INTERIM REPORT

Project Title: HOUSEHOLD ARCHAEOLOGY AT BRIDGE RIVER, BRITISH COLUMBIA

NEH Grant RZ-51287-11

Project Director: Anna Marie Prentiss, Ph.D.

Grantee Institution: The University of Montana

Date Submitted: April 30, 2013

Interim Performance Report

Accomplishments

The original proposal for the project detailed a number of specific annual goals. Most fundamentally, the project was designed to complete excavation of the 13 floors and seven roofs associated with Housepit 54 at the Bridge River site. To accomplish this, it was anticipated that approximately 3-5 floors and where necessary, associated roofs would be excavated in each of the three field seasons. Thus, we expected to complete excavation of at least three floors during 2012 to be followed by the full range of expected laboratory studies and development of artistic works.

Field research in 2012 focused exclusively on the final floor and roof from Housepit 54. Excavations revealed that the deposit was deeper and far more complex than had been anticipated from test excavations conducted in 2008. As is described in detail in the appendix, the final floor and roof dated to the Fur Trade period and represents the first time a house of this size from the 19th century has been fully excavated. Cultural materials recovered included hearth and cache pit features, over 12,000 stone artifacts, over 10,000 pieces of fire-cracked rock (from cooking activities), 51 18th and 19th century European trade items (beads, button, ring, etc.), over 5500 faunal remains, several hundred plant items, and a complex array of soil geochemical and ancient DNA samples. These data provide an extraordinary opportunity to reconstruct an aboriginal household actively engaged in production and exchange of goods with Europeans, while preserving traditional cultural values in the face of an expanding European presence. Early in the field phase in 2012, the PI and colleagues recognized that even if this slowed the schedule, it was critical not to waste this opportunity by excavating too fast and losing important data. The materials are significant enough that we now plan to submit a manuscript to the University of Utah Press for publication focusing entirely on the Fur Trade occupation at Housepit 54.

Careful excavation of the Fur Trade floor and roof at Housepit 54 did slow down progress towards completion of the excavation. This means that we have to complete six floors per year in the coming two field seasons. Anticipating the coming two summer field seasons, it is unlikely that this will happen. It is more likely that approximately four floors will be excavated per year. Fortunately, the old floors and occasional roofs do not appear to be as thick or dense with cultural materials (especially fire-cracked rock) as those of the final floor and roof. Thus, more rapid progress should be made retaining an ideal goal of six floors per season. The project will still expect to publish a scholarly book on these deeper and older floors and follow with a highly illustrated broad audience book examining the entire project.

The proposal outlined a plan to develop a project website under the assumption that the University would make this option available free of charge. This did not happen and consequently the PI is raising funds to develop this expectation in the coming six months. Fortunately, until now the project has not had results to display in this context. We expect to have the results available on the web in the form of the excavation report and associated data (attached appendix) in the coming days.

All laboratory and artistic works are moving forward as planned. The project developed studies of dating and stratigraphy, lithic artifacts, historical artifacts, animal bones, plant remains, sediment geochemistry, and ancient DNA. The ancient DNA has been initiated but not completed for this cycle. Isotope studies of animal bones and plant remains (especially pine needles) will begin after the next field season. Spatial analyses of recovered materials are ongoing. Artistic depictions have been initiated by artist Eric Carlson as field sketches to be finalized as we develop the publications.

Changes to Project Methodology

There are no changes to project methodology at this time. Field and laboratory research are proceeding as outlined in the proposal.

Consultants

There are no changes in the role of project consultants.

Automation

As demonstrated in the appended report, the project has benefitted from a variety of computer applications including data base, statistical, and mapping (GIS) programs. No changes anticipated with computer applications.

Matching Funds

Not relevant to this project.

Appendix

Report of Household Archaeology at Bridge River 2012 Field Season

REPORT OF THE 2012 UNIVERSITY OF MONTANA INVESTIGATIONS AT THE BRIDGE RIVER SITE (EeRl4): HOUSEPIT 54 DURING THE CANADIAN FUR TRADE 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

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April 2013

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 Brenda Frank, Josh Jack, and Aina Williams for their long hours of hard work. Excavations were also facilitated by an archaeological field school from The University of Montana. We thank students (order not significant), Jack Lynam, Katherine Hill, James Zaksek, Ayme Swartz, Jared Fischer, Spencer Propp, Vic Bondi, Phillip Hamilton, Katy Sanders, and Adam Keele. Three individuals contributed volunteer labor on the project. We thank Anna Antoniou, Kainoa Little, and Justin Kuenstle. Our University of Montana graduate student team included Kristen Barnett, Alexandra Williams, Kelly French, Matt Mattes, and Sara Hocking. The latter group also put in long hours in the laboratory and contributed significantly to the project. We thank funded laboratory collaborators, Dongya Yang, Linda Scott Cummings (PaleoResearch Institute), Naoko Endo, and DirectAMS. Finally, we thank our unfunded collaborators for providing a variety of contributions including study of European manufacture artifacts (Mary Bobbitt and Riley Augé), geochemical analysis (Nathan Goodale, Alissa Nauman, Katy Hill, and David Bailey), and consultation regarding spatial analysis and interpretation (Kelly Dixon, Thomas Foor, Nathan Goodale, Matt Walsh, Pei-Lin Yu, and Matthew Schmader).

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Chapter One

Introduction

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During summer of 2012 the Bridge River Archaeological project initiated the first of several field seasons of excavation focused on Housepit 54. The Bridge River site is a large housepit village located several kilometers from the confluence of the Bridge River and large Fraser River, near Lillooet, British Columbia. The village is one of several in the Middle Fraser Canyon context that have received intensive archaeological studies during the past several decades (Prentiss and Kuijt 2012). While Middle Fraser archaeological research has focused most intensely on occupations pre-dating about 1000 years ago, the Middle Fraser villages also offer abundant evidence for more recent occupation associated directly with the historical St'át'imc (Upper Lillooet) people known best from the detailed ethnographies of James Teit (1906) and a variety of more recent works (e.g. Hayden 1992; Kennedy and Bouchard 1977, 1978 1998). The two most intensively studied villages, Bridge River and Keatley Creek, are known to have multiple late-dating housepits (Hayden and Adams 2004; Prentiss et al. 2008) though they are not generally known to contain materials associated with the presence of Europeans in the Canadian Plateau region. Housepit 54 is an exception to this rule.

Housepit 54 at Bridge River is a moderate sized house of about 13 meters diameter, thought to contain approximately 13 finely bedded occupation floors and possibly seven roof deposits interspersed between some of the stratified floors (Prentiss et al. 2012; Prentiss and Kuijt 2012). The deepest 12 floors pre-date 1100 cal. B.P., but the final floor and roof contain materials clearly post-dating the arrival of Europeans in the region and signaling the likelihood of a household engaged in socio-economic and political relationships with a variety of Native and non-Native groups. While the Bridge River project seeks to develop a detailed understanding of processes of change across the dozen floors predating 1100 years ago, the final occupation presents an outstanding opportunity to study cultural practices of the St'át'imc people during the Fur Trade period. In doing so, it permits us to offer contributions to a wider range of discussions within Colonial period indigenous archaeology focusing on the demographic, socio-economic and political history of the St'át'imc people as they engaged within an increasingly complex world impacted by an encroaching Capitalist world system.

This research takes a number of positions regarding the nature of history and cultural processes. First, following Wolf (1977), we assert that indigenous history, ethnohistory, and oral history reflect history, the same history we describe for western nations. Thus, a fundamental goal to our research is gaining an understanding of St'át'imc history in the era immediately before and during the Colonial period. This permits us to avoid the pitfalls of some models of world history (e.g. Wallerstein 1974) that could easily relegate the St'át'imc to the slot of "other" or "periphery" (Stein 1998). Second, we do not view the cultural practices of the St'át'imc or other indigenous groups as simplistically bounded, autonomous, and self-regulating as might be implied by some models of sociology, anthropology, and archaeology (e.g. Binford 1986; Rostow 1960; Sahlins and Service 1960; White 1949). Rather we view them as the outcome of a complex web of inheritances, influences and interactions. Thus, understanding the dynamics of Middle Fraser settlement, subsistence and social behavior takes us beyond essentialist conceptions to a view of people interacting in array of complex social networks. This does not mean that human social networks and cultural transmission processes existed outside of the effects of local and global economic and ecological contexts (Wolf 1977). Nor does it mean that these groups did not hold common traditions that were only effectively visible in the actions of finite human populations (e.g. Soltis et al. 1995). Human history from this standpoint is effectively an outcome of cultural transmission, human action, feedback (e.g. economic and demographic impacts), and the effects of events of historical contingency, operating simultaneously on multiple scales (Boyd and Richerson 1992; Prentiss 2011; Wolf 1977). Third, we recognize that given the cultural and historical complexity of this context, that theoretical plurality may yield complimentary insights. Thus, we employ a range of theoretical models from Darwinian cultural transmission and human behavioral ecology to Marxian inspired political economy and social theory in our considerations of technological traditions, foraging strategies, household production activities, social arrangements, and exchange relationships.

This chapter seeks to provide context for this study beginning with a short introduction to issues in Fur Trade period archaeology in British Columbia. I follow with a discussion of late pre-Colonial and Fur Trade period cultural dynamics in the Middle Fraser context drawing upon sources that include archaeology, Fur Trade history, and ethnology. These ideas provide a broad framework to develop a range of more specific hypotheses to be tested with the myriad of archaeological data developed in this project. Finally, I introduce and review the contributions of the chapters in this report.

Archaeology and Ethnology of Aboriginal Societies in British Columbia during the Fur Trade Period

Archaeological research into the Fur Trade in western Canada has overwhelmingly favored investigation of European settlements, especially forts (Carlson 2000; Klimko 2004). Within interior British Columbia this included such places as Fort d'Epinette (Bedard 1990; Burley et al. 1996), Fort Mcleod (Quackenbush 1990), Rocky Mountain Portage House (Burley et al. 1996), Fort St. John's (Burley et al. 1996), and Fort Kamloops (Carlson 2000, 2006). With rare exceptions (e.g. Carlson 2000, 2006), Native settlements during this time have rarely been studied. As noted by Carlson (2000, 2006; see also Rubertone 1989, 2000) Fur Trade archaeology up to the early 1980s emphasized two dominant research themes, a focus on Europeans as primary drivers of the major cultural developments of this period, and subsequently, Native peoples as passive consumers and victims of an inevitably expanding European presence. Scholars implicitly avoided recognition of indigenous agency and assumed that Native peoples were simply subject to acculturation processes. Consequently, despite a significant amount of important research, researchers were for the most part unable to consider different forms of engagement that included self-interested participation in exchange networks and resistance to colonial depredations (e.g. Klimko 2004; Lightfoot et al. 1998; Rogers 1990; Rubertone 2000).

Perspectives on aboriginal cultures during the colonial period have changed significantly in recent decades. A range of studies have examined aboriginal settlement and architecture, subsistence, and social relations in villages on the Northwest Coast (e.g. Mackie and Williamson 2003; Marshall 2000; Martindale 2003; McMillan 1999). One implication of this work is the recognition that aboriginal engagements with Europeans often altered relationships between indigenous groups with sometimes unanticipated consequences. One good example is the development of complex confederations and polities in some portions of the B.C. coastal region during the colonial period (Martindale 2003; McMillan 1999; Schaepe 2006). It is well known that the flood of European goods within aboriginal exchange networks altered long standing social relationships between households and led to increased overt status competition via potlatching and warfare (Acheson and Delgado 2004; Fisher 1977, 1996).

Carlson (2000, 2006) conducted the most comprehensive archaeological study of aboriginal cultural practices on the British Columbia Plateau during the Fur Trade period. Her study examines Secwepemc (Shuswap) housepit occupations associated with Fort Kamloops at the confluence of the North and South Thompson Rivers. She demonstrates that despite occupations at the fort and frequent interactions with Europeans employed by the Hudson's Bay Company beginning in 1821, Secwepemc people maintained a wide range of traditional practices that included house construction primarily with native materials (e.g. nails and glass rarely used), reluctance to favor many European technologies, and persistent use of traditional tools (e.g. lithic projectile points, knives, scrapers, basketry, leather items). On the other hand some things did change as for example shifting cooking from stone boiling in baskets to placement of metal basins directly over heat. Social relations appeared as substantially egalitarian though the few ceramic fragments of European origin appeared in the larger pithouses suggesting the possibility of variation in household standing with European traders and thus differential ability to access goods. Carlson's study has filled an important gap in our knowledge of aboriginal practices directly associated with Fur Trade forts. Her results confirm similar outcomes elsewhere (e.g. Lightfoot et al. 1998; Rogers 1990). However, we still know relatively little regarding persistence of cultural traditions and engagements with Europeans within aboriginal communities at greater distances from the forts.

The Middle Fraser Canyon had no fur trade fort or permanent European presence during the early decades of the 19th century. Yet, it is clear that aboriginal people of the region did interact with Europeans and other Native peoples who in turn were in more direct contact with the newcomers based in such places as Fort Kamloops and Fort Langley (Porter 1997). Historically, the Middle Fraser area was occupied by three Plateau Salishan speaking groups. The area between approximately Cayoosh Creek and Pavilion Creek (generally known as the Lillooet area referring to the contemporary town of that name) was controlled by the St'át'imc or Upper Lillooet (Teit 1906); the Lil'wat or Lower Lillooet occupied the montane valleys west of the Fraser Canyon associated with Seton lake, the Lillooet River, and upper Harrison Lake (Teit 1906). South/southeast of this area including a substantial portion of the Lower Fraser Canyon was generally considered Nlaka7pamux or Thompson territory (Teit 1900, 1906). North of Pavilion Creek and to the east of the Middle Fraser Canyon were the Secwepemc or

Shuswap people (Teit 1909). The Athapaskan speaking Chilcotin occupied the montane forests and valleys to the northwest of the St'át'imc (Matson and Magne 2007). Within the St'át'imc area, aboriginal groups interacted annually at a locality known as "the Fountain" a narrow spot in the Fraser River recognized for rapids and exceptional salmon fishing during the late summer spawning season. Teit (1906:231) notes that not only would representatives from the Canadian Plateau Salishan groups meet here for fishing and trade, but that representatives from the Hudson's Bay Company would sometimes also make the trip presumably from Fort Kamloops.

The St'át'imc: A People with History

While ancestors of today's Salishan peoples have occupied southern British Columbia for many millennia, the Middle Fraser Canyon (henceforth Mid-Fraser) villages appear to have had their start in the centuries immediately following 2000 years ago (Prentiss and Kuijt 2012). Intensive research at the Bridge River site along with nearby Keatley Creek and Bell (Prentiss et al. 2003, 2005, 2007, 2008, 2012; Prentiss and Kuijt 2012; Stryd 1973) has resulted in the development of a chronology of village evolution that suggests early establishment of what would become the largest villages at dates spanning approximately ca. 1600-1850 cal. B.P. The early villages require significant further research. However, current data suggest that they consisted of small groups of housepits of a wide range of sizes (11 to 16 m in diameter) reflecting a range of group sizes. Between this time and ca. 1000 the Bridge River village grew from a maximum of 7 to at least 30 simultaneously occupied houses. Although data are limited it would appear that other villages may have grown at similar rates (Prentiss et al. 2003, 2007). An analysis of inter-household variability in material wealth markers (Prentiss et al. 2012) indicates there was limited variation during the BR 2 period or ca. 1300-1600 cal. B.P. However, by BR 3 times (ca. 1300-1100 cal. B.P.), there were significant differences in a host of indicators including subsistence items, dog remains, non-local lithic raw materials, and prestige artifacts like steatite beads and nephrite tools. These have been interpreted as indicators of emergent social inequality. While the data do not strongly indicate long term inherited status within houses, it is still possible that some form of ascribed status could have developed right at this time as better manifested at Keatley Creek and possibly the Bell site (Prentiss et al. 2007). Another important development recognized at Bridge River is the establishment of circular arrangements of houses during BR 2 times. By the BR 3 period, we recognize two distinct "neighborhoods," the southern group featuring 11 houses in a single ring and the northern neighborhood exhibiting a double ring of 19 houses. Also, during BR 3, we recognize for the first time the development and use of large extra-household meat and fish roasting pits (Dietz 2004). Finally, we recognize at this point one very large house (HP 25) lacking storage facilities but containing an abnormally large central fire pit and a dense scatter of minimally butchered deer bones. The latter house is the best candidate for a house designated at least part time for community events that could have included feasting.

Drawing from Teit's ethnographies, it has long been assumed that the Mid-Fraser villages were much like those of the coast, autonomous socio-economic and political entities, connected to nearby smaller villages only by kin and trade relations. However, archaeologists have periodically suggested that at peak sizes, say ca. 1300-1000 cal. B.P., that the Mid-Fraser villages could have been organized in some form of multi-village chiefdom-like polities (Hayden and Ryder 1991; Prentiss and Kuijt 2012). Ranked families in households (e.g. Hayden 1997), formal arrangements of ranked houses centered around plazas, structures set aside for special social rituals, public displays of wealth, and a triad of settlement sizes within individual valleys could potentially imply the latter. While the polity question remains to be formally investigated it is clear that by the BR 3 period the villages were large and socially complex. They were also on the brink of abandonment. Current studies implicate an array of factors may have been important in declining access to critical food resources. Climate change is a likely factor in reduction in salmon numbers (Prentiss et al. 2011) while rapid population growth and a prestige economy may have been hard on local deer and possibly geophyte or root populations (Kuijt 2001; Kuijt and Prentiss 2004; Prentiss et al. n.d.). Whether autonomous village or polity, this combination of economic factors may have been enough to cause local households to drop their investment (e.g. Tainter 1988) in the social experiment underway in the large villages and return to more egalitarian and mobile lifestyles.

Current data suggest that while the Mid-Fraser Canyon area was never entirely abandoned, regular life in semi-sedentary housepit villages did not resume until some point around ca. 500 cal. B.P. (or ca. A.D. 1450). While we are not yet sure about all the critical factors involved in the reoccupation of places like Bridge River and Keatley Creek, it is clear that salmon populations were large and predictable again, as likely were geophytes and various mammal populations including deer. However, the pattern of late pre-Colonial village occupations was now different from before. Houses in the reoccupied villages were no longer organized in rings as at Bridge River or formal rows as might have been the case at Keatley Creek prior to 1000 cal. B.P. The Bridge River village now featured nearly random distributions of perhaps around seven to ten simultaneously occupied houses. Occupation patterns at Keatley Creek are less well understood, but appear to have included some houses in the core village (Prentiss and Kuijt 2012) and some smaller structures on terraces beyond the core area (Hayden and Adams 2004). Geophysical investigations and test excavations at Bridge River (Prentiss et al. 2012) along with nearly full house excavations at Keatley Creek (Muir et al. 2008) indicate that houses were no longer organized as multi-family dwelling with separate family spaces positioned around the perimeters of the floors. Now, houses were organized around a single central hearth with individual kitchen, sleeping, tool making and perhaps, ritual areas positioned across the floors. Variability in material wealth items still suggests the likelihood of wealth-based ranking on an inter-household level (Reininghaus 2010). However, there is no evidence for intra-household distinctions or variability on an inter-village basis glimpsed at times pre-dating about 1000 years ago. Then, at about the time of Simon Fraser's famous voyage down the Fraser River of A.D. 1808, the big villages appear (with exceptions such as HP 54 at Bridge River) to have been largely vacated. Since there is no good evidence for catastrophic epidemics at this date, it seems more likely that village occupants may have recognized opportunity that would come with positioning closer to the main trunk of the Fraser River say near the town of Lillooet or on Fountain Flats roughly east of the Bridge River confluence.

Indeed, Simon Fraser identifies a fortified village on the east side of the Fraser River opposite the confluence of the Seton River (Lamb 1960).

Indigenous people dominated the early to mid-19th Century landscape in British Columbia and small groups of Europeans were far more reliant upon the natives than vice versa. Carlson's (2000, 2006) archaeological research into Secwepemc occupations at Fort Kamloops suggest that indigenous cultural traditions remained substantially unchanged despite direct regular contact with the newcomers. If Carlson is correct, it may be that aboriginal groups on the Canadian Plateau sought economic opportunity through interactions with Fur Traders while maintaining their more ancient ways of life. This raises the possibility that for groups living at greater distances, as was the case with the St'át'imc, European encounters were infrequent and typically indirect. Access to European trade goods was thus primarily embedded within older exchange relationships. This does not mean, however, that there were no measurable changes within St'át'imc groups. Desire for certain European goods such as cloth, iron, beads, and even horses could have driven individuals within households to engage in surplus production on scales higher than under previous conditions.

Teit (1900) provides some details regarding items exchanged between First Nations groups and European traders. It is evident that St'át'imc engaged in two forms of exchange of goods that ended up in European hands. First, Teit notes that Hudson's Bay Company (HBC) members could travel to the Fountain for direct exchange during the height of fishing season. Second, the more common pattern was apparently "down the line" exchange whereby St'át'imc goods were traded to intermediaries from adjacent Nations. Middle Fraser folk produced and exchanged a variety of products included dried salmon, salmon oil, dentalia (from the coast), hemp bark, bark twine and rope, deer products (e.g. dried meat and hides), furs (marten and other fur bearers), native copper sheets and manufactured items, mountain goat blankets, and hunting dogs (Teit 1900, 1906, 1909). Recent research also suggests that nephrite tools such as adzes were produced and traded by Middle Fraser peoples (Morin 2012). A variety of materials were received in turn from surrounding groups. Lower Lillooet or Lil'wat people provided goods from the coast and the coastal forests that included dentalia and other shells; cedar, yew, and "vine-maple" wood; blacktail deer hides, hazelnuts, goat hair blankets, and fish oil. Secwepemc people to the east exchanged dentalia, deer, elk, caribou, moose, and buffalo hides, hemp bark, limited roots and berries, bone beads, and at some point horses (Teit 1900). Teit (1900) describes various European goods traded from HBC employees to the Nlaka7pamux including red cloth, tobacco, hatchets and tomahawks, flintlock guns, horses, kettles, steel traps, HBC shirts, and canoes. It is likely that HBC traders brought similar items directly to the St'át'imc at the Fountain. Down the line trade in European goods likely also included glass beads, finger rings, ball and shot, steels and flints, woolen blankets, and iron, acquired initially by Secwepemc people once Fort Kamloops was established in 1821 (Teit 1909).

We can expect that there may have been significant advantages to optimal geographic positioning as the Fur Trade networks ramped up in the decades after Fraser's visit. Given the importance of salmon to the Europeans, there may also have been some practical advantage to having such villages very close to the fishery and its associated fish processing areas along the river in terms of defending this resource from human raiders (Cannon 1992) and marauding bears. However, given the range of products made by St'át'imc households for exchange, it is hard to imagine that every household would produce exactly the same goods. Household and village locations would likely have played a major role in the type and quantity of specialty goods produced. Obviously, those located on terraces directly adjacent to the best fishing places along the Fraser River would have had some advantage in salmon production, a resource often desperately desired at Fort Kamloops (Carlson 2000, 2006; Drake-Terry 1989; Teit 1900, 1906). But residential contexts located at some distance from the river might have had advantage with other resources more easily obtained away from the main trunk of the river. Housepit 54, located at the long-lived Bridge River village locality, may have offered some advantages in this regard. While located several km from the famous fishing rocks of Six Mile Rapids and the Fountain, salmon did run in large numbers up the Bridge River. However, the Bridge River context may have offered other far more significant advantages over localities along the Fraser River. Ungulate populations including deer and mountain goats were likely far more abundant up the Bridge River valley than in the Fraser Canyon. The Bridge River valley also contains significant exposures of metamorphic rocks including steatite, nephrite and native copper, highly valued for production of a range of tools and ornaments. Given variability in the distributions of these resources, house groups may have had the opportunity to make strategic decisions regarding trade good specializations. If so, then some may have chosen to remain in higher terraces and river valleys at some distance from the Fountain/Six Mile Rapids area if such alternatives to salmon were available in enough abundance as to make production of surplus for exchange cost-effective.

If Bridge River and other Mid-Fraser house groups did engage in production of surplus goods for purpose of exchange within Fur Trade era networks, then it appropriate to ask if this had significant effects on other aspects of socio-economic and political organization. Mid-Fraser groups were not economically tethered to any specific Fur Trade post and thus were free to pursue traditional resources following the traditional annual cycle (Alexander 1992; Prentiss and Kuijt 2012). However, demands for production of surplus animal products may have resulted in local reductions in critical species and thus, increased the frequency and severity of periodic famines (Drake-Terry 1989). Further, demands of intensified goods production (e.g. fish, hides, blankets, stone items) could have favored shifts in the organization of work and in the demographics of some households. As on the Northwest Coast, inter-household competition could have been heightened leading to larger scale potlatches and feasts and rapid growth in numbers of persons occupying the most successful households. Teit's 1906 ethnography of the St'át'imc implicates a society much like other Salishan groups of the nearby Northwest Coast. Teit describes household and village groups organized around social ranking that included chiefs, commoners, and slaves, with all individuals also born into a range of social groups (e.g. Hill-Tout 1905) or clans. He notes two pathways to elite status, that of achievement and inheritance. Achievement and maintenance of inherited status required demonstration of wealth, leadership, and generosity. Wealthy households maintained position through at least partial control of fishing, hunting and possibly even quarrying locales. Large households had the capability of producing a lavish array of goods including ornaments, foods, hides, and woven blankets that could be kept for household use, traded, or given away in potlatch-like events (Kennedy and Bouchard 1978). Teit (1906) notes that village demographic growth could lead to fissioning and establishment of new villages. In the latter case, highest ranked chiefs in the original village could still assert some limited authority in the new village context.

Teit's goal in his ethnographies was to create a detailed portrait of St'át'imc society prior to the significant impacts of Euro-Canadian expansion during the mid to late 19th century. But, it is not clear from his work which elements of St'át'imc socio-economic and political organization were of more ancient origin and which had developed during the Fur Trade (Carlson 2000). Two alternative hypotheses can be offered to fully understand the historical development of the ethnographic socio-political pattern. First, it is possible that the system of social ranking, feasting and potlatching, and property ownership developed prior to the coming of Europeans. Currently two alternatives are equally likely. One could be that these practices have an ancient origin, dating perhaps prior to 1000 years ago, during the "Classic Lillooet period" (Hayden and Ryder 1991; Prentiss and Kuijt 2012). However, given the abandonment of the Mid-Fraser villages (e.g. Bridge River and Keatley Creek) around 1000 years ago and their re-settlement during the final two to three centuries before the coming of Europeans, it is possible that some practices was transmitted from the coast as the St'át'imc came to reoccupy their ancestral villages (Harris 2012). An entirely different hypothesis would assert that while some trappings of social inequality associated with feasting and control of hunting and fishing locations had developed prior to 1000 years ago (e.g. Prentiss et al. 2007, 2012; Prentiss and Kuijt 2012), the abandonment of the great villages during the Medieval Warm period (ca. 1100-600 years ago), effectively returned Mid-Fraser groups to a much more egalitarian political economy. This approach to social life did not change appreciably with the re-population of the Middle Fraser villages. Thus, the altered social conditions and enhanced opportunities for acquisition of prestige goods in the Fur Trade period triggered a revolution in household growth, production, and competition. This in turn led to the formation of distinct status identities and the installation of the system of ranks over a possibly more ancient clan system described by Teit.

This Study

This study has several goals. First, it seeks to examine St'át'imc cultural life during the Fur Trade period from the standpoint of the archaeological record of Housepit 54. This is accomplished by developing and testing hypotheses concerning house architecture and the organization of technology, goods production, subsistence, household space, and social relationships in Housepit 54 drawing from ethnographic information (e.g. Hayden 1992; Hill-Tout 1905; Kennedy and Bouchard 1978, 1998; Teit 1900, 1906, 1909) considered in light of archaeological theorizing regarding socio-economic and political organization in household contexts (e.g. Ashmore and Wilk 1988; Blanton 1994; Byrd 2000; Coupland et al. 2009; Flannery and Winter 1976; Hayden and Cannon 1982; Hayden et al. 1985; Hastorf 1991; Kent 1984, 1987; Marshall 2000; Netting et al. 1984; Smith 1987; Wilk and Rathje 1982; Yanagisako 1979). We expect this work to permit us to develop a more comprehensive understanding of indigenous Middle Fraser cultural traditions and how they were maintained and adjusted during this portion of the Fur Trade. This allows us to address questions of aboriginal agency during the early Colonial period. We expect it to permit us to derive new Middle Range (cf. Binford 1977, 1981) insights into archaeological formation processes associated with Mid-Fraser housepits that might be used to also better understand more ancient occupation patterns. The second major goal of this study is diachronic in nature. Once a comprehensive perspective on socio-economic and political organization at Housepit 54 is developed we will be able to examine patterns of continuity and change over time between this household and others pre-dating the Colonial period at Bridge River, in the Bridge River Valley (e.g. the S7i7stken site), and those elsewhere (e.g. Keatley Creek). This will permit us to offer an assessment of the utility of explanatory models associated with Colonial period social and economic organization.

This report is a comprehensive documentation of excavation results at Housepit 54 (HP 54) from the 2012 field season focusing on the Fur Trade period occupation, which is also the final floor and roof of the housepit. Chapter Two is an introduction to the archaeology of the Bridge River site. This includes an overview of previous investigations and a detailed review of the 2012 Housepit 54 excavation that includes an introduction to stratigraphy and dating. This chapter also considers evidence for architecture during this final occupation. Chapter Three focuses on lithic artifacts. While the primary goal is a review of basic lithic artifact data, some preliminary conclusions are offered regarding raw material quarry and transport practices, tool production and raw material management, and tool use variability. Chapter Four provides an analysis of the Euro-Canadian trade goods recovered at HP 54. Two goals are critical to this study: first the chapter offers a preliminary examination of artifact origins and dating; second, the chapter provides an initial assessment of artifacts uses and functions. The goal here is to not only recognize the dating and sources of these items, but to also examine their roles within HP 54. Chapter Five examines faunal remains from HP 54. Here the primary focus is on reconstruction of diet and predation practices. There are adequate faunal remains to permit not only an examination of subsistence but also field butchery and transport practices. This chapter also provides a review of bone tools and two osteological remains recovered at HP 54. Additional subsistence studies are reviewed in appendices. Appendix D covers paleoethnobotany. The 2012 excavation sampled floor, feature and roof contexts for paleoethnobotanical remains in a relatively intensive manor, thereby permitting a detailed assessment of variability in the uses and archaeological deposition of plant materials. Data from this study contribute to our understanding of diet and occupation seasonality, but also other practices like development of bedding and architecture. Appendix E introduces residue studies on fire-cracked rock that have the goal of identifying food sources and consumption practices not easily recognized otherwise in the archaeological record. Chapter six presents a preliminary spatial analysis of the floor and roof materials. This permits us to test alternative hypotheses regarding the organization of family food and tool preparation, sleeping, and other activities and traditions. The roof study permits us to address questions concerning the organization of work outside (e.g. rooftop) the house versus simple refuse discard in roof sediments. Chapter seven follows with a similar study of floor contexts drawing upon data from geochemical analysis of floor sediments.

Chapter eight draws the various strands of evidence together to summarize the nature of the Housepit 54 occupation during the Fur Trade. This chapter provides an overview of the range of studies and interpretations developed by contributors and offers implications of this study on a range of issues including aboriginal engagements and entanglements with Europeans in the Middle Fraser Canyon and elsewhere. It also reviews outcomes of diachronic analysis and considers relevance of some models for emergent social complexity. The report closes with appendices that include Appendix A (Excavation Maps and Photographs), Appendix B (GIS Maps), Appendix C (Lithic Artifact Typology), Appendix D (Paleoethnobotany report), and Appendix E (Residues Report).

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Chapter Two

Archaeology of Bridge River and Housepit 54

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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 2012 excavations with a focus on excavation and data collection methods. Finally, the chapter reviews data on Housepit 54 stratigraphy, features, dating, and spatial organization as measured by features and mapped fire-cracked rock. Conclusions are drawn regarding occupation dating and household activities during the Fur trade period.

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.

Phase 2 of the Bridge River project was focused primarily on examining BR 2 and 3 inter-household variability 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. HP 54 has 13 occupation floors and 7 roof deposits spanning the BR 2-4 periods. 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. While much attention in future years will focus on the 12 BR 2-3 floors, this current research is focused on the Fur Trade period floor and roof. The excavations were designed to expose nearly the entire floor and roof so that variability in indoor and exterior activities could be examined to reconstruct household life from the standpoints of building construction and maintenance, household subsistence economy, technological strategies, regional trade, and social relationships. The Fur Trade was a period of major flux in native culture and it has rarely been possible to examine the indigenous experience during this time. Much greater attention has been paid to Fur Trade forts and posts of the period (Burley et al. 1996).

The 2012 Archaeological Investigations at Housepit 54: Excavation Methods

The 2012 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-H (see maps in Appendix A). Each block contained 16 1x1 m squares. The squares were further sub-divided into four quads each. However, the squares were only excavated in quads when in floor, bench or midden contexts. Surface and roof sediments were not excavated in quads. 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. Stratum I was limited to a single 10 cm level. Strata V, and XVI were excavated in 10 cm levels. Strata II and XIV were excavated in 5 cm levels. Excavators point provenience mapped all cultural items (artifacts and bones) greater in maximum diameter than 3 cm and other items including charcoal fragments and fire-cracked rock (FCR) greater than 5 cm. Soil samples were taken systematically. A one litre sample was taken from the SW and NE (1 and 4 respectively) quads on floors and upper (first level) of bench 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. Features were either collected in their entirety for flotation or sampled systematically in stratified contexts with 2 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. All point-provenienced FCR were collected and samples were also taken from feature and midden (Stratum XIV) contexts to facilitate residue analyses. 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.

Table 2.1. Cultural Strata at Housepit 54 as identified in 2012.

Stratum I. Surface
Stratum II. BR 4 floor
Stratum V. BR 4 roof
Stratum XIV. BR 4 midden
Stratum XVI. BR 4 bench/rim
Stratum Va. Final BR 3 roof deposit
Stratum IIa. Final BR 3 floor

Stratigraphy

BR 4 sediments consisted of surface, roof, floor, midden and bench and are described by excavation block. Profile and plan maps can be located in Appendix A.

Block A

Block A sediments consisted of a thick roof (V) burying bench (XVI) and floor (II) sediments. Squares in the NE portion of the block also held a midden deposit (XIV) filled with FCR, charcoal, bones, and lithic artifacts (Tables 2.2-2.5). Several patterns are obvious in Table 2.2. First, floor, bench and midden contexts have distinctly higher clay content than roof deposits. Floors were likely created from sediments high in clay content and it is likely that bench sediments consist primarily of re-deposited floor materials. Second, the midden also has relatively high pebble content; most of the pebble and cobble materials in this context derive from FCR (Table 2.3), probably associated with the nearby hearth feature (Feature D.1). Bark rolls were relatively rare and concentrated in floor and bench contexts. Finally, a narrow pit feature was excavated in Square 8 that could have been initiated as a posthole.

Table 2.2. Block A sediment summary (data derived from all squares) in percentages.

Stratum	I	V	II	XIV	XVI
Cobble	7	6	3	6	6
Pebble	18	13	13	27	14
Gravel	18	10	13	11	17
Sand	19	18	16	7	11
Silt	27	38	31	25	28
Clay	11	15	24	24	24

Table 2.3. Block A fire-cracked rock data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
5	23				
6	51	169	41		2
7		433			
(1)			11	30	
(2)			30	63	
(3)			30	18	
8	69	373			
(1)			19		
(2)			23		
(3)					
(4)			1		
9	45				
10	93	204			
(1)			32		187
(3)			5		22
(4)			10	10	
11	78	233			
(3)			13	50	
(4)			12	219	
12	72	178		109	
13	34				
14	131	627			
(1)					7
(2)			16	26	42
(3)			6		7
(4)			31	21	
15	138	376		640	35
16	115	144		768	

Table 2.4. Block A excavated volume (cubic meters) data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
5	.05				
6	.08	.08	.08	.08	
7	.05	.19			
(1)			.004		.004
(2)			.003		.003
(3)			.006		.006
8	.05	.19			
(1)			.006		
(2)			.01		
(3)					
(4)			.01		
9	.03				
10	.09	.12			
(1)			.006		.02
(3)			.009		.01
(4)				.003	
11	.08	.14			
(3)			.003	.004	
(4)			.003	.013	
12	.06	.08		.08	
13	.04				
14	.08	.19			
(1)			.003		.006
(2)			.0001	.003	
(3)			.01		.01
(4)			.004	.004	
15	.08	.19		.1	
16	.06	.09		.08	

Table 2.5. Block A Bark Roll Data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
7 (3)					3
10 (1)			7		
14					3

Block B

Block B featured a relatively thick roof (V) deposit burying a floor (II) of variable thickness and, on the south side of the block a thick bench (XVI) deposit (Tables 2.6-2.9). Roof sediments were distinct from floor and bench on the basis of higher percentages of larger clast sizes (cobble, pebble, and gravel). Floor sediments were higher in silt and clay. Bench was relatively high in silt and clay as well. As in Block A, bench appears to be generally more similar in sedimentary makeup to floor than roof. A very large quantity of FCR was recorded on the floor in several squares raising the possibility of a dump zone or activity area. Bark rolls were found primarily in the roof deposits in Block B, with a particularly large concentration in Square 16. A small pit feature was excavated in Square 5. Similar to the one in Block A, Square 8, this pit may have originally served as a posthole.

Table 2.6. Block B sediment data summary (derived from units 5, 8, 13, and 16).

Stratum	I	V	II	XVI
Cobble	3	5	1	1
Pebble	10	15	8	14
Gravel	12	8	8	10
Sand	11	10	8	10
Silt	49	39	51	32
Clay	15	22	24	33

Table 2.7. Block B fire-cracked rock data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
5	62	524			
(1)			5		
(4)			7		
6	196	1949			
(1)			8		17
(2)			47		193
(3)			61		
(4)			8		
7	46	460			
(1)			28		338
(2)			50		322
(3)			13		
(4)			44		186
8	50	145			
(1)					501
(2)					414
(3)			52		174
(4)			10		84
9	45	148			
(1)			45		
(4)			15		
10	44	372			
(1)			217		
(2)			110		
(3)			266		
(4)			132		
11	39	515			
(2)			74		
(4)			66		
12	73	487			
(2)			11		
(3)			29		
(4)			26		
13	44	170			
(1)			2		
(2)			12		
(3)			5		
(4)			14		
14	91	344			
(1)			47		

(2)			50		
(3)			6		
(4)			22		
15	104	59			
(1)			16		
(2)			28		
(3)			26		
(4)			2		
16	70	275			
(1)			28		
(2)			11		
(3)			33		
(4)			8		

Table 2.8. Block B excavated volume (cubic meters) data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
5	.1	.11			
(1)			.002		
(2)			.004		
(3)			.002		
(4)			.003		
6	.1	.35			
(1)			.002		.01
(2)			.002		.01
(3)			.002		
(4)			.002		
7	.08	.12			
(1)			.003		.04
(2)			.003		.02
(3)			.001		
(4)			.001		.005
8	.08	.13			
(1)			.002		.02
(2)			.003		.02
(3)			.003		.01
(4)			.003		.01
9	.08	.08			
(1)			.002		
(2)					
(3)			.002		
(4)			.003		
10	.08	.07			
(1)			.007		

(2)			.007
(3)			.007
(4)			.007
11	.05	.11	
(2)			.004
(4)			.003
12	.08	.23	
(1)			.008
(2)			.001
(3)			.01
(4)			.002
13	.08	.06	
(1)			.01
(2)			.03
(3)			.005
(4)			.01
14	.08	.05	
(1)			.004
(2)			.004
(3)			.003
(4)			.003
15	.04	.06	
(1)			.01
(2)			.01
(3)			.01
(4)			.004
16	.06	.11	
(1)			.007
(2)			.006
(3)			.006
(4)			.004

Table 2.9. Block B bark roll data.

Stratum	I	V	II	XIV	XVI
Square (Subsquare)					
5					
6		3			
7					
(1)					1
(2)					
(3)					
8		1			
9		4			
(2)			1		
(3)					
(4)					
15		1			
16		22			

Block C

Portions of Block C were challenging to excavate due to inconsistency in stratigraphic patterns across the block and, in some squares, significant bioturbation from rye grass roots. There was no evidence for BR 4 floor deposits in squares 2, 3, and 6. They were evidently removed or never established by the original occupants. Thus roof (V) sat directly on the BR 3 final floor (IIa). Excavators had a difficult time identifying floor in square 8 due to bioturbation. Excavators also inadvertently excavated a portion of the final BR 3 roof and floor squares 3, 11, and 15, though no significant data were collected from the latter squares. Midden (XIV) was found in squares 3 and 4. Bench deposits (XVI) on the west and north sides of Block C were thick and apparently created in a "step-like" pattern. A rare posthole was found in Square 13, Quad 2. Roof deposits were distinct from floor and bench with high percentages of cobbles and a comparatively low percentage of clay. Block roof deposits also featured relatively frequent pieces of ponderosa pine bark and larger than usual pieces of birch bark. FCR was consistently distributed on the roof and floor. The floor had lower numbers compared to Block B. Bark rolls concentrated in the roof, particularly in Square 7.

Table 2.10. Block C sediment data summary (units 4, 7, 14; II and XVI from Quad 3 where present in each square).

Stratum	I	V	II	XIV	XVI
Cobble	3	5	0	3	2
Pebble	6	12	10	10	15
Gravel	11	16	16	8	8
Sand	14	10	10	10	5
Silt	63	41	37	54	30
Clay	3	16	27	15	40

Table 2.11. Block C FCR data.

Stratum	I	V	II	Va	IIa	XIV	XVI
Square (Subsquare)							
2	68	635					
3	15	173			27	78	
4	32	82				34	
(1)			10				
(2)							
(3)			9				
(4)			1				
5	46	188					54
(2)			5				
(4)			3				
6	86	148					
7	44	242					
(1)							
(2)			16				
(4)			34				
8	113						
9	85	230					347
(2)			24				
(4)			42				
10	46	700					
(1)			11				
(2)			3				
(3)			30				
(4)			5				
11	86	352					

(1)			10	
(2)			28	
(3)			8	
(4)			48	
12	76	182		
(1)			4	
(2)			1	
(3)			1	
13	94	155		370
(2)			17	
(4)			24	
14	149	531		122
(1)			33	
(2)			25	
(3)			26	
(4)			28	
15	107	570		11
(1)			36	
(2)			24	
(3)			32	
(4)			33	
16	115	374		
(1)			56	
(2)			13	
(3)			8	
(4)			1	

Table 2.12. Block C excavated volume (cubic meters) data.

Stratum Square (Subsquare)	I	V	II	Va	IIa	XIV	XVI
2	.08	.23					
3	.06	.06			.06	.07	
4	.06	.04					
(1)			.005				
(2)			.0006				
(3)			.03				
(4)			.08				
5	.03	.06					
(2)			.003				.03
(4)			.01				.005
6	.05	.1					
7	.1	.05					
(1)			.002				
(2)			.002				
(4)			.0001				
8	.08	.05					
9	.04	.11					
(2)			.002				.006
(4)			.01				.003
10	.08	.3					
(1)			.002				
(2)			.002				
(3)			.01				
(4)			.01				
11	.1	.2					
(1)			.003				
(2)			.008				
(3)			.008				
(4)			.01				
12	.08	.08					
(1)			.01				
(2)			.006				
(3)			.01				
13	.04	.08					
(2)			.01				.05
(4)			.01				.04
14	.07	.22					
(1)			.01				.01
(2)			.008				
(3)			.01				.03

(4)			.01					.01
15	.1	.26						
(1)			.02					.02
(2)			.003					.03
(3)			.02					
(4)			.01					
16	.08	.2						
(1)			.01					
(2)			.006					
(3)			.01					
(4)			.009					

Table 2.13. Block C bark roll data.

Stratum	I	V	II	IIa	XIV	XVI
Square (Subsquare)						
9		1				2
11		1				
12	1	7				1
14	1					
15	1					
16		1				

Block D

Block D featured the same basic stratigraphy as seen in Blocks A-C (Tables 2.14-2.17). Roof (V) deposits are relatively thin with the exception of the northern and eastern edges of the block, closer to the bench zone. Block D included a low section of bench in Squares 12, 15, and 16. Block D also contained the BR 4 floor’s only two hearths, located in Squares 1, 15, and 16. As recognized elsewhere, roof sediments are marked by slightly higher large clast percentages and a low clay percentage. Floor and bench are comparatively high in clay, again supporting the idea that bench reflects re-deposited floor. The stratigraphic profile on the east side of Blocks D and B (Appendix A) illustrates the high likelihood that a side entrance was located in this area given the slope of bench sediments and overlying roof materials. FCR is consistently present throughout all deposits but appears to be particularly concentrated in the roof of Square 12. Bark rolls are relatively common and concentrated in the roof of Square 11.

Table 2.14. Block D sediment data summary (data from Units 2, 5, 10, and 16).

Stratum	I	V	II	XVI
Cobble	6	3	0	2
Pebble	12	10	6	14
Gravel	17	13	8	14
Sand	18	11	12	5
Silt	33	47	52	40
Clay	14	16	22	25

Table 2.15. Block D FCR data.

Stratum	I	V	II	Va	IIa	XIV	XVI
Square (Subsquare)							
1	44	25					
(1)			2				
(2)			3				
(3)			5				
(4)			12				
2	79	42					
(1)			1				
(2)							
(3)			8				
(4)			2				
3	77	184					
4	195	192					
(1)			9				
(2)			8				
(3)			20				
(4)			5				
5	52	72					
(1)			12				
(2)			10				
(3)			16				
(4)			28				
6	60	83					
(1)			4				
(4)			1				
7	79	521					
(1)			21				
(2)			7				
8	100	442					
9	100	119					

(1)			4				
(2)			19				
(3)			6				
(4)			7				
10	176	271					
(1)			35				
(2)			14				
(3)			16				
(4)			21				
11	528	597					
12	254	1269		97			44
13	122	735					
(1)			24				
(2)			22				
(3)			9				
(4)			4				
14	129	616					
(1)			14				
(2)			4				
(3)			3				
(4)			1				
15	63	398	222*		137		308
16	225	471					288
(1)			29				
(3)			24				
(4)			14				

*Associated with hearth feature not recognized during excavation of this unit.

Table 2.16. Block D excavated volume (cubic meters) data.

Stratum	I	V	II	IIa	XIV	XVI
Square (Subsquare)						
1	.05	.006				
(1)			.0002			
(2)			.003			
(3)			.004			
(4)			.008			
2	.08	.02				
(1)			.002			
(2)			.002			
(3)			.006			
(4)			.0002			
3	.08	.02				
4	.06	.04				
(1)			.0002			
(2)			.0002			
(3)			.0002			
(4)			.006			
5	.06	.04				
(1)			.01			
(2)			.03			
(3)			.006			
(4)			.01			
6	.09	.09				
(1)			.01			
(2)			.003			
(4)			.008			
7	.1	.14				
(1)			.001			
(2)			.002			
(4)			.003			
8	.08	.15				
9	.06	.08				
(1)			.01			
(2)			.04			
(3)			.01			
(4)			.04			
10	.1	.13				
(1)			.04			
(2)			.02			
(3)			.02			
(4)			.02			

11	.09	.05				
12	.04	.17				
13	.08	.14				
(1)			.006			
(2)			.02			
(3)			.01			
(4)			.02			
14	.1	.25				
(1)			.003			
(2)			.008			
(3)			.01			
(4)			.003			
15	.1	.1	.1	.06		.1
16	.08	.03				.05
(1)			.02			
(3)			.003			
(4)			.008			

Table 2.17. Block D bark roll data.

Stratum	I	V	II	IIa	XIV	XVI
Square (Subsquare)						
10		1				
(4)			5			
11		14				
12		6				
13		1				
14		7				
(4)			2			
15				1		6
16		1				1

Block E

Only four squares (9, 13, 14, 15) were opened in Block E, located on the east side of Block B. Sediments in this block consisted entirely of roof (V), sloping down from east to west over bench (XVI) deposits of maximum thickness to the east. Roof deposits were relatively rocky and contained comparatively lower amounts of clay compared to the bench. FCR was relatively common and only one bark roll was recovered.

Table 2.18. Block E sediment data summary (data from all squares).

Stratum	I	V	XVI
Cobble	1	0	1
Pebble	13	25	11
Gravel	22	22	13
Sand	11	5	7
Silt	50	27	40
Clay	5	22	31

Table 2.19. Block E FCR data.

Stratum	I	V	XVI
Square (Subsquare)			
9	34	728	153
13	29	215	161
14	144	58	276*
15		52	534*

* FCR excavated as II counted as XVI here.

Table 2.20. Block E excavated volume (cubic meters) data.

Stratum	I	V	XVI
Square (Subsquare)			
9	.07	.23	.04
13	.06	.11	.03
14	.08	.05	.13
15		.01	.06

Table 2.21. Block E bark roll data.

Stratum	I	V
Square (Subsquare)		
14		1
15		

Block F

Like Block E, Block F consists entirely of roof (V) and bench (XVI) deposits structured in a similar manner. Unlike other blocks, excavators recorded similar quantities of larger clasts and clay in both roof and bench deposits. Relatively large numbers of FCR were recovered in the bench deposits and bark rolls were also concentrated in this context.

Table 2.22. Block F sediment data summary (data derived from all squares).

Stratum	I	V	XVI
Cobble	1	1	3
Pebble	7	13	11
Gravel	10	11	12
Sand	7	5	5
Silt	66	42	47
Clay	9	29	22

Table 2.23. Block F FCR data.

Stratum	I	V	XVI	Va
Square (Subsquare)				
1	2	123	84	
5	10	132	500	
9	69	104	559	10
10	108	82	200	

Table 2.24. Block F excavated volume (cubic meters) data.

Stratum	I	V	XVI
Square (Subsquare)			
1	.08	.11	.17
5	.08	.02	.2
9	.08	.03	.31
10	.05	.03	.1

Table 2.25. Block F bark roll data.

Stratum	I	V	XVI
Square (Subsquare)			
5			3
9			7

10	3

Block G

Block G is located on the north side of Block D and includes only one square (1) (Tables 2.25-2.27). Sediments are relatively consistent throughout, though roof (V) deposits are slightly higher in cobbles and the bench (XVI) is higher in clay. FCR is most common in the roof and there are no bark rolls.

Table 2.25. Block G sediment data summary (data from all squares).

Stratum	I	V	II	XVI
Cobble	1	1	0	0
Pebble	1	11	15	8
Gravel	9	15	10	9
Sand	41	15	20	8
Silt	43	28	30	40
Clay	5	25	25	36

Table 2.26. Block G FCR data.

Stratum	I	V	II	XVI
Square (Subsquare)				
1	178	653		46
(1)			11	
(2)			1	
(3)			4	
(4)			10	

Table 2.27. Block G excavated volume (cubic meters) data.

Stratum	I	V	II	XVI
Square (Subsquare)				
1	.1	.01		.14
(1)			.003	
(2)			.003	
(3)			.03	
(4)			.01	

Block H

Block H is located on the NE side of Block C and includes Squares 4 and 8 (Tables 2.28-2.31). A relatively thin roof (V) covered a thick bench (XVI). Excavators inadvertently also excavated a portion of the BR 3 final roof (Va) in Square 4. Roof deposits (whether BR 4 or 3) were generally low in clay content, while the opposite was true for floor and bench sediments. FCR was most concentrated in the roof of Square 4 and only one bark roll was recovered from the Square 4 roof.

Table 2.28. Block H sediment data summary (data derived from all squares).

Stratum	I	V	II	Va	XVI
Cobble	1	1	1	0	0
Pebble	12	9	6	4	13
Gravel	11	13	11	7	14
Sand	7	31	4	4	8
Silt	54	36	53	73	43
Clay	15	10	24	12	22

Table 2.29. Block H FCR data.

Stratum	I	V	II	Va	XVI
Square (Subsquare)					
4	156	699		54	154
(1)			5		
(2)			2		
(3)					
(4)			3		
8		30[1]			36[2]

[1]Combines Strata I and V

[2] Combines Strata II and XVI as transition was not clear.

Table 2.30. Block H excavated volume (cubic meters) data.

Stratum	I	V	II	Va	XVI
Square (Subsquare)					
4	.08	.04		.002	.02
(1)			.003		
(2)			.003		
(3)					
(4)			.003		
8		.05		.01	

Table 2.31. Block H bark roll data.

Stratum	I	V	XVI
Square (Subsquare)			
4		1	

Housepit 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 (1973, 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. 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 layers of additional beams. The wooden framework was then covered by bark, needles, matting, or other materials to prevent earthen insulation from falling through on to the floor. A side entrance could also be present to increase ease of access for elders and others. Sometimes an escape tunnel was also established in case of attack. 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 can be challenging to say the least to reconstruct pithouse architecture from archaeological data as inferences must be drawn from the patterns evident in roof sediments, preserved wood and mat material, and posthole distributions. The BR 4 (Fur Trade period) occupation at Housepit 54 is no exception. Roof sediments contain very little indicator of architecture as there are no intact roof beams or woven material. Given this pattern, it is likely that this final roof did not burn but simply collapsed and settled into the housepit. Excavations revealed what are likely three postholes found at locations associated with the margins of the house, literally against the walls in the northwest and southern portions of the floor. Wall stratigraphy from the east side of Blocks B and D and the west sides of Blocks E and F indicate the strong possibility of a side entrance. Significantly, there are no central postholes on this floor raising the possibility that either the house was supported entirely by roof beams anchored on the margins or constructed "log cabin" style (Bouchard and Kennedy 1973) or that major support posts were simply rested on the floor (Alexander 2000; MacDonald 2000). Small clusters of artifacts mapped in the approximate centers of Blocks C and D could reflect the positions of such posts if artifacts were permitted to accumulate in such spaces. The high density of materials throughout much of Blocks A and B do not permit recognition of these patterns. It is not clear whether the house included a roof-ladder entrance. Empty spaces in the north-central portions of the floor (Blocks C and D) could reflect spaces associated with roof ladders. The great quantity of roof sediments and associated artifacts precludes the possibility of a high slope roof (e.g. MacDonald 2000). Rather it seems far more likely that this was a classic low slope roof upon which outdoor activities could take place, refuse deposited, and access to the house (if a roof ladder) facilitated.

Dating

One radiocarbon was one run from the BR 4 roof at HP 54. The sample consisted of a single piece of unburned Ponderosa pine bark derived from the Area 1 Trench excavated in 2008. In the 2012 grid system the piece of bark would be located in Block C, Square 10, Quad 2. Stratigraphically, it was extracted from the lowest level of the roof (V) nearly touching the Stratum II floor. The sample was run at DirectAMS in Seattle Washington using the AMS technique, which returned a date of 112+/-25 (laboratory number 1217-038-01). The date was calibrated using Calib 6.0 (M. Stuiver, P.J. Reimer, and R. Reimer 2013), generating the data in Table 2.32. At one sigma this generates a range spanning AD 1692 to 1919 with highest probability being AD 1831-1890. At two sigmas we receive a more narrow date range of AD 1682-1737. A number of European trade items were found within the BR 4 deposits at Housepit 54 (Chapter Four). Dates for these items span the late 18th through the mid-19th century. Most critically, a set of green, red, and white striped beads were like manufactured in Europe between 1852 and 1863. Given that some of the beads were found on the final floor of Housepit 54 it is likely that the last occupation of the house falls within this period. However, it is likely that the house was also occupied for a longer period potentially extending back decades. This is suggested by accumulated BR 4 bench/rim material that appears to be old floor and roof material and the presence of artifact types (horse shoe, bone button, and glass beads) known to have manufactured during the late 1700s through the 1830s.

Table 2.32. Calibration results (data from Calib 6.0 output).

% area enclosed	cal AD age ranges	relative area under probability distribution
68.3 (1 sigma)	cal AD 1692- 1709	0.151
	1717- 1728	0.089
	1811- 1828	0.140
	1831- 1890	0.533
	1909- 1919	0.087
95.4 (2 sigma)	cal AD 1682- 1737	0.285

Features

Six features were excavated on the Housepit 54 BR 4 floor (Table 2.33). Feature A1 (Block A, Square 8) is a relatively narrow cache pit. The bulk of the feature was excavated in 2008 (Prentiss et al. 2009); excavations in 2012 emphasized collection of samples for flotation and paleoethnobotanical analysis. Fill within the feature suggests that the final use was as a household garbage receptacle. Feature A2 (Block A, Square 10) is a relatively shallow bowl-shaped pit. It is possible that this feature was initiated as a posthole adjacent to the wall of the house, but was later widened and converted to a garbage pit. Feature B1 (Block B, Square 5) is very similar to A2 but appears to preserve a remnant of the original posthole as one portion of the pit is much deeper than the other portions. Feature C1 (Block C, Square 13) is clearly a posthole given its relatively narrow width (23.5 cm), depth (about 57 cm below floor surface) and position adjacent to the NW wall of the house. Feature D1 is a relatively large shallow hearth, located in the approximate center of the floor (Block D, Square 1). Sediments are heavily oxidized well into deeper sediments below suggesting frequent and intensive use. The dense arrangement of FCR in the Stratum XIV midden and adjacent floor areas of Blocks A, B and C likely derive from activities associated with this feature. A very large quantity of highly fragmentary bone (see faunal analysis chapter) was also recovered from flotation of soil from Feature D1. Clearly, Feature D1 served as the central cooking hearth for occupants of HP 54. Finally, Feature D2 is a shallow hearth located on a low bench deposit in Block D, Squares 15 and 16. It is different from D1 in that it is somewhat smaller and shallower. It also contains a large quantity of FCR and had relatively few bones associated with its matrix. Given its position on the low bench shelf, its shallow nature, and abundant FCR we can posit two possibilities for function. One option is that this hearth primarily served to warm people sleeping on the bench in this portion of the house with the abundant FCR serving to maintain heat for longer periods. Another possibility is this feature served other options such as cooking, heating FCR for stone boiling, or providing extra light for household activities.

Table 2.33. Features excavated in 2012 BR 4 occupation of Housepit 54 (DB=Deep Bowl shaped pit; CP=Cylindrical cache pit; SB=Shallow Bowl; BH=Basin shaped hearth; PH=Posthole).

Feature				Sediments				Estimated	FCR
#	Type	Cob.	Peb.	Grav.	Sand	Silt	Clay	Vol. (cm^3)	Count
A1[1]	CP		5	5	20	60	10	48,984	15[2]
A2	DB		15	5	15	40	25	34,681	42
B1	SB	1	5	6	8	40	40	24,640	53
C1	PH		8	14	6	64	19	25,773	3
D1	BH		10	10	10	60	10	10,638	34
D2	BH	15	25	8	8	30	14	919	57

[1]Remnant of feature excavated in 2012 and collected entirely for flotation and Paleoethnobotanical analysis. These data derive from 2008 excavation (Feature 8 in 2008).
[2]FCR data derive from approximately 75% of feature fill.

Spatial Organization on the Floor

Spatial analysis of floor materials is considered in greater depth in Chapter Six. Thus, I limit my discussion to reflections on the distribution of features, midden, and benches. 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 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.

As illustrated in the Housepit 54 Floor (Stratum II) map (Appendix A), the house was clearly organized in a manner closer to Teit’s (1900) model. While there is relatively little direct evidence of food storage (other than the single cache pit), kitchen related debris (especially the Stratum XIV midden) clusters intensively on the south and southwest portion of the floor adjacent to Feature D1, the central hearth. A broad and low bench is found on the northeast side of the floor that includes a shallow hearth feature (D2). While virtually no pine needles (sometimes associated with bedding;

Lepofsky 2000) were recovered it is still possible that this area may have been used for sleeping purposes among other things. The relatively "empty nature of much of Blocks C and D away from the benches speaks to the possibility of public space.

Conclusions

The 2012 excavations resulted in the establishment of a detailed stratigraphic sequence of roof, floor, midden, and bench materials. Sedimentary analysis demonstrates some consistent distinctions between strata with roofs generally containing larger rocks and less clay while benches and floors contain more silt and clay with fewer large clasts. Roof architecture is not clear but most likely included a large and low pitch roof supported by posts resting on the floor. There was also a side entrance on the east side of the house. Six features were excavated on the floor and included postholes, a cache pit, and two hearths. Radiocarbon dating suggests a 19^{th} century occupation. This is corroborated by examination of historic artifacts strongly suggestive of a mid-19^{th} century occupation. Examination of feature distributions supports an activity organization scenario close to Teit's (1900) description, expecting distinct activity-based "rooms." In this case we clearly recognize a "kitchen" zone and a likely open or public space.

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Chapter Three

Lithic Artifacts

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Introduction

Excavations of the Fur Trade Era occupation of Housepit 54 at Bridge River, conducted during the 2012 field season, recovered 12,631 lithic artifacts from Strata I, V, II and XIV. Analysis of materials recovered from Stratum XVI is still underway. Of this sample, debitage amounted to 11,182 artifacts, while tools and cores comprised the remaining 1,449 artifacts. Tools and cores were classified according to 170 types that were identified according to and modified from precedent SFU-Keatley Creek (EeRl7) and Bridge River lithic typologies (Hayden et al. 1996b, 2000c; Prentiss et al. 2003, 2005, 2009, 2010; Appendix C). This large sample was obtained with attention to artifact distributions within Blocks A-G. Given the known complexities of household group cohabitation, coupled with the social, economic, and political complexities of participation trade relations, the analyses of excavated lithics focused on questions of assemblage variability, material choice selections relative to risk/reward decisions, subsistence resources processing methods, and trade goods production specialization. The following provides an initial review of patterns in lithic artifact data.

Methods

Debitage were sorted by raw material type, thermal alteration, size, completeness-related types, cortex, technological type, and when applicable, fracture initiation. A total of 48 raw material types were identified during analysis. Thermal alteration was marked as present or absent. Lithics that had flake scars that were smooth or soapy in texture compared to older surfaces that had grainier and duller texture were likely heat-treated (Whittaker 1994). Another defining characteristic of heat-treated lithics is color. Lithics that had a greasy luster, crazing, and or a pink to reddish color were likely to have been heat-treated (Crabtree and Butler 1964:1; Purdy and Brooks 1971:322). Debitage and tools were also separated into five size catagories: 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 et al. 1998, 2001, 2009, 2010). Completeness of debitage was defined and sorted using a modified Sullivan and Rozen typology (MSRT) (Prentiss 1998; Sullivan and Rozen 1985). This MSRT typology initially sorted debitage by size. Following the size designation, it was determined if a single interior surface (ventral face) was present or absent. If debitage did not have a single interior surface it was defined as Nonorientable. The next step was to determine if the debitage had a point of applied force, or platform. If no platform was present, the debitage was defined as a Medial/Distal Fragment. If a platform was present the flake was either Proximal or Complete. A Complete flake has intact margins while a Proximal flake does not.

Finally, if a flake is sheared longitudinally, it was defined as a Split flake. Lastly any debitage that was sorted as a Complete Flake, Proximal Flake, or Split Flake, was analyzed to determine its fracture initiation. Three fracture initiation categories were designated: Cone, Wedge or Bend. 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 (Prentiss et al. 2009, 2010). The cortex cover on the dorsal face was measured to establish stage of reduction on the scale of Primary (99-100% cortex), Secondary (1-98% cortex), or Tertiary (0% cortex). Finally, technological origin for individual platform bearing flakes was identified including early stage reduction (thick flake with high dorsal platform angle and limited platform faceting), biface thinning (medium and larger flake with small facetted platform, thin and broad form, and low dorsal platform angle), retouch (small or extra-small flake typically with medium to low dorsal platform angle), notching (small to extra-small oval flake with distinct raised platform), bipolar (wedge initiated, compression-controlled propagation, and often crushing on ends), core rejuvenation (flake with attributes of dorsal platform from core removed to facilitate further flaking), and blade (flake with length at least double width, high dorsal platform angle, and lateral symmetry).

Tools recovered were sorted using a wide range of characteristics. The size of tools was determined using sliding calipers. All tools were drawn in plan view and profile, and when necessary, some tools such as projectile points were drawn showing multiple faces and margins (e.g. proximal and distal profiles). Macroscopic and microscopic techniques were employed to identify use-wear and retouch characteristics. Microscopic techniques utilized Motic SMZ-168-BP; .75x – 50x zoom microscopes. Use wear analysis defined such things as polish, striations, rounding, crushing, etc. Measurements were taken to determine edge angle using Wards Contact Goniometer. Each distinct working edge was termed 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). The Bridge River lithic tool typology (Appendix C) was applied to all lithic artifacts recovered in 2012. Several new tool types were added to this typology during the lithic analysis (see Appendix C for a complete list of all tool types including new tool types added for the lithic artifacts recovered in 2012). 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.

Data Analysis

The following section outlines preliminary analysis of lithic artifact data (summarized in Tables 3.1-3.4) recovered during the 2012 field season. The purpose of this analysis is to examine the role lithic technology played in the adaptive strategies of winter pithouse occupation at Bridge River Village by extrapolating a model from the ethnographic record in order to test the historic strategies discussed by Teit (1900, 1906, 1909). As a winter village, the raw materials, which would be used for tasks such as hide scraping, woodworking and stone working tools, were collected in the warmer months when snow and ice did not make travel difficult and the materials inaccessible. This research seeks to explore the problem of limited resources access and if it was solved using various lithic technologies. With limited resources, the risk of tool failure during the winter months is expected to be high; as a result, one would expect to see more late stage reduction to be present as well as more bipolar cores, since materials would become exhausted over the winter. Smaller tools with longer use lives and high reduction intensity would also be present along with more expedient tools with multiple uses.

Table 3.1. Stratum I lithic artifacts.

Block	Flakes	Scraper	Biface	Used Flake	Kamloops Point	Other	Stone Bead	Ornament	Spindle Whorl	Core
A	265	10	0	2	1	16	0	0	0	8
B	510	14	2	2	2	13	0	0	0	2
C	273	10	0	0	0	16	0	0	0	3
D	425	12	1	0	3	34	1	0	0	12
E	84	0	0	0	4	5	0	0	0	2
F	95	2	0	0	2	4	0	0	0	4
G	16	2	0	0	0	4	0	0	0	1
H	68	1	0	0	0	4	0	0	0	1

Table 3.2. Stratum V lithic artifacts

Block	Flakes	Scraper	Biface	Used Flake	Kamloops Point	Other	Stone Bead	Ornament	Spindle Whorl	Core
A	1814	69	15	21	17	75	4	0	0	45
B	1741	54	2	4	8	76	4	1	0	30
C	1403	82	13	16	10	108	1	3	0	33
D	2104	56	5	16	8	100	0	0	0	51
E	134	19	1	0	1	5	0	0	0	4
F	35	7	0	0	1	10	1	0	0	6
G	0	4	0	0	0	5	0	0	0	1
H	2	5	0	0	1	6	1	0	0	3

Table 3.3. Stratum XIV lithic artifacts.

Block	Flakes	Scraper	Biface	Used Flake	Kamloops Point	Other	Stone Bead	Ornament	Spindle Whorl	Core
A	352	8	2	2	4	18	0	1 figurine	2	8
B	36	3	0	0	0	2	0	0	0	2
C	47	0	0	0	0	0	0	0	0	0

Table 3.4. Stratum II lithic artifacts.

Block	Flakes	Scraper	Biface	Used Flake	Kamloops Point	Other	Stone Bead	Ornament	Spindle Whorl	Core
A	212	8	2	0	2	19	0	0	0	5
B	679	10	1	1	1	12	2	0	0	0
C	355	4	0	0	1	12	0	0	0	3
D	588	8	1	0	1	24	0	1	0	6
E	14	0	0	0	0	0	0	0	0	1
G	17	1	0	0	2	0	0	0	0	0
H	114	2	0	0	1	1	0	0	0	0

Analysis of Risk Management (Kelly French)

To assess possible risk management techniques (or lack thereof), a variety of methods were applied. One of the factors expected in a winter household assemblage is more late stage production. To infer production stage, flake sizes, stages of reduction, and flake types are analyzed. Tool reduction intensity is measured by flake sizes and tool sizes. The percent of bipolar cores is also important in understanding rates of raw material use. Seven tool classes are identified: Bifacial, Unifacial, Projectile Points, Cores, Groundstone and Ornaments, and by breaking down each category, we can establish which core types were most represented. The number of expedient tools versus formal tools is also measured as well as the percentage of tools with multiple functions. A final measure is to count how many tools were noticeably reused after a break. There were a total of 1,449 tools recovered in 2012; however, on flake tools with multiple functions each EU was treated as its own tool. This means that a tool with two functionally different EUs (i.e. one with scraper wear and one with knife wear) would count separately as two tools: one scraper and one knife. After applying this methodology, the total number of tools equaled 1,537. Looking at different use-wear on each EU allows for a more precise measure of technological tool types. Data used in this discussion are presented in Tables 3.5-3.12 and Figures 3.1-3.3.

Table 3.5. The number and percentage of identifiable technological debitage types.

Debitage Technological Types								
	Early Stage	Thinning Flake	Bipolar Flake	Retouch Flake	'R' Billet Flake	Rejuvenation Flake	Notch Flake	Unknown
Amount	113	159	280	2189	43	11	3	11
Percentage	4%	6%	10%	78%	2%	.4%	.1%	.4%

Table 3.6. The number and percentage of flakes in each MSRT category.

Modified Sullivan and Rozen Typology (MSRT)						
	Complete	Medial/Distal	Proximal	Non-Orientable	Split	Unknown
Amount	187	8456	2266	130	135	7
Percentage	2%	76%	20%	1%	1%	.1%

Table 3.7. Number and percentage of flakes in each size class.

Debitage Sizes					
	XLRG (>64 cm^2)	LRG (16-64 cm^2)	MED (4-16 cm^2)	SM (.64-4 cm^2)	XSM (<.64 cm^2)
Amount	5	45	1005	6911	3211
ercentage	.04%	.4%	9%	62%	29%

Table 3.8. Number and percentage of major tool classes.

Morpho-Functional Tool Types							
	Bifacial	Unifacial	Groundstone	Projectile Points	Cores	Ornamental	Other
Amount	209	454	424	174	241	32	3
Percentage	14%	30%	28%	11%	15%	2%	.1%

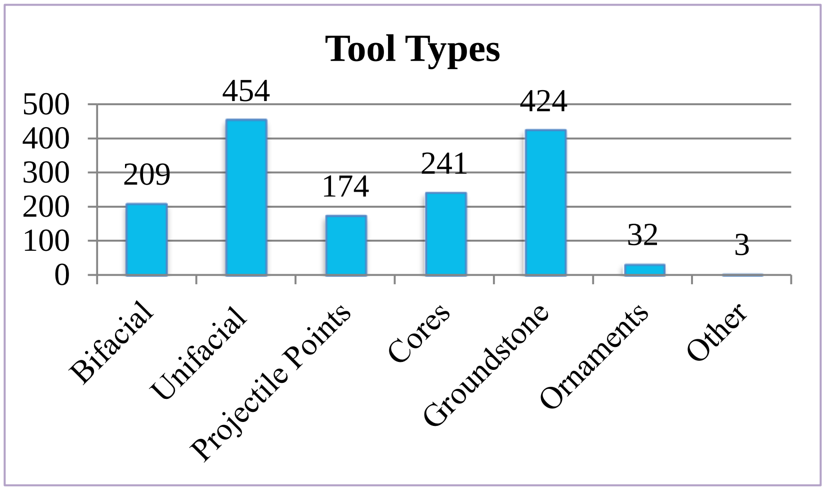

Figure 3.1. Bar graph of tool type counts.

Table 3.9. Number and percentage of core types. Data do not include microblade cores

Core Types*				
	Bipolar Core	Unidirectional Core	Multidirectional Core	Small Flake Core
Amount	219	5	14	1
Percentage	91.6%	2%	6%	.4%

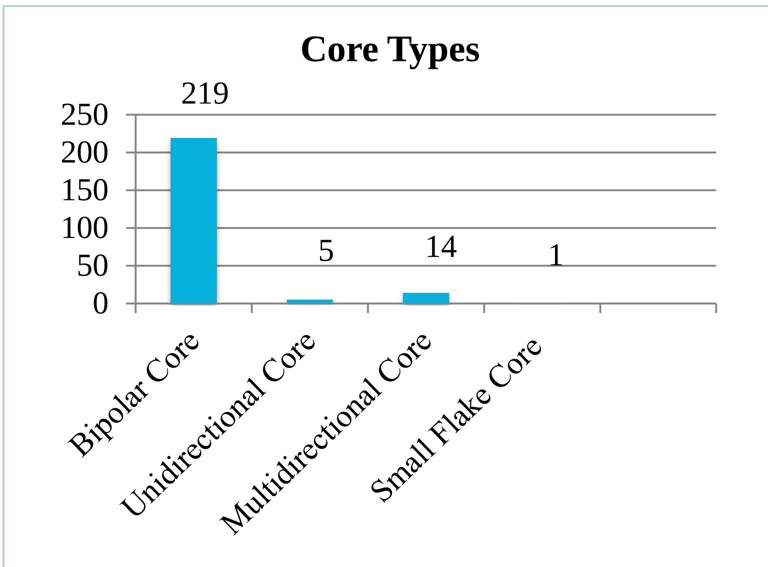

Figure 3.2. Bar graph of core type counts.

Table 3.10. Number and percentage of tools in each size class.

Tool Sizes					
	XLRG (>64 cm^2)	LRG (16-64 cm^2)	MED (4-16 cm^2)	SM (.64-4 cm^2)	XSM (<.64 cm^2)
Amount	42	251	539	581	18
Percentage	3%	17%	38%	41%	1%

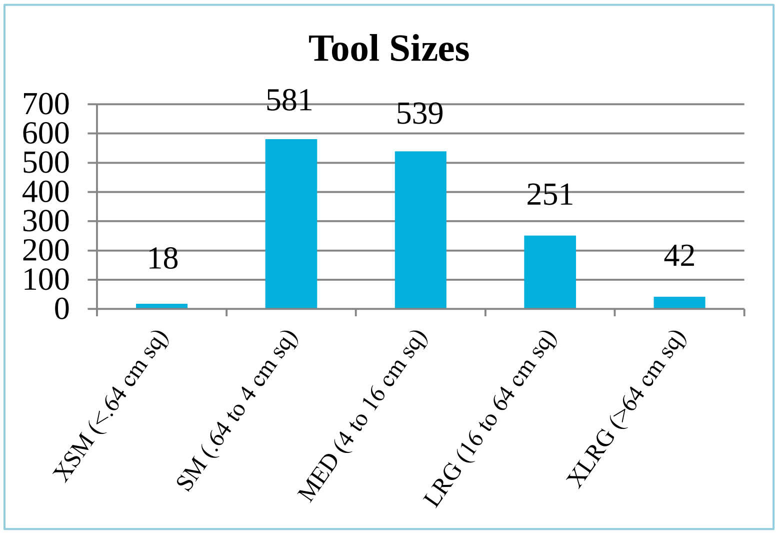

Figure 3.3. Bar graph of tool size counts.

Table 3.11. Number and percentage of expedient and formal tools. These data do not include ornaments or unknown tools.

Tool Curation		
	Expedient	Formal
Amount*	812	690
Percentage	54%	46%

Table 3.12. Number and percentage of multi-use and recycled tools.

Multiuse and Recycled Tools			
	Multiuse	Recycled/Reused	Total
Amount	94	38	132
Percentage	7%	3%	10%

Lithic analysis of the Housepit 54 floor assemblage suggests some risk-minimizing techniques were implemented as a result of limited resource access; however, some expectations were not fully supported. It was hypothesized that due to limited resources more late stage production would be present in a winter pithouse occupation. This was supported by the data. The analysis of the lithic debitage showed consistent evidence of late stage production, with small retouch flakes dominating the assemblage. A high number of bipolar cores were also expected. Overall there were a total of 241 cores in the assemblage and of the cores present, 219 were bipolar. This suggests that the people had to extract as much as possible from the materials within the house. Fifteen tools were also bipolar reduced, further demonstrating a strategy of bipolar reduction from seemingly exhausted materials. Another expectation was that the assemblage would be dominated by 'Small' tool sizes. Table 3.10 shows that, while the majority of tools are under 4 cm^2, a substantial portion of tools also falls into the 'Medium' category. It is clear though that very few tools were over 16 cm^2, which does support the hypothesis of high reduction intensity leading to smaller tools. Finally, there are a high number of expedient tools in the assemblage but only approximately 10% showed signs of having multiple uses. The number of formal tools was also higher than expected. This may show that the people of Housepit 54 relied heavily on the Groundstone industry (which accounted for approximately 424 of the formal tools – most of them being slate scrapers). While ground slate tools were classified in this study as formal tools, they may well have been used in a more expedient manner given the fact that most had very limited to no evidence for actual grinding and polishing on tool faces or margins. If this is the case then the lithic tool assemblage is truly dominated by situational need tools.

Lithic analysis of the Housepit 54 floor assemblage suggests some risk-minimizing techniques were implemented as a result of limited resource access. There was a heavy reliance on bipolar reduction as well as high reduction intensity, which suggests a need to extract as much from the raw materials as possible. Tool production activities generated a wide range of tool forms, most of which have been classified as expedient. Slate scrapers are primarily chipped into form, though some include grinding and marginal sawing. Functionally these appear to primarily be associated with hide working. This implies a level of hide processing exceeding evidence in earlier deposits at Housepit 54 and elsewhere at Bridge River.

Testing a Central Place Foraging Model (Sara Hocking)

This study tested two hypotheses drawn from central place foraging theory (e.g. Beck et al. 2002): (1) that more distant lithic raw material sources required more intensive field processing to maximize transport load utility; and (2) tools made from lithic material from more distant sources would be more intensely used and recycled. Lithic raw materials studied included dacite, pisolite, chalcedony, Hat Creek jasper, and obsidian. Hypothesis one required the classification of flakes into early and late stage reduction, in order to determine the extent of field processing. The expectations for this hypothesis were that: dacite would be dominated by early stage reduction; pisolite would have an equal distribution of early and late stage flakes; and obsidian, jasper, and chalcedony would be dominated by late stage reduction. By comparing the expectations with the analysis it becomes clear that the results differ from the expectations. The dacite, obsidian, jasper, pisolite and chalcedony are characterized by late stage reduction (Table 3.13).

The flake stage analysis (Table 3.13) revealed that field processing was occurring on the obsidian, pisolite, dacite, jasper, and chalcedony. This emphasis on field processing may be indicative of processing raw materials for stockpiling. As the hypothesis only focused on the relative distance from the material source, it did not take into account the cost of transporting the raw material across the Fraser River that also caused them to be retouched. The emphasis on field processing may also have been affected by a need to transport via canoe (at least in part).

Table 3.13. Flake stage data. Ratio of early stage to total number of flakes in parentheses.

	Dacite	**Obsidian**	**Pisolite**	**Jasper**	**Chalcedony**
Early Stage	623 (.07)	5 (.05)	4 (.03)	4 (.02)	12 (.06)
Late Stage	1755	19	23	23	70
Unknown	6267	68	88	152	133
Total Sample Size	8625	92	115	179	215

Unlike the flake analysis, the tool analysis showed more differential use of raw material (Table 3.14-3.17). As illustrated in Table 3.14, jasper has a high tool to debitage ratio score suggesting strong emphasis on this raw material source for tool production.

Table 3.14. Tool data (counts and tool to flakes ratio in parentheses).

	Dacite	**Obsidian**	**Pisolite**	**Jasper**	**Chalcedony**
Tools	1006 (.12)	13 (.14)	10 (.09)	41 (.23)	21 (.1)
Scrapers	137	2	4	13	7
Multi-Tools	75	0	0	5	3

The tools were also analyzed regarding variation in use-patterns (see Tables 3.15 and 3.16). The distribution of employable units (Figure 3.4) per raw material type shows that over 50% of tools from all the raw materials had only one employable unit. Dacite and chalcedony are the two outliers: dacite includes tools with up to four employable units and chalcedony tools up to three employable units. The employable unit analysis shows that soft dacite was more frequently retouched than the other material types. Variability in multi-tools (tools with EUs of different functions) pattern in relation to sample size (Table 3.16; Figure 3.5) and likely does not reflect variation in human decision-making.

Table 3.15. Employable units data (count and percentage of tools with one to four employable units).

	Dacite	Obsidian	Pisolite	Jasper	Chalcedony
Frequency	75	0	0	5	3
EU1	48%	80%	56%	61%	60%
EU2	44%	20%	44%	39%	20%
EU3	7%	0%	0%	0%	20%
EU4	1%	0%	0%	0%	0%
EU 1	334	4	5	20	9
EU 2	303	1	4	13	3
EU 3	47	0	0	0	3
EU 4	8	0	0	0	0

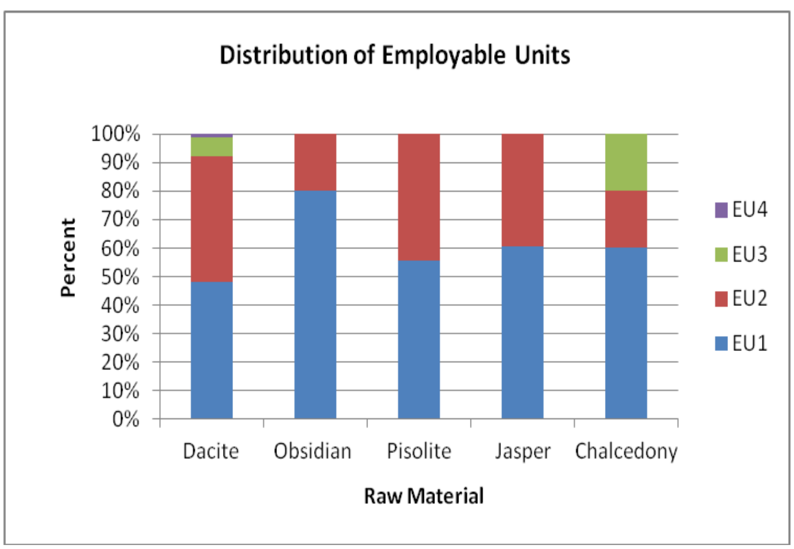

Figure 3.4. Employable Unit Distribution (see data in Table 3.15).

Table 3.16. Frequency of multi-tools.

Raw Material	Frequency	Percent
Dacite	75	90%
Obsidian	0	0%
Pisolite	0	0%
Jasper	5	6%
Chalcedony	3	4%

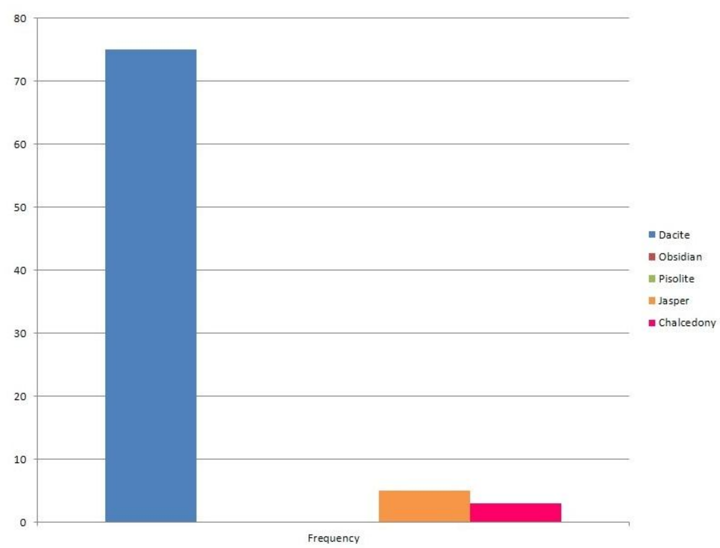

Figure 3.5. Distribution of Multi-tools by raw material.

The Clarkson Index (Clarkson 2002) provides a measure of retouch intensity, which is useful for testing predictions associated with hypothesis two. By examining the Clarkson Index data in a box plot the majority of the data falls between 0.313 and 0.125, with 0.563 being an extreme outlier. The Clarkson Index data were also compared by raw material (Figure 5.6). The dacite scores show a pattern that is grouped between 0.125 and 0.281. This suggests that little retouch was occurring on the dacite scrapers, perhaps due to local abundance of dacite. However, there are seven outliers in the data set. These outliers may be a result of differential access occurring not by raw material but possibly by scraper type. The Jasper tools grouped between 0.094 and 0.25, while the chalcedony was grouped between 0.093 and 0.281. These results suggest that extent of retouch was limited on all the raw materials.

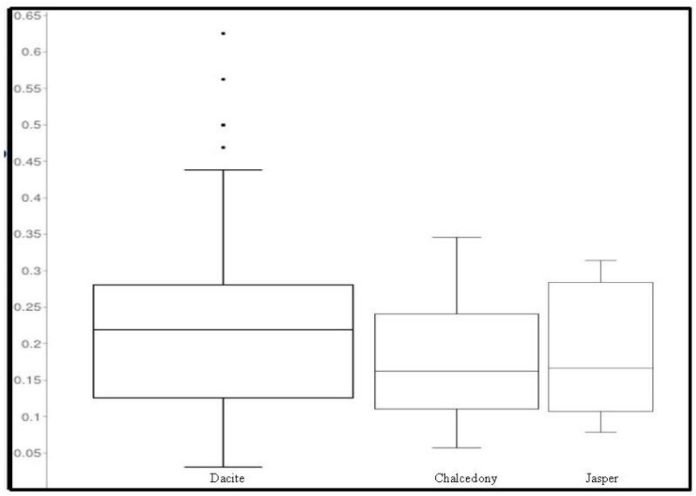

Figure 3.6. Box Plot of Clarkson Index by Raw Materials.

As little retouch was occurring on the raw materials, there is little evidence for a conservation of raw materials. This may suggest that either there was not a high demand for scrapers at the Bridge River site during winter or as the scrapers were unifacial there would not be significant retouch intensity shown in the Clarkson Index.

Conclusions

Underpinning the research questions investigated in this chapter is the understanding that subsistence and livelihood in a winter village on the British Columbian Plateau was predicated in part on the access to lithic raw materials, and likely trade network participation as well (Blake 2004; Hayden and Schulting 1997; Teit 1906). Limitations in access to lithic raw material sources could have been mitigated by a number of means. For instance, storage of blank nodules collected during months of better weather and greater accessibility could offset periods of lessened resource accessibility, participation in materials trade networks could have continued the flow of goods through the village throughout the year, intensive reuse and recycling of tools with singular and multiple applications could have been implemented as a function of constrained subsistence and food processing decisions, and technological developments may have reshaped the inter-workings of all these mitigating factors and methods on a scale that illustrates a larger picture of cultural changes among the historic Bridge River people.

The data presented in this chapter indicate that while some material diversity exists, including those from non-local sources, a primary emphasis in the lithic industries found in Housepit 54's archaeological record was on expedient tool production and use, though with the archaeological complexity of limited multi-functional design and reuse/recycling effort. We interpret this analytical complexity, when coupled with the large volume of groundstone tools, as indicative of a marked emphasis on fish and hide processing occurring during Fur Trade times. Lithic artifact data from Housepit 54 is therefore another line of evidence that the people of historic Bridge River were situated in a socio-economically and politically complex world requiring both short and long-term planning to insure to insure access to critical food and non-food resources.

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Chapter Four

Colonial Period Artifacts at Bridge River Housepit 54

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Introduction

At the end of the 18th century, British, French and Russian fur traders made first contact with indigenous Pacific Northwest inhabitants. Through networks of direct and indirect trading interactions, objects of European design and manufacture steadily became components of native people's material culture. Research conducted at the Bridge River site since 2003 has mainly concentrated on prehistoric house pits (e.g. at Housepit 54) and prehistoric artifacts; however, in the summer of 2012 archaeological field crews excavated a number of artifacts associated with material brought to the region through Euro-American trade networks in the 18th and 19th centuries and correlate to a period associated with early European – First Nation interactions. During this period trading posts were subsequently established throughout the region and by 1792 maritime fur trading activities between indigenous people and Europeans were in full force. It is by examination of this trading process that we begin to understand how objects were introduced into indigenous cultures and how the material affected traditional behavior of First Nation's people during the Fur Trade Era as the adoption of non-traditional materials and objects often resulted in adapting those forms physically or ideologically to correspond with traditional modes of meaning.

The first section of this report on the Colonial period artifacts focuses on their descriptive documentation and the process of their distribution through intertribal and European trade networks. The second section turns to a brief analysis and interpretation of the artifacts as examples of the various ways cultural groups respond to non-traditional materials and objects introduced through trade interactions.

Trade Networks at the Bridge River Site

Artifacts recovered from the floor and the roof levels at Housepit 54 consisted of a large number of prehistoric artifacts (12,631 excluding Stratum XVI) and a small number of artifacts likely originating as European trade goods (n=51). In an attempt to better understand the provenance of these artifacts and their correlation to the fur trade networks, it is important to understand the location of trade posts established throughout areas of British Columbia (Figure 4.1).

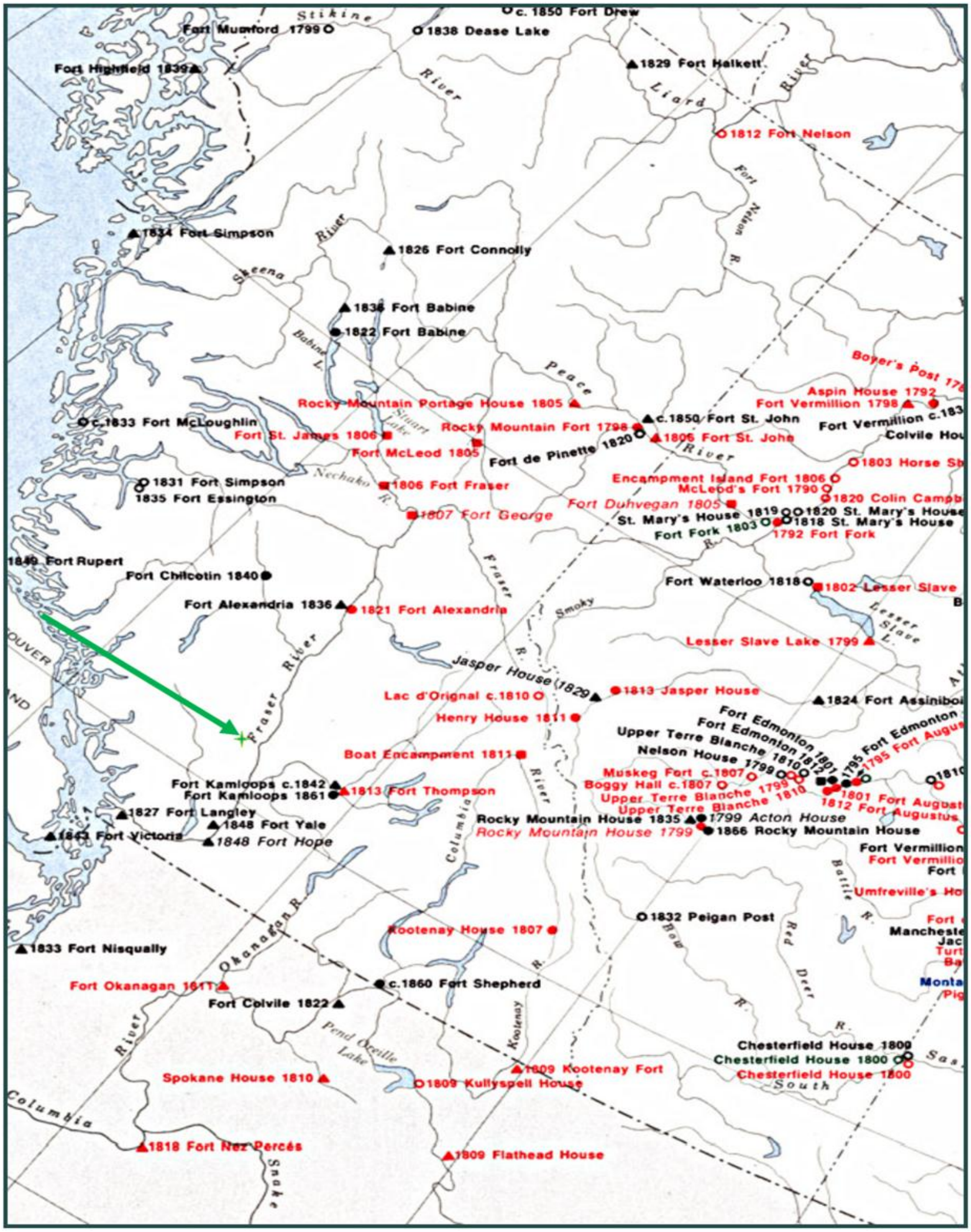

Figure 4.1. Map illustrating location and time period of trade forts, *Red* denotes forts owned by Northwest Company and ***Black*** denotes forts owned by Hudson Bay Company. The *Green* arrow denotes the location of the Bridge River Site (EeRl4) *(National Atlas of Canada*).

Canada's fur trade industry provided principal motivation and an economic basis for the exploration of land within the interior of Canada (National Atlas of Canada 1974). A majority of the trading posts in British Columbia that were established and in operation between the years 1798 and 1860 were owned and operated by the London-based Hudson Bay Company and the Montreal-based Northwest Company. These companies were the two largest enterprises associated with the Canadian Fur trade (National Atlas of Canada; Burley et al. 1996). Although the Bridge River site is located along a river corridor rich in animal resources, historical records indicate that no European trade forts were located within close proximity of the housepit site. Between 1813 and 1863 ten forts were established within a 200 mile radius of the Bridge River site. In the late 18th century and early 19th century, decreasing numbers in pelt production and competiveness between the Hudson Bay Company and Northwest Company pushed exploration into the far reaches of Canada (Burley et al. 1996), and specifically west into British Columbia. In 1793 Alexander Mackenzie of the Northwest Company made his way through British Columbia, thus making this region a new focus for European commercial enterprise (Burley and Hobler 1997). Simon Fraser, also of the Northwest Company, encountered members of the Upper Lillooet (St'át'imc) in 1808 while exploring the region, and he was followed three years later by Alexander Ross and David Stuart with the Pacific Fur Company (Sturtevant et al. 1998). Ethnographic accounts described by James Teit (1906) discuss major trade routes used by the Lower and Lake Lillooet groups who were actively trading with coastal groups. Teit goes on to describe that materials brought inland from the coast were traded between the Upper Lillooet and other neighboring bands (Sturtevant et al.1998). Other historical accounts told by explorers such as Lewis and Clark, Alexander Mackenzie, and Simon Fraser reveal that some indigenous tribes were in possession of trade items such as beads and metal objects long before they had had actual contact with Europeans (Griswald 1954; Dawson 1891). Given these written accounts, it is evident that European goods trickled their way into the lives of people in interior British Columbia through intertribal trade networks during the early 19th century. In turn, new trading relationships began to develop. To the indigenous people, acts of exchange and trade were seen as ways of validating relationships among Native groups and insured future trade between neighboring groups (Brasser 2009). Trade goods such as beads were popular items of trade in the 18th and 19th century. Items such as bracelets, finger rings, nose rings, pendants, buttons, and jingle cones were also in demand, and these objects were bartered, ready-made from other indigenous people or from European traders (Karklins 1991).

Artifacts From Housepit 54

Table 4.1 provides a list of beads recovered from 2012 excavations at the Bridge River site. All the beads are made of glass (Figure 4.2). The artifacts' attributes and manufacturing methods are described in Table 4.1. The beads are categorized as either a simple drawn bead or a simple compound bead. The term *drawn bead* indicates that the bead was made from sections of glass tubing drawn out using a hollow globe of molten glass (Kirklin, 1985); the terms *compound* and *simple* are used to describe the number of colors attributed to a bead; *compound* refers to a bead exhibiting more than one color and *simple* means the bead is a single color. Out of the 31 beads, five (5) were broken and one (1) bead was badly burnt causing its color to be undetermined.

Table 4.1. Sample catalogue of glass beads collected from the Bridge River site (EeRl4)

Artifact#	Level	Manufacturing Method		Color	Length	Diameter
2	1	Drawn	Compound	White/Green Red	2.8mm	3.1mm
6A	1	Drawn	Simple	Blue	2.6mm	3.7mm
6B	1	Drawn	Simple	Blue	3.4mm	2.5mm
7A	2	Drawn	Simple	Blue	1.9mm	2.9mm
7B	2	Drawn	Simple	Blue	2.2mm	3.4mm
8	1	Drawn	Compound	White/Green Red	2.4mm	3.6mm
9	1	Drawn	Simple	Blue	2.4mm	3.5mm
10	2	Drawn	Compound	White/Green Red	2.6mm	3.8mm
11	1	Drawn	Simple	Blue	3.7mm	2.4mm
13	1	Drawn	Simple	Blue	2.7mm	3.6mm
14	1	Drawn	Simple	Blue	4.7mm	5.6mm
15	2	Drawn	Simple	Blue	Na	Na
16	2	Drawn	Simple	Blue	7.8mm	9.1mm
17	3	Drawn	Simple	White	3.6mm	4.1mm
24	1	Drawn	Simple	Na	2.3mm	3.5mm
28	1	Drawn	Simple	White	2.5mm	3.7mm
30	1	Drawn	Simple	Green	2.3mm	3.3mm
38	2	Drawn	Simple	Light Blue	2.7mm	3.5mm
39	2	Drawn	Simple	Blue	2.7mm	2.4mm
41	3	Drawn	Simple	Blue	1.4mm	2.0mm

45	3	Drawn	Simple	Blue	2.8mm	3.1mm
47A	1	Drawn	Simple	Red	Na	Na
47B	2	Drawn	Simple	White	2.9mm	3.2mm
52	1	Drawn	Simple	White	2.6mm	3.4mm
55	1	Drawn	Compound	White/Green/Red	2.1mm	3.0mm
59A	1	Drawn	Simple	White	3.8mm	5.1mm
59B	1	Drawn	Simple	White	3.1mm	4.1mm
61	1	Drawn	Compound	White/Green/Red	2.7mm	3.4mm
75	1	Drawn	Simple	Green	2.4mm	3.3mm
232	1	Drawn	Simple	Blue	2.3mm	3.5mm
N/A	1	Drawn	Simple	Blue	2.1mm	3.6mm

Glass beads primarily appeared in the Northwest Coast through intertribal trade networks that were already established prior to the arrival of Hudson Bay Company and Northwest Company traders. In 1778 Captain James Cook arrived on the Pacific coast and traded with indigenous peoples that he encountered (Burley et al. 1996; Griswald 1953). Historical accounts and fort inventory records report that the Pacific Northwest's indigenous people valued blue and white trade beads. These beads were chosen over a variety of other colors and were seen as concomitants to wealth and noted for aesthetic display (Griswald 1953; Karklins 1992). During the 18th and 19th centuries the majority of beads being manufactured and traded to North America were coming from shops in Venice and Czechoslovakia (Burley et al. 1996; Carlson 2006). Throughout the fur trade, beads were also manufactured in Germany, France, China, Russia, and England (Burley et al. 1996).

Analysis of the White/ Red /Green drawn beads from Housepit 54 resemble beads from Karlis Karklins 1985 book, *Glass Beads: the Levin Catalogue of Mid-19th Century Beads.* These beads have a manufacturing date range of 1851- 1863. The date range for these striped beads aligns with the radiocarbon dating results from the Housepit. Dates for the remaining beads are yet to be determined. Historical accounts and ethnographic records place blue and white beads (and other colors as well) in southern British Columbia around the late 18th century (Dawson 1906; Griswald 1954). Other archaeological excavations at sites associated with the Fur Trade period in British Columbia have produced glass beads with similar dates. Archaeological work conducted in the Peace River area in northern British Columbia recovered 19,000 beads, these beads were common of beads traded in the late 18th to early 19th century and 98 percent were beads measuring less than 4 millimeters in diameter (Burley et. al 1996).

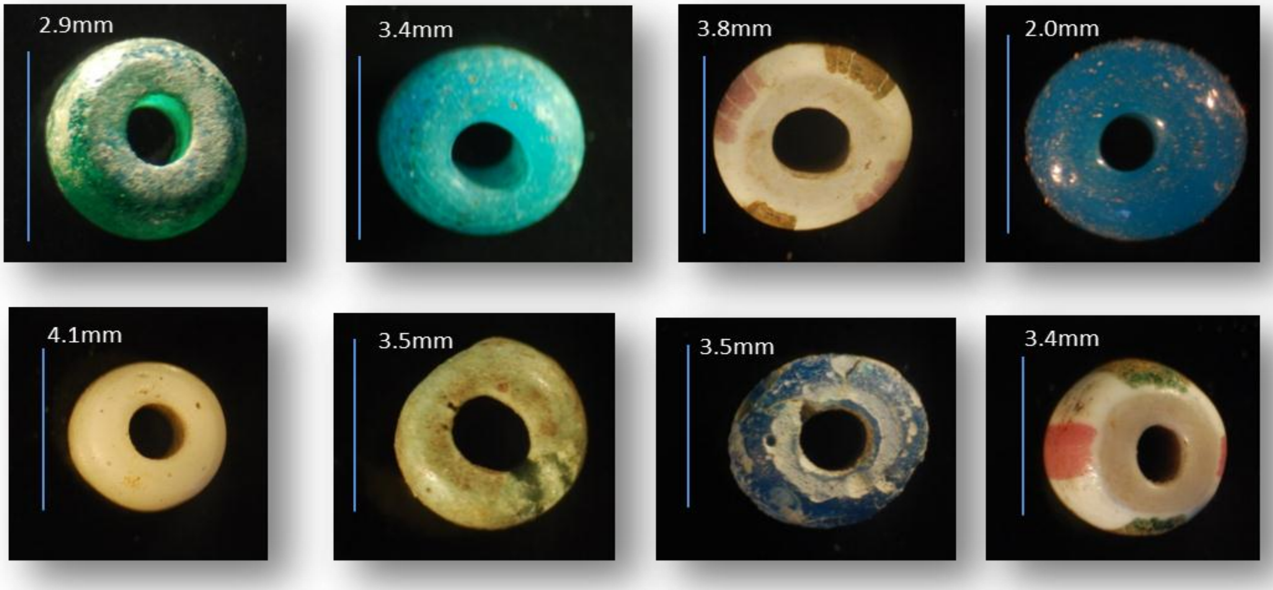

Figure 4.2. Selected beads recovered from Housepit 54. From the top left: Simple drawn translucent green glass bead; Simple drawn translucent light blue glass bead; Compound drawn opaque white, red and green stripe glass bead; Simple drawn translucent glass bead. From the bottom left: Simple drawn opaque white glass bead; Simple drawn opaque light blue glass bead; Simple drawn translucent blue glass bead; Compound drawn opaque white, red and green stripe glass bead.

The remaining contact period artifacts recovered within Housepit 54 are delineated in Table 4.2. In addition to glass beads, materials such as metal trade points, brass rings, and jingle cones and (Figure 4.3) moved west during the fur trade through traditional systems of exchange in the mid to late 18th century.

Figure 4.3. Possible Jingle Cones from Housepit 54. The two artifacts on the left are iron and the artifact on the right is possibly tin or an iron alloy.

Figure 4.4. Iron trade points from Housepit 54.

The use of metal began to replace stone and bone items for making implements (Burley et al. 1996). Metal objects such as arrow points were sometimes cut and hammered out to serve different functions such as adornments that were attached to clothing and/or hair (Burley et al. 1996; Karklins 1992). Excavations at Housepit 54 recovered one (1) complete point and another possibly fragmented point (Figure 4.4). In addition to these artifacts, three possible jingle cones, (Figure 4.3) two made of rolled iron and one from an iron alloy, were recovered from roof deposits. Early references to jingle cones are found in Northeast region of the United States and date back to the 1600s (Beauchamp 1902; Thiel 2007). Other references to the use of jingle cones are centered in the upper Midwest among the Ojibwa of the Minnesota –Ontario boundary area and were made out of local copper. After the 18th century the cones were commonly made from items of sheet tin, coins, and thimbles acquired through fur trade exchange (Thiel 2007).

Table 4.2. Sample catalogue of metal/glass/faunal material associated with Euro-American trade goods collected from the Bridge River site (EeRl4).

Artifact #	Level	Material	Description
1	1	Metal	1possible jingle cone made from tin
3	1	Metal	1 iron horseshoe
4	1	Metal	1 unknown piece of iron, rounded tip at one end.
23	1	Wood/ plastic	1 unknown spiral piece of plastic or wood.
26	1	Metal	1 folded stripe of tin.
27	1	Faunal	1 machine made faunal button. Four holes in center

29	1	Metal	2 thin flat fragments of iron, possibly part of a trade point.
33	1	Metal	2 small fragments of iron from and unknown object.
34	2	Metal	1 thin piece of brass, small hole in the middle (possible button back or sequin).
41	1	Metal	1 iron trade point
43	3	Metal	3 iron fragments from an unknown object.
44	2	Metal	1 small folded piece of copper/tin.
46	2	Metal	1small brass finger ring.
51	1	Glass	1 piece of flat colorless glass.
60	1	Metal	2 fragments of iron from an unknown object.
62	1	Metal	1 iron piece, possibly a jingle cone.
99	1	Metal	1 small fragment of iron from an unknown object.
250	1	Metal	1 cone shaped iron piece, possible jingle cone.
651	1	Metal	2 small iron fragments, broken and from an unknown object.
757	1	Metal	1 square piece of iron indented through the center.

Figure 4.5. Faunal button from Housepit 54. Figure 4.6. Brass ring from Housepit 54.

Artifacts such as a faunal button (Figure 4.5) and a brass ring (Figure 4.6) were also recovered from Housepit 54. The button from Housepit 54 is a machine made button and dates to the 1800s-1830s (Hume 1970). Simple band brass rings, convex on the outside are common in archaeological sites dating to the 18th century in eastern parts of North America (Hume 1970).

Indigenous Uses of Non-traditional Materials and Objects

The introduction of novel materials or objects from one cultural group into that of a significantly different group can prompt three primary responses. The receiving group may find the new materials or objects viable substitutions or improvements to those they currently use and adopt them unilaterally. They may, however, find the new items wholly incompatible with their lifestyle and worldview and reject them utterly. Finally, they may see in the materials or objects applications that, while highly divergent from the objects' original intent, could be adapted and used within their own cultural framework (Loren 2008).

All three responses can be interpreted from the archaeological record of Mid-Fraser peoples. Some objects, like metal arrow points were certainly accepted as more durable replacements for Native stone tools. Glass beads supplemented the already common practice of beadwork and adornment, but only specific colors would be acceptable while others would be rejected. Most of the non-traditional artifacts recovered from Housepit 54 at the Bridge River Site exemplify the modification and repurposing of foreign materials and objects into forms and applications that embodied and conveyed culturally appropriate meanings for the Native people. The metal arrow point, glass beads, tinkle cones, horseshoe, and faunal button found at Housepit 54 all illustrate the three possible responses to non-traditional materials and objects.

Tinkle Cones

There appears to be something virtually universal about the belief in the power of sound to ward off malign forces and channel, if not innately generate, healing energy. Several cultures and belief systems attribute the sound of bells and other jingling noises to divine beings and use these devices as protective wards and amulets in both mundane and formalized ritual ceremonies (Paine 2004). Metal bells and jinglers have the added attribute of reflective flashiness, which is also believed to repel evil forces. That Native peoples also held these beliefs is substantiated by numerous ethnographic and historic studies (Dawson 1891; Griswald 1954; Karklins 1992; Browner 2002; Loren 2008).

One of the most widespread artifacts exemplifying the Native refashioning and repurposing of metal trade good items is the tinkle cone (also called jingle cone). Tinkle cones were made by cutting up copper and brass kettles and pots into small rectangles and folding and rolling them into a bugle-shape. Paired with other symbolic elements like beads, colors, and animal hair and sewn onto garments and ceremonial objects or used as ear and hair ornaments, the sound of tinkle cones provided protection and healing. Browner (2002) explains how sacred "jingle dress dances" have evolved among the Ojibwa, Anishnaabeg, Ho-Chunk, and Lakota as healing rituals and emphasizes their connection to traditional female gender roles and values as the caretakers of the family.

According to Karklins (1992), the indigenous people of the Mid-Fraser also favored tinkle cones, but apparently not with the same gender associations as the more eastern tribes. Tinkle cones, along with other metal adornments like discs, triangular and rectangular "tags," coins, and buttons were used by both men and women as clothing and hair ornaments as well as for jewelry items like earrings and neck pendants. In each instance, the metal objects created the clinking, tinkling sound that held particular meaning and spiritual power for those wearing them.

In addition to the possible tinkle cones recovered from Housepit 54, several small unidentified metal fragments were also found. These fragments, like the tinkle cones, likely represent the intentional appropriation of non-traditional materials to enhance Native enactments of their cultural beliefs and values.

Horses and Horseshoes

One of the most enigmatic artifacts recovered from Housepit 54 is an iron horseshoe still retaining two nail fragments (Figure 4.7). The horseshoe, discovered in the roof stratum in the southwestern quadrant of the housepit, appears to be a left front shoe. Although horseshoes defy precise dating, they do exhibit some broadly datable characteristics. This particular shoe most resembles a style introduced after 1800 and most frequently associated with machine-made horseshoes, a process not invented until 1835 in New York (Chappell 1973:105).

Figure 4.7. Metal horseshoe (left: foot surface; right: ground surface). Four (4) nail holes per side with fragments of two (2) nails remaining in top holes. This shoe is possibly a left front shoe. 188mm long x 101.87 mm wide; thickness varies; weight, 184.2g.

Several sources document the presence of horses in the Pacific Northwest and their integration into Native lifeways prior to the arrival of white traders and trappers (Teit 1912; Haines 1938; Griswald 1954; Burley et al. 1996; Lewis and Phillips 2006) where they appear to have been highly valued animals. Teit's (1912: 358) ethnographical survey of the Lillooet people records a creation story in which Horse is one of the primary original animals, and Griswald (1954:41) and Lewis and Phillips (2006) both note the importance of horses as trade items. Horse trade appears to have been between Native groups and from Natives to white traders, not as an item traded from whites to Native people. This is an important distinction to bear in mind for the interpretation of the horseshoe from Housepit 54.

Fur trade transport mainly transpired by canoe, but horses were sometimes utilized as pack animals in transporting trade goods. They also provided a source of meat in the absence of game animals and in times of severe food shortage (Burley et al. 1996:96). John Work's journal records the difficulty he encountered with acquiring a sizable number of horses from Native tribes in 1826 because the owners were either reluctant to part with the animals or they valued the horses so highly they demanded prices beyond what Work found reasonable or was willing to pay (Lewis and Phillips 2006). Clearly, as historic sources indicate, horses constituted an important component of Native lifeways in the late 18th and early 19th centuries.

Significantly, Native horses were not shod. Although, some larger trading posts are known to have had blacksmiths who produced a wide range of metal trade items like axe heads, knives, files, and awls, documentation is lacking about the production and use of horseshoes. Their use, even on European-owned horses, in this area of British Columbia during the early 19th century seems to be uncommon. The presence of one horseshoe at a Mid-Fraser village suggests then that its function and importance had little if any resemblance to its European functions as protective footwear for a horse. Its location in the roof of a housepit and its unaltered form imply an embodied value and meaning for whoever acquired it and placed it there.

Aside from the mention of a mythological Horse-being in the Lillooet traditions recorded by Teit (1912), graphic representations and artifactual evidence have not revealed any particular associations between spiritual beliefs and horses or horseshoe-shaped symbolism. However, like many such beliefs and symbols, it may be that these horse-related elements have merely not been previously considered in interpretations of the Native peoples of the Mid-Fraser region.

European Trade Beads

By sheer volume, glass beads comprise the largest number of European trade items. In fact, they are so ubiquitous in the archaeological record of colonial era and post-European Native sites that their absence from a site would seem anomalous. While Housepit 54 at the Bridge River site excavation did not yield great numbers of beads (Table 4.1), it did produce thirty-one (31) beads of varying colors and patterns, including five (5) green, red, and white striped beads, sixteen (16) opaque and translucent blue beads, two (2) translucent green beads, six (6) opaque white beds, one (1) translucent red bead, and one (1) bead too deteriorated to determine its original color.

Color, and to some degree shape, was a determining factor in the acceptability of trade beads. The predominance of blue and white beads is common as historic trading records often note a Native preference for these colors. Griswald (1954: 73), quoting Lewis and Clark's journal, cites Clark as noting the Native peoples they encountered along the Columbia River, "are all fond of...Beads particularly blue and white beads." To which he added, "I attempted to purchase some few roots which I offered red beads for, they would give scarcely any thing for Beeds [sic] of that color." The rejection of beads of particular colors indicates that Native people were highly selective in their trade dealings, choosing only those items that would incorporate into traditional lifeways (Burley et al. 1996:17).

It would be a mistake to assume the bead color preference was primarily aesthetic. The issue of color is a critical component in many cultural constructs of cosmology and symbolism. As DeBoer (2005) explains, for virtually all Native peoples particular colors corresponded with cardinal directions and landscape elements; clockwise/counterclockwise movement; spiritual forces and realms; gender and other social constructs; and particular rituals, songs, prayers, creations, and other interactions with and enactments of the cosmos. The importance of beads, and particularly beads of specific colors, to the Native peoples of the Mid-Fraser area, as elsewhere, cannot be overstated. Karklins (1992:164) delineates thirteen applications for beads for the people of this area of British Columbia and indicates possible gender associations for some of these applications as well as noting again the preference for blue and white beads. So, although European traders listed and viewed beads as mere "trinkets," Native peoples accepted those of culturally appropriate and meaningful color as valuable expressions of a wide range of social and spiritual beliefs.

According to Dr. E. B. Eiselein (2013), Canadian Anishinabe and direct descendent of Northwest Company's explorer and trader Alexander MacKenzie (1764-1820), when the bead colors offered by European traders were insufficient to express cultural meanings, Native peoples would melt the beads to rework them into color variants, combinations, and patterns specific to the group's color symbolism. As these re-created beads have no provenance in European manufacturing manifests and trade ledgers, the resulting beads found in archaeological contexts provide yet another example of Native agency in adapting non-traditional materials into culturally appropriate forms.

Conclusions

In order for trading interactions to result in a prosperous venture, the result of the interactions must benefit both parties. So while this means that the items exchanged must satisfy their respective recipients, it does not imply that there is a shared understanding or agreement of the values, meanings, or appropriate usages of those trade goods. As Loren (2008) asserts, even when an object appears to be utilized similarly by two distinctly different cultural groups, it cannot be assumed that motivations and meanings associated with the object signify synonymous connotations. The Native peoples of 18th and 19th century North America, including the Mid-Fraser region of British Columbia, were confronted with numerous European materials (e.g., metal, glass) and objects (e.g., mirrors, kettles, guns, buttons, cloth, and horseshoes) offered to them in exchange for their animal resources. While some of these objects (e.g., metal arrow points and glass beads) directly suited Native applications, most of the materials suggested alternative forms and usages and were readily modified or repurposed to reflect a Native cultural logic.

Materials or objects modified into alternative forms present relatively obvious examples of cultural adaptation; however, those that retain their original form and characteristics like horseshoes, beads, glass, or buttons require greater consideration and research to recognize how they have been conceptually rather than morphologically modified. In the exchange of material culture between two cultural populations, it should always be expected that each respective group will alter the exchanged materials or their uses to suit its particular worldview, so the materials excavated from archaeological sites must be viewed through the lens of the culture that used them rather than the one that originally produced the materials. It is too easy to assume a simple, seemingly straight-forward and pragmatic object— a button, for example—has but one purpose; but, Native peoples used buttons for a variety of adornment and amulaic purposes and apparently not at all as clothing fasteners (Karklins 1992).

To understand the more subtle adaptions suggested by seemingly enigmatic artifacts like a horseshoe in the roof, or a button, a single shard of glass, or small fragments of metal recovered across an archaeological site requires careful recordation of depositional locations, orientations, and associations that can be compared to other archaeological sites and ethnographic accounts. The gradual accumulation of similarly situated and utilized materials and objects should ultimately provide a window into the processes whereby human beings manifest their beliefs, concerns, and values through the appropriation, creation, and manipulation of material culture.

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Chapter 5

Faunal and Osteological Analysis

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Introduction

Inhabitants of the Bridge River village participated in a seasonally structured subsistence pattern requiring great knowledge of the regional ecology. As serial-specialists and collectors they dispersed during the spring, summer, and early fall seasons to target various resources with a focus on salmon in addition to terrestrial resources such as deer, roots, and berries (Prentiss et al. 2009, 2010). During the winter months aggregated band members depended on stored food and supplemental hunting efforts (Prentiss 2012; Prentiss and Kuijt 2012). Under these conditions careful planning was required to coordinate hunting and gathering activities with processing and storage to ensure enough provisions are amassed for the winter village occupation when resources are scarce (Prentiss et al. 2011). An analysis of these faunal resources informs not only the diet of a seasonally occupied village, but also the complex decisions and tradeoffs of HP 54 household members. However, we can also move beyond subsistence to socioeconomic relationships by examining non-subsistence prey use and spatial distributions of remains. Together these analyses will provide a broader understanding of the role of fauna at the Bridge River site.

Salmon, the keystone subsistence resource, were mass collected along the Fraser and Bridge Rivers with dip, set, or float nets (Prentiss and Kuijt 2012; Teit 1906). Three types of Pacific salmon are native to the region, including pink (*O. gorbuscha*), chinook (*O. tshawytscha*), sockeye (*O. nerka*), and coho (*O. kisutch*) (Berry 2000; Kew 1992). Each species received differential preparation based on their spawning season, element utility, fat content, and taste. Chinook and sockeye salmon, which run in the early spring and summer seasons, were preferred for their taste. However, due to their high oil content, they required more attention in the processing and drying stages than other species (Berry 2000). Chinook and sockeye salmon, which run in the early spring and summer seasons, were preferred for their taste. However, due to their high oil content, they required more attention in the processing and drying stages than other species. The thoracic vertebral region offered the highest payoffs in fat and meat while precaudal and caudal sections provided fillets of secondary importance (Butler 1993; Hoffman et. al 2000; Prentiss et al. 2012). Precaudal and caudal sections were often eaten on location or fed to dogs. However, some of these vertebral elements, called "neckties," were often dried for soup in the winter (Kusmer 2000a; Prentiss et al. 2012). Sockeye salmon caught later in their running season during the fall were sometimes freeze-dried or even dried whole when cooler and wetter weather made drying the flesh more difficult (Berry 2000). When such preservation was not possible, the salmon were made into powder, given away, or consumed immediately (Berry 2000). Heads, because they contain high amounts of fat, were difficult to preserve and heavy to transport whole (Butler 1993; Hoffman et al. 2000; Partlow 2006; Prentiss et. al 2012). While heads were often discarded or rendered into oil immediately at the fishing site, they sometimes were roasted or dried for later oil extraction at the village site (Colley 1990; Hayden 1997; Prentiss et al. 2012; Teit 1900).

Deer were the most utilized terrestrial faunal resource and are secondary in importance only to the mass spawning salmon (Kuijt 1989; Perlman 1970; Romanoff 2000; Smith 2012). Hunting usually occurred in the fall when deer had higher fat contents and thicker furs. During this time they were more accessible at higher elevations, though hunting throughout the winter and early spring was possible in the montane forests and intermediate grassland settings (Alexander 1992a, 1992b; Romanoff 1992). This availability of deer during the seasonal village occupation would have been vital if salmon stores became low due to poor run cycles or prolonged winter weather (Prentiss and Kuijt 2012; Romanoff 1992). Field butchering and transport decisions depended on the setting in which the deer were procured. Deer caught in the summer at field camps were sometimes returned to the village as cuts of smoked meat wrapped in hides, though often the meat was smoked with the bone intact (Romanoff 2000; Teit 1900, 1906). When hunters traveled long distance to acquire prey, they often performed some butchering in the field and transported only the high utility portions back to the site, often with low utility "rider" elements attached (Binford 1978; Daly 1969). In deer high utility items are those that not only contain the highest amount of meat, but those that also provide large quantities of marrow and grease that are extracted through heavy fragmentation and boiling of the elements (Church and Lyman 2003; Madrigal and Holt 2002; Marshall and Pilgram 1991; Outram 2001). High utility elements in deer consist of the upper limbs, which include the femur, tibia, humerus, radio-ulna; moderate utility items include the elements of the axial skeleton, such as vertebrae, ribs, sternum, scapulae, and innominates (Madrigal and Holt 2002; Marshall and Pilgram 1991; Rogers and Broughton 2001). Low utility items occur in two anatomical regions, the head and the lower limbs containing the metapodials, carpals, tarsals, and phalanges (Madrigal and Holt 2002; Prentiss et al. 2007).

Other prey, including mountain sheep (*Ovis canadensis*), rabbits (*Lepus sp.)*, birds (phasianids), and trout (salmonids) were occasionally included in the diet breadth (Alexander 1992a, 1992b; Prentiss et al. 2009). A variety of prey was exploited for non-subsistence resources. Prey utilized for their pelts are especially important in understanding household economy during the Fur Trade Era. Mustelids, such as the long-tailed weasel, short-tailed weasel, yellow-bellied marmot, marten, mink, fisher, and wolverine, were utilized more frequently. Other carnivores, including canids (wolf, coyote, and red fox), felids (cougar, lynx, and bobcat), and ursids (grizzly and black bears), also provided desirable furs (Alexander 1992a, 1992b). High rates of these prey items could indicate that the HP 54 household participated in the Fur Trade; however, the presence of bones may be rare if only pelts rather than the whole carcass were returned to the village. Teeth were also a valuable resources used for both ceremonial and utilitarian functions; bear teeth were used for ornamentation while the incisors of beavers (*Castor canadensis*) and squirrels (scuridae) were used as carving tools (Alexander 1992a, 1992b; Prentiss et al. 2009). Bird bones were used to create beads, gaming pieces, and drinking straws for ceremonial and decorative purposes. Additionally, wings may have had cultural significance (Teit 1900, 1906, 1909).

Domesticated dogs served a variety of roles within the region, including beast of burden, hunting companion, prestige signal, famine food, and feasting fare (Cail 2011; Crellin and Heffner 2000). As a managed resource, dogs are costly, requiring about one kilogram of salmon a day (Cail 2011; Crellin and Heffner 2000; Hayden 1997). If utilized as risk-management resources, dogs would be most likely consumed during the late winter or early spring when stored resources depleted; dogs intended for feasts, however, could be utilized any time of the year. Differences in slaughter and processing could also identify the purpose of the dog. Those used as a risk-management resource may have been killed through slitting the throat, breaking the neck, or blunt force trauma. In feasting settings, dogs were killed more ceremoniously by using its own forelimbs to strangle it, resulting in diagnostic breaks in the radius and ulna, or a blow to the head, creating cranial fractures (Cail 2011; Hayden 1997; Teit 1909). Once cooked, the animal was eaten enthusiastically possibly in a "scramble" where many people simultaneously cut and consumed the meat (Hayden 1997).

An assessment of the distribution and characteristics of these prey elements will not only inform the subsistence decisions made by HP 54 inhabitants but also socioeconomic relationships within and outside of the household. Variations in fauna distribution can reveal differences in resource access (Arnold 1996). Concentrations of faunal remains may also reveal spatial divisions of the household (Hayden and Handly 2000; Stahl and Zeilder 1990). While previous faunal analyses emphasized emerging cultural complexity and inequality as a result of ecological change and resource stress (Prentiss et. al 2009), this research focuses on an equally critical period, the Fur Trade Era. The presence of pelt-bearing prey could indicate a wider interaction sphere between Native and non-Native groups. Approaching these relationships allow a broader understanding of the role of fauna at the Bridge River site.

Methodology

Faunal materials were recovered from the 2012 field excavations at the Bridge River site through *in situ* discovery, collection from 1/8-inch screens, or separation from the heavy fractions of soil flotations. The specimens were analyzed within the lab facilities of the Department of Anthropology of the University of Montana, Missoula. The fauna was identified to the most discrete taxonomic class possible. Every bone was analyzed for element type, side (right/left), end (proximal/distal), and relative age (juvenile/subadult/ adult) (Cannon 1987; Gilbert 1990). To aid in the identification process comparative collections from the University of Montana's Phillip L. Wright Zoological Museum and Anthropology Department were utilized. Dave Dyer, the curator of the Philip L. Wright Zoological Museum, provided additional support.

Fragments of unidentifiable mammalian species are classified according to relative size (small, medium, large). Small mammal includes small-sized rodents through rabbit-sized while medium mammal includes beavers though dog-sized. Large mammal is considered to be deer-sized and larger (Smith 2012). These fragments are categorized into six size grades (1-9mm, 10-19mm, 20-29mm, 30-39mm, 40-49mm, and 60+mm) to demonstrate differences in butchering techniques and the intensity of processing (Smith 2011). Church and Lyman (2003) have shown that small fragments more consistently render a greater amount of grease than larger fragments. Smaller fragments (>5cm) also more efficiently render grease through boiling within a shorter time frame. Fracture type can also reveal additional processing within mammalian prey. While spiral and oblique fractures suggest marrow and grease production, linear breaks (e.g. transverse) occur more often in less fresh specimens (Alexander 1992; Gilbert 1990; Kusmer 2000b Outram 2001). Irregular fractures can occur in small fragments due to heavy processing. Different techniques are used for salmonids due to their small specimen size and overall fracture irregularity.

The presence of human modifications, such as blows, chopping marks, scraping marks, saw marks, and abrasion, are noted when present (Gilbert 1990; Lyman 1987; Reitz and Wing 2008). Faunal artifacts are also described. Taphonomic processes are also recorded. To understand the relationship between bone preservation and the soil environment, an analysis of soil acidity is performed. Weathering is assessed according to Behrensmeyer's (1978) five stages, with a value of 0 signifying no weathering and 5 signifying that the bone is unrecognizable due to cracking and complete exfoliation. Burning will be identified through texture and color, from being charred (black), to being completely calcined (white) (Shipman et al. 1984). Patterns in burnt bone can reveal how fauna were processed. Burnt bones can indicate whether meat was subject or near to heat during cooking, boiling, or smoking processes that increase the returns of the resource. Distributions of burnt bone between strata can also reveal if the structure was intentionally burnt between occupations as a means of warding of pests. Upon completion the data from this analysis were entered into a digital database though hard copy records are also available.

Soil Environment and Bone Preservation

Descriptions of the soil environment in the 2008 and 2009 Bridge River site reports indicate that poorer bone preservation was present in HP 54's uppermost strata where clay caps did not offer greater protection to specimens against leaching water, krotovinas, and root activity (Prentiss et al. 2009, 2010). To ensure that these conditions did not bias the assemblage, pH tests were conducted to measure soil acidity (Table 5.1).

Table 5.1. Soil Acidity.

Strata	Block and Square	pH Value
Stratum V	A 12	7.00
	C 5	7.00
	F 10N	7.00
Stratum II	A 16NE	6.75
	B 8SW	6.80
	D 13SW	7.00
Stratum XVI	E 14	7.00
	B 8	7.00
Stratum XIV	A 15	6.90
	B 9	7.00

Soil acidity does not negatively impact the faunal assemblage; in fact, the overall neutrality of the soil has benefited bone preservation. The roof (stratum V) consistently provided neutral scores (7.00). The floor was more variable, with scores ranging from only slightly acidic (6.75 and 6.80) to neutral (7.00). However, these slight differences would not greatly affect bone survivorship. The peripheral bench (stratum XVI) also provided neutral values. The midden deposit (stratum XIV) showed minor variation, with two neutral scores (7.00) and one slightly more acidic (6.90). Overall, these pH scores reflect a favorable environment for faunal preservation.

Faunal Remains

The faunal assemblage offers a total of 8,848 specimens across seven strata, including the sod layer (stratum I), the BR 4 roof (stratum V), the BR 4 floor (stratum II), the midden (stratum XIV), the peripheral bench (stratum XVI), the BR 3 roof (stratum Va), and the most recent BR 3 floor (stratum IIa). A summary of the prey present and their distribution across these contexts can be seen in Table 5.2. While this table combines specimens collected through different methodologies, the analysis will discuss those specimens collected in situ or from 1/8-inch screens separately than those recovered from soil sample heavy fractions by stratum and block.

Stratum I

Stratum I contains 102 specimens across Blocks A, B, C, D, E F, and H. A summary of the taxon present is available in Table 5.3.

Block A contains a total 24 specimens, including 12 *Oncorhynchus sp.*, 1 large mammal, 1 medium/large mammal, 1 Arvicolinae, 8 indeterminate specimens, and 1 freshwater shellfish. The majority of the *Oncorhynchus sp.* elements are high utility vertebrae, including, 2 thoracic vertebrae, 2 caudal vertebrae and 7 vertebral fragments. One cranial fragment is also present. Only 1 specimen is present for the large mammal and medium/large mammal categories, a diaphysis fragment and cancellous fragment, respectively. One mandible represents the Arvicolinae subfamily. Indeterminate specimens include 8 unidentifiable fragments. One freshwater shellfish shell fragment is present.

Block B contains 6 specimens, 2 *Oncorhynchus sp.*, 3 medium/large mammals, and 1 indeterminate specimen. Both *Oncorhynchus sp.* elements are vertebra fragments. Medium/large mammal elements include 2 diaphysis fragments and 1 unidentifiable fragment. One indeterminate specimen is present, an unidentifiable fragment.

A total of 61 specimens were collected from Block C: 7 *Oncorhynchus sp.*, 1 *Odocoileus sp.*, 46 Mammalia, 3 Arvicolinae, and 4 indeterminate specimens. Vertebral elements, including 1 precaudal vertebra, 3 caudal vertebrae, and 3 vertebral fragments, comprise the *Oncorhynchus sp.* taxon. One *Odocoileus sp.* element is present, a distal fragment of a first phalanx. One large mammal diaphysis fragment is present. Medium/large mammal elements include 18 diaphysis fragments and 19 unidentifiable fragments. Medium mammal specimens include 8 diaphysis fragments. Three Arvicolinae mandibles are present. Four indeterminate specimens occur: 3 diaphysis fragments and 1 unidentifiable fragment.

Table 5.2. Distribution of Taxon by Stratum

	Taxon	Strata								Total
		I	V	II	XIV	XVI	Va	IIa	Unknown	
Salmoninae	*Oncorhynchus sp.*	21	688	896	17	245	4	62	53	1,986
	cf. *Oncorhynchus tshawytscha*	-	6	5	-	-	-	1	-	12
	Salmonid (trout-sized)	-	266	74	-	22	-	71	-	433
Artiodactyla	*Odocoileus sp.*	1	47	10	16	30	1	9	6	120
	Ovis canadensis	-	2	1	-	-	-	-	-	3
	Cervidae	-	8	1	-	1	-	-	-	10
	Artiodactyl	-	9	2	3	9	-	-	1	24
Mammalia	Large	3	211	195	98	261	5	24	11	808
	Medium/large	50	1,009	726	191	649	35	151	124	2,935
	Medium	8	111	24	-	34	6	20	7	210
	Small	-	3	6	-	1	-	-	-	10
	Mammal	-	44	679	274	-	-	11	-	1,008
Carnivora	*Canis familiaris*	1	10	2	5	4	-	5	1	28
	Canis latrans	-	4	-	-	-	-	-	-	4
	Martes pennanti	-	-	-	-	1	-	-	-	1
	Mustilis sp.	-	2	-	-	-	-	-	-	2
	Carnivore	-	-	1	-	1	-	-	-	2
Rodentia	*Castor canadensis*	-	-	-	-	4	-	3	-	7
	Neotoma cinerea	-	4	-	-	-	-	-	-	4
	Arvicolinae	4	1	-	-	-	-	-	-	5
	Rodent	-	2	-	-	-	-	-	-	2
Lagamorpha	*Lepus sp.*	-	5	-	-	-	-	-	-	5
Aves	Grouse-sized	-	5	-	-	-	-	-	-	5
	Flicker-sized	-	1	-	-	-	-	-	-	1
	Aves	-	10	1	-	-	-	-	-	11
Bivalvia	Freshwater shellfish	1	-	-	-	-	-	-	-	1

Indeterminate	Indeterminate	13	6	1182	1	6	-	2	1	1,211
	Total	102	2,454	3,805	605	1,268	51	359	204	8,848

Table 5.3. Stratum I Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp*.	12	2	7	-	-	-	-	-	21
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-
	Salmonid (trout-sized)	-	-	-	-	-	-	-	-	-
Artiodactyla	*Odocoileus sp.*	-	-	1	-	-	-	-	-	1
	Ovis canadensis	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	-	-	-	-	-	-	-
	Artiodactyl	-	-	-	-	-	-	-	-	-
Mammalia	Large	1	-	1	-	-	1	-	-	3
	Medium/large	1	3	37	4	3	1	-	1	50
	Medium	-	-	8	-	-	-	-	-	8
	Small	-	-	-	-	-	-	-	-	-
	Mammal	-	-	-	-	-	-	-	-	-
Carnivora	*Canis sp.*	-	-	-	-	1	-	-	-	1
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	1	-	3	-	-	-	-	-	4
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-
	Aves	-	-	-	-	-	-	-	-	-
Bivalvia	Freshwater shellfish	1	-	-	-	-	-	-	-	1

Indeterminate	Indeterminate	8	1	4	-	-	-	-	-	13
	Total	24	6	61	4	4	2	-	1	102

Four medium/large mammal specimens are present in Block D, including 1 diaphysis fragment and 3 unidentifiable fragments.

Four specimens are present in Block E, 3 medium/large mammals and 1 *Canis sp*. The medium/large mammal specimens include 3 unidentifiable fragments. One complete *Canis sp.* phalanx is present.

Two specimens occur within Block F, 1 large mammal and 1 medium /large mammal. Both specimens are diaphysis fragments.

Only 1 specimen was recovered from Block H, a medium/large mammal fragment.

Stratum V

Stratum V contains 2,363 specimens from Blocks A-H. A summary of this data is available in Table 5.4.

Block A contains 244 specimens, including 40 Salmoninae, 23 Artiodactyla, 175 Mammalia, 1 *Canis sp.*, 1 Arvicolinae, 2 *Lepus sp.*, and 2 indeterminate specimens. Vertebral elements dominate the *Oncorhynchus sp.* taxon with 9 thoracic vertebrae, 4 precaudal vertebrae, 9 caudal vertebrae, and 11 vertebral fragments. Salmonid specimens also include vertebral elements with 2 thoracic vertebrae and 5 vertebral fragments. A variety of *Odocoileus sp.* elements from limb and axial anatomical regions. Limb elements are represented by 7 first phalanges, 1 third phalange, 1 astragulus, 1 lunar, 2 metapodials, 1 metatarsal, and 1 radius, Axial elements include 2 iliums, 1 innominate fragment, 2 scapula, and 3 vertebral fragments. One metapodial diaphysis fragment of artiodactyl is present. Large mammal elements consist of 1 humerus epiphysis, 1 epiphysis fragment, 21 diaphysis fragments, and 9 fragments. Medium/large mammal specimens include 6 cancellous fragments, 5 cranial fragments, 37 diaphysis fragments, and 89 unidentifiable fragments. One diaphysis fragment 3 enamel plates, and 1 unidentifiable fragment represent the medium mammal taxon. One *Canis sp.* distal ulna fragment is present. Only a single Arvicolinae specimen is present, a reentrant tooth fragment. Two femur fragments of *Lepus sp.* were recovered. Two indeterminate specimens, a diaphysis fragment and an unidentifiable fragment, are present.

A total of 237 specimens are present in Block B: 42 Salmoninae, 6 Artiodactyla, 181 Mammalia, 2 *Canis sp.*, 2 rodents, 3 Aves, and 1 indeterminate specimen. *Oncorhynchus sp.* elements include 2 cranial fragments, 3 caudal vertebrae, and 11 vertebral fragments. Two cf. *Oncorhynchus tshawytscha* elements are present, a caudal vertebra and vertebral fragment. The Salmonid taxon is also dominated by axial elements with 1 caudal vertebra and 23 vertebral fragments. Ten large mammal specimens are present, 1 cancellous fragment, 5 diaphysis fragments, 1 epiphysis fragment, and 3 unidentifiable fragments. Medium/large mammal elements include 8 cancellous fragments, 1 cranial fragment, 27 diaphysis fragments, and 125 unidentifiable fragments. Eight medium mammal elements are present with 2 diaphysis fragments, 1 rib, and 5 unidentifiable fragments. Lower limb elements represent *Odocoileus sp*., including 1 first phalanx, 1 second phalanx, 1 lunar, 1 tibia, and 1 ulna. Only one Cervidae element is present, and antler fragment. Six artiodactyl specimens, 1 diaphysis fragment and 5 selenodont tooth fragments, were collected. *Canis sp.* elements include a phalanx and an enamel fragment. Two rodent elements are present, a cranium and sacrum fragments. The

Table 5.4. Stratum V Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp.*	33	16	261	367	-	10	-	1	688
	cf. *Oncorhynchus tshawytscha*	-	2	4	-	-	-	-	-	6
	Salmonid (trout-sized)	7	24	129	104	-	1	-	-	265
Artiodactyla	*Odocoileus sp.*	22	5	9	11	-	-	-	-	47
	Ovis canadensis	-	-	-	2	-	-	-	-	2
	Cervidae	-	1	7	-	-	-	-	-	8
	Artiodactyl	1	-	6	2	-	-	-	-	9
Mammalia	Large	33	10	79	76	-	2	3	4	207
	Medium/large	137	161	354	283	11	33	17	5	1,001
	Medium	5	8	9	43	-	6	-	4	75
	Small	-	-	-	2	-	-	1	-	3
	Mammal	-	-	1	1	-	-	-	-	2
Carnivora	*Canis sp.*	1	2	1	6	-	-	-	-	10
	Canis latrans	-	-	1	3	-	-	-	-	4
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	2	-	-	-	-	-	2
	Carnivore	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	4	-	-	-	-	-	4
	Arvicolinae	1	-	-	-	-	-	-	-	1
	Rodent	-	2	-	-	-	-	-	-	2
Lagamorpha	*Lepus sp.*	2	-	3	-	-	-	-	-	5
Aves	Grouse-sized	-	-	-	5	-	-	-	-	5
	Flicker-sized	-	-	1	-	-	-	-	-	1
	Aves	-	5	-	5	-	-	-	-	10
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-

Indeterminate	Indeterminate	2	1	-	2	-	1	-	-	6
	Total	244	237	871	912	11	53	21	14	2,363

Aves taxon is represented by 2 humerus fragments, 2 diaphysis fragments, and 1 mandible. One indeterminate fragment is present.

Block C has 871 specimens, including 394 Salmoninae, 22 Artiodactyla, 443 Mammalia, 4 Carnivora, 4 *Neotoma cinerea*, 3 *Lepus sp.*, and 1 flicker-sized bird. The *Oncorhynchus sp.* assemblage is dominated by axial elements with 22 thoracic vertebrae, 7 precaudal vertebrae, 36 caudal vertebrae, 176 vertebral elements, 9 ribs, and 9 rib/rays, though 1 cranial fragment and 1 hypural are also present. Four cf. *Oncorhynchus tshawytscha* vertebral fragments were recovered. Salmonid elements include 12 thoracic vertebrae, 4 caudal vertebrae, and 113 vertebral fragments. *Odocoileus sp.* elements are primarily from the limb regions, with 1 fourth/central tarsal, 1 astragulus, 3 metapodials, 1 metatarsal, 1 tibia, and 1 trapezoid-magnum. A mandible fragment was also collected. Seven antler fragments corresponding to Cervidae are present. Six artiodactyl specimens are present, with 1 diaphysis fragment and 5 selenodont tooth fragments. Large mammals are represented by 9 cancellous fragments, 1 carpal/tarsal, 6 cranial fragments, 44 diaphysis fragments, 1 innominate, 1 scapula, 2 vertebral fragments, and 15 unidentifiable fragments. The medium/large mammal taxon contains 15 cancellous fragments, 7 cranial fragments, 87 diaphysis fragments, 1 epiphysis fragment, 1 pubis, and 243 unidentifiable fragments. Medium mammal specimens include 6 diaphysis fragments and 3 vertebral fragments. One identifiable mammal fragment is present. The Carnivora order contains 1 mandibular third incisor of cf. *Canis latrans*, 1 vertebra fragment of cf. *Canis sp*., and 2 mandible fragments of *Mustilis sp.* Four *Neotoma cinerea* specimens are present, 2 fragments of a first mandibular molar and 2 fragments of a 2nd mandibular molar. *Lepus sp.* is represented by three elements, a calcaneus, first phalanx, and femur fragment. One flicker-sized bird tibiotarsus is present.

Block D has a total of 912 specimens: 471 Salmoninae, 15 Artiodactyla, 405 Mammalia, 9 *Canis sp.*, 10 Aves, and 2 indeterminate specimens. *Oncorhynchus sp.* elements include 40 thoracic vertebrae, 2 precaudal vertebrae, 20 caudal vertebrae, and 303 vertebral fragments. Although dominated by axial elements, 1 cranial fragment and 1 urohyal are also present. Salmonid specimens include 15 cancellous fragments, 11 thoracic vertebrae, 1 precaudal vertebra, and 77 vertebral fragments. Eleven *Odocoileus sp.* elements are present: 1 occipital, 1 pubis, 2 ilium fragments, 1 tibia, 3 metapodial fragments, 1 metatarsal, 1 trapezoid-magnum, and 1 phalanx. *Ovis canadensis* is represented by two elements, a second phalanx and a distal tibia fragment. Artiodactyl specimens are a selenodont tooth fragment and a metapodial fragment. The large mammal taxon contains 4 cancellous fragments, 45 diaphysis fragments, 2 epiphysis fragments, 1 scapula, and 24 unidentifiable fragments. Medium/large mammal specimens are 35 cancellous fragments, 43 diaphysis fragments, and 175 unidentifiable fragments. Medium mammal specimens include 1 cancellous fragment, 24 diaphysis fragments, 1 epiphysis fragment, 1 femur fragment, and 16 unidentifiable fragments. Only 1 general mammal specimen was recovered, an unidentifiable fragment. Two small mammal specimens occur, 1 vertebral fragment and 1 unidentifiable fragment. The *Canis sp.* taxon is represented by 1 second phalanx, 1 phalanx, 1 fibula, 1 cervical vertebra, 2 vertebral fragments, and 3 canine fragments. Five grouse-sized bird specimens are present, 1 humerus, 1 tibiotarsus, 1 coracoid, and 2 scapula fragments. More generally identified Aves specimens include 1 tibiotarsus fragment, 3 diaphysis fragment, and 1 epiphysis fragment. Two indeterminate diaphysis fragments are present.

Block E contains 11 specimens, all of which are medium/large mammals. Specimens include 1 cancellous fragment, 4 diaphysis fragments, and 6 unidentifiable fragments.

Fifty-three specimens are present in Block F: 11 Salmoninae, 41 Mammalia, and 1 indeterminate specimen. The ten *Oncorhynchus sp.* and 1 Salmonid specimens are all vertebral fragments. Two large mammal specimens, a cancellous fragment and a diaphysis fragment, were recovered. Medium/large mammal specimens include 3 cancellous fragments, 14 diaphysis fragments, and 16 unidentifiable fragments. The 6 medium mammal specimens consist of 2 cancellous fragments, 3 diaphysis fragments, and 1 unidentifiable fragment. One indeterminate fragment is present.

A total of 21 specimens were collected from Block G, all of which are more generally identified mammals. Three large mammal diaphysis fragments are present. Medium/large mammal specimens consist of 2 cranial fragments, 7 cancellous fragments, and 8 diaphysis fragments. One small mammal diaphysis fragment is present.

Block H contains 14 specimens. Four large mammal diaphysis fragments are present. Medium/large mammal specimens include 3 diaphysis fragments and 1 unidentifiable fragment. Four medium mammal diaphysis fragments were recovered.

Stratum II

A total of 1,014 specimens were collected from Stratum II across Blocks A-D and G-H. A table summarizing the distributions of taxa across the blocks is available below (Table 5.5).

Block A contains 76 specimens with 19 Salmoninae, 1 *Odocoileus sp.*, and 58 Mammalia. *Oncorhynchus sp.* elements include 1 thoracic vertebra and 10 vertebral fragments. Eight Salmonid vertebral fragments were collected. One third phalanx represents *Odocoileus sp.* There are 11 large mammal diaphysis fragments. Medium/large mammal specimens include 1 diaphysis fragment, 1 epiphysis fragment, and 45 unidentifiable mammal fragments.

Block B has 391 specimens, including 83 Salmoninae, 2 Artiodactyla, 294 Mammalia, 1 *Canis sp.*, and 11 indeterminate specimens. *Oncorhynchus sp.* specimens consist of 4 thoracic vertebrae, 3 caudal vertebrae, and 39 vertebral fragments. Five cf. *Oncorhynchus tshawytscha* caudal vertebrae are present. Salmonid specimens include 4 thoracic vertebrae and 28 vertebral fragments. One second phalanx of *Odocoileus sp.* is present. A selenodont tooth fragment represents the more general artiodactyl taxon. Large mammal specimens include 19 cancellous fragments, 67 diaphysis fragments, and 6 unidentifiable fragments. There are 182 medium/large mammals, with 55 cancellous fragments, 14 diaphysis fragments, 1 epiphysis fragment, and 112 unidentifiable fragments. Seven diaphysis fragments and 10 unidentifiable fragments comprise the medium mammal taxon. Three small mammal diaphysis fragments were recovered. Eleven indeterminate fragments are present.

A total of 101 specimens were collected from Block C: 14 Salmoninae, 3 Artiodactyla, 82 Mammalia, 1 carnivore, and 1 Aves. Eight vertebral fragments represent in *Oncorhynchus sp.* Six vertebral fragments represent the Salmonid taxon. Two *Odocoileus sp.* elements, a cuneiform and a metapodial fragment, are present. One artiodactyl calcaneus was recovered. Large mammal specimens include 1 cancellous

Table 5.5. Stratum II Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp.*	11	46	8	169	-	-	1	4	239
	cf. *Oncorhynchus tshawytscha*	-	5	-	-	-	-	-	-	5
	Salmonid (trout-sized)	8	32	6	17	-	-	-	-	71
Artiodactyla	*Odocoileus sp.*	1	1	2	5	-	-	-	1	10
	Ovis canadensis	-	-	-	1	-	-	-	-	1
	Cervidae	-	-	-	-	-	-	-	-	-
	Artiodactyl	-	1	1	-	-	-	-	-	2
Mammalia	Large	11	92	28	52	-	-	-	2	185
	Medium/large	47	182	48	133	-	-	2	11	423
	Medium	-	17	4	2	-	-	-	-	23
	Small	-	3	-	3	-	-	-	-	6
	Mammal	-	-	2	-	-	-	-	-	2
Carnivora	*Canis sp.*	-	1	-	1	-	-	-	-	2
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	1	-	-	-	-	-	1
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-
	Aves	-	-	1	-	-	-	-	-	1
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-

Indeterminate	Indeterminate	-	11		32	-	-	-	-	43
	Total	78	391	101	415	-	-	3	18	1,014

fragment, 15 diaphysis fragments, 1 rib fragment, and 11 unidentifiable fragments. Medium/large mammal specimens consist of 14 cancellous fragments, 9 diaphysis fragments, and 25 unidentifiable fragments. Four medium mammal specimens, 3 diaphysis fragments and 1 unidentifiable fragment, were collected. Two mammal fragments are present, an enamel plate and an unidentifiable fragment. One carnivore premolar is present. One Aves diaphysis fragment was collected.

Block D contains a total of 415 specimens: 186 Salmoninae, 6 Artiodactyla, 185 Mammalia, 1 *Canis sp.*, and 32 indeterminate specimens. *Oncorhynchus sp.* specimens include 5 thoracic vertebrae, 1 precaudal vertebra, 5 caudal vertebrae, 156 vertebral fragments, 1 rib, and 1 rib/ray. Five thoracic vertebrae and 12 vertebral fragments comprise the Salmonid taxon. Five *Odocoileus p.* elements are present, 1 second phalanx, 1 metacarpal, 1 metapodial, 1 tibia, and 1 ulna. A second phalanx of *Ovis canadensis* was recovered. Large mammal specimens include 1 cranial fragment, 36 cancellous fragments, 11 diaphysis fragments, and 4 unidentifiable fragments. Medium/large mammal specimens consist of 1 cranial fragment, 11 cancellous fragments, 20 diaphysis fragments, and 101 unidentifiable fragments. Two medium mammal diaphysis fragments were collected. Three small mammal specimens were recovered, 1 diaphysis fragment and 2 unidentifiable fragments. One vertebral fragment of *Canis sp.* is present. The 32 indeterminate specimens are unidentifiable fragments.

Block G contains 3 specimens, 1 *Oncorhynchus sp.* thoracic vertebra and 2 medium/large mammal unidentifiable fragments.

Eighteen specimens were collected from Block H: 4 *Oncorhynchus sp.*, 1 *Odocoileus sp.*, and 13 Mammalia. The *Oncorhynchus sp.* specimens include 1 thoracic vertebra, 1 precaudal vertebra, 1 caudal vertebra, and 1 vertebral fragment. One tibia of an *Odocoileus sp.* is present. Two large mammal specimens are present, a diaphysis fragment and an unidentifiable fragment. Medium/large mammal specimens include 3 scapula fragments and 8 unidentifiable fragments.

Stratum XIV

The midden, designated stratum XIV, has 199 specimens across Blocks A, B, and C. A summary of the taxa present is available in Table 5.6.

A total of 134 specimens, including 1 *Oncorhynchus sp.*, 9 Artiodactyla, and 124 Mammalia, were recovered from Block A. The *Oncorhynchus sp.* specimen is an unidentifiable fragment. Eight *Odocoileus sp.* elements are present, including 1 mandibular third molar, 2 cervical vertebra fragments, 1 thoracic vertebra, 1 radius, 1 first phalanx, and 1 unciform. An artiodactyl ulna is also present. Large mammal specimens include 18 cancellous fragments, 13 diaphysis fragments, and 14 unidentifiable fragments. Medium/large mammal specimens consist of 27 cancellous fragments, 3 diaphysis fragments, 1 epiphysis fragment, and 48 unidentifiable fragments.

Block B contains 18 specimens with 1 *Oncorhynchus sp.*, 16 large mammals, and 1 medium/large mammal. One *Oncorhynchus sp.* vertebral fragment is present. The large mammal specimens include 15 cancellous fragments, and 1 diaphysis fragment. One medium/large mammal unidentifiable fragment is present.

Block C has 47 specimens: 10 Artiodactyla, 31 Mammalia, 5 *Canis sp*., and 1 indeterminate specimen. Six *Odocoileus sp.* elements are present, including 1 cervical

Table 5.6. Stratum XIV Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp*.	1	1	-	-	-	-	-	-	2
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-
	Salmonid (trout-sized)	-	-		-	-	-	-	-	-
Artiodactyla	*Odocoileus sp.*	8	-	8	-	-	-	-	-	16
	Ovis canadensis	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	-	-	-	-	-	-	-
	Artiodactyl	1	-	2	-	-	-	-	-	3
Mammalia	Large	45	16	18	-	-	-	-	-	79
	Medium/large	79	1	13	-	-	-	-	-	93
	Medium	-	-	-	-	-	-	-	-	-
	Small	-	-	-	-	-	-	-	-	-
	Mammal	-	-	-	-	-	-	-	-	-
Carnivora	*Canis sp.*	-	-	5	-	-	-	-	-	5
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-
	Aves	-	-	-	-	-	-	-	-	-
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-

Indeterminate	Indeterminate	-	-	1	-	-	-	-	-	1
	Total	134	18	47	-	-	-	-	-	199

vertebra, 3 metatarsal fragments, 3 fourth/central tarsals, and 1 lunar. Artiodactyl specimens consist of a first phalanx fragments and a lumbar vertebra fragment. Large mammal specimens include 15 diaphysis fragments and 3 unidentifiable fragments. The medium/large mammal specimens consist of 5 diaphysis fragments and 7 unidentifiable fragments. One identifiable fragment of a medium mammal is present. Five *Canis sp.* elements are present, including a second carpal, third carpal, fourth carpal, and an accessory.

Stratum XVI

The stratum XVI, or the bench, contains 1,268 specimens across Blocks A-H. Table 5.7 provides a summary of the taxa present.

Block A has 90 specimens, with 13 Salmoninae, 2 *Odocoileus sp.*, and 75 Mammalia. Twelve *Oncorhynchus sp.* specimens are present, 1 precaudal vertebra and 11 vertebral fragments. One Salmonid vertebral fragment was also recovered. Two *Odocoileus sp.* elements, a first phalanx and a third phalanx, are present. Large mammal specimens include 3 cancellous fragments, 7 diaphysis fragments, and 3 unidentifiable fragments. Medium/large mammal specimens consist of 12 cancellous fragments, 12 diaphysis fragments, and 37 unidentifiable fragments. One medium mammal diaphysis fragment was recovered.

A total of 165 specimens were collected from Block B: 3 *Oncorhynchus sp.*, 11 Artiodactyla, and 151 Mammalia. Three vertebral fragments represent *Oncorhynchus sp.* Ten *Odocoileus sp.* elements are present, 3 ulna fragments, 2 metapodial epiphysis fragments, 1 metatarsal, 2 first phalanges, and 2 rib fragments. An artiodactyl selenodont tooth fragment was also recovered. Large mammal specimens include 2 cancellous fragments, 16 diaphysis fragments, 2 mandible/maxilla fragments, and 10 unidentifiable fragments. The medium/large mammal taxon contains 110 specimens: 3 cancellous fragments, 18 diaphysis fragments, and 89 unidentifiable fragments. Medium mammal specimens include 1 cancellous fragment, 9 diaphysis fragments, and 1 unidentifiable fragment.

Block C contains 296 specimens, including 82 Salmoninae, 9 Artiodactyla, 202 Mammalia, 2 Carnivora, and 1 *Castor canadensis*. Nine thoracic vertebrae, 2 precaudal vertebrae, 14 caudal vertebrae, and 49 vertebral fragments represent *Oncorhynchus sp.* Salmonid specimens include 4 thoracic vertebrae and 4 vertebral fragments. Seven *Odocoileus sp.* specimens are present, including 4 selenodont tooth fragments, 1 ulna, 1 trapezoid-magnum, and 1 first phalanx. One Cervidae selenodont tooth fragment was collected. One artiodactyl ulna is present. Large mammal specimens include 10 cancellous fragments, 1 scapula fragment, 33 diaphysis fragments, and 26 unidentifiable fragments. Thirteen cancellous fragments, 28 diaphysis fragments, and 81 unidentifiable fragments are present for the medium/large mammal taxon. Medium mammal elements consist of 3 diaphysis fragments and 6 unidentifiable fragments. Two Carnivora specimens are present, a *Canis sp.* rib and a general carnivore tooth fragment. One rib of cf. *Castor canadensis* was recovered.

Block D has 301 specimens with 114 Salmoninae, 6 Artiodactyla, 176 Mammalia, 1 *Canis sp.*, and 4 indeterminate fragments. *Oncorhynchus sp.* elements include 7 thoracic vertebrae, 5 caudal vertebrae, and 91 vertebral fragments. Eleven Salmonid

Table 5.7. Stratum XVI by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp.*	12	3	74	103	7	19	8	19	245
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-
	Salmonid (trout-sized)	1	-	8	11	1		-	1	22
Artiodactyla	*Odocoileus sp.*	2	10	7	4	1	3	1	2	30
	Ovis canadensis	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	1	-	-	-	-	-	1
	Artiodactyl	-	1	1	2	4	1	-	-	9
Mammalia	Large	13	30	70	35	60	23	7	23	261
	Medium/large	61	110	122	129	-	81	22	38	563
	Medium	1	11	9	12	86	1	-	-	120
	Small	-	-	1	-	-	-	-	-	1
	Mammal	-	-	-	-	-	-	-	-	-
Carnivora	*Canis sp.*	-	-	1	1	2	-	-	-	4
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	1	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	1
	Carnivore	-	-	1	-	-	-	-	-	1
Rodentia	*Castor canadensis*	-	-	1	-	3	-	-	-	4
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-
	Aves	-	-	-	-	-	-	-	-	-
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-

Indeterminate	Indeterminate	-	-	-	4	-	-	1	1	6
	Total	90	165	296	301	164	129	39	84	1,268

specimens are present, 2 thoracic vertebrae and 9 vertebral fragments. *Odocoileus sp.* elements include 1 lumbar vertebra, 1 radius, 1 first phalanx, and 1 calcaneus. Two artiodactyl tooth fragments are present. Large mammal specimens include 3 cranial fragments, 3 cancellous fragments, 17 diaphysis fragments, 2 epiphysis fragments, and 10 unidentifiable fragments. Medium/large mammal specimens include 3 cancellous fragments, 14 diaphysis fragments, 1 epiphysis fragment, and 111 unidentifiable fragments. Twelve medium mammal diaphysis fragments are present. One vertebral fragment of cf. *Canis sp.* is present. Four indeterminate specimens, 1 diaphysis fragment and 3 unidentifiable fragments, are present.

A total of 164 specimens were collected from Block E: 8 Salmoninae, 5 Artiodactyla, 146 Mammalia, 2 *Canis sp.*, and 3 *Castor canadensis*. Seven *Oncorhynchus sp.* specimens are present, 1 caudal vertebra and 6 vertebral fragments. One salmonid thoracic vertebra is present. One *Odocoileus sp.* metatarsal was recovered. Artiodactyl specimens consist of 1 selenodont tooth fragment, 1 rib fragment, and 2 metapodial diaphysis fragments. Large mammal specimens include 3 cranial fragments, 6 tooth fragments, 4 cancellous fragments, 8 diaphysis fragments, and 41 unidentifiable fragments. Medium/large mammal specimens include 2 cranial fragments, 8 cancellous fragments, 37 diaphysis fragments, 1 epiphysis fragments, and 38 unidentifiable fragments. Two *Canis sp*. first phalanx fragments are present. Three *Castor canadensis* lophodont tooth fragments were collected.

Block F contains 129 specimens with 19 *Oncorhynchus sp.*, 4 Artiodactyla, 105 Mammalia, and 1 *Martes pennanti*. *Oncorhynchus sp.* specimens include 4 thoracic vertebrae, 2 caudal vertebrae, 11 vertebral fragments, 1 hypural, and 1 rib. Three *Odocoileus sp.* elements are present, 2 metapodial diaphysis fragments and 1 ulna. One artiodactyl tooth fragment is present. Two cranial fragments, 1 cancellous fragment, 12 diaphysis fragments, and 8 unidentifiable fragments are present under large mammals. Medium/large mammal specimens include 8 cancellous fragments, 20 diaphysis fragments, and 53 unidentifiable fragments. One medium diaphysis fragment is present. A mandibular second molar represents *Martes pennanti*.

Block G has 39 specimens, 8 *Oncorhynchus sp.*, 1 *Odocoileus sp.*, 29 Mammalia, and 1 indeterminate specimen. Eight *Oncorhynchus sp.* specimens are present, 2 thoracic vertebrae, 3 caudal vertebrae, and 3 vertebral fragments. One *Odocoileus sp.* scapula fragment is present. Large mammal specimens include 3 cancellous fragments, 3 diaphysis fragments, and 1 unidentifiable fragment. Medium/large mammal specimens include 6 cancellous fragment, 4 diaphysis fragments, and 12 unidentifiable fragments. One indeterminate fragment was recovered.

A total of 84 specimens are from Block H: 20 Salmoninae, 2 *Odocoileus sp.*, 61 Mammalia, and 1 indeterminate specimen. The *Oncorhynchus sp.* specimens include 6 thoracic vertebrae, 2 caudal vertebrae, 10 vertebral fragments, and 1 hypural. One vertebral fragment is present under the Salmonid taxon. Two *Odocoileus sp.* specimens were recovered, 1 first phalanx and 1 ilium fragment. Large mammal specimens include 1 cancellous fragment, 1 costal cartilage fragment, 16 diaphysis fragments, and 5 unidentifiable fragments. Medium/large mammal specimens consist of 14 cancellous fragments, 3 diaphysis fragments, and 21 indeterminate fragments. One indeterminate diaphysis fragment is present.

Stratum Va

Stratum Va contains 51 specimens from Blocks B, C, D, F, and H. Table 5.8 summarizes the taxa present. Block B contains 12 specimens, 2 large mammals and 12 medium/large mammals. Large mammal specimens include 1 diaphysis fragment and 1 unidentifiable fragment. All 10 medium/large mammal specimens are unidentifiable fragments. Block C contains 2 *Oncorhynchus sp.* thoracic vertebrae, 4 medium/large mammal unidentifiable fragments, and 5 medium mammal diaphysis fragments. Block D contains 3 specimens: 1 large mammal scapula and 2 medium/large mammal unidentifiable fragments. Block F has 13 medium/large mammal unidentifiable fragments. Block H contains 12 specimens: 2 *Oncorhynchus sp.* vertebral fragments, 1 *Odocoileus sp.* rib, 1 large mammal diaphysis fragment and unidentifiable fragment, 4 medium/large mammal unidentifiable fragments, 1 medium/large mammal diaphysis, and 1 medium mammal vertebral fragment.

Stratum IIa

A total of 338 specimens were recovered from stratum IIa across Blocks B, C, D, and H. A summary of the taxa present is available in Table 5.9

Only 1 specimen was collected from Block B; a large mammal unidentifiable fragment.

Block C contains 306 specimens: 106 Salmoninae, 9 *Odocoileus sp.*, 181 Mammalia, 5 *Canis sp.*, 3 *Castor canadensis*, and 2 indeterminate specimens. The *Oncorhynchus sp.* specimens include 5 thoracic vertebrae, 1 precaudal vertebra, 5 caudal vertebrae, and 35 vertebral fragments. One caudal vertebra of cf. *Oncorhynchus tshawytscha*. Salmonid specimens consist of 20 thoracic vertebra, 3 precaudal vertebra, 2 caudal vertebrae, and 34 vertebral fragments. One cf. *Oncorhynchus sp.* caudal vertebra is present. *Odocoileus sp.* elements include 1 ulna, 3 radius fragments, 1 tibia, 1 metapodial diaphysis, 1 metapodial epiphysis, 1 trapezoid-magnum, and 1 first phalanx. Large mammal specimens include 2 cranial fragment, 8 diaphysis fragments, 1 vertebra fragment, and 7 unidentifiable fragments. Medium/large mammal specimens consist of 8 cancellous fragments, 30 diaphysis fragments, 1 epiphysis fragment, 1 vertebral fragment, and 105 unidentifiable fragments. Two cranial fragments, 9 diaphysis fragments, and 7 unidentifiable fragments comprise the medium mammal specimens. *Canis sp.* elements include 3 mandible fragments, 1 mandibular canine, and 1 radius fragment. Three *Castor canadensis* specimens are present, 1 mandible fragment and two mandibular incisors. Two indeterminate specimens are present, an enamel fragment and an epiphysis fragment.

Block D contains 20 specimens: 13 Salmoninae and 7 Mammalia. One *Oncorhynchus sp.* caudal vertebra is present. Twelve Salmonid vertebral fragments were recovered. Large mammal specimens include 3 cancellous fragments and 2 unidentifiable fragments. One diaphysis fragment and unidentifiable fragment comprise the medium/large mammal specimens.

Block H contains 11 specimens, 9 *Oncorhynchus sp.* and 2 medium mammals. *Oncorhynchus sp.* specimens include 1 cranial fragment and 8 vertebral fragments. Two medium mammal unidentifiable fragments were collected.

Table 5.8 Stratum Va Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp.*	-	-	2	-	-	-	-	2	4
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-
	Salmonid (trout-sized)	-	-	-	-	-	-	-	-	-
Artiodactyla	*Odocoileus sp.*	-	-	-	-	-	-	-	1	1
	Ovis canadensis	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	-	-	-	-	-	-	-
	Artiodactyl	-	-	-	-	-	-	-	-	-
Mammalia	Large	-	2	-	1	-	-	-	2	5
	Medium/large	-	10	4	2	-	13	-	6	35
	Medium	-	-	5	-	-	-	-	1	6
	Small	-	-	-	-	-	-	-	-	-
	Mammal	-	-	-	-	-	-	-	-	-
Carnivora	*Canis familiaris*	-	-	-	-	-	-	-	-	-
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-
	Aves	-	-	-	-	-	-	-	-	-
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-

Indeterminate	Indeterminate	-	-	-	-	-	-	-	-	-
	Total	-	12	11	3	-	13	-	12	51

Table 5.9. Stratum IIa Taxon by Block

	Taxon	Block								Total
		A	B	C	D	E	F	G	H	
Salmoninae	*Oncorhynchus sp.*	-	-	46	1	-	-	-	9	56
	cf. *Oncorhynchus tshawytscha*	-	-	1	-	-	-	-	-	1
	Salmonid (trout-sized)	-	-	59	12	-	-	-	-	71
Artiodactyla	*Odocoileus sp.*	-	-	9	-	-	-	-	-	9
	Ovis canadensis	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	-	-	-	-	-	-	-
	Artiodactyl	-	-	-	-	-	-	-	-	-
Mammalia	Large	-	1	18	5	-	-	-	-	24
	Medium/large	-	-	145	2	-	-	-	-	147
	Medium	-	-	18	-	-	-	-	2	20
	Small	-	-	-	-	-	-	-	-	-
	Mammal	-	-	-	-	-	-	-	-	-
Carnivora	*Canis sp.*	-	-	5	-	-	-	-	-	5
	Canis latrans	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	3	-	-	-	-	-	3
	Neotoma cinerea	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-

	Aves	-	-	-	-	-	-	-	-	-
Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-
Indeterminate	Indeterminate	-	-	2	-	-	-	-	-	2
	Total	-	1	306	20	-	-	-	11	338

Unknown Strata

A total of 204 specimens do not have stratigraphic designations due to unclear strata boundaries or shovel test pits (STP) (5.10). One specimen was recovered from Block A, a large mammal diaphysis. Block B contains 2 medium/large mammal unidentifiable fragments. Block C contains 2 *Odocoileus sp.* specimens, 1 astragulus and 1 humerus fragment, and 1 *Oncorhynchus sp.* caudal vertebra. Only 1 specimen was recovered from Block D, a vertebral fragment. Five specimens were recovered from Block F: 2 large mammal diaphysis fragments, 2 medium/large mammal unidentifiable fragments, and 1 medium mammal unidentifiable fragment. Block H contains 3 medium/large mammal specimens, including 1 cranial fragment and 2 unidentifiable fragments.

STP 2 contains 4 specimens: 2 medium/large mammal diaphysis fragments, 1 medium/large mammal unidentifiable fragment, and 1 medium mammal unidentifiable fragment.

Eight specimens were collected from STP 3, all of which are identified as medium/large mammal. They include 1 diaphysis fragment and 7 unidentifiable fragments.

Six specimens were collected from STP 4, including 1 large mammal diaphysis fragment and 5 medium/large mammal unidentifiable fragments.

STP 6 has 14 specimens with 6 *Oncorhynchus sp.*, 1 *Odocoileus sp.*, and 7 Mammalia. One thoracic vertebra, 1 precaudal vertebra, 1 caudal vertebra, and 3 vertebral fragments represent *Oncorhynchus sp.* One second phalanx of *Odocoileus sp.* was recovered. One large mammal diaphysis is present. Medium/large mammal specimens include 2 cancellous fragments, 2 diaphysis fragments, and 2 unidentifiable fragments are present.

A total of 72 specimens are associated with STP 7, including 6 *Oncorhynchus sp.*, 2 large mammals, 63 medium/large mammals, and 1 medium mammal. The *Oncorhynchus sp.* elements consist of 2 thoracic vertebrae and 4 vertebral fragments. One diaphysis fragment and 1 unidentifiable fragment are identified as large mammal. Medium/large mammal specimens include 22 cranial fragments, 6 cancellous fragments, 17 diaphysis fragments, and 18 unidentifiable fragments. One medium mammal specimen was recovered, a rib fragment.

Ten specimens were collected from STP 8; including 1 large mammal unidentifiable fragment, 5 medium/large mammal unidentifiable fragments, and 4 medium mammal unidentifiable fragments.

STP contains 7 specimens, including 6 cancellous fragments and 1 unidentifiable fragment.

STP 10 contains 40 specimens: 23 *Oncorhynchus sp.*, 2 *Odocoileus sp.*, 13 Mammalia, 1 *Canis sp.*, and 1 indeterminate specimen. *Oncorhynchus sp.* elements include 8 thoracic vertebrae, 1 caudal vertebra, 6 vertebral elements, 1 hypural, and 1 unidentifiable fragment. *Odocoileus sp*. specimens include 1 ilium and 1 pubis fragment. One large mammal diaphysis fragment was collected. Medium/large mammal specimens include 5 cancellous fragments and 7 diaphysis fragments. One cf. *Canis sp.* ulna is present. One indeterminate fragment is present.

Table 5.10. Unknown Strata Taxon by Testing Unit

	Taxon	Testing Unit															Total
		A	B	C	D	F	H	STP 2	STP 3	STP 4	STP 6	STP 7	STP 8	STP 9	STP 10	STP 11	
Salmoninae	*Oncorhynchus sp.*	-	-	1	1	-	-	-	-	-	6	6	-	-	23	16	53
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Salmonid (trout-sized)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Artiodactyla	*Odocoileus sp.*	-	-	3	-	-	-	-	-	-	1	-	-	-	2	-	6
	Ovis canadensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Cervidae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Artiodactyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Mammalia	Large	1	-	1	-	2	-	-	-	1	1	2	1	-	1	1	11
	Medium/large	-	2	-	-	2	3	3	8	5	6	63	5	7	12	8	124
	Medium	-	-	-	-	1	-	1	-	-	-	1	4	-	-	-	7
	Small	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mammal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carnivora	*Canis sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	Canis latrans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Martes pennanti	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Carnivore	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Arvicolinae	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rodent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Flicker-sized	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aves	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Bivalvia	Freshwater shellfish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeterminate	Indeterminate	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
	Total	1	2	5	1	5	3	4	8	6	14	72	10	7	40	26	204

STP 11 is associated with 26 specimens, including 16 *Oncorhynchus sp.*, 1 Artiodactyl, and 9 Mammalia. The *Oncorhynchus sp.* specimens include 5 thoracic vertebrae, 2 precaudal vertebrae, 3 caudal vertebrae, 5 vertebral fragments, and 1 ethmoid.

Summary

The majority of the field-collected fauna are high utility elements. The Salmoninae assemblage is dominated by axial elements, including thoracic vertebrae, precaudal vertebrae, caudal vertebrae, and vertebral fragments. Lower utility cranial, pelvic, or pectoral elements occur rarely. This suggests the selective transport of the high utility fillets. Identifiable Artiodactyla elements tend to be low utility lower limb elements, including metapodials, carpals, tarsals, and phalanges, while the corresponding upper limb elements are not as common. Low utility cranial elements and medium utility axial elements are less numerous. When viewing these trends in relation to the high amounts of large mammal and medium/large mammal diaphysis fragments and unidentifiable fragments, transport and processing patterns emerge. The elements present suggest the predominant transportation of high utility limbs and medium utility axial elements. Because the limbs are identified mainly with lower utility lower limb elements, it appears that the high utility upper limb elements experienced increased processing to extract bone marrow and grease. Such practices would have obscured the presence of these elements in the assemblage and increased the amount of generally identified mammalian specimens. The presence of *Canis sp.* elements may reflect that domestic dogs played an important role as a prestige or subsistence resource within HP 54. Other carnivores occur more rarely. Aves elements are high utility limbs and medium utility pectoral girdle elements. The lack of cranial or axial elements may indicate differential transportation or processing. Lower utility rodents, *Lepus sp.*, and small mammals occur rarely, suggesting they were not targeted prey within the diet breadth.

Heavy Fraction Fauna

The heavy fractions of soil flotations yielded a total of 3,309 faunal specimens across strata V, II, XIV, and IIa. Table 5.11 offers a summary of the taxa across these contexts.

Stratum V

A total of 91 faunal specimens were collected from Stratum V heavy fractions from Blocks A, B, C, and F. Thirteen specimens are associated with Block A: 12 mammal fragments and 1 Salmonid vertebra fragment. Eight medium/large mammal specimens, 3 diaphysis fragments and 5 unidentifiable fragments, are present. Block C contains 55 specimens, including 4 large mammals, 36 medium mammals, and 15 mammals. Four large mammal diaphysis fragments are present. Medium/large mammal specimens include 2 cancellous fragment, 1 diaphysis fragment, and 12 unidentifiable

Table 5.11. Heavy Fraction Fauna by Stratum

	Taxon	Strata				Total
		V	II	XIV	IIa	
Salmoninae	*Oncorhynchus sp.*	-	657	15	6	678
	cf. *Oncorhynchus tshawytscha*	-	-	-	-	-
	Salmonid (trout-sized)	1	3		-	4
Artiodactyla	*Odocoileus sp.*	-	-	-	-	-
	Ovis canadensis	-	-	-	-	-
	Cervidae	-	1	-	-	1
	Artiodactyl	-	-	-	-	-
Mammalia	Large	4	10	19	-	33
	Medium/large	8	303	98	4	413
	Medium	36	1	-	-	37
	Small	-	-	-	-	-
	Mammal	42	677	274	11	1,004
-	*Canis sp.*	-	-	-	-	-
	Canis latrans	-	-	-	-	-
	Martes pennanti	-	-	-	-	-
	Mustilis sp.	-	-	-	-	-
	Carnivore	-	-	-	-	-
Rodentia	*Castor canadensis*	-	-	-	-	-
	Neotoma cinerea	-	-	-	-	-
	Arvicolinae	-	-	-	-	-
	Rodent	-	-	-	-	-
Lagamorpha	*Lepus sp.*	-	-	-	-	-
Aves	Grouse-sized	-	-	-	-	-
	Flicker-sized	-	-	-	-	-
	Aves	-	-	-	-	-
Bivalvia	Freshwater shellfish	-	-	-	-	-
Indeterminate	Indeterminate	-	1,139	-	-	1,139

Total	91	2,791	406	21	3,309

fragments. Thirty-six mammal unidentifiable fragments were recovered. Block F contains 15 mammal unidentifiable fragments.

Stratum II

Stratum II heavy fractions contained 2,791 specimens from Blocks A, B, C, D, and. Block A has 130 specimens with 12 *Oncorhynchus sp.* vertebral fragments, 1 Cervidae selenodont tooth fragment, 1 large mammal diaphysis fragment, 10 medium/large mammal diaphysis fragments, 18 medium/large unidentifiable fragments, 82 mammal unidentifiable fragments, and 6 indeterminate fragments. Block B has 558 specimens, including 23 *Oncorhynchus sp.*, 508 Mammalia, and 7 indeterminate fragments. Eleven rib/rays and 32 vertebral fragments represent the *Oncorhynchus sp.* taxon. Three large mammal cancellous fragments and 1 enamel fragment were collected. Medium/large mammal specimens include 13 cancellous fragments, 7 diaphysis fragments, and 184 unidentifiable fragments. A total of 300 mammal unidentifiable fragments were recovered.

Block C has 188 specimens with 23 *Oncorhynchus sp.*, 163 Mammalia, and 2 indeterminate specimens. The *Oncorhynchus sp.* specimens include 5 rib/rays and 18 vertebral fragments. Three large mammal specimens were collected, 1 diaphysis fragment and 2 unidentifiable fragments. Medium/large mammal specimens consist of 6 cancellous fragments, 10 diaphysis fragments, and 32 unidentifiable fragments. Mammal specimens include 1 cancellous fragment and 111 unidentifiable specimens. Two indeterminate fragments were also recovered.

Block D contains 1,896 specimens: 590 Salmoninae, 194 Mammalia, and 1,121 indeterminate specimens. *Oncorhynchus sp.* specimens include 257 ribs/rays, 315 vertebral fragments, and 6 fragments. Three Salmonid thoracic vertebrae are present. Two large mammal specimens, 1 epiphysis fragment and 1 unidentifiable fragment, were collected.

Block H is associated with 19 specimens, 1 *Oncorhynchus sp.*, 1 medium/large mammal enamel fragment, 6 medium/large mammal unidentifiable fragments, 8 mammal unidentifiable fragments, and 3 indeterminate unidentifiable fragments.

Stratum XIV

A total of 406 specimens were collected from Stratum XIV across Blocks A, B, and C. Block A has 209 specimens, including 10 *Oncorhynchus sp.*, 3 large mammals, 41 medium/large mammals, and 155 medium mammals. The 10 *Oncorhynchus sp.* specimens are vertebral fragments. Three large mammal specimens are present, 1 diaphysis fragment, 1 epiphysis fragment, and 1 unidentifiable fragment. Medium/large mammal specimens include 37 cancellous fragments and 3 unidentifiable fragments. Mammal specimens consist of 155 unidentifiable fragments. Block B contains 142 specimens with 5 *Oncorhynchus sp.* vertebral fragments, 11 medium/large mammal cancellous fragments, 1 medium/large mammal diaphysis fragment, 1 medium/large mammal unidentifiable fragment, and 119 mammal unidentifiable fragments. A total of 55 specimens were collected from Block C heavy fractions, including 16 large mammal diaphysis fragments, 15 medium/large mammal diaphysis fragments, and 34 medium/large mammal unidentifiable fragments.

Summary

The heavy fraction assemblage is dominated by heavily fragmented *Oncorhynchus sp.* and mammalian specimens. *Oncorhynchus sp.* specimens tend to be high utility vertebral fragments, ribs, and rib/rays. Mammalian specimens are not as identifiable; the majority are diaphysis or unidentifiable fragments. The heavy fragmentation is consistent with processing efforts to extract additional resources as well as other taphonomic processes like trampling that limit more specific identifications by taxon and element. Such remains provide vital information on faunal processing even when larger debris has been removed.

Taphonomy

Size Grade

Trends in size grade distribution are consistent with heavy fragmentation to extract additional bone marrow and grease resources (Table 5.12). The smallest size grades (1-99mm, 10-19mm, 20-29mm) are the most common throughout each stratum. Larger size grades (40-49mm, 50-59mm, +60mm) occur most frequently in stratum V and stratum XVI. These distributions may correspond to complex patterns in deposition and housepit construction. The deposition of larger fauna specimens on the roof may be indicative of two processes: primary stage faunal processing and discard of larger debris. Ethnographic and archaeological descriptions indicate that the roof was often used as an activity area where early stage butchering and hide working occurred (Hayden 1997; Prentiss and Kuijt 2012; Teit 1900). The presence of larger specimens may reflect such activities. Additionally, the roof was utilized to dispose of refuse. As seen in Table 5.13, smaller fragments were more easily incorporated into the floor context (Hayden and Handly 2000), while larger faunal remains would have been more visible and easier to remove during household cleaning. Such processes are consistent with the low count of large fauna and high count of small fauna in stratum II and the relatively high count of large specimens in stratum V. Concentrations of larger faunal size grades within the strata XVI bench context may reveal how the feature was constructed. The presence of large fragments within the matrix may reflect the use of collapsed roof materials or refuse to build the bench.

Table 5.12. Fauna Size Grade by Stratum

Strata	Size Grade							
	1-9mm	10-19mm	20-29mm	30-39mm	40-49mm	50-59mm	+60mm	Total
Stratum I	56	39	7	-	-	-	-	102
Stratum V	1,672	420	155	54	27	21	14	2,363
Stratum II	782	170	34	14	7	2	5	1,014
Stratum XIV	85	75	25	9	4	-	1	199
Stratum XVI	799	313	83	41	10	6	16	1,268
Stratum Va	22	24	1	3	1	-	-	51
Stratum IIa	258	43	22	8	3	2	2	338
Unknown	134	41	16	7	5	1	-	204
Total	3,808	1,086	343	136	57	32	38	5,539

Table 5.13. Heavy Fraction Fauna Size Grade by Stratum

Strata	Size Grade			
	1-9mm	10-19mm	20-29mm	Total
Stratum V	79	12	-	91
Stratum II	2,744	36	11	2,791
Stratum XIV	384	22	-	406
Stratum IIa	19	2	-	21
Total	3,226	72	11	3,309

Fracture Patterns

Distributions of different fracture types across the strata may reveal patterns in processing and discard of faunal resources (Table 5.14). Spiral, oblique, and irregular fractures are indicative of increased faunal processing to extract bone marrow and grease. While the proportion of spiral fractures is similar throughout each stratum, the highest counts occur in strata V and XVI. Oblique fractures are the second most frequent fracture type. The highest counts are associated with the strata V, II, and XVI contexts; when viewed proportionately to their totals, stratum XVI has the densest distribution. Irregular fractures occur the most frequently. The highest proportions occur within the BR 4 and 3 roof and floor contexts, although stratum XVI also contains a dense accumulation. These distributions suggest that while the remains associated with the floor may reflect in situ faunal processing, the concentrations in the roof and bench may reflect discard practices as well as the use of such material to construct the bench. Transverse breaks occur less frequently. The highest percentages occur in the upper most strata as well as the bench setting. In these settings faunal specimens were not as protected, therefore they were more likely to experience transvers breaks due to heavy traffic. Complete elements occur rarely; when they are present, they are usually smaller *Oncorhynchus sp.* elements or low utility mammalian carpals, tarsals, and phalanges.

Similar distributions of fracture types are present with heavy fraction fauna (Table 5.15), though no complete elements are present and spiral fractures are more rare. Irregular fractures dominate the assemblage though oblique fractures are also frequent. The incorporation of these fragments into the strata matrices allows an examination of fauna utilization even when larger debris has been removed.

Table 5.14. Fauna Fracture Pattern by Stratum

Strata	Fracture Pattern					
	Spiral	Oblique	Transverse	Irregular	Complete	Total
Stratum I	1	19	9	65	8	102
Stratum V	30	252	111	1,930	40	2,363
Stratum II	9	166	41	793	5	1,014
Stratum XIV	4	33	9	147	6	199
Stratum XVI	24	498	72	654	20	1,268
Stratum Va	1	15	2	31	2	51
Stratum IIa	6	26	14	270	22	338
Unknown	3	11	6	165	19	204
Total	78	1,020	264	4,055	122	5,539

Table 5.15. Heavy Fraction Fracture Pattern by Stratum

Strata	Fracture Pattern					
	Spiral	Oblique	Transverse	Irregular	Complete	Total
Stratum V	-	17	-	74	-	91
Stratum II	-	261	15	2,515	-	2,791
Stratum XIV	1	49	4	352	-	406
Stratum IIa	-	2	-	19	-	21
Total	1	329	19	2,960	-	3,309

Burn Stages

Stratigraphic distributions of burnt bone can aid in understanding fauna processing as well as patterns other taphonomic processes. In each stratum the opposite ends of the burn spectrum occur the most frequently (Table 5.16): non-burnt bone and burnt white bone. This indicates that while the majority of faunal specimens were not subjected to heat, when they were they remained in that setting of high heat for long periods of time until they were completely calcined. This pattern may have developed due to cleaning processes. Fauna may have been swept into hearths as a temporary means of disposing debris. Periodically the hearth was cleaned and the refuse was introduced into other settings. A complementing pattern emerges with heavy fraction fauna (Table 5.17). The highest amounts of late burn stages (gray/blue, gray, white) occur within the Feature D1, although relatively low counts of these three stages are associated with the field-collected data of stratum II. This suggests that while larger late stage burnt specimens were removed; fragments recovered from heavy fractions were too small to be easily disposed. The association of early stage burnt bone in the stratum XIV reflects the disposal of cooked elements rather than relocated refuse from the hearths. The high amount of non-burnt or early stage burnt specimens in strata V relative to other burn stages may indicate that the roof was not burned upon the final abandonment. This is consistent with the lack of red oxidized soils in this context. The presence of burnt bone in the roof appears to be from dumping activities. The relatively high amount of non-burnt bone in stratum Va, which does show oxidation, may be due to the small sample size.

Table 5.16. Fauna Burn Stage by Stratum

Strata	Burning Stage							
	Non-burnt	Black	Brown/black	Brown	Gray/blue	Gray	White	Total
Stratum I	33	8	5	23	-	2	31	102
Stratum V	1,459	58	35	308	6	23	474	2,363
Stratum II	526	10	12	227	3	40	196	1,014
Stratum XIV	22	1	26	127	-	-	23	199
Stratum XVI	840	13	-	76	5	2	332	1,268
Stratum Va	37	-	-	11	-	1	2	51
Stratum IIa	268	2	-	43	-	6	19	338
Unknown	162	3	1	9	-	1	28	204
Total	3,317	95	79	810	14	75	1,092	5,539

Table 5.17. Heavy Fraction Fauna Burn Stage by Stratum

Strata	Burning Stage							
	Non-burnt	Brown	Brown/black	Black	Gray/blue	Gray	White	Total
Stratum V	5	66	-	1	-	-	19	91
Stratum II	245	832	-	6	560	1	1,147	2,791
Stratum XIV	23	357	-	-	-	-	26	406
Stratum IIa	2	18	-	-	-	-	1	21
Total	275	1,273	-	7	560	1	1,193	3,309

Weathering Stages

Weathering may be seen as a general indicator of the level of processing or the environmental stresses specimens experienced. The majority of all specimens across each stratum were categorized as having stage 2 weathering (Tables 5.18 and 5.19). This may indicate that despite beliefs that the uppermost strata were more exposed to harmful factors affecting faunal assemblages (Prentiss et al. 2009), the overall neutrality of the soil provided a beneficial environment for bone preservation. Higher proportions of stage 3 fauna occur in strata V, II, and IIa. Those specimens associated with the floor contexts may reflect greater processing efforts that undermined their structural integrity. Stage 3 fauna recovered from the roof would have additionally faced environmental exposure.

Table 5.18. Fauna Weathering Stage by Stratum

Strata	Weathering Stage			
	Stage 2	Stage 3	Stage 4	Total
Stratum I	85	8	9	102
Stratum V	1,552	809	2	2,363
Stratum II	629	371	14	1,014
Stratum XIV	194	5	-	199
Stratum XVI	1,180	88	-	1,268
Stratum Va	38	13	-	51
Stratum IIa	215	123	-	338
Unknown	143	60	1	204
Total	4,036	1,477	26	5,539

Table 5.19. Heavy Fraction Fauna Weathering Stage by Stratum

Strata	Weathering Stage			
	Stage 2	Stage 3	Stage 4	Total
Stratum V	91	-	-	91
Stratum II	2,791	-	-	2,791
Stratum XIV	406	-	-	406
Stratum IIa	21	-	-	21
Total	3309	-	-	3309

Cultural and Natural Modifications

Evidence for cultural modifications is rather limited (Table 5.20). Cut marks are the most common cultural modification, affecting 6 specimens from strata V, II, and XVI as well as STP 8. Drilled holes appear on 3 strata XVI specimens. Grinding and polishing occur less frequently and may indicate that the specimens were utilized as tools. Two specimens from strata V show carnivore gnawing that may be associated with domestic dogs. One specimen from the more exposed strata I evidenced rodent gnawing.

Table 5.20. Cultural Modifications

Modification	Strata						Total
	I	V	II	XVI	IIa	STP 8	
Cut Marks	-	1	1	3	-	1	6
Drilling	-	-	-	3	-	-	3
Grinding	-	-	-	-	1	-	1
Polishing	-	3	-	-	-	-	3
Carnivore Gnawing	-	2	-	-	-	-	2
Rodent Gnawing	1	-	-	-	-	-	1
Total	1	4	1	6	1	1	16

Faunal Artifacts

The presence of faunal artifacts may reflect additional processing efforts to increase the delivery rates of prey packages. A variety of faunal artifacts were recovered throughout the strata (Table 5.21), most of which are produced from medium/large or large mammal elements. Strata V contains 1 antler wedge, 2 refitting pieces of an awl, 2 refitting pieces of a drinking straw with an incised pattern of parallel lines along the margins, 2 refitting game piece fragments with an incised pattern, and three faunal specimens with polishing along their margin suggesting use wear. Stratum II contains 1 artifact, a large mammal diaphysis fragment with polishing along the margin. Three artifacts are associated with the bench, including 2 beads with drilled holes and 1 large mammal fragment with a rounded tip and polishing. Stratum IIa contains 2 artifacts, 1 fragmented awl piece and 1 large mammal diaphysis fragment with grinding on its edge.

Table 5.21. Faunal Artifacts

Artifact Type	Strata				Total
	V	II	XVI	IIa	
Antler Wedge	1	-	-	-	1
Awl	2	-	-	1	3
Bead	-	-	2	-	2
Drinking Straw	2	-	-	-	2
Game Piece	2	-	-	-	2
Polishing	3	1	1	-	5
Grinding	-	-	-	1	1
Total	10	1	3	2	16

Osteology

Two human specimens were identified during fieldwork and laboratory analyses. The first element is an adult canine that was discovered wrapped in birch bark in Block D, Square 14, stratum V, level 1. The tooth was fragmented transversely midway through the root structure. The occlusal surface is flatly worn. An additional wear pattern is visible between the occlusal and lingual surfaces so that the lingual border of the crown is angled rather than sharp. This pattern has a width of approximately 1-2mm. Since initial observations the tooth had further fragmented into three sections along the cracks that were previously visible. Despite the fragility of the specimen, it was described as having stage 2 weathering. No pathology was observed. The second specimen is an adult mandibular second premolar that was identified during laboratory analyses. The specimen was recovered from stratum II, level 1 of Block B, Square 15NW. The tooth displays an irregular fracture. Well preserved, it was described as having stage 2 weathering. No pathology was observed.

Discussion

The faunal remains recovered during the 2012 excavation of HP 54 and the heavy fractions of soil flotations reveal aspects of predation practices, depositional processes, and socioeconomic relationships. The distribution of different taxa reveals that HP 54 inhabitants had a relatively narrow diet breadth emphasizing high yielding *Oncorhynchus sp.* and artiodactyls, especially deer. While other species are present, they occur in significantly less numbers. The elements representing these taxa suggest a pattern of field butchering and transport in which only high utility cuts were returned back to the site. In salmon species, high utility elements occur within the axial skeleton, including thoracic vertebrae, precaudal vertebrae, caudal vertebrae, and vertebral fragments that belong to dried fillets. Although this anatomical region also contains neural and haemal spines as well as ribs, these elements were recovered rarely, perhaps due their fragility. Few cranial, pectoral, and pelvic elements were recovered. Artiodactyl element patterns are more complex. While lower limb elements suggest that whole limbs were transported to the site, the corresponding higher utility upper limbs do not occur in as high numbers as the lower utility elements. When viewed with the very high counts of medium/large and large mammal fragments, it appears that these artiodactyl elements received additional processing efforts, such as bone marrow and grease extraction, to yield higher returns. This requires the heavy bone fragmentation observed in the generally identified medium/large and large mammals. Moderate distributions of medium utility axial elements of artiodactyls, including vertebrae, ribs, scapulae, and innominates, were recovered. Cranial elements occur rarely and consist predominately of selenodont tooth fragments indicative of Cervidae. The artiodactyl assemblage reveals that high utility limbs and moderate utility axial elements were most frequently transported back to HP 54, suggesting that prey were procured some distance from the central base camp; however, occasionally the whole prey were returned, implying that they were captured nearer the village. The analysis of these faunal resources informs not only the diet of a seasonally occupied village, but also the complex decisions and tradeoffs of HP 54 household members.

The presence of other prey types, like *Castor canadensis*, weasel-sized carnivore, *Lepus sp.*, and *Martes pennanti*, may indicate that the HP 54 household participated in the fur trade. The low number of specimens associated with these taxa may not be an accurate indicator of their use, especially if only pelts were returned to the site. Although deer served as the secondary faunal subsistence resource, their skins were also valuable. While providing variable caloric returns, these taxa have the desirable pelts exchanged in this multicultural network between indigenous populations and European settlers. The high counts of lithic scrapers suggest that HP 54 invested greatly in hide working. In combining these data, it appears that HP 54 inhabitants were producing surplus furs for ceremonial events or trade.

The presence of *Canis sp.* elements may reflect that domestic dogs played an important role as a prestige (e.g. feasting) or subsistence resource within HP 54. Elements from different anatomical regions throughout the skeleton were recovered, suggesting that dogs were local rather than sought resources. The lack of evidence suggesting cause of death, however, does not reveal if dogs were utilized in feast or famine contexts.

Taphonomic characteristics of the faunal assemblage reveal stratigraphic differences in the use and deposition of fauna. The distribution of larger size grades, as well as the presence of spiral and oblique fracture types, supports ethnographic and archaeological records describing the roof as both an activity area for early stage faunal processing and a location for refuse disposal (Hayden 1997; Prentiss and Kuijt 2012; Teit 1900). The high amount of non-burnt or early stage burnt specimens in stratum V relative to other burn stages reveals that the roof was not burned upon the final abandonment, which is consistent with the lack of red oxidized soils in this context. The presence of burnt bone in the roof appears to be from dumping activities. The accumulation of stage 3 weathered fauna from the roof coincides with the greater environmental exposure the specimens experienced. Taphonomic patterns associated with strata II include higher proportions of smaller size grades and greater numbers of oblique, spiral, and irregular fracture types indicative of bone marrow and grease extraction. High concentrations of late stage burnt bone were recovered from the hearth features, which suggests the features served duel purposes in food preparation and refuse disposal. The use of the central hearth as a receptacle for faunal debris is supported by very high accumulation of specimens within the feature the dearth of specimens surrounding it, revealing that fauna was swept towards the hearth as a means of maintaining the central space. The higher distribution of larger and earlier stage burnt specimens within stratum XIV reflects the disposal of food items rather than relocated refuse. Concentrations of larger faunal size grades and oblique and transvers fractures within the strata XVI may suggest the use of collapsed roof materials or refuse to build the bench.

Faunal artifacts provide additional information on the use of fauna as well as socioeconomic relationships. The presence of faunal artifacts produced from medium/large or large mammal fragments reveals additional processing efforts to increase the delivery rates of prey packages. While the majority of the artifacts are utilitarian, the drinking straw, the game piece, and the beads are valuable socioeconomic objects that reflect gender roles. Drinking straws, or tubes, made from the long bones of birds were important items during female puberty or pregnancy (Teit 1900, 1906, 1909). During this time women's mouths were not allowed to touch the water surface, thus necessitating a different method to intake liquids. Occasionally these objects had additional holes allowing them to also serve as a whistle. The game piece corresponds to a gambling practice called the "guessing game," which was usually played by men though in some regions women also participated. Beads were important decorative items used to adorn clothing. The presence of faunal beads in conjunction with glass beads suggests the interweaving of traditional and historic material culture during the fur trade era.

Faunal evidence from HP 54 was instrumental in informing the complex decisions and tradeoffs associated in a seasonally structured subsistence pattern. HP 54 inhabitants had a relatively narrow diet breadth that emphasized high yielding salmon and artiodactyls. To increase the returns for these prey items, only high or moderate utility elements were usually transported back to the central base. The faunal assemblage has also allowed us to move beyond subsistence to socioeconomic relationships by examining non-subsistence prey, spatial distributions of remains, and faunal artifacts. The presence of pelt-bearing taxa desired during the fur trade in conjunction with high scraper counts may indicate the HP 54 participated in this multicultural exchange. Differential distributions of taphonomic characteristics have aided in understanding how faunal resources were utilized within different contexts as well as aspects of housepit construction. Faunal artifacts included an array of utilitarian tools among important socioeconomic items reflecting gender roles, thus allowing an examination of various aspects of daily life. Together theses analyses have provided a broader understanding of the role of fauna within the HP 54 household.

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Chapter Six

Spatial Analysis of the Housepit 54 Final Occupation

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An in depth spatial analysis for Housepit 54 was undertaken utilizing the accumulation of artifacts, eco-facts, features, and botanical sampling recovered during the 2012 field excavations. ArcMap was utilized to create a spatial model of both roof and floor from the Fur trade period (final floor/roof) occupation. Quantum GIS was used to create density layers for artifacts based on a wide range of elements. The final results were an interactive spatial reconstruction from which users can make queries based on any number of characteristics to better understand the household spatial organization and the dispersal of artifacts, both primary, secondary and defacto, and features for interpretation. This chapter provides a short introduction to these studies.

Methods

Standard laboratory analysis was conducted on lithics, faunal, botanical, fire-cracked rock (FCR), and historical remains. Once initial analysis was completed, all of the information was entered into a data base and coded for standard attributes as well as additional attributes utilizing a rich ethnographic record provided by James Teit (1900, 1906) as well as ethno-archaeology work from the Mid-Fraser Region of B.C. (Laforet 1981).

Fauna

Faunal remains incurred additional coding based on utility of element (Binford 1978) and ranking of species (high, medium, and low) based on cultural preferences (Teit 1906). Categories of age and gender were considered based on cultural taboos outlined in the ethnographic data, but proved to be unsuccessful at this time due to inadequate faunal representation from this occupation.

Lithics

In addition to standard categories of coding used in analysis, tools were coded by locality of material: local, non-local, and unknown (Rousseau 2000) and utility of material based on a combination of “knapability” and cultural preference (Prentiss et al. 2010). Categories were created for gender and age utilizing both archaeological and ethnographic evidence (Gero 1991; Teit 1906) as well as curation: expedient and formal (Binford 1978). Debitage received additional coding for locality and utility based on the same criteria utilized for tools.

Botanicals

Botanical results were coded for various categories based on the ethno-botanical record (Teit 1973; Turner 1997). The categories included: medicinal, food, mythology, drink, smoking, scents, dyes, special beliefs, life stage, gender, and manufacture.

Historical Artifacts

Historical artifacts were coded by categories determined in the standard analysis with the addition of categories of gender, age, and source material.

Fire Cracked Rock (FCR)

FCR data were entered by count per unit or quad, varying by excavation method between the floor of the house and the roof.

Data Entry and Map Creation

Each data set was entered into an excel spreadsheet by specific x, y, and z coordinates corresponding to the grid imposed on the site while in the field. Lithics, fauna, and historical artifacts were entered as one line per artifact with the corresponding codes attached to the line item. FCR were entered by unit and quad with a total count per area in one line. Botanicals were entered in the same manner as FCR. Each of these categories created its own layer in ArcMap.

A base layer fishnet was created in ArcMap representing the grid while an additional layer for the house floor was created identifying non-variable features such as hearths, midden, cache pits, post holes, and benches.

Raster files (density maps) were created using Quantum GIS, an online shareware program. Once created they were saved as tif files and imported back into ArcMap serving as independent layers that could interact with additional queries. Once reconstructed, we removed the grid layer from the house. This permitted interpretation of space without the imposition of western scientific images onto the household.

Discussion

Roof

The results of the spatial reconstruction of the roof during the latest occupation at housepit 54 confirmed both a roof and side entrance of the house. This is significant for offering initial insight into the household demography. Ethnographical and ethno-archaeological data indicate that side entrances are restricted to use by women and elderly (Laforet 1981; Teit 1900, 1906) and are not a standard part of house construction. Roof data also informs us of formation processes, primary and secondary refuse patterns, and use of roof as a social space; an extension of the interior living space (Figures 6.1 and 6.2).

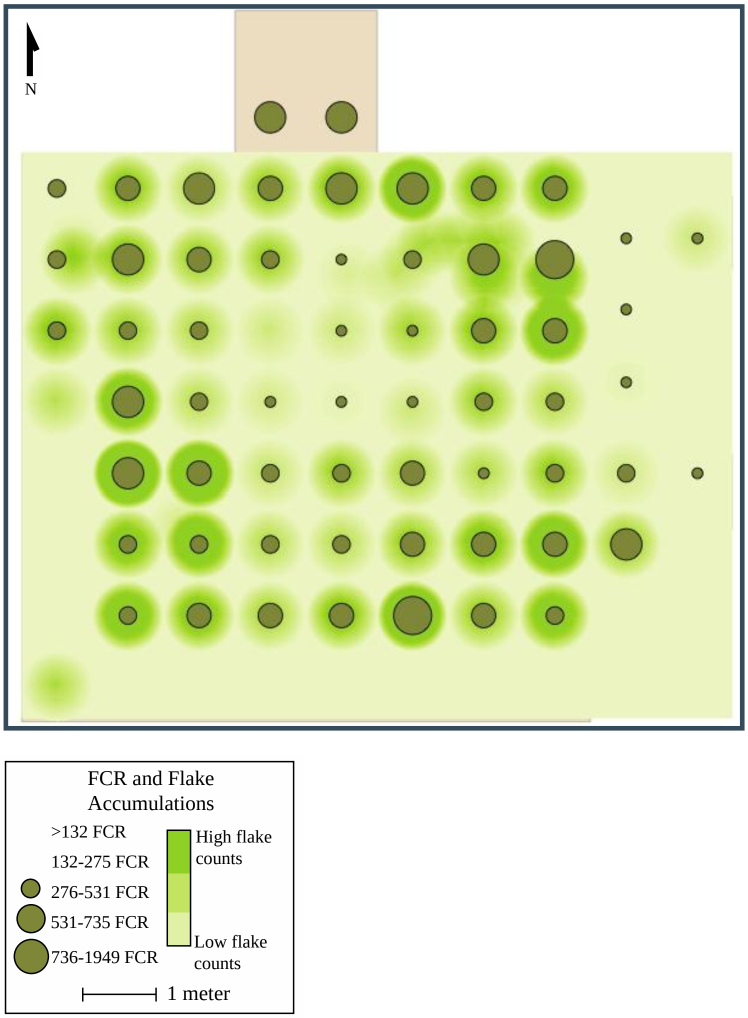

Figure 6.1. Tool distribution on the roof.

Figure 6.2. Fire-cracked rock and debitage distribution on the roof.

Floor

Floor reconstruction results allowed for the identification of social and personal spaces within the household allowing for a greater understanding of social organization within the home (see Appendix B). In addition, we can identify high production and low production/recreational space shared by various, if not all, members of the household.

Results of these analyses indicate that HP 54 was organized by activity areas rather than residential units. Interpretative maps illustrating activity areas (Figure 6.3) and depositional patterns (Figure 6.4) are available below. The distribution of features is consistent with ethnographic descriptions of housepits with shared activity areas. This is most evident with the central hearth (Feature 1 Block D), which served as the focus for household activities. High accumulations of fauna within the hearth indicate that it served as the primary cooking feature. The frequency of its use is indicated with the deep extent of oxidized soils as well as the high concentrations of late stage burnt bone. High concentrations of irregular, oblique, and spiral fractures associated with greater fauna processing efforts that surround the hearth signal that the region was used more intensely for fauna-oriented activities than other areas. The very low distribution of FCR recovered from within the feature suggests that the feature was maintained through the removal of refuse to the nearby midden. Low distributions of FCR, debitage, and faunal debris as well as tools in the area immediately surrounding the hearth indicate that the area was cleaned regularly for communal use. While the midden may have served as the dominant refuse receptacle, the high faunal concentrations may indicate that fauna was additionally swept into the hearth.

Patterns associated with the northeast hearth (Feature 2, Block D) reveal that it had a very different use life than the central hearth. The lack of oxidized soil and lower concentrations of late stage burnt fauna suggests that the feature was established late into the floor's history and used less intensely. The higher accumulations of FCR, debitage, and faunal debris in and near the hearth suggest that the feature was not maintained like the central hearth and likely served a different purpose with respect to its location in a "personal corner" area (Laforet 1981). While associated with relatively high amounts of fauna, including higher ranking food items, the low distributions of fracture types associated with additional processing, as well as heavy fraction, support this interpretation. In addition to being an area of limited large scale food preparation, a small but dense distribution of debitage and an abrader in conjunction with various tool types, including personal production items such as piercers and drills, suggests that it was an area of both chipped and ground stone tool production as well as. This cluster of tools along the feature's margins may signal they were stored positioning items. Such objects are placed in areas with little traffic, usually near features, so that they are out of the way and stored for safekeeping.

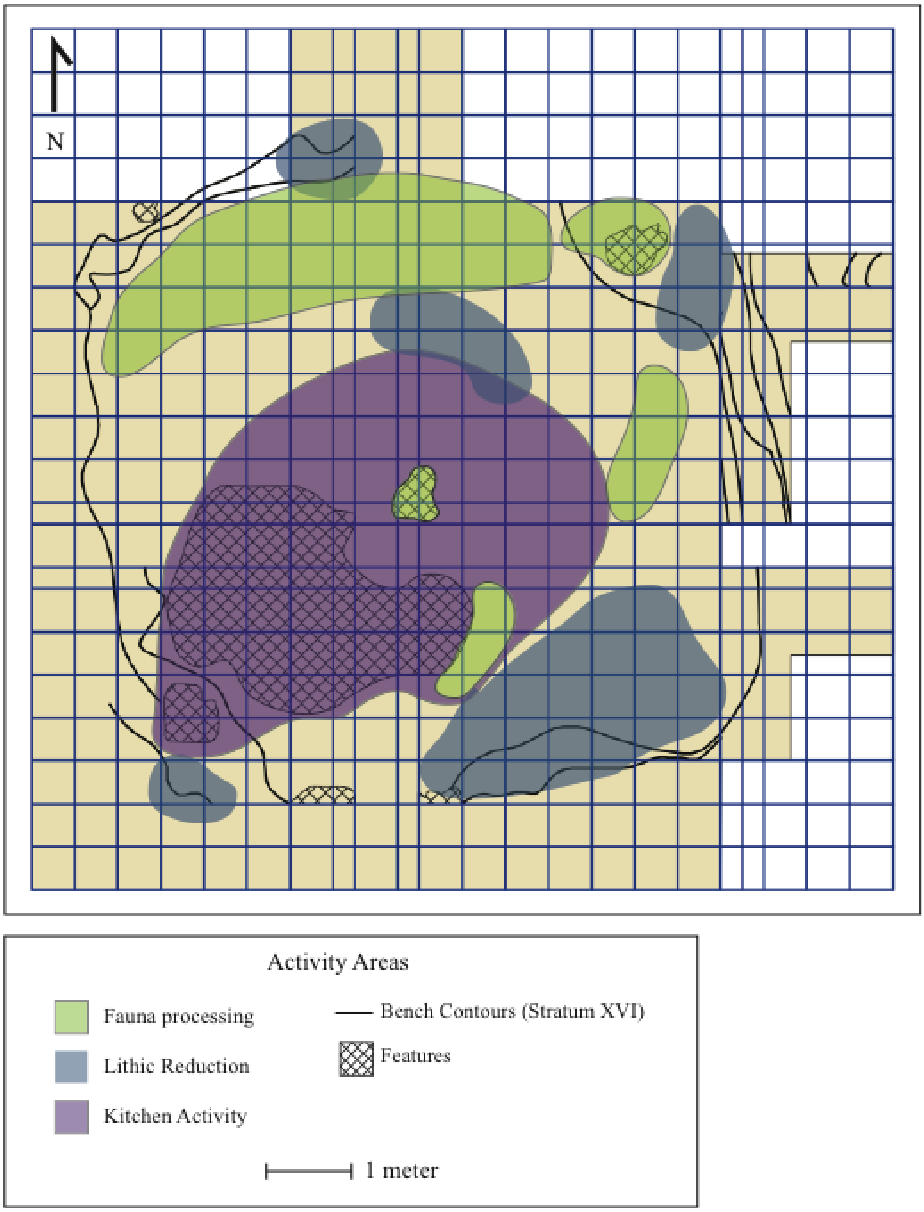

Figure 6.3. Activity areas on the Housepit 54 final floor.

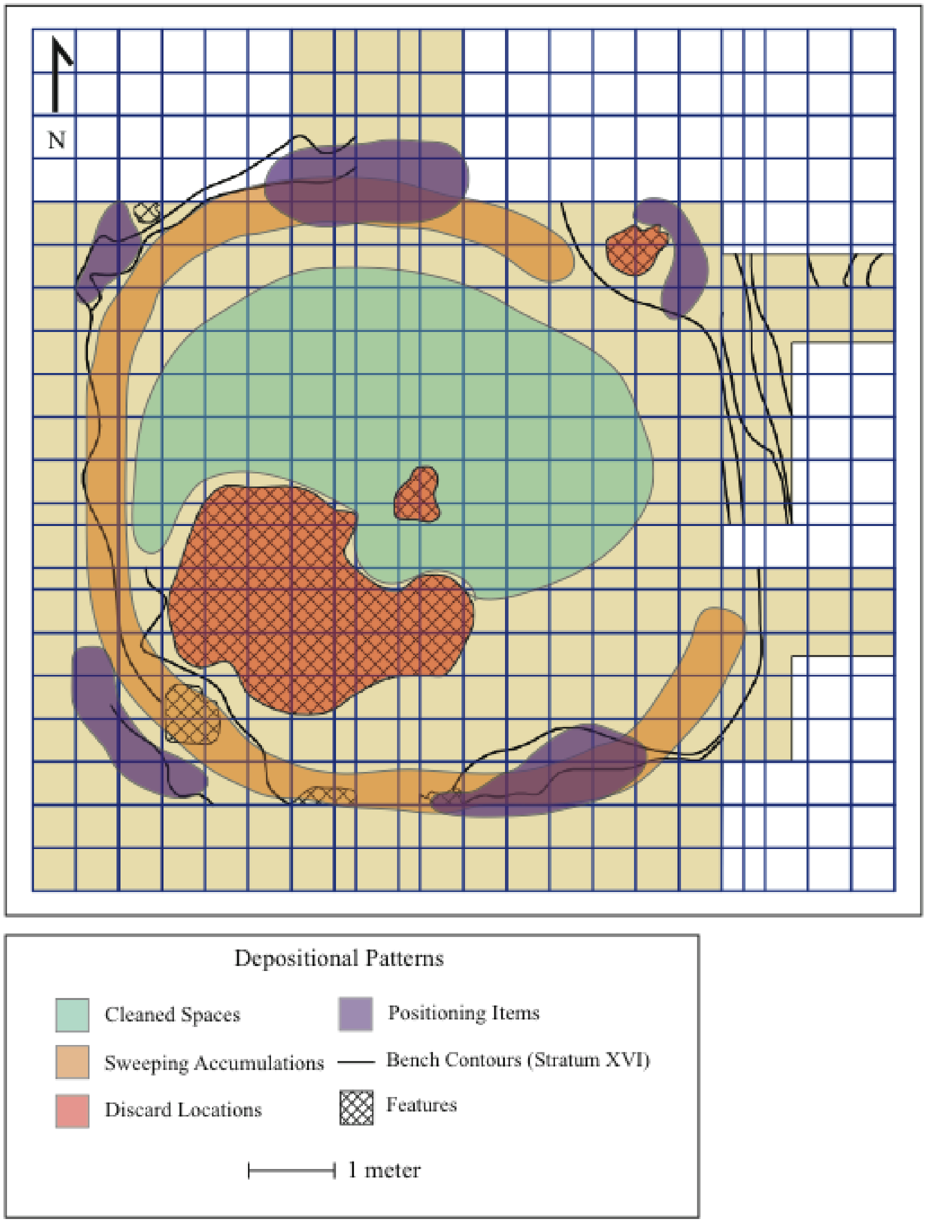

Figure 6.4. Variation in formation processes on the Housepit 54 final floor.

The region near the post hole, in the northwest corner, also seems to be a focus of an activity area as witnessed by isolated accumulations of debitage and a variety of tools represented by cutting implements, scrapers, and drills/piercers. Their accumulation around the post hole could indicate they were stored positioning items (per Binford 1978). These tool types correspond with the capture and preparation of faunal subsistence resources as well as hide working. The location of this tool cluster within moderate concentrations of faunal remains suggests that the area was utilized for fauna-oriented activities as well as an area of personal production as indicated by the piercer/drills, mimicking the NE corner.

The size of the midden and the high distributions of FCR, debitage, tools, and fauna associated with it are consistent with its communal use for discarding exhausted or unwanted objects. This pattern is especially evident with the distribution of burnt bone and fracture types. High accumulations of early and late stage burnt specimens as well as oblique, spiral, and irregular fracture types associated with additional processing efforts occur in the midden, suggesting that these faunal specimens experienced additional processing to extract the maximum amount of nutrition possible before being discarded. Only a single cache pit is present, suggesting that household inhabitants shared its contents. The margins of the feature are surrounded by moderate accumulations of fauna, the majority of which are high and medium utility species and high utility elements that are consistent with subsistence decisions to store high-yielding foods. The lack of fauna associated within the feature may suggest that it was actually a refuse pit. The two shallow pit features (Features Block A F2 and Block B F1) are associated with relatively low to moderate distributions of fauna though moderate to high accumulations of FCR and debitage. While both seem to originally have been post holes, their most recent function remains unclear; however, the wide variety of materials that are associated with them may suggest their use as additional middens.

The southeast corner of the house appears to be an activity area in which lithic production occurred. This is supported by large distributions of debitage that corresponds to high tool counts as well as low faunal distributions. The majority of the tools present are cutting implements, scrapers, and drills/piercers. The presence of an abrader in association with these tools indicates that both chipped and ground stone tool production occurred. Relatively low numbers of FCR, debitage, tools, and faunal remains northwest of the central hearth suggests it is a high traffic area associated with the roof ladder. Similar distributions occur near the eastern margin of the pithouse between Blocks B and D, suggesting a side entrance. Such findings are consistent with HP 54 roof analyses conducted with the same methodology as this research (Hamilton et al. 2013).

The bench running along the periphery of the structure provides sleeping and personal spaces for individual families. In some areas, like the northwest corner of block C, the bench is multi-tiered. Such areas may have been too small to accommodate sleeping but may have served as activity areas. Depositional patterns associated with the bench are consistent with two processes: the placement of positioning items and the sweeping of refuse towards features. While clusters of tools that occur along the bench may reflect positing items stored for future use, concentrations of FCR, debitage, and larger fauna fragments represent refuse that was swept out of the way. While this process can be intentional, it can also occur unintentionally as debris accumulates in areas that are harder to clean.

No indications of significant material wealth-based inequalities are present. Such disparities would be evident with locations within the housepit containing both high distributions of higher ranking items and high utility faunal resources; however, while high utility fauna is limited to the hearth or midden features, prestige items (e.g. stone beads, nephrite tools, European trade goods) have a wider distribution throughout the household. These patterns imply an organization by activities rather than areas with disparate proportions of material wealth. Together these trends suggest that HP 54 was organized by shared activity areas corresponding to a communalist mode of a corporate household strategy (e.g. Feinman 2000) with repressed material wealth-based distinctions.

Further spatial analysis will be conducted, utilizing the same methods, in future excavations at HP 54. This will allow us to measure cultural continuity, demography, and social organization including the use of both interior and exterior household space.

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Chapter Seven

Elemental Characterization of Floor Sediments from Housepit 54, Bridge River Housepit Village, British Columbia

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Introduction

Anthropogenic sediments are formed through a complex interplay between human and natural factors. The organization and use of household space influences the elemental composition of sediments. Daily activities introduce liquid and/or solid by-products into underlying sediment, altering their chemical composition (Middleton 2004). Large debris such as broken tools, animal bones, and food waste are often discarded in middens, while fine grained or liquid waste enter sediment directly, at the location of discard. Sources of debris could include flintknapping, woodworking, ceramic manufacture, food preparation and consumption. Additionally, feet and clothing carry detritus, while human bodies introduce skin cells, oils, perspiration, urine, and other bodily products into sediment (Middleton and Price 1996).

This report presents geochemical data generated through the multi-element analysis of sediments from Housepit 54 (HP 54) at the Bridge River Housepit Village, British Columbia. Sediment was sampled from the most recent occupational floor, associated with the historic Fur Trade period. The purpose of this study was to investigate the impact of human occupation on the elemental composition of the Fur Trade floor sediments. This was accomplished by analyzing variation in the intensity of major and trace elements. Geochemical analysis using portable x-ray fluorescence spectrometry (pXRF) was used to enhance our understanding of the spatial organization and use of HP 54. Future work will compare the chemical signatures within HP 54 to the elemental variation found in natural sediments from the vicinity of Bridge River.

Field Collection

Bridge River is a large housepit village located near Lillooet, in the Mid-Fraser Canyon of British Columbia. Mid-Fraser villages emerged in the centuries immediately following 2000 years ago (Prentiss and Kuijt 2012). The semi-subterranean domed residences at Bridge River were occupied by a northwest interior Salish people, known as the Upper Lillooet or St'át'imc. Vertical profiles of HP 54 reveal a series of superimposed layers, representing 13 occupational floors and as many as seven roof deposits (Prentiss and Kuijt 2012). The Bridge River Archaeological Project excavated Stratum II, the historic Fur Trade period floor of HP 54 during the summer of 2012. The floor was divided into 1m x 1m excavation units, comprising eight blocks. Individual units were subdivided into four quadrants (NE, NW, SE, SW). A total of forty sediment samples were collected for analysis in this study. As samples were not uniformly collected across the study area, portions of the floor were not analyzed and, therefore, lack chemical characterization.

Analysis

Sediment samples collected during excavation were sifted through a 4 mm Standard Testing Sieve to separate out large clasts and artifacts. Sieved samples were air-dried for 24 hours. 40g of each sample were weighed out into ceramic crucibles and oven-heated at 500°C for 5 hours. The samples were then pulverized using a SPEX 8510 Shatterbox with tungsten carbide ring mill. The equipment was cleaned between samples, using isopropyl alcohol and compressed air, to avoid cross-contamination. 5.95g of each powdered sample were mixed with 1.05g (15%) SPEX CertiPrep PrepAid 3644 Ultrabind, and pressed into a pellet using 8 tons of pressure for 3 minutes.

Portable x-ray fluorescence (pXRF) technology produces rapid and simultaneous identification of several major and trace elements in natural geologic materials (Goodale et al 2012). An Olympus Innov-X Delta handheld pXRF was utilized in the elemental characterization of HP 54 Fur Trade period floor sediments. The instrument was operated in two-beam mining mode for 60 seconds per beam at 40kv, fluorescing iron (Fe) and zinc (Zn), and at 10kv, fluorescing aluminum (Al), potassium (K), phosphorus (P), calcium (Ca), and titanium (Ti) (Table 7.1). Concentrations for the seven elements were reported for each sample in weight percentage and then converted to parts per million (ppm). The Delta instrument was calibrated with assayed samples from the USGS, the University of Georgia Center for Applied Isotope Studies, and Hamilton College in-house standards.

Data Presentation

The northing and westing coordinates of the SW corner of each excavation unit were coded and the samples were plotted onto the HP 54 floor map displaying recovered features and artifacts (Figure 7.1). For analysis of the house floor, three-dimensional contour maps were created for concentrations of each element using Golden Software Surfer 9, which were then georeferenced and placed over the HP 54 floor map in ArcGIS 10. The surface plots were visually examined for patterning in elemental concentrations. Particular attention was given to Ca, P, and K, elements determined by Middleton (2000) and ethnoarchaeological studies to be useful in identifying human activity areas.

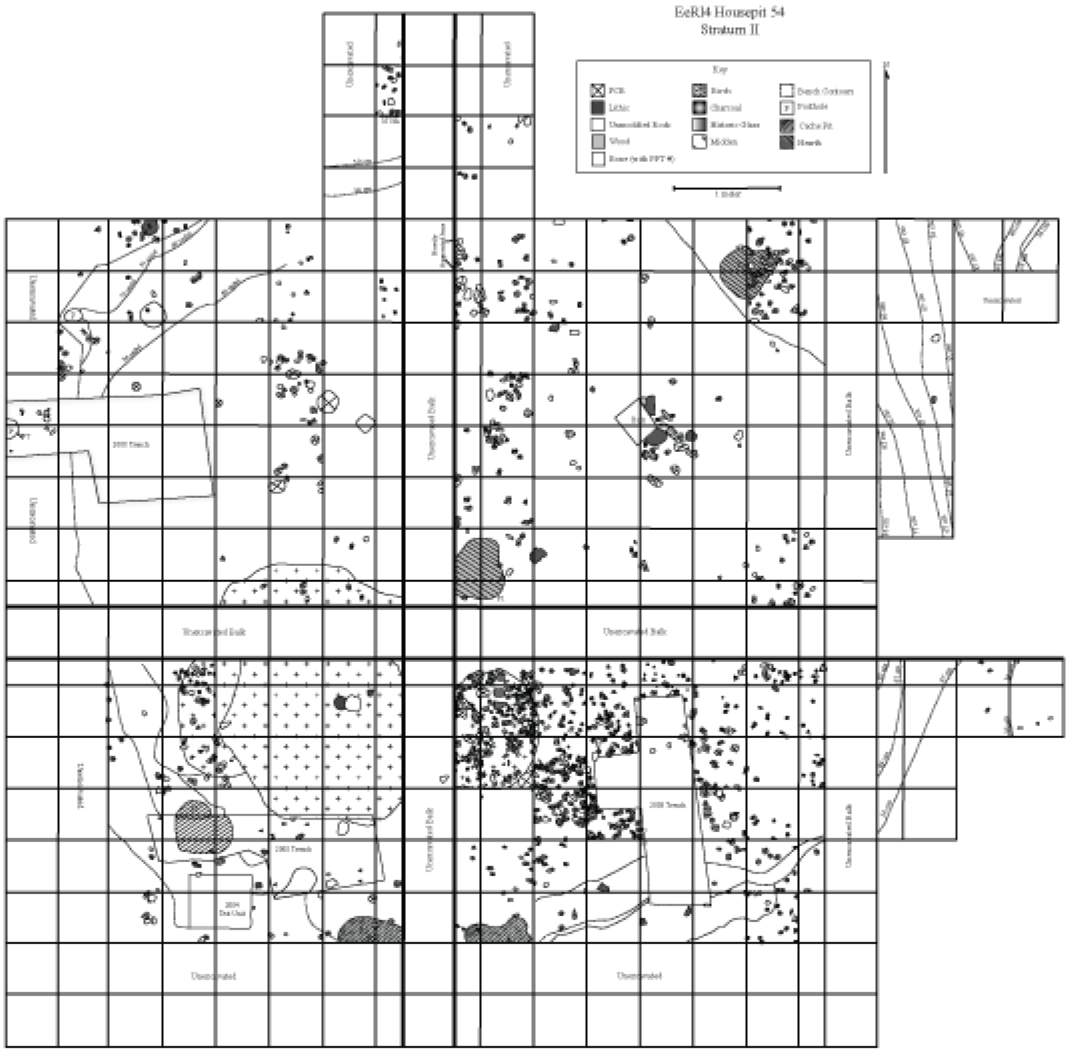

Figure 7.1. HP 54 Fur Trade floor with recovered features and artifacts.

Results

The geochemical data obtained revealed patterns in the elemental composition of floor sediments in HP 54. These findings suggest that different functional areas display characteristic geochemical signatures. The housepit's eastern entrance is associated with elevated levels of P and low concentrations of Ca, Zn, Ti, K, Al, and Fe. Phosphorus (Figure 7.2) is concentrated in a horseshoe pattern around the periphery of the floor, away from the central fire hearth. Aluminum (Figure 7.3) occurs in high concentrations along the western region of the floor and in low concentrations in the east-central region. High levels of Al appear to skirt around the center of the floor to the west and south, concentrating at the fire hearth. Phosphorus and Potassium (Figure 7.4) are typically associated with wood ash and burning (Middleton 2000). Therefore, we would expect to see elevated levels of these elements associated with the central hearth.

However, these chemical signatures are not encountered in HP 54. While K is found in moderately high concentrations, P concentrations are lowest in the sediment associated with the central hearth. Future investigations will address this finding. Calcium (Figure 5) and Fe (Figure 7.6) occur in high concentrations over most of the floor. However, while high levels of Ca correspond with the concentration of fire-cracked rock (FCR) in the southeast portion of the house, Fe levels are low. Zinc (Figure 7.7) is at low levels throughout much of the house, with three isolated concentrations. Zn and Ti (Figure 7.8) show a near negative correlation with the three Zn concentration peaks located where Ti concentrations are lowest.

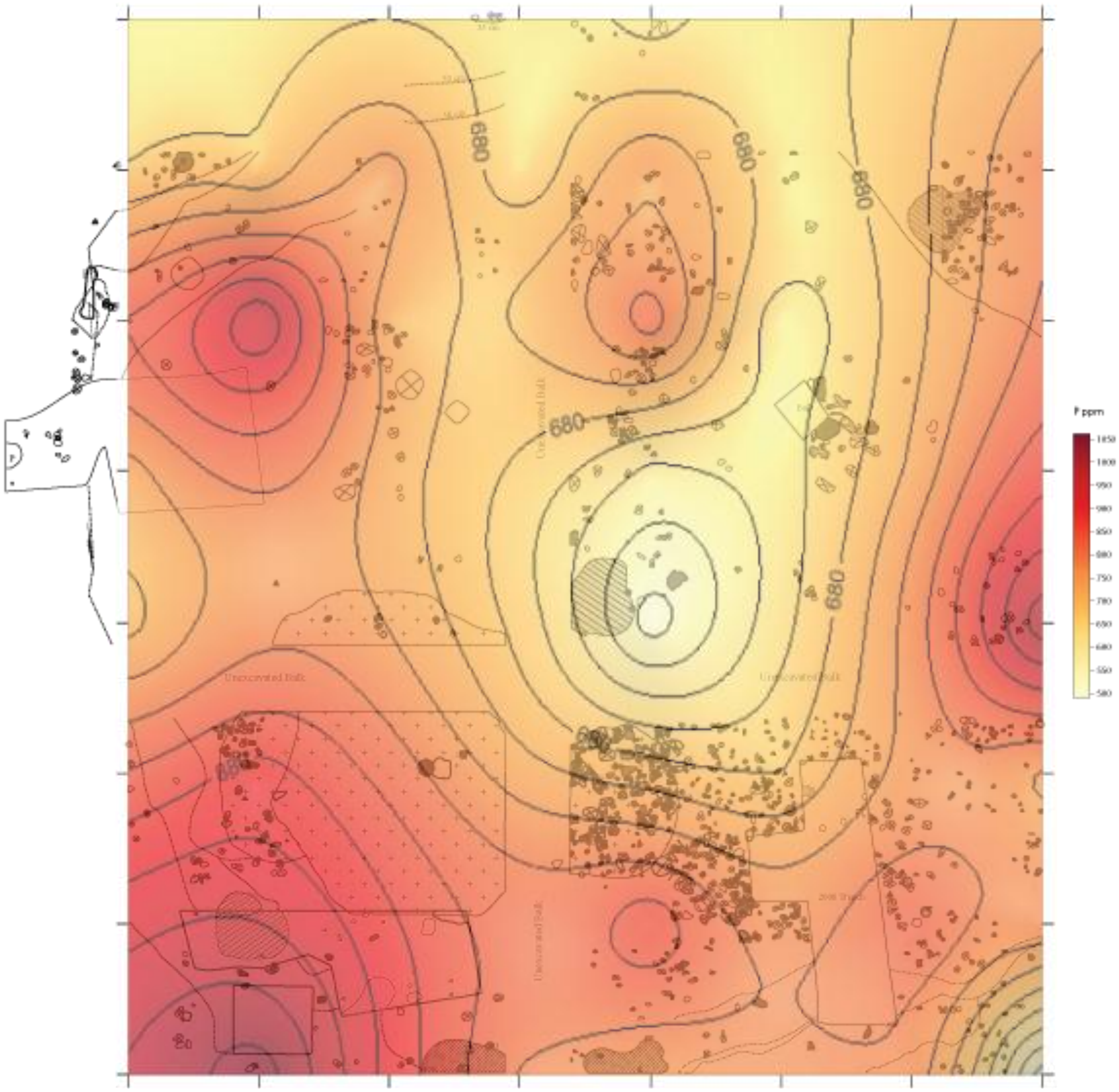

Figure 7.2. Concentrations (ppm) of phosphorus, HP 54, Stratum 2.

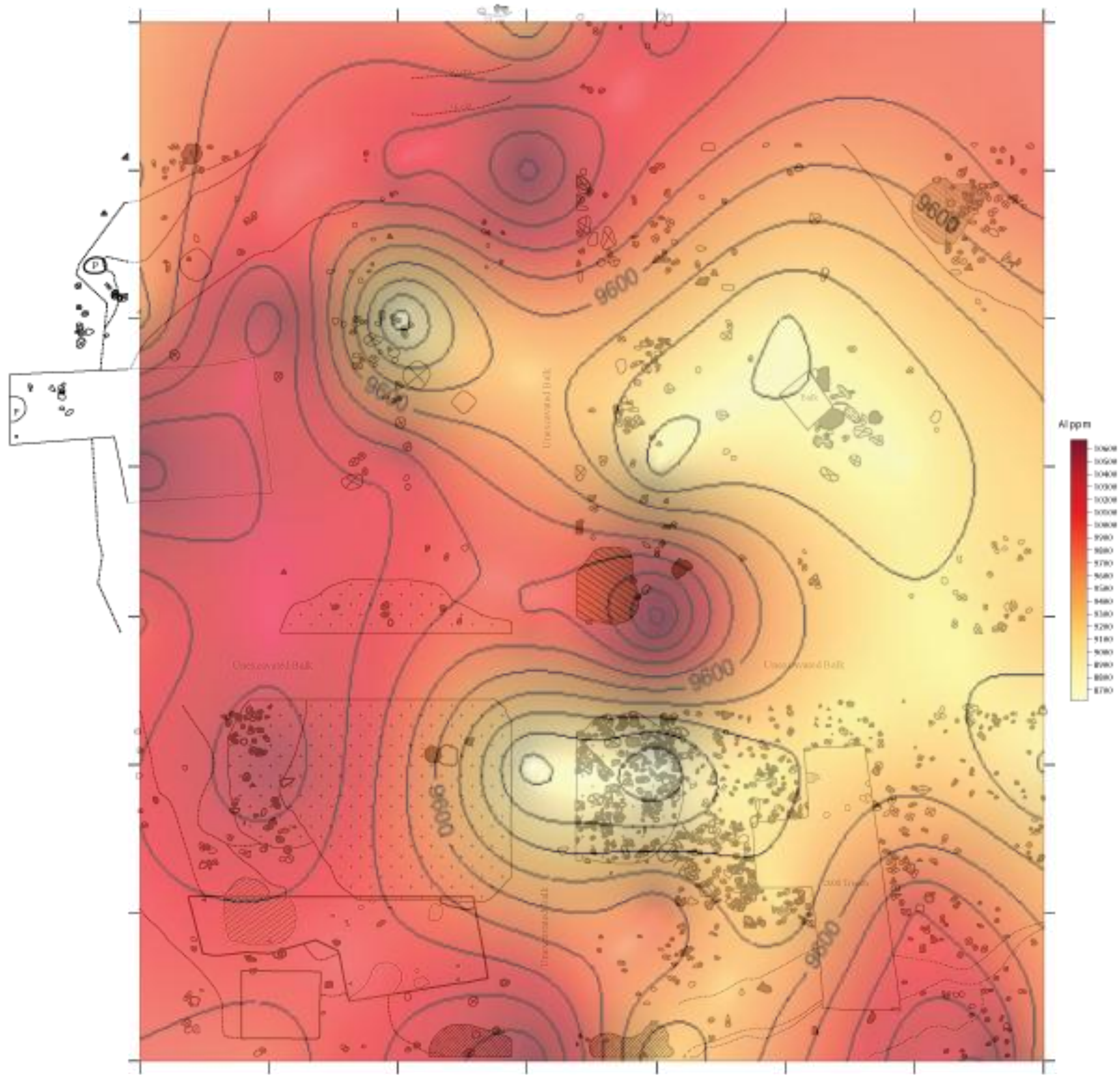

Figure 7.3. Concentrations (ppm) of aluminum, HP 54, Stratum 2.

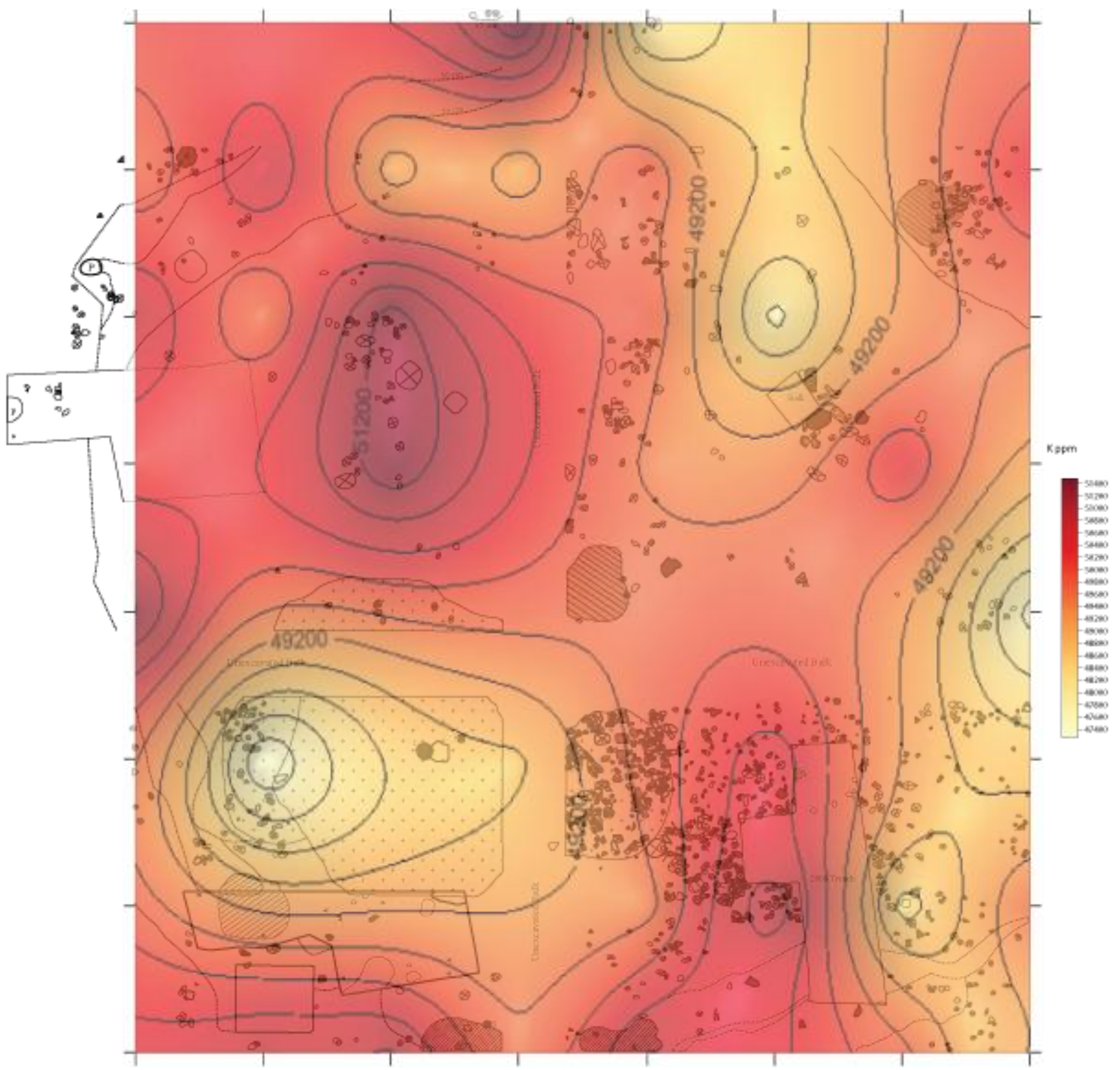

Figure 7.4. Concentrations (ppm) of potassium, HP 54, Stratum 2.

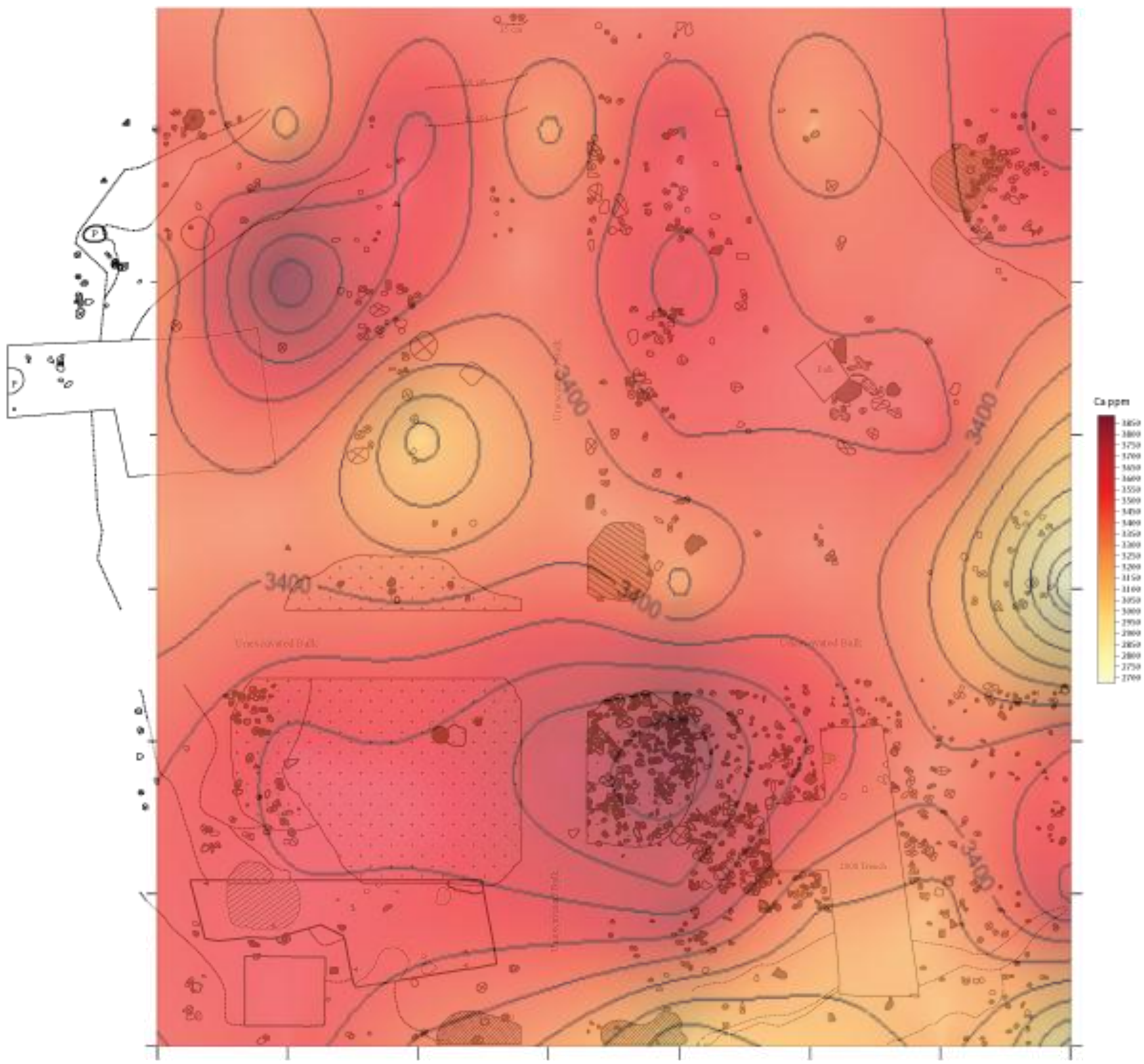

Figure 7.5. Concentrations (ppm) of calcium, HP 54, Stratum 2.

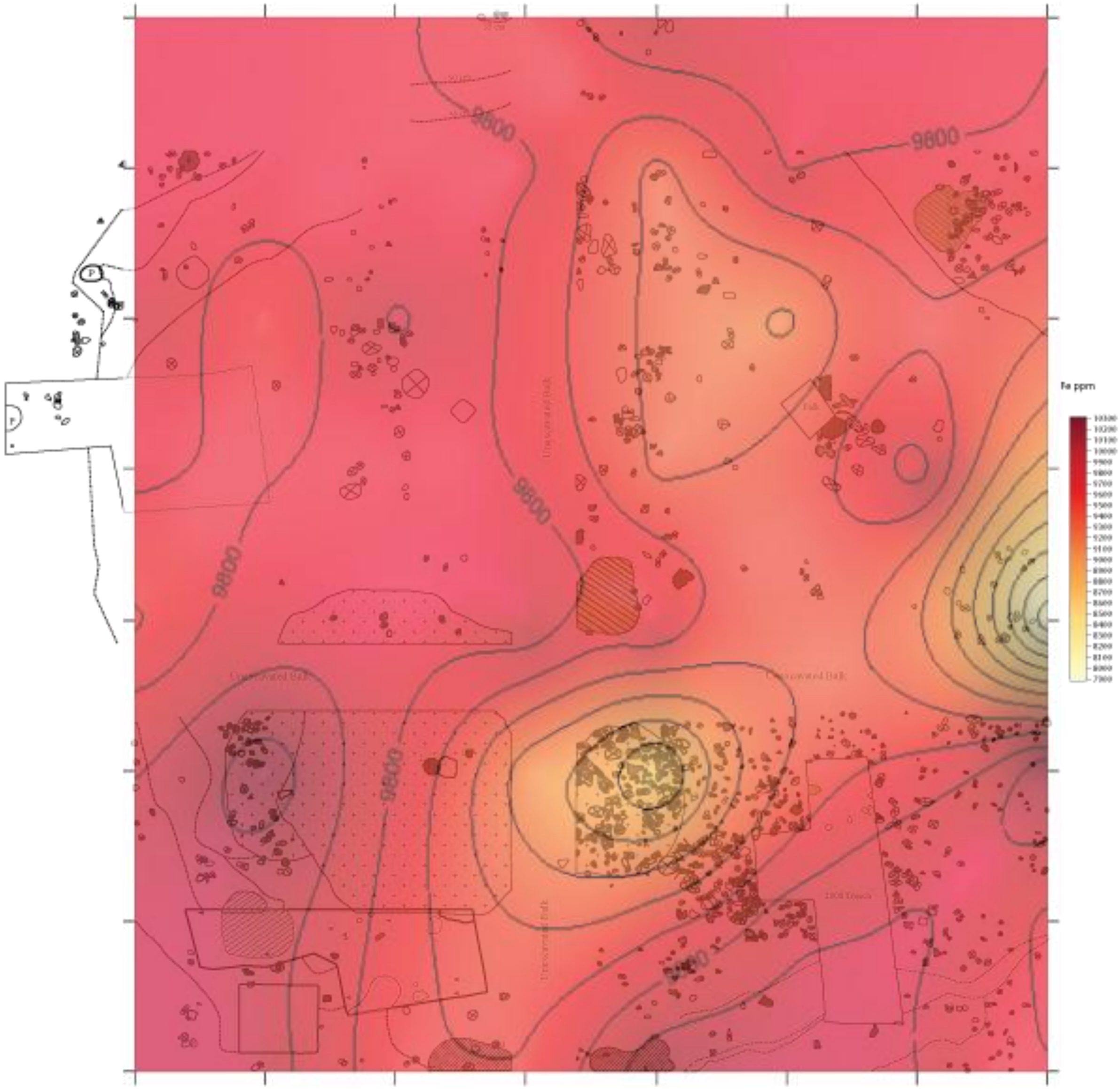

Figure 7.6. Concentrations (ppm) of iron, HP 54, Stratum 2.

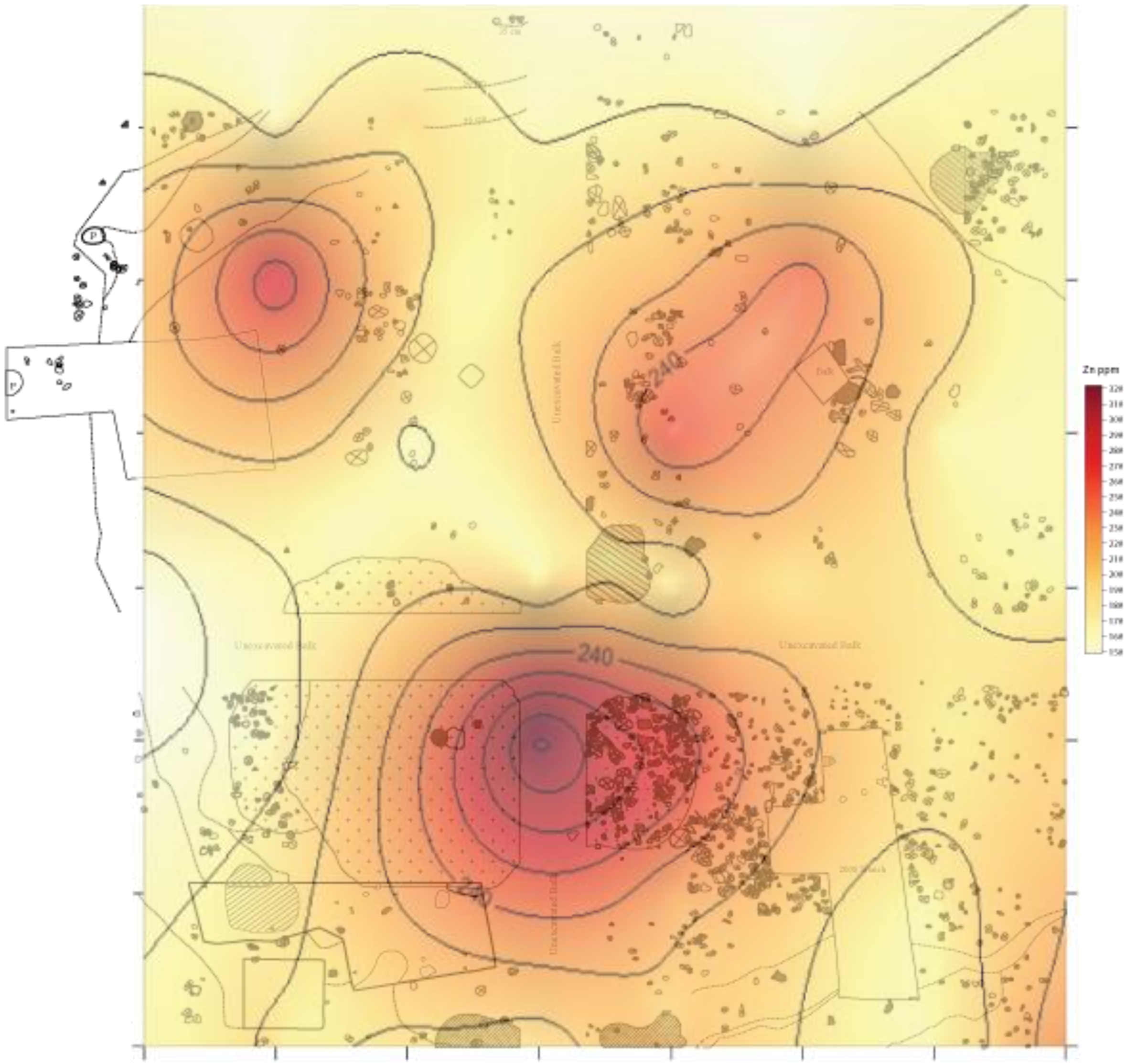

Figure 7.7. Concentrations (ppm) of zinc, HP 54, Stratum 2.

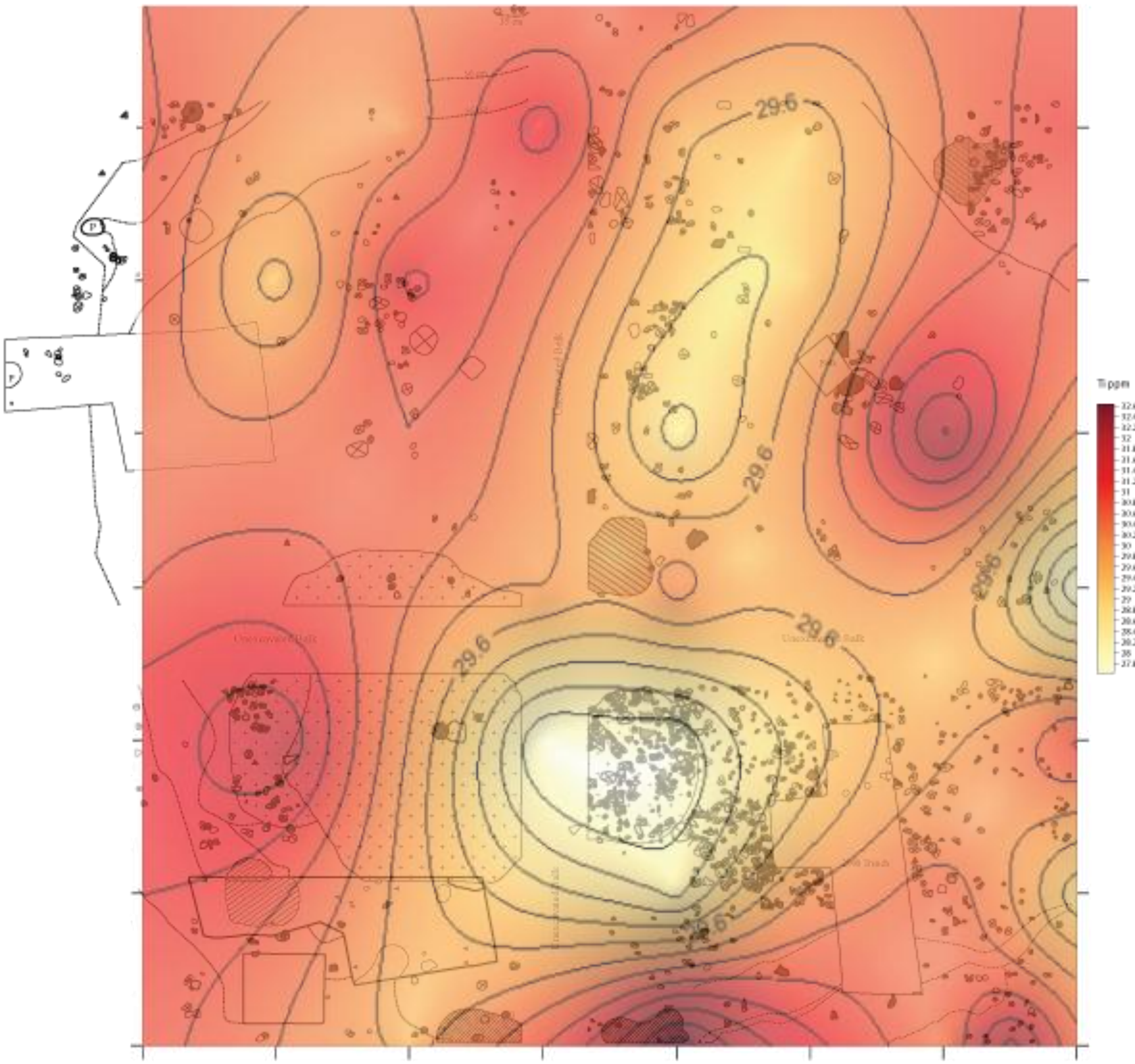

Figure 7.8. Concentrations (ppm) of titanium, HP 54, Stratum 2.

Discussions and Conclusions

The results of multi-element analysis suggest that the Fur Trade period floor of BR HP 54 was spatially organized with designated activity areas. The geochemical data complement observations made during excavation. Several of the features identified, including the east entrance, the central hearth and the large FCR deposit, are distinguishable by their chemical signatures.

Sediment element concentrations suggest a pattern of activity consistent with that described in Bridge River ethnography. The center of the floor was viewed as public space, while the periphery of the floor was designated as personal space. Ethnoarchaeological studies (Middleton and Price 1996) have determined high levels of Ca to be indicative of covered and enclosed spaces, including food preparation and general activity areas. Phosphorus has also proved to be a good indicator of food preparation areas. The element is primarily introduced (anthropogenically) by organic debris such as excrement, plant tissue, and bone (Middleton and Price 1996). In HP 54, the central hearth represents the lowest levels of P, while the inferred personal activity areas show high concentrations of P and Ca. Variation in phosphorus concentrations also suggest that occupants deposited refuse into dump areas (moderate to low P) positioned adjacent to food preparation and general activity areas (high P and Ca). Additional analysis is required to better understand the spatial patterning of Ti, Fe, Al, and Zn concentrations, and the peculiar chemical signature associated with the east side entrance to the house.

Acknowledgments

The archaeological excavations at Housepit 54 Bridge River Housepit Village are funded through the National Endowment for the Humanities and the University of Montana. Geochemical research was also made possible through the Dean of Faculty at Hamilton College.

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Table 1. Elemental concentrations of forty samples collected from HP 54 Stratum II. Data include both weight percent (%) and parts per million (ppm).

Sample #	Al %	Al ppm	P %	P ppm	K %	K ppm	Ca %	Ca ppm	Ti %	Ti ppm	Fe %	Fe ppm	Zn %	Zn ppm
20	9.88	9880	1.0622	1062.2	50.81	50810	3.5427	3542.7	0.0304	30.4	10.08	10080	0.2034	203.4
21	10.6	10600	0.7961	796.1	49.62	49620	3.2816	3281.6	0.0308	30.8	9.62	9620	0.1892	189.2
22	8.7	8700	0.7388	738.8	48.75	48750	3.7465	3746.5	0.0276	27.6	9.09	9090	0.3256	325.6
24	9.17	9170	0.6807	680.7	50.6	50600	3.5964	3596.4	0.029	29	9.42	9420	0.2236	223.6
25	9.27	9270	0.7829	782.9	51.03	51030	3.3225	3322.5	0.0301	30.1	9.93	9930	0.2053	205.3
26	10.02	10020	0.8362	836.2	48.22	48220	3.2707	3270.7	0.0306	30.6	10.02	10020	0.1911	191.1
28	9.34	9340	0.8219	821.9	49.89	49890	3.6532	3653.2	0.0293	29.3	9.35	9350	0.2177	217.7
29	9.94	9940	0.7586	758.6	49.89	49890	3.6108	3610.8	0.0297	29.7	9.35	9350	0.1849	184.9
34	10.53	10530	0.9591	959.1	49.6	49600	3.8988	3898.8	0.0294	29.4	9.63	9630	0.2746	274.6
49	9.94	9940	0.7972	797.2	50.34	50340	3.6602	3660.2	0.0311	31.1	9.75	9750	0.1914	191.4
50	10.24	10240	0.905	905	50.86	50860	3.3819	3381.9	0.0299	29.9	9.66	9660	0.1965	196.5
56	10	10000	0.6659	665.9	49.76	49760	3.4422	3442.2	0.03	30	9.96	9960	0.1859	185.9
57	8.66	8660	0.7347	734.7	51.41	51410	3.5384	3538.4	0.0313	31.3	10.03	10030	0.202	202
58	10.69	10690	0.6456	645.6	48.95	48950	3.265	3265	0.0314	31.4	9.83	9830	0.1771	177.1
64	8.92	8920	0.5876	587.6	49.53	49530	3.5003	3500.3	0.0286	28.6	9.37	9370	0.2587	258.7
65	10.25	10250	0.776	776	48.99	48990	3.6417	3641.7	0.0302	30.2	9.83	9830	0.1978	197.8
67	10.7	10700	0.7433	743.3	50.16	50160	3.38	3380	0.0306	30.6	9.84	9840	0.1964	196.4
68	10.16	10160	0.7386	738.6	51.5	51500	3.0426	3042.6	0.0308	30.8	9.83	9830	0.1771	177.1
74	9.52	9520	0.8436	843.6	50.79	50790	3.3198	3319.8	0.0308	30.8	9.98	9980	0.2086	208.6
78	8.98	8980	0.6122	612.2	47.86	47860	3.4722	3472.2	0.0293	29.3	9.16	9160	0.2494	249.4
79	9.96	9960	0.707	707	51.26	51260	3.3251	3325.1	0.0308	30.8	9.57	9570	0.1484	148.4
85	9.33	9330	0.8538	853.8	49.66	49660	4.2952	4295.2	0.031	31	9.58	9580	0.1915	191.5
88	9.59	9590	0.6608	660.8	48.75	48750	3.2955	3295.5	0.0294	29.4	9.81	9810	0.1718	171.8
89	9.45	9450	0.6638	663.8	51.52	51520	3.488	3488	0.0304	30.4	9.69	9690	0.1633	163.3
90	9.06	9060	0.7298	729.8	50.35	50350	3.5289	3528.9	0.0321	32.1	9.89	9890	0.1907	190.7
91	10.72	10720	0.5011	501.1	49.76	49760	3.2707	3270.7	0.0302	30.2	9.78	9780	0.1825	182.5
103	10.59	10590	0.8973	897.3	47.21	47210	3.63	3630	0.032	32	10.32	10320	0.1715	171.5
105	9.59	9590	0.6833	683.3	49.69	49690	3.5051	3505.1	0.0309	30.9	9.92	9920	0.1891	189.1
106	9.94	9940	0.5401	540.1	50.57	50570	3.0345	3034.5	0.0301	30.1	9.54	9540	0.2073	207.3
112	8.96	8960	0.7522	752.2	48.63	48630	3.4945	3494.5	0.0309	30.9	10.19	10190	0.2135	213.5
113	8.57	8570	0.7035	703.5	49.76	49760	3.8893	3889.3	0.0277	27.7	8.56	8560	0.2765	276.5
114	9.21	9210	0.7658	765.8	50.83	50830	2.9999	2999.9	0.0327	32.7	10.15	10150	0.2173	217.3
117	9.81	9810	0.8674	867.4	49.45	49450	3.6853	3685.3	0.0283	28.3	9.54	9540	0.2253	225.3
120	9.36	9360	0.9877	987.7	47.44	47440	2.6495	2649.5	0.0276	27.6	7.83	7830	0.1932	193.2
126	9.55	9550	0.7881	788.1	49.6	49600	3.6352	3635.2	0.0289	28.9	9.75	9750	0.2201	220.1
127	10.42	10420	0.6687	668.7	49.05	49050	3.1219	3121.9	0.0318	31.8	9.82	9820	0.2034	203.4
128	10.35	10350	0.7842	784.2	49.72	49720	3.2313	3231.3	0.0304	30.4	10	10000	0.1865	186.5
134	10.28	10280	0.6263	626.3	47.93	47930	3.4551	3455.1	0.0309	30.9	9.99	9990	0.1633	163.3
138	10.06	10060	0.6891	689.1	50.75	50750	3.2637	3263.7	0.0302	30.2	9.89	9890	0.1746	174.6
139	9.66	9660	0.4905	490.5	49.21	49210	2.8427	2842.7	0.0305	30.5	9.81	9810	0.2347	234.7

Chapter Eight

Conclusions

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The 2012 investigations at Housepit 54 within the Bridge River site focused entirely on excavation of the Fur Trade period occupation also recognized as the final floor (Stratum II), roof (Stratum V), bench/rim (Stratum XVI), midden (XIV), and surface (I). Excavations recovered six features, 12,631 lithic artifacts (total count to date excludes bench/rim materials still under analysis), 51 European trade artifacts, and 5539 faunal remains. Additional data were collected on starches from fire-cracked rock, 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.

Dating the final occupation at Housepit 54 has relied on a combination of radiocarbon dating and consideration of manufacture dates for artifacts of European origin. Radiocarbon dating of one sample returned a date of 115+/-25, calibrating to a wide range spanning the late 18th through much of the 19th century. One additional sample has been submitted for dating. Historical artifacts accumulated at Housepit 54 have manufacture dates spanning the late 18th century through the mid-19th century. Some beads, the horseshoe and the bone button could date to earlier in the 19th century. One type of bead, those with green, red, and white stripes, was manufactured in Italy between 1851 and 1863 CE. Given their presence in floor and roof contexts in Housepit 54, this provides an upper limit to the occupation date. Bench and rim stratigraphy implies one or more re-flooring episodes and if, per ethnography (e.g. Alexander 2000; Teit 1900, 1906), re-roofing and re-flooring happened at approximately 20 year intervals the original Fur Trade period occupation of the house could have been in the range of perhaps 1820 to 1858 CE. The latter date is a likely abandonment date given the catastrophic (to aboriginal people) influx of gold miners beginning in that year (Terry 1989).

Construction of the house emphasized establishment of a clay-silt floor with benches and cooking features. The house appears to have had a single central hearth through much of its existence. A smaller hearth on the bench in the northeast area was likely added shortly before abandonment. There appears to have been a roof and a side entrance, much as described in the ethnographic record (LaForet and York 1981; Teit 1900, 1906). Placement position of roof support posts was not obvious as no central postholes were found. Clusters of artifacts in the approximately correct places for such posts may imply the presence of post that were simply placed on the surface of the floor and held in place by the weight of the roof (Alexander 2000). The final roof was not burned and thus there are few timbers present in the roof deposits to provide insight on construction techniques.

The large lithic artifact assemblage provides an excellent source of insight into a range of activities within Housepit 54. A wide range of raw material sources were documented spanning local dacite, slate, cherts, and nephrite to more distant cherts and obsidian. Analysis of manufacturing within the house suggests that virtually all materials were prepared at quarry or other procurement localities before transport back to the house. Cherts, and dacite were preferred for a wide range of tools including projectile points, knives, drills, piercers, and scrapers. Slate was used primarily for hide scrapers, though slate knives and adzes were recovered. The highly abundant slate scrapers (over 400) suggest that the household had a major investment in hide working as might be expected of a group entangled with Europeans during the Fur Trade period. This may also explain the large number of projectile points recovered (over 180). Nephrite was used for adzes and potentially scrapers. Steatite provided a source stone for beads, pendants, pipes, and a statuette. Tool production within the house occurred during the winter months and thus focused on managing the risk of running short on raw materials. Consequently, many tools received resharpening and materials were recycled via bipolar reduction techniques. An obvious outcome of the lithics study was that aboriginal technological traditions continued relying upon tools and organizational tactics much as they had had done during pre-Colonial times (e.g. Hayden et al. 1996). Modifications during the Fur Trade included a likely expanded emphasis on acquisition and production of hides.

Housepit 54 members clearly gained access to a variety of European trade goods including a wide range of beads, iron objects (including jingle cones, projectile points, and a horse shoe), a bone button, and a brass ring. Manufacture sources of these items spanned eastern North America to Europe, placing Housepit 54 in a complex network that extended across at least two continents. Uses of European manufactured goods appears to have been varied from personal adornment (beads and ring) to functional practicality (points and button) and perhaps ritual (horse shoe). It is not clear whether these goods came to the household via direct trade with Europeans or so called down the line trade with adjacent aboriginal groups as documented by Teit (1900, 1906). Intensive hide production may have been a means by which some of these items were obtained.

Faunal and floral remains provide insight into subsistence activities of Housepit 54 members. Clearly salmonids of several species were critical to subsistence. Current data suggest the likelihood that spring and sockeye salmon possibly along with local trout were imported into the house. Near complete lack of head parts suggests that traditional processing in fishing camps favored removal of heads in that context, drying, and transport of dried fish with backbones to the house. Next most important were deer, whose remains were primarily appendicular parts. This implies acquisition of deer at localities some distance from the village requiring field processing prior to transport. Salmon and deer were further processed within the house, particularly associated with the hearths. Other faunal remains included dog, beaver, and bird. Dogs were likely used for a variety of purposes (Crellin 1994). However, at Housepit 54 they were also apparently eaten on occasion. Analysis of botanical remains provides insight into the collection of several plant foods. A variety of berry seeds were recovered including Saskatoon, rose, raspberry, kinnikinnick, and heather. This implies berry collecting in both lower elevation dry contexts and wetter, likely higher elevation, places. Dried berries were an essential food for winter survival, eaten plain but also placed in stews and roasts (Turner 1992). Residue analyses (starches) on fire-cracked rock pointed to a variety of foods including the possibility of nuts and seeds. Study of the plant remains from Housepit 54 is ongoing.

Spatial analyses of a wide range of data were initiated and this research continues. Current results suggest several distinct activity areas. The central portion of the house was an active cooking area. South of the central hearth were areas for accumulated kitchen debris (stratum XIV), and a variety of food-related and tool production activities. The southeastern portion of the floor was particularly dense in tool manufacturing and use materials. Another hearth-related activity area was located on the northeastern corner of the floor atop a low bench and associated with a small hearth. Faunal remains and lithic artifacts suggest a variety of likely food-related activities. The north-central portion of the floor was likely well-lit due to light from the roof entrance. It is no surprise that a variety of materials accumulated in this area suggesting intermittent use for many activities. While sparse in artifacts, the northwest portion of the floor (Block C) had geochemical evidence for some form of activity that generated strong phosphorus scores. It suggests the possibility of a place frequently used for animal food processing but also regularly cleaned of obvious debris. The northern sectors of the floor were routinely cleaned as indicated by relatively sparse artifacts. Overall, spatial studies to date indicate that the household was organized by functional activity areas, cooking adjacent to hearths, debris accumulation on the southwest corner, knapping in the southeast and north-central, and sleeping likely on benches up off the floor. Thus, the organization of life within Housepit 54 was similar to that predicted by ethnographies of the St'át'imc (Alexander 2000; LaForet and York 1981; Teit 1906).

Analyses of data generated by the 2012 field season at Bridge River are ongoing and many of these conclusions will be further clarified in the near future. However, they do offer implications for issues raised in the introduction to this report. It is clear that members of Housepit 54 had significant independent agency with regard to their role within the Fur Trade. The very large assemblage of hide scrapers and projectile points, coupled with a mammalian faunal assemblage dominated by deer, suggests that they may have sought a niche within the network as producers of deer hides. It is possible that they may also have produced salmon for trade purposes. However, this is not clear from the current evidence. The location of the house up and away from the core fishing localities in the Fraser River does imply a greater interest in commercial hunting than fishing. Fish, however, were clearly a critical component of the diet within the house, much as they had always been. We must also remember that the Bridge River itself once offered access to large runs of spawning salmon. While engaged in the Fur Trade it is also abundantly clear that life within Housepit 54 remained significantly true to ancient traditions of tool production and use and undoubtedly a range of rituals. One significant area of study not fully considered yet is the role of gender as an organizing factor within houses. The presence of spindle whorls, a small figurine of a female baby (found in the kitchen midden/stratum XIV – see Appendix A), extensive food preparation debris, basketry materials (birch bark fragments – see Chapter Two), and an extensive flake tool industry imply a critical role for women within the house. A study of the record of male, female, young, and old household members is ongoing. Finally, from a historical-processual standpoint Housepit 54 in the Fur Trade period currently appears to be the last house occupied at a village that was initiated over 1800 years ago. The ability of this household to outlast the others is a question worthy of continued study. We must be prepared to consider economic and reproductive payoffs from optimal decisions made by the household membership. However, we must also be prepared to consider factors of simple historical contingency.

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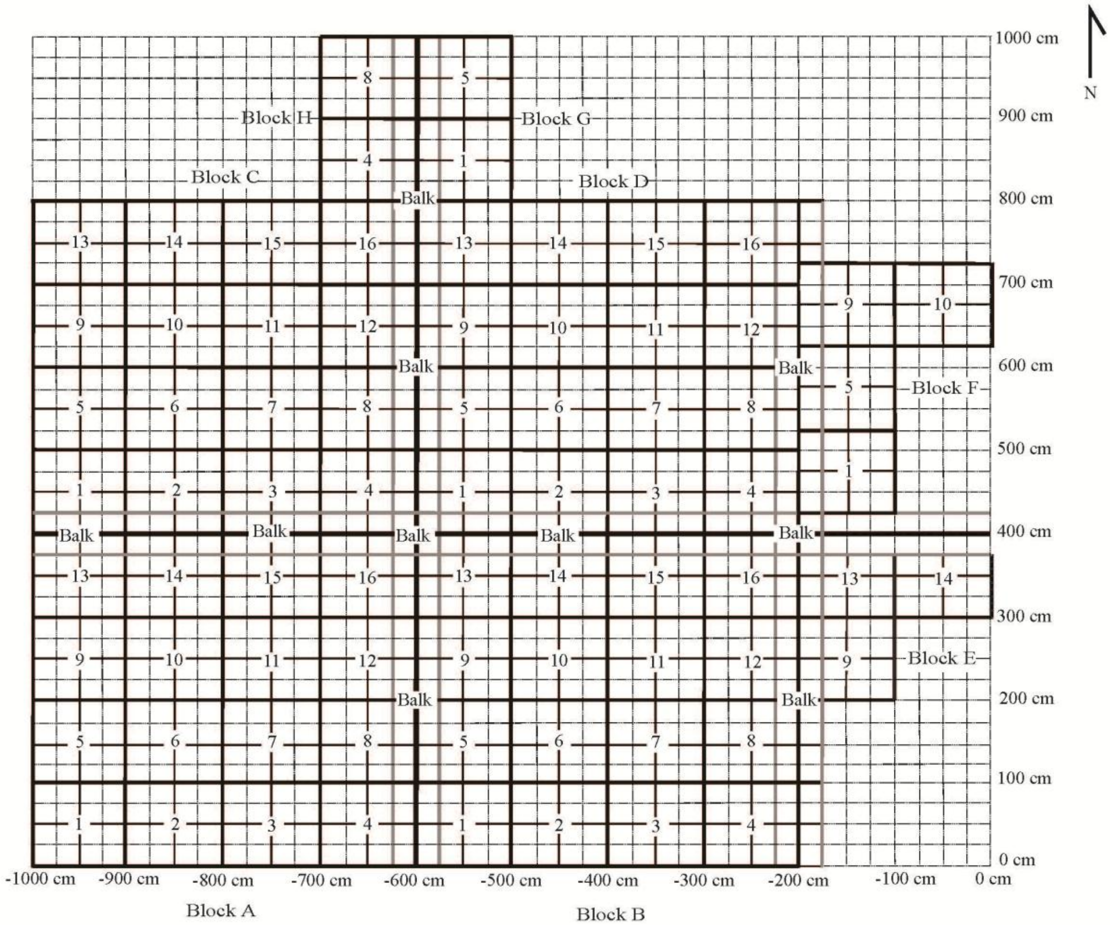
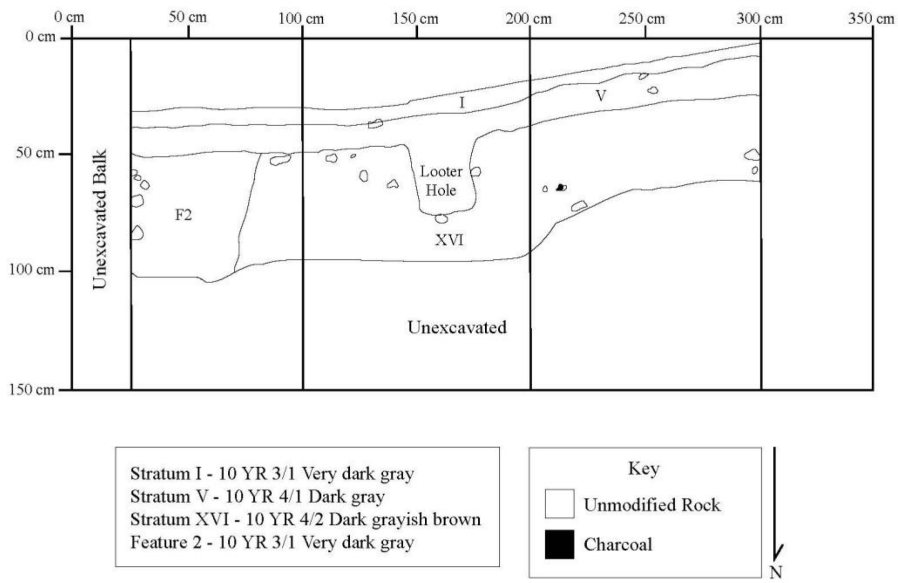
Appendix A

Maps and Photographs

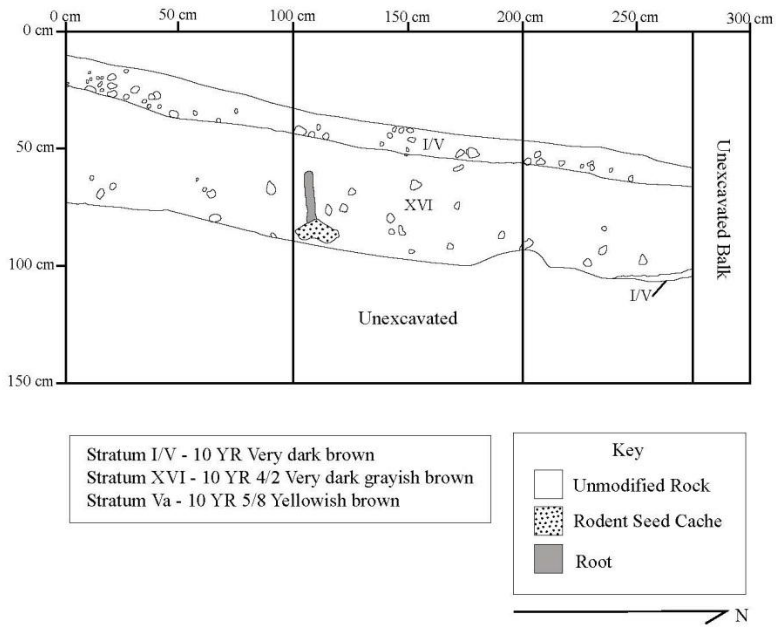


Excavation grid for Housepit 54

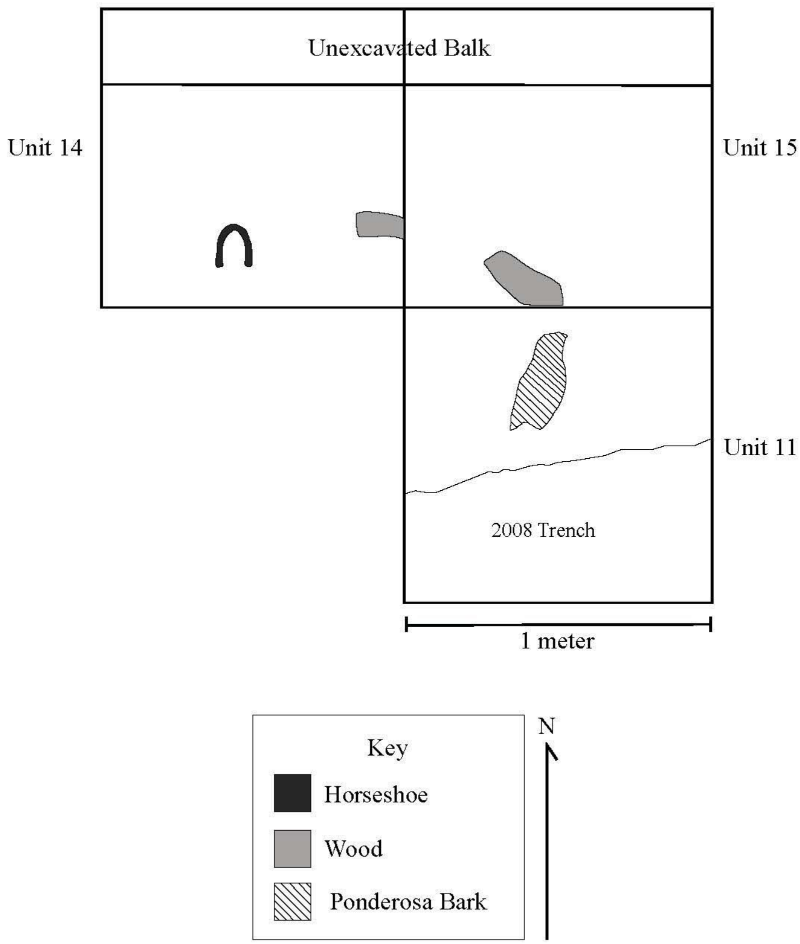
EeRl4 Housepit 54
Block A South Wall Profile



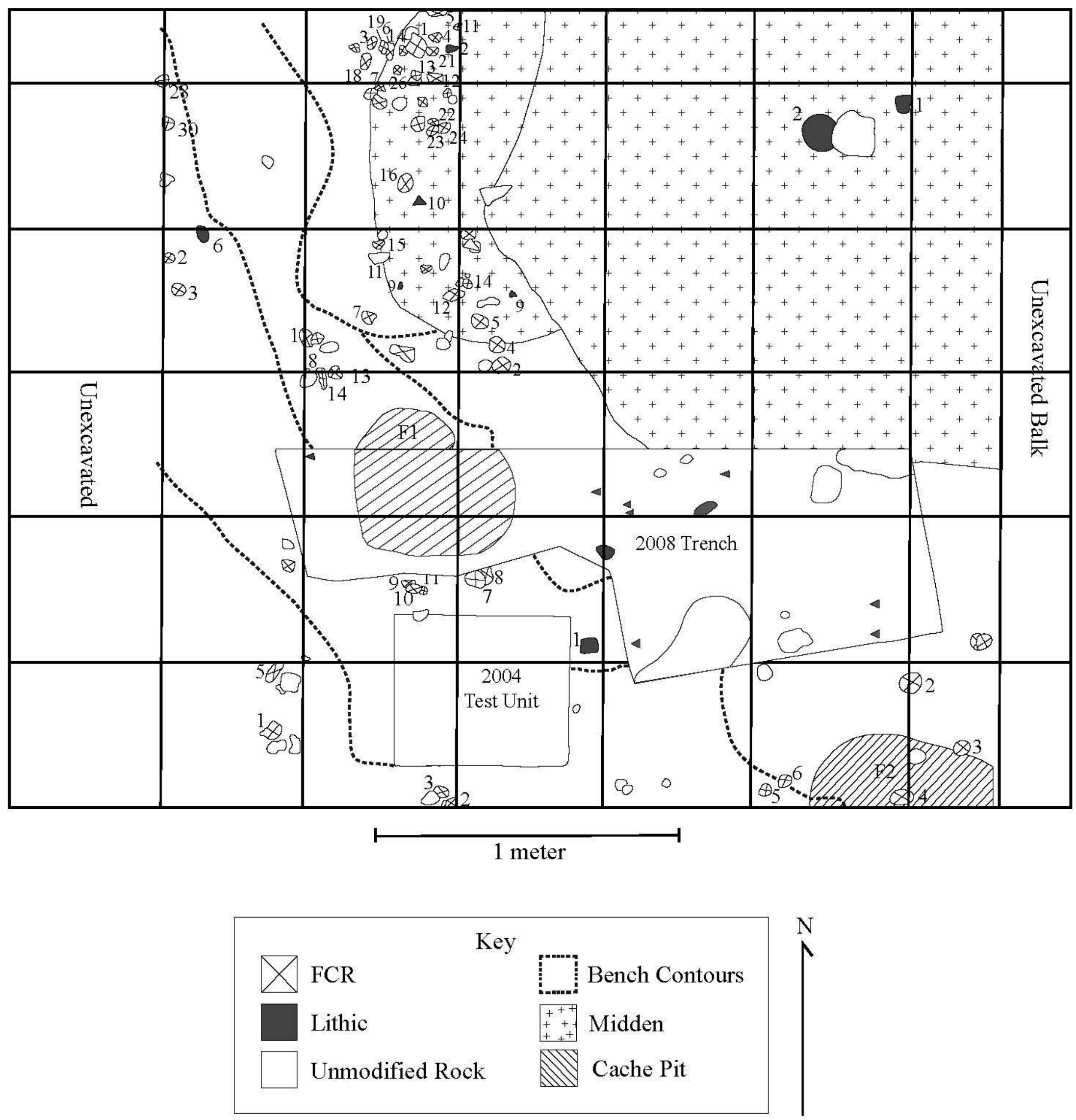
EeRl4 Housepit 54
Block A West Wall Proifle



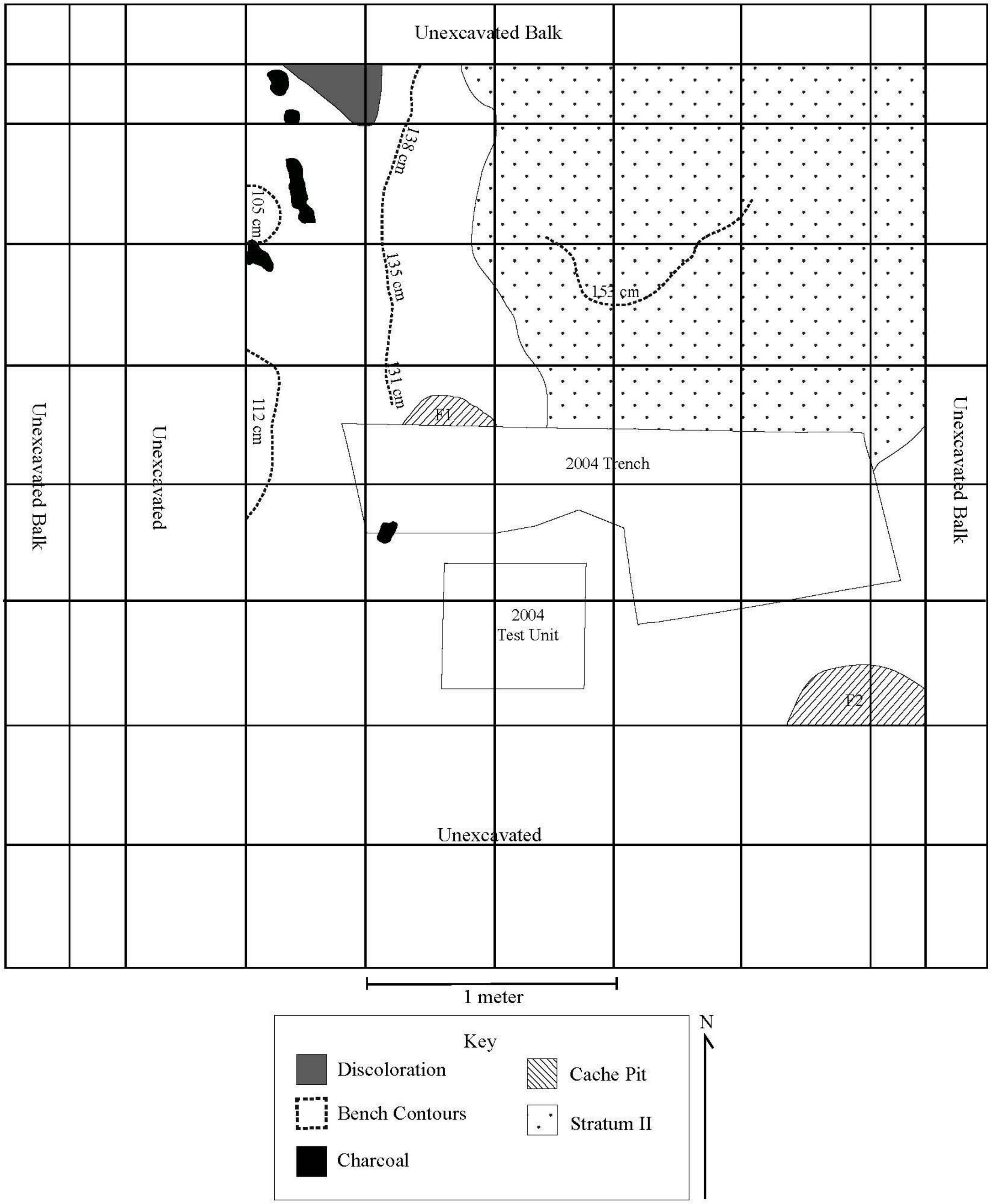
EeRl4 Housepit54
Block A, Units 11, 14, and 15
Stratum V



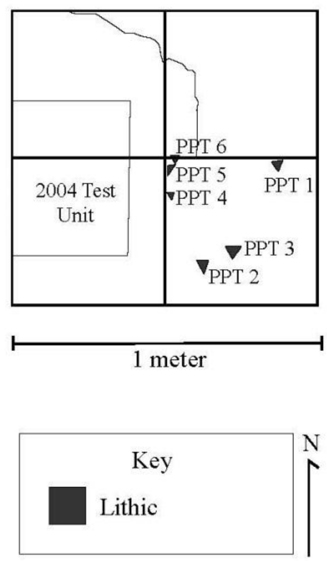
EeRl4 Housepit 54
Block A Stratum II



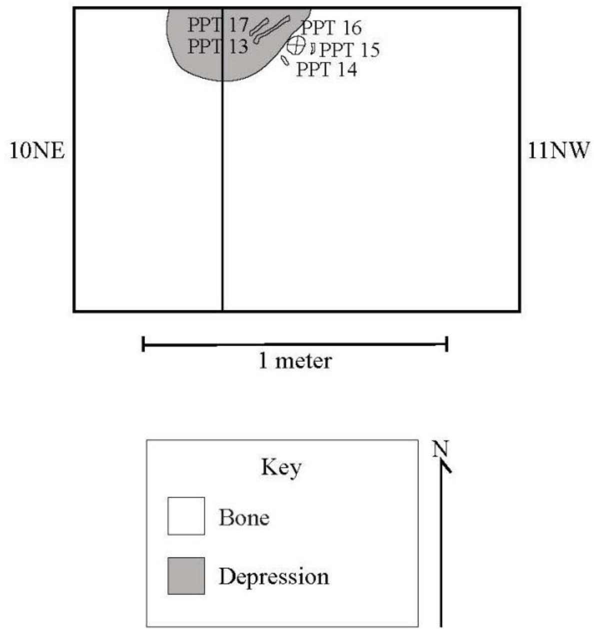
EeRl4 Housepit 54
Block A Stratum Va

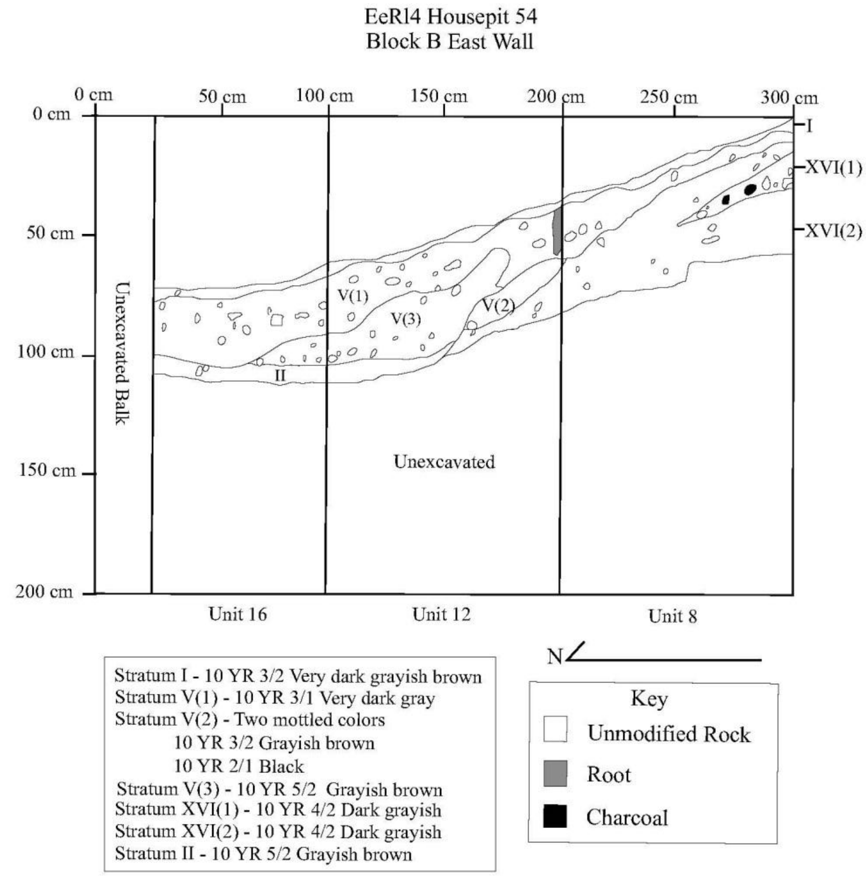


EeRl4 Housepit 54
Block A, Unit 7SE, Stratum

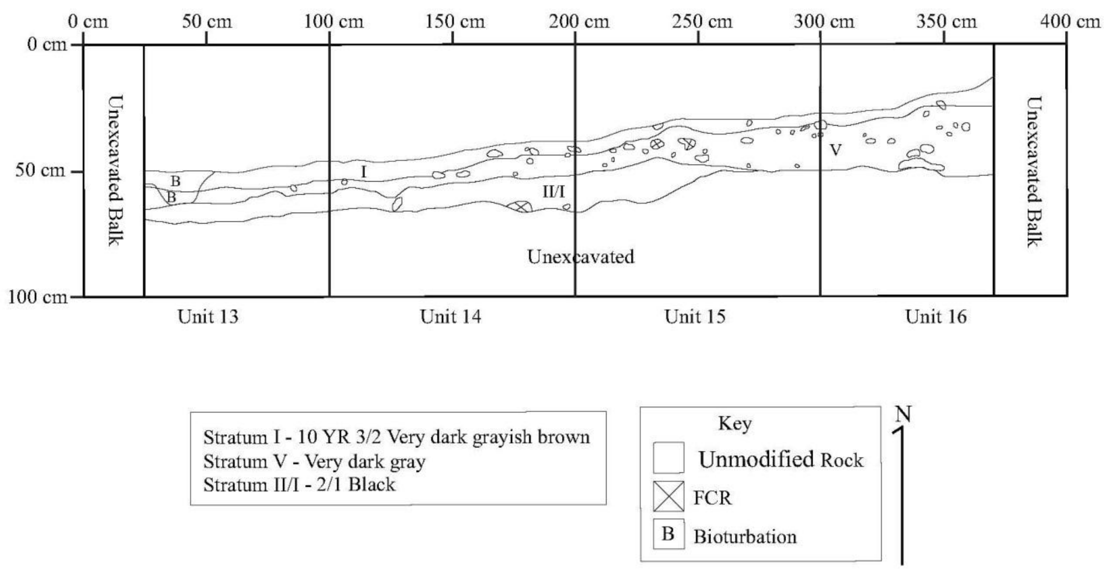


EeRl4 Housepit 54
Block A, Unit 11NW, Stratum II

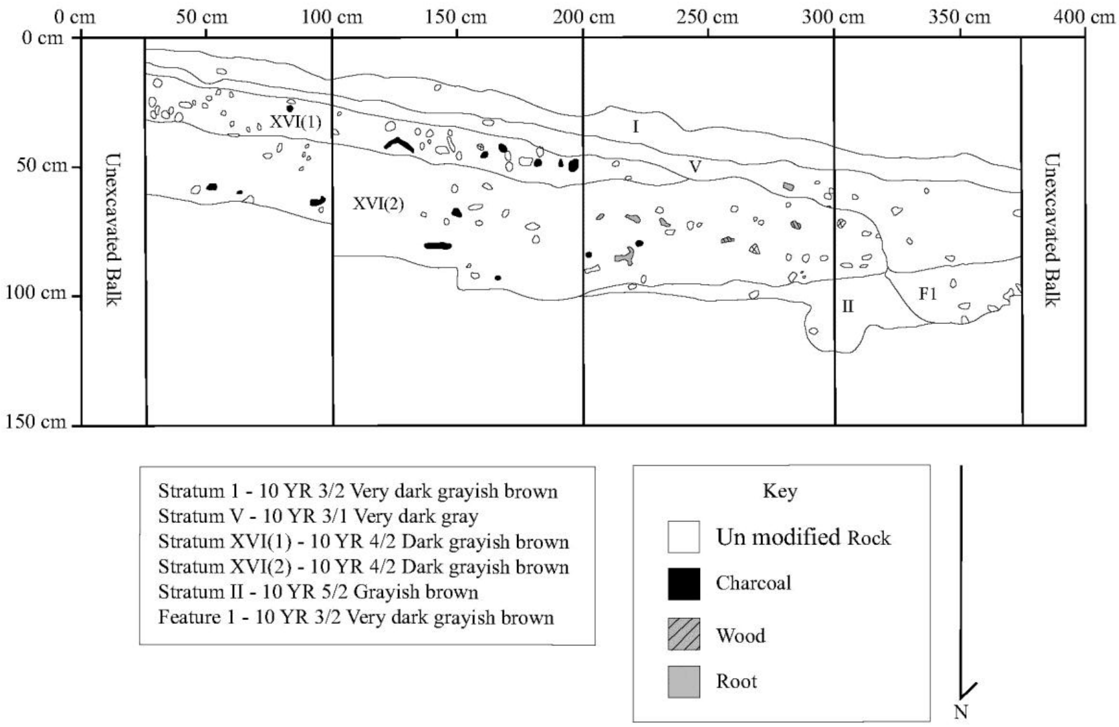



EeRl4 Housepit 54
Block B East Wall
0 cm
50 cm
100 cm
150 cm
200 cm
250 cm
300 cm
0 cm
50 cm
100 cm
150 cm
200 cm
I
XVI(1)
XVI(2)
V(1)
V(3)
V(2)
II
Unexcavated Balk
Unexcavated
Unit 16
Unit 12
Unit 8
N
Stratum I - 10 YR 3/2 Very dark grayish brown
Stratum V(1) - 10 YR 3/1 Very dark gray
Stratum V(2) - Two mottled colors
10 YR 3/2 Grayish brown
10 YR 2/1 Black
Stratum V(3) - 10 YR 5/2 Grayish brown
Stratum XVI(1) - 10 YR 4/2 Dark grayish
Stratum XVI(2) - 10 YR 4/2 Dark grayish
Stratum II - 10 YR 5/2 Grayish brown
Key
Unmodified Rock
Root
Charcoal

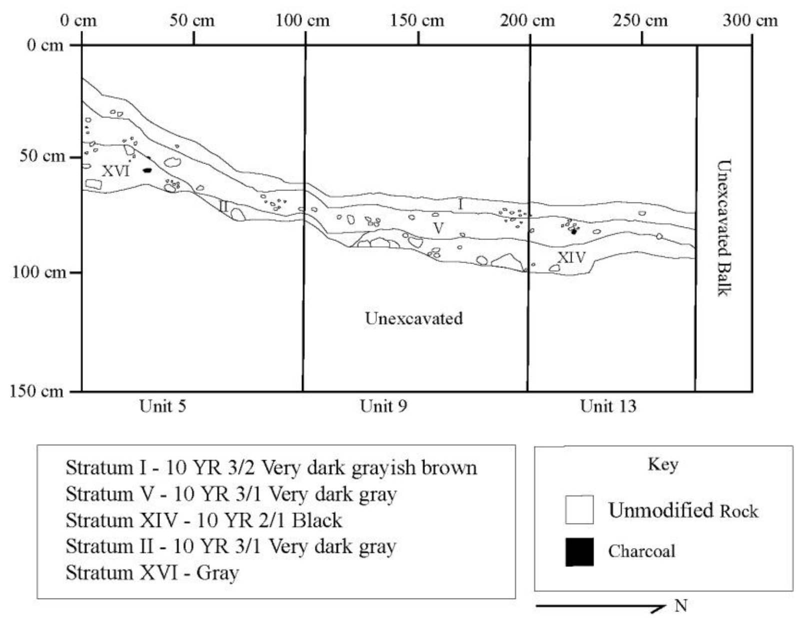
EeRl4 Housepit 54
Block B North Wall Profile



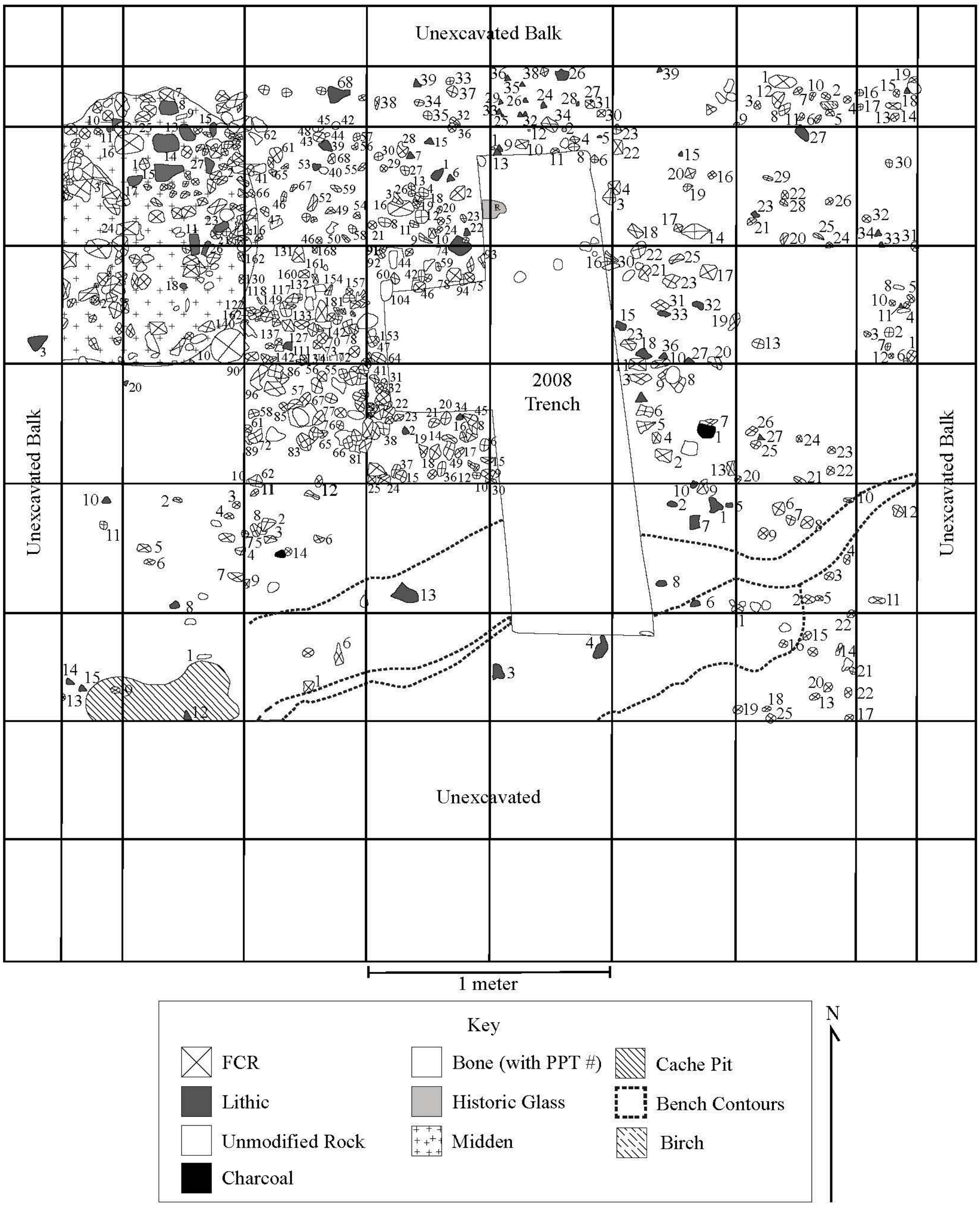
EeRl4 Housepit 54
Block B South Wall Profile



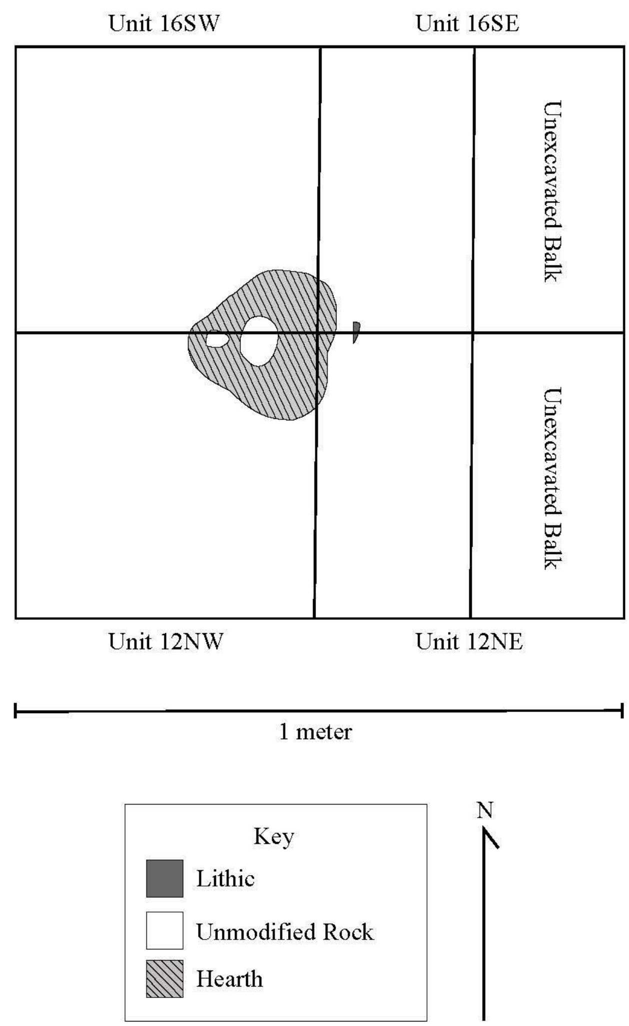
EeRl4 Housepit 54
Block B West Wall Profile



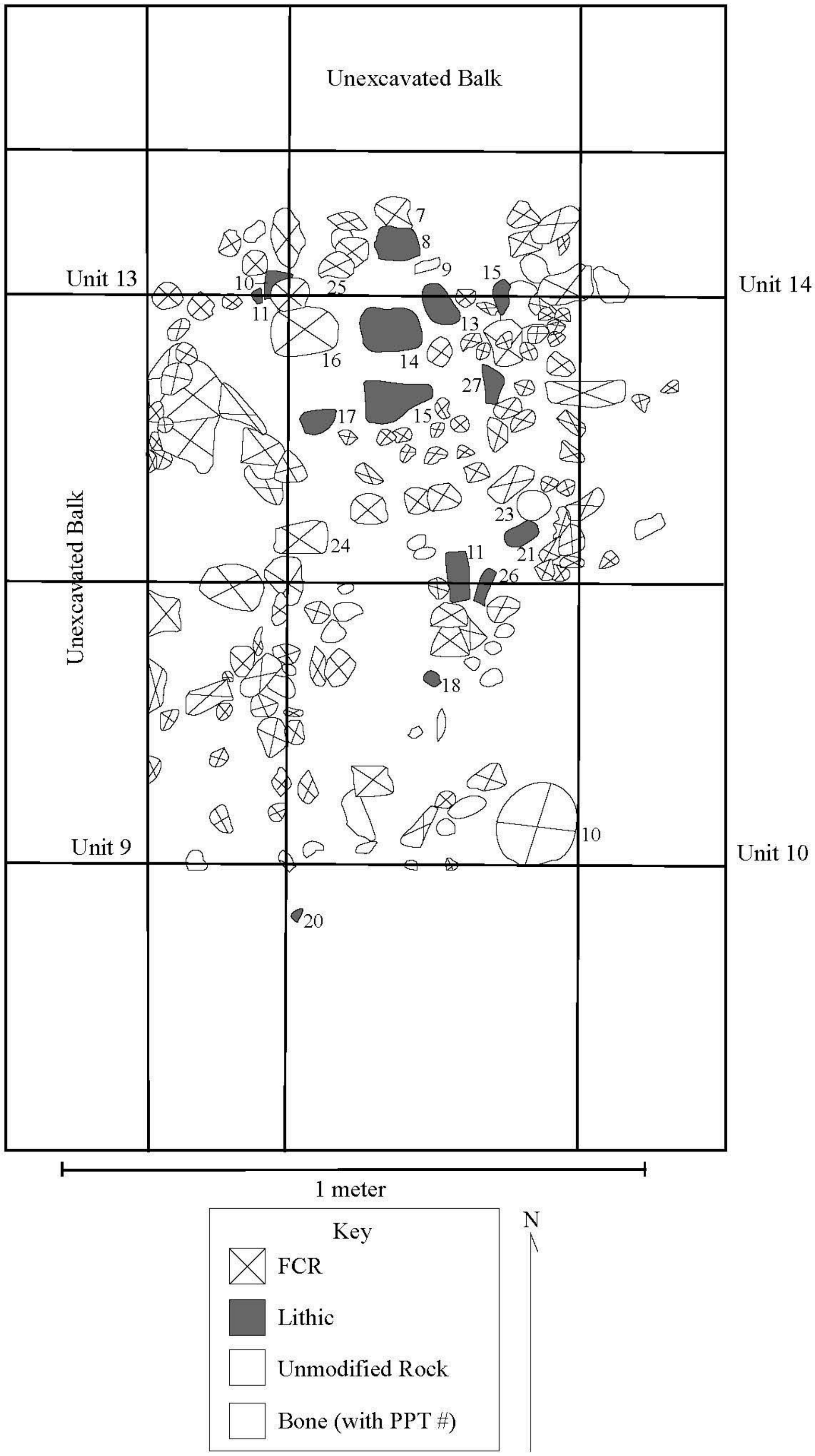
EeRl4 Housepit 54
Block B Stratum II



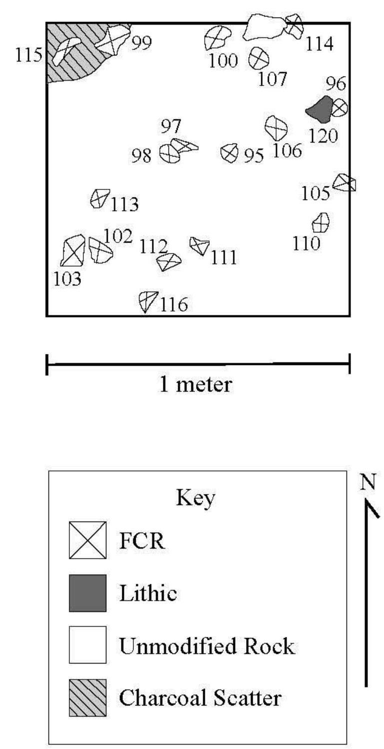
EeRl4 Housepit 54
Block B Units 12 and 16
Stratum IIa, Level 1
Feature 2



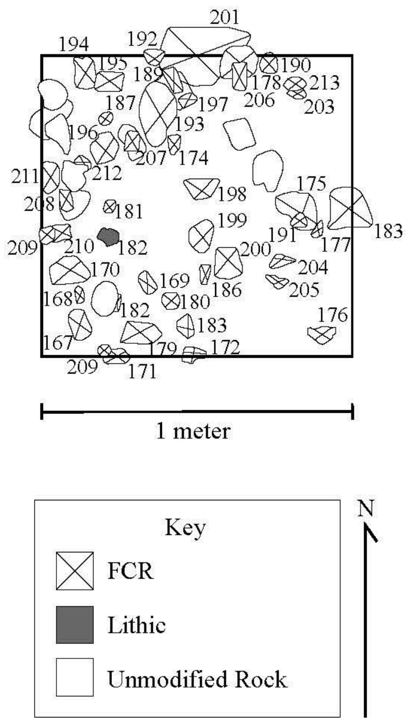
EeRl4 Housepit 54
Block B Stratum XIV Map



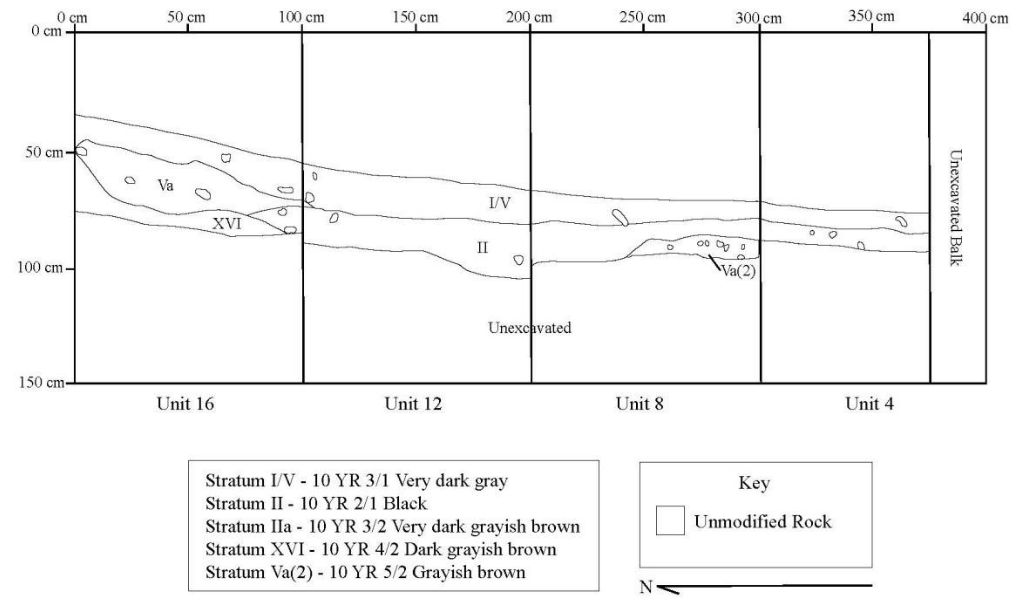
EeRl4 Housepit 54
Block B, Unit 10SW, Stratum II



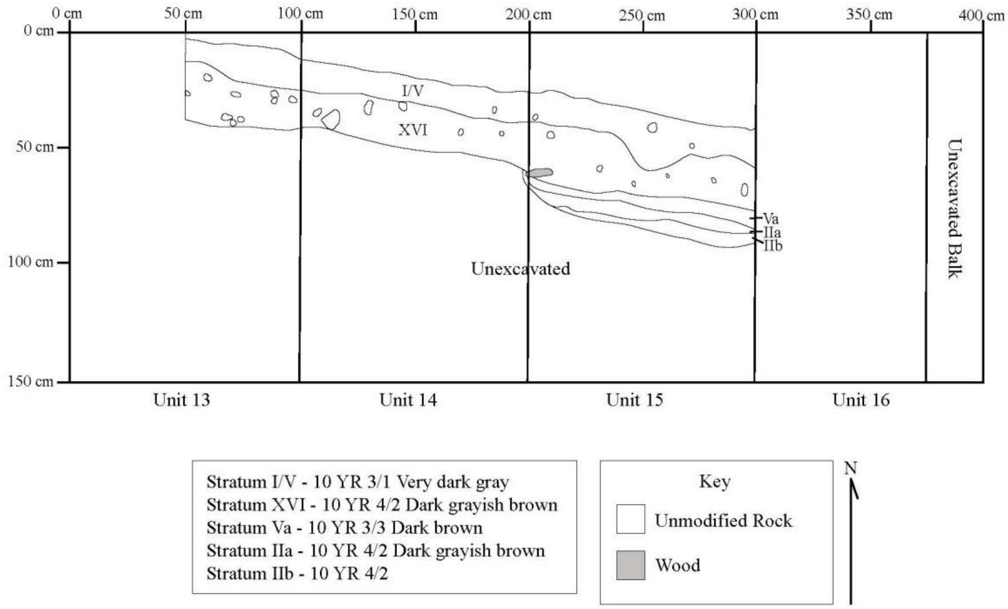
EeRl4 Housepit 54
Block B, Unit 10NW, Stratum II



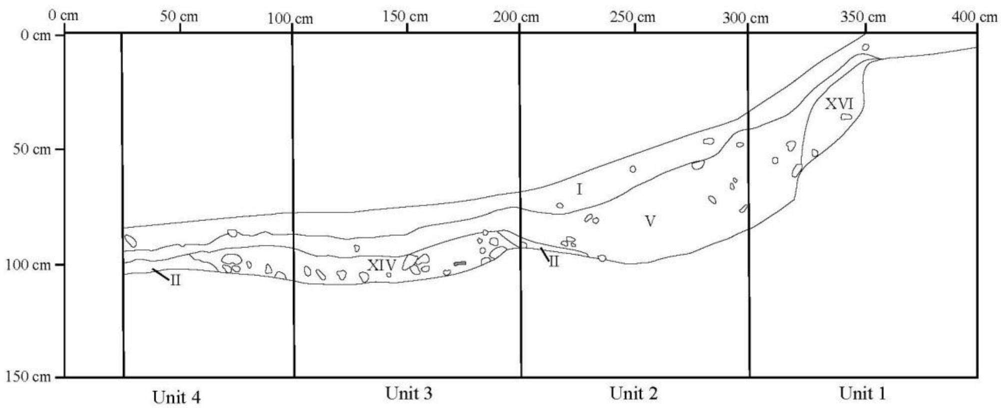
EeRl4 Housepit 54
Block C East Wall Profile



EeRl4 Housepit 54
Block C North Wall Profile



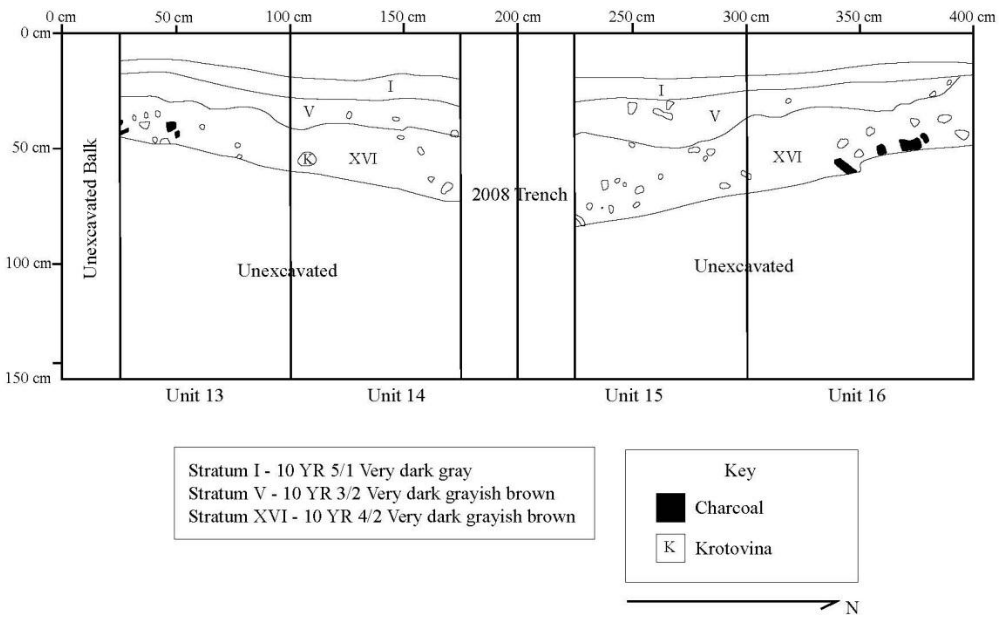
EeRl4 Housepit 54
Block C South Wall Profile



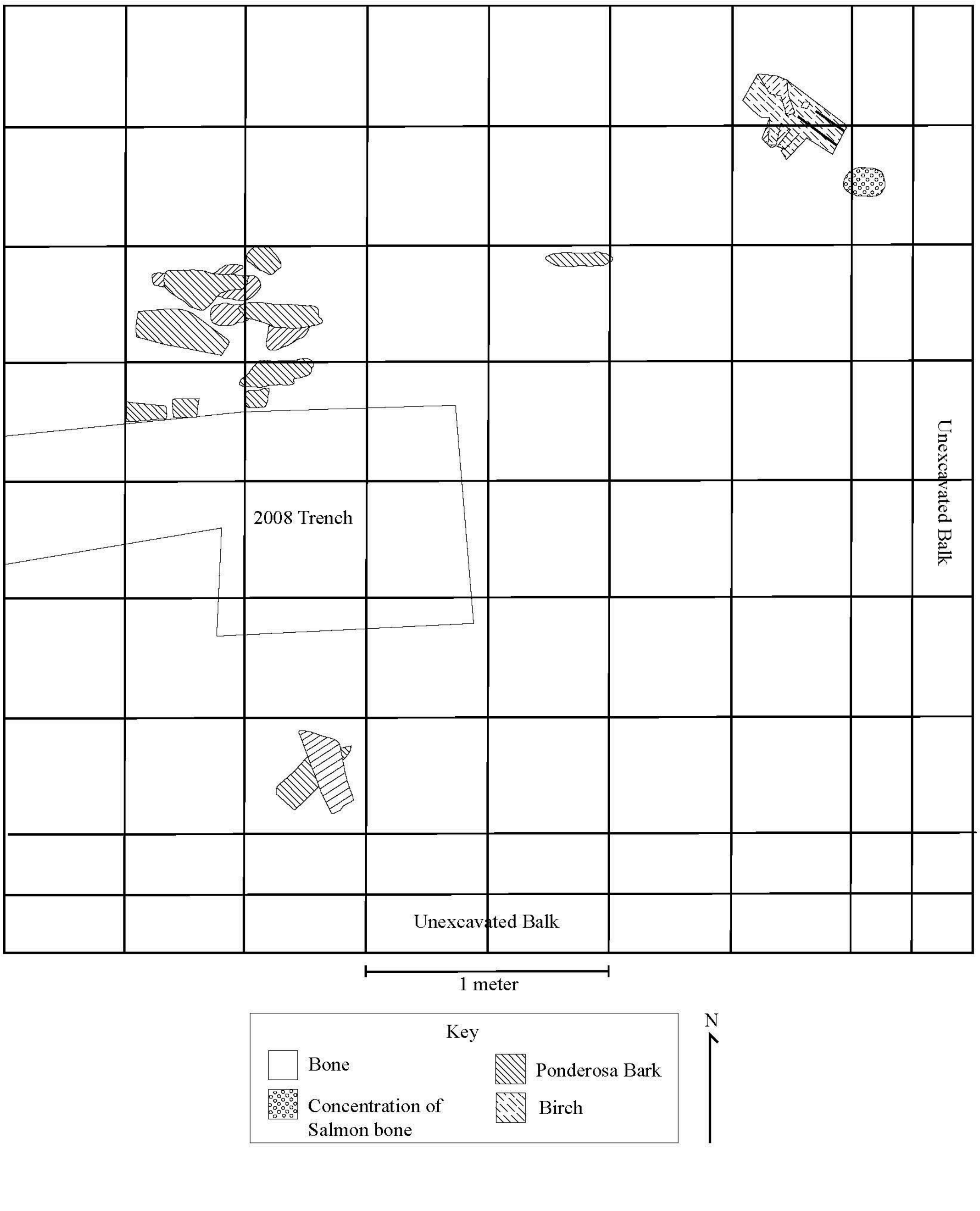
Stratum I - 10 YR Very dark brown
Stratum V - 10 YR 3/2 Very dark grayish brown
Stratum XIV - 10 YR 2/1 Black
Stratum XVI - 10 YR 4/1 Dark gray
Stratum II - 10 YR 3/1 Very dark gray

Key
Unmodified Rock
Bone

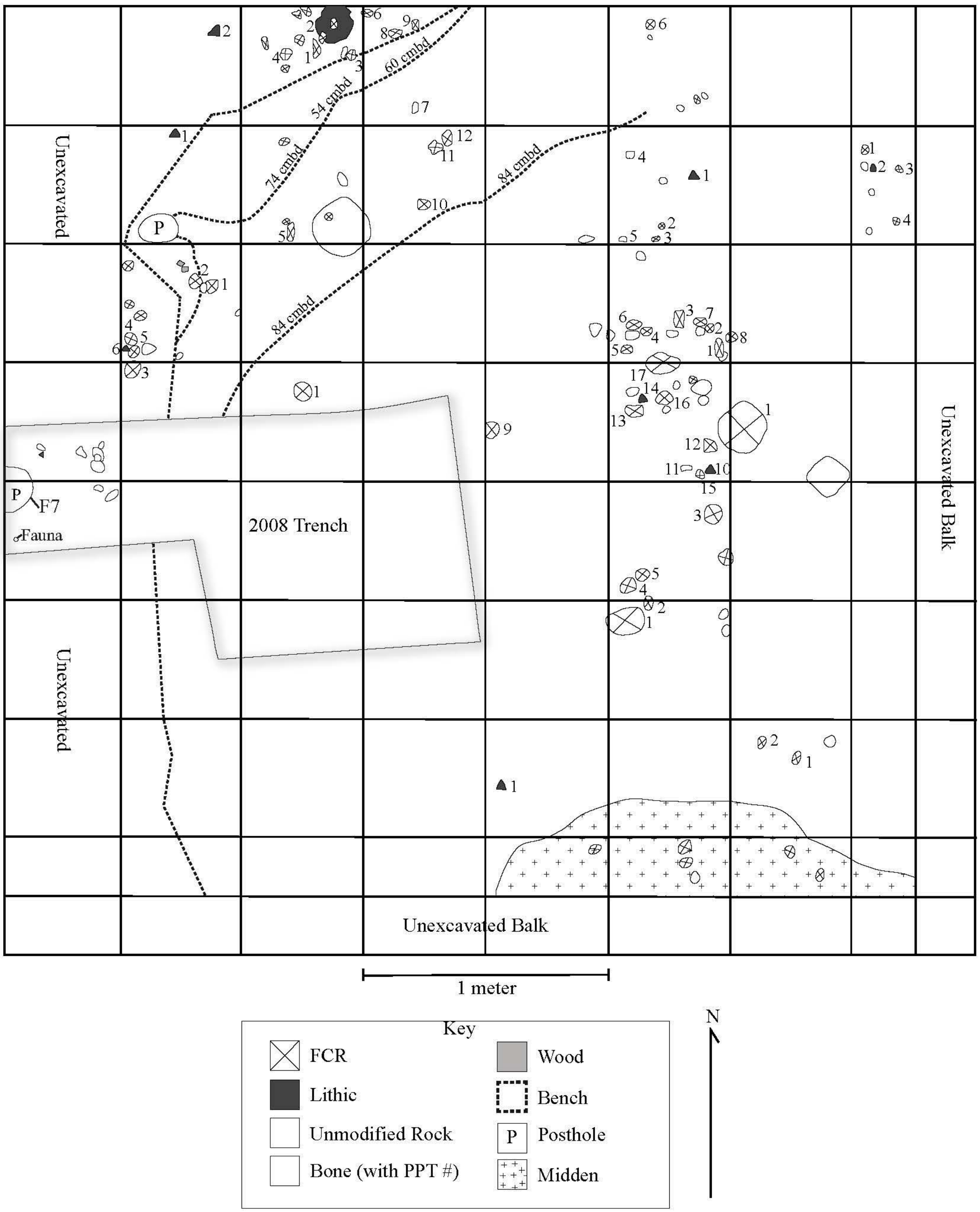
EeRl4 Housepit 54
Block C West Wall Profile



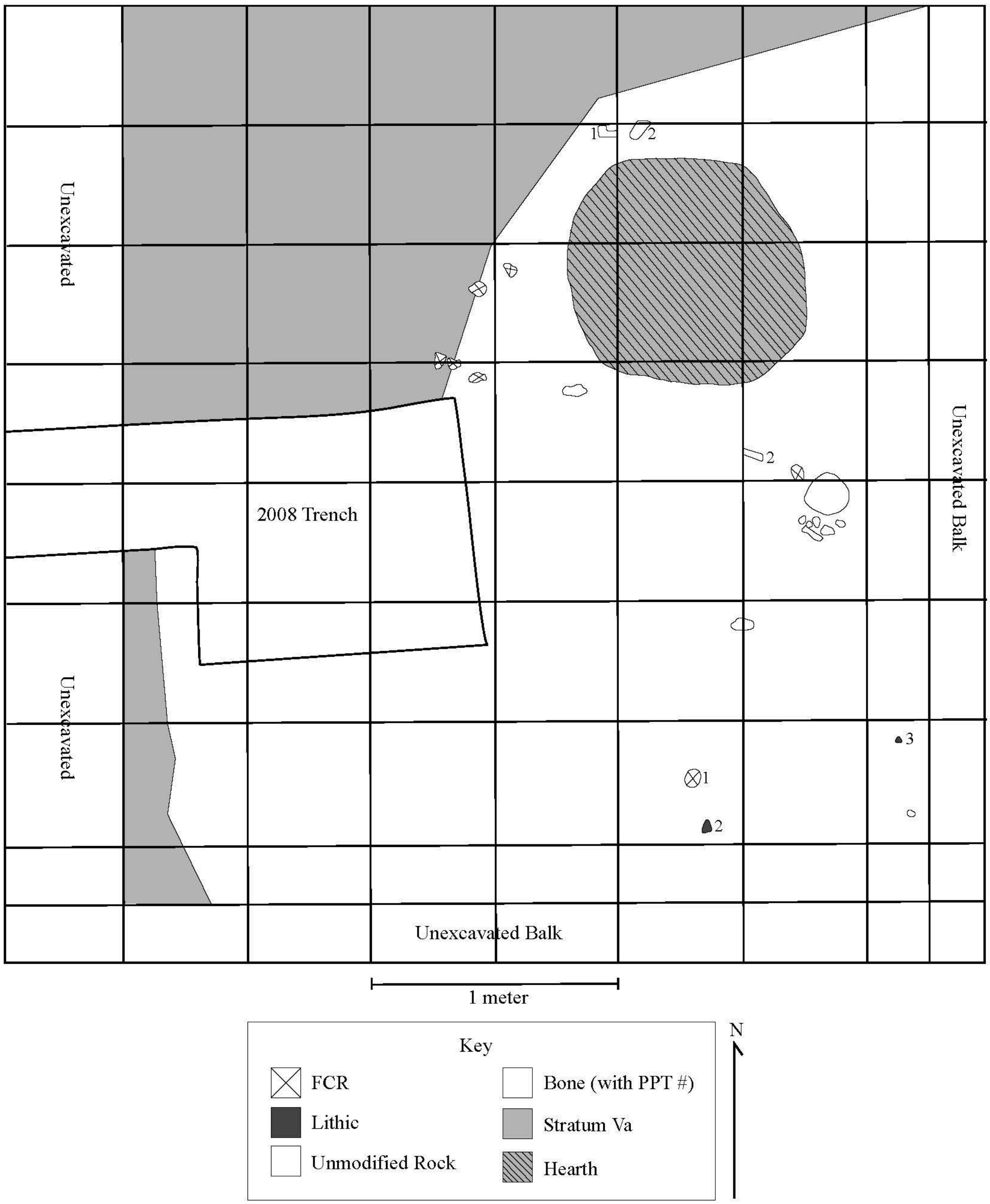
EeRl4 Housepit 54
Block C Stratum V

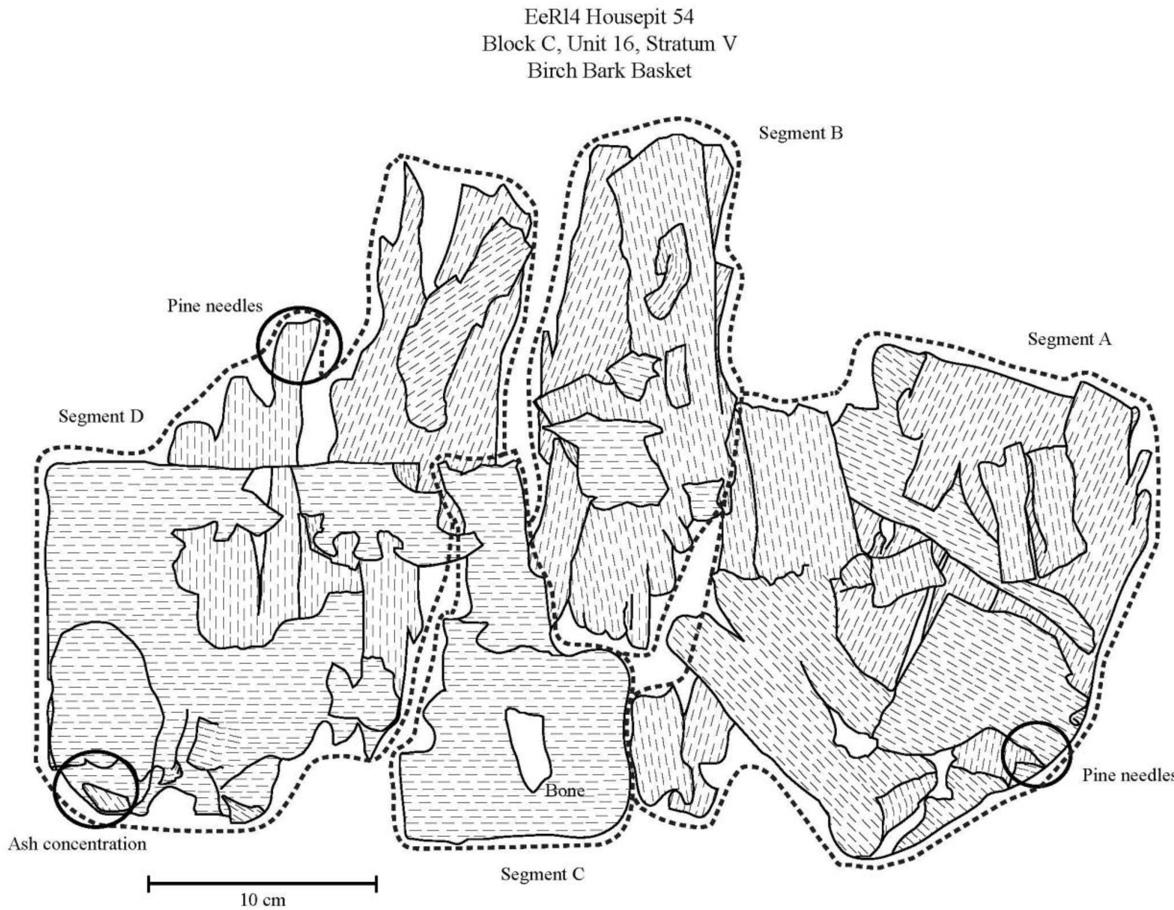


EeRl4 Housepit 54
Block C Stratum II

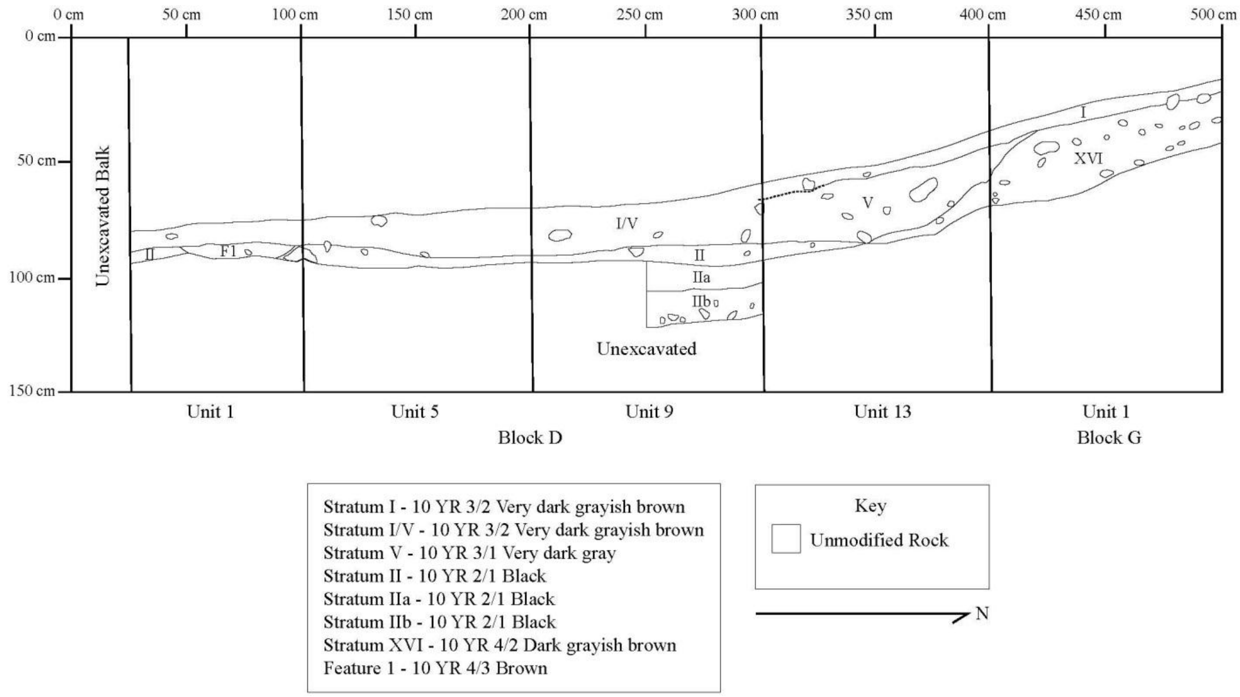


EeRl4 Housepit 554
Block C Stratum IIa

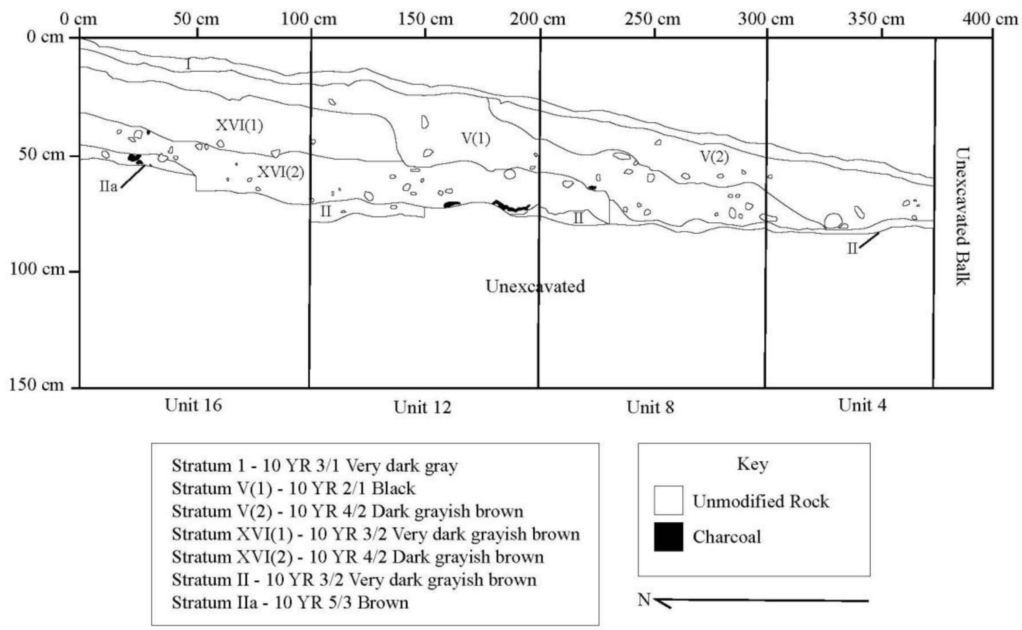



EeRl4 Housepit 54
Block C, Unit 16, Stratum V
Birch Bark Basket
Segment B
Pine needles
Segment A
Segment D
Bone
Pine needles
Ash concentration
10 cm
Segment C

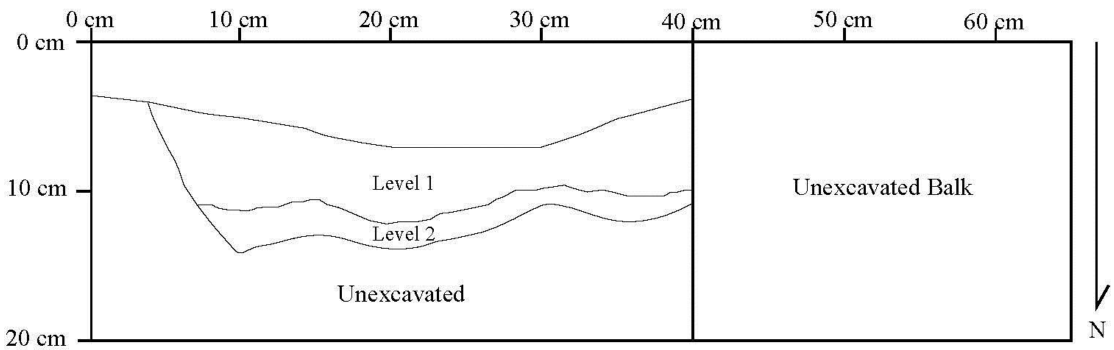
EeRl4 Housepit 54
Block D and G West Wall Profile



EeRl4 Housepit 54
Block D East Wall Profile

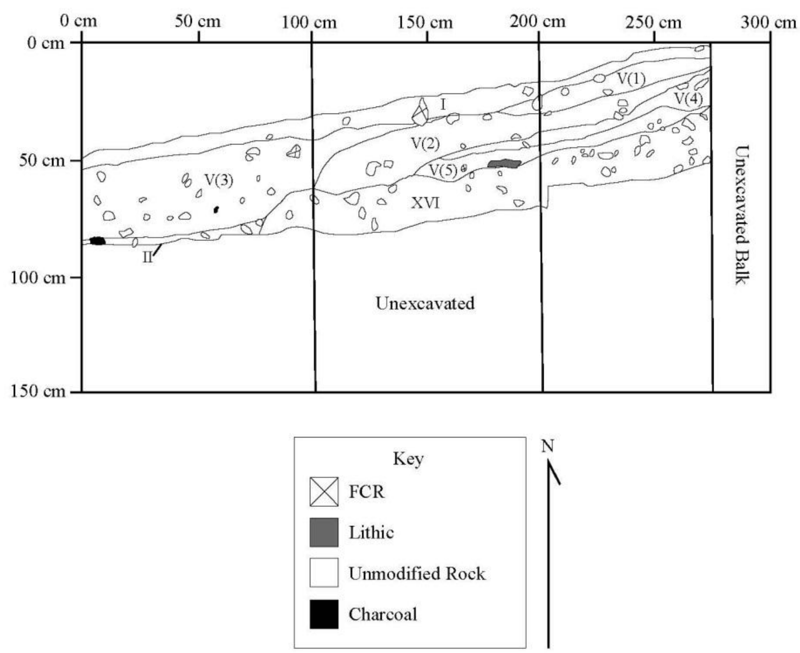


EeRl4 Housepit 54
Block D, Unit 1, Stratum V, Level 1
Feature 1

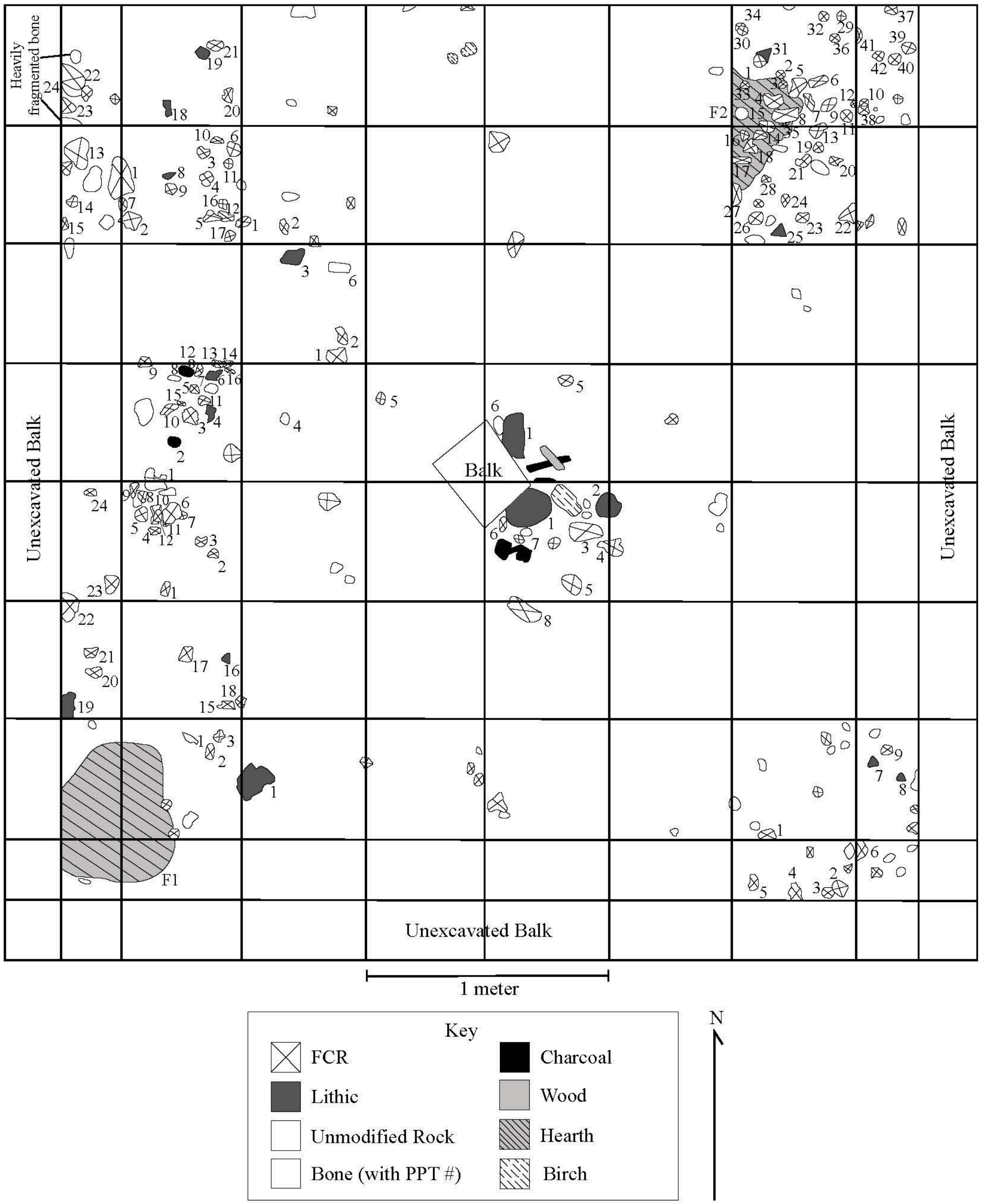


Level 1 - 10 YR 4/3 Brown
Level 2 - 10 YR 3/6 Dark yellowish brown

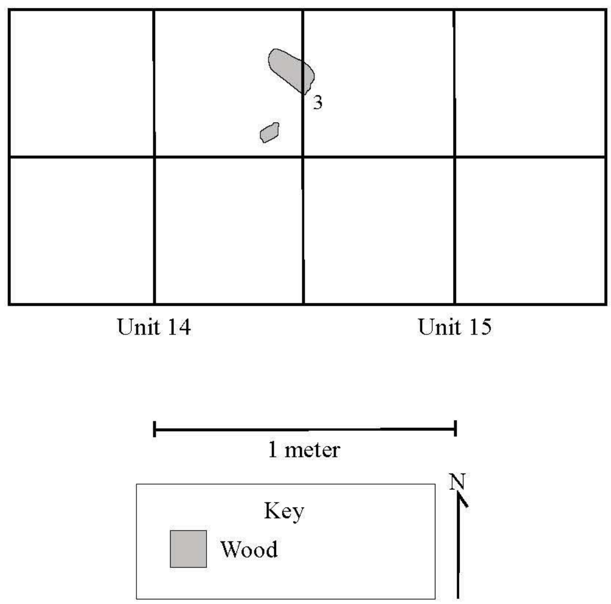
EeRl4 Housepit 54
Block D North Wall Profile



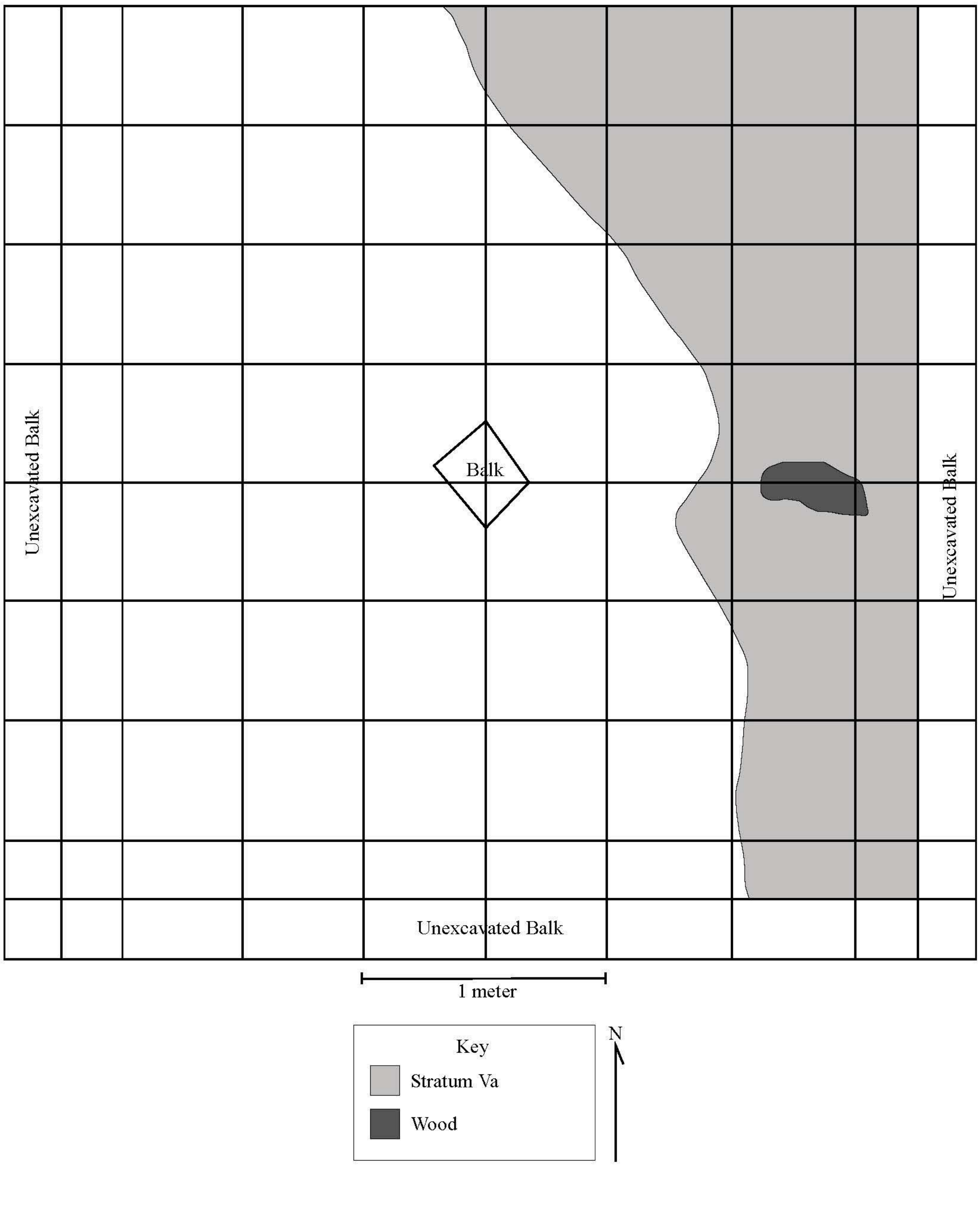
EeRl4 Housepit 54
Block D Stratum II

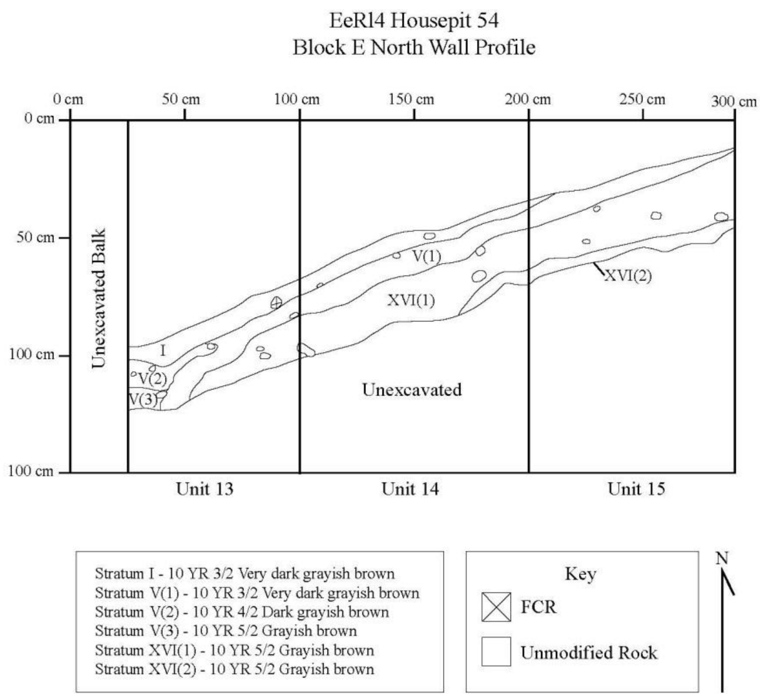


EeRl4 Housepit 54
Block D, Units 14 and 15, Stratum IIa

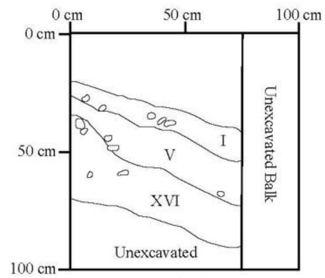


EeRl4 Housepit 54
Block D, Stratum Va




EeRl4 Housepit 54
Block E North Wall Profile
0 cm
50 cm
100 cm
150 cm
200 cm
250 cm
300 cm
0 cm
50 cm
100 cm
100 cm
Unexcavated Balk
I
V(1)
V(2)
V(3)
XVI(1)
XVI(2)
Unexcavated
Unit 13
Unit 14
Unit 15
Stratum I - 10 YR 3/2 Very dark grayish brown
Stratum V(1) - 10 YR 3/2 Very dark grayish brown
Stratum V(2) - 10 YR 4/2 Dark grayish brown
Stratum V(3) - 10 YR 5/2 Grayish brown
Stratum XVI(1) - 10 YR 5/2 Grayish brown
Stratum XVI(2) - 10 YR 5/2 Grayish brown
Key
FCR
Unmodified Rock
N

EeRl4 Housepit 54
Block E South Wall Profile



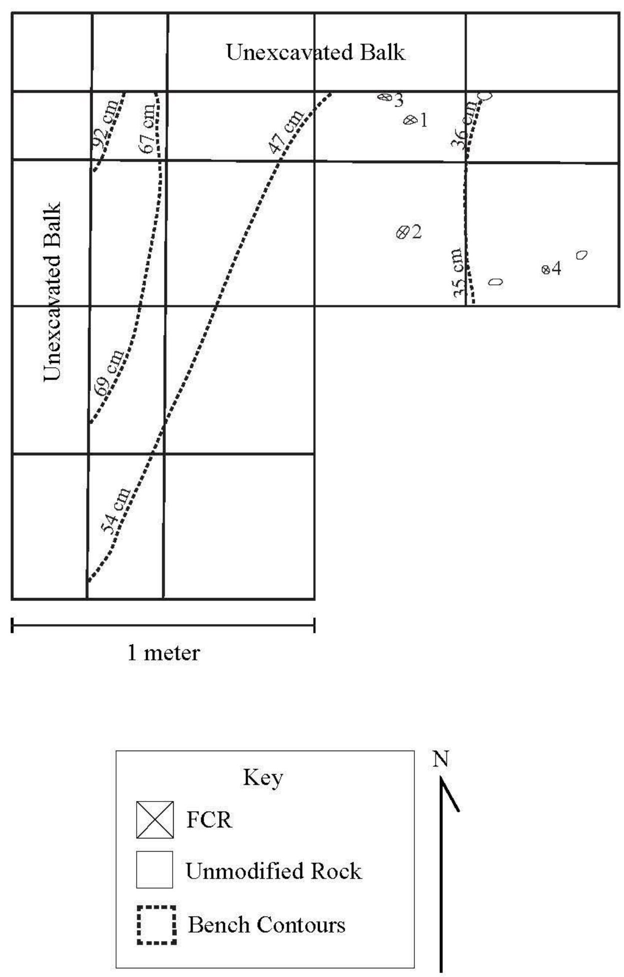
Unit 9

Stratum I - 10 YR 3/2 Very dark grayish brown
Stratum V - 10 YR 2/1 Black and 10 YR 3/2 Very dark grayish brown
Stratum XVI - 10 YR 4/2 Dark grayish brown

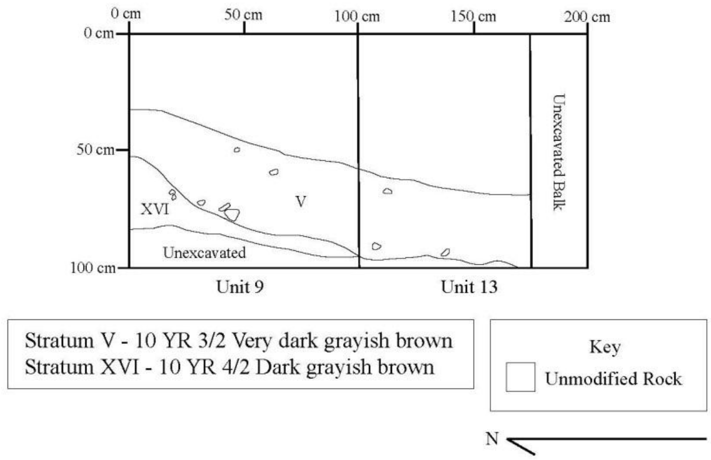
Key
Unmodified Rock

N

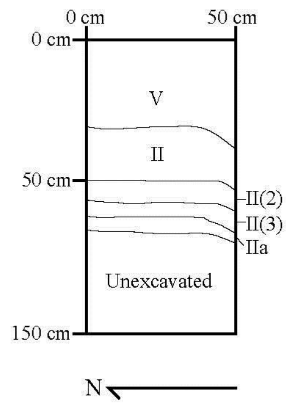
EeRl4 Housepit 54
Block E Sratum XVI



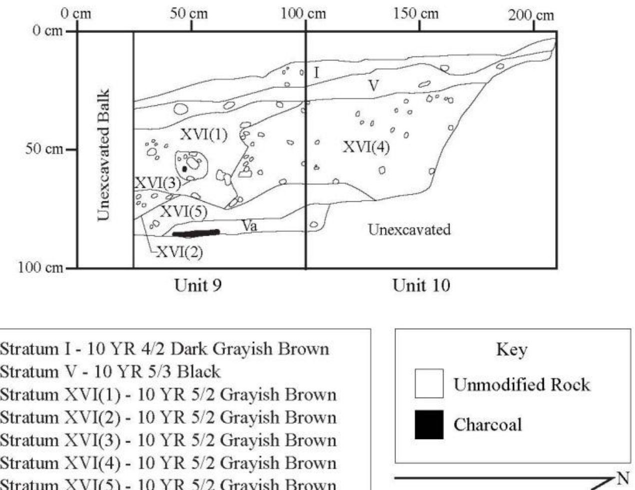
EeRl4 Housepit 54
Block E West Wall Profile



EeRl4 Housepit 54
Block F East Wall Profile



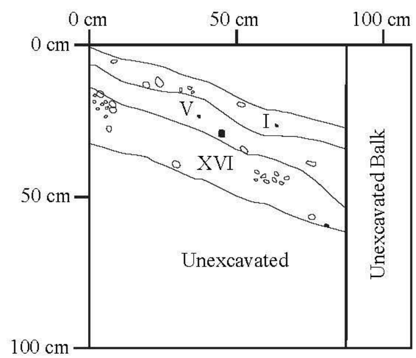
EeRI4 Housepit 54
Block F North Wall Profile



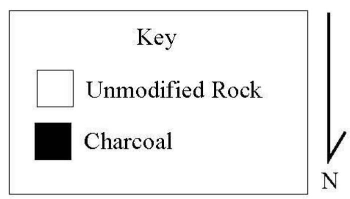
Stratum I - 10 YR 4/2 Dark Grayish Brown
Stratum V - 10 YR 5/3 Black
Stratum XVI(1) - 10 YR 5/2 Grayish Brown
Stratum XVI(2) - 10 YR 5/2 Grayish Brown
Stratum XVI(3) - 10 YR 5/2 Grayish Brown
Stratum XVI(4) - 10 YR 5/2 Grayish Brown
Stratum XVI(5) - 10 YR 5/2 Grayish Brown
StratumVa - 10YR 5/2 Grayish Brown

Key
Unmodified Rock
Charcoal

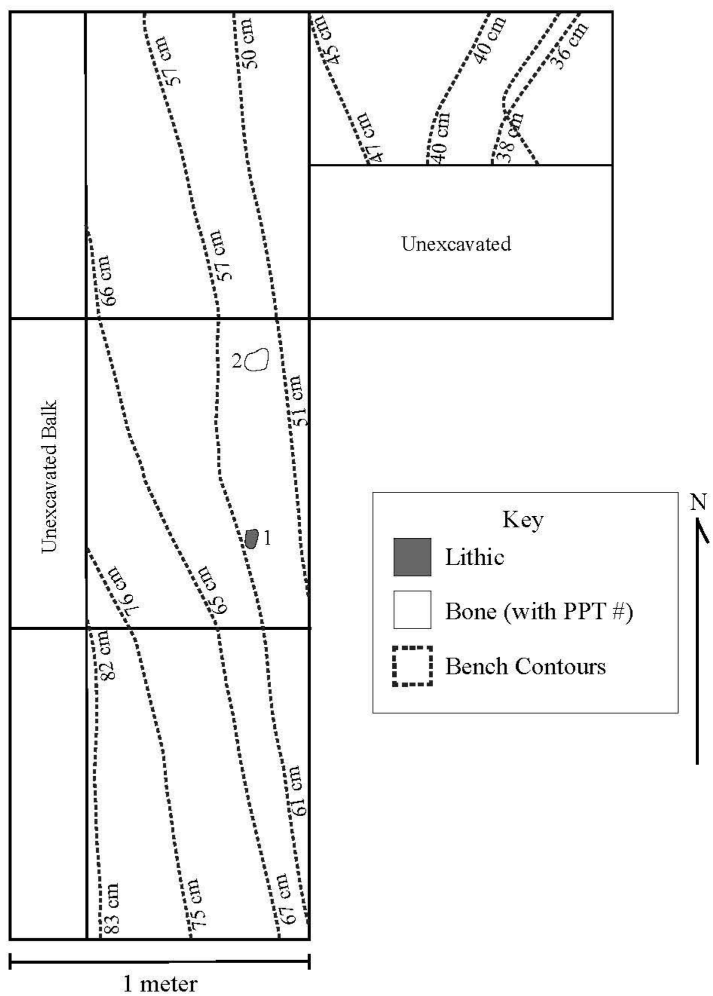
EeRI4 Housepit 54
Block F South Wall Profile



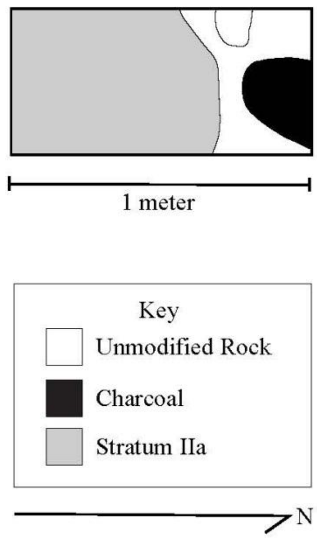
Stratum I - 10 YR 4/2 Dark grayish brown
Stratum V - 10 YR Very dark grayish brown
Stratum XVI - 10 YR 5/2 Grayish brown



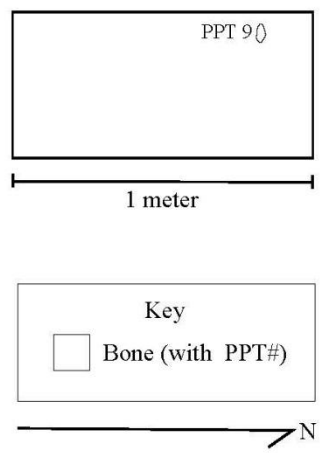
EeRl4 Housepit 54
Block F Stratum XVI



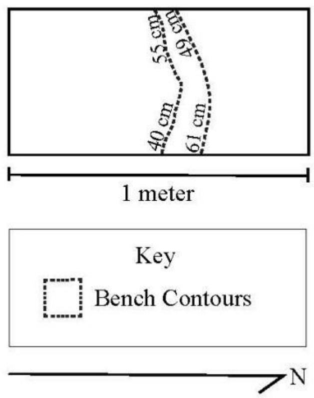
EeRl4 Housepit 54
Block F, Unit 9, Stratum II



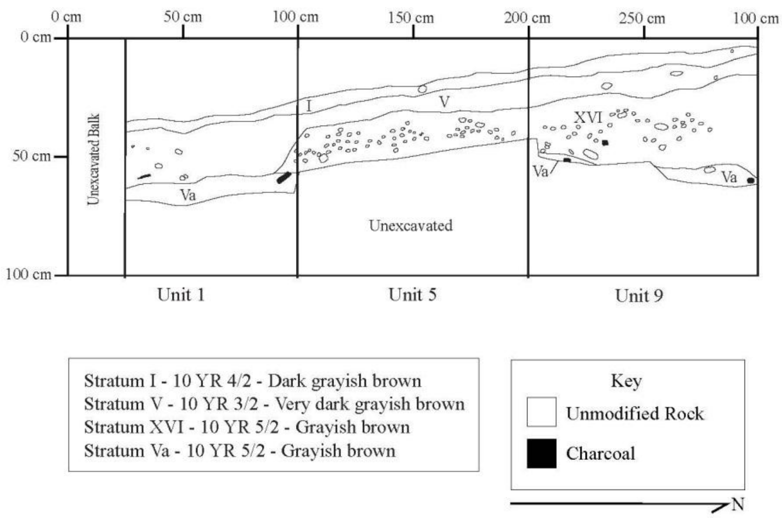
EeRl4 Housepit 54
Block F Stratum IIa



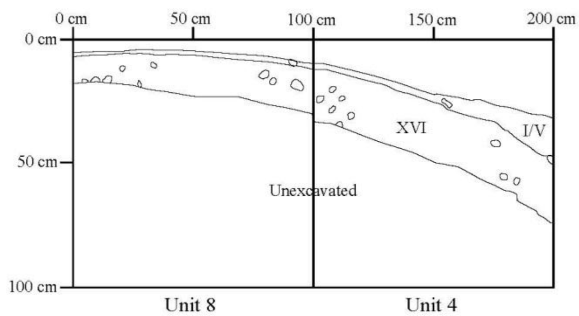
EeRl4 Housepit 54
Block F Stratum V



EeRl4 Housepit 54
Block F West Wall Profile



EeRl4 Housepit 54
Block G West Wall Profile



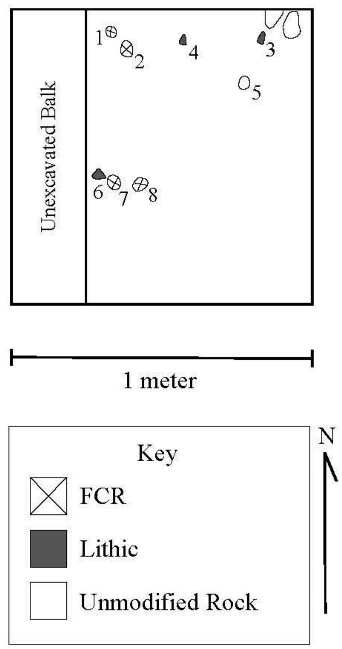
Stratum I/V - 10 YR 3/1 Very dark gray
Stratum XVI - 10 YR 4/2 Dark grayish brown

Key

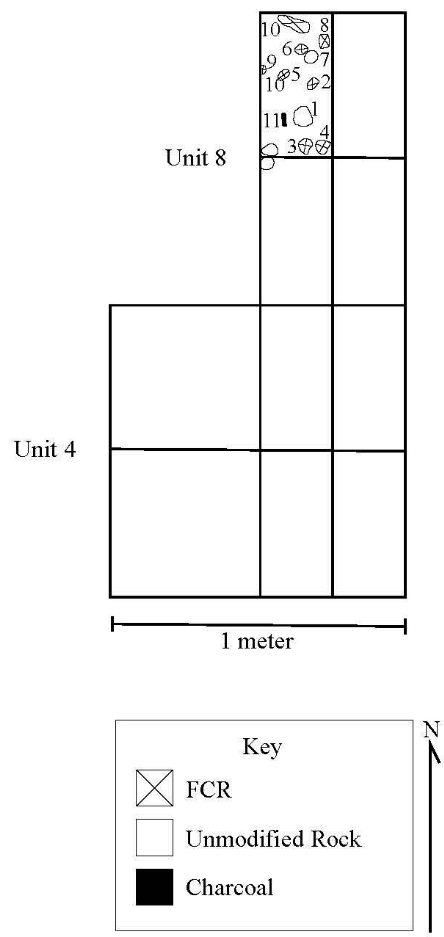
Unmodified Rock

N

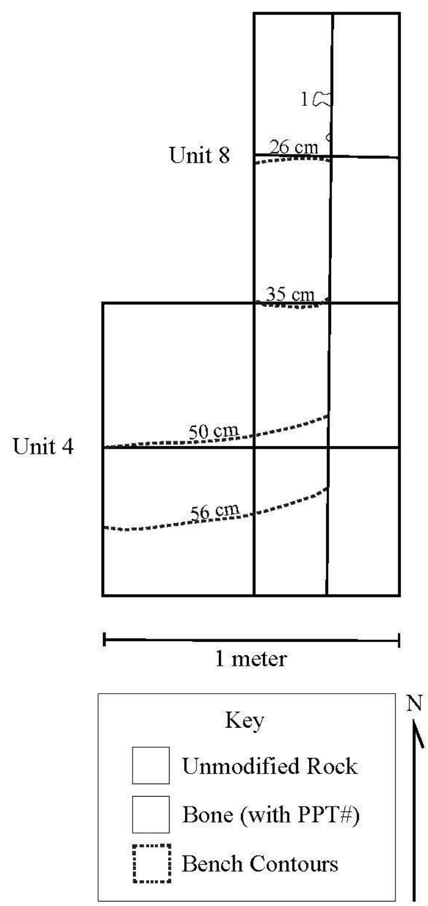
EeRl4 Housepit 54
Block G, Unit 1 Stratum II



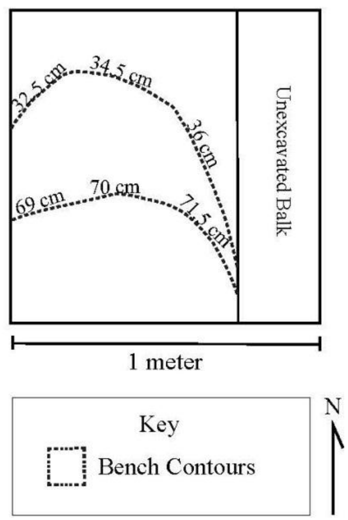
EeRl4 Housepit 54
Block H Stratum II



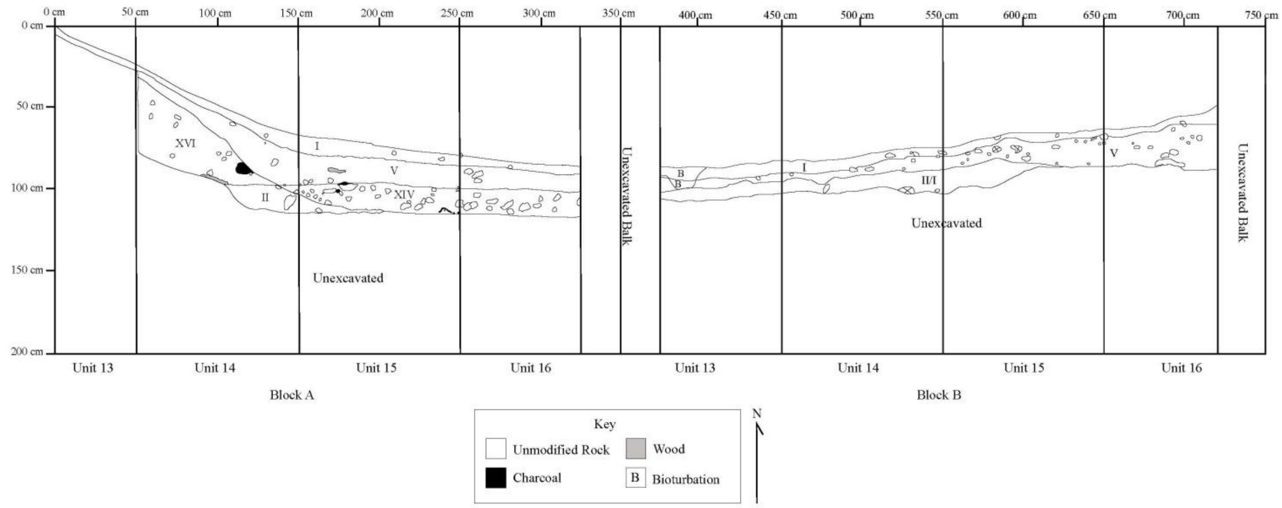
EeRl4 Housepit 54
Block H Stratum XVI



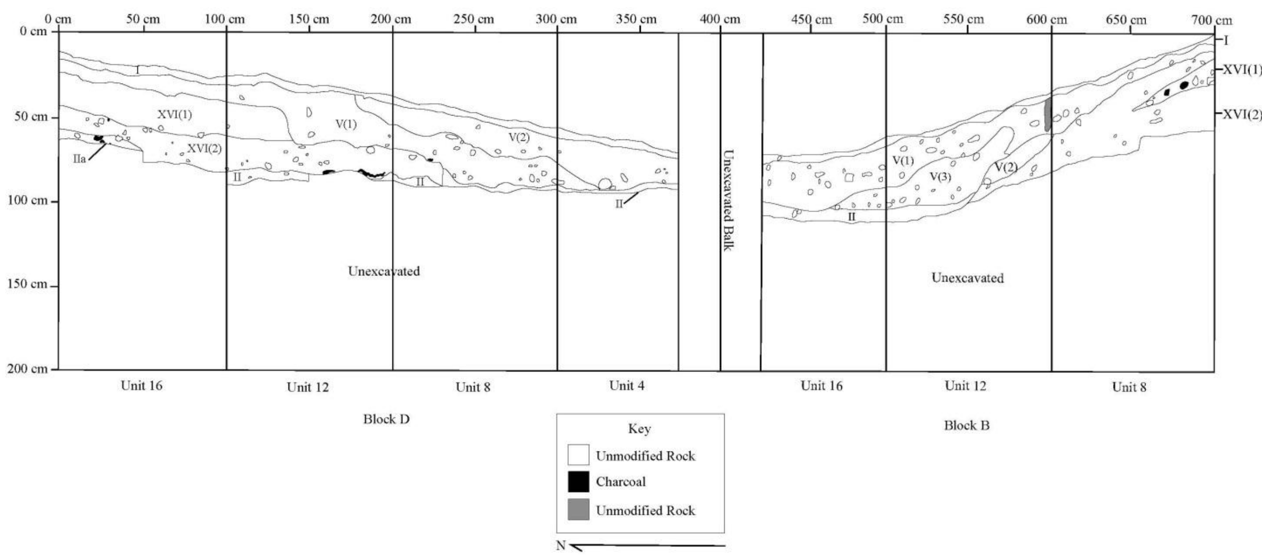
EeRl4 Housepit 54
Block H Stratum XVI



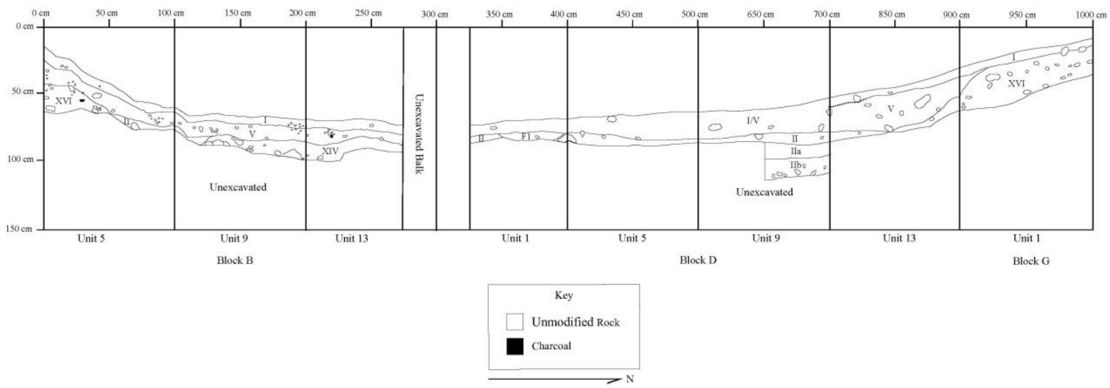
EeRl4 Housepit 54
Blocks A and B North Wall Profile



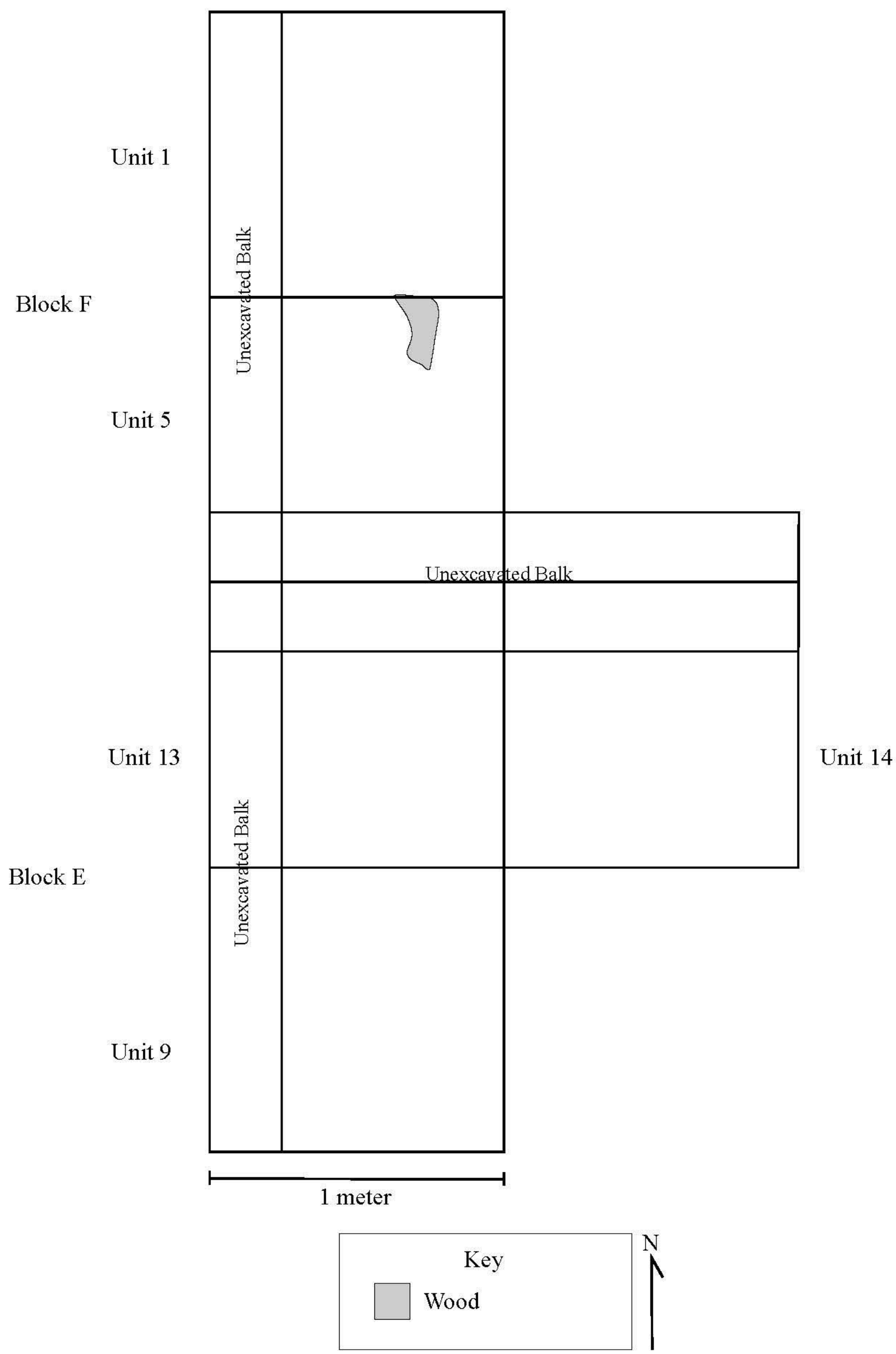
EeRl4 Housepit 54
Blocks B and D East Wall

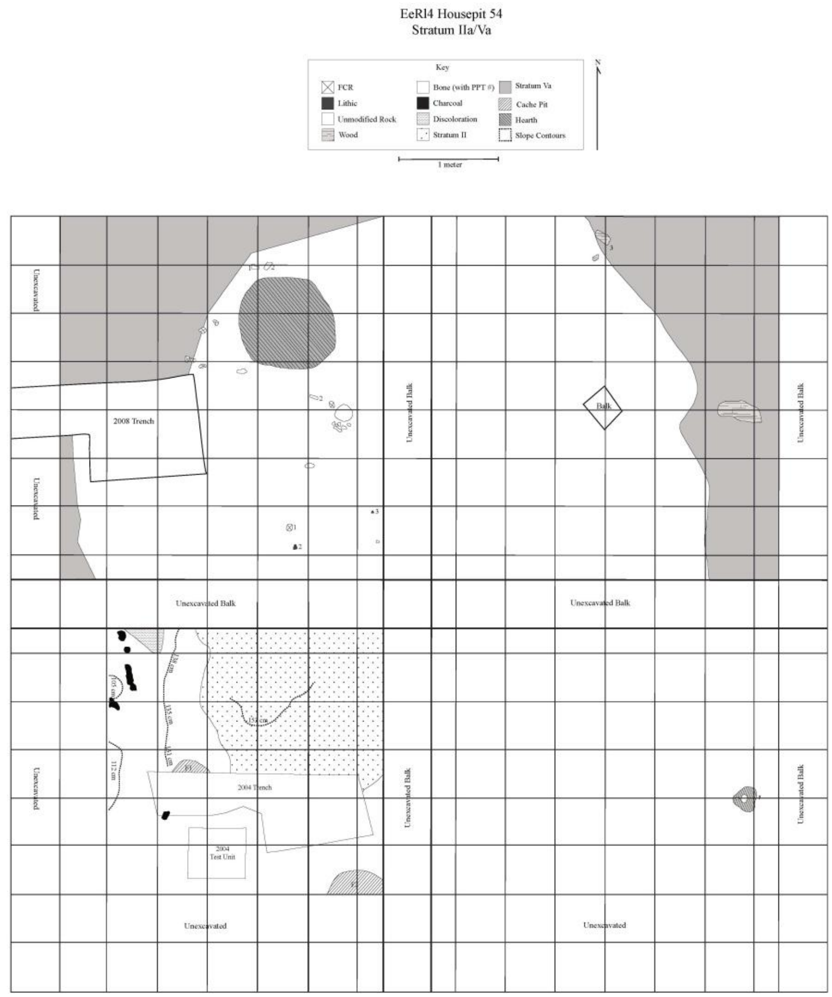


EeRl4 Housepit 54
Blocks B, D, and G West Wall Profile

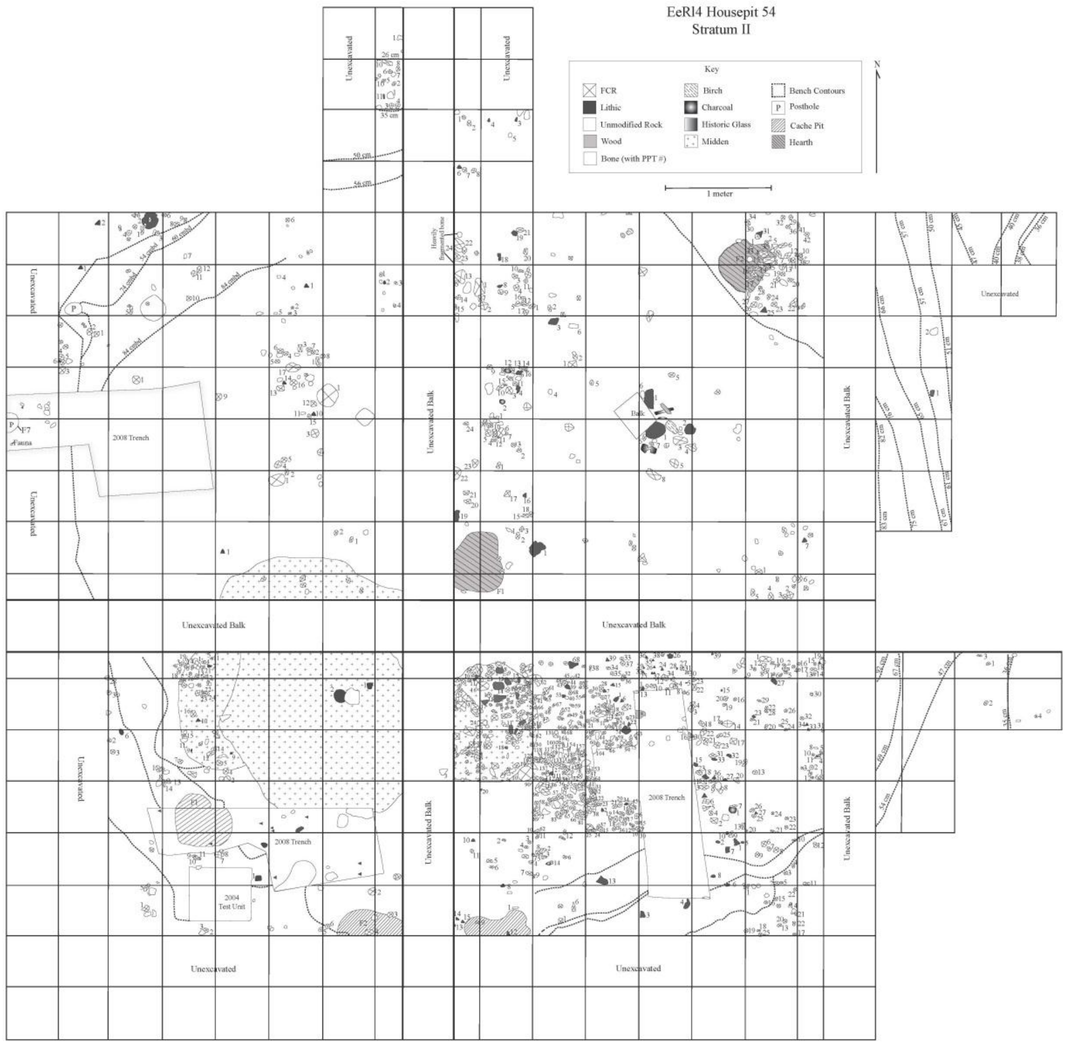


EeRl4 Housepit 54
Block E and F Stratum V





Housepit 54 Plan View Strata IIa and Va.



Housepit 54, Plan View Stratum II

Stratum I Base (trenches excavated in 2008).

Block A Stratum I base; Stratum V surface

Block B, Stratum I base, Stratum V surface

Block C, Stratum I base, Stratum V surface

Blcok D, Stratum I base, Stratum V surface

Horseshoe, in situ in Stratum V, Block A.

Surface Feature 1, Block D, Stratum II

Birch bark, Stratum V, Block C

Base Stratum V, Surface Stratum II and XIV, Block A

Surface Stratum II with portion of Stratum XIV excavated, Block A

Base Stratum V, Surface Stratum II and XIV, Block B

Base Stratum V and surface Stratum II and XIV, Block C; Portion of Stratum II excavated
In units 8 and 12 (left side of photo)

Block C Feature 1, Plan View

In situ artifacts, Unit 11, Quad 1, Stratum II, Block D

Block D, Feature 2, Plan View, Stratum XVI

Block A, Feature 2, Plan View, Stratum II

Block A, Stratum XIV (midden) base (excavated)

Steatite statuette of female baby recovered in Stratum XIV, Block A.

Block B, Stratum XIV with fire-cracked rock and artifacts *in situ*

Stratum XIV excavated (left) in Block A and with FCR exposed in Block B (right)

Block B, Stratum XIV post-excavation.

Base Stratum II and XIV, surface Stratum Va and IIa, Block A

Base Stratum II and XIV, surface Stratum IIa and Va, Block C (view facing south)

Base Stratum II and XIV, surface Stratum IIa and Va, Block C (view facing west)

Base Stratum II, Surface Stratum Va and IIa, Block D

Surface Stratum VA and IIa, Block H

Base Stratum V and surface Stratum Va. Block E

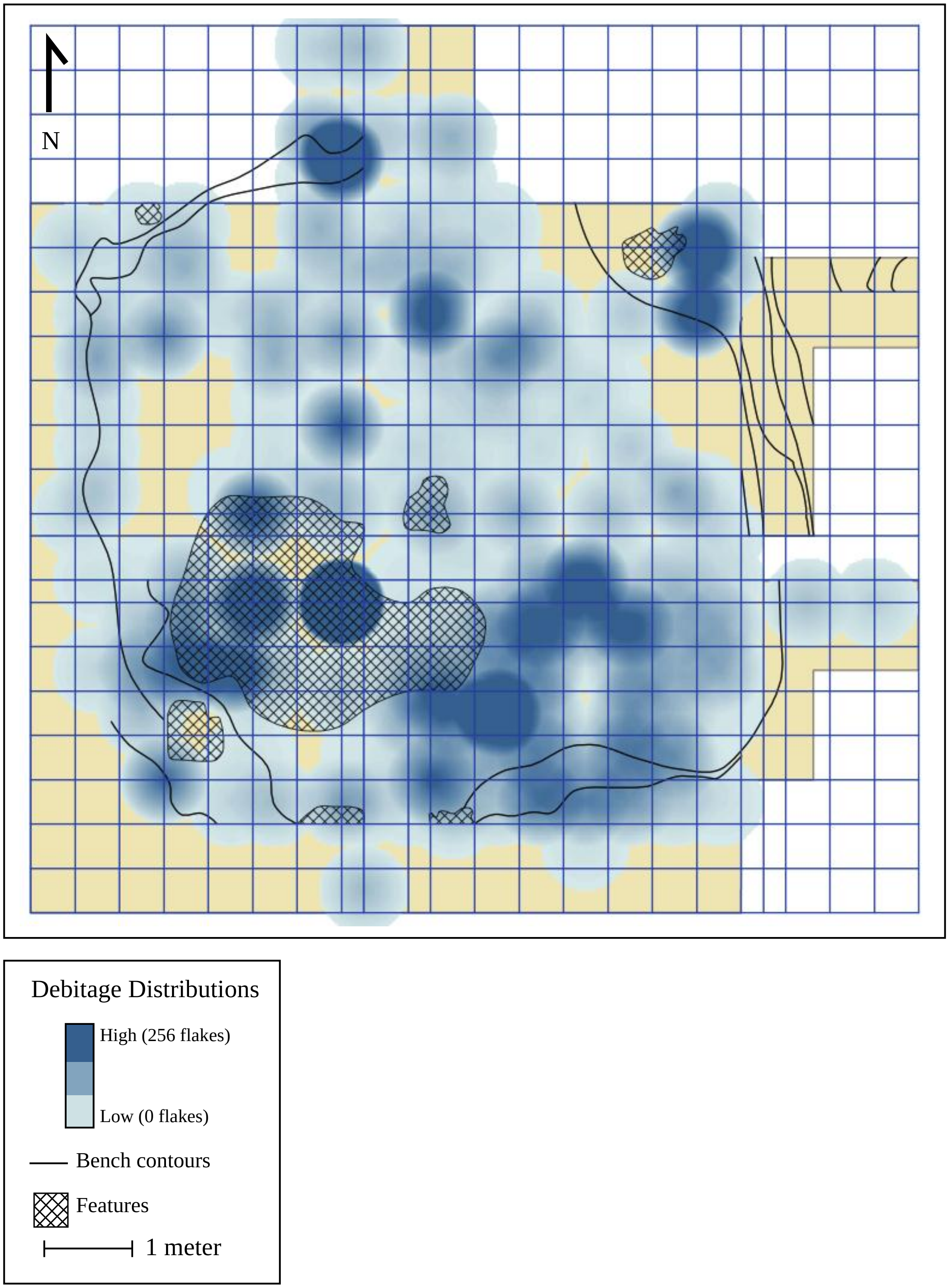
Block E, west wall profile.

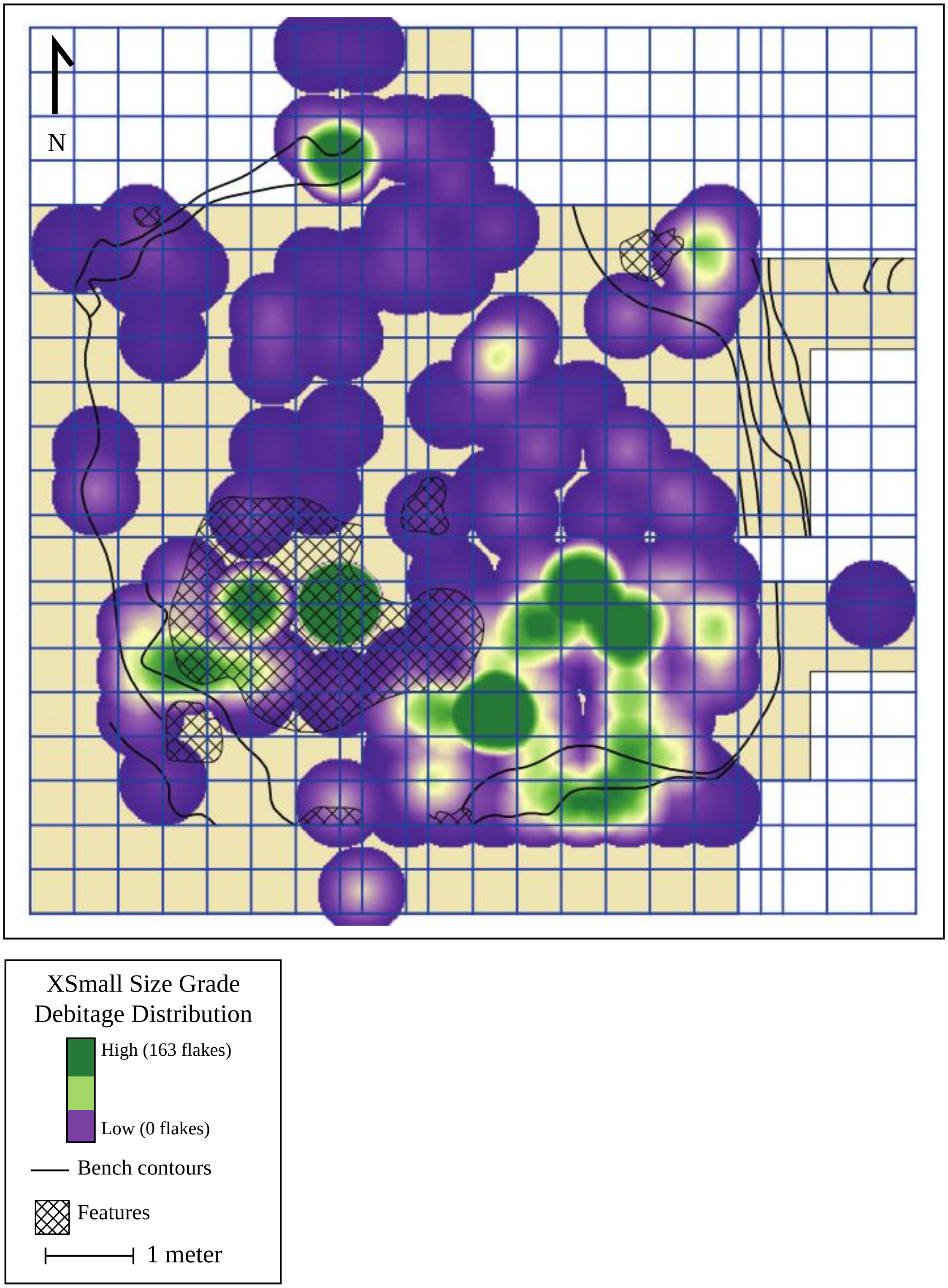

Completed excavation. Visible surface is Stratum IIa and Va. View facing northwest.

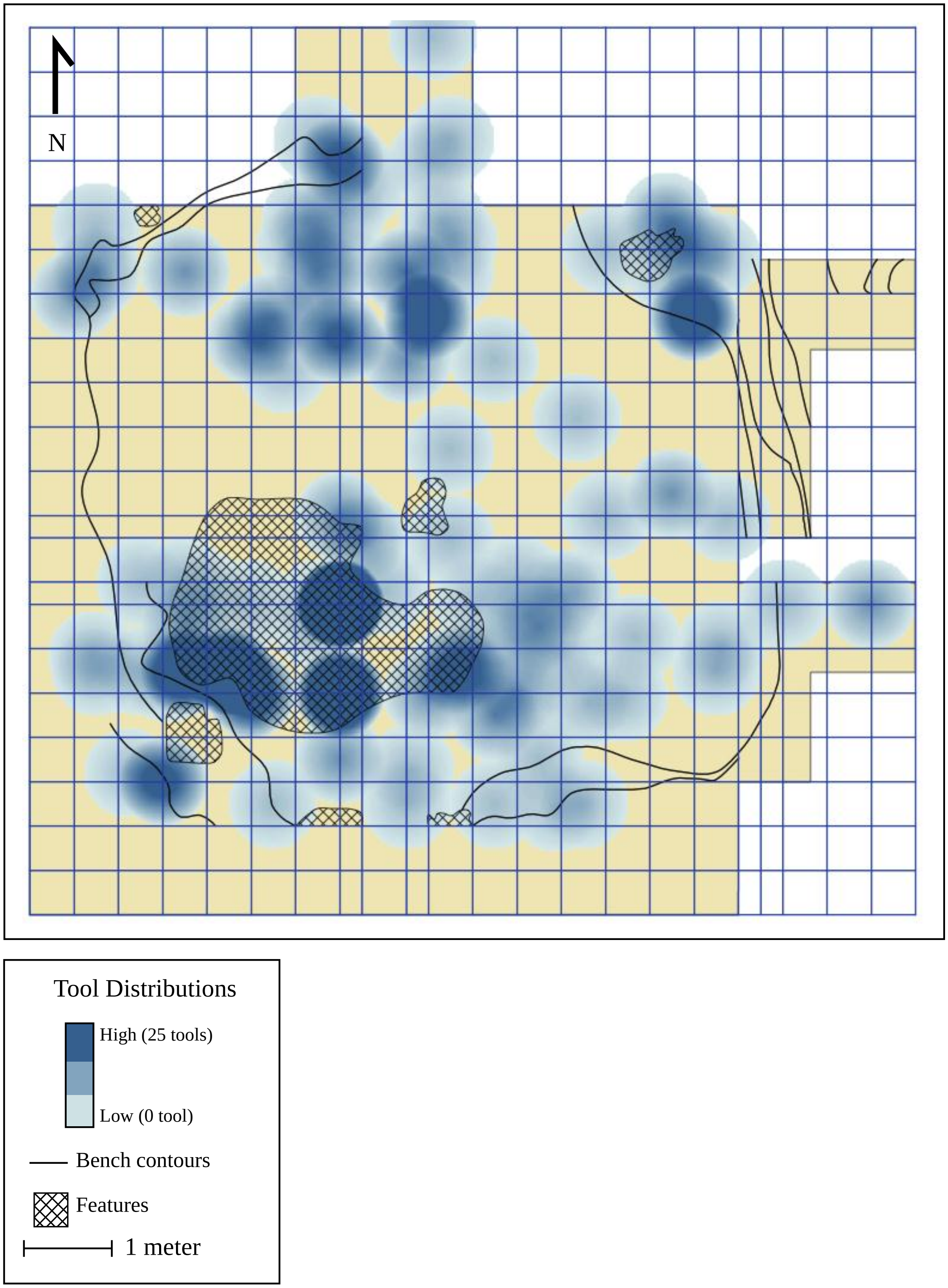
Completed excavation. Visible surface is Stratum IIa and Va. View facing southeast.

Appendix B

GIS Maps


N
Debitage Distributions
High (256 flakes)
Low (0 flakes)
Bench contours
Features
1 meter


N
XSmall Size Grade
Debitage Distribution
High (163 flakes)
Low (0 flakes)
Bench contours
Features
1 meter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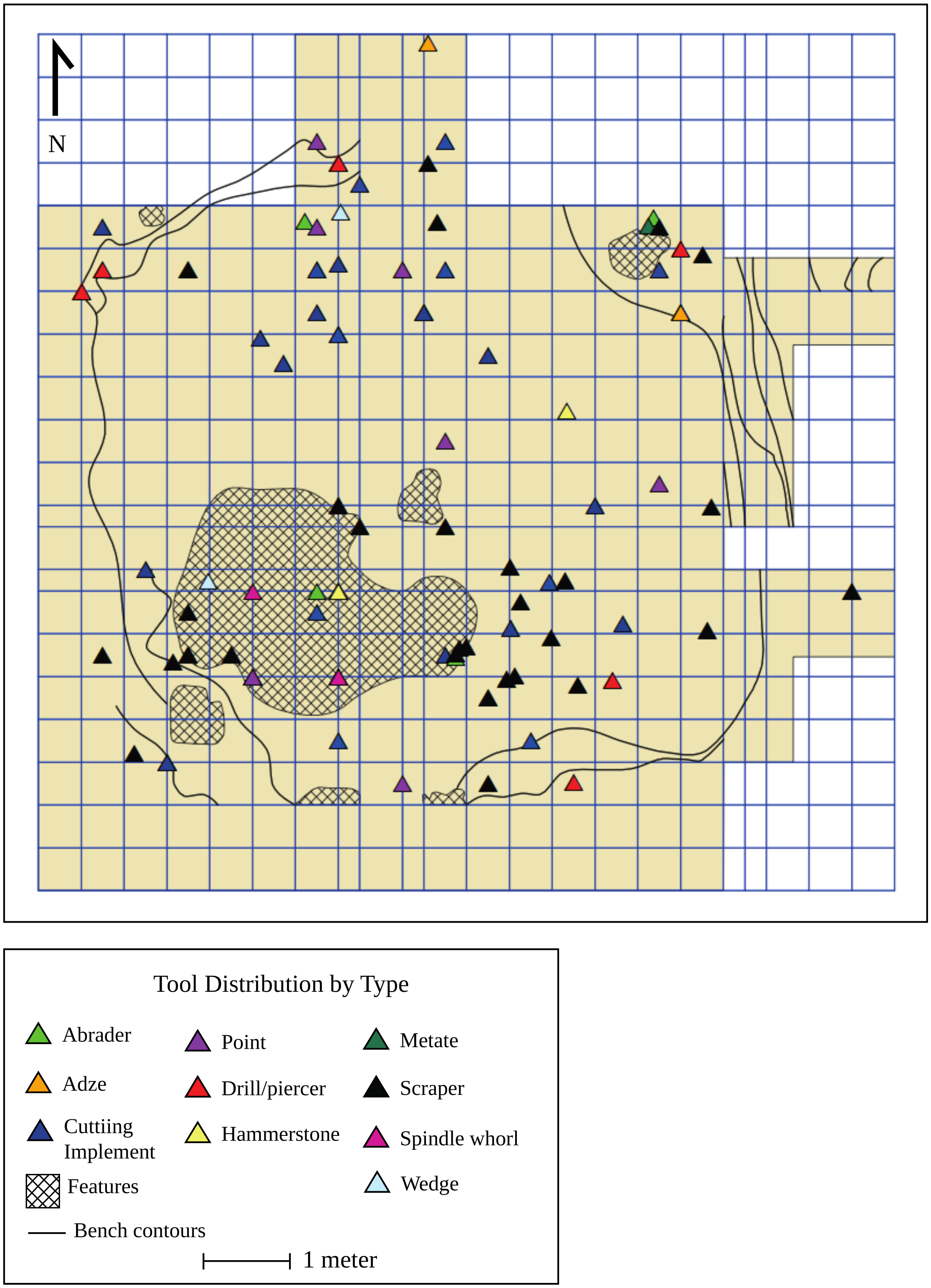
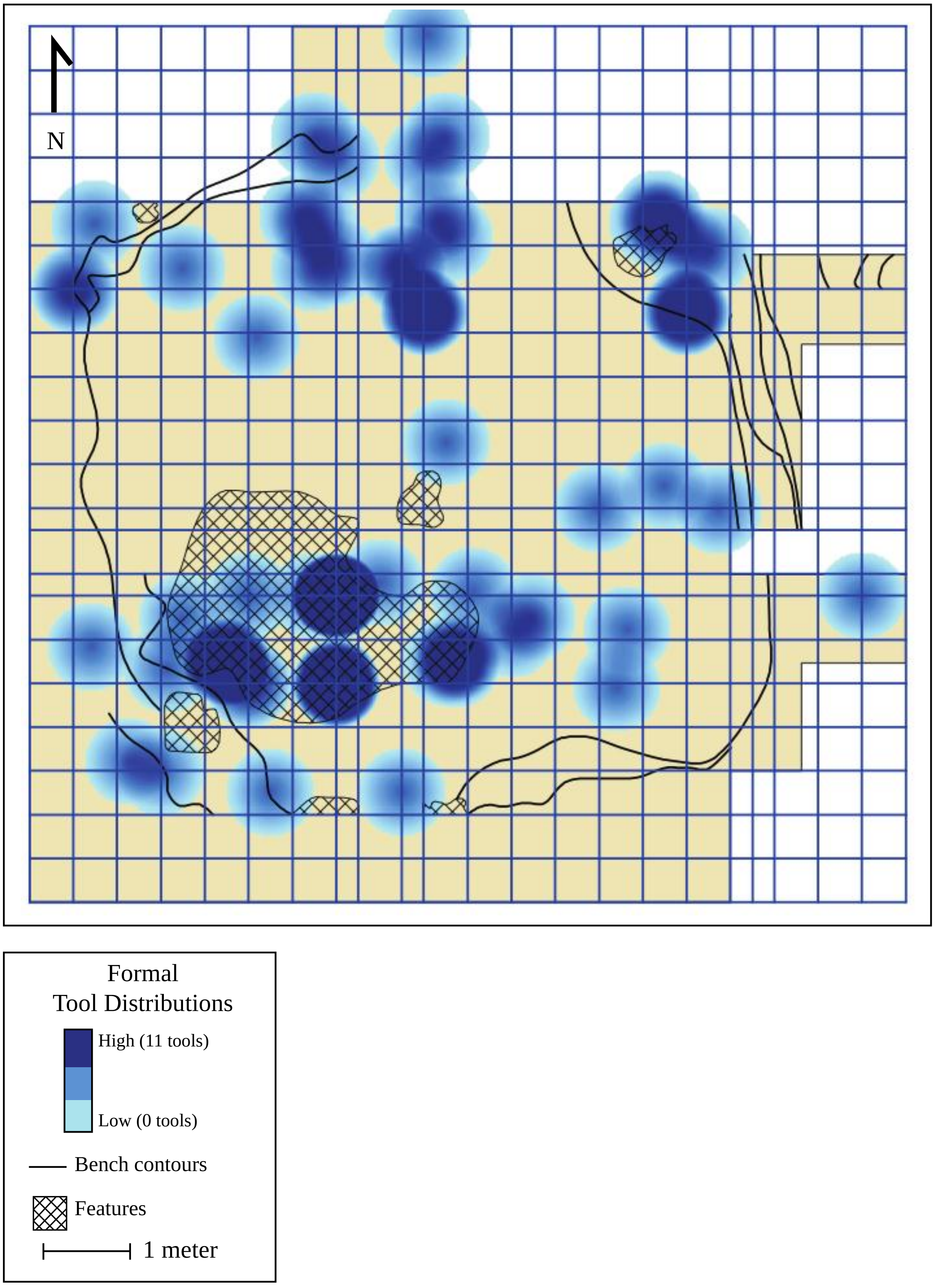
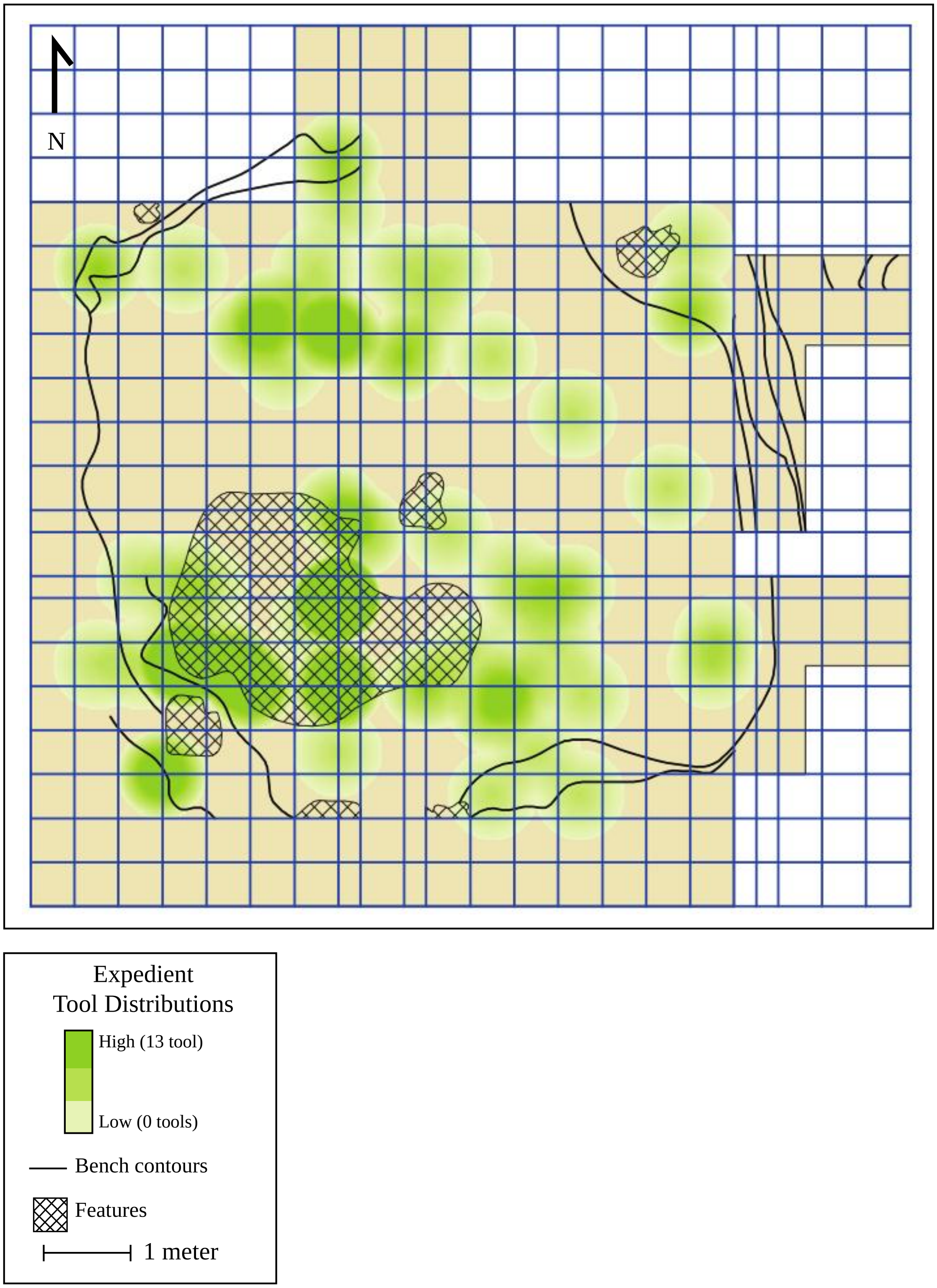
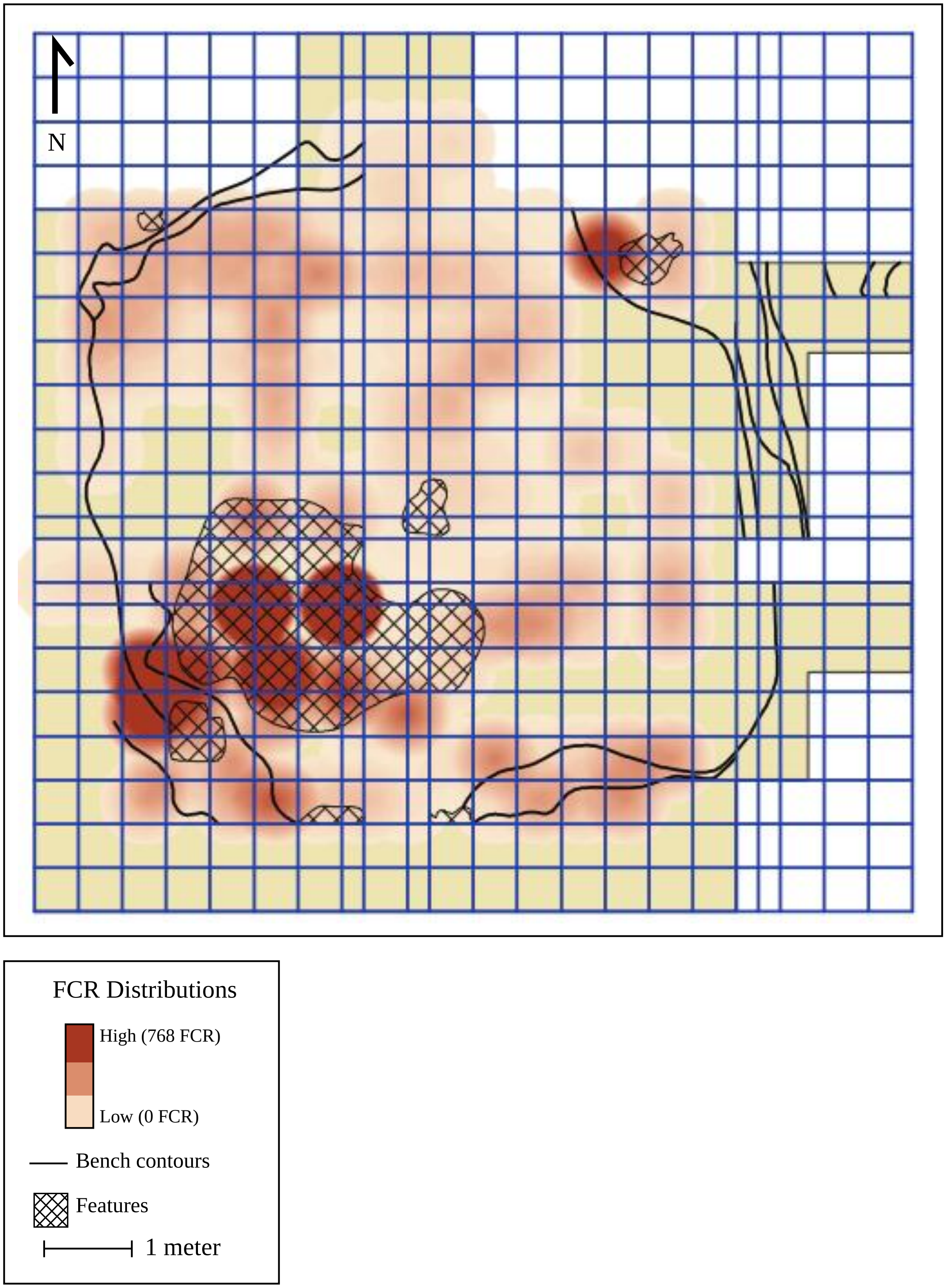
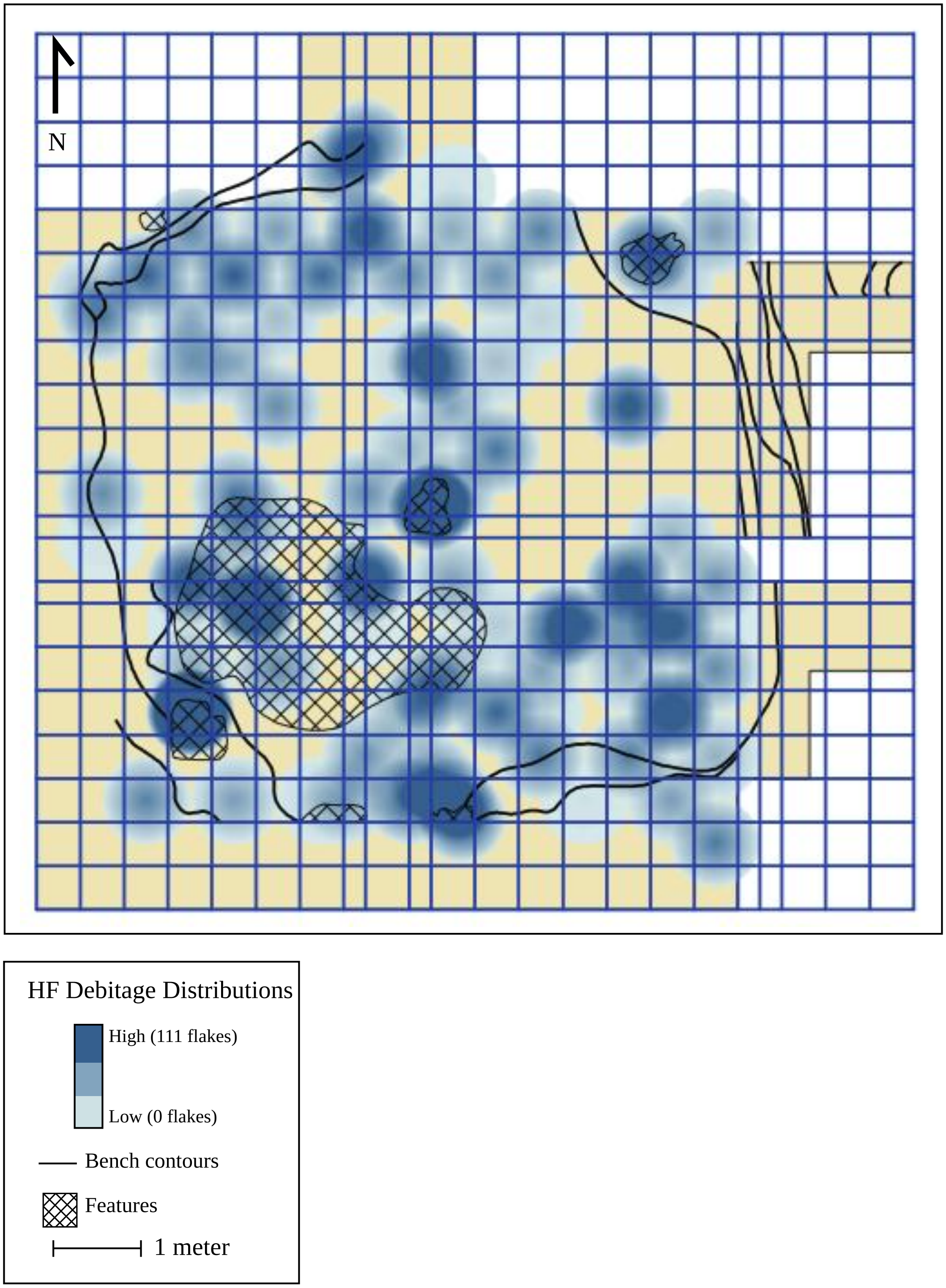
Tool Distributions
High (25 tools)
Low (0 tool)
Bench contours
Features
1 meter

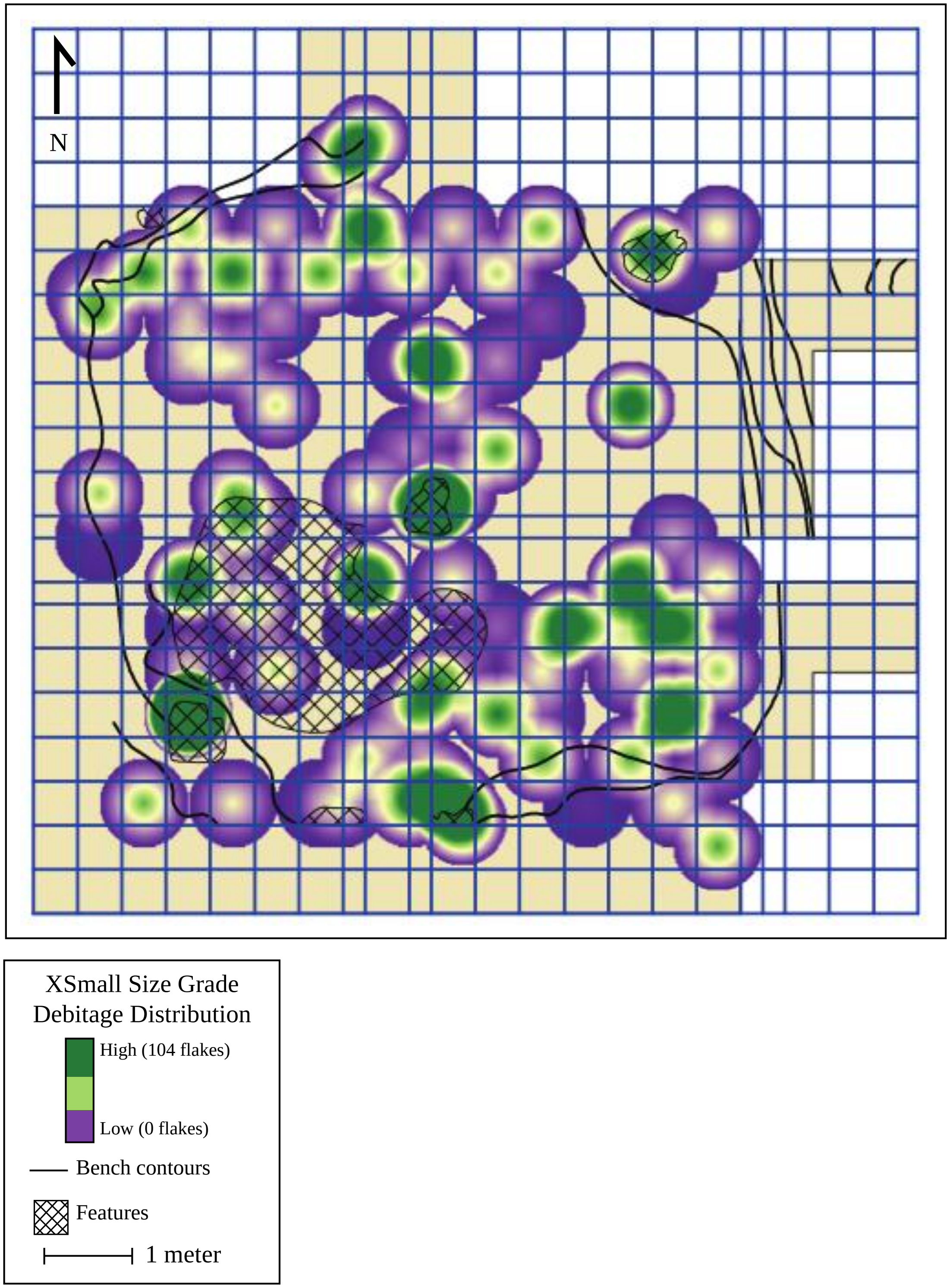

N
Tool Distribution by Type
Abrader
Point
Metate
Adze
Drill/piercer
Scraper
Cuttiing Implement
Hammerstone
Spindle whorl
Features
Wedge
Bench contours
1 meter

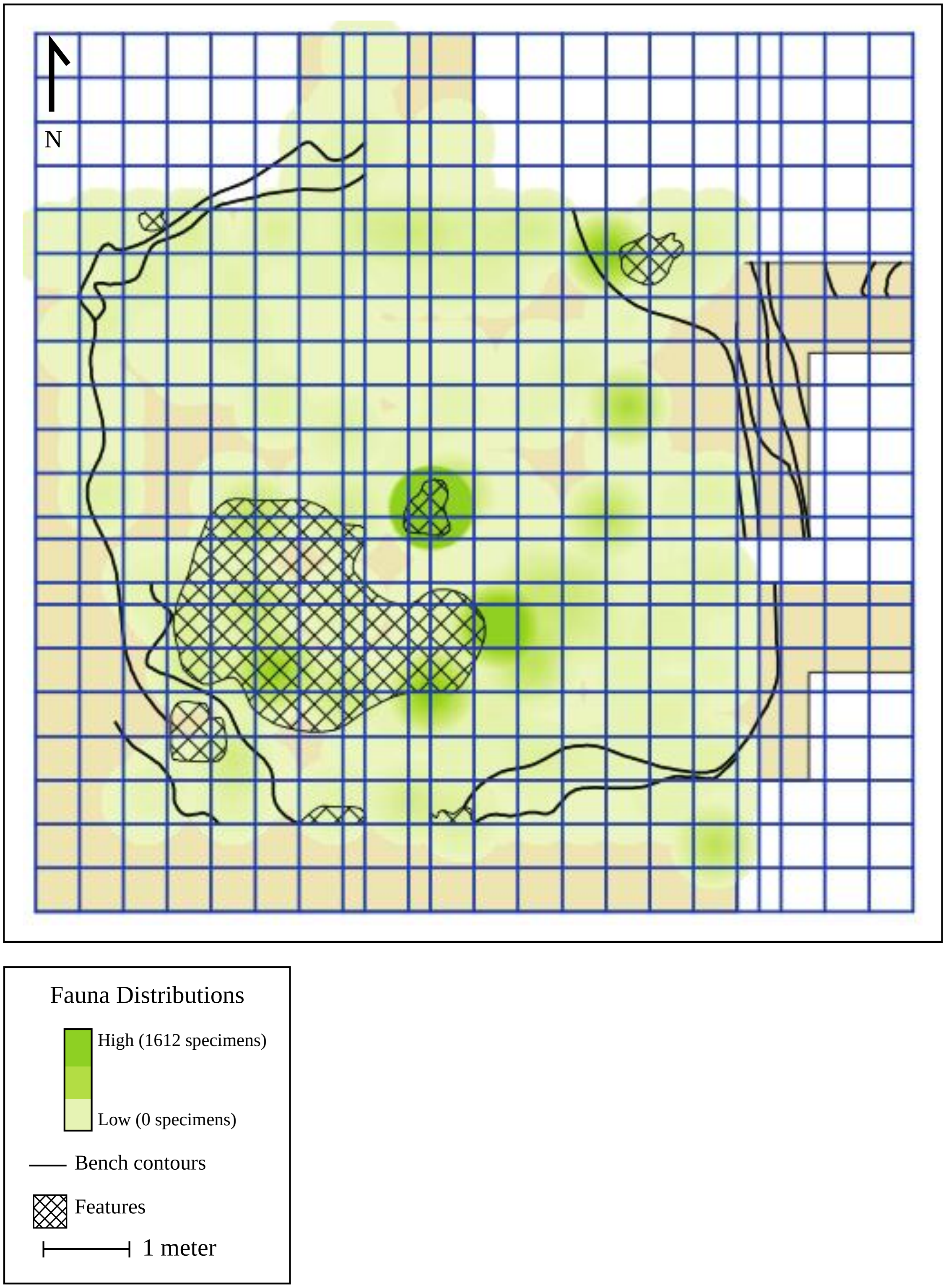

N
Formal
Tool Distributions
High (11 tools)
Low (0 tools)
Bench contours
Features
1 meter

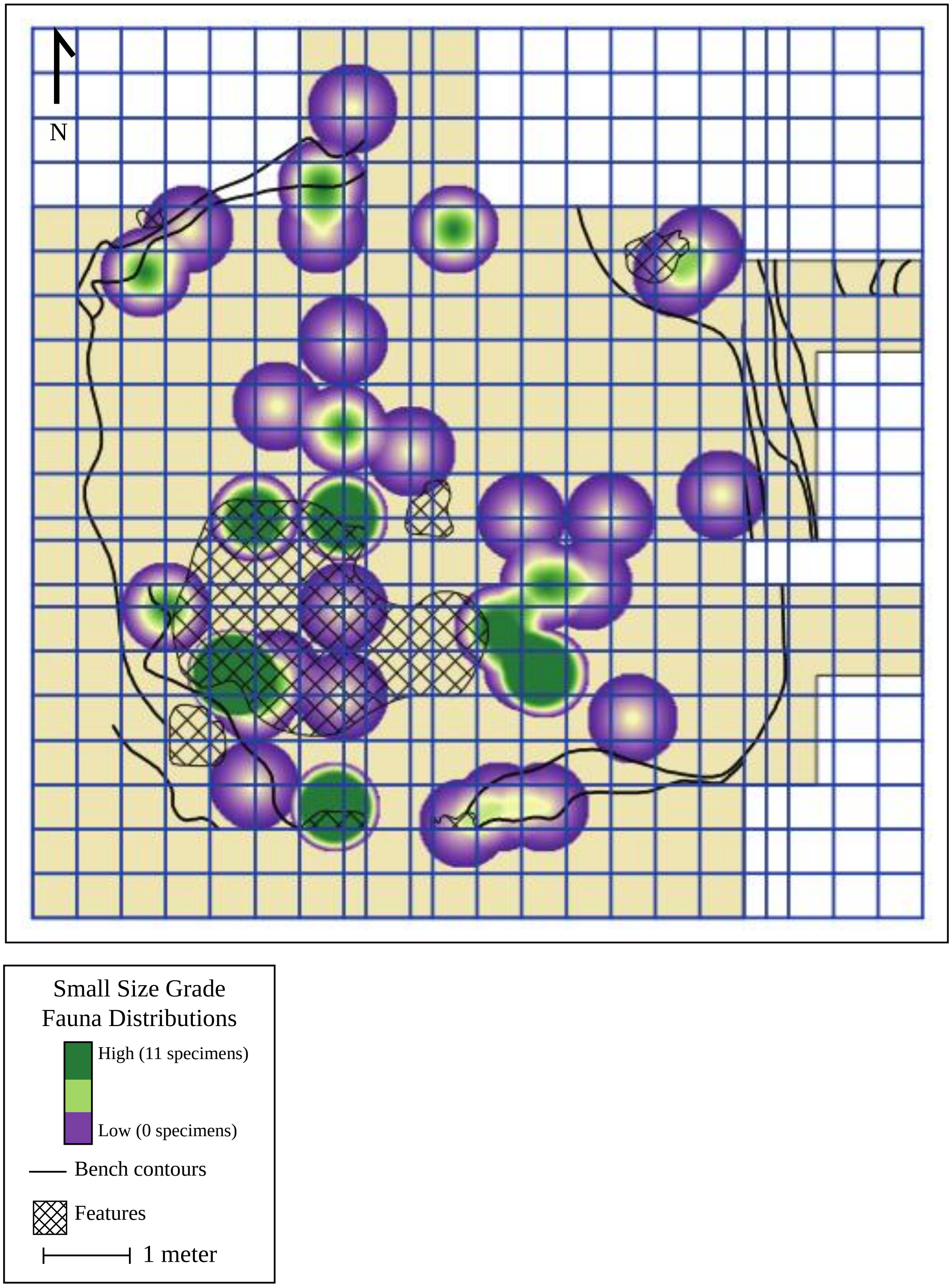

N
Expedient
Tool Distributions
High (13 tool)
Low (0 tools)
Bench contours
Features
1 meter


N
FCR Distributions
High (768 FCR)
Low (0 FCR)
Bench contours
Features
1 meter

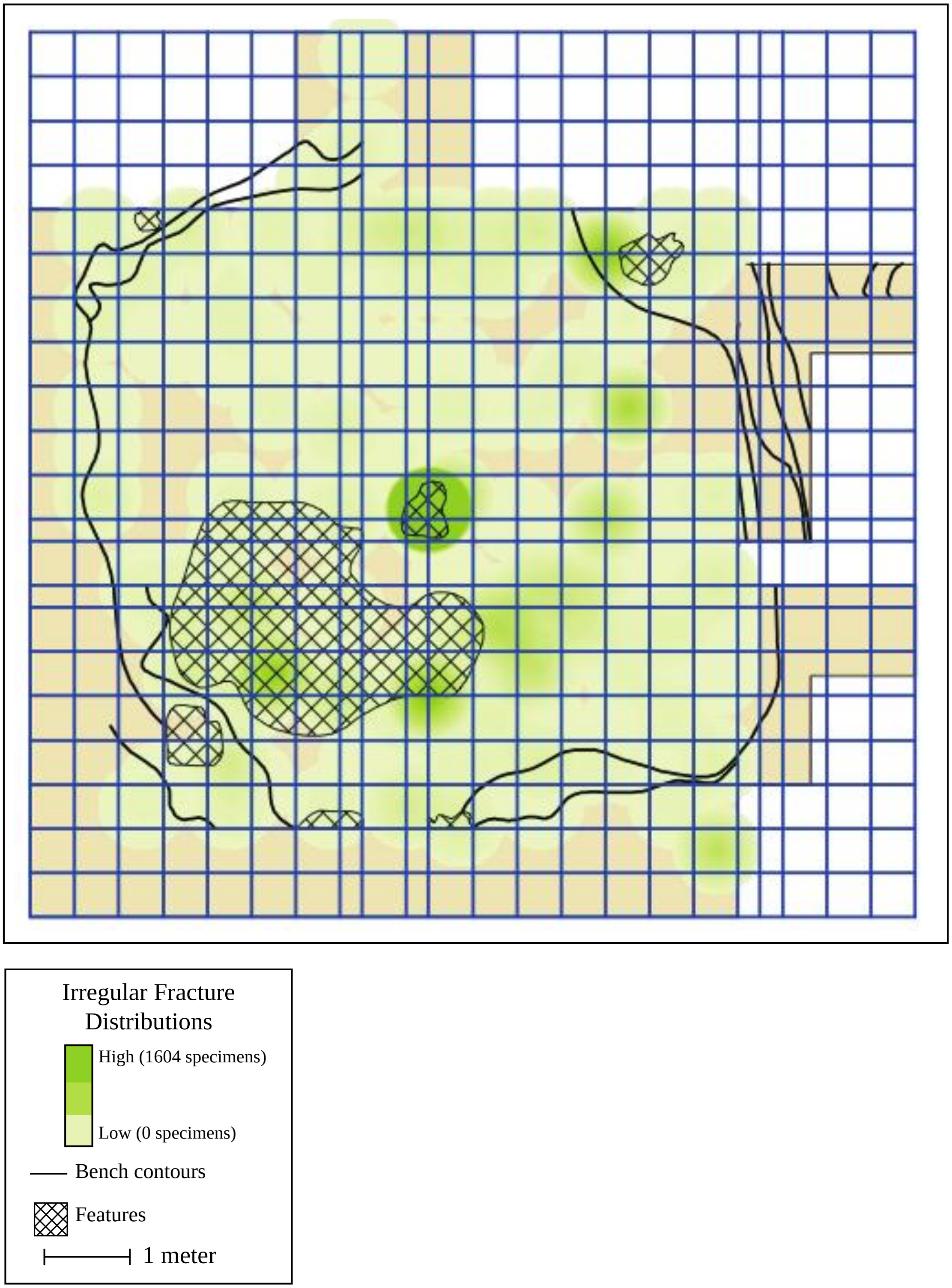

N
HF Debitage Distributions
High (111 flakes)
Low (0 flakes)
Bench contours
Features
1 meter

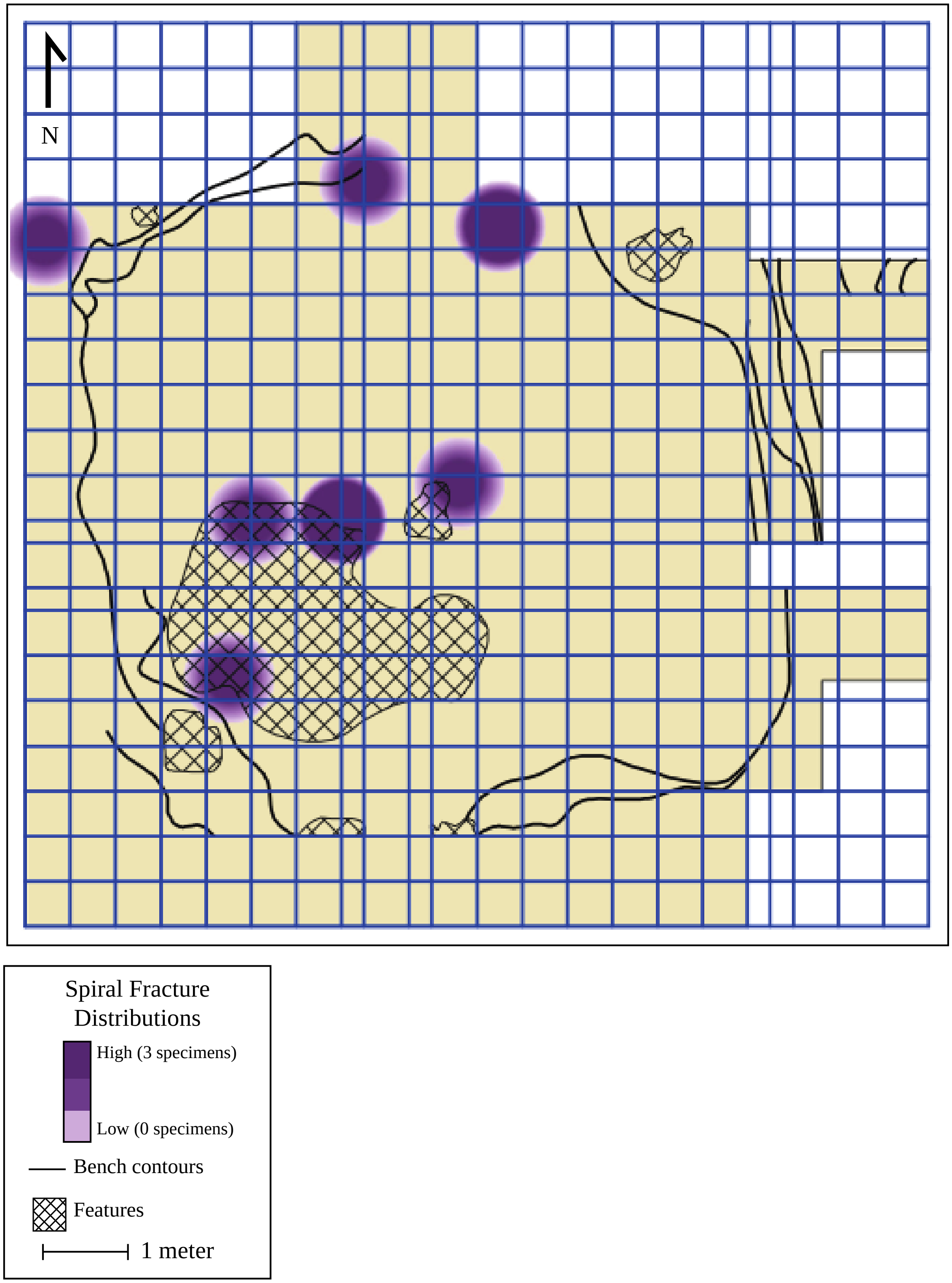

N
XSmall Size Grade
Debitage Distribution
High (104 flakes)
Low (0 flakes)
Bench contours
Features
1 meter

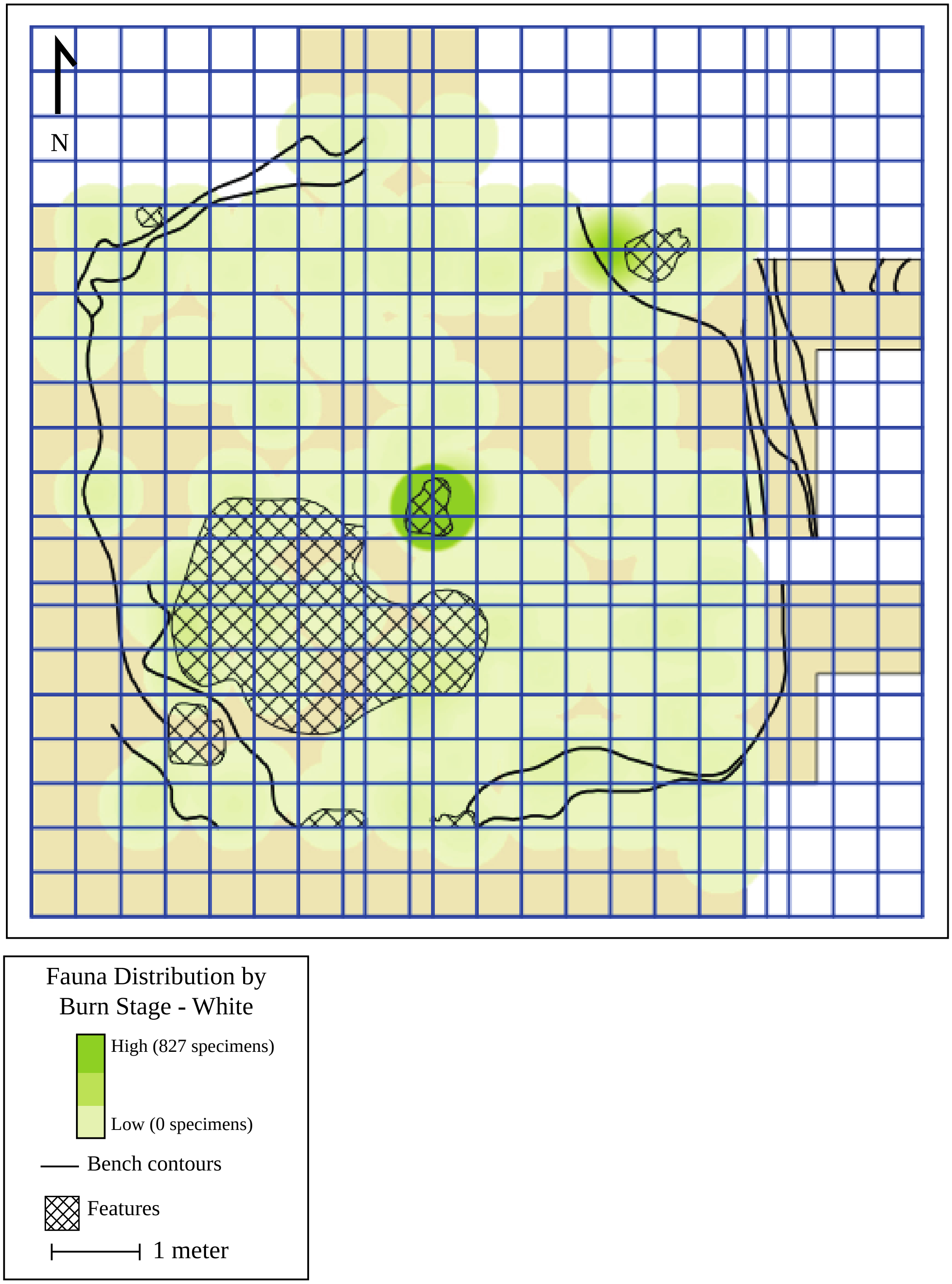

N
Fauna Distributions
High (1612 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

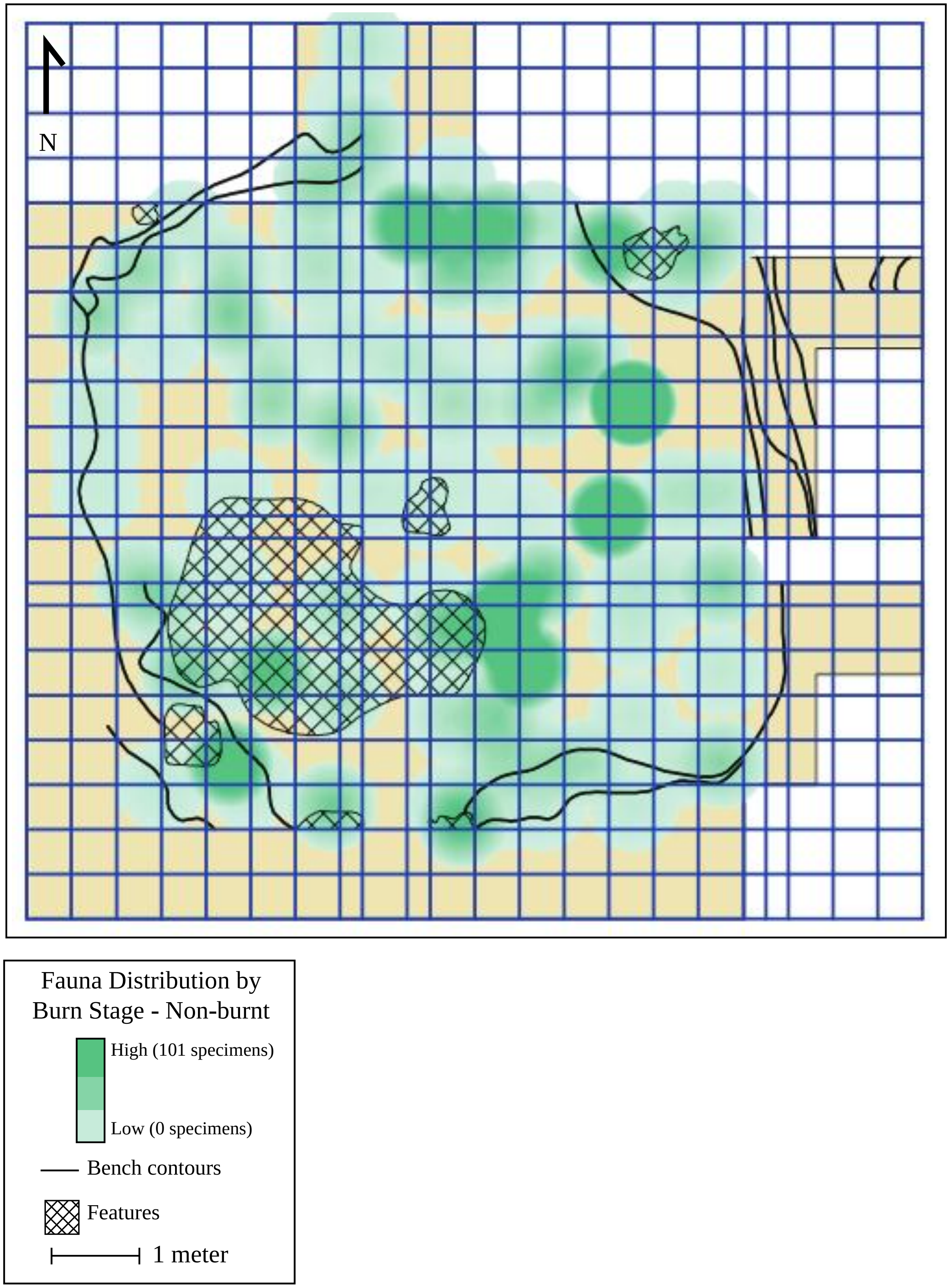


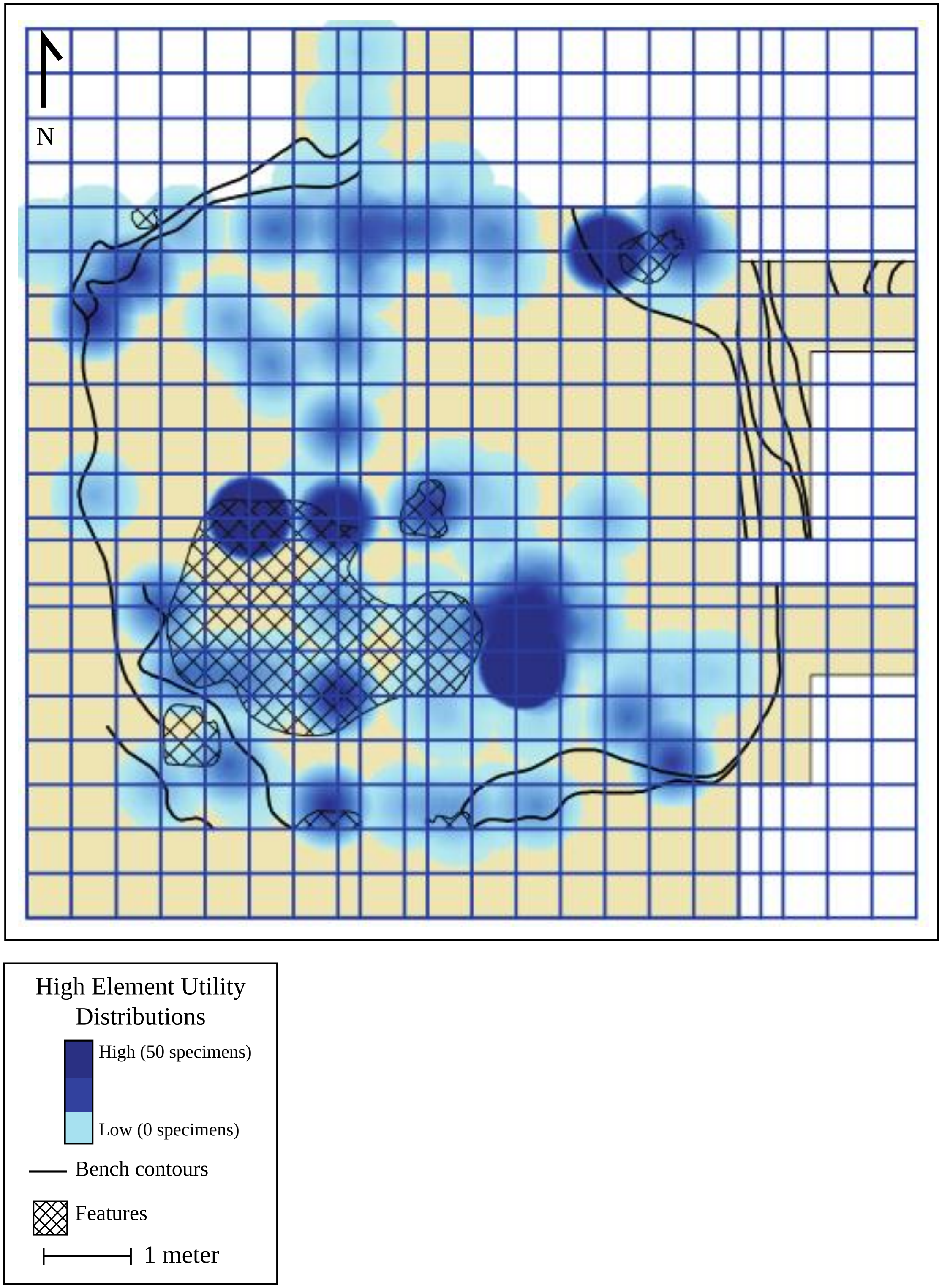
N
Small Size Grade
Fauna Distributions
High (11 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

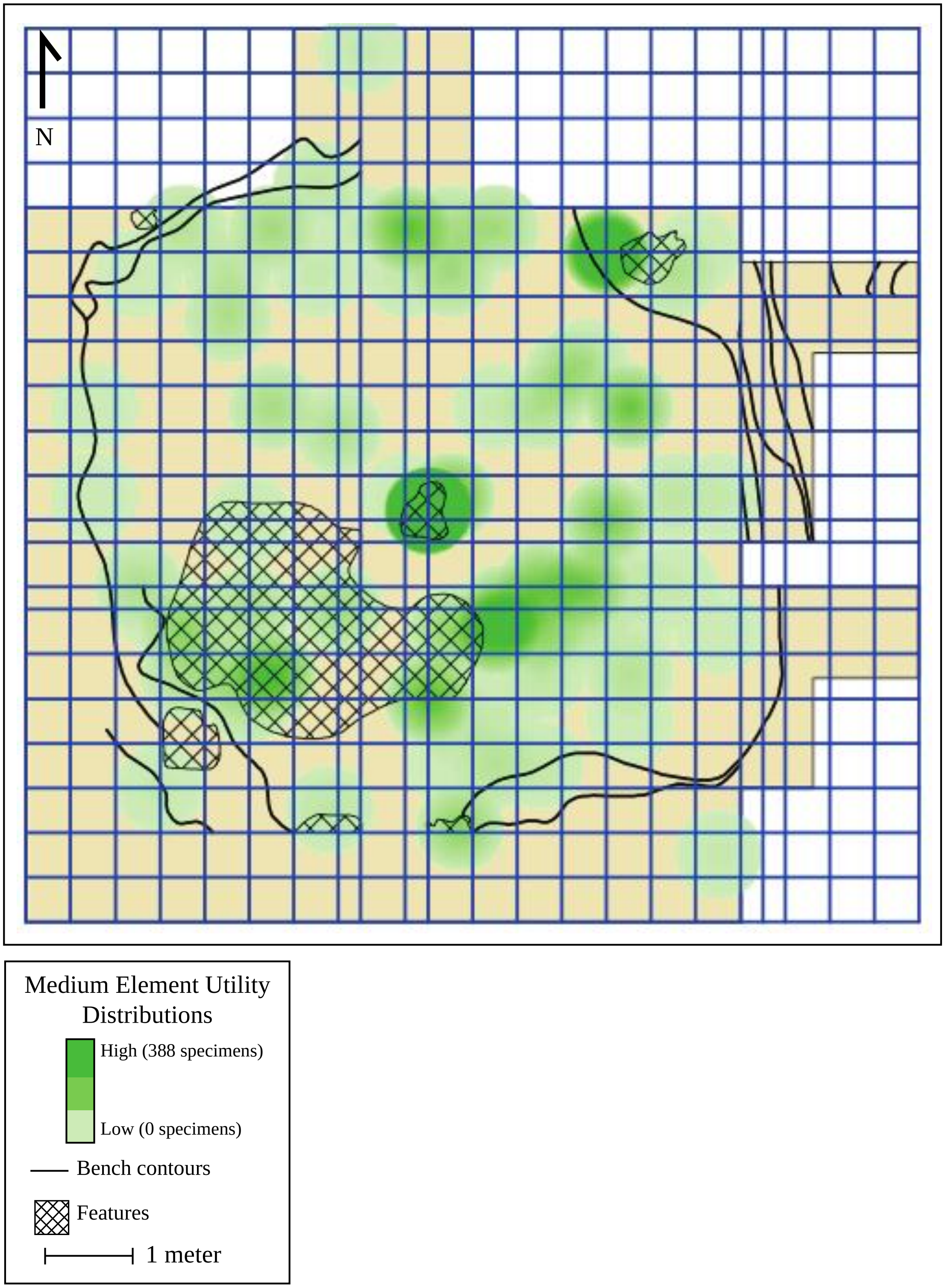

Irregular Fracture Distributions
High (1604 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

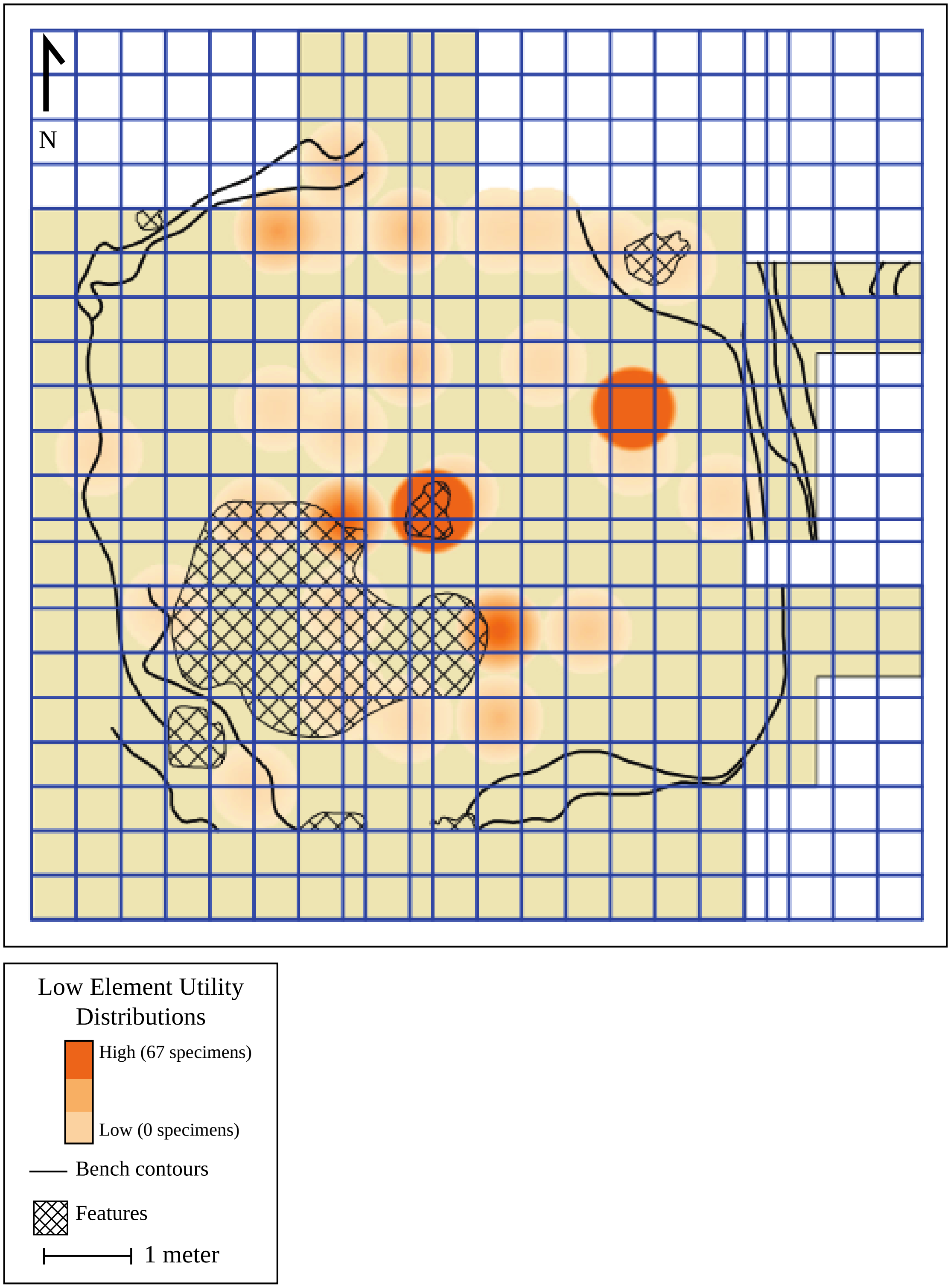

N
Spiral Fracture Distributions
High (3 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

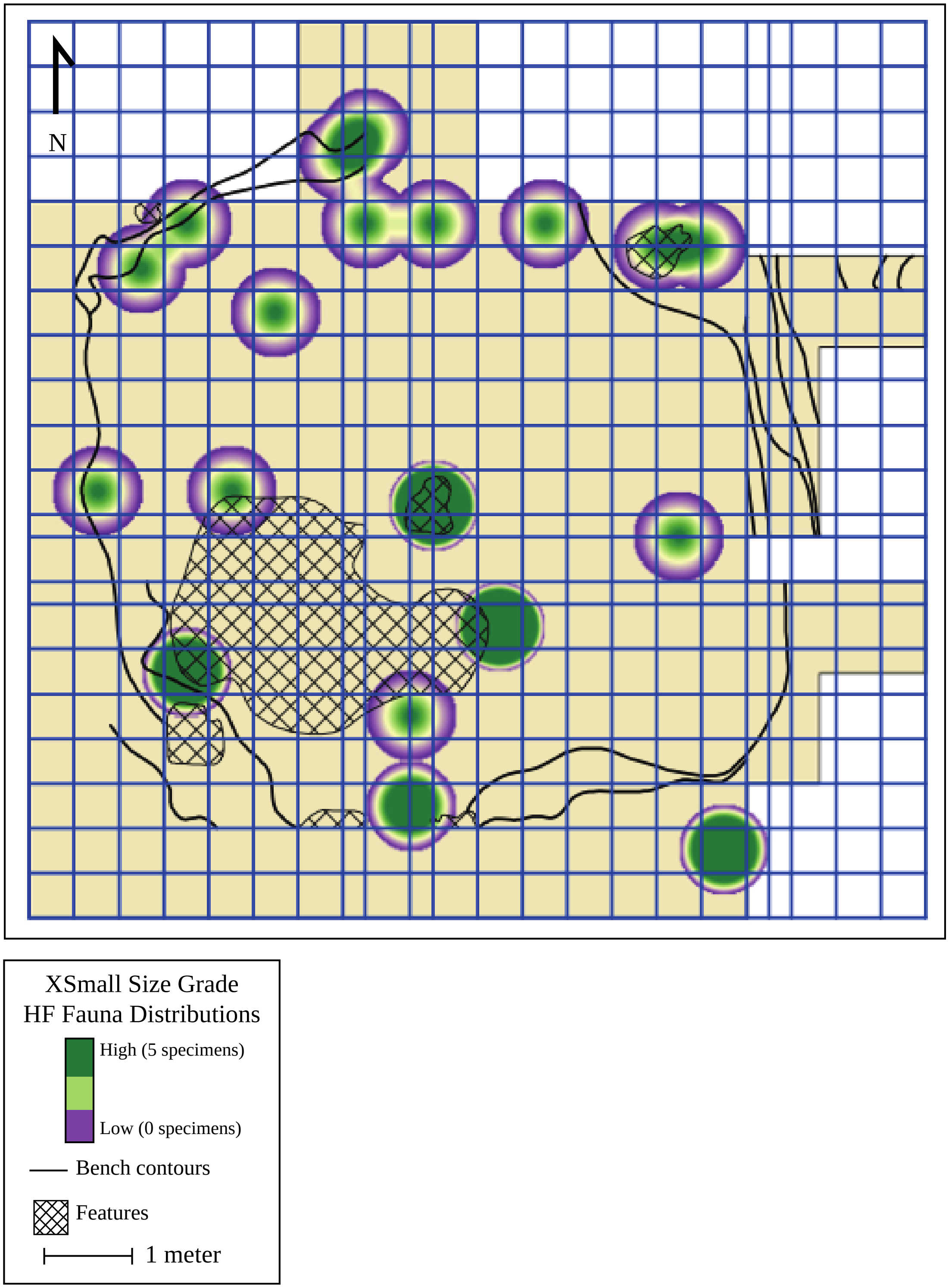

N
Fauna Distribution by Burn Stage - White
High (827 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

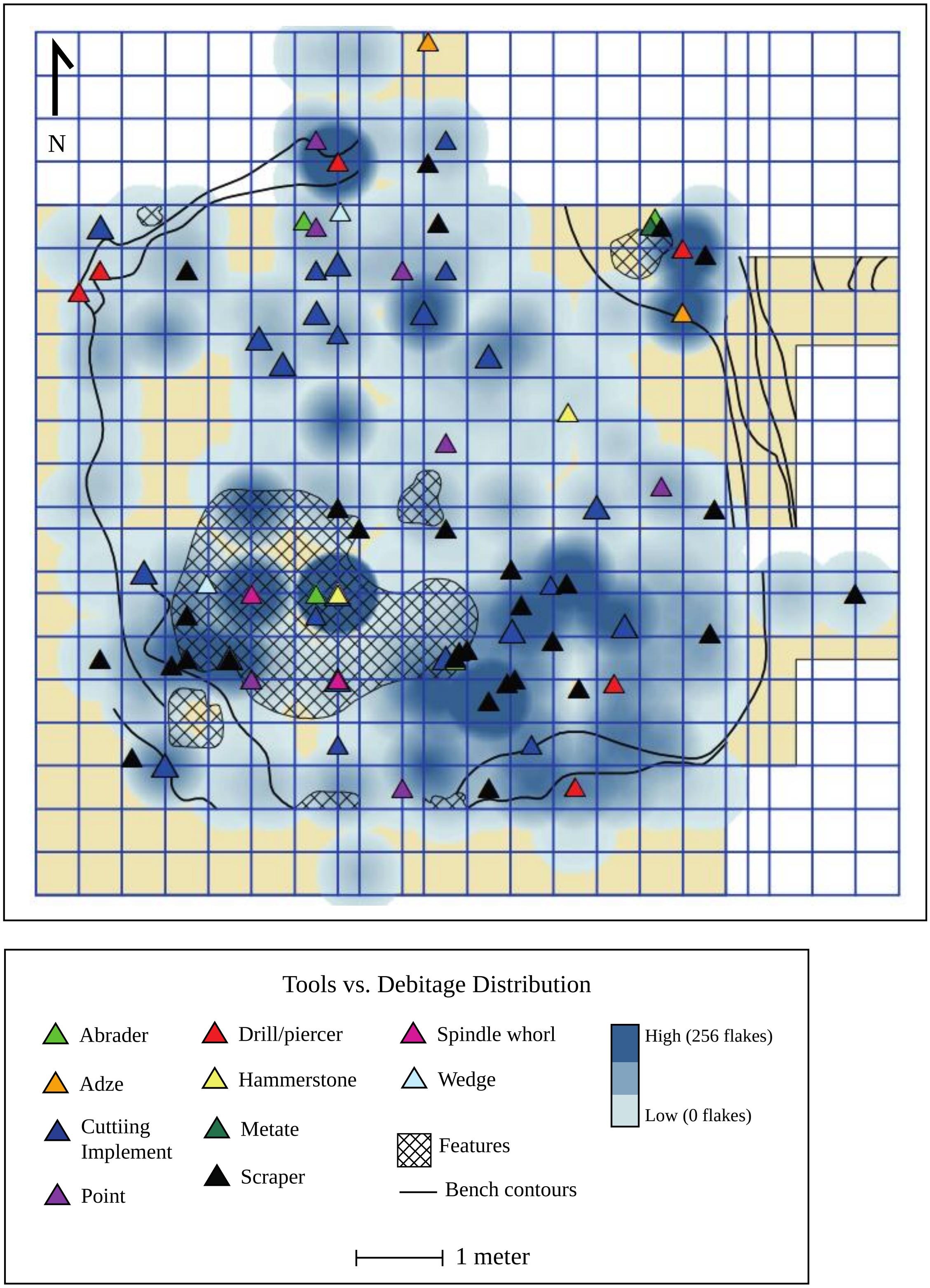

N
Fauna Distribution by
Burn Stage - Non-burnt
High (101 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

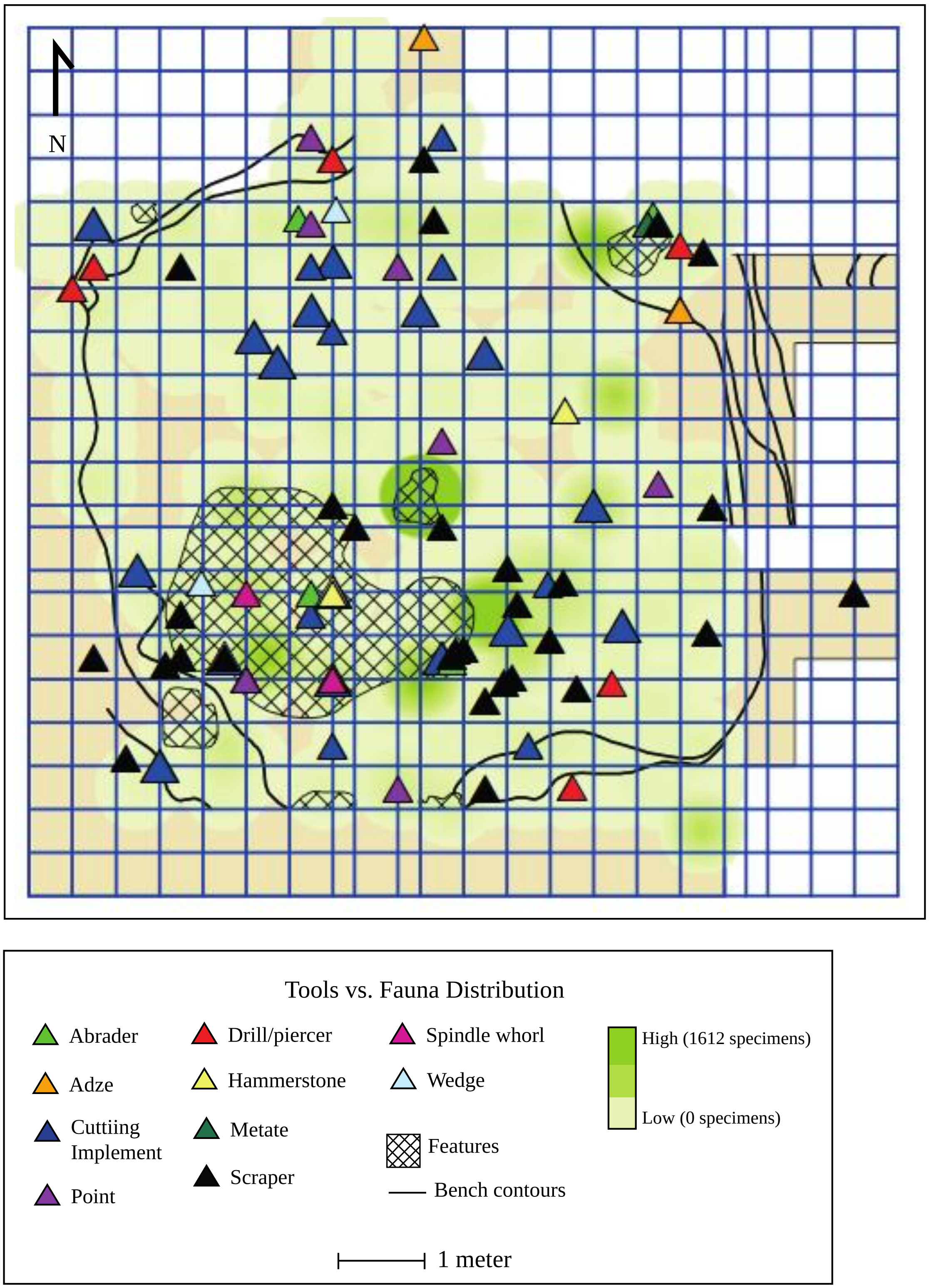

N
High Element Utility Distributions
High (50 specimens)
Low (0 specimens)
Bench contours
Features
1 meter

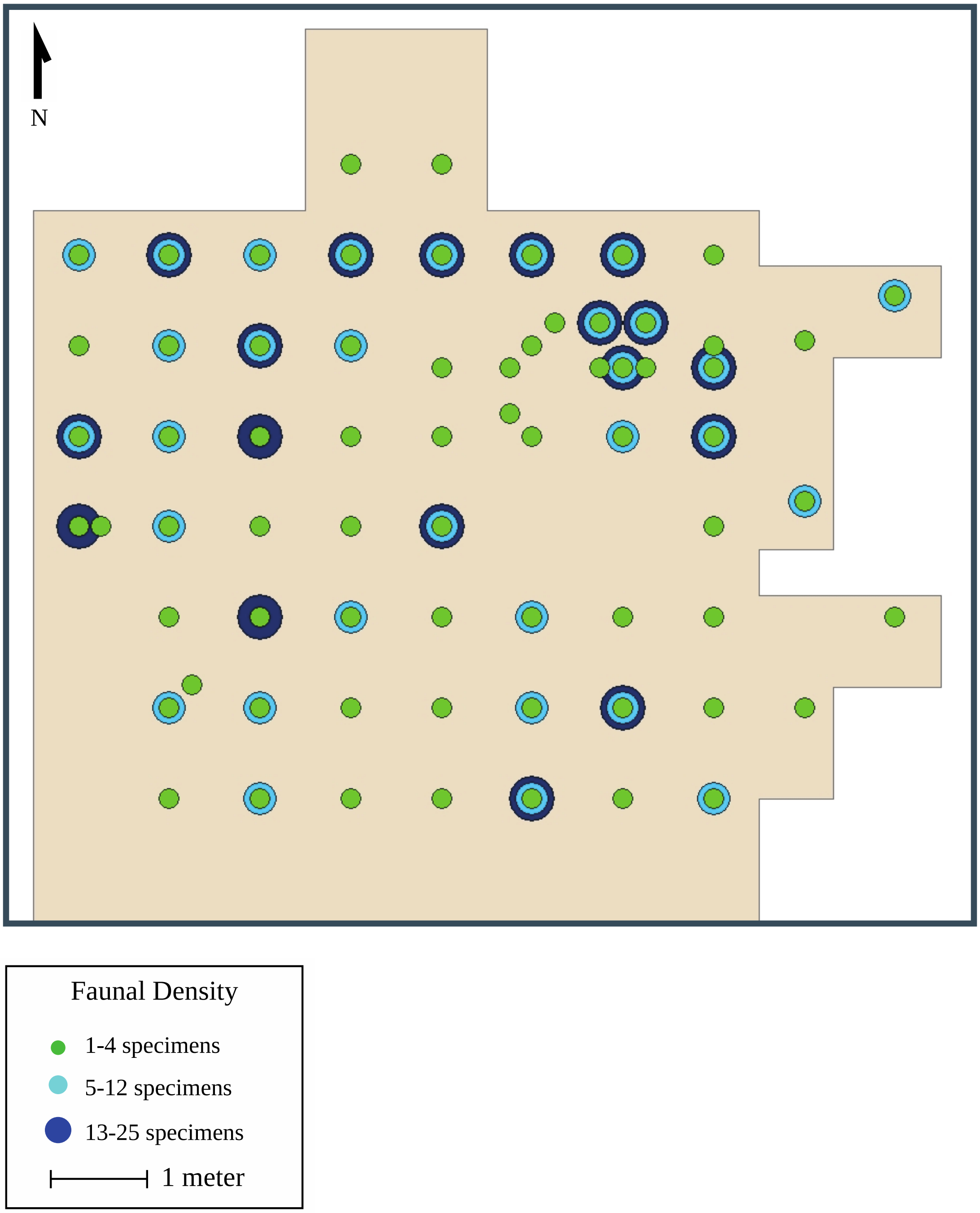

N
Medium Element Utility Distributions
High (388 specimens)
Low (0 specimens)
Bench contours
Features
1 meter


N
Low Element Utility Distributions
High (67 specimens)
Low (0 specimens)
Bench contours
Features
1 meter


N
XSmall Size Grade
HF Fauna Distributions
High (5 specimens)
Low (0 specimens)
Bench contours
Features
1 meter


N
Tools vs. Debitage Distribution
Abrader
Adze
Cuttiing Implement
Point
Drill/piercer
Hammerstone
Metate
Scraper
Spindle whorl
Wedge
Features
Bench contours
High (256 flakes)
Low (0 flakes)
1 meter

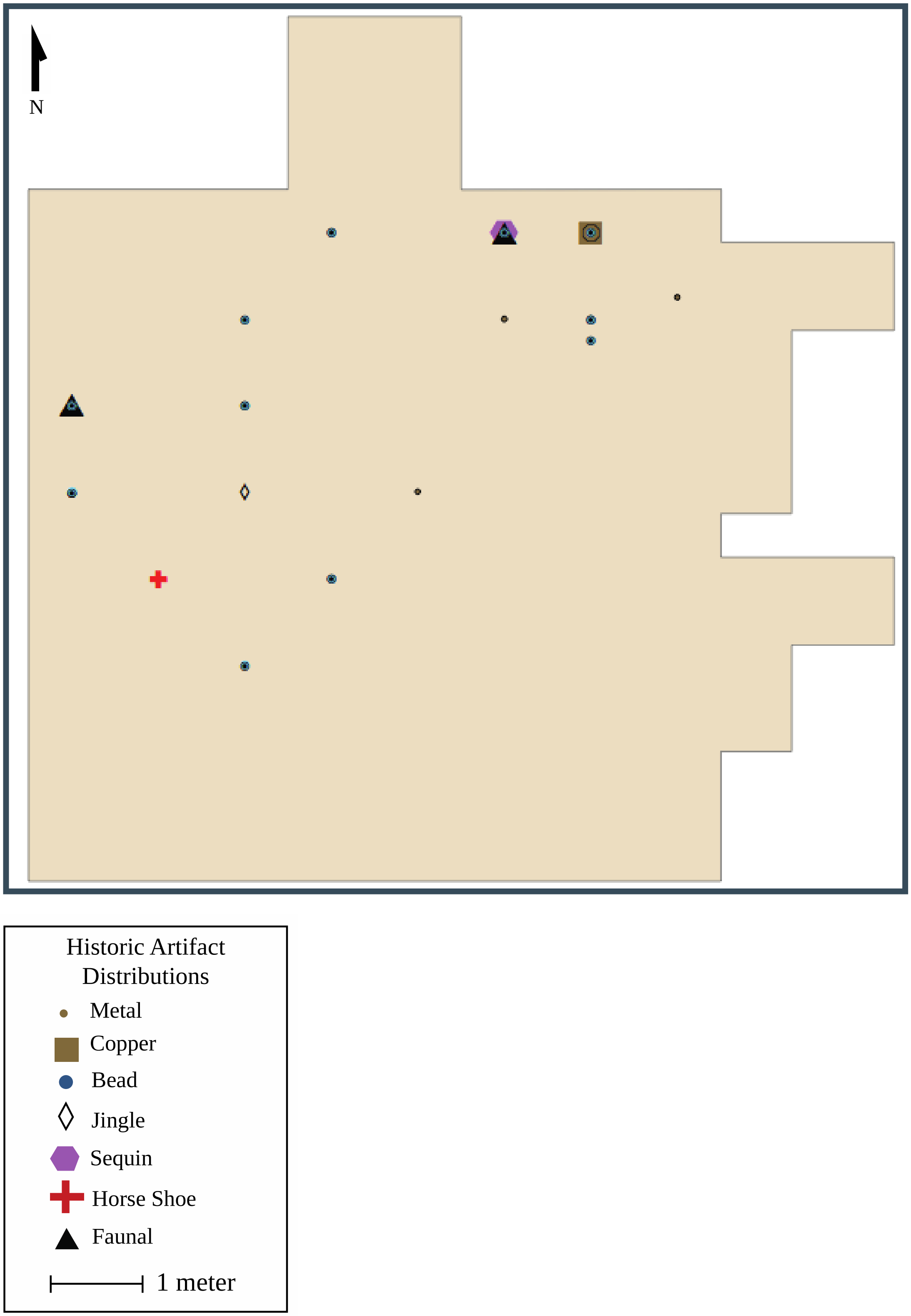

N
Tools vs. Fauna Distribution
Abrader
Adze
Cuttiing Implement
Point
Drill/piercer
Hammerstone
Metate
Scraper
Spindle whorl
Wedge
Features
Bench contours
High (1612 specimens)
Low (0 specimens)
1 meter



Faunal density on the roof.

Tool distribution on the roof.

Artifacts of European origin on the roof.



Appendix C

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

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

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	shuswap contracted stem slight shoulders
122	shuswap contracted stem pronounced shoulders
123	shuswap parallel stem slight shoulders
124	shuswap 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

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 handmaul
298	Polished steatite 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 D

Paleoethnobotany Report

Bridge River Archaeological Project 2012: Archaeobotanical Analysis

This report presents the results of archaeobotanical analysis of 55 bulk samples collected from the entire floor and some features including floor middens of Housepit 54 at Bridge River, near Lillooet, British Columbia. All samples came from the late occupation of this housepit. These were 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 summer field season of 2012. Dried samples were placed into labeled plastic bags and transported to Simon Fraser University for analysis. Standard palaeoethnobotanical 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, cone parts, unidentifiable plant remains, bone, shell 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). 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 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. 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 13 taxa representing 9 plant families were identified, in the form of seeds, needles, and other macrobotanical remains. Of the 214 seeds recovered, 210 have been identified and are classified into 7 known taxa. Fleshy berries are represented by the seeds of Saskatoon, kinniknnick, raspberry, Heath family and Rose family. Other herbaceous species identified from seeds are: grass family, sedges, chenopod, bedstraw, and waterleaf. Ponderosa pine is represented by needles, stems and bundle bases. Douglas-fir is represented by needles, buds, and cone scales. Paper birch is represented by its bark fragments or rolls. Organic residue analysis by Dr. Cummings reported that FCR from midden deposits exhibited plant residue signatures including raw nutmeats and nutshells; however, I did not find any nutshells from chosen floor midden samples at this time.

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Block	Unit	feature	y	x	z	Medicinal	Food	Mythology	drink	smoking	scents	manufacture	child	adol.	dye	sp. Bel.	Amelanchier alnifolia	Arctostaphylos uva-ursi	Chenopodium	Cyperus sp.	Ericaceae	Galium sp.	Phacelia sp.	Poaceae	Rosaceae	Rubus sp.	Unid.	Pinus ponderosa	P. menziesii	Unid.	needle stem	grass stem	cone parts	Conifer bud	needle base	Unid. Plant tissue	Insect parts	fish bone	birch bark	wood charcoal
A	12		250	-650	29	2	3		2												1			1					2						2		152			0.38g
B	14		350	-450	29	6	1	1	1	1					1	1		1					3			1			1								10			0.89g
C	5		550	-950	29	20	21		20	1			1	1		1		2										1	19								1	.01g		1.18g
D	1	1/outer			28	100	105	1	99	1			5	5		5	1	1										5	98									.05g		1.72g
D	1	1/inner			28	2	2		2	1								1											1					1			2	.36g		.32g
D	9N		675	-950	28	1	8		1	1			3			3		1			8	2					1													.21g
A	15		350	-750	28	14	22	4	10	8							4	8			8	2					1		2									.06g	.06g	.93g
A	1/area 3					43	50		40	6			6	6		6		6			4		3	2				6	34						1		13			1.94g
A	1/area 3					20	27	1	19	1			5	5		5	1	1			2			1				5	18		2	3					3	.01g		1.13g
F	10N				29	6	7		6												1			1					6								3			.25g
A	6sw		125	-875	28																																			0.94
B	10ne		275	-425	28	1																	1													X	3			0.25
D	16	2			28	9	9		9	1								1						1			1		8						1		4		0.09	8.96
A	16ne		362	-637	28	5	7		4												3		1						4											0.43
D	16	2			28	8	11		6	2			2	2		2		2			1							2	4					1			1	0.1		19.71
C	11ne		675	-725	28	2	3		2	2								2			1																			1.63
D	13sw		712	-562	28	3	4	1	3	3			1	1		1	1	2						1				1									19	0.08		10.99
C	10ne		675	-825	28																																			5.58
D	16ne		775	-637	28		2						2	2		2												2							1		1			1.85
A	8sw		125	-675	28	3	3		3	2			1	1		1		2										1	1											1.76
A	8s	1			28		2						2	2		2								1				2									1			0.81
C	4ne		475	-637	28																																			1.31
A	8ne		175	-637	28	2	2		2	2								2																				0.44		1.26
C	3		450	-750	28	3	5		3	2								2			2	1							1									0.02		1.26
A	10ne		275	-825	28	45	50	2	43	3			5	5		5	2	3										5	40	2								0.03		2.8
C	7ne		575	-725	28	1	1		1													1							1											1.75
B	15ne		362	-325	28	17	19	2	15	1			1	1		1	2	1			1							1	14											2.18
D	14ne		775	-425	28	2	7	1	1				1	1		1	1	1		1	4							1	1	1								0.02		2.55
C	1ne		475	-925	28	6	7		6												1								6									0.08		1.32
C	9ne		675	-925	28																																			0.18
D	1ne		475	-525	28	1	1		1																				1									0.01		0.16
B	14ne		362	-425	28	18	10	1	8	1							1	1			1		9	3					7	2				4				0.01		0.15
A	7sw		125	-775	28	21	24	6	15	5			2	2		2	6	5			1							2	10						1					6.26
D	5ne		575	-525	28	2	4		2				1	1		1		1			1			1				1	2											1.68
B	8ne		175	-237	28	1	3		1	1											2						1										1			0.17
B	9ne		275	-525	28	1	3	1									1	1			2	2							1		2							0.65	0.02	0.66
B	9ne		275	-525	28	8	12	1	4	3			6	6		6	1	3			1		3					6	50	1				2						0.44
C	14ne		775	-825	28	50	50		50																															2.99
B	13ne		362	-525	28	19	18	14	4	4							14	4				1	1	4					4		1			2						0.62
C	13ne		775	-925	28	4	4		4																															0.07
D	6sw		525	-475	28																																			0.17
B	5ne		175	-525	28																																			1.11
A	14ne		362	-825	28																								1										0.02	2.33
C	3nw		475	-775	28	3	3	1	2	1							1	1																				0.03		1.1
B	7ne		175	-325	28	5	6		2	2			4	4		4		2				3						4	11	2					1					0.96
A	11ne		275	-725	28	14	16	1	13	2			1	1		1	1	2			1						1	1	1									0.04		0.71
D	4ne		475	-262	28	3	5	1	2	1			1	1		1	1	1			1							1	3					1		X		0.01		1.69
D	10ne		675	-425	28	4	4	1	3								1																							1.15
B	12ne		275	-262	28	1	2		1	1			1	1		1		1										1	1		2		1	1				0.01		1.72
C	15se		725	-725	?	1	1		1		2				2				2										1									0.12	0.03	6.86
B	9		250	-550	28	5	8	1	3	3							1	3			4	1											1							0.59
B	6ne		175	-425	28	4	6		4	2			2	2		2		2										2	2											1.89
B	11ne		275	-325	28																																			0.94
D	7ne		575	-325	28	16	19		15	1		1	3	3		3		1						1	1			3	14									0.51		4.05
C	16		750	-650	29	4	4		4										2										4									0.05	0.06	1.53

Appendix E

Residues Analysis Report

ORGANIC RESIDUE (FTIR) ANALYSIS OF FIRE-CRACKED ROCK FROM THE BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA, CANADA

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November 2012

INTRODUCTION

Ten fire-cracked rocks from the historic Bridge River site near Lillooet, British Columbia, Canada were submitted for organic residue analysis. Samples were tested for organic residues using Fourier Transform Infrared Spectroscopy (FTIR). Organic residue analysis provides information concerning the compounds that were extracted from the fire-cracked rock. These data are evaluated to interpret which foods might have been processed in association with thermal features through matches with our reference library of raw and processed plants and animal products.

METHODS

FTIR (Fourier Transform Infrared Spectroscopy)

A mixture of chloroform and methanol (CHM) was used as a solvent to remove lipids and other organic substances that had soaked into the surface of the fire-cracked rock. This mixture is represented in the FTIR graphics as CHM. The CHM solvent and sample were placed in a glass container, covered, and allowed to sit for several hours. After this period of time, the solvent was pipetted into an aluminum evaporation dish, where the CHM was allowed to evaporate. This process leaves the residue of any absorbed chemicals in the aluminum dish. The residue remaining in the aluminum dish then was placed on the FTIR crystal and the spectra were collected. The aluminum dishes were tilted during the process of evaporation to separate the lighter fraction of the residue from the heavier fraction. The lighter and heavier fractions are designated upper (lighter fraction) and lower (heavier fraction), respectively, in the subsequent analysis.

FTIR is performed using a Nicolet 6700 optical bench with an ATR (attenuated total reflection) accessory and a diamond crystal. The sample is placed in the path of a specially encoded infrared beam, which passes through the sample and produces a signal called an "inferogram." The inferogram contains information about the frequencies of infrared that are absorbed and the strength of the absorptions, which is determined by the sample's chemical make-up. A computer reads the inferogram, uses Fourier transformation to decode the intensity information for each frequency (wave numbers), and presents a spectrum.

FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR) REVIEW

Infrared spectroscopy (IR) is a technical method that measures the atomic vibrations of molecules. It is currently one of the more powerful methods used in organic and analytical chemistry for the extraction and identification of organic compounds. The infrared spectrum is produced by passing infrared radiation through a sample, whether the sample is from a liquid, paste, powder, film, gas or surface. The measurement of this spectrum is an indication of the fraction of the incident radiation that is absorbed at a particular energy level (Stuart 2004). This provides information on infrared radiation absorption, heat conversion, and the structure of the organic molecules. Analysis of specific regions and peaks in the infrared spectrum enables identification of organic compounds, including both plant and animal fats or lipids, plant waxes, esters, proteins, and carbohydrates.

The Fourier Transform Infrared Spectrometer is an instrument that converts the raw data and measures the infrared spectrum to be interpreted. Advantages of using this technique over others include the simultaneous measurement of all wavelengths, a relatively high signal-to-noise ratio, and a short measurement time. Since molecular structures absorb vibrational frequencies (i.e. wavelengths) of infrared radiation the bands of absorbance can be used in the identification of organic compound compositions. The spectrum is divided into two groups, the functional and fingerprint regions. These groups are characterized by the effect of infrared radiation on the respective group's molecules. The functional group region is located between 4000 and c. 1500 wave numbers and the fingerprint region is located below 1500 wave numbers. The molecular bonds display vibrations that can be interpreted as characteristic of the vibrations of fats, lipids, waxes, lignins, proteins, and carbohydrates. The portion of the infrared spectrum that is most useful for this research and in the identification of organic compounds (e.g. carbohydrates, lipids, proteins) is the electromagnetic spectra between 4000 and 400 (Isaksson 1999:36-39). The recorded wavelengths of the electromagnetic spectra can then be compared to the reference collections housed in the PaleoResearch Institute (hereafter PRI) library. The results from the sample are compared with the reference collection, with the aim of identifying the closest match. For example, plant lipids and fats are identifiable between 3000 and 2800 wave numbers. This portion of the spectrum can be suggestive of the presence of animal fats, plant oils, oily nuts (e.g. hickory, walnut, or acorn), or plant waxes.

Samples from archaeological contexts are difficult to analyze because they often result from complex compound mixtures. For instance, groundstone tools and ceramic cooking vessels are often multi-purpose artifacts that were used to process (e.g. crush, grind, cook) a variety of foodstuffs or ingredients. Thus, multi-purpose artifacts can create a spectra that have overlapping absorption bands with few distinctive characteristics. In particular, FTIR is a useful technique in the examination of organic compounds in fire-cracked rock (FCR) because there are so few other techniques that can be used. Organic compounds are often deposited on rocks during cooking. The fats, lipids, waxes, and other organic molecules may be deposited onto rock surfaces as a result of dropping or oozing from foods being cooked or baked in a pit, or seepage out of or spill over from cooking vessels. Re-use of rocks is possible, in which case the organics recovered from the FCR might represent multiple cooking episodes. The PRI extraction method gently removes these organic molecules from the groundstone, ceramics, and/or rocks so that they can be measured with FTIR and subsequently identified. Organic molecules from sediments can also be extracted, measured, and identified. This is useful in the identification of dark horizons that are a result of the decay of organic matter, whether plant or animal. For example, if the dark horizon is the result of decaying organic matter, FTIR will yield a signature of decaying organic remains. If the dark horizon is the result of ash blown from a cultural feature (i.e. hearth), then the signature will be considerably different. Below is a discussion of the common organic materials that can be identified in archaeological samples using FTIR.

Lipids

Lipids that are solid at room temperature are called fats and those that are liquid at room temperature are referred to as oils (Wardlaw and Insel 1996:108). Both forms of lipids can be detrimental, as well as beneficial, to human health. Consumption of certain animal fats rich in saturated fatty acids can lead to heart disease, while ingesting omega-3 fatty acids such as EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), found in both fish and plants, is essential for good health. Lipids, whether fats or oils, are noted between 3000 and 2800 wave numbers on the FTIR spectrum.

Fatty acids are components of most lipids in humans, animals, and plants foods (Wardlaw and Insel 1996:108). A fatty acid is considered saturated if the carbons are connected by single bonds. Saturated fatty acids occur in high proportions in animal fats. If the carbon chain has only one double bond between two of the carbons, then the fatty acid is monounsaturated. If there are two or more double bonds between carbons, then the fatty acid is polyunsaturated. Essential fatty acids are those lipids necessary for human health including normal immune function and vision. Essential fatty acids include omega-3 and omega-6, alpha-lineolic, and linoleic (Wardlaw and Insel 1996:110-111). Diets high in essential fatty acids reduce the risk of heart attacks because they minimize the tendency for blood to clot (Wardlaw and Insel 1996:112).

Esters

Esters are components of the biological compounds fats, oils, and lipids and, as such, are an important functional group. In an ester, the basic unit of the molecule is known as a carbonyl. Esters may be recognized using FTIR by three strong bands appearing near 1700, 1200 and 1100 wave numbers. Esters are divided into aliphatic and aromatic groups (Stuart 2004:78) or into saturated and aromatic groups (Smith 1999:108). Aromatic esters take their name from their ability to produce distinctive odors and occur naturally in many plant foods. They are defined by the presence of a benzene ring as part of the alpha carbon (Smith 1999:108). This is recognizable in the FTIR by the wave number assignment of the peaks. Aromatic esters are expressed in the FTIR spectrum by distinct peaks located at 1730-1715, 1310-1250, 1130-1100, and 750-700 wave numbers. In contrast, aliphatic esters do not contain a benzene ring. Some have distinctive odors, while others do not. Saturated esters are defined by saturation of the alpha carbon (Smith 1999:108). Saturated (or aliphatic) esters are represented by peaks in the ranges 1750-1735, 1210-1160, 1100-1030, with a unique peak for acetates expressed at approximately 1240 wave numbers, the latter of which can be very strong (Smith 1999:110-112). It is easy to identify the distinction between saturated/aliphatic and aromatic esters when all three bands are present since they occupy different wave number regions.

Proteins

The majority of the building blocks for proteins, or amino acids, are produced by plants. Humans do not have all the enzymes required for biosynthesis of all the amino acids, which are organic compounds that contain both an amino and a carboxyl group, so many must be supplied by the diet. The human body uses protein from both plant and animal sources to perform key bodily functions (e.g. blood clotting, fluid balance, hormone and enzyme production, cell growth and repair and vision). The human body requires thousands of different types of proteins that are not all available within the body (Wardlaw and Insel 1996:152). Through a process known as translation amino acids are linked in a variety of ways to form necessary proteins (Rodnina 2007). The order in which the amino acids are arranged is determined by the genetic code of the mRNA template, which is a copy of an organism's genetic code (Creighton 1993). Amino acids are divided into standard and non-standard types. There are twenty naturally-occurring standard amino acids (Creighton 1993). These are divided into essential and nonessential amino acids, essential because they are necessary for human growth and cannot by produced by the body (Young 1994). Essential amino acids must be obtained from food sources, and include histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine (Furst and Stehle 2004; Reeds 2000; Wardlaw and Insel 1996:154).

Nonessential amino acids also are essential for human health, but do not need to be obtained from the diet because they can be produced by the body. However, certain nonessential amino acids may become essential on an individual basis if the health of the individual is compromised (Wardlaw and Insel 1996:155), leading to difficulties in producing these amino acids. Nonessential amino acids include alanine, arginine, asparagine, aspartate (aspartic acid), cysteine, glutamate (glutamic acid), glutamine, glycine, proline, serine, and tyrosine (Furst and Stehle 2004; Reeds 2000; Wardlaw and Insel 1996:154). There are also nonstandard amino acids that encompass two groups, those that are chemically altered after incorporation into a protein and those that exist in living organisms but are not found in proteins (Driscoll and Copeland 2003).

Carbohydrates

Carbohydrates are a product of photosynthesis in green plants and are the most prevalent group of compounds on earth. They include sugars, starches, and fibers: sugars are the simple carbohydrates found in table sugar, honey, fruit, and molasses; starches are simple or complex carbohydrates present in legumes, grains, vegetables, and fruits; and fibers (cellulose, hemicellulose, and pectin) are present in whole grains, legumes, vegetables, and fruits (Garrison and Somer 1985:13). There are four groups of carbohydrates that are classified based on their molecular structure. These are monosaccharides, disaccharides, oligosaccharides, and polysaccharides. This discussion presents a brief overview of the different carbohydrates with a more detailed discussion of the polysaccharides.

Monosaccharides, Disaccharides, and Oligosaccharides

Monosaccharides are naturally occurring simple sugars containing three to seven carbon atoms. Variations in the carbon chains create different sugars including, glucose, D-glucose, fructose, galactose, and mannose. The most important dietary monosaccharides are hexoses ($C_6H_{12}O_6$). Disaccharides are formed when two monosaccharides are combined (Wardlaw and Insel 1996:72). Sucrose, lactose, and maltose are the three most common disaccharides found in nature (Wardlaw and Insel 1996:72). Oligosaccharides comprise two or more hexoses with the exclusion of one water molecule ($C_{12}H_{22}O_{11}$). These carbohydrates are water soluble and are able to crystallize. Raffinose and stachyose are oligosaccharides that are found in legumes. Humans (and other monogastric animals) are missing the α-GAL enzyme that allows for the digestion of these two carbohydrates (Wardlaw and Insel 1996:80). Thus, ingestion of raffinose and stachyose results in gas-producing bacteria in the lower intestine (carbon dioxide, methane, and/or hydrogen), which leads to flatulence (and discomfort).

Polysaccharides

Polysaccharides ($C_6H_{10}O_5$) are complex starchy compounds (cellulose in plants and glycogen in animals). These carbohydrates are not sweet, do not crystallize, and are not water soluble. They are formed of repeating units of mono- or disaccharides that are joined together by glycosidic bonds. Polysaccharides are often heterogeneous and slight modifications of the repeating units result in different FTIR signatures. The different types of polysaccharides include storage (starches and glycogen), structural (cellulose and chitin), acidic (containing carboxyl groups, phosphate groups, and/or sulfuric ester groups), neutral (presumably without the acid features), and bacterial (macromolecules that include peptidoglycan, lipopolysaccharides, capsules and exopolysaccharides).

The two primary storage polysaccharides are starch and glycogen, both of which are digestible by humans (Murray, et al. 2000:155; Wardlaw and Insel 1996:80-81). Cooking starches allows for easier digestion by making them more water soluble and available for breakdown by digestive enzymes (Wardlaw and Insel 1996:80). The two primary types of plant starch are amylose and amylopectin, both of which are sources of energy for plants and subsequently for animals (Murray, et al. 2000:155; Wardlaw and Insel 1996:80). Glycogen, often referred to as animal starch, is a storage polysaccharide found in the liver and muscles of humans and other animals. Structurally, glycogen is similar to amylopectin, but it has a more complex branching pattern of glucose molecules that allows for easier energy conversion because the enzyme breakdown of glycogen occurs only at the ends of chains of glucose molecules. This makes glycogen an ideal form for carbohydrate storage in the body (Wardlaw and Insel 1996:81). Breakdown of glycogen yields glucose-phosphate molecules, which can either be converted into glucose by the liver and transferred into the blood stream or be broken down in the muscles through a non-enzymatic process termed glycolysis (Wardlaw and Insel 1996:81,335). Glycolysis in the muscles during intense physical activity or stress yields lactic acid under anaerobic conditions or carbon dioxide and water under aerobic conditions (Wardlaw and Insel 1996:336). Therefore, glycogen is absent in meat from butchered and hunted animals because in response to stress and/or intense physical activity the glycogen is broken down into lactic acid and/or metabolized by the animal (Food and Agriculture Organization of the United Nations 2009; Green, et al. 2006; Sheeler and Bianchi 2004; Wardlaw and Insel 1996:81).

Humans and other animals cannot digest structural polysaccharides, also known as dietary fibers. Structural polysaccharides are primarily composed of cellulose, hemicellulose, pectin, gum, and mucilage (Wardlaw and Insel 1996:82). Lignins are complex alcohol derivatives that make up the only non-carbohydrate component of insoluble plant fibers (Wardlaw and Insel 1996:82). Pectin, gums, and mucilages are soluble fibers found inside and around plant cells that help “glue” them together (Wardlaw and Insel 1996:82).

Acidic polysaccharides are defined as containing carboxyl groups, phosphate groups, and/or sulfuric ester groups. Carboxylates are often identified in FTIR with a signature peak between 1560 and 1410 wave numbers. Neutral polysaccharides lack carboxyl groups, phosphate groups, and/or sulfuric ester groups and include chitin, chitosan, curdlan, dextran, glucan, inulin, arabinogalactan, arabinogalactorhamnoglycan, and other compounds that are a result of fermentation or are plant-specific.

Bacterial polysaccharides are diverse macromolecules that include peptidoglycan, lipopolysaccharides, and exopolysaccharides. Peptidoglycans function as one of the components of structural cell walls. Pathogenic bacterial may produce a thick, mucous-like, encapsulating layer of polysaccharide, which cloaks the antigenic proteins on the surface of the bacteria that are used by the host organism to provoke an immune response, leading to the destruction of the bacteria. These are referred to as "bacterial capsular polysaccharides". This encapsulating layer also protects the bacterium from harsh environments, such as *Pseudomonas* in the human lung. Bacteria, fungi, and algae may secrete polysaccharides to help them adhere to surfaces and/or to prevent them from drying out. Humans have used some of these polysaccharides, such as xanthan gum, as thickening agents in food.

DISCUSSION

The historic River Bridge site is located near Lillooet, British Columbia, Canada. Local vegetation consists of ryegrass (*Lolium*), bunch grasses (Poaceae), service/saskatoon berries (*Amelanchier*), ponderosa pine (*Pinus ponderosa*), and white birch (*Betula*). The site includes at least one housepit (Housepit 54). The recovery of trade beads and other historic period artifacts from the final floor of Housepit 54 has dated the floor to the mid-nineteenth century (Anna Prentiss, personal communication, August 23, 2012). Strata designations within the housepit represent different cultural use of the house floor, including the floor itself, a hearth, and a kitchen midden. Fire-cracked rock recovered from these strata was submitted for organic residue analysis and tested using Fourier Transform Infrared Spectroscopy (FTIR) (Table 1). All of the fire-cracked rock samples were received by PaleoResearch Institute wrapped in foil, then contained in plastic bags. As a result, samples were off-gassed for the standard two week period prior to extraction. Organic residue analysis was used to determine possible foods processed in association with fire-cracked rock at this site. Results are discussed by strata below.

<u>House Floor (Stratum II)</u>

Stratum II represents the house floor (Anna Prentiss, personal communication, August 23, 2012). Organic residue analysis of fire-cracked rock recovered from the house floor (sample 784) yielded peaks representing major categories (functional groups) of compounds (4000-1500 wave number), as well as specific compounds noted in the fingerprint region (1500-400 wave numbers) of the spectrum. The functional group peaks indicate the presence of fats/oils/lipids and/or plant waxes (Tables 2 and 3). Lipids are organic compounds insoluble in water, but soluble in non-polar organic solvents such as chloroform, ether, and/or methanol, that, along with proteins and carbohydrates, constitute the principal structural components of living cells. Lipids include fats, waxes, sterols, triglycerides, phosphatides, cerebrosides, and related and derived compounds. Peaks observed within the fingerprint region represent the presence of aromatic rings, protein, the amino acid lysine, calcium oxalates, and cellulose and carbohydrates.

Matches were made only with deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates (Table 4). The lysine peak at 1611/10 and the calcium oxalate peak at 778/77 remain unmatched. They do, however, provide information that suggests deteriorating materials containing lysine and/or calcium oxalates that came in contact or perhaps were surrounding the fire-cracked rock recovered from this portion of the floor.

Plants that typically contain calcium oxalates include cacti, members of the goosefoot family (Chenopodiaceae), cattails (*Typha*), and several other monocots such as yucca.

Hearth (Feature 2)

Feature 2 is a small hearth located on a raised portion of the house floor (Stratum II) (Anna Prentiss, personal communication, August 23, 2012). Three fire-cracked rocks from this feature were tested for organic residues. The first fire-cracked rock, represented by sample 567A, yielded functional group peaks indicating the presence of absorbed water and fats/oils/lipids and/or plant waxes. Peaks in the fingerprint region represent aromatic rings, protein, the amino acid leucine, calcium oxalates, and cellulose and carbohydrates.

Deteriorated cellulose is indicated by the portions of the spectrum representing cellulose and carbohydrates. No matches were made specifically with the leucine peak at 1375 wave numbers nor with the calcium oxalate peak at 778 wave numbers. Matches with only single peaks usually do not indicate that item is present. Matches to much larger portions of the spectra are required to identify the presence of items or foods that might have been processed. In this case it is likely that calcium oxalate were introduced either from processing plants that contain this chemical or through local growth and deterioration of these plants in the sediments. The leucine peak also probably represents deterioration of an item containing the amino acid leucine.

Sample 567B, representing the second fire-cracked rock recovered from Feature 2, yielded peaks representing functional group compounds including absorbed water and fats/oils/lipids and/or plant waxes. Other peaks identified in the fingerprint range indicate the presence of aromatic rings, protein, the amino acids glutamate and leucine, calcium oxalates, humates, and cellulose and carbohydrates.

Matches were made only to deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates. The peaks representing glutamate at 1560, leucine at 1375, and calcium oxalate at 779/78/77 were not matched with individual foods. Instead, these peaks indicate that the amino acids glutamate and leucine were present, as was the mineral calcium oxalate. These peaks might be present through cooking meat and perhaps a member of the cactus family, the goosefoot family, or another plant that contains calcium oxalate. Alternatively, it is possible that these peaks are present as a result of deterioration of these items in the local sediments.

FTIR analysis of the third fire-cracked rock (sample 567C) recovered from the small hearth on the house floor yielded functional group peaks indicating the presence of absorbed water and fats/oils/lipids and/or plant waxes. Peaks within the fingerprint range of the spectrum represent aromatic rings, protein, the amino acid glutamate, calcium oxalates, and cellulose and carbohydrates.

The results for this FCR sample were similar to those above. A match was made only to deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates. The glutamate peak (1420/19) and the calcium oxalate peak (778/77) are consistent with peaks noted above, and remain unmatched.

Kitchen Midden (Stratum XIX)

Stratum XIX represents a kitchen midden on the house floor southwest of a large central hearth (Anna Prentiss, personal communication, August 23, 2012). The kitchen midden contains dense fire-cracked rock, dark soil, bones, botanic remains, and lithic artifacts. A total of six fire-cracked rock samples from this stratum were examined for organic residues. Three samples were taken from Level 1 and three samples were taken from Level 3.

The first fire-cracked rock (769C) recovered from Level 3 in the kitchen midden yielded peaks representing functional group compounds including absorbed water and fats/oils/lipids and/or plant waxes (Table 5). Other peaks in the fingerprint region indicating the presence of aromatic rings, protein, the amino acid glutamate, calcium oxalates, and cellulose and carbohydrates also were identified.

This signature is very similar to that obtained on FCR 567C, discussed above. The results are the same. This signature matched with deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates (Table 6). No matches were made for the glutamate peak (1420) or the calcium oxalates peak (779/78).

Sample 769B represents the second fire-cracked rock from Level 3 analyzed for organic residues. This sample (769B) yielded functional group peaks indicating the presence of absorbed water and fats/oils/lipids and/or plant waxes. Peaks in the fingerprint portion of the spectrum represent aromatic rings; aromatic and saturated esters; phospholipids; protein; the amino acids glutamate, alanine, and leucine; calcium oxalates; humates; and cellulose and carbohydrates.

The match with deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates is similar to that obtained from other FCR from this project. This sample contained more peaks in the fingerprint region than have been noted in other samples. The presence of peaks representing aromatic and saturated esters, as well as phospholipids, for instance, provides additional information concerning the fats/lipids present in the sample. Identification of peaks representing protein, three amino acids (glutamate, alanine, and leucine) also provides clarification to the record. Raw seeds and nutmeat usually exhibit a peak at or near 1463, representing protein in general and the amino acid alanine specifically. Since this peak is associated with raw materials, it is likely part of the environmental signal in the sediments, and hence on the FCR, rather than part of the record that resulted from cooking food. Likewise, the association of peaks representing saturated esters and phospholipids at 1735 wave numbers, aromatic esters at 1707 wave numbers, a protein/alanine peak at 1463 wave numbers, a lipids and humate peak at 1376 wave numbers, and a very common aromatic ester peak at 719 wave numbers is associated with raw nutshells, which might have been plentiful in the sediments as a result of discard during food preparation. Since these compounds are typical of raw nutshells, rather than cooked or baked nutshells, it is likely this portion of the record represents items that were discarded in the kitchen midden. As they deteriorated, these items likely contributed their signatures to the sediments and ultimately to the FCR that also was discarded in the kitchen midden. No specific matches were made with the peaks representing glutamate (1560), leucine (1375), and calcium oxalate (779/78/77).

FTIR analysis of the third fire-cracked rock (sample 769A) from Level 3 in the kitchen midden yielded peaks representing functional group compounds including absorbed water and fats/oils/lipids and/or plant waxes. Peaks indicating the presence of aromatic rings, protein, the amino acid tyrosine, calcium oxalates, humates, and cellulose and carbohydrates also were observed in the fingerprint range.

A match with deteriorated cellulose was made for portions of the spectrum representing cellulose and carbohydrates. The peaks representing the amino acid tyrosine (1598) and calcium oxalate (779/78/77) remain unmatched. Therefore, no signature could be obtained from this FCR to indicate specific foods that might have been cooked in the large central hearth adjacent to the kitchen midden from which this FCR was collected.

A fire-cracked rock from Level 1, represented by sample 1402C, yielded functional group peaks indicating the presence of absorbed water and fats/oils/lipids and/or plant waxes. Other peaks in the fingerprint portion of the spectrum represent aromatic rings, aromatic esters, protein, the amino acids lysine and glutamine, calcium oxalates, lignin, humates, cellulose and carbohydrates, and the polysaccharide rhamnogalacturonan.

The typical match with deteriorated cellulose was made for portions of the spectrum representing cellulose and carbohydrates. In addition, matches were shared with raw nutmeat at 1604 (protein), 1508 (lignin), and 1459 (a common protein peak found in many plants and animals, including raw nutshell lining). A cellulose peak at 1032 also was noted in raw nutshell lining reference samples. Raw nutshells exhibit a peak at 1718, representing aromatic esters. Peaks at 1618 (amino acid lysine and/or glutamine), 826 (polysaccharide rhamnogalacturonan), and 779 (calcium oxalate) remain unmatched. Peaks from this sample of FCR might reflect items discarded in the kitchen midden and the presence of deteriorated compounds in that kitchen midden, which were then imparted onto the FCR.

Sample 1402B, representing a second fire-cracked rock from Level 1 of the kitchen midden, yielded peaks indicating functional group compounds including absorbed water and fats/oils/lipids and/or plant waxes. Peaks in the fingerprint range representing aromatic rings, protein, the amino acids glutamate and leucine, calcium oxalates, humates, and cellulose and carbohydrates also were noted.

The limited peaks identified in this sample matched deteriorated cellulose for portions of the spectrum representing cellulose and carbohydrates. No matches were made for the peaks representing the amino acids glutamate (1560) and leucine (1375). The calcium oxalate peak at 780/778/776 also was not matched.

The final fire-cracked rock sample (1402A) taken from Level 1 yielded functional group peaks representing absorbed water and fats/oils/lipids and/or plant waxes. Peaks in the fingerprint region also indicate the presence of aromatic rings; aromatic and saturated esters; phospholipids; protein; the amino acids lysine, alanine, leucine, and serine; calcium oxalates; humates; cellulose and carbohydrates; and the polysaccharide galactoglucomannan.

Deteriorated cellulose matched for the portions of the spectrum representing cellulose and carbohydrates. Once again raw seeds and nutmeat shared peaks with those found in this sample. A very common peak at 1463, representing protein and the amino acid alanine, is found in raw seeds and nutmeat, and many plant stems. The presence of this peak does not identify which type of seed or nut might be present. Raw nutshell lining, raw nutshells, bark, and many plant stems also exhibits a peak at 1735 wave numbers, representing saturated esters/phospholipids. In addition, a peak at 1376 wave numbers usually is associated with lipids and/or humates. This peak is very common in sediments. Other common ester peaks include 729 and 720, meaning that these peaks are observed in many plant and animal samples, including many plant stems and bark. Plant stems and bark also exhibit a peak at 1170, representing lipids. Bark also exhibits a peak that might represent the amino acid lysine at 1632 wave numbers. Peaks that remain unmatched include 1552 (lysine), 1375 (leucine), 937 (galactoglucomannan), and 779/78 (calcium oxalate).

SUMMARY AND CONCLUSIONS

FTIR analysis of ten FCR from Housepit 54 at the Bridge River site in Lillooet, British Columbia revealed patterns that likely reflect the different areas in the house. Samples were collected from the house floor, a small hearth, and from kitchen middens to the southwest of the large central hearth. FCR exhibiting the most simple signatures were recovered from the house floor and the small hearth. These pieces of FCR yielded signatures typical of deteriorated cellulose. In addition, they contain peaks typical of calcium oxalates, which might represent plants growing in the local vegetation community or plants that were present or processed inside the house. A few peaks recovered also represent individual amino acids, which are present in animal products. These peaks might reflect use of animal hides on the floor, cooking meat in the hearth, or simple deterioration of animal products in these sediments. The peaks representing amino acids were not matched with any particular types of animals.

Some of the samples collected from kitchen midden deposits exhibited more diverse signatures that probably represent deterioration of other food processing debris or garbage within these midden deposits. Peaks representing saturated and aromatic esters were more common in these samples than in samples from the house floor and small hearth. Peaks representing protein, amino acids, and polysaccharides also were noted to be more common in FCR from the kitchen midden. All of these additional peaks recovered from FCR collected from the kitchen midden deposits are very common peaks noted in many plant and/or animal reference samples in our collection. In addition, these peaks are typical of the raw, rather than cooked, specimens. For instance, raw seeds and nutshells, raw nutmeats, and raw nutshell linings all exhibit some of the peaks that were common in these samples. Other peaks were typical of raw bark and raw plant stems. These additional peaks noted in samples collected from the kitchen midden deposits suggests the possibility that these esters, proteins, amino acids, and polysaccharides were imparted onto the FCR after it was discarded in the midden, rather than as part of the cooking activities in the hearth.

Macrofloral, phytolith, pollen, and starch analysis of fill from these middens likely would identify the seeds and/or nuts that were processed to a much more specific level than was possible using this analysis. In addition, these analyses are expected to yield more information concerning resource processing in Housepit 54.

TABLE 1
PROVENIENCE DATA FOR FIRE-CRACKED ROCK FROM HOUSEPIT 54,
BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

Sample No.	Feature No.	Block	Unit	Stratum	Stratum/Feature Description	Lvl	Description	Analysis
784		B	10	II	House floor	2	Fire-cracked rock	FTIR
567A	2	D	16		Small hearth on a raised portion of the house floor (essentially a raised bench)	1	Fire-cracked rock	FTIR
567B						1	Fire-cracked rock	FTIR
567C						1	Fire-cracked rock	FTIR
1402A		B	9	XIX	Kitchen midden on house floor, southwest of the large central hearth	1	Fire-cracked rock	FTIR
1402B						1	Fire-cracked rock	FTIR
1402C						1	Fire-cracked rock	FTIR
769A		A	16		Kitchen midden on house floor, southwest of the large central hearth	3	Fire-cracked rock	FTIR
769B						3	Fire-cracked rock	FTIR
769C						3	Fire-cracked rock	FTIR

Lvl = Level
FTIR = Fourier Transform Infrared Spectroscopy

TABLE 2
FTIR PEAK SUMMARY TABLE FOR FIRE-CRACKED ROCK FROM STRATUM II
IN HOUSEPIT 54, BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

		House floor	Feature 2: small hearth		
Peak Range	Represents	784 FCR	567A FCR	567B FCR	567C FCR
Absorbed Water:					
3600-3200	Absorbed Water (O-H Stretch)		3356,3305, 3274	3297,3281	3323,3320, 3281
Fats, oils, lipids, waxes:					
3000-2800	Aldehydes: fats, oils, lipids, waxes	2917, 2850,2848	2917, 2849	2919/18	2918/17, 2849
1377	Fats, oils, lipids, humates (CH_3 symmetric bend)			1376	
	Lipids: Aromatic Esters:				
1585	Aromatic ring mode				1585
692	Aromatic ring bend (phenyl ether)	693/92	694/93	694/93	694/93
Proteins:					
1700-1500	Protein, incl. 1650 protein	1611/10, 1578	1578/77, 1571	1577,1560	1578/77
1500-1400	Protein			1401	1420/19
1490-1350	Protein		1379,1375	1401, 1375	1420/19, 1380
1394, 1379, 1366	Split CH3 umbrella mode, 1:2 intensity		1379		1380
	Proteins: Amino Acids:				
1640-1610, 1550-1485	Lysine (amino acid) NH_3^+ bending	1611/10			
1560,	Glutamate (amino acid) CO_2^- asymmetric stretching			1560	
1415	Glutamate (amino acid) CO_2^- symmetric stretching				1420/19

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TABLE 2 (Continued)

Peak Range	Represents	House floor	Feature 2: small hearth		
		784 FCR	567A FCR	567B FCR	567C FCR
	Proteins: Amino Acids (Continued):				
1375	Leucine (amino acid) CH_3 symmetric bending		1375	1375	
1375	CH_3 Umbrella mode		1375	1375	
Carbohydrates (General):					
1028-1000	Cellulose Carbohydrates	1005/04/03	1007, 1005/04	1005/04	1008/07, 1004
Minerals:					
780	Calcium oxalate	778/77	778	779/78/77	778/77

FCR = Fire-cracked Rock

TABLE 3
INDEX OF ORGANIC COMPOUNDS NOTED IN FIRE-CRACKED ROCK FROM HOUSEPIT 54, BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

Compound	Description	Source
LIPIDS:		
Aldehydes	• Organic compounds that contain the carbonyl group (〉C=O) (Davis, et al. 1984:851). • Ubiquitous in nature (O'Brien, et al. 2006).	• Compounds naturally emitted by plants (O'Brien, et al. 2006). • Formed by the oxidation of alcohols (e.g. formaldehyde (methanol), acetaldehyde (ethanol), propionaldehyde (propanol) (Davis, et al. 1984:851).
Phospholipids	• Fats and/or lipids + phosphorus.	• Plants and animals. • Present in shells of freshwater and seawater crustaceans, the chitinous exoskeleton of insects (Ignatyuk and Isai 1993). • Milk fat (Crane and Horrall 1943). • Essential components of oils present in nuts and seeds (Salas 2006a), including acorns (Bonner and Vozzo 1987), pine nuts (Shahidi and Tan 2008:146; Yu and Slavin 2008), sunflower seeds (Salas 2006a, b), and pumpkin seeds (Yoshida 2005). • Concentrated in the cotyledon embryo of plants (Salas 2006a).
ESTERS: (Components of fats, oils, and lipids)		
Aliphatic esters (saturated and unsaturated)	• Esters of fatty acids (more saturated from fats, less saturated from oils) (Davis, et al. 1984:844).	• Common in plants and animals (Davis, et al. 1984:845).
Aromatic esters	• Responsible for flavors and smells (Davis, et al. 1984:843).	• Plant parts (fruits, flowers, bark, etc.) (e.g. cinnamon, mint) (Davis, et al. 1984:843).

TABLE 3 (Continued)

Compound	Description	Source
PROTEINS:		
Amino Acids: (Organic compounds that contain both an amino group and a carboxyl group)		
Essential Amino Acids: (Necessary to build protein, but cannot be synthesized in human body)		
Leucine	• Used in the liver, adipose tissue, and muscle tissue (Combaret, et al. 2005; Rosenthal, et al. 1974).	• Most concentrated in meat, fish, shellfish, and eggs, but also found in sizable quantities in nuts, seeds, and legumes (Combaret, et al. 2005; Rosenthal, et al. 1974).
Lysine	• Important for calcium absorption, building muscle, recovering from injuries or illnesses, and the production of hormones, enzymes, and antibodies (Nelson and Cox 2005).	• Legumes, gourds/squash, spinach, amaranth, quinoa, and buckwheat (Wardlaw and Insel 1996:158). • Beef, poultry, pork, fish, eggs, and dairy products.
Non-Essential Amino Acids: (Necessary to build protein, can be synthesized in human body)		
Alanine	• Plays an important role in the glucose-alanine cycle between tissues and liver (Nelson and Cox 2005).	• Common sources of alanine in the diet include such diverse things as meat, eggs, fish, legumes, nuts and seeds, and maize.
Glutamate (syn. glutamic acid)	• Important molecule in cellular metabolism (animals) (Nelson and Cox 2005). • Recent research suggests glutamate plays a role in plant nitrogen metabolism; however, its absence in many plants has prompted speculation (Forde and Lea 2007).	• All animal products (e.g. dairy, eggs, meat (beef, pork, poultry, wild meats, and fish) (Reeds, et al. 2000). Distribution of glutamate in the plant kingdom is limited to protein-rich plants (e.g. whole grains and beans) (Forde and Lea 2007).

TABLE 3 (Continued)

Compound	Description	Source
Non-Essential Amino Acids (Continued): (Necessary to build protein, can be synthesized in human body)		
Glutamine	• Synthesized by the body (animals) from the amino acid glutamate (Lee, et al. 1998). • Animal muscles produce and contain 90% of glutamine used by their bodies (Lee, et al. 1998). • Considered a conditionally essential amino acid (for animals) under certain circumstances (e.g. illness or injury) (Lee, et al. 1998). • One of the few amino acids that crosses the blood–brain barrier (Lee, et al. 1998). • Beneficial in healing the cells of the gastrointestinal tract.	• Most concentrated in high-protein foods including beef, chicken, fish, eggs, legumes, and dairy products, but also occurs in cabbage, beets, spinach, and parsley.
Serine	• Important in metabolic function (Nelson and Cox 2005). • Neuronal signal by activating N-methyl-D-aspartate (NMDA) receptors in the brain and helps to build muscle tissue (Mothet, et al. 2000).	• Beef, eggs, nuts and seeds, legumes, and milk.
Tyrosine	• Assists and supports neurotransmitters in the brain, which help nerve cells communicate (Nelson and Cox 2005).	• Dairy products, chicken, turkey, fish, almonds, avocados, bananas, legumes, and pumpkin and sesame seeds. • Can be produced in the body from phenylalanine.
CARBOHYDRATES:		
Polysaccharides (structural):		
Lignin	• Links plant polysaccharides to give strength to cell walls (Chabannes, et al. 2001).	• Plants.
Cellulose	• Straight-chain glucose polymer linked by beta bonds (Wardlaw and Insel 1996:82).	• Plants.

TABLE 3 (Continued)

Compound	**Description**	**Source**
Hemicelluloses:		
Galactoglucomannan	• Water-soluble hemicellulose, consisting of galactose, glucose and mannose (Willför, et al. 2008).	• Plants (Stephen 1982). • Woody tissue of all coniferous plants (Bochicchio and Reicher 2003), *Trifolium* (clover) (Buchala and Meier 1973).
Pectin, Gums, and Mucilages:		
Rhamnogalacturonan (pectic)	• Composed primarily of rhamnose and galacturonic acid (Willats, et al. 2001). • Results from the degradation of pectin (Willats, et al. 2001).	• Terrestrial Plants (cell walls) (Willats, et al. 2001).
MINERALS:		
Calcium Oxalate (abbreviated CaOx)	• CaC_2O_4 or Ca $(COO)_2$ • Crystal forms include styloids, raphids, pyramids, or rosettes. • Primary function of calcium oxalate formation in plants is to regulate high-capacity calcium and protect against herbivory (Franceschi and Nakata 2005:41). • Poisonous when ingested by animals, including humans.	• Most abundant in plant leaves and roots (Patnaik 2003:765). • *Populus* (cottonwood), *Salix* (willow), *Agave*, *Yucca*, Cactaceae (cacti), *Nicotiana* (tobacco), *Datura*, all members of the Fabaceae or legume family, and various plants in the Chenopodiaceae such as *Atriplex* (saltbush), *Chenopodium* (goosefoot); *Oxalis* and Araceae, and roots and leaves of rhubarb and buckwheat (Streitweiser 1976).

TABLE 4
MATCHES SUMMARY TABLE FOR FTIR RESULTS FROM STRATUM II
IN HOUSEPIT 54, BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

Match (Common Name)	House floor	Feature 2: Small hearth		
	784 FCR (Range)	567A FCR (Range)	567B FCR (Range)	567 FCR (Range)
Deteriorated cellulose	1093-902 809-785	1207-854 806-785	1186-839 809-788	1201-848 815-785

FCR = Fire-cracked rock

TABLE 5
FTIR PEAK SUMMARY TABLE FOR FIRE-CRACKED ROCK FROM STRATUM XIX (KITCHEN MIDDEN) IN HOUSEPIT 54, BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

Peak Range	Represents	1402A FCR	1402B FCR	1402C FCR	769A FCR	769B FCR	769C FCR
Absorbed Water:							
3600-3200	Absorbed Water (O-H Stretch)	3364,3342, 3330	3369,3345, 3294	3371,3363	3352,3344, 3331	3344,3332	3335,3302
3371, 3342, 3334	O-H Stretch	3342, 3330	3345	3371	3344, 3331	3344, 3332	3335
Fats, oils, lipids, waxes:							
3000-2800	Aldehydes: fats, oils, lipids, waxes	2917/16, 2850/49	2918/17, 2849	2955, 2926,2920, 2853	2919, 2852	2951, 2917/16, 2850	2920
2974, 2968, 2965, 2962, 2956, 2872	CH_3 Asymmetric Stretch			2955			
2959, 2938, 2936, 2934, 2931, 2930, 2926, 2924, 2922	CH_2 Asymmetric stretch			2926, 2920			2920
2876, 2872, 2863, 2858, 2855	CH_2 Symmetric stretch			2853	2852		
1377	Fats, oils, lipids, humates (CH_3 symmetric bend)	1378	1376	1376	1376	1376	
1170	Lipids	1170					

TABLE 5 (Continued)

Peak Range	Represents	1402A FCR	1402B FCR	1402C FCR	769A FCR	769B FCR	769C FCR
	Lipids: Saturated Esters:						
1750-1730	Saturated esters (C=O Stretch)	1735				1735	
1737	Lipids (Phospholipids, C=O Stretch)	1735				1735	
1100-1030	Saturated esters	1074,1031					
	Lipids: Aromatic Esters:						
1730-1705	Aromatic esters (C=O Stretch)	1711		1718		1707	
1604, 1602, 1586, 1497, 1362	Aromatic ring mode				1582		
1585	Aromatic ring mode				1582		
750-700	Aromatic esters	729,720		720		719	
692	Aromatic ring bend (phenyl ether)	694/93	694/93	694	694	694,692	694
Proteins:							
1700-1500	Protein, incl. 1650 protein	1632, 1578,1552	1579/78, 1560	1618, 1605/04	1598,1578	1578,1560	1578
1500-1400	Protein	1463		1459		1463	1420
1465-1455	Protein/lipids	1463		1459		1463	

TABLE 5 (Continued)

Peak Range	Represents	1402A FCR	1402B FCR	1402C FCR	769A FCR	769B FCR	769C FCR
Proteins (Continued):							
1490-1350	Protein	1463, 1380,1375	1375,1364	1459, 1379	1364	1463, 1375	1420, 1388,1364
1394, 1379, 1366	Split CH3 umbrella mode, 1:2 intensity			1379			
1384, 1364	Split CH3 umbrella mode, 1:1 intensity		1364		1364		1364
1386, 1385, 1381/80/79	CH_3 Umbrella mode	1380					1388
	Proteins: Amino Acids:						
1640-1610, 1550-1485	Lysine (amino acid) NH_3^+ bending	1632, 1552		1618			
1615	Proteins (Glutamine, NH_2 Bend)			1618			
1600, 1450	Tyrosine (amino acid) Benzene ring vibrations				1598		
1560,	Glutamate (amino acid) CO_2^- asymmetric stretching		1560			1560	
1415	Glutamate (amino acid) CO_2^- symmetric stretching						1420

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TABLE 5 (Continued)

Peak Range	Represents	1402A FCR	1402B FCR	1402C FCR	769A FCR	769B FCR	769C FCR
	Proteins: Amino Acids (Continued):						
1465	Alanine (amino acid) CH_2 bending	1463				1463	
1375	Leucine (amino acid) CH_3 symmetric bending	1375	1375			1375	
1375	CH_3 Umbrella mode	1375	1375			1375	
1350-1250	Serine (amino acid) O-H bending	1259					
Carbohydrates (General):							
1590, 1510	Lignin			1508			
1170-1150, 1050, 1030	Cellulose			1162, 1032,1028		1160	
1162	Cellulose			1162		1160	
1028-1000	Cellulose Carbohydrates	1020	1017,1012	1028,1012	1008	1012, 1008/07	1012,1008
1059, 1033	Cellulose			1032			
	Polysaccharides (Specific):						
934	Galactoglucomannan	937					
823	Rhamnogalacturonan			826			

TABLE 5 (Continued)

Peak Range	Represents	1402A FCR	1402B FCR	1402C FCR	769A FCR	769B FCR	769C FCR
Minerals:							
780	Calcium oxalate	779/78	780,778,776	779	779/78/77	779/78/77	779/78
Other:							
993, 910, 718, 640	Alkene out-of-plane C-H bend					719, 642	
722-719	CH_2 Rock (methylene)	720		720		719	

FCR = Fire-cracked Rock

TABLE 6
MATCHES SUMMARY TABLE FOR FTIR RESULTS FROM STRATUM XIX (KITCHEN MIDDEN) IN HOUSEPIT 54, BRIDGE RIVER SITE, LILLOOET, BRITISH COLUMBIA

Match (Common Name)	Part	1402A FCR (Range)	1402B FCR (Range)	1402C FCR (Range)	769A FCR (Range)	769B FCR (Range)	769C FCR (Range)
Deteriorated cellulose		1135-953 815-788	1075-965 815-788	1111-926 815-788	1231-848 812-782	1257-848 815-785	1275-845 812-788
Plant	Seed (raw)	1484-1419				1484-1410	
	Nutmeat (raw)			1628-1574 1517-1502 1479-1404			
	Nutshell lining (raw)	1750-1679		1479-1404 1066-986			
	Nutshell (raw)	1750-1679 1395-1365 738-705		1732-1694		1753-1694 1484-1410 1401-1338 735-708	
	Stem (raw)	1750-1679 1484-1419 1198-1147 738-705					
	Bark (raw)	1750-1679 1649-1619 1198-1147 738-705					

FCR = Fire-cracked rock

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