**
Ostreidae spp.	**0**	0	0
			0
Unidentifiable		**1**	**1**

Stratum IIc (Table 4.5)

The Stratum IIc (singular floor deposit) consisted of a total of 647 faunal specimens. Of these, 257 were from fish, 389 were mammal bones, and 1 was bird. The bird bone consisted of a cranial fragment that compares favorably to that of a hawk (*Buteo* sp.). In addition to salmon and artiodactyls, the IIc floor also contained remains of dog and beaver.

Table 4.5. Stratum IIc Animal Taxa Distribution by Block.

Taxon		Stratum IIc Taxon by Block			
	A	B	C	D	Stratum IIc Assemblage
Osteichthyes	**12**	**2**	**243**	**0**	**257**
Salmonidae	11	0	0	**0**	**11**
c.f. *Oncorhynchus nerka*	1	0	171	**0**	**172**
c.f. *Oncorhynchus tshawytscha*	0	0	0	**0**	**0**
c.f. *Salmonid* (trout-sized)	0	1	0	**0**	**1**
Indeterminate	0	1	72	**0**	**73**
Mammalia	**51**	**48**	**290**	**0**	**389**
Small	0	0	0	**0**	**0**
Medium	3	7	40	**0**	**50**
Small-Medium	0	0	1	**0**	**1**
Large	5	40	238	**0**	**283**
Medium-Large	28	1	11	**0**	**40**
Undeterminate	15	0	0	**0**	**15**
Artiodactyla	**2**	**1**	**28**	**0**	**31**
Indeterminate *Artiodactyl*	0	0	0	**0**	**0**
Odocoileus hemionus	2	1	26	**0**	**29**
Ovis canadensis	0	0	2	**0**	**2**
Carnivora	**0**	**0**	**1**	**0**	**1**
Ursus americanus	**0**	**0**	**0**	**0**	**0**
U. arctos	**0**	**0**	**0**	**0**	**0**
Canis sp.	**0**	**0**	**1**	**0**	**1**
Rodentia	**1**	**0**	**1**	**0**	**2**
Castor canadensis	1	0	1	**0**	**2**
Ondatra zibethicaus	0	0	0	**0**	**0**
Peromyscus maniculatus	0	0	0	**0**	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**1**	**0**	**0**	**0**	**1**
Falconiformes c.f. *Buteo* sp.	**1**	**0**	**0**	**0**	**1**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**0**	**0**	**0**

Strata Vb2 and IId

Strata Vb2 and IId (representing a roof-floor occupation sequence) contained a collective total of 448 specimens. Of these, 196 were fish bones, 233 were mammal bones, and 19 specimens were those of the bivalve class of *Ostriedae*, or “True Oysters”, most likely the remains of *Ostrea conchaphila*, the native Pacific “Rock” Oyster. The oyster remains were greatly deteriorated and are prone to relatively rapid disintegration upon exposure but portions of hinge and shell seam allowed for their positive identification. It is possible that the presence of oyster shell in the assemblage represents trade from the coast in shell as raw material because such a small sample is not likely to have been introduced as a subsistence food product. Morin (2004) has proposed that shell knives may have been quite effective for the purposes of salmon processing, and the hard, easily sharpened edge of oyster shell may have been a valuable introduced commodity for the task of processing multitudes of salmon during a short period of time as was often the case during the larger spring and late summer salmon runs along the Mid-Fraser.

The Vb2-IId sequence exhibits an increase in the amount of rodent bones deposited on the IId floor relative to other floors in the overall sequence, including both medium-sized rodents, beaver and muskrat (*O. zibethicus*) and the much smaller deer mouse (*P. maniculatus*). In addition to these relatively small mammals, the IId floor also contained a fragmented and highly deteriorated portion of the atlas bone (1st cervical vertebra) of a brown bear (*U. arctos*) that exhibited a series of fine perpendicular cut marks along the base of the anterior arch, possibly the result of the removal of the animal's head during butchery. The presence of bear remains at HP54 is interesting but should not be all too unexpected. Teit (1906: 218, 254) and Native sources attest to the people living at Bridge River as being of the Bear Clan and having used bear masks during ceremonies and bear skins for more utilitarian purposes. Numerous sources describe bear as having been hunted (e.g. Bouchard and Kennedy 1978: 52; Teit 1906: 225). In addition to these remains, dog bones were present in small quantity on the IId floor. Mammal bones and fish bones are nearly equally common across the Stratum, but distinctly medium-sized mammal bones are far more common than elsewhere. This, coupled with the identifiable presence of two types of fur-bearing semi-aquatic mammals, may be evidence for the processing of hides for furs during this occupation, probably for the manufacture of warm clothing or perhaps for trade.

Table 4.6. Stratum Vb2-IId Animal Taxa Distribution by Block.

Taxon	Vb2-IId Occupation Faunal Distribution		
	Stratum Vb2	Stratum IId	Vb1-IIb Occupatior
Osteichthyes	**9**	**187**	**196**
Salmonidae	**9**	13	22
c.f. *Oncorhynchus nerka*	**0**	139	139
c.f. *Oncorhynchus tshawytscha*	**0**	1	1
c.f. *Salmonid* (trout-sized)	**0**	3	3
Indeterminate	**0**	31	31
Mammalia	**17**	**216**	**233**
Small	**1**	12	13
Medium	**0**	100	100
Small-Medium	**0**	4	4
Large	**7**	64	71
Medium-Large	**9**	26	35
Undeterminate	**0**	10	10
Artiodactyla	**2**	**10**	**12**
Indeterminate *Artiodactyl*	**1**	1	2
Odocoileus hemionus	**1**	9	10
Ovis canadensis	**0**	0	0
Carnivora	**0**	**4**	**4**
Ursus americanus	**0**	0	0
U. arctos	**0**	1	1
***Canis* sp.**	**0**	3	3
Rodentia	**0**	**9**	**9**
Castor canadensis	**0**	**2**	2
Ondatra zibethicaus	**0**	**2**	2
Peromyscus maniculatus	**0**	**1**	1
Erethizon dorsatum	**0**	**0**	**0**
***Scuriudae* sp.**	**1**	**0**	**1**
Aves	**0**	**0**	**0**
Falconiformes c.f. *Buteo* sp.	**0**	0	0
Phasianidae spp.	**0**	0	0
Bivalvia	**0**	**19**	**19**
Ostreidae spp.		19	19
Unidentifiable	**0**	**0**	**0**

Stratum IIe (Table 4.7)

The Stratum IIe (singular floor deposit) consisted of a total of 183 faunal specimens. Of these, 129 are from fish, and 54 are mammal bones. As excavations in this Stratum are incomplete, further description will be included in forthcoming excavation report(s).

Table 4.7. Stratum IIe Animal Taxa Distribution by Block.

Taxon		**Stratum IIe Taxon by Block**			
	A	**B**	**C**	**D**	**Stratum IIe Assemblage**
Osteichthyes	**123**	**0**	**6**	**0**	**129**
Salmonidae	0	0	0	**0**	**0**
c.f. *Oncorhynchus nerka*	66	0	3	**0**	**69**
c.f. *Oncorhynchus tshawytscha*	0	0	0	**0**	**0**
c.f. *Salmonid* (trout-sized)	6	0	0	**0**	**6**
Indeterminate	51	0	3	**0**	**54**
Mammalia	**42**	**0**	**12**	**0**	**54**
Small	1	0	1	**0**	**2**
Medium	29	0	0	**0**	**29**
Small-Medium	0	0	0	**0**	**0**
Large	5	0	11	**0**	**16**
Medium-Large	7	0	0	**0**	**7**
Undeterminate	0	0	0	**0**	**0**
Artiodactyla	**2**	**0**	**5**	**0**	**7**
Indeterminate *Artiodactyl*	0	**0**	0	0	**0**
Odocoileus hemionus	2	**0**	5	0	**7**
Ovis canadensis	0	**0**	0	0	**0**
Carnivora	**0**	**0**	**0**	**0**	**0**
Ursus americanus	**0**	**0**	**0**	**0**	**0**
U. arctos	**0**	**0**	**0**	**0**	**0**
***Canis* sp.**	**0**	**0**	**0**	**0**	**0**
Rodentia	**1**	**0**	**1**	**0**	**2**
Castor canadensis	0	**0**	0	0	**0**
Ondatra zibethicaus	0	**0**	0	0	**0**
Peromyscus maniculatus	0	**0**	0	0	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**0**	**0**	**0**	**0**	**0**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**0**	**0**	**0**

Stratum IIf (Table 4.8)

The Stratum IIf (singular floor deposit) consisted of a total of 200 faunal specimens. Of these, 107 are from fish, and 93 are mammal bones. As excavations in this Stratum are incomplete, further description will be included in forthcoming excavation report(s).

Table 4.8. Stratum IIf Animal Taxa Distribution by Block.

Taxon		Stratum IIf Taxon by Block			
	A	B	C	D	Stratum IIf Assemblage
Osteichthyes	**107**	**0**	**0**	**0**	**107**
Salmonidae	0	**0**	**0**	**0**	0
c.f. *Oncorhynchus nerka*	43	**0**	**0**	**0**	43
c.f. *Oncorhynchus tshawytscha*	0	**0**	**0**	**0**	0
c.f. *Salmonid* (trout-sized)	1	**0**	**0**	**0**	1
Indeterminate	63	**0**	**0**	**0**	63
Mammalia	**90**	**0**	**0**	**3**	**93**
Small	0	**0**	**0**	**0**	**0**
Medium	2	**0**	**0**	**0**	**2**
Small-Medium	0	**0**	**0**	**0**	**0**
Large	87	**0**	**0**	**3**	**90**
Medium-Large	1	**0**	**0**	**0**	**1**
Undeterminate	0	**0**	**0**	**0**	**0**
Artiodactyla	**27**	**0**	**0**	**3**	**30**
Indeterminate *Artiodactyl*	20	0	0	1	**21**
Odocoileus hemionus	7	0	0	2	**9**
Ovis canadensis	0	0	0	0	**0**
Carnivora	**0**	**0**	**0**	**0**	**0**
Ursus americanus	**0**	**0**	**0**	**0**	**0**
U. arctos	**0**	**0**	**0**	**0**	**0**
***Canis* sp.**	**0**	**0**	**0**	**0**	**0**
Rodentia	**0**	**0**	**0**	**0**	**0**
Castor canadensis	0	0	0	0	**0**
Ondatra zibethicaus	0	0	0	0	**0**
Peromyscus maniculatus	0	0	0	0	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**0**	**0**	**0**	**0**	**0**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**0**	**0**	**0**

Stratum IIg (Table 4.9)

The Stratum IIg (singular floor deposit) consists currently of a total of 11 faunal specimens, all of which are the fragmented remains of large mammal. As excavations in this Stratum are incomplete, further description will be included in the forthcoming excavation report for the 2014 field season.

Table 4.9. Stratum IIg Animal Taxa Distribution by Block.

Taxon		**Stratum IIg Taxon by Block**			
	A	B	C	D	**Stratum IIg Assemblage**
Osteichthyes	**0**	**0**	**0**	**0**	**0**
Salmonidae	**0**	**0**	**0**	**0**	**0**
c.f. *Oncorhynchus nerka*	**0**	**0**	**0**	**0**	**0**
c.f. *Oncorhynchus tshawytscha*	**0**	**0**	**0**	**0**	**0**
c.f. *Salmonid* (trout-sized)	**0**	**0**	**0**	**0**	**0**
Indeterminate	**0**	**0**	**0**	**0**	**0**
Mammalia	**11**	**0**	**0**	**0**	**11**
Small	0	0	0	0	0
Medium	0	0	0	0	0
Small-Medium	0	0	0	0	0
Large	11	0	0	0	**11**
Medium-Large	0	0	0	0	0
Undeterminate	0	0	0	0	0
Artiodactyla	**0**	**0**	**0**	**0**	**0**
Indeterminate *Artiodactyl*	**0**	**0**	**0**	**0**	**0**
Odocoileus hemionus	**0**	**0**	**0**	**0**	**0**
Ovis canadensis	**0**	**0**	**0**	**0**	**0**
Carnivora	**0**	**0**	**0**	**0**	**0**
Ursus americanus	**0**	**0**	**0**	**0**	**0**
U. arctos	**0**	**0**	**0**	**0**	**0**
***Canis* sp.**	**0**	**0**	**0**	**0**	**0**
Rodentia	**0**	**0**	**0**	**0**	**0**
Castor canadensis	**0**	**0**	**0**	**0**	**0**
Ondatra zibethicaus	**0**	**0**	**0**	**0**	**0**
Peromyscus maniculatus	**0**	**0**	**0**	**0**	**0**
Erethizon dorsatum	**0**	**0**	**0**	**0**	**0**
***Scuriudae* sp.**	**0**	**0**	**0**	**0**	**0**
Aves	**0**	**0**	**0**	**0**	**0**
Bivalvia	**0**	**0**	**0**	**0**	**0**
Ostreidae spp.	**0**	**0**	**0**	**0**	**0**
Unidentifiable	**0**	**0**	**0**	**0**	**0**

Stratum III (Table 4.10)

The Stratum III (singular floor deposit) consists currently of a total of 112 faunal specimens. Of these, 29 specimens are from fish, 81 are from mammals, and 2 are bird. One of the bird bone specimens is a diaphyseal portion of a *Phasianidae* sp. scapula, likely that of a pheasant, quail, or similarly-sized bird.

Table 4.10. Stratum III Animal Taxa Distribution by Block.

Taxon		Stratum III Taxon by Block			
	A	B	C	D	Stratum III Assemblage
Osteichthyes	0	0	29	0	29
Salmonidae	0	0	9	0	9
c.f. *Oncorhynchus nerka*	0	0	1	0	1
c.f. *Oncorhynchus tshawytscha*	0	0	0	0	0
c.f. *Salmonid* (trout-sized)	0	0	2	0	2
Indeterminate	0	0	17	0	17
Mammalia	0	0	81	0	81
Small	0	0	0	0	0
Medium	0	0	0	0	0
Small-Medium	0	0	1	0	1
Large	0	0	55	0	55
Medium-Large	0	0	25	0	25
Undeterminate	0	0	0	0	0
Artiodactyla	0	0	2	0	2
Indeterminate *Artiodactyl*	0	0	0	0	0
Odocoileus hemionus	0	0	2	0	2
Ovis canadensis	0	0	0	0	0
Carnivora	0	0	0	0	0
Ursus americanus	0	0	0	0	0
U. arctos	0	0	0	0	0
***Canis* sp.**	0	0	0	0	0
Rodentia	0	0	0	0	0
Castor canadensis	0	0	0	0	0
Ondatra zibethicaus	0	0	0	0	0
Peromyscus maniculatus	0	0	0	0	0
Erethizon dorsatum	0	0	0		0
***Scuriudae* sp.**	0	0	0	0	0
Aves	0	0	2	0	2
Phasianidae spp	0	0	1	0	1
Bivalvia	0	0	0	0	0
Ostreidae spp.	0	0	0	0	0
Unidentifiable	0	0	0	0	0

Strata XVI and XVII

Excavations in Strata XVI and XVII are as yet incomplete and the faunal assemblage from each is currently partial and therefor non-representative of future discoveries. Further excavations will be detailed in the report of investigations for 2014.

Heavy Fractions

Identifiable faunal remains from heavy fraction samples were few. Only two heavy fraction samples yielded somewhat identifiable fragments of faunal materials that could be quantified. These consisted of only a few specimens of highly fragmentary (crumbling) mid-shaft long bone fragments from a medium- or large-sized mammal and selenodont tooth fragments from an indeterminable artiodactyl. Tooth specimens were likely from a single tooth but were too small (each specimen <4mm) to identify further and too few to register any significant weight. The assortment of disintegrated long bone fragments, all under 5mm in length (except for one specimen consisting of the partially-carbonized remains of a third phalange of a deer with portions of the proximal articular surface intact). Even this specimen was too badly degenerated to determine any additional information.

Quantitative Indices

Given the generally dichotomous nature of the HP54 faunal assemblage (consisting largely of the remains of two general types of animals: i.e. fish and mammals, principally and respectively: salmon and deer), a valuable way of assessing the relationships between these key subsistence resources is to look at their abundance in the assemblage relative to one another. Broughton (1994) describes "a simple quantitative index of the relative abundance" of fish and mammals as the "mammal/fish index". The mammal/fish index is defined as:

$$\Sigma \textbf{ Mammals} / \Sigma \textbf{ (Mammals + Fish)}$$

This simple equation provides a ratio between the relative abundance of fish as compared to mammals (or *vice versa*) as a number between 0 and 1. The closer the resulting number is to "1" the more relatively abundant that resource is. Table 4.11 provides a rundown of the relative abundances of *identifiable* salmon and *identifiable* artiodactyls. These results indicate generally very low reliance on artiodactyls and very high reliance on salmon (the inverse of the artiodactyl index number is the salmon index, e.g. the artiodactyl index for Stratum Va of 0.212851406 can also be read as a salmon index of 0.787148594, from which can be basically inferred that roughly 78% of remains represented in the sample are those of salmon, and thus that salmon provided ¾ of the diet garnered from animal protein.

However, if we look at total numbers of individual specimens rather than identifiable specimens, the results become more provocative (given the highly fragmentary nature of the majority of medium and large mammal long bones, this is a heuristically valuable concession). Table 4.12 provides a view of the relative abundances of all fish bones to all medium- to large-sized and large-sized mammals (as an indicator of a hunting strategy focused on the acquisition of larger bodied prey). This index may provide a more accurate vision of subsistence strategies at different occupation levels, because it accounts for the large numbers of larger mammal bones that cannot be designated to greater degrees due to high levels of attrition. For instance, as can be observed in Table 4.12, the occupation Va-IIa presents the possibility that medium and large mammals may have provided for a large portion of the diet, even while salmon remained a significant contribution as well (when considering overall numbers). In contrast, the Vb1-IIb occupation indicates a shift in subsistence toward a focus on fish resources even while the overall mammal specimen numbers remain similar to previous exploitation. This likely indicates a genuine increase in the importance of salmon during this occupation, as numbers of terrestrial mammals do not wane, but fish numbers increase substantially. This could also mark increased human population, necessitating an increase in fish acquisition. Further data will stimulate further analyses along these lines.

Table 4.11. Σ Artiodactyl / Σ (Artiodactyl+Salmon) Relative Abundance Index for all Strata.

Artiodactyl Index by Stratum			
Strata	**Salmon NISP**	**Artiodactyl NISP**	**Artiodactyl Index**
Stratum Va	196	53	0.212851406
Stratum IIa	192	27	0.123287671
Occ Va-IIa	388	80	**0.170940171**
Stratum IIb	1195	36	0.029244517
Stratum Vb1	0	11	1
Occ Vb1-IIb	1195	47	**0.03784219**
Stratum IIc	184	31	0.144186047
Stratum IId	156	10	0.060240964
Stratum Vb2	9	2	0.181818182
Occ Vb2-IId	165	12	**0.06779661**
Stratum IIe	75	7	0.085365854
Stratum IIf	44	30	0.405405405
Stratum IIg	0	0	-
Stratum III	12	2	0.142857143

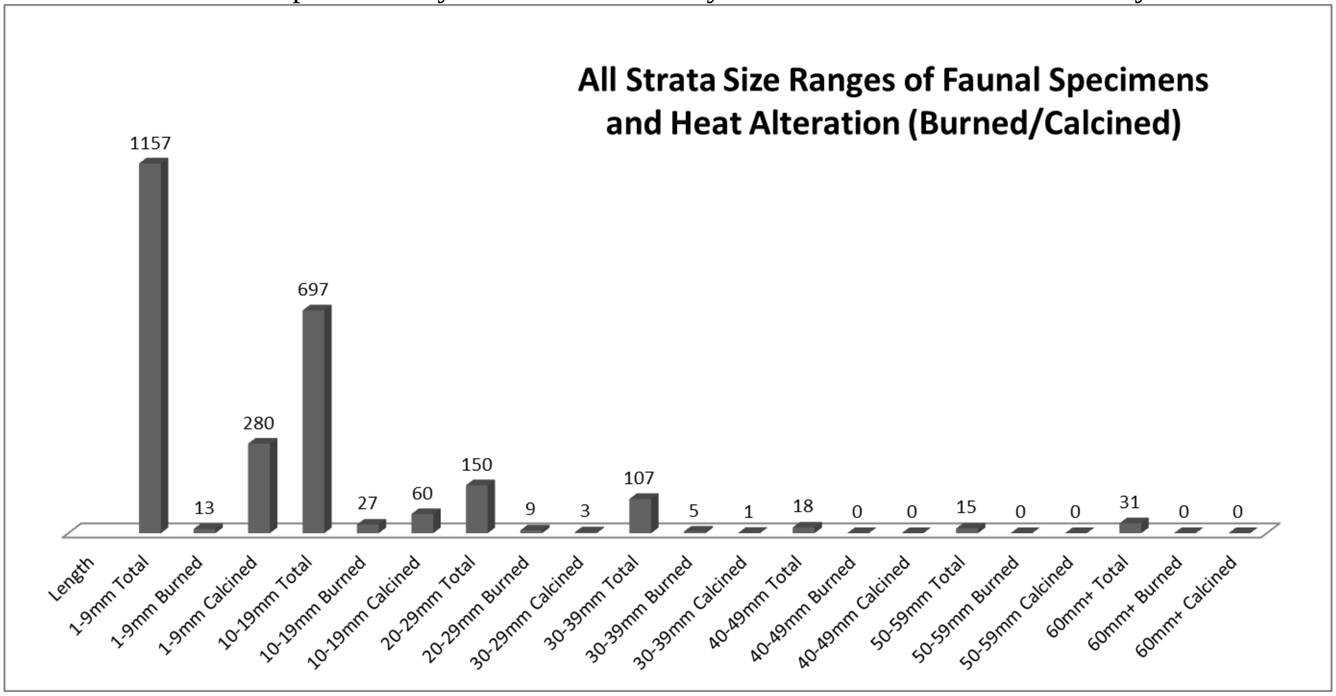
Table 4.12. Σ Medium and Large Mammals / Σ (M-L Mammals + All Fish) Relative Abundance Index for all Strata.

Medium-Large Mammal Index by Stratum			
Strata	**Fish NISP**	**ML-L Mammal NISP**	**ML-L Mammal Index**
Stratum Va	239	608	0.717827627
Stratum IIa	211	284	0.573737374
Occ Va-IIa	450	892	**0.664679583**
Stratum IIb	1305	282	0.177693762
Stratum Vb1	0	85	1
Occ Vb1-IIb	1305	367	**0.219497608**
Stratum IIc	257	323	0.556896552
Stratum IId	187	90	0.324909747
Stratum Vb2	9	16	0.64
Occ Vb2-IId	196	106	**0.350993377**
Stratum IIe	129	23	0.151315789
Stratum IIf	107	91	0.45959596
Stratum IIg	0	11	1
Stratum III	29	80	0.733944954

Bone Attrition: Fragment Size and Heat Alteration

As mentioned above, all but 14 specimens in the assemblage are fragmentary. Table 4.13 illustrates the distribution of specimen sizes from all strata, indicating the severity of fragmentation among all samples. As can also be observed, the frequency of heat alteration, particularly the degree of calcination, is much greater among smaller fragments. As discussed above, the degree to which bone is fragmented may be an indicator of processing for marrow or bone grease. Clearly, as bone fragments become larger they are less likely to have been exposed to and altered by heat. In the 2013 assemblage, fragments larger than 40mm show no sign of exposure to heat. The greater frequency of calcination and burning among smaller specimens is likely the result of very small pieces of bone being aggregated at sources of extreme heat, most probably the product of having being swept into hearths during cleaning occasions.

Table 4.13. Sizes of Specimens by Strata and Summary of Burned and Calcined Bone by Strata.



Conclusions

The 2013 excavation at Housepit 54 generated 5015 faunal specimens (representing 16 taxa, including three identifiable varieties of salmonids, two ungulates, two bear sub-species, canids, three rodent species including two medium fur-bearing species, porcupine, squirrel, two bird Genera including *Galliformes* and *Falconiformes*, and one species of *Bivalvia*). These findings provide a framework for stimulating preliminary assessments of animal utilization and household predation decision-making at HP54 during the BR3 Period. This data indicates that during the Va-IIa occupation terrestrial mammals were a commonly-acquired resource, with large and medium-large mammals dominating the assemblage. This may be an indicator of increased human population in the pithouse necessitating an increased reliance on terrestrial mammals as a major source of food, or it may be an indicator of seasonality, such as in mid- to late-Fall during which wide-scale hunting occurred. The results may also be a matter of taphonomy, given conditions in which large quantities of salmon bones may be absent simply due to discard of trash during cleaning of the household area. Earlier occupations display contrasting strategies during Vb1-IIb and Vb2-IId. Vb1-IIb indicates a distinct concentration on fish resources with a notable decline in terrestrial resources (though terrestrial animals are still most represented by larger-sized animals). Vb2-IId illuminates an occupation highly reliant on salmon, but still procuring terrestrial mammals of various diverse types, possibly indicating a wider diet-breadth than subsequent occupations. The Vb2-IId assemblage also offers evidence for long distance trade, evincing the potential acquisition of coastal resources (such as oysters) as well as the possibility of hide/fur production possibly for inter-village use or export. The IIc occupation suggests a slightly higher degree of terrestrial mammal acquisition than in earlier strata (although the development of currently incomplete data may alter this observation). This observation fits well with the lithic data (see Chapter Three) that suggest increased markers of hunting during IIc. These results suggest that the subsistence decisions made at Housepit 54 varied over time and to different degrees. The dynamic use of subsistence resources will be further illustrated as excavations continue, providing a greater understanding of changing socio-economic conditions and organizational processes over time within the household. Further data and analyses will provide more accurate and comprehensive representations of household subsistence practices during discrete occupations of the pithouse through time, and offer valuable insights into the lifeways of Mid-Fraser pithouse communities.

References Cited

Behrensmeyer, Anna K.

1978 Taphonomic and Ecologic Information from Bone Weathering. *Paleobiology* 2: 150-162.

Binford, Lewis R.

1978 *Nunamiut Ethoarchaeology*. Academic Press, New York.

1981 *Bones, Ancient Man and Modern Myths*. Academic Press, New York.

Bouchard, Randy, and Dorothy L.D. Kennedy

1978 Lillooet Stories. *Sound Heritage*, Vol. 6, No. 1, pp. 1-78.

Broughton, Jack M.

1994 Declines in Mammalian Foraging Efficiency during the late Holocene, San Francisco Bay, California. *Journal of Anthropological Archaeology*, Vol. 13: 371-401.

Cannon, Debbi Yee

1987 *Marine Fish Osteology: A Manual for Archaeologists*. Simon Fraser University, Department of Archaeology Publication, No. 18. Burnaby, British Columbia.

Church, Robert R., and R. Lee Lyman

2003 Small Fragments Make Small Differences in Efficiency when Rendering Grease from Fractured Artiodactyl Bones by Boiling. *Journal of Archaeological Science*, 30:1077-1084.

Gilbert, B. Miles.

1980 *Mammalian Osteology*. B.M. Gilbert.

Gilbert, B. Miles, Martin, L. D., and Savage, H. G.

1981 *Avian Osteology*. B.M. Gilbert.

Grayson, Donald K.

1984 *Quantitative Zooarchaeology*. New York: Academic Press.

Lyman, R. Lee

1994 *Vertebrate Taphonomy*. Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge.

2008 *Quantitative Paleozoology*. Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge.

Morin, Jesse
2004 Cutting Edges and Salmon Skin: Variation in Salmon Processing Technology on the Northwest Coast. *Canadian Journal of Archaeology*, Vol. 28: 2281-318.

Reitz, Elizabeth J., and Elizabeth S. Wing
2008 *Zooarchaeology*. Cambridge Manuals in Archaeology, Cambridge University Press, Cambridge.

Shipman, P., G. Foster, and M. Schoeninger
1984 Burnt Bones and Teeth: An Experimental Study of Color, Morphology, Crystal Structure and Shrinkage. *Journal of Archaeological Science* 11: 307-325.

Teit, James A.
1906 *The Lillooet Indians*. Memoirs of the American Museum of Natural History 4(5). American Museum of Natural History.

1909 *The Shuswap*. Memoirs of the American Museum of Natural History 4(7). American Museum of Natural History.

Chapter Five

Conclusions

(Anna Marie Prentiss)

The 2013 investigations at Housepit 54 within the Bridge River site focused on excavation of a sequence up floor and roof deposits that date mid- to late in the Bridge River 3 (BR3) period. Most progress in excavation centered in Blocks A-C (Appendix A) while limited excavation occurred in Block D. Floor strata excavated included IIa, IIb, IIc, IId, IIe, and IIf; the latter two floors were exposed on in Block A. Stratum IId was exposed in Blocks A and C. We also excavated portions of three roof deposits designated as Va, Vb1, and Vb2. Excavations recovered 39 features, 5647 lithic artifacts (5263 flakes and 384 tools and cores), one small wooden harpoon tip, and 5015 faunal remains. Additional data were collected from paleoethnobotanical remains from the house floor and associated features, and geochemical signatures from the house floor. This chapter provides a brief summary of results and conclusions.

Five new radiocarbon dates were presented in this report. Three of these establish dates for the Va and Vb1 roofs in a range spanning 1092-1338 cal. B.P. at two sigmas. Representation of Va in Blocks A and B can be tentatively established as the same roof given statistical similarity of their respective dates. In contrast, Vb1 is clearly an older roof, fitting with its stratigraphic position below IIa in Block B. The other two dates establish the fact that Stratum VXI (bench), as defined in the 2012 field season is most likely the upper strata of Stratum III, rim, dating to very late BR 3 times. Indeed, the 1047+/-31 B.P. date on Feature D2 suggests that HP 54 may have been the last or at least one of the very last houses surviving during the late BR abandonment of the Bridge River site.

Analysis of floor and roof sediments provided some insight on housepit formation processes. Briefly, the HP 54 floors appear to have accumulated via progressive addition of sediments over older floors. Given little evidence for clean-up related disturbance to artifacts and faunal remains on the floors, it would appear that once residents decided that a new floor was in order, they simply covered the old one over, leaving discarded lithic tools, debitage, animal bones, plant materials, and other items in place, effectively preserving them. Roofs do not appear to have been changed after every floor. Also, the BR 3 roofs do not cover the entire floors below. This suggests that roof burning may have followed only after substantial clearing of roof materials prior to burning. Once these remnants of roofs burned and fell, they were simply covered over with their associated floors by inhabitants engaged in creation of the next floor. The presence of post-holes on many floors indicates that roofs were supported by post structures. Regardless, there were still fewer post-holes than expected for a roof of this size. This raises the possibility that select posts simply rested on the floor as we discovered in the Fur Trade period occupation sediments. Distributions of features on floors suggested a relatively consistent pattern in the use of space. Virtually every floor stratum within each excavation block generated one or more hearths and associated tools and food remains. Geochemical results confirm complex relationships between features and geochemical signatures in floor sediments. While much more extensive analysis of spatial relationships will be necessary, it is evident that the BR 3 floors were occupied by multiple domestic units – most likely families whose lives were focused on spaces positioned around the perimeter of the house floor. Spatial analyses following after the 2014 field season (Year 3 of this grant) will benefit from more complete coverage of each floor and a significantly higher number of deeper floors. We expect analyses to focus on further defining family activity space, special activity areas, clean-up and dump zones, and markers of individual uses of space with a focus on gender and age-related groups.

Lithic artifacts demonstrate a number of provocative patterns. Limited sampling of early dating floors (IId, IIe, and IIf) suggests technological investments in wood working and a reduced focus on transportable hunting gear (bifaces and projectile points). Middle depth floors (IIb and IIc) have a much increased proportion of likely hunting–related gear. Stratum IIa and its associated roof, Va, illustrate a highly diverse range of activities with no dominant focus on any single class of artifacts. Implications are that the Va/IIa stratum sediments represent the most demographically dense occupation and this is supported by the fire-cracked data in Chapter Two. It is possible that the middle strata reflect more gearing up operations for hunting while the deeper floors reflect more preparation for fishing. However, this does not necessarily mean that faunal remains will directly corroborate these results. For example, if gear was prepared for extended hunting trips but only dried meat and hides returned then counts of faunal remains would be inverse to that of tools. Lithic artifacts will continue to be essential as we develop research drawing from more complete floors that include those from more extreme stratigraphic depths. Lithic analyses will play an essential role in the study of spatial organization and thus inter-group and inter-personal socio-economic and political relationships. Lithics will also be essential as we reconstruct changing household economies and relationships to other houses and villages. Towards that end, tabulation of raw material classes is now complete though time has not permitted statistical analysis of variation.

A total of 222 food and non-food seeds were recovered from flotation and subsequent paleoethnobotanical analysis (Appendix C). Formal quantitative analysis of these materials will occur along with new items recovered during summer of 2014 and will be included in the final report due April 2015. A cursory examination of the botanical data suggests that Saskatoon (*Amelanchier alnofolia*) and Kinnikinnick (*Arctostaphylos uva-ursi*) were consistently the most important berry species. However, several other species occur including heather (*Ericaceae*), wild cherry (*Prunus*), and Blackcap or Thimble berry (*Rubus sp.*). Berries played an essential role as critical winter foods for Mid-Fraser peoples. Pine needles occurred in substantial numbers within select features, particularly associated with deeper floors (e.g. IId to IIf). One botanical artifact was recovered. This was a small (about 7 cm in length) wooden harpoon tip with a pointed end and two sharp barbs on one lateral margin. The harpoon tip was partially burned and recovered from a shallow bowl-shaped feature filled with a variety of refuse (Feature A2, Stratum IIa, Level 1, Unit 6, NW Quad, Block A). Local informants concluded that this rare artifact likely represents the tip of a fishing arrow perhaps used for salmon or even more likely, trout fishing. Paleoethnobotanical data will play an essential role in our examinations of subsistence change once more complete floors from deeper contexts come available after the 2014 field season.

Analysis of faunal remains identified 5015 specimens representative of 16 taxa. Taxa were dominated by anadromous salmon followed artiodactyls. Analysis of variability in relative abundances identified several provocative patterns. First, the final roof/floor (Va/IIa) was most diverse and even in representation of taxa. Data suggest that foraging and fishing activities during this occupation were the most diversified, which is in line with expectations associated with high occupation density during this time. Further investigations of this pattern should explore two options for explaining this pattern. One could be that large numbers of people on this floor and presumably elsewhere in the village depressed local game resources forcing the household to diversify its prey base. Another option could have been with higher numbers of food collectors of different ages and genders, strategies for food collection were simply more variable than in earlier occupations. The other striking pattern concerns mammal prey abundances compared to fish. Mammal scores are quite high for Va/IIa and IIc. Scores are lower for other strata (excluding IIe and IIf as likely sample biased). The high IIc mammal index scores correspond with expectations from lithic analysis for frequent products of hunting. The relatively low Vb1/IIb scores for mammals suggest that other factors may be affecting frequencies of animal bones and lithic artifacts (as discussed above). Further research with more complete samples will be necessary to more fully evaluate these issues. Faunal analysis will also play a critical role in understanding variability in household socio-economic and political strategies.

The research design for the Housepit 54 project calls for investigation of a range of questions centered on inter-occupational variation in demography, subsistence, technology, and social organization. Results from the 2013 field season provide the first data that will be applied towards consideration of these problems when combined with data from the 2014 field season. Current data permit to draw some very preliminary conclusions in line with overall project goals. Assessment of demographic change using fire-cracked rock densities suggest a study increase in intensity or frequency of cooking from floor IId through IIa. If cooking rates are correlated with numbers of persons then it could imply steadily rising numbers of persons inhabiting HP 54. Increases in numbers of hearth features, particularly comparing IIa to older floors, partially confirm this conclusions. This figure is not corroborated by lithic artifact counts, which have greatest density in floor IIc. However, I suggest that a number of other factors could affect rates of lithic tool production and discard beyond simple numbers of persons. One of these could be effort expended in gearing up for activities away from the village. The high frequency of hunting-related gear in IIc helps to corroborate this conclusion.

Subsistence change is an essential part of this study. The combined study of faunal and floral remains will permit the project to assess changing predation strategies as associated with human demographic growth and decline and associated socio-political shifts. The current effort provides only a very preliminary look at the developing data. Current data do suggest some degree of fluctuation with deeper floors likely focused more on anadromous fish and larger mammals becoming more important in later times. One point that is also clear is that we may need to expect some unpredictable variability between floors even where there is a general trend. A good example is the drop in mammal abundances and major spike in fish in the Vb1/IIb occupation, where mammals were much more important during Va/IIa and IIc. Reasons for such variability need to be assessed but it would not be unreasonable to expect local prey fluctuations, shifts in household capabilities and interests, effects of social obligations, and idiosyncratic taphonomic factors to affect assemblage composition.

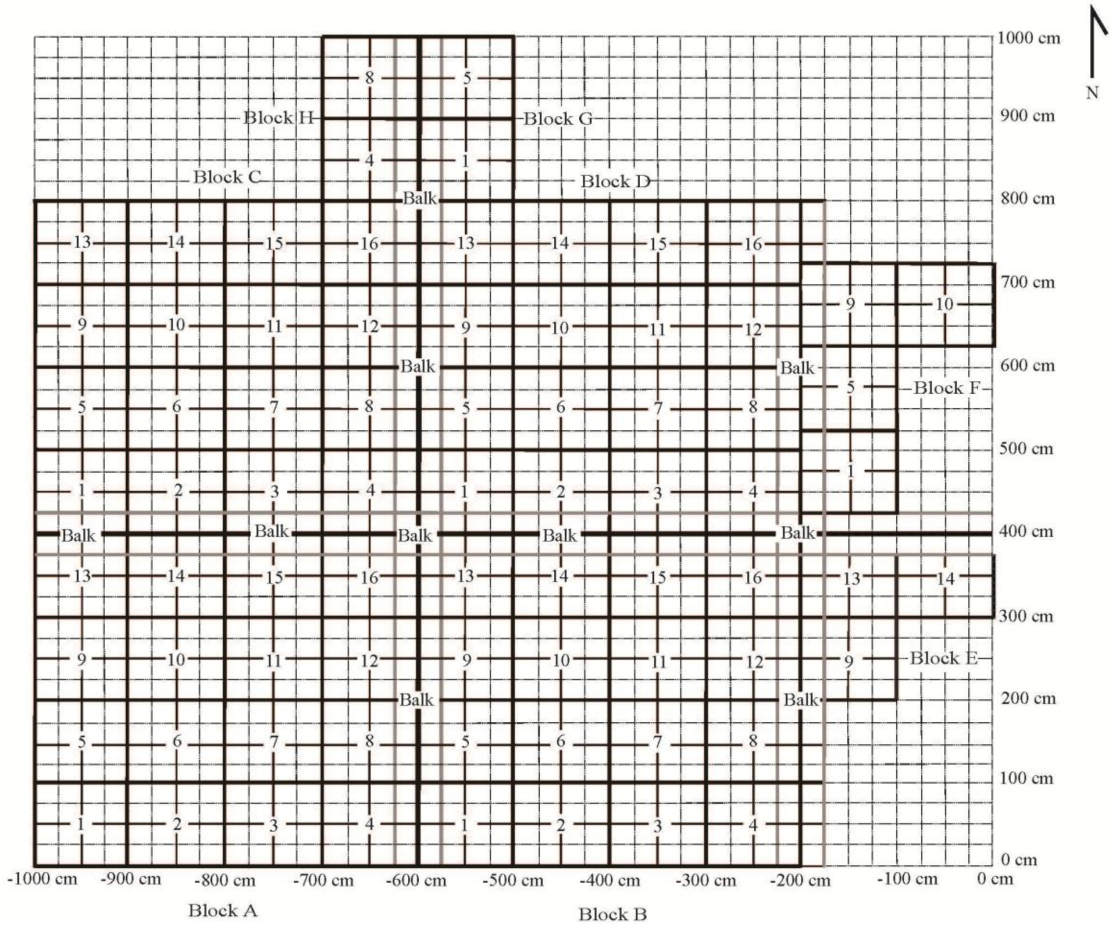
The lithic artifact assemblage is extensive and complex. As with other data classes we await outcomes of the 2014 field season for development of sophisticated quantitative work with lithic tools and debitage. However we can make a few statements based on preliminary analysis. Context of lithic artifact discard appears to shift over time. Deeper floors have extensive materials while roof sediments have relatively little. In contrast the most recent floor and roof feature an inverse pattern with extensive lithics in the roof and relatively lower densities on the floor. One possibility to explain this is rising numbers of people on the floor favoring more cleanup and dumping on roof sediments and/or more lithics related work actually on the roof.

Examining production of different tool classes between floors, it is apparent that the middle-depth floors (IIb and in particular, IIc) do contain higher numbers of likely hunting-related tools such as projectile points and formal bifaces. However, these floors also feature somewhat higher densities of bipolar cores and groundstone artifacts of all kinds. It is not yet clear if there is a relationship between hunting and groundstone tool production and this will be a subject for further investigations. Earlier dating floors (IId-IIf) have a stronger signal for wood-working but also for hide working tools. If the primary subsistence item in these contexts was fish, it could mean that hides were imported as trade items. So, far there is no evidence for major technological innovations as the major tool classes are consistently represented. However, lack of wooden items, basketry or hide artifacts constrains us from recognizing innovations in all but stone tools.

A major goal of the HP 54 project at Bridge River is an assessment of sociality between occupations. It is well known that the Bridge River village grew substantially between the BR 2 and 3 periods (transition at ca. 1250-1350 BP). Growth appears to have been accompanied by major social changes that included emergence of material wealth distinctions between houses, village-wide intensification of production, heightened trade activities, and possibly the formation of complex inter-village socio-political groups. Study of the HP 54 floors will provide an important window into the nature of social relations in the Bridge River village. It will permit us to address critical questions associated with inter-group, family and individual relationships during this critical time period. Once more complete floor distributions and a greater number of floors have been excavated, as is expected for the 2014 field season; analysis of house floor space will be a major focus for project members. Most fundamentally, we seek to reconsider the nature of individual and family space with a goal of understanding variability in the nature of cooperation and competition or conflict. This can be accomplished drawing from ethnographically defined classifications of artifacts and food remains combined with an approach to spatial analysis designed to measure co-associations of these items on multiple scales. Results of these studies, in turn, will permit us to begin to assess a range of wider anthropological questions regarding the means by which families maintained households under both optimal and suboptimal economic and demographic conditions; the effects of a variety of opportunities and pressures on inter-family and personal social relationships that could have led to new forms of cooperation and/or conflict; and the persistence of tool manufacture traditions over time and the impacts of external influence on inherited knowledge.

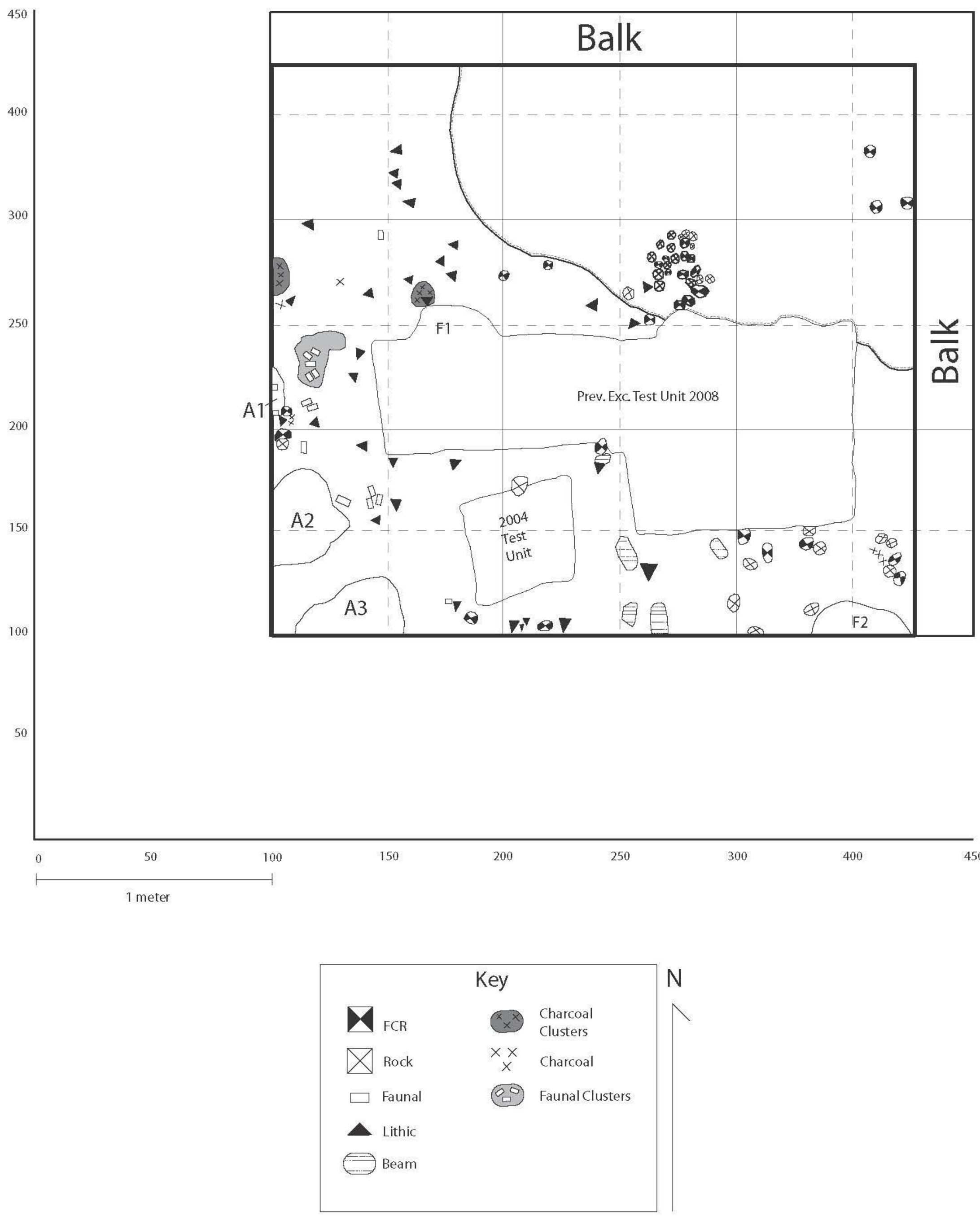
Appendix A

Maps and Photographs of 2013 Excavations at Bridge River

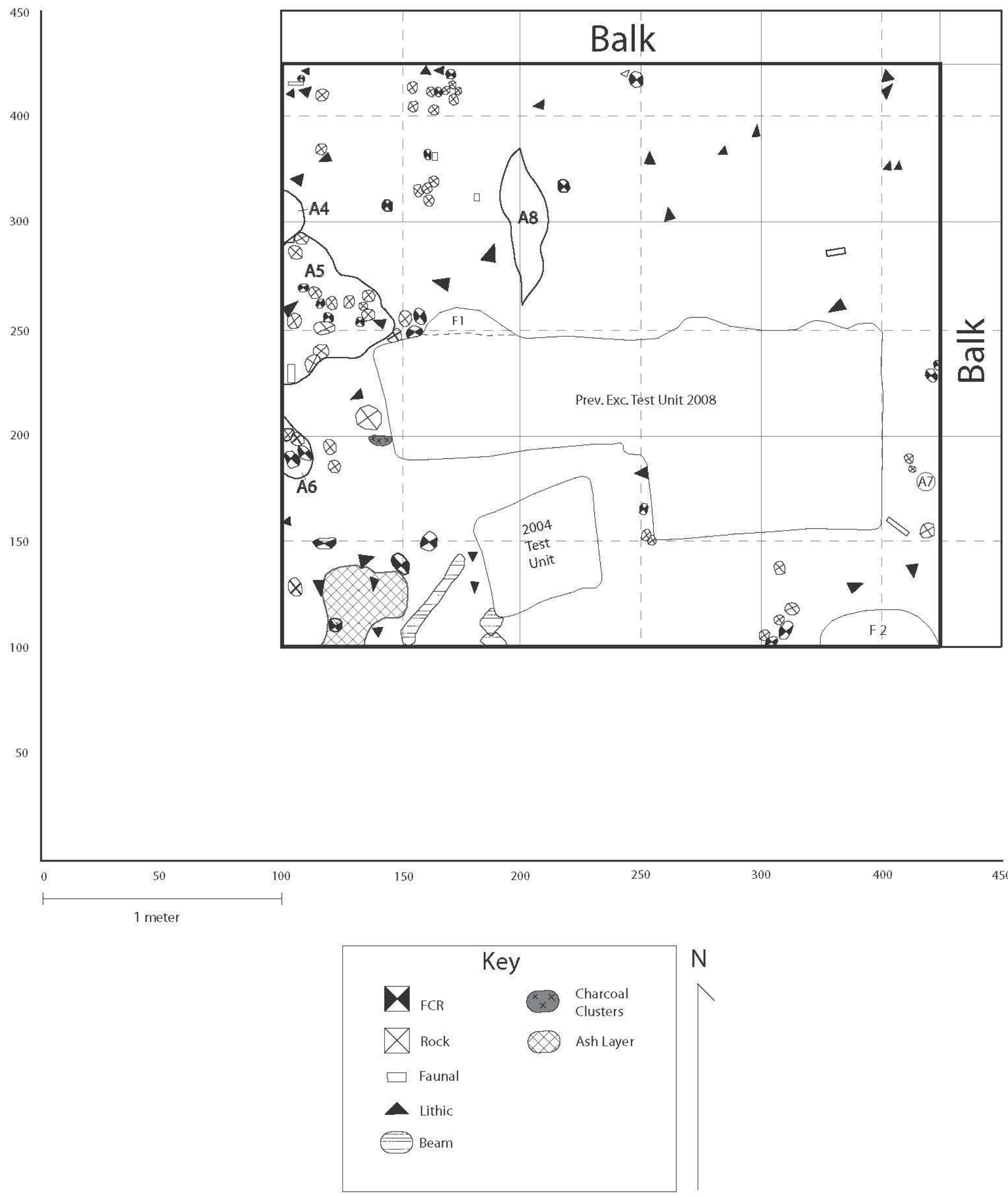


Excavation grid over Housepit 54 showing blocks, units, quads, and balk locations

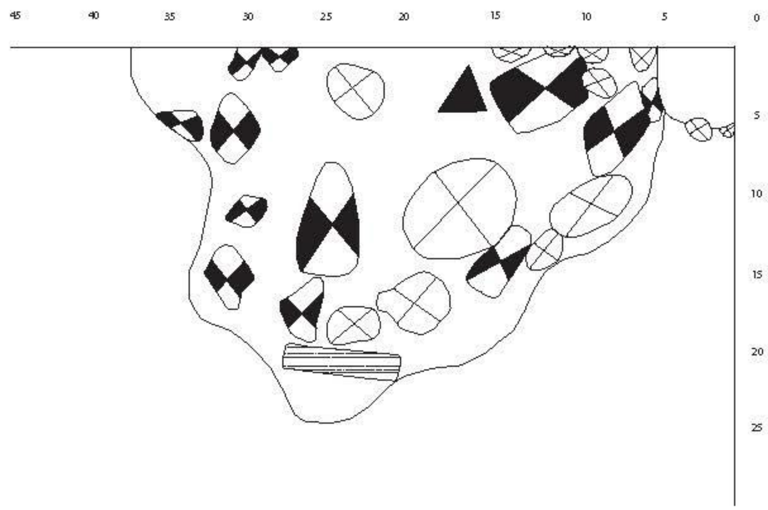
Block A Stratum IIa Level 1

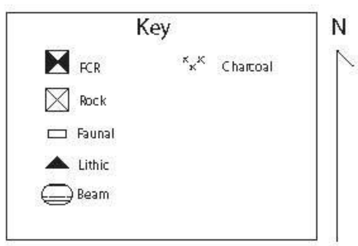


Block A Stratum IIb Level 1



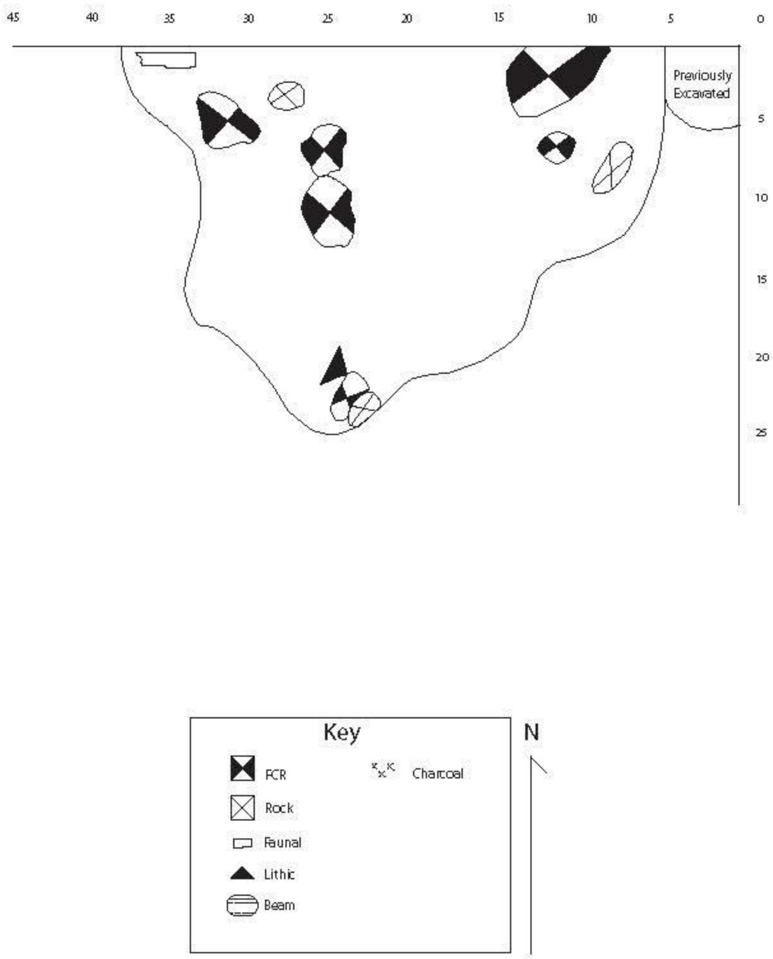
Block A Unit 10NW Stratum IIB Level 1





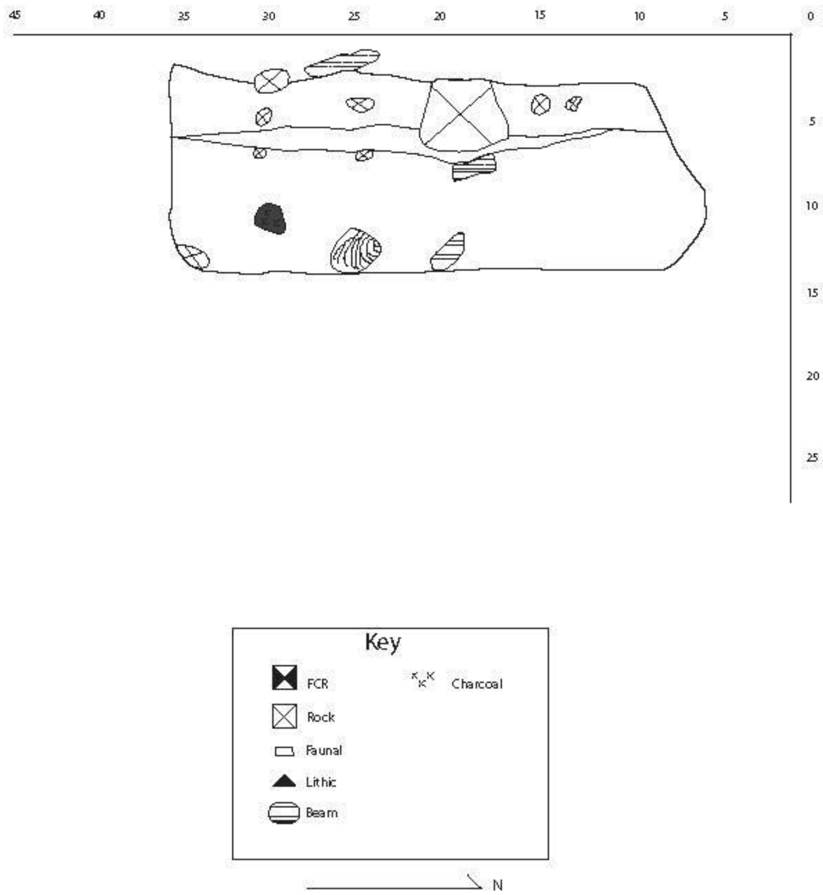
Feature A5, surface/level 1, Plan View, detail

Block A Unit 10 Stratum IIB Level 2



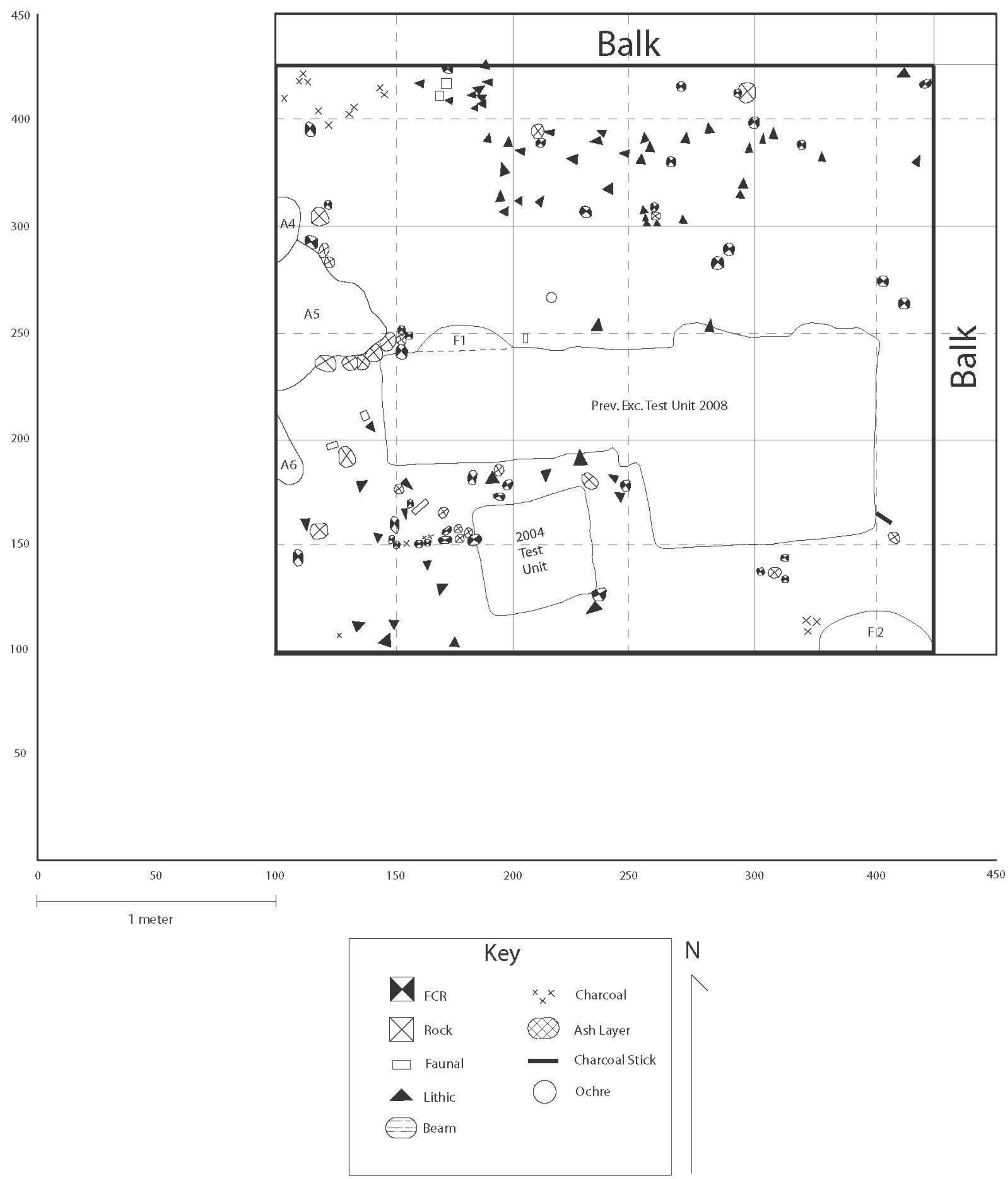
Feature A5, surface/level 2, Plan View, detail

Unit 10 Stratum IIB Feature A5

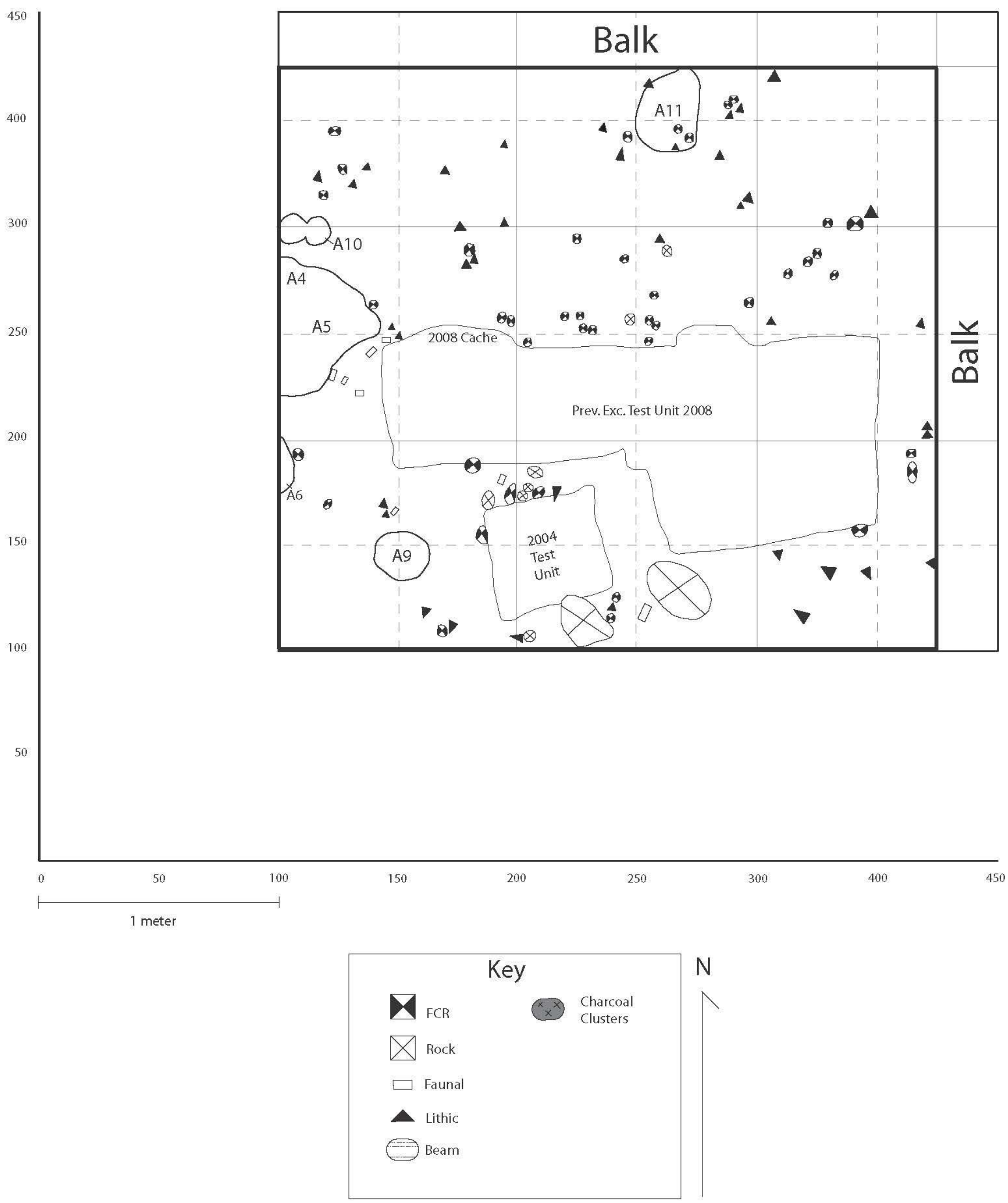


Feature A5 profile.

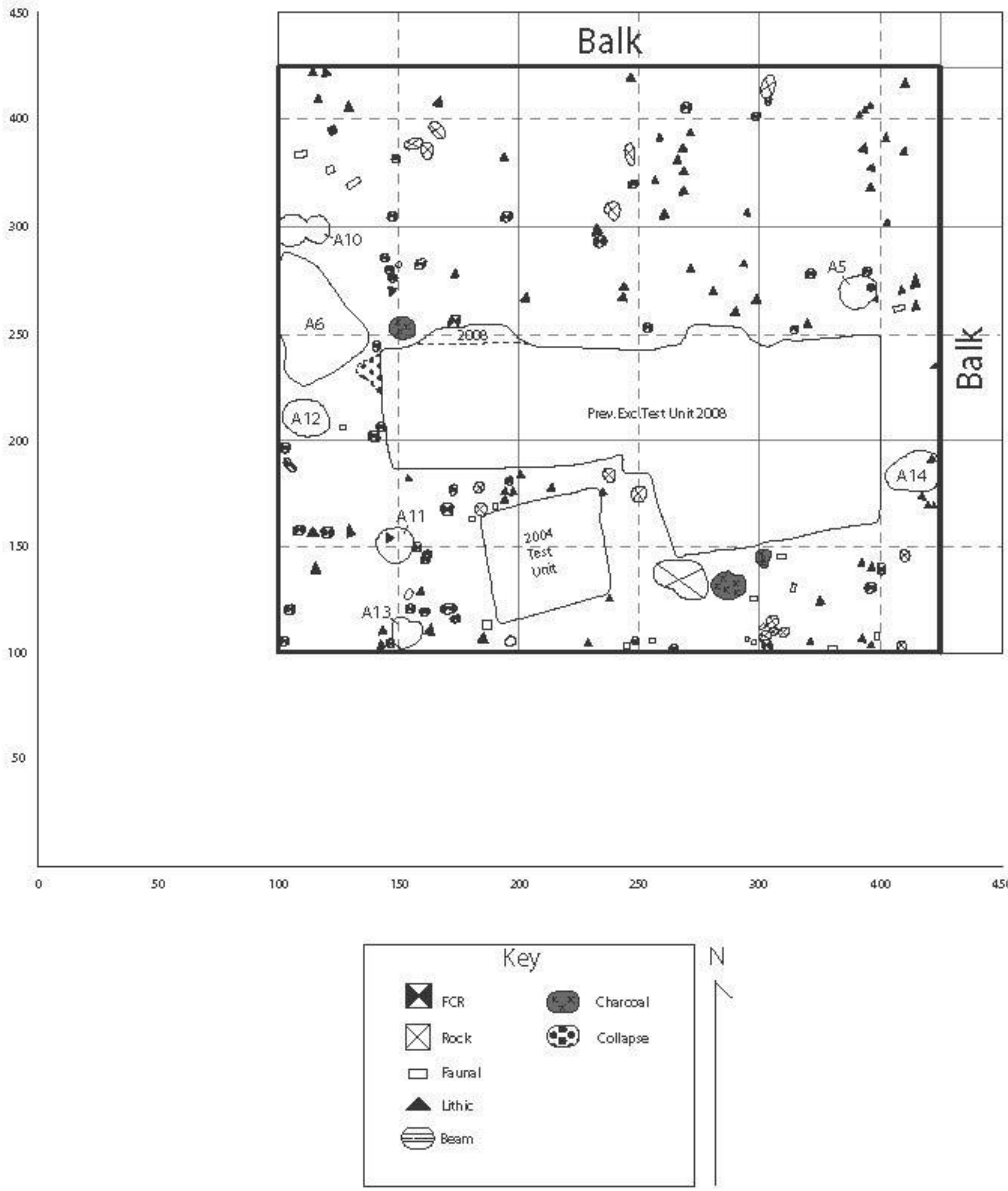
Block A Stratum IIc Level 1



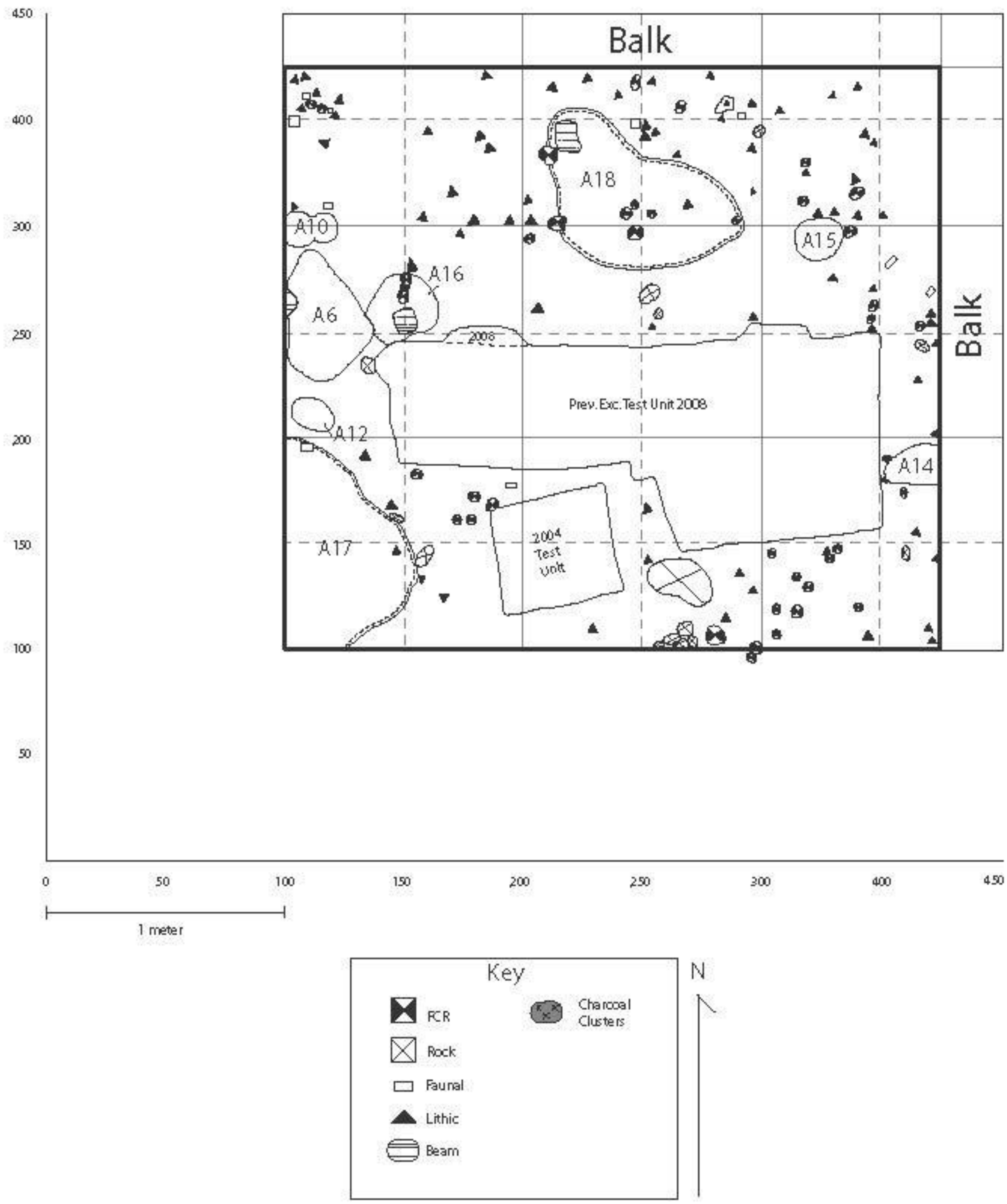
Block A Stratum IId Level 1



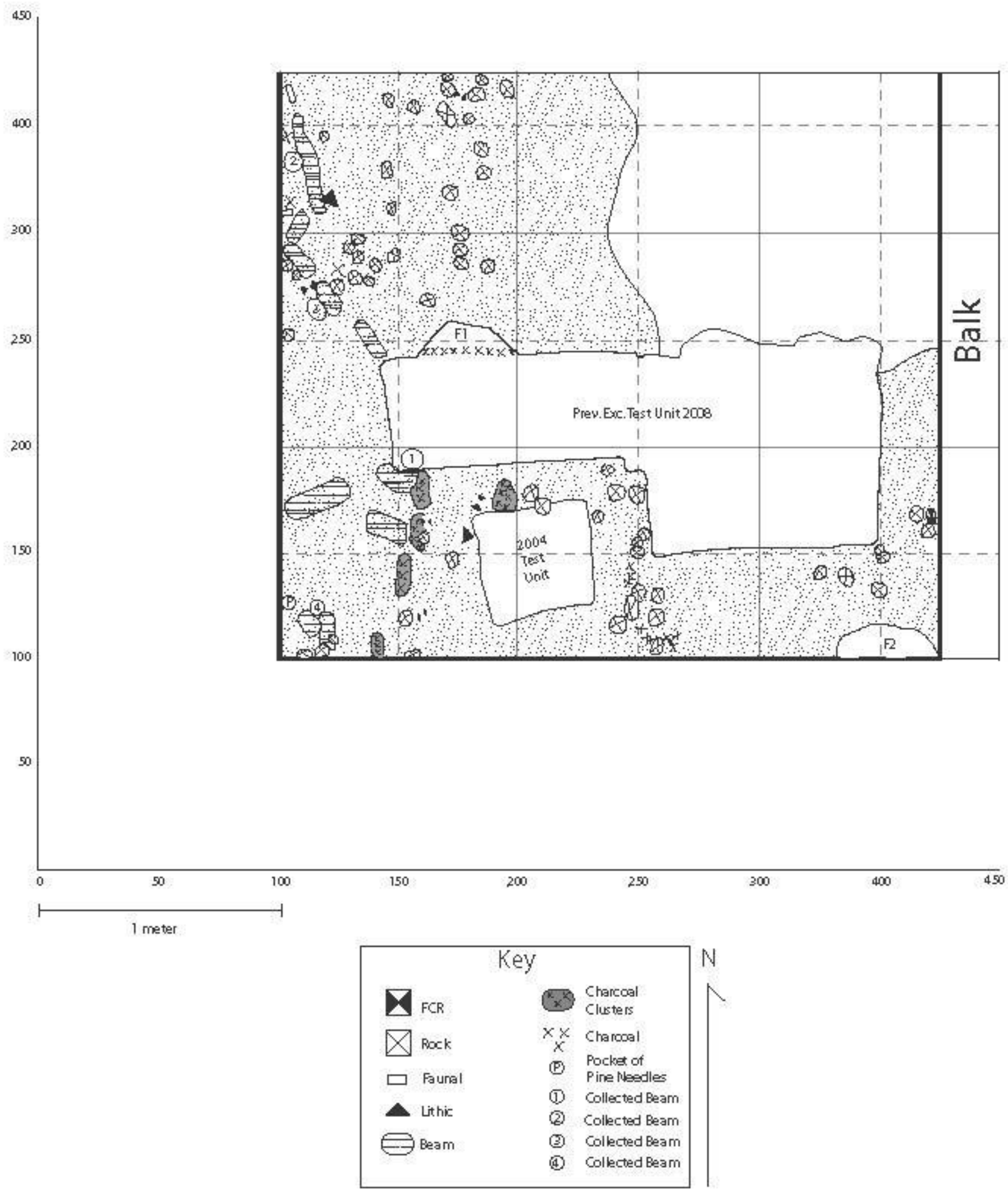
Block A Stratum IIe Level 1

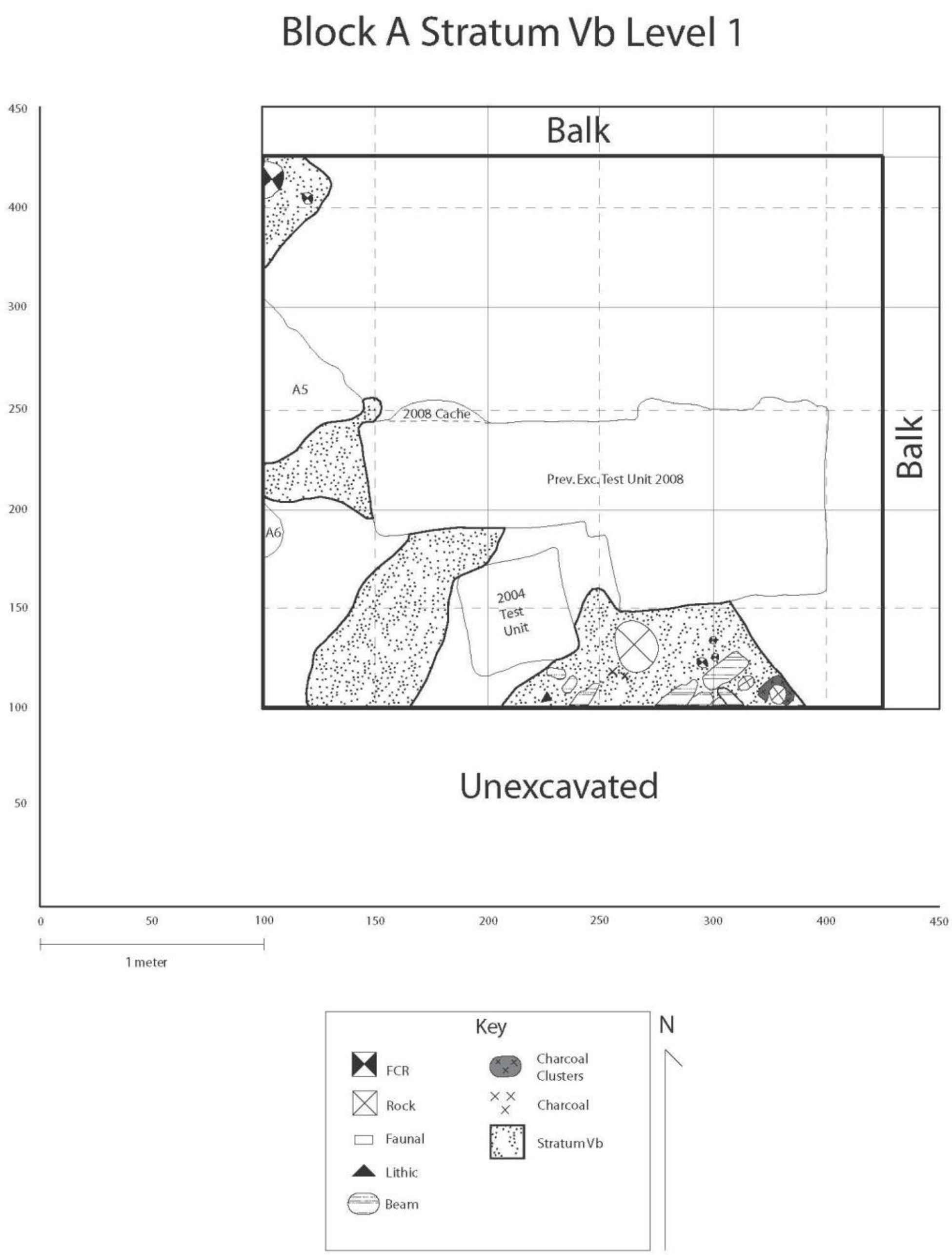


Block A Stratum IIf Level 1



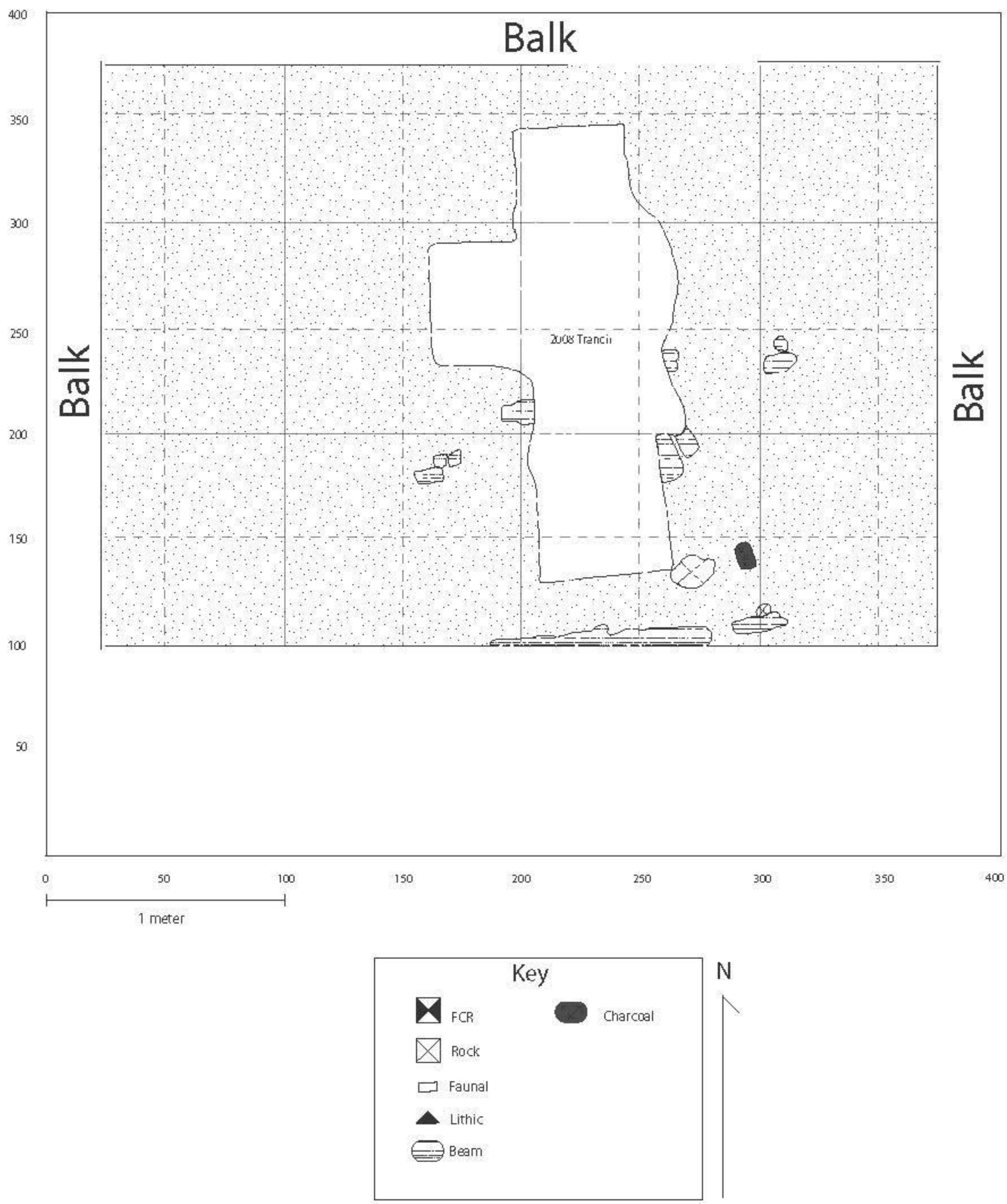
Block A Stratum Va Level 1



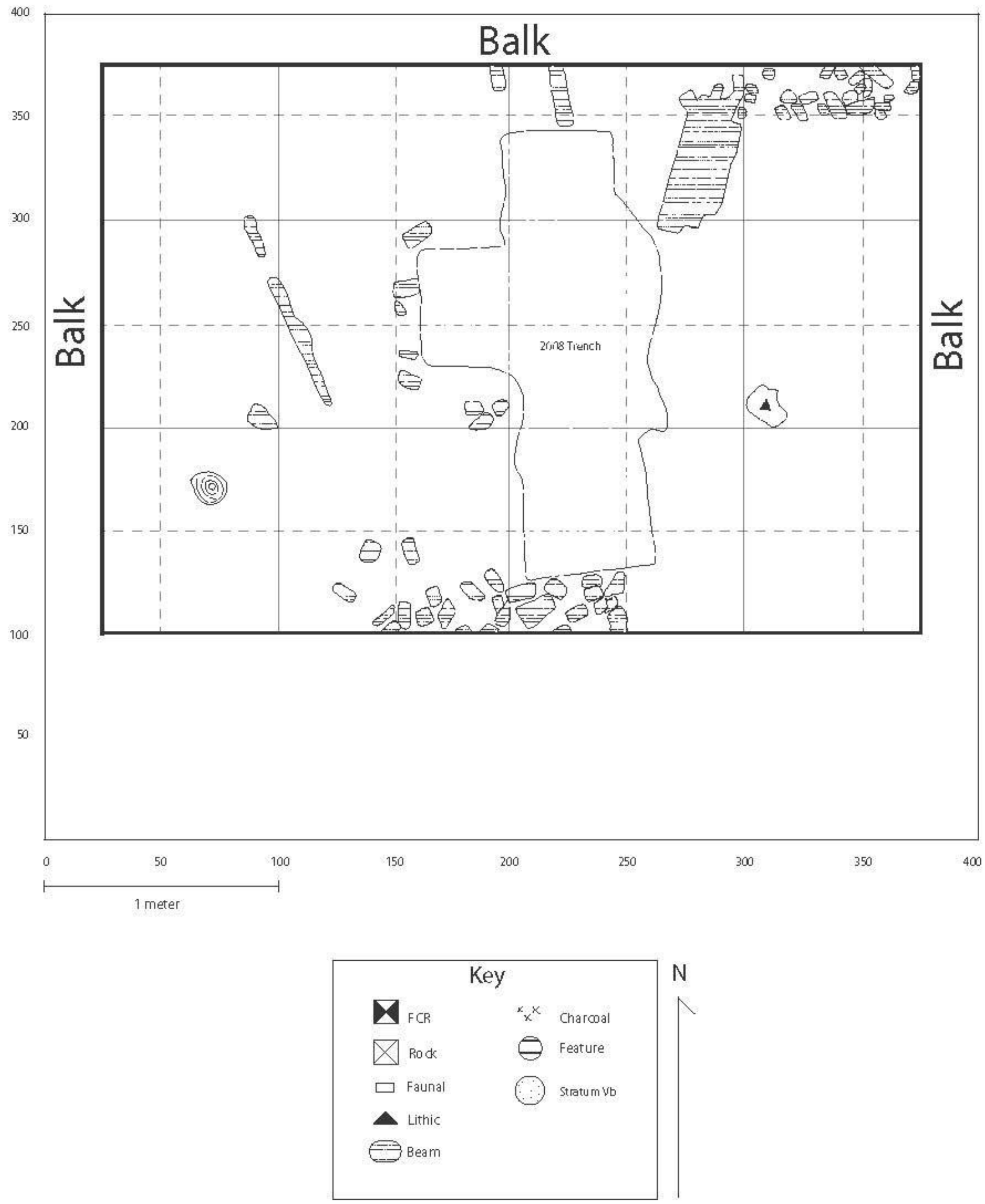


Block A, Stratum Vb2, plan view

Block B Stratum Va Level 1

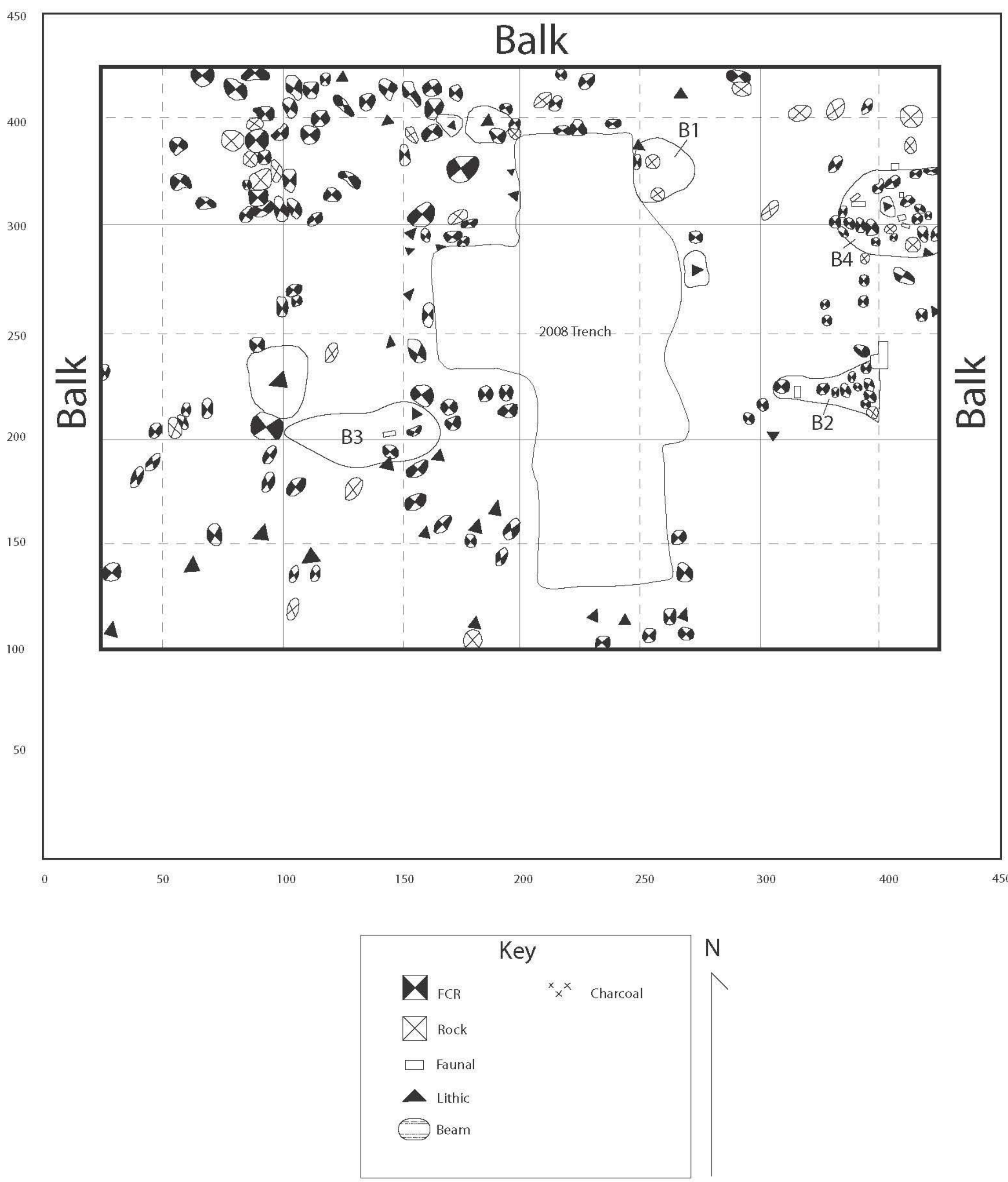


Block B Stratum Vb Level 1

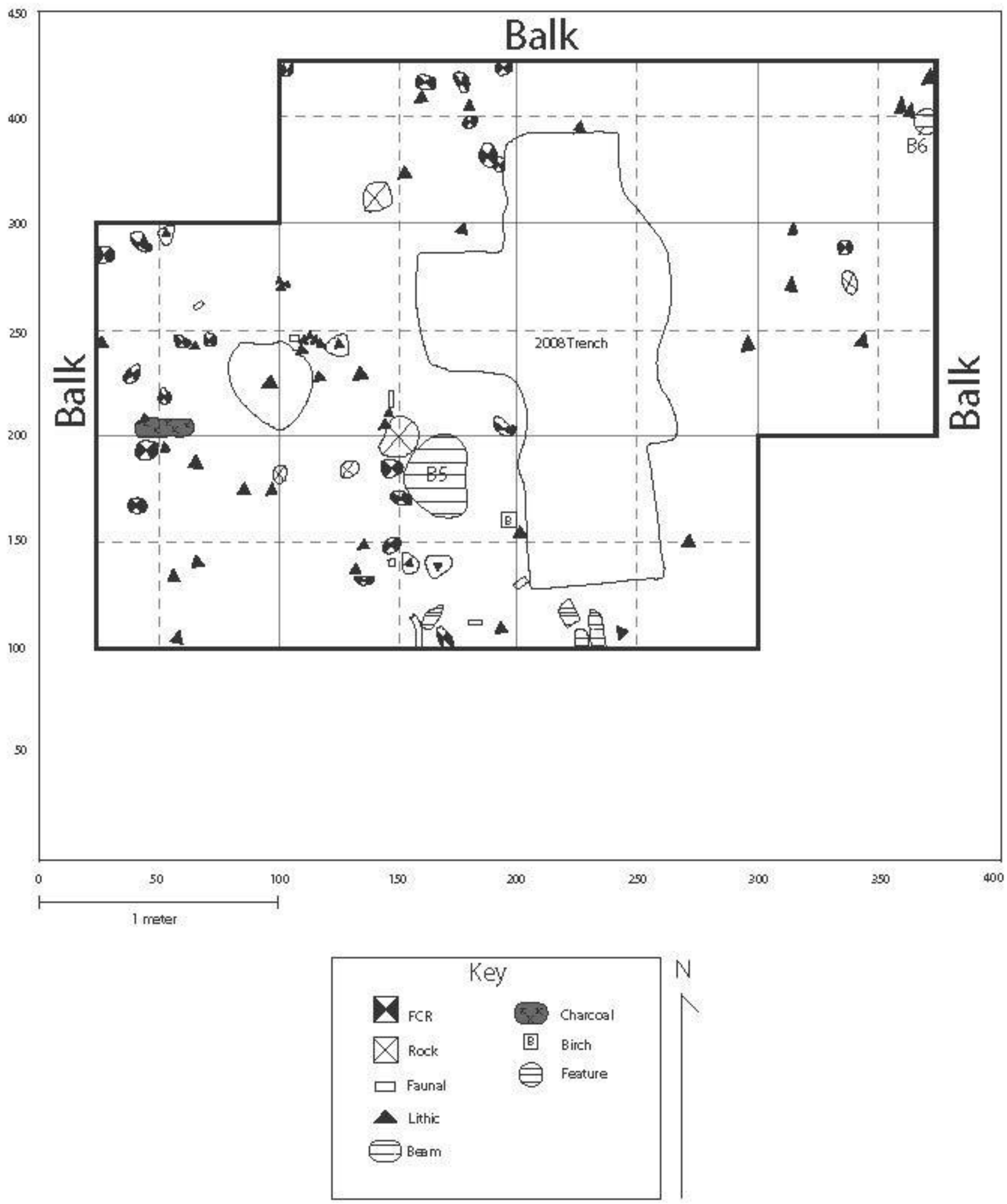


Block B, Stratum Vb1, plan view

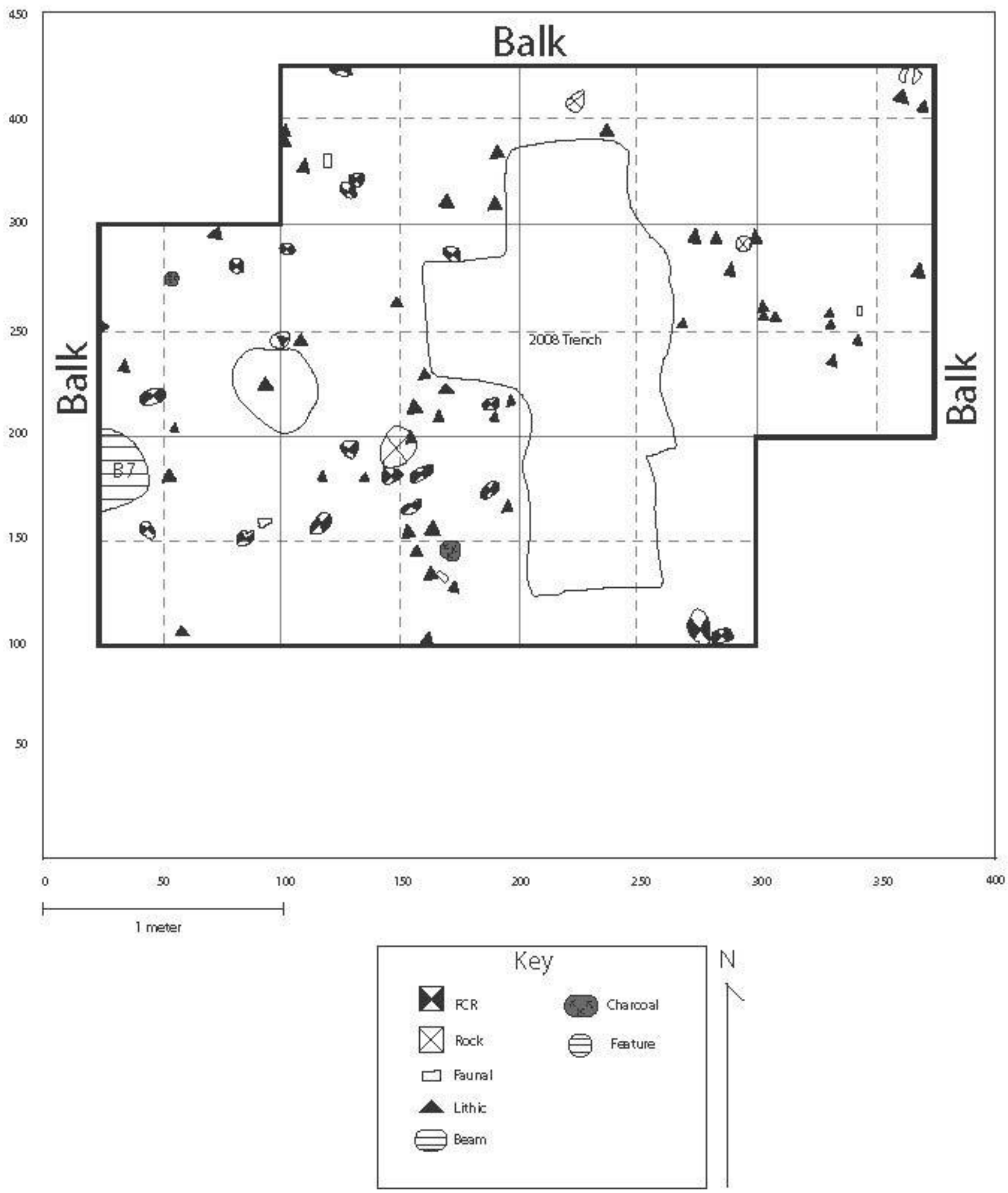
Block B Stratum IIa Level 1



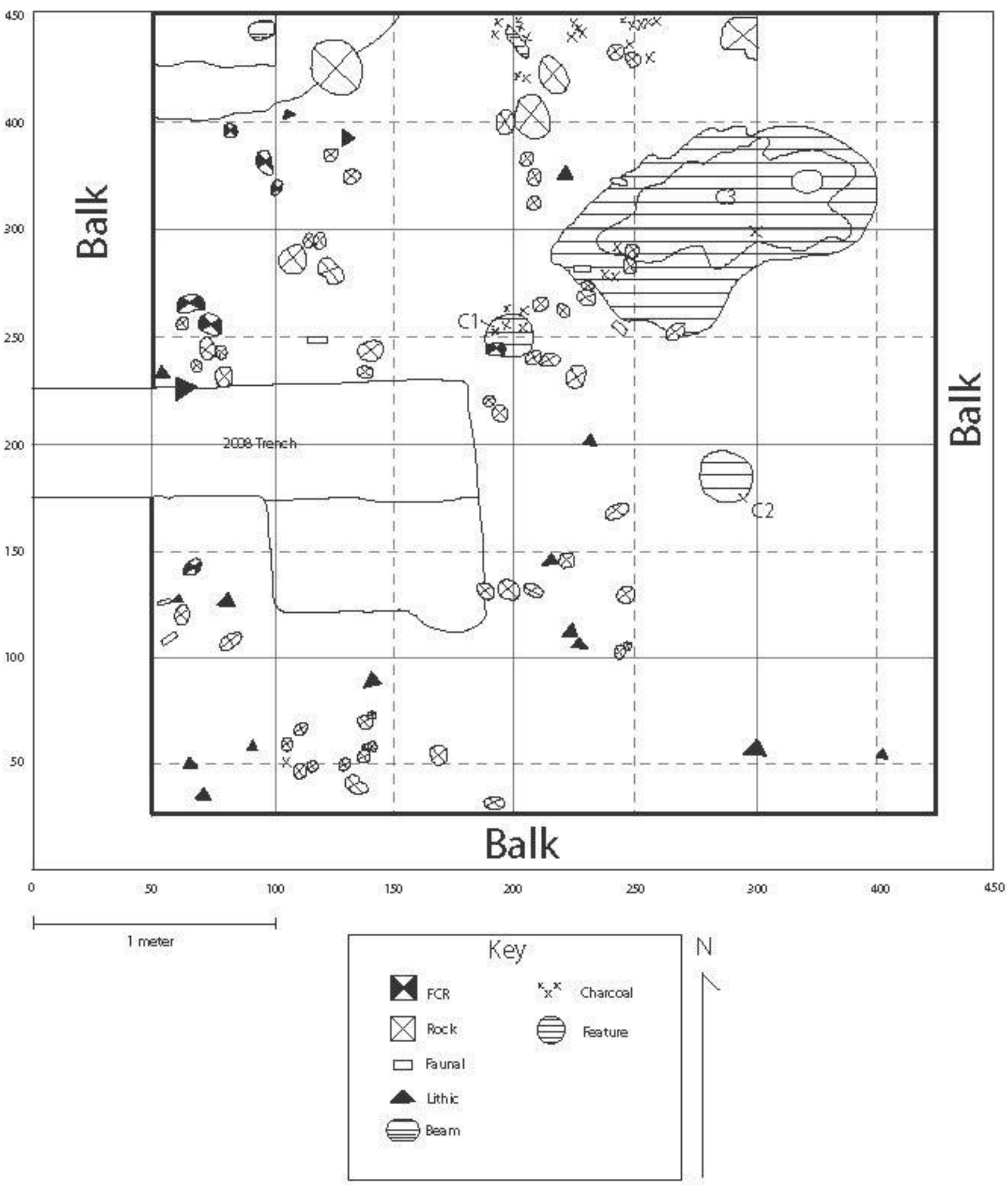
Block B Stratum IIb Level 1



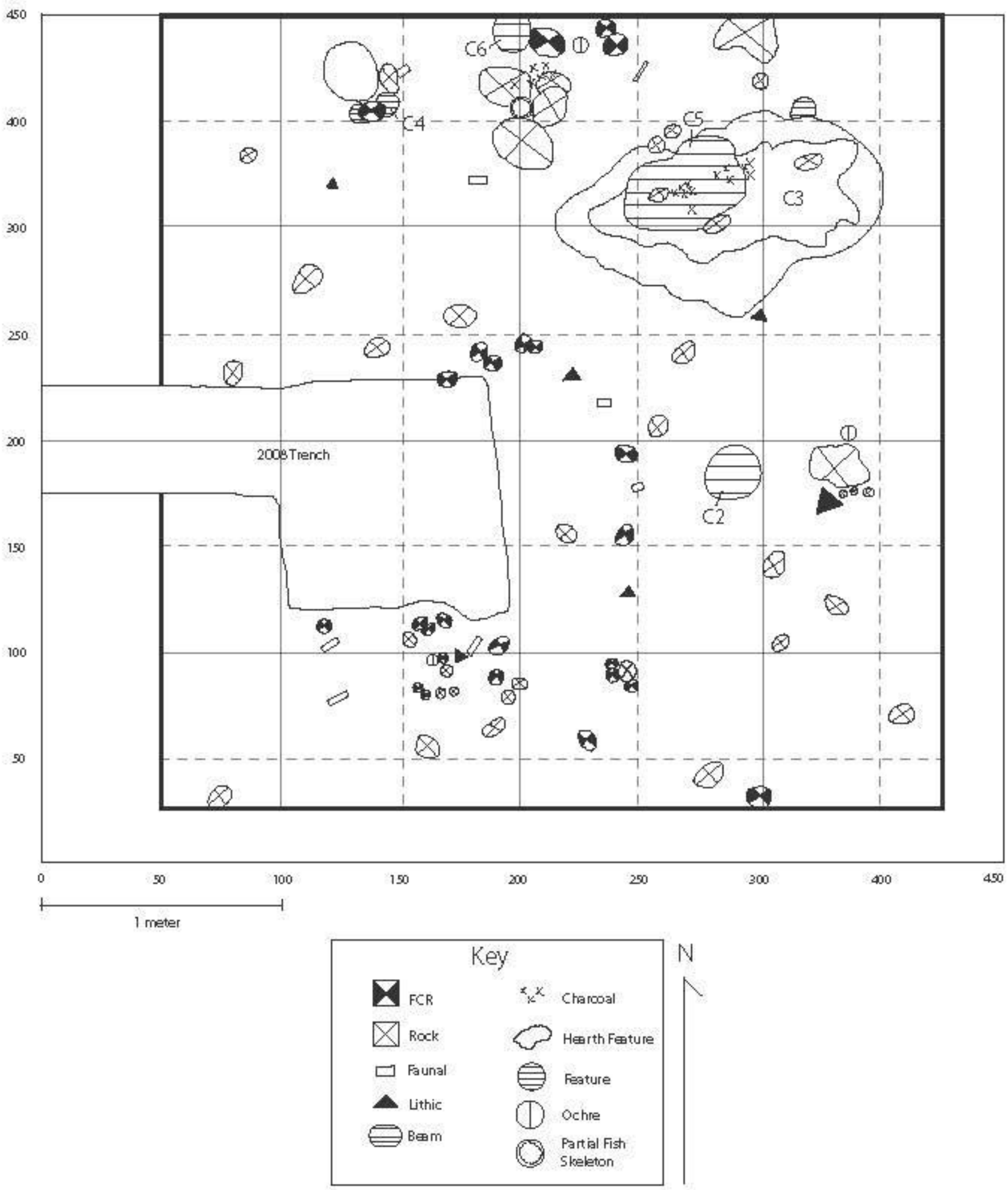
Block B Stratum IIc Level 1



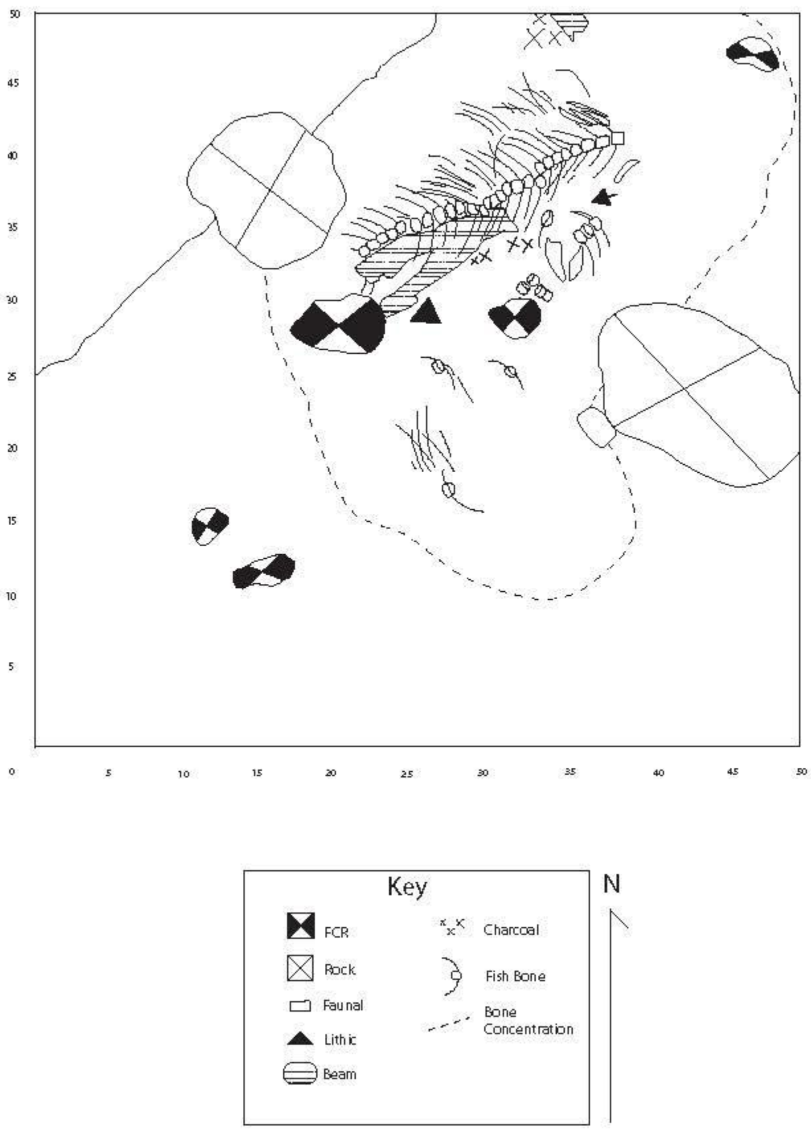
Block C Stratum IIa Level 1



Block C Stratum IIb Level 1

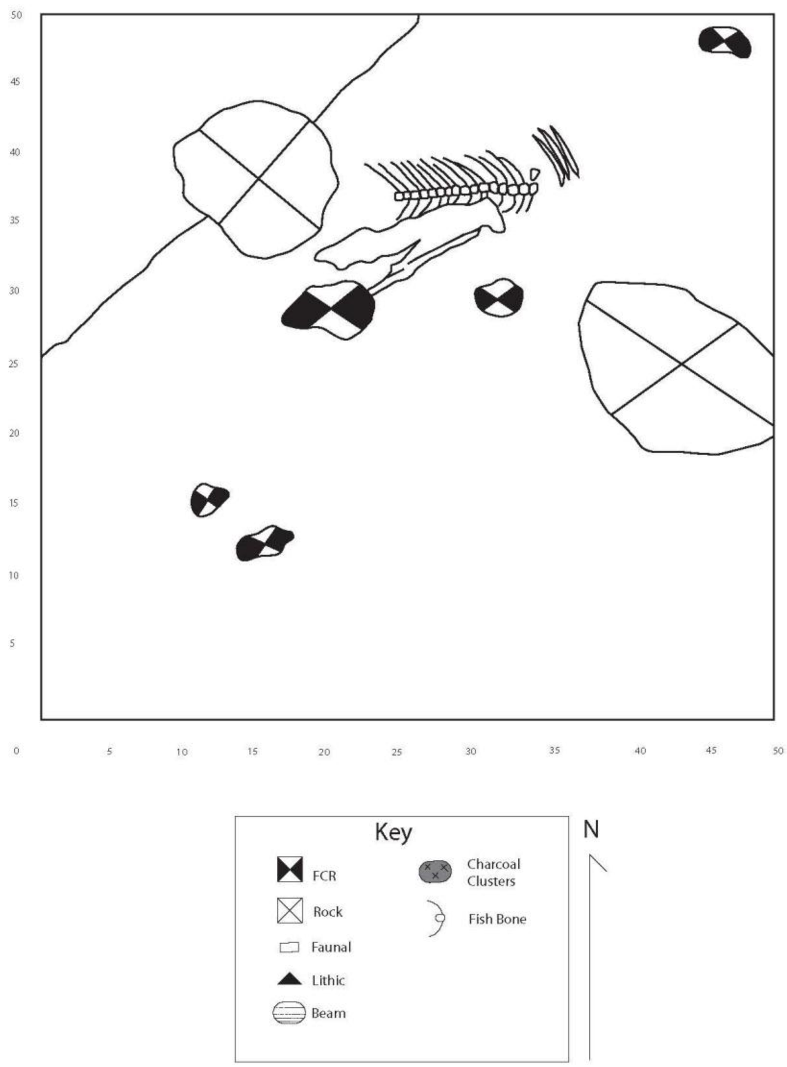


Block C Unit 14 Stratum IIb Level 1
1 of 2



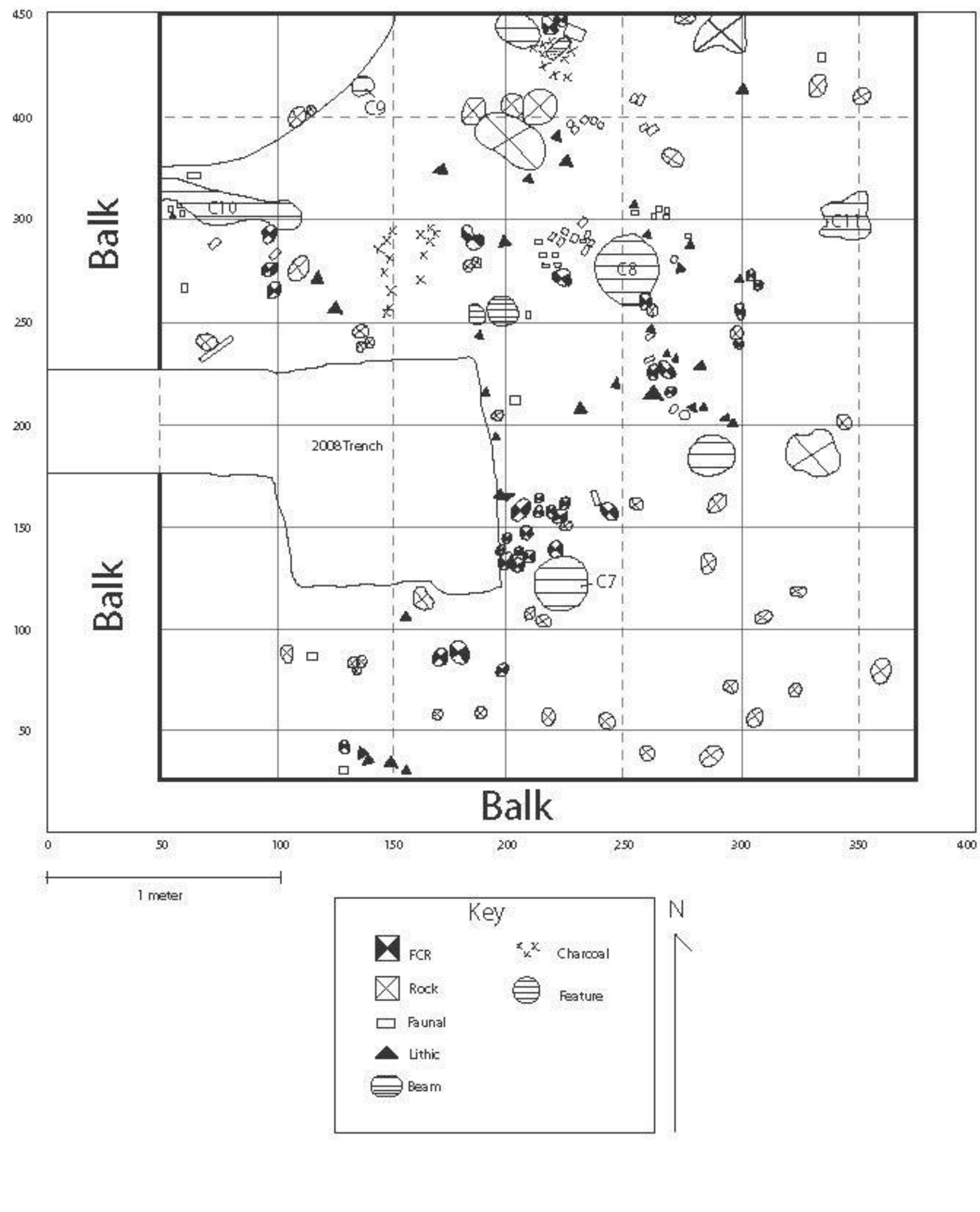
Block C, Unit 14, Stratum IIb, level 1, detail plan view (scale is in 2 cm increments; thus 50cm=100 cm).

Block C Unit 14 Stratum IIb Level 1

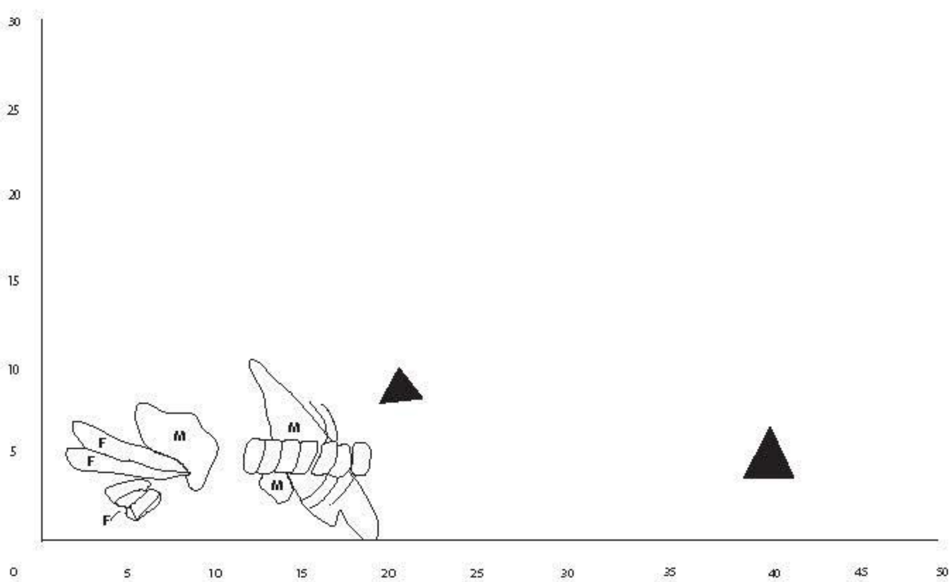


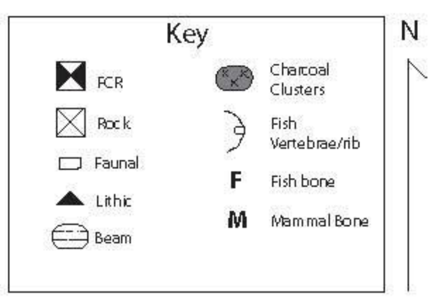
Block C, Unit 14, Stratum IIb, level 1, detail plan view (scale is in 2 cm increments; thus 50cm=100 cm) (second of two).

Block C Stratum IIc Level 1

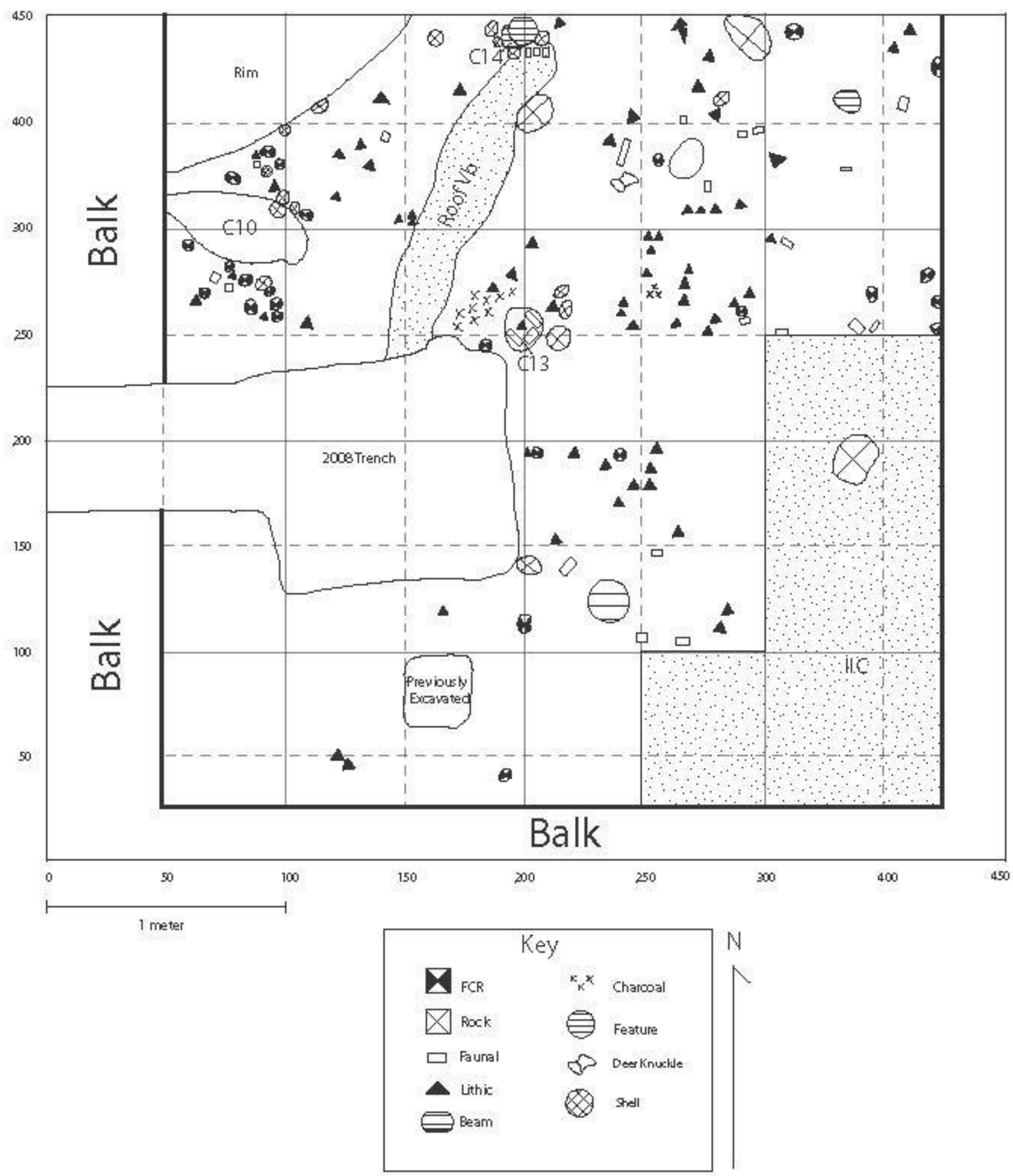


Block C Unit 15 SE Stratum IIc Level 1

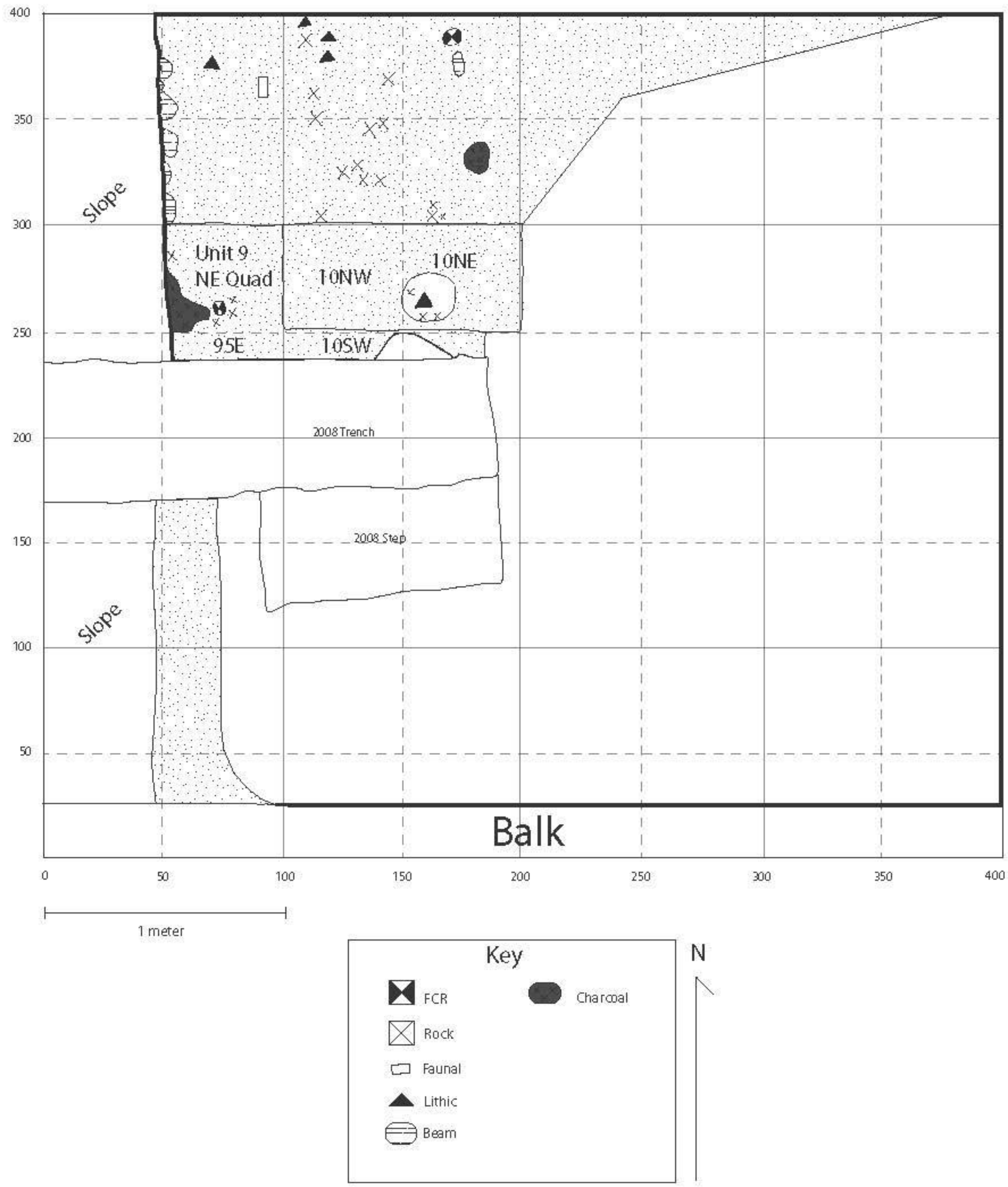




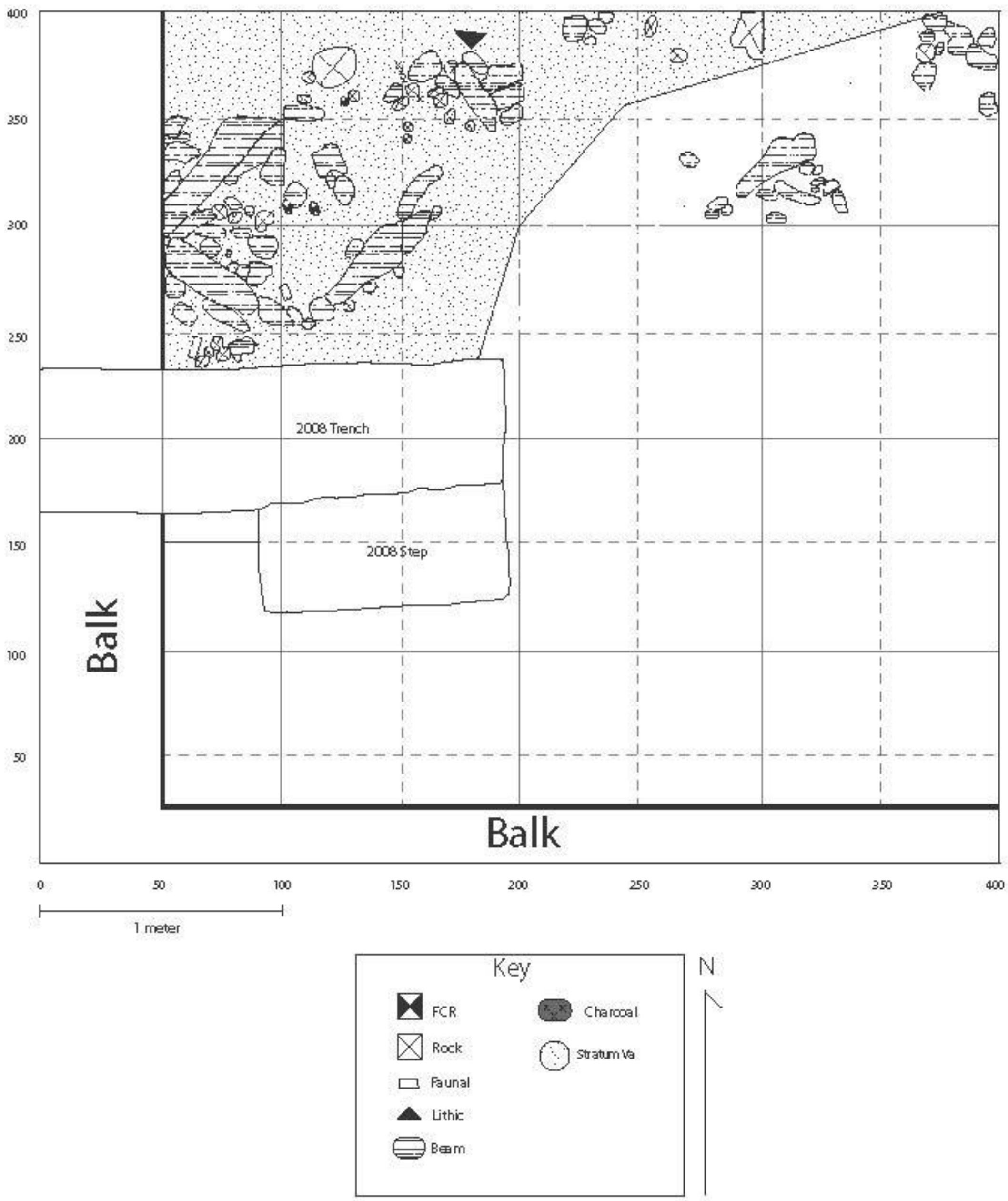
Block C Stratum IId Level 1



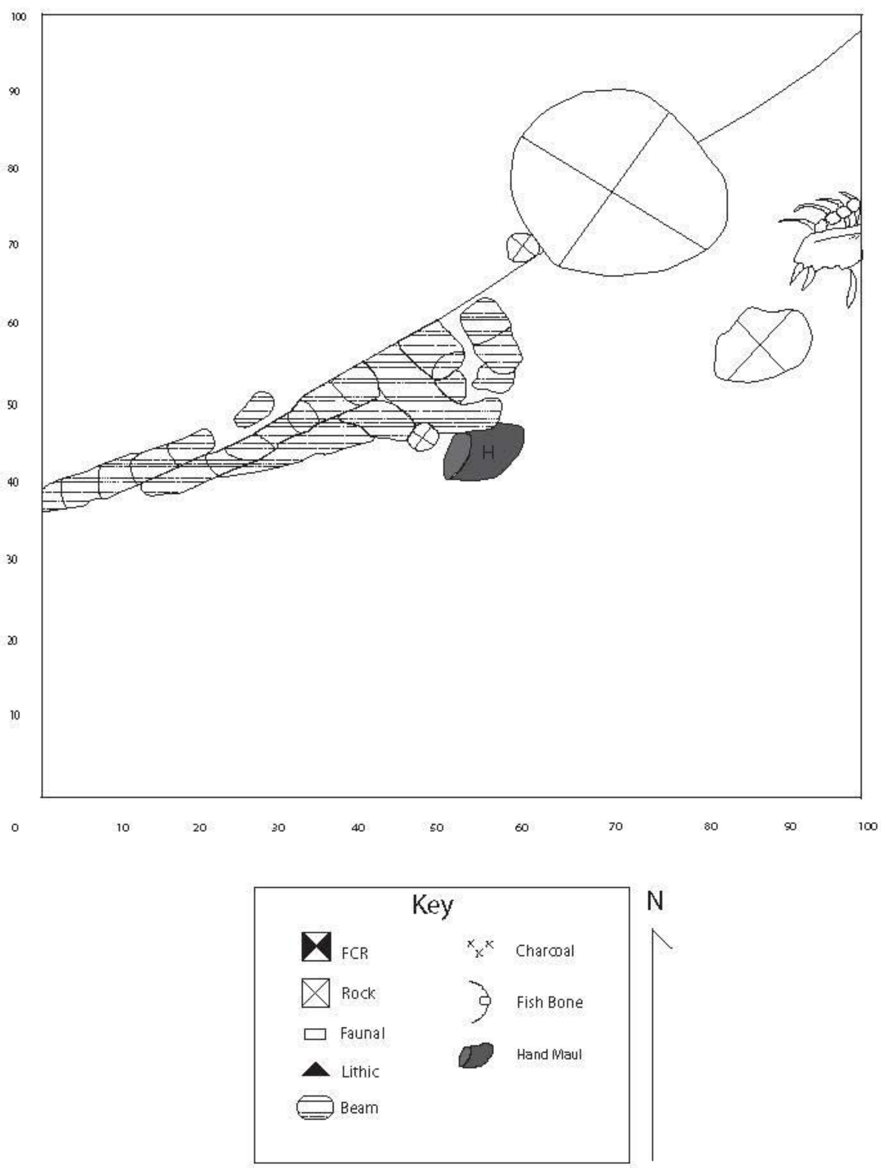
Block C Stratum Va Level 1



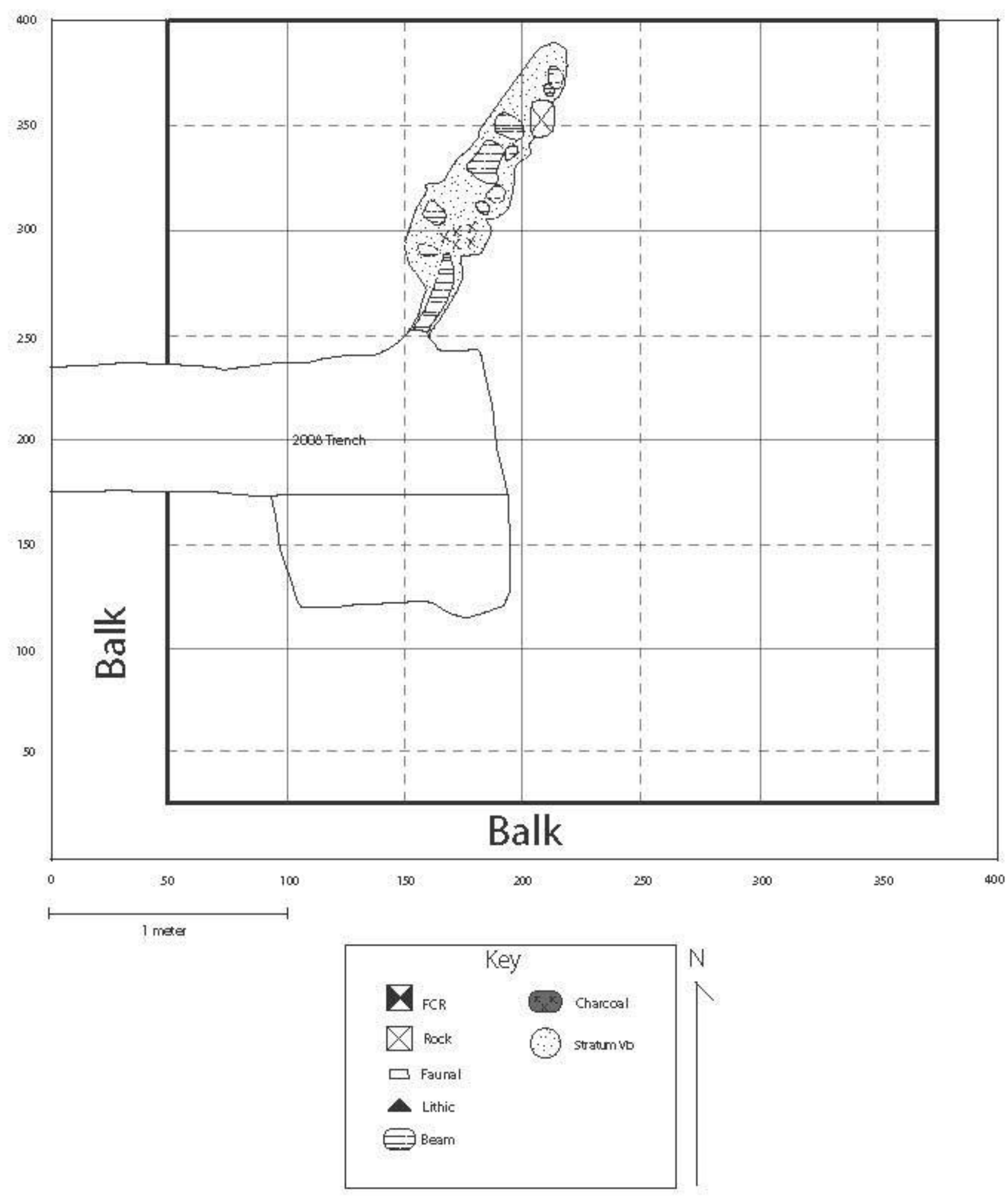
Block C Stratum Va Level 2/3



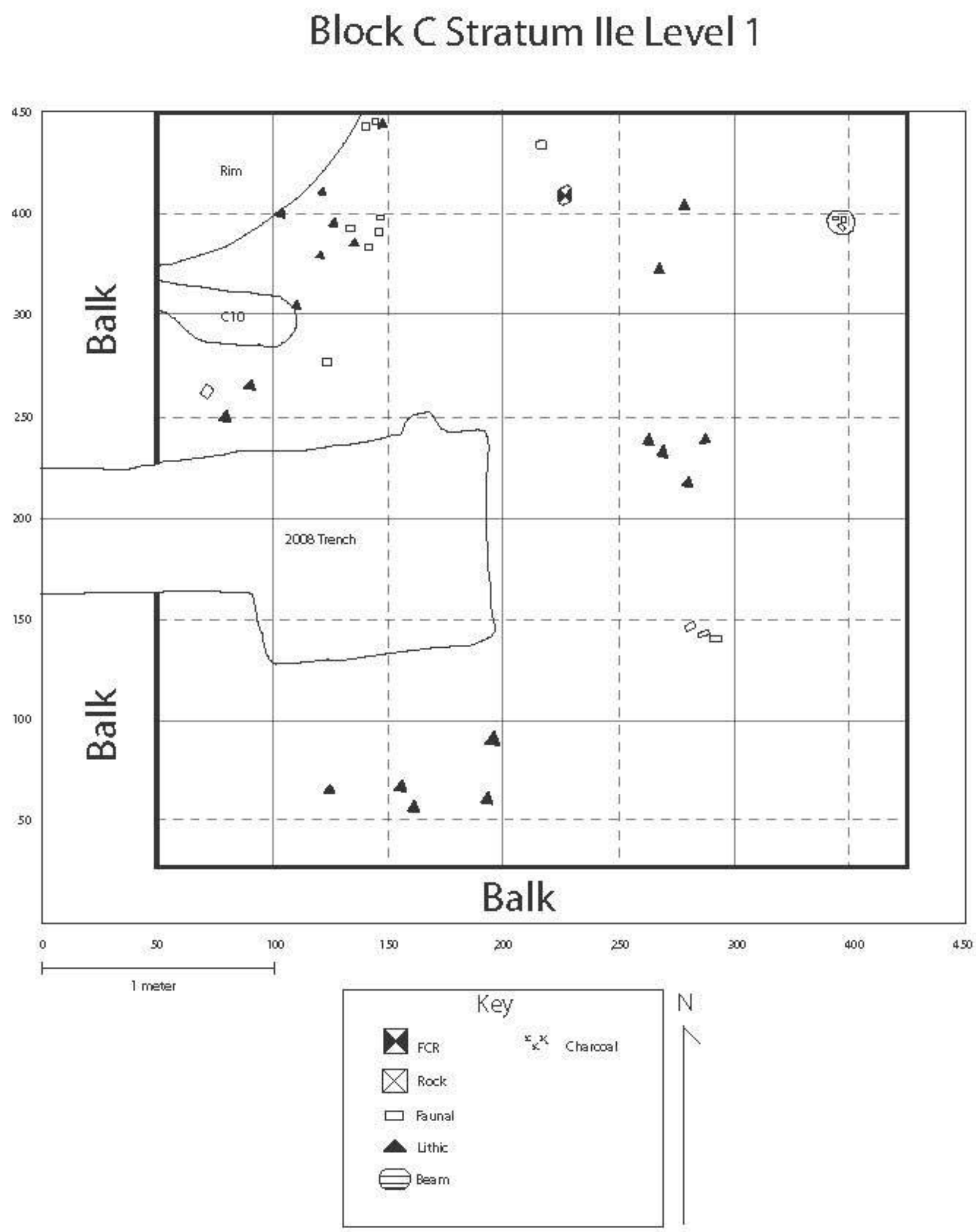
Block C Unit 13/14 Stratum Va-IIa Level 3/4



Block C Stratum Vb Level 1



Block C, Stratum Vb2, Plan View



Block C, Stratum IIe plan view surface (this stratum was not excavated in 2013; these items sit on its surface).

Photo of Housepit 54 at close of 2012 field season; surface of Stratum Va/IIa/XVII; view facing northwest.

Photo of Housepit 54 at close of 2012 field season; surface of Stratum Va/IIa/XVII; view facing northeast.

Burned roof beams in Block A, Stratum Va

Burned roof beams in Block A, Stratum Va

Burned roof beams in Block A, Stratum Va

Burned roof beams in Block A, Stratum Va, view facing west

Block A, Stratum IIa plan view

Block A, Stratum IIa, Feature A2 plan view, surface

Block A, Stratum IIa, Feature A2 plan view, excavated

Cluster of birch bark and animal bones, Block A, Unit 10, SW Quad, Stratum IIa

Clusters of fire-cracked and other rocks on Stratum IIa, Block A, Unit 11, N

Block A, Stratum IIa, Feature A3, plan view surface

Block A, Stratum IIb plan view.

Block A, Stratum IIb, Feature A5, Plan View surface

Block A, Stratum IIb, Feature A5, Plan View excavated

Block A, Stratum IIc, Plan View

Block A, Stratum IIc, Feature A7, Plan View, burned post

Block A, Stratum IId, Plan View

Block A, Stratum IId, Feature A9 Plan View excavated

Block A, Stratum IId, Feature A10 Plan View excavated

Block A, Stratum IId, Feature A11 Plan View surface

Block A, Stratum IIe, Plan View

Block A, Stratum IIe, Feature A12 Plan View excavated

Block A, Stratum IIe, Feature A14 Plan View excavated

Block A, Stratum IIe, Feature A15 Plan View surface

Block A, Stratum IIf, Plan View

Block A, Stratum IIf, Feature A16 Plan View surface

Block A, Stratum IIf, Feature A16 Plan View excavated

Block A, Stratum IIf, Feature A17 Plan View surface

Block A, Stratum IIf, Feature A18 Plan View surface

Block A, Stratum IIg, Surface

Block B, Stratum Va, Burned roof beam

Block B, Stratum Va, Burned roof beams

Block B, Stratum Va, Burned roof beam

Block B, Stratum Va, Burned roof beam

Block B, Stratum Va, Burned roof beam

Block B, Stratum Va, Burned roof beam

Block B, Stratum IIa, Plan View

Block B, Stratum IIa, Feature B2, Plan View surface

Block B, Stratum IIa, Feature B3, Plan View surface

Block B, Stratum IIa, Feature B4, Plan View surface

Block B, Stratum IIa, Feature B4, Plan View partially excavated

Block B, Stratum IIa, Feature B4, Plan View, fully excavated

Block B, Stratum Vb, Plan View

Block B, Stratum Vb1, burned roof beam

Block B, Stratum Vb1, burned roof beam

Block B, Stratum Vb1, burned roof beam

Block B, Stratum IIb, Plan View

Block B, Stratum IIb, Feature B5 plan view surface

Block B, Stratum IIb, Feature B6 plan view excavated

Block B, Stratum IIc, Plan View

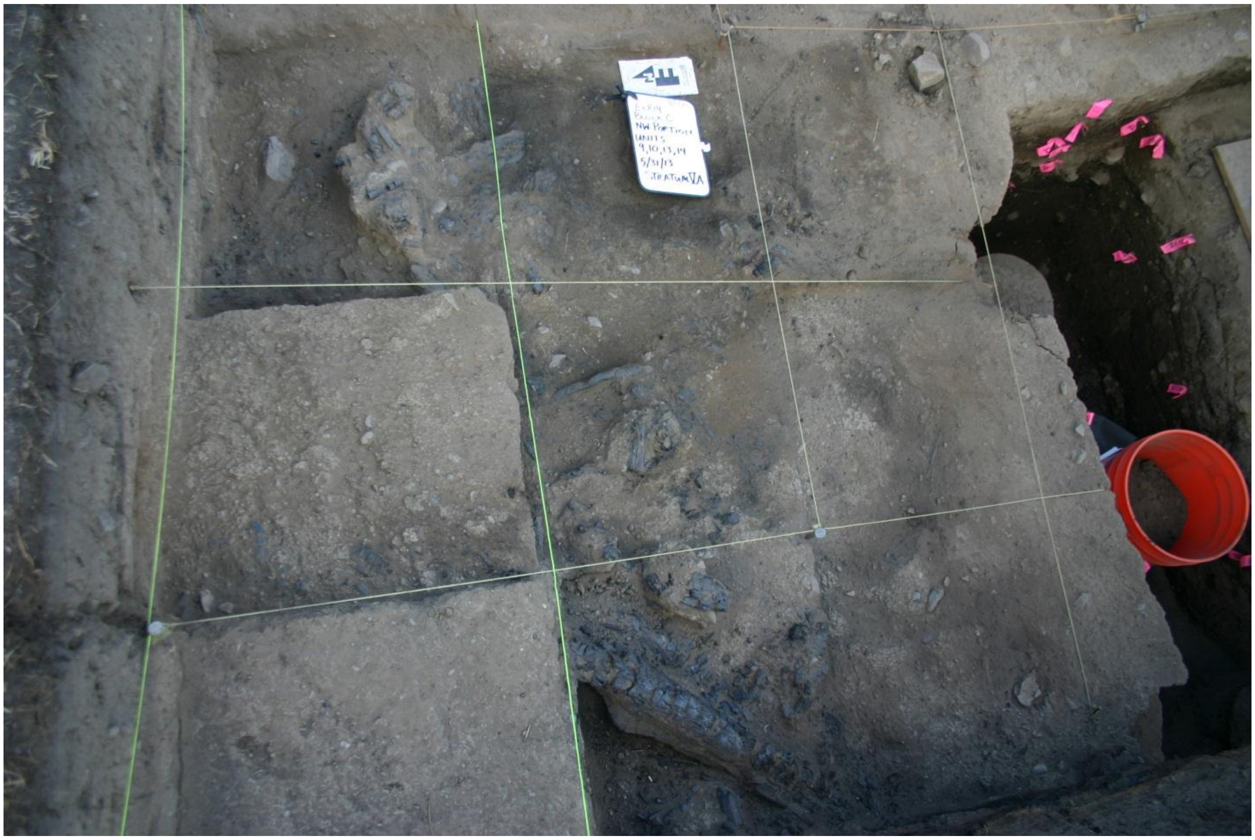
Block B, Stratum IIc, Feature B6 plan view excavated

Block B, Stratum IId, Plan View

Block C, Stratum Va burned roof beams

Block C, Stratum Va burned roof beams

Block C, Stratum Va burned roof beams



Block C, Stratum Va burned roof beams

Block C, Stratum Va burned roof beams and needles close-up

Block C, Stratum Va, plan view detail burned wood, bark, and needles

Block B, Stratum IIa, Plan View

Block C, Stratum IIa, Feature C1 surface

Block C, Stratum IIa, Feature C2 surface

Block C, Stratum IIa, Feature C3 surface

Block C, Stratum IIb, Plan View

Block C, Stratum IIb, Feature C4 excavated

Block C, Stratum IIb, Feature C5 surface

Block C, Stratum IIb, Feature C6 excavated

Block C, Stratum IIb, Feature C7 excavated

Block C, Unit 14, Stratum IIb, plan view showing articulated salmon remains with deer scapula

Block C, Unit 14, Stratum IIb, plan view showing additional articulated salmon remains (see photo above) with deer scapula

Block C, Stratum IIc, Plan View

Block C, Stratum IIc, Feature C8 surface

Block C, Stratum IIc, Feature C11 excavated

Block C, Stratum Vb2, plan view -- base

Block C, Stratum IId, Plan View

Block C, Stratum IId, Feature C13 surface

Block C, Stratum IId, Feature C13 excavated

Block D, Stratum Va, burned roof beams

Completed 2013 excavation, view facing northeast

Completed 2013 excavation, view facing southwest.

Appendix B

Lithic Artifact Typology

Unifacially Retouched Artifacts

1	miscellaneous
50	Unifacial blade tool
71	Used flake on a break
88	Dufour bladelet
143	Scraper retouch flake
148	Flake with polish sheen
150	Single scraper
151	Unifacial perforator
152	Unifacial borer/drill
153	Small piercer
154	notch
156	Alternate scraper
157	Miscellaneous uniface
158	Key shaped uniface
159	Unifacial knife
160	Unifacial denticulate
162	End scraper
163	Inverse scraper
164	Double scraper
165	Convergent scraper
180	Used flake
183	Spall tool
184	Retouched spall tool
188	Retouched backed tool
232	Stemmed scraper
255	Abruptly retouched truncation on a flake
279	Hafted unifacial knife w/some bifacial chipping on haft
302	End Scraper on snapped Kamloops projectile point

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
140	Knife-like biface
141	Scraper-like biface
145	Piece esquillees
192	Stage 2 biface
193	Stage 3 biface
225	Tang knife
240	Chipped wedge tool on angular slate or shale

258	Hafted knife on a spall
262	Side notched bifacial drill
286	Steep retouched truncation on a biface
291	Bifaical knife retouch flake
299	Key-shaped biface
286	Steep retouched Truncation on a biface

Points

19	Late plateau point
35	Point tip
36	Point fragment
99	Misc. point
101	Lochnore 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	220huswap contracted stem slight shoulders
122	220huswap contracted stem pronounced shoulders
123	220huswap parallel stem slight shoulders
124	220huswap parallel stem pronounced shoulders
125	Shuswap corner removed concave base
126	Shuswap corner-removed eared
127	Shuswap stemmed single basal notch
128	Shuswap shallow side-notched straight basal margin
129	Shuswap shallow side-notched concave basal margin
134	Preform
136	Plateau preform
137	Kamloops preform
229	Shuswap 10: stem/eared with concave base
231	Ground/sawed slate projectile point
236	Limestone or marble projectile point
237	El khiam style point: side notched point on a triangular blade-like flake
244	Small triangular point
245	Large straight to concave base side-notch point
251	Slate side-notched point with a straight base
254	Large square stemmed dart point
256	Kamloops split base corner notched
285	Unifacial point preform
289	Lame a crete
292	Notched flake w/distal impact fracture
295	Plateau corner-notched point w/base missing
301	Crude projectile point (shape of point chipped on flake)

303	Kamloops corner-notched projectile point with base mising

Groundstone

185	Wedge-shaped bifacial adze
190	hammerstone
200	Misc. groundstone
201	abrador
202	Sandstone saw
203	Ground slate
204	Steatite tubular pipe
205	Abrader/saw
206	Anvil stone
207	Abraded cobble or block
208	Abraded cobble spall
209	Ornamental ground nephrite
211	Groundstone mortar
218	celt
219	Groundstone maul
220	Ground slate piercer/borer with chipped edges
222	Slate scraper
226	Sawed gouge
228	Groundstone adze on a natural break
230	Slate knife
233	Nephrite adze
234	Burnishing/polishing stone
235	metate
238	Groundstone spike
239	Small stone bowl
241	Sawed adze
242	Ochre grinding stone
246	Slate knife with bored hole
250	Ground nephrite scraper
257	Ground slate adze, without cutting/sawing
259	Groundstone cube
260	mano
261	Groundstone effigy
263	Ground slate chopper
264	Adze perform
265	Shallow ground slate bowl
266	Sawed scraper on an igneous spall
267	Miscellaneous groundstone base, possible effigy or bowl
268	Nephrite adze core
276	Hafted slate with blunt edge and parallel

	striations, most likely mate scraper
277	Incised slate
278	Slate knife retouch flake
280	Chipped slate
281	Sawed slate
282	Slate chopper
283	Steatite tubular pipe manufacture reject
284	Chipped adze
293	Ground nephrite adze preform
294	Chipped stone chopper
296	Nephrite polished scraper
297	Scraper on a flake derived from a hand maul
298	Polished steatite fragment
300	Small groundstone disk
304	Slate Scraper retouch flake
305	Incised or pecked image on ground surface
306	Polished nephrite fragment

Ornaments

210	ochre
212	Mica ornament
214	Stone bead
215	Stone pendant or eccentric
216	Ground or sculpted ornament
217	Copper artifact
243	Sawed/sliced bead
252	Copper bead
253	Copper pendant
287	Spindle whorl preform
288	Spindle whorl
290	Ornament/pendant blank

Other

213	Misc. metal artifact
223	Burin spall tool
224	burin
227	Sawed stone disk
247	Misc. drilled artifact
248	Misc. sawed stone
249	Painted stone tool
269	Glass beads
270	Misc. glass
271	Window glass
272	Iron projectile point
273	Other historic period beads
274	Horseshoe
275	nail

Cores

146	Bipolar core
147	Microblade
149	Microblade core
182	Core rejuvenation flake
186	Multidirectional core
187	Small flake core
189	Unidirectional core
221	Slate core

Size

XSM	Extra small	1 cm square
SM	Small	4 cm square
M	medium	16 cm square
L	Large	64 cm square
XL	Extra large	Greater than 64 cm square

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 reduction
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

Use-wear

0a	Polish
0b	Rounding
1a	Perpendicular striations
1b	Parallel striations
1c	Oblique striations
2a	Scalar/step chipping
2b	Oblique/perp. chipping
3a	crushing
3b	Grinding
3c	Blunting
4	Sawing
5	Gouging/borering
6	Notched
7a	drilled
7b	incised

8	Pecked
9	Battering

Material

1	Dacite
2	Slate
3	Silicified shale
4	Coarse dacite
5	Obsidian
6	Pisolite
7	Coarse basalt
8	Nephrite
9	Copper
10	Ortho-quartzite
11	Basalt
12	Steatite/soapstone
13	Chert (green)
14	Chert
15	Jasper
16	Jasper (hat creek)
17	Chalcedony
18	Chalcedony (yellow)
19	Igneous intrusive
20	Granite/diorite
21	White marble
22	Green siltstone
23	Sandstone
24	Graphite
25	Conglomerate
26	Andesite
27	Vesicular basalt
28	Phyolite
29	Limestone
30	Mica- black
31	Porphyry
32	Silicified wood
34	Schist
35	Misc.
36	Serpententite/serpentine
37	Gray vitric tuff
38	Gypsum
39	Mudstone
40	Galena
41	Quartz crystal
42	Metal/iron
43	Glass
44	Quartzite

45	Other greenstone metamorphics
46	Rhyolite
47	metomorphosed
48	Gneiss

Appendix C

Paleoethnobotanical Report

Bridge River Archaeological Project 2013: Archaeobotanical Analysis

Naoko Endo

Department of Archaeology, Simon Fraser University

This report presents the results of archaeobotanical analysis of 60 bulk samples collected from the BR3 floor sequence (floors IIa to IIf) of Housepit 54 at Bridge River, near Lillooet, British Columbia. These are analysed using flotation, microscopic examination, and comparison to reference collections housed at Simon Fraser University. The analysis of these samples is focused on recovery of smaller macroremains such as seeds and conifer needles. For the purpose of this study, "seed" refers to various fruiting structures including: achene, legume, and caryopsis, as well as the 'true seed' which describes the fertilized ovule, stored nutrients (endosperm or cotyledons) and a seed coat (testa) (Fahn 1995).

Methods:

Samples were processed by flotation at the Bridge River site by the students of University of Montana during the early summer field season of 2013. Dried samples were placed into labeled plastic bags and transported to Simon Fraser University for analysis. Standard archaeobotanical techniques were used in the sorting and identification of macroremains. Light fractions were weighed, and then screened through a series of stacked sieves with mesh sizes of 4.0 mm, 2.0 mm, 1.0 mm, .425 mm and .250 mm. Each of the five fractions was weighed and sorted independently. In this study, the contents of the coarser sieves (4.0mm and 2.0mm) were sorted in their entirety into the components of archaeological significance: seeds, needles, wood charcoal, bark fragments, cone parts, unidentifiable plant remains, bone, and lithics. I also sorted for insects or its parts. All the fractions captured in finer sieves(1.00mm, 0.425mm and .250mm) were sorted exclusively for seeds and needles. In order to facilitate the sorting process, only the 2.00 and 0.250mm mesh sieves were sorted when the total weight of a light fraction sample was less than 20g. All of the sieved samples were then examined under a dissecting microscope with a magnification range of 6-40x. Charcoal weights are estimated per sample from the combined weight of the 4.0 and 2.0mm fractions.

Identifications are primarily based on the visible characteristics of the seed morphology: form and structure; however, some seeds can be positively identified only by examining the internal morphology of the true seed. Seed identifications were made with the aid of several reference manuals on seed identification (Martin and Barkley 1961; Montgomery 1977). Wood charcoal identification follows standard methods set out by Hoadley (1990) and Pearsall (1989). Wood charcoal was randomly selected from each sample and identified using a reflected light microscope (100-500x). Ten wood charcoal specimens were identified per sample. Charcoal identification involved the recognition of anatomical features from the cross, tangential and radial sections of specimens. Criteria for the wood charcoal are based on morphological comparison with reference specimens and published sources (Friedman 1978; Hoadley 1990). Also, the plant remains from Bridge River were examined side-by-side with modern specimens from comparative collections housed at Dr. Dana Lepofsky's palaeoethnobotany laboratory at the Archaeology Department of Simon Fraser University. I would like to express my continued appreciation to Dana for the extensive use of her facilities and collections at the university.

Results:

The assemblage of charred macroremains from BR3 floors of Housepit 54 is summarised in Table 1. The most solid identifications are indicated by the genus of family name with no other symbols indicated. When a family name is listed with no genus, the specimen could only be identified to the family level based upon its characteristics, such as general shape, size and surface textures. Archaeological tissues, which likely represent the remains of charred root foods, are not identifiable beyond this general category, thus they are noted as present/absent (represented by an "X" in Table 1). Unidentifiable seeds are fragments do not have diagnostic features that indicate their identity, given the use of a binocular microscope. Also, samples with an asterisk symbol indicate that one quarter of the sample was sorted exclusively for conifer needles and the number recovered was simply multiply by four to get an estimate number.

Quantifications of plant remains are made as counts, rather than weight, because many of the plant remains are small seeds of negligible weight. These taxa are lost when weights were used to display the samples. Following Lepofsky et al. (1996), conifer needle counts represent the total number of fragments. Charcoal is represented by weight, as is standardized in archaeobotanical reports due to the high number and size range of fragments (Pearsall 1989). In addition to quantification, all remains were also assigned a ubiquity measure (see Table1). Ubiquity measures the percentage of taxon presence across a group of samples regardless of its abundance in each context. Presence values provide a measure of comparison within an assemblage that to a certain extent controls for the differential preservation of species (Popper 1988).

A total of 16 taxa representing 10 plant families were identified, in the form of seeds, needles, and other macrobotanical remains. Of the 221 seeds recovered, 209 have been identified and are classified into 12 known taxa. Fleshy berries are represented by the seeds of Saskatoon, kinniknnick, raspberry, cherry, and Heath family. Other herbaceous species identified from seeds are: sedges, chenopod, bedstraw, dogwood, Grass family and Legume family. Ponderosa pine is represented by needles and bundle bases. Douglas-fir is represented by needles, stems, buds, and cone scales. Paper birch is represented by its bark fragments. All wood charcoal samples from a stack of burned roof beams are identified as Douglas-fir.

References cited:

Fahn, A.

1990 Plant Anatomy. Fourth ed. Butterworth-Heinemann Ltd, Oxford.

Friedman, J.

1978 Wood identification by microscopic examination: a guide for the archaeologist on the Northwest coast of North America. Heritage Record No.5. British Columbia Provincial Museum. Victoria.

Hoadley, R. B.

1990 Identifying wood: accurate results with simple tools. The Taunton Press.

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

1996 Reconstructing prehistoric socioeconomies from palaeoethnobotanical and zooarchaeological data: an example from the British Columbia Plateau. Journal of Ethnobiology 16, 31-62.

Martin, A.C. and Barkley, W.D.

1961 Seed Identification Manual. University of California Press, Berkeley.

Montgomery, F. H.

1977 Seeds and fruits of plants of eastern Canada and northeastern United States. University of Toronto Press, Toronto.

Pearsall, D.M.

1989 Palaeoethnobotany. Orlando: Academic Press.

Popper, V.

1988 Selecting Quantitative Measurements in Paleoethnobotany. In Current Palaeoethnobotany: Analytic Methods and Cultural Interpretations of Archaeological Plant Remains, eds. C. Hastorf and V. Popper. University of Chicago Press: Chicago, pp.53-71.

2013 Bridge River Macroremains

Provenience								
Flotation#	Block	Square/Feature	Strat/Level	Feature	Volume(l)	*Amelanchier alnifolia*	*Arctostaphylos uva-ursi*	*Chenopodium*
281	B	14E/15W	II b/1	B8	1		3	
325	A	10NE	II f/1	A16	1	1		1
364	A	6SW	II f/2	A17	1	2	8	8
377	A	6SW	II f/4	A17	1			3
359	C	10E/11W	II d/2	C13	1		1	
358	A	6NW	II f/1	A17	1		4	9
367	A	6NW	II f/3	A17	1		1	
28	A	10SW	II a/1	A1	0.5			
34	B	15SE	II a/1	B1	1			
95	A	14NE	II b/1		1	1	6	8
38	A	6NW	II a/1	A2	1.5	1	2	2
49	A	6SW	II a/1	A3	1			
137	C	15SW,SE;11NW,NE;16SW;12NW	II a/II b/1	C3	1	1	1	1
93	A	10NW	II b/1	A5	1			
265	C	16NW	II b/1	C12	0.6			
237	A	8SE	II e/1	A14	0.5		6	
376	B	5NW	II c/1	B7	0.6			
395	A	15SE	II f/1	A18	1			
378	A	11NW	II f/1	A18	1			
262	B	6NE	II b/1	B5	1		1	
239	A	12NE	II e/1	A15	0.25		1	

SEEDS(N)								
Cornus sp.	Ericaceae	Fabaceae	*Galium* sp.	*Phacelia* sp.	Poaceae	*Prunus* sp.	*Rubus* sp.	*Scirpus* sp.
			1					
			1					
					4			
	1	1						
					1	1		1
1	1	1						
					4			
	1							1
							1	
			1					

		NEEDLES(N)						Ster
Unidentifiable	TOTAL	*Abies*	*Pinus ponderosa*	*P. menziesii*	*Tsuga*	Unidentifiable	TOTAL	Needle stem(N)
	4						0	
	3		2	33	7	5	47	
	22		22	76		5		1
	3		19	42			61	
	3		1	2			3	
1	17		26	64			100	
	1		13	44			57	
	0		20	40		3	63	
	0						0	
1	19		3	6			9	
	9		40*	10418*			10458*	98
2	4		28*	429*		12*	469*	
1	5						0	
			6	67	5	8	86	
	0						0	
	6		1				1	
	0						0	
	0						0	
	0						0	
	1	1		2			3	
	1						0	

n(N)	OTHER							
Grass stem(N)	Cone parts(N)	Conifer bud(N)	Needle base(N)	Unid.plant tissue(x)	Insect part(N)	Fish bone /fauna(g)	Birch bark frag.(g)	Wood Charcoal Wt.(g)(g/l)
								7.91
						0.01	3.03	1.13
		2						9.24
								7.71
							0.05	10.58
			4	X				7.42
			1					9.51
			1					4.1
								10.3
					X			1.61
		16	9					17.79
		4	2					2.79
		2						5.49
								6.52
			1			0.03		0.44
						0.11		0.32
								0.27
								0.2
								0.56
				X				3.18
								0.43

2013 Bridge River Macroremains

Provenience								
Flotation#	Block	Square/Feature	Strat/Level	Feature	Volume(l)	*Amelanchier alnifolia*	*Arctostaphylos uva-ursi*	*Chenopodium*
281	B	14E/15W	II b/1	B8	1		3	
325	A	10NE	II f/1	A16	1	1		1
364	A	6SW	II f/2	A17	1	2	8	8
377	A	6SW	II f/4	A17	1			3
359	C	10E/11W	II d/2	C13	1		1	
358	A	6NW	II f/1	A17	1		4	9
367	A	6NW	II f/3	A17	1		1	
28	A	10SW	II a/1	A1	0.5			
34	B	15SE	II a/1	B1	1			
95	A	14NE	II b/1		1	1	6	8
38	A	6NW	II a/1	A2	1.5	1	2	2
49	A	6SW	II a/1	A3	1			
137	C	15SW,SE;11NW,NE;16SW;12NW	II a/II b/1	C3	1	1	1	1
93	A	10NW	II b/1	A5	1			
265	C	16NW	II b/1	C12	0.6			
237	A	8SE	II e/1	A14	0.5		6	
376	B	5NW	II c/1	B7	0.6			
395	A	15SE	II f/1	A18	1			
378	A	11NW	II f/1	A18	1			
262	B	6NE	II b/1	B5	1		1	
239	A	12NE	II e/1	A15	0.25		1	
212	A	15NE	II d/1	A11	1			
261	B	10SW	II b/1		1			
286	B	16SE	II b/1	B6	0.6			2
396	C	14NE	II d/1	C14	0.7			
267	C	16SW	II b/1		0.3	1		
354	B	16SW	II c/1		1			
356	B	10SW	II c/1		1		1	
216	C	10NE	II c/1	CC1	1			
209	C	11NW	II c/1	C8	1			
69	A	14SW	II b/1		1		1	
211	A	10SW	II e/1	A12	1			2
73	B	6NW	II a/1	B3	1			1

168	C	15SE	II b/1	C5		1			
183	C	7SW	II b/1	C7		1			
361	C	10E/11W	II d/3	C13		1			
179	A	6NE	II d/1	A9		1			
123	C	7NE	II a/1	C2		1			
333	C	10NE	II d/1			1			
238	A	6SE	II e/1	A13		0.6			
138	B	16SE	II a/1	B4		1	1	53	3
181	A	14SW	II d/1	A10		1			

SEEDS(N)								
Cornus sp.	Ericaceae	Fabaceae	*Galium* sp.	*Phacelia* sp.	Poaceae	*Prunus* sp.	*Rubus* sp.	*Scirpus* sp.
			1					
			1					
					4			
	1	1						
					1	1		1
1	1	1						
					4			
	1							1
							1	
			1					
					1			1
			1		1			
							1	
					1			
			1					
	1							
	2				1			

13 8 1

		NEEDLES(N)						Ster
Unidentifiable	TOTAL	*Abies*	*Pinus ponderosa*	*P. menziesii*	*Tsuga*	Unidentifiable	TOTAL	Needle stem(N)
	4						0	
	3		2	33	7	5	47	
	22		22	76		5		1
	3		19	42			61	
	3		1	2			3	
1	17		26	64			100	
	1		13	44			57	
	0		20	40		3	63	
	0						0	
1	19		3	6			9	
	9		40*	10418*			10458*	98
2	4		28*	429*		12*	469*	
1	5						0	
			6	67	5	8	86	
	0						0	
	6		1				1	
	0						0	
	0						0	
	0						0	
	1	1		2			3	
	1						0	
	0						0	
	0						0	
	4		1				1	
	2		7	80		3	90	
2	4						0	
	0						0	
	2						0	
	0						0	
	1						0	
	2		14	42		2	58	
	5		8	32		6	46	
	1			4			4	

	0		11		11	
	0				0	
	0				0	
	0	18	42	5	65	
	0				0	
	0	1	9		10	
	0	24	42	4	70	
2	81	11	4		15	3
	0	18	45	11	74	

n(N)	OTHER							
Grass stem(N)	Cone parts(N)	Conifer bud(N)	Needle base(N)	Unid.plant tissue(x)	Insect part(N)	Fish bone /fauna(g)	Birch bark frag.(g)	Wood Charcoal Wt.(g)(g/l)
								7.91
						0.01	3.03	1.13
		2						9.24
								7.71
							0.05	10.58
			4	X				7.42
			1					9.51
			1					4.1
								10.3
					X			1.61
		16	9					17.79
		4	2					2.79
		2						5.49
								6.52
			1			0.03		0.44
						0.11		0.32
								0.27
								0.2
								0.56
				X				3.18
								0.43
								0.8
								0.78
								5.27
						0.02		1.33
			1					0.78
								0.55
								0.35
								3.46
							0.01	0.13
								3.31
						0.2		3.15
								1.08

			3.03
			0.6
			20.3
		0.53	8.31
	1		2.74
	1		4.83
1			2.37
		0.63	4.83
	1		8.3

Appendix D

Geochemical Analysis Report

Preliminary Report on the Elemental Characterization of Floor Sediments Block A Strata IIa – IIf and Block C Strata IIa-IId, Housepit 54, Bridge River Site

By

Nathan Goodale[1*]

Katherine Hill[1]

Alissa Nauman[1]

David G. Bailey[2]

Bruce Wegter[2]

Anna M. Prentiss[3]

[1]Anthropology Department, Hamilton College, Clinton, NY 13323

[2]Geosciences Department, Hamilton College. Clinton, NY 13323

[3]Department of Anthropology, Missoula, MT, 59812

[*]corresponding author ngoodale@hamilton.edu

DRAFT REPORT

INTRODUCTION

This study presents geochemical data generated through the multi-element analysis of floor sediments from Housepit 54 (HP 54) at the Bridge River Housepit Village, British Columbia. Sediments were systematically sampled across multiple superimposed floors.

The purpose of this research is to investigate the impact of human occupation on the elemental composition of domestic floor sediments. Portable X-ray fluorescence spectrometry (pXRF) is used to analyze spatial variation in the intensity of major and trace elements. Elemental analyzer isotope ratio mass spectrometry (EA-IRMS) is employed to examine variation in stable isotopes (Carbon and Nitrogen). The geochemical data may provide insight into the organization and use of household space. Particular attention is given to patterns of cultural continuity and change through time.

BRIDGE RIVER SITE

Bridge River is a large housepit village located near the town of Lillooet, in the Middle Fraser Canyon of British Columbia (Figure 1). The village emerged in the centuries immediately following 2,000 years ago. Housepit 54 demonstrates an exceptionally long history of occupation, containing as many as thirteen occupational floors, interspersed with seven roof deposits. While the final floor post-dates contact, the underlying floors pre-date 1100 cal. B.P. The historic Fur Trade period floor was excavated in 2012, in contribution to the Bridge River Archaeological Project. During the 2013 field season, excavators exposed several underlying floors associated with prehistoric occupations. The sediments collected across these floors are the subject of analysis in this study.

ELEMENTAL CHARACTERIZATION

Anthropogenic sediments are formed through the complex interplay between human and natural factors. Daily activities such as cooking, food preparation, waste disposal, and craft production introduce distinct chemical residues into underlying sediment. Unless the sediment is significantly altered, residues are preserved in their original depositional contexts, and are chemically detectable.

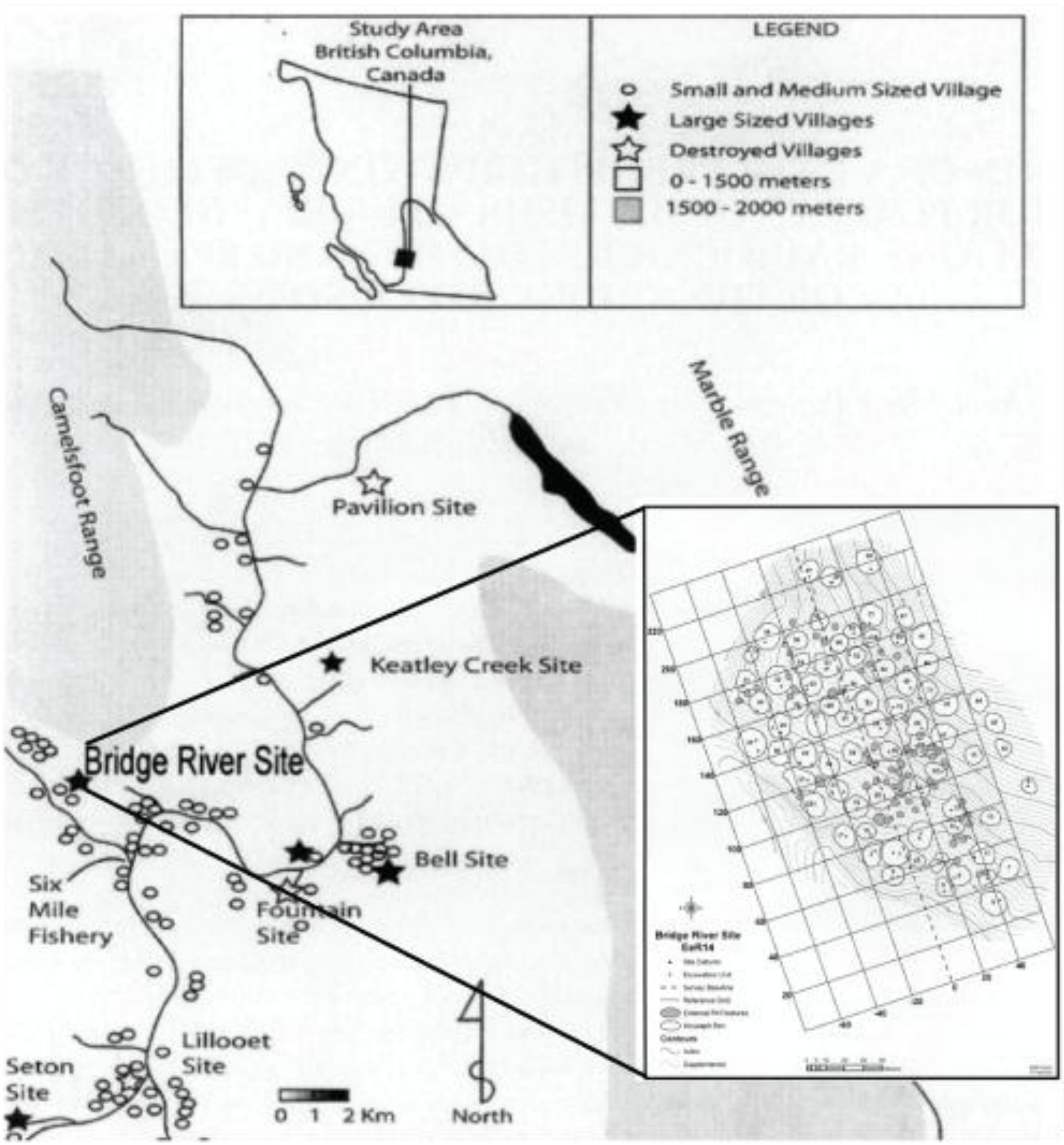


Figure 1. Location of Bridge River Housepit Village, B.C., Canada. Inset detailed map of village configuration.

LABORATORY PROCEDURES

Preliminary Sample Preparation: Sediments were systematically collected in every other 50x50cm quadrant. Samples were dried on a hot plate overnight and sifted through a 4 mm Standard Testing Sieve to separate out large clasts and artifacts. Sieved samples were oven-heated at 500° C for 5 hours. Once cool, samples were pulverized using a SPEX 8510 Shatterbox with tungsten carbide ring mill. Equipment was cleaned between samples, using isopropyl alcohol and compressed air, to avoid cross-contamination.

Preparation for pXRF: SPEX CertiPrep 31mm X-Cell Sample Cups were filled to the top (but not compacted) with powdered sediment. Each sample cup was carefully covered with a ULTRALENE (4µ thick) pre-cut circular window to produce the smoothest seal possible. Individual sample cups were labeled and stored in sealable plastic bags to protect the film and avoid cross-contamination.

Preparation for EA-IRMS: A microbalance (0.001mg) was used to measure 20mg of each sample. Weighed samples were transferred into cylindrical tin capsules using a stainless steel forming device. Filled capsules were folded and manipulated with precision tweezers into tightly packed balls, and loaded individually into an automatic sampler.

X-RAY FLUORESCENCE SPECTROMETRY (pXRF)

pXRF allows for the rapid and simultaneous identification of several major and trace elements in natural geologic materials (Goodale et al. 2012). The initial chemical analysis of HP 54 floor sediments was carried out using a Premium Delta Olympus handheld analyzer. The instrument operated in 3-beam soil mode (calibrated to a modified fundamental parameters based on six international powdered rock samples), analyzing samples for 100 seconds per beam (300 seconds total) and standard for 60 seconds per beam. At 40kv, Beam 1 secondarily fluoresced Fe. Beam 2 primarily fluoresced Fe at the same voltage. At 15kv, Beam 3 primarily fluoresced P, K, and Ca, and secondarily fluoresced Fe. A Cal check was performed using a 316 Stainless Steel Calibration Check Reference Coin to begin each series of sample test runs. The standard reference material (SO-3) was analyzed 5 times following calibration, and again at the end of each session, to monitor analytical drift. Concentrations were reported in parts per million (ppm).

STABLE ISOTOPE ANALYSIS

Isotope analysis allows for the detection of subtle changes in the natural abundance of stable isotopes. Unlike radioactive isotopes, stable forms do not decay over time. However, biological, chemical, and physical processes can cause variations in the isotopic composition of a material. Human activities give rise to different biochemical processes that are reflected in distinctive isotope signals. Carbon and Nitrogen are found in the earth, the atmosphere, and all living things. Each consists of a heavy stable isotope (13C and 15N), and a more abundant light stable isotope (12C and 14N).

Sediments from HP 54 were analyzed for carbon and nitrogen isotopes using a Costech Elemental Combustion System/Analyzer coupled, via an interface, to a Thermo Scientific Delta V Advantage IRMS. Samples were interspersed with several laboratory standards at the beginning, middle, and end of analysis. Standards have been calibrated against NIST Standard Reference Materials. Preliminary values were normalized and reported on the international stable isotope reference scale, based on the known values of laboratory standards. For the purpose of this study, data are reported in weight percent (wt%).

RESULTS

XRF and IRMS data demonstrate very similar elemental distributions for most of the investigated floors in Blocks A and C. In general, the distributions of C and N align with the distributions of the other investigated elements. Phosphorus appears to pattern more independently. Areas of elemental enrichments and depletions are consistently patterned across individual floors (Figures 2 and 3). There is no obvious explanation for the tight correlation between the elements, apart from their association with human activities carried out within the house. Future interpretations will consider the patterns highlighted by the analysis and the results presented here should be considered preliminary.

DISCUSSION AND CONCLUSIONS

The results of this study suggest that multi-elemental characterization of floor sediments may be used to identify and distinguish between activity areas. Chemical analyses of HP 54 reveal variation in elemental patterning for each occupation. The spatial variability in elemental footprints may reflect significant changes in the use of domestic space over time.

Elemental characterization of sediments from living floors may aid in establishing past spatial organization and human behavioral adaptations. This information is of greatest value when used to supplement more traditional lines of archaeological evidence. Additional examination of the spatial distribution of lithics, fauna, and features may help to elucidate the significance of elemental enrichments and depletions, in terms of activity areas.

FUTURE GOALS

Further study will be conducted to examine the possibility of artificial correlations. Samples will be analyzed microscopically to evaluate the degree of mineralogical variation between sediments from different floors. Fundamental differences (e.g., grain size, mineral composition) in the bulk matrix of sediments from different strata may in part account for the correspondence between elemental signatures. Additional data points within each floor unit may elucidate the observed trends. Consideration will be given to determining the degree of leaching through the superimposed floors. In addition, background samples will be collected and analyzed to establish a chemical baseline against which human impact can be measured.

ACKNOWLEDGMENTS

Thank you to Dr. Anna M. Prentiss for allowing us to be a part of this project, and to Kristen Barnett for inviting us to present in this symposium. The archaeological excavations at Housepit 54, Bridge River Housepit Village are funded by the National Endowment for the Humanities and the University of Montana. Geochemistry research was also made possible through the Dean of Faculty at Hamilton College.

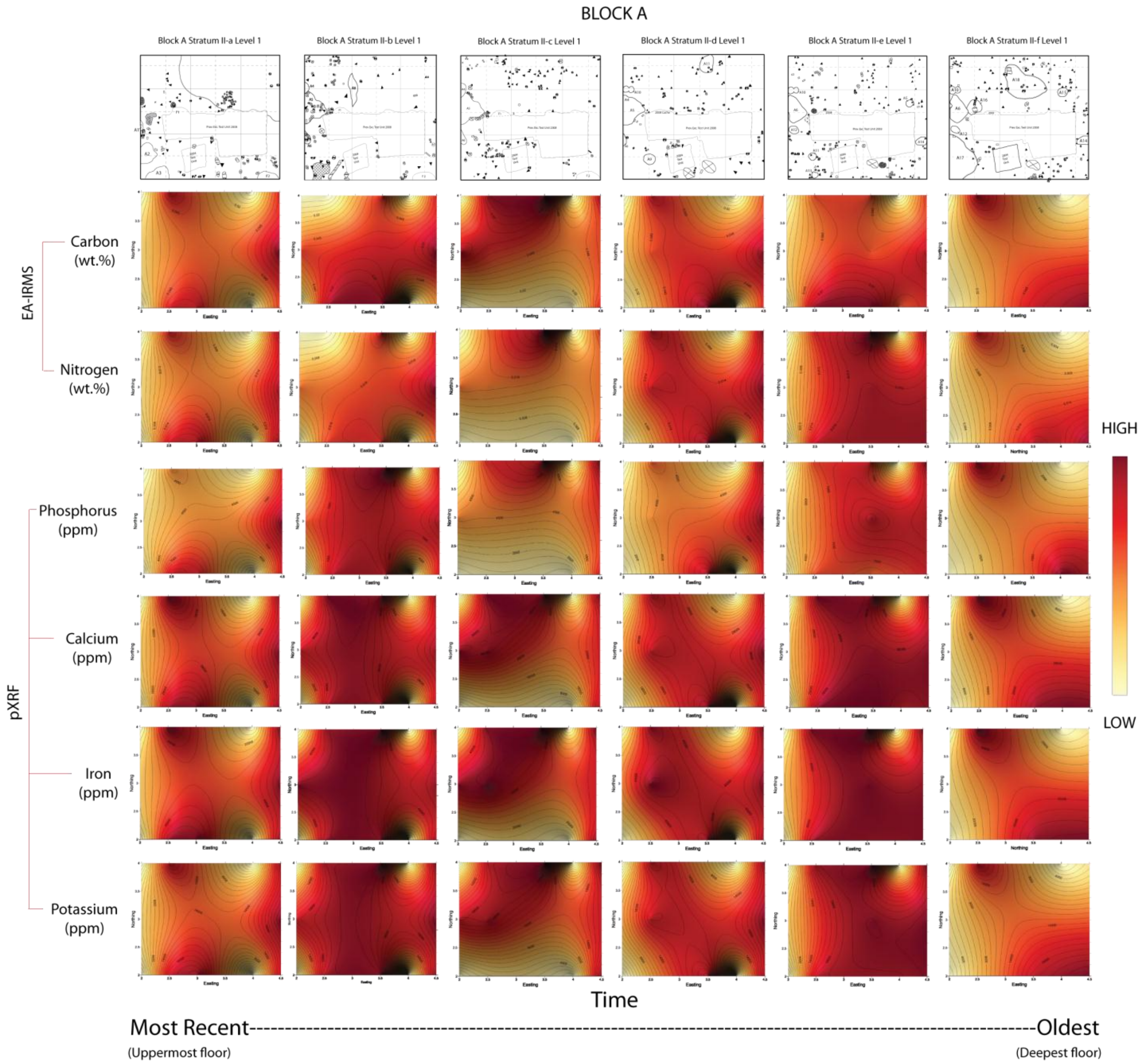


Figure 2. Geochemical Results from Block A strata IIa – Iif.

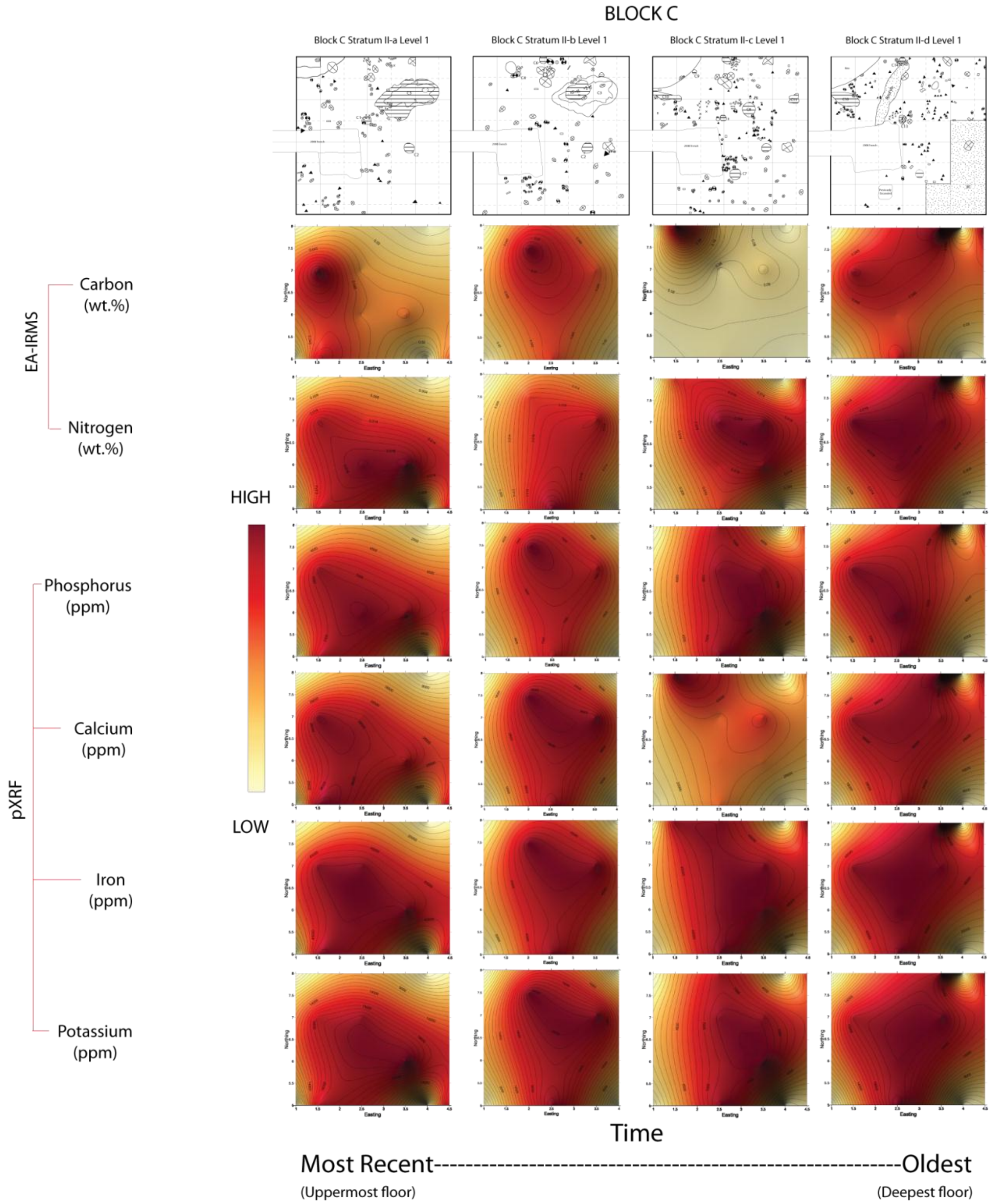


Figure 3. Geochemical Results from Block C Strata IIa – IId.

REFERENCES CITED

Goodale, N. et al.

2012 pXRF: A Study of Inter-instrument Performance. Journal of Archaeological Science 39:875-883.

Middleton, W.D.

2000 Chemical Identification of Activity Areas in the Keatley Creek Housepits. In The Ancient Past of Keatley Creek: Vol. II: Socioeconomy, edited by Brian Hayden, Pp. 103-117. Archaeology Press, Burnaby. Simon Fraser University.

Middleton, W.D.

2004 Identifying Chemical Activity Residues on Prehistoric House Floors: A Methodology and Rationale for Multi-Elemental Characterization of a Mild Acid Extract of Anthropogenic Sediments. Archaeometry 46(1):47-65.

Appendix E

Ancient DNA Report (Data from Fur Trade floor -- Stratum II)

aDNA LAB REPORT
(2013-04)

Ancient DNA Analysis of Housepit Floor Sediments from the Bridge River Site (British Columbia).

Ancient DNA Laboratory
Simon Fraser University

Project Conducted by Antonia Rodrigues

Project Supervised by Dongya Yang

August 2013

Ancient DNA Laboratory, Department of Archaeology, Simon Fraser University, Burnaby, BC, Canada
www.sfu.ca/~donyang | donyang@sfu.ca | Tel:778-782-4651 | Fax:778-782-5666

SUMMARY: Ancient DNA analysis was conducted on nine archaeological sediment samples recovered from housepits at the Bridge River archaeological site. Extracted DNA displayed signs of inhibition and target DNA was not successfully recovered. Ongoing work will aim to overcome the current levels of PCR inhibition.

ORIGIN: The archaeological sediments were collected from the Bridge River site (EeRl-4) in British Columbia.

DATE: The samples were provided to Dongya Yang in July 2012.
Ancient DNA analysis was conducted between September 2012 and August 2013.

CONTACT: Anna Prentiss
Department of Anthropology
Social Science 235
University of Montana
Missoula, MT 59812
Tel: 406-243-6152 Email: anna.prentiss@umontana.edu

MATERIAL: All samples are loose sediments. All samples were randomly selected and grouped into a number of sets and recorded with lab numbers (APx) to be processed in different DNA extractions. The renumbering and regrouping were used to create a mechanism to more sensitively detect any potential systematic contamination in the lab. The weight of individual samples extracted ranges from 1.012-1.625 g (Table 1).

Table 1: Sample information for Bridge River housepit sediments.

SFU ID	Prentiss Sample Info	Weight Extracted (g)
AP1	(1) A-14, Q4, II, lvl.1	1.139
AP2	(2) D-10, Q3, II, lvl.1	1.215
AP3	(3) C-16, Q3, II, lvl.1	1.613
AP4	(4) B-10, Q2, II, lvl.1	1.289
AP5	(5) D-5, Q3, II, lvl.1	1.267
AP6	(6) B-6, Q3, II, lvl.1	1.348
AP7	(7) D-7, Q3, II, lvl.1	1.012
AP8	(8) C-13, Q4, II, lvl.1	1.625
AP9	(9) B-12, Q3, II, lvl.1	1.438

DNA EXTRACTION: Sample preparation and DNA extraction was conducted in the dedicated Ancient DNA laboratory located in the Department of Archaeology at Simon Fraser University. Approximately one gram aliquots of sediment samples were weighed out and incubated overnight in a lysis buffer (0.5 M EDTA pH 8.0; 0.5% SDS; 0.5 mg/mL proteinase K) in a rotating hybridization oven at 50°C. Samples were then centrifuged and 2.0 mL of supernatant from each sample was concentrated to <100 µL using Amicon Ultra-4 Centrifugal Filter Devices (30 KD, 4mL, Millipore). Concentrated extracts were purified using QIAquick spin columns (QIAGEN, Hilden, Germany) based on the method developed by Yang et al. (1998). 100 µL of DNA from each sample was eluted from QIAquick column for PCR amplification. DNA extracts were dark in colour (see Figure 1), suggesting the co-extraction of PCR inhibitors alongside DNA.

Figure 1: Typical DNA extract from Bridge River housepit sediments. The dark colour of the sample is indicative of the presence of PCR inhibitors.

Due to the dark colour of the DNA extracts, a positive control 'spiked' inhibition test was undertaken. A known sample of DNA was added to an aliquot of each extract. These 'spiked' samples were then diluted in series with ultra-pure water [to determine the point where the potential inhibitors no longer affect PCR amplification]. Dilution series were are follows: 1X (undiluted), 5X diluted, 25X diluted and 125X diluted. PCR amplification was inhibited at 1X and 5X dilutions; PCR amplification was successfully amplified after 25X dilution. All subsequent sample analysis was carried out on 25X diluted samples.

PCR SETUP: PCR amplifications (60 cycles) were performed on an Eppendorf™ Mastercycler Gradient using a 30 µL reaction volume containing 1.5X Applied Biosystems™ Buffer, 2 mM $MgCl_2$, 0.2 mM dNTP, 1.0 mg/mL BSA, 3.0 µL DNA sample and 1.125 U AmpliTaq Gold LD (Applied Biosystems). Salmonid cytochrome b (cytb) fragments (168bp), cervid 12S (125bp) fragments and universal mammalian 16S fragments (130bp) were amplified separately using previously published protocols (Yang and Speller 2006). Five uL of PCR product from each sample was separated on a 2% agarose gel, and visualized using SYBR Green™ (Clare Chemical Research Co.), on dark reader. Despite multiple attempts, salmonid cytb fragments were not successfully amplified. Three cervid 12S fragments were successfully amplified (AP1, AP3, AP9); three mammalian 16S fragments were successfully amplified (AP2, AP4, AP7).

SEQUENCING: All successfully amplified samples were purified enzymatically using ExoSAP-IT® (Affymetrix, Inc.) and sent to Eurofins MWG Operon (Huntsville, AL) for sequencing. Poor quality 12S sequences were obtained for two samples; the remaining sample (AP3) produced a good quality sequence. Good quality 16S sequences were obtained for all samples. The sequences were compared to Genbank sequences through the BLAST application to determine their closest match, and to ensure that they did not match with any other unexpected species or sequences.

Ancient DNA Laboratory, Department of Archaeology, Simon Fraser University, Burnaby, BC, Canada
www.sfu.ca/~donyang | donyang@sfu.ca | Tel:778-782-4651 | Fax:778-782-5666

RESULTS:

According to lab protocols, a species identification is assigned to a sample only if it matches identically or very closely with published reference sequences, and if no other evidence, including reproducibility tests or additional sequencing of the same sample indicated a different species. One 12S amplification (AP3) yielded sequences which matched either identically, or within a few base pairs, with Genbank BLAST reference sequences for uncultured bacterium, indicating unspecific primer binding. All three 16S amplifications matched either identically, or within a few base pairs, with Genbank BLAST reference sequences for *Bos taurus*. This is likely a reflection of the universal mammalian primers sporadically binding to the bovine serum albumin (BSA) used in PCR to help overcome inhibition.

The results suggest that the 25X dilution required to overcome PCR inhibition may dilute the target DNA too much for successful PCR amplification. Current, ongoing work is testing alternative methods to overcoming PCR inhibition which extend to both the extraction and PCR amplification steps. This includes modifying DNA extraction steps to incorporate chemical reagents such as InhibitEX tablets (Qiagen, Hilden, Germany), which are designed to remove impurities during the extraction of difficult samples. It also includes the use of DNA polymerases engineered with broad resistance to common PCR inhibitors (e.g. humic and fulvic acids) (Kermekchiev et al. 2009).

CONTAMINATION CONTROLS:

The dedicated ancient DNA laboratory at SFU follows strict contamination control protocols such as: the separation of the pre-PCR and post-PCR work spaces; the use of ancient DNA dedicated equipment including clothing, equipment and reagents and the analysis of negative controls alongside the ancient DNA samples. Ancient DNA amplicons and sequences are scrutinized to ensure that they follow expected amplification and phylogenetic patterns.

The contamination controls undertaken in this study were successful at eliminating any systematic contamination as no PCR amplification was observed in blank extracts and PCR negative controls.

Ancient DNA Laboratory, Department of Archaeology, Simon Fraser University, Burnaby, BC, Canada
www.sfu.ca/~donyang | donyang@sfu.ca | Tel:778-782-4651 | Fax:778-782-5666

REFERENCES:

Kermekchiev, Milko B, Lyubka I Kirilova, Erika E Vail, and Wayne M Barnes
2009 Mutants of Taq DNA polymerase resistant to PCR inhibitors allow DNA amplification from whole blood and crude soil samples. *Nucleic Acids Research* 37(5): 1-14.

Yang, Dongya Y., Barry Eng, John S. Waye, J. Christopher Dudar, and Shelley R. Saunders
1998 Improved DNA extraction from ancient bones using silica-based spin columns. *American Journal of Physical Anthropology* 105:539-543.

Yang, D. Y. and C. F. Speller
2006 Co-amplification of cytochrome b and D-loop mtDNA fragments for the identification of degraded DNA samples. *Molecular Ecology Notes* 6(3):605-608.

Ancient DNA Laboratory, Department of Archaeology, Simon Fraser University, Burnaby, BC, Canada
www.sfu.ca/~donyang | donyang@sfu.ca | Tel:778-782-4651 | Fax:778-782-5666