# REPORT OF THE 2009 UNIVERSITY OF MONTANA INVESTIGATIONS AT THE BRIDGE RIVER SITE (EeRl4)

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# CHAPTER ONE

# INTRODUCTION

(Anna Marie Prentiss)

## Introduction

This is the report for archaeological field research conducted at the Bridge River site (EeRl4), located in the Middle Fraser Canyon of south-central British Columbia during summer of 2009 (see Appendix A). The overarching goal of the project is to develop a better understanding of the processes by which dense aggregate villages and socio-economic inequality evolved in the Interior Pacific Northwest Plateau region (Hayden 1997a; Prentiss et al. 2003, 2005a; 2005b, 2007, 2008). The Bridge River site is a large housepit village consisting of approximately 80 house depressions, located on a terrace of the Bridge River several kilometers upstream from its confluence with the Fraser River. As noted by Hayden (1997a), it is one of several remaining intact large villages from the Mid-Fraser Canyon. Recent research at the Bridge River site suggests that the village emerged by ca. 1800 cal. B.P., was abandoned by ca. 1100 cal. B.P. and briefly reoccupied at ca. 400-200 cal. B.P. (Prentiss et al. 2008). These dates indicate that the village was occupied at approximately the same time as the other large villages (Keatley Creek and Bell) located about 10 km to the east (Hayden 2000a, 2005; Prentiss et al. 2003; Stryd 1973, 1974). The site is located within several kilometers of the Fraser River Six Mile rapids, the most famous aboriginal salmon fishery in interior British Columbia (Kennedy and Bouchard 1992; Kew 1992; Romanoff 1992). Not surprisingly, subsistence data indicate that the village was highly dependent upon salmon (Bochart 2005). A relatively high degree of regional affluence is indicated by the frequent presence of groundstone prestige items (Hayden 1998) such as beads, pendants, and adzes, in addition to non-local trade goods such as obsidians and dentalium shell in many of the housepits (Prentiss et al. 2005c).

This research (inclusive of 2008 and 2009 field seasons) provides the second stage of a test of two different models of Mid-Fraser housepit village evolution and organization initially developed during research at the Keatley Creek site (Hayden 2000b; Prentiss et al. 2003). Building upon the work of Stryd (1972, 1973, 1974, 1980; Stryd and Baker 1968; Stryd and Lawhead 1978), Hayden (1997a, 1997b, 1998, 2000b, 2005; Hayden and Ryder 1991) has argued that the archaeological record at Keatley Creek village reflects the emergence of socio-economic and political complexity, termed the "Classic Lillooet" period, throughout the Mid-Fraser area. The Classic Lillooet period dates to approximately 1000-2000 B.P. and is characterized at Keatley Creek by dense settlement, a ranked society (Hayden 2000c, 1998; Schulting 1995), intensification of select resources such as salmon (Kusmer 2000), and participation in wide-ranging exchange networks (Hayden and Schulting 1997). In his "aggrandizer model" Hayden explains the emergence of the Mid-Fraser villages (Keatley Creek in particular) as the consequence of the behavior of self-interested, aspiring elites (Hayden 1995, 1997a, 1998). He suggests that once inexhaustible resources such as salmon became available and technologies were in place for production and storage of surplus, certain individuals with psychological predispositions for competitive behavior developed and implement schemes for increasing their own prestige. This striving for individual success resulted in the rapid and early emergence of aggregated housepit villages featuring status inequality. This resulted in the rapid development of the Mid-Fraser villages during the peak Neoglacial climatic episode between ca. 3000 and 2300 B.P. during which conditions were optimal for procurement of surplus salmon and root resources (Chatters 1998) and collector economic systems were in place (Richards and Rousseau 1987; see also Prentiss and Kuijt 2004). Hayden (1997a, Hayden et al. 1996; Hayden and Ryder 1991) argues that once in place the Mid-Fraser villages were economically successful and residentially stable persisting to at least 1000 B.P.

Prentiss and her colleagues (Lenert 2001; Prentiss et al. 2003, 2005a, 2005b, 2007; 2008) offer an alternative model for the evolution of the cultural pattern reflected in particular by the late Classic Lillooet period records of Keatley Creek and Bridge River. Current data suggest that this process occurred in several phases. During Period I, ca. 1900-1500 cal. B.P., the aggregated villages rapidly emerged featuring all house sizes, salmon and root intensification, but no obvious indicators of ranking other than house size. Period II is relatively brief, spanning approximately 1500 to 1200 cal. B.P. and is marked by village expansion, salmon intensification, and decline in root roasting (Lepofsky and Peacock 2004; Prentiss et al. 2003, 2008). At Keatley Creek, artifactual indicators of status variation between housepits are extremely rare, while at Bridge River, the more obvious prestige items appear most consistently in higher numbers within the smaller houses. Further, Bridge River housepits appear to be organized in semi-circular clusters at the northern and southern ends of the site suggesting the possibility that the village featured two or more large-scale co-habiting social groups (Prentiss et al. 2008). Period III persists from 1200 B.P. to the abandonment of the last Mid-Fraser villages at ca. 800 B.P. (Prentiss et al. 2003, 2006a). Housepits at Keatley Creek reflect the Classic Lillooet ranked corporate group pattern described by Hayden (1997a, 1997b, 2000b, Hayden and Ryder 1991). Subsistence data from Keatley Creek reflect declines in access to salmon and expanded use of terrestrial resources, possibly resulting in local resource depression (e.g. Broughton 1994), especially associated with ungulates (Prentiss et al. 2007). If salmon numbers did undergo a significant reduction, then it is no surprise that the Bridge River village was abandoned at the beginning of this period since this village was fewer subsistence options than nearby Keatley Creek and Bell.

From this standpoint, the Classic Lillooet pattern emerged in three phases: First, an initial aggregation process associated with control of the Mid-Fraser resources (fishery) may have offered substantial reward after 1900 cal. B.P. due to rising populations, expanding patchiness of terrestrial resources associated with increasingly warm and dry climatic conditions (Bennett et al. 2001; Hallett et al. 2003a; Hallet and Walker 2000), increasing access to salmon, and expanding exchange opportunities on both the coast and interior (Chatters 1998; Rousseau 2004). Second, population growth and apparent economic success led to rapid growth of the Mid-Fraser villages that may have resulted in increasing numbers of social groups or units, peaking by ca. 1200-1300 cal. B.P. (e.g. Hayden 1997a). It is likely that social complexity became more pronounced during this period. However, there are few archaeological indicators of any formal hereditary ranking or stratification prior to this time (Prentiss et al. 2007;

Schulting 1995). Current data suggest that, shortly after the beginning of Period III, a sudden decline in salmon may have led to collapse of some villages (e.g. Bridge River) and the emergence of stratification at Keatley Creek (Prentiss et al. 2007). It is likely that the people of Bridge River had taken some steps towards social complexity featuring status inequality prior to its abandonment. Under this perspective, stratification comes as an unintended by-product of competition for control of patchy dwindling resources at select villages (Prentiss et al. 2005b, 2007) as local groups took advantage of environmental and demographic changes to develop ways of insuring more secure living conditions for themselves (e.g., Arnold 1993; Kirch 1988, 1997, 2000; Wiessner 2002).

The 2009 Bridge River research is a component of a larger program with the primary goal of improving our understanding of the evolution of the complex hunter-gatherer societies of the late prehistoric Pacific Northwest, and more broadly, to examine the general principles behind cultural evolution. Three focus areas define this program.

First, Northwest Coast and Interior societies of the Late Prehistoric period are defined economically by the use of collector mobility and subsistence strategies (e.g. Binford 1980). Prentiss and Chatters (2003a, 2003b; Chatters and Prentiss 2005; Prentiss and Kuijt 2004) suggest that collector strategies evolved in one or more isolated contexts of the northern Northwest Coast and spread into other areas such as the Interior during the early Neoglacial climatic period shortly after 4000 cal. B.P. Second, when and why did the aggregated winter village pattern (Chatters and Pokotylo 1998) emerge on the Plateau? Once collector strategies came to exist on the Plateau, it was still some time before the larger group aggregates emerged in the form of large villages or even towns (Hayden 1997a). Despite some opinions to the contrary (Hayden 2000b, 2005), it is clear that the large villages, featuring 20-50 simultaneously occupied houses of widely varying sizes, did not begin to evolve in the Mid-Fraser area until after 2000 cal. B.P. (Chatters and Pokotylo 1998; Prentiss et al. 2003, 2005b, 2006a). Complete explanation of this phenomenon requires further research, but recent studies suggest that simple arguments such as population pressure (e.g. Croes and Hackenberger 1988; Lohse and Sammons-Lohse 1986; Matson 1983, 1985) are not adequate. It is also clear that there was no simple link to maximum numbers of salmon since salmon numbers may have been at their highest over 1000 years prior to the development of the Mid-Fraser villages (Chatters 1995; Chatters et al. 1995).

Recent research suggests two possible models for explaining initial emergence of the Mid-Fraser villages. First, it is possible that small groups of indigenous collectors moving in and out of the Mid-Fraser clustered to take advantage of newly invigorated salmon runs after 1900 cal. B.P. using a residential strategy that included co-residential corporate groups operating from large housepits (e.g. Hayden et al. 1985). This model asserts that while this “complex collector” strategy (Prentiss et al. 2005b) had already developed to some degree near the coast, it did not play a role in the emergence of similar tactics on the interior. Second, the complex collector strategy developed in the Fraser Valley closer to the Coast, perhaps as reflected in the large and early dating house at the Scowlitz site (Lepofsky et al. 2000; see also Lepofsky et al. 2005). Then, either the fundamentals were transmitted via human communications (e.g. Cavalli-Sforza and Feldman 1981) to the interior or movement of actual populations possessing the strategy, up from the Fraser Valley (west of Hope, B.C.), perhaps originating from the vicinity of the lower Harrison and Lillooet Rivers. Some data from previous investigations at

Bridge River hint at the latter alternative particularly including the appearance of a ground slate technology previously somewhat unknown to the Plateau, but typical of the Fraser Valley, in the earliest dating housepits (Prentiss et al. 2005b). If this is the case, it suggests that basic structure of the winter-village/corporate group strategy, typical of the Mid-Fraser Canyon, evolved elsewhere and was transported into the region, possibly by groups seeking to take advantage of those same resources recognized under the first model.

Finally, when and why did social inequality emerge in the Pacific Northwest region and how did it vary in structure? The historic period central and northern Northwest Coast, Lower Columbia, and Mid-Fraser societies were characterized by large aggregate villages with hereditarily stratified social organizations (Matson and Coupland 1995; Teit 1906). Defining the evolutionary history of this form of institutionalized inequality (e.g. Wiessner 2002) is an important priority in Pacific Northwest archaeology (Ames and Maschner 1999). To most archaeologists who work in this region, it is clear that some form of incipient status differentiation was present shortly after the emergence and expansion of collector strategies (Matson and Coupland 1995). However, it appears very unlikely that any form of institutionalized hereditary differentiation occurred earlier than approximately 1800 cal. B.P. when burials of the later Marpole phase on the Central Coast begin to contain indicators of inherited status differences (Burley and Knusel 1989). This form of social organization appears to have occurred very rarely and relatively late on the Plateau; post 1200 cal. B.P. in the Mid-Fraser and post 500 cal. B.P. on the Lower Columbia (Prentiss et al. 2005b).

Two approaches to explanation have been prominent in the literature. Ecologists look for unequal relationships between demographics and resource productivity, generally asserting that resource patchiness and packing will trigger patterns of social behavior consistent with emergent inequality (Binford 2001; Fitzhugh 2003). Agency theorists link emergent inequality to the complex interactions between individual agency and social structure. Hayden (1992) links the emergence of inequality to optimal resource conditions, arguing that opportunity for acquisition of surplus resources would favor competitive behavior from "aggrandizers." Maschner (1991, 1995) adds an additional step to Hayden's process, suggesting that resources do not directly equate to power. Rather, community members must use resource surplus to attract a large kin-based following. Power is thus achieved and maintained via corporate group size. Arnold (1993) and Wiessner (2002) agree in part with these assertions, but suggest that institutionalized inequality could only come about during a short lived period of adverse resource conditions or some other historical calamity, that might allow aspiring elites to manipulate others, less well off. Keatley Creek data now indicate that a similar process associated with localized resource shortages and group movements may have played a critical role in the emergence of inequality in the Mid-Fraser (Prentiss et al. 2007).

The current research seeks to ultimately understand the evolution and organization of the Bridge River housepit village. The project is expected to require at least three major phases of research. The first phase focused on site wide mapping, geophysical investigations, test excavations, and extensive radiocarbon dating. Results of that research indicate rapid village growth between ca. 1900 and 1100 cal. B.P., followed by abandonment and late reoccupation. The radiocarbon dating program provided 78 radiocarbon dates on 55 housepits (12 additional dates were on external roasting pit features [Dietz 2004]), providing insight into changes in demographics and social organization from the standpoint of inter-household spatial arrangements (Prentiss et al. 2008). The second and current phase emphasizes excavation of select housepit floors across all periods in the history of the village in order to better define changes in demography and socio-economic organization. A third phase will likely explore the histories of select housepits in further detail.

The Bridge River research program has been designed to answer a number of broad questions. First, what is the occupational and cultural chronology at the Bridge River site? This question has been substantially answered during Phase I of the Bridge River project. It is clear now that the Bridge River village emerged earlier than nearby Keatley Creek, but was also abandoned earlier. Given its early dates, it is possible that groups from Bridge River may have even been responsible for the establishment of some other villages like Keatley Creek. It is also possible that the abandonment of Bridge River may have played a role in the development of institutionalized inequality at Keatley Creek. Second, what was the nature of socio-economic and political organization and how did it change during the history of the Bridge River community? Selected tests in housepits and extensive geophysical investigations hint that even the earliest Bridge River households were multi-family and perhaps "corporate group" (Hayden and Cannon 1982) in nature. It is also clear that significant differences in house sizes characterized the village throughout its history. There also appear to be two major clusters of housepits that simultaneously grew in size from the earliest period until the abandonment. However, based upon earlier investigations there is no clear association between larger houses and highest numbers or quality of prestige items prior to the late reoccupation, as might be expected from ethnographies (Teit 1906) or previous investigations at Keatley Creek (Hayden 1997a) or Bell (Stryd 1973). It is clear that while Bridge River social organization was undoubtedly complex from the start, the nature of that complexity has not been clear. Two avenues of investigation of social organization are being explored: The first focuses on identification of status differentiation as marked by consistent variation in household location, construction, subsistence patterns, wealth items, and possibly even religious icons (e.g. Lesure and Blake 2002); and the second emphasizes "horizontal" (e.g. Johnson 1982) social complexity emphasizing differences and similarities between the north and south clusters in the realms of subsistence economy, wealth, and stylistic markers (e.g. "clan" [Teit 1906] or lineage group symbolism).

Status inequality within complex hunter-gatherer societies has been subject of a growing literature that has sought to define variation and evolutionary origins of this phenomenon around the world (Arnold 1993, 1995, 1996a, 1996b; Earle 1997; Feinman 1995; Fitzhugh 2003; Hayden 1995; Wiessner 2002). As noted by Wiessner (2002), arguments seeking to explain emergent inequality in intermediate scale societies generally fall into two groups: managerial and agency. Managerial models vary widely and include population pressure (Cohen 1981; Croes and Hackenberger 1988), scalar stress (Ames 1985; Johnson 1982), warfare (Carneiro 1970), and ecological patchiness and population packing (Binford 2001; Fitzhugh 2003). As a group, they argue that cultural practices, sometimes described in aggregate as systems of behavior, adjust to new conditions in adaptive ways sometimes leading to the need for more complex social relations in order to efficiently harvest, process, protect, and distribute resources. Many of these models (pressure, packing, scalar stress, resource stress) assume adverse conditions revolving around imbalances between available food resources and human populations that require change in order to restore balance.

In contrast, agency approaches look to the generation of new social phenomena via the dialectic that forms between agency and social structure. While environmental and economic conditions provide an important backdrop, it is this complex social process that generates changes that eventually become institutionalized. Several versions of this approach have been offered by Hayden (1994, 1995), Clark and Blake (1994), Maschner and Patton (1996), Arnold (1993, 1996a), and Lepofsky et al. (2005). Major differences, measurable in the archaeological record, within this group revolve around ecological conditions that favor the ability of individuals to successfully pull off wealth building schemes within their surrounding communities. Researchers have not generally explored the interesting issue of resistance to such schemes. Hayden (1994, 1995; see also Clark and Blake 1994; Maschner and Patton 1996) argues that optimal resource conditions are necessary for people to tolerate new forms of resource ownership and control. In contrast, Arnold (1993, 1996) argues that aspiring elites will not gain opportunity to exert control over new groups until those groups become stressed enough to be willing to submit to these actions. She looks to altered resource conditions or population-resource imbalances as the background to successful machinations of elites.

Darwinian archaeologists have not often explored issues of social change (but see Braun 1990). However, current research suggests that inequality and other hallmarks of so-called complex societies may have often emerged through exaptive processes associated with attempts by groups to solve problems associated with labor, households, and economies, unintentionally creating new social problems. Prentiss (2011) proposes that inequality in the Pacific Northwest may have come about in several stages associated with the development of house groups and competition to maintain such houses.

## Previous University of Montana Investigations in the Mid-Fraser Canyon

Teams from the University of Montana have been conducting field research in the Mid-Fraser Canyon since 1999. The following discussion reviews results from the Keatley Creek and Bridge River Projects.

### *Keatley Creek*

This research was designed to test three alternate models seeking to explain the emergence of social inequality at Keatley Creek. In brief, these included Brian Hayden's (1995, 1997a, 1998) aggrandizer model and two other models. The first of the latter two derives from Rosenberg (1998) and others who view population pressure as leading to competition for control of optimal spaces resulting in gradually more intense levels of social competition and eventual collapse due to abuse of local resources (e.g. Broughton 1994). The other asserts that technological enhancement was the primary driving force, suggesting that complexity was derived from technological innovations increasing effectiveness of hunting, fishing and warfare. This resulted in competition for control of optimal spaces such as the Mid-Fraser canyon, eventually producing complex villages.

In order to adequately test the hypotheses, data collection procedures were designed to answer a series of specific questions concerning chronology and processes of cultural change. When did the transition to socio-economic inequality occur and was this transition abrupt or gradual? The 1999, 2001 and 2002 field seasons at Keatley Creek resulted in a new dating sequence for the rim midden deposits of Housepit 7 and the Keatley Creek village. New dating of early features suggests that Housepit 7 and likely the entire aggregated village existed between ca 1600 and 750 cal. B.P. Within this time frame there appear to have been four phases to the history of Housepit 7. The core village formed during Period 1 ca. 1600-1400 cal. B.P., expanding substantially during Periods 2 and 3 ca. 1400-1200 cal. B.P. Small houses were abandoned and signs of hereditary inequality came about in the final period of ca. 1200-750 cal. B.P.

Studies of artifacts, faunal remains and plant materials led to a revised view of cultural processes leading to emergence of inequality and later to site abandonment (Prentiss et al. 2007). Faunal remains suggest that while salmon was probably the critical subsistence item early in village history, this was to eventually change. By Rim 4 times (post 1200 cal. B.P.) predation was increasingly emphasizing mammals over salmon, whose numbers had significantly declined. The deer bone assemblage also suggests that early village groups tended to hunt locally (indicated by more complete element representation) while in Rim 4 times, deer hunting probably required longer trips (as marked by faunal assemblages nearly completely dominated by limbs only). Plant data also suggest an increasingly extensive approach to resources. Rim 4 contains major increases in pine nuts and prickly pear cactus seeds, generally low ranked species, compared to local geophytes (Lepofsky and Peacock 2004). Evidence for geophyte processing nearly disappears from the archaeological record during Rim 4 times. Berry seeds also parallel results of the deer bone analysis with the early village dominated by species more adapted to dry conditions (e.g. the arid terraces associated with the Keatley Creek village), while the later occupation seems to focus to a higher degree on species requiring consistently wetter soil, as are most commonly found away from the village at higher elevations (Prentiss et al. 2007). These results are supported by analysis of lithic artifacts which indicate a steadily increasing role for hunting related gear (e.g. projectile points and bifacial knives) peaking during the Rim 4 period. Critically, prestige artifacts also jump dramatically during the final phase forming the inter-house disparities discussed so frequently by Hayden (e.g. 1997a), suggesting major social changes manifested at this time.

Prentiss et al. (2007) argue that the Keatley Creek village emerged at the beginning of an uptrend in salmon productivity. They suggest that the village grew in tandem with a rise in salmon numbers that may have peaked and rapidly declined at about 1200 cal. B.P. This decline in salmon may have occurred relatively quickly, radically affecting the value of key fishing spots and likely places for hunting and gathering terrestrial food resources and triggering a new wave of competition for control of those places. It is even possible that human-driven resource depression may have played a role in the famous Keatley Creek abandonment. The Keatley Creek research explicated a new view of village evolution, one in which inequality came about as a by-product of drastically rearranged subsistence resource access, labor scheduling, and social arrangements. However, excavations at one village are not enough to fully understand such a process, one that was probably acted out on a much larger scale. This led to the next round of research at the nearby Bridge River village.

*Bridge River*

The Bridge River project was proposed as a logical test of the competing hypotheses regarding the evolution of Keatley Creek. Previous research (Stryd (1974) suggested that the Bridge River village was occupied at the same time as Keatley Creek and it seemed reasonable to conclude that similar processes must have played a role in the history of that village. Thus, the Bridge River project was initially viewed as a place where archaeologists could "replicate the experiment."

The primary goal of Phase I (2003 and 2004 field seasons) at Bridge River was to overcome some of the data inadequacies that had always hampered research at Keatley Creek, namely determining changes in village size as indicated by similarly dated housepit floors. To accomplish this, a program of extensive surface and subsurface mapping using geophysical techniques was instituted resulting in maps of nearly the entire village derived from magnetic and conductivity surveys (Prentiss et al. 2008). Strong negative-valued anomalies on the magnetic gradient map were used to project locations of datable features such as hearths and clusters of burned roof beams lying on house floors. Subsequently, test units were excavated to explore stratigraphy, collect artifact and ecofact samples, and most critically, dating samples. Success in recognizing datable contexts using the geophysical methods was approximately 80% and resulted in collection of 90 radiocarbon samples and dating of 55 housepit floors and 13 external pit features. It was very clear from this research that the village offers outstanding opportunities for very fine grained analysis of socio-economic change within this complex hunter-gatherer context.

Radiocarbon dates suggested that the village evolved during four major periods. Earliest dating housepits are associated with Bridge River 1 and 2 between ca. 1800 and 1300 cal. B.P. The village peaked in size during Bridge River 3 at ca. 1300-1100 cal. B.P. with at least 29 occupied houses (Prentiss et al. 2008). The village was subsequently abandoned until approximately 400-500 cal. B.P. at which point it was occupied into the beginnings of the historical period. Spatial arrangements of occupied housepits suggest that by Bridge River 3 times (possibly BR 2) two social groups (perhaps something like Teit's [1906] "clans") may have existed. Also, distinctions between larger and smaller houses appear to have existed throughout the life of the village (as expected by Hayden 1997a for Keatley Creek) suggesting some variability in household size and perhaps wealth. Faunal remains indicate an intensely salmon oriented economy throughout all periods in the life of the village (Bochart 2004). Lithic artifacts support this contention but also suggest that other forms of hunting and gathering were also critical (Clarke 2006). An entirely new lithic industry (to the Plateau) was discovered at the village focused on production of slate tools using combinations of cutting, grinding, and chipping to create a variety of scrapers, knives and even one projectile point. A general correlation was recognized between frequency of ground slate tools and intensity of salmon fishing (Mandelko 2006).

The 2003 and 2004 Bridge River data suggest that the village emerged earlier than Keatley Creek but was also abandoned earlier. Reasons for the early emergence are not yet clear, but may be associated with better access to the 6-Mile rapids fishing site in the nearby Fraser Canyon and the quality salmon fishing within the Bridge River valley as well. This critical economic tie to salmon may help us to better understand the early abandonment. While the Bridge River valley is a better place for salmon fishing than the Keatley Creek area, it does not offer the same degree of access to productive foraging patches (say for deer and geophytes). Consequently, Bridge River peoples may have been substantially more dependent on salmon as a food resource, but also trade goods, than those of Keatley Creek. It can be hypothesized that when salmon productivity declined after ca. 1200 cal. B.P., the first major casualty was the Bridge River village. Prentiss et al. (2007) suggest that it was that specific event and probably others like it that provided the context for emergent hereditary inequality at Keatley Creek, since original families could provide shelter to the newly poor and use of their labor, but may have maintained their original property rights by passing them along to only their own children. The question remains, however, had this form of inequality already developed at Bridge River? In contrast, did a different but equally complex form of social organization evolve at this village, possibly in the form of opposing clan or lineage groups, each with their own forms of social ranking and individual rights to resources?

The current research is emphasizing clarification of the transition point between the pre-aggregated village pattern and the emergent complex villages. The *in situ* emergence of corporate group households may have been a rapid and complex cultural evolutionary event (Prentiss et al. 2005b). It is not clear if this process actually occurred in the Mid-Fraser or if it had occurred earlier on the Central Northwest Coast, eventually leading to expansion of those groups into the Mid-Fraser area. Additional research focuses on the processes leading the development of social inequality. The Mid-Fraser research is of critical importance since inequality undoubtedly emerged *in situ* in this context in the centuries prior to ca. 1000 cal. B.P. A final area concerns the crucial relationships between technology and subsistence economy. Of special significance at Bridge River are studies into the organization of groundstone technology since at Bridge River groundstone is far more common and diverse in form that at either Keatley Creek or the other large excavated village, Bell.

Research conducted in 2008 at the Bridge River site focused on activity areas in Housepits 20, 24, and 54 (Prentiss et al. 2009). Potential activity areas were identified on the basis of strong positive and especially negative magnetic anomalies (see Appendix B). Negative anomalies tend to indicate stratigraphic depressions, especially cache pits. However, results from 2009 also indicate steep rim/roof slopes as contributors. There was significant variation by housepit in 2008. Excavations were completed for Housepit 54 and 24 while two of three were done at Housepit 20. Housepit 54 is a smaller house (13 m diameter) but had the most complex floor stratigraphy featuring 13-14 floors and seven stratified roof deposits. These strata formed during occupations associated with the BR2, 3 and 4 periods. It is the only house excavated in 2008 to return historic period materials (iron and glass trade beads). Housepit 20 also featured occupations resulting in floor and roof deposits formed during BR 2, 3, and 4 times. Housepit 24 returned only one floor and roof deposit resulting from a BR 3 period occupation. Analysis of variability in lithic artifacts, faunal remains, and features suggested a variety of conclusions. Assessment of fire-cracked rock and cache pits data suggested a process of population growth culminating in potentially high density occupations of select houses (particularly HP 24). There was also some evidence for deer intensification with a general trend through time towards greater transport of limb bones over axial parts.

Finally, examination of multiple data sets measuring accumulation of material wealth, predation behavior, and demographics suggested that only one occupations (HP 24) illustrated significant accumulation of wealth thereby implying a late date for the emergence of wealth-based inter-household differentiation.

## Field and Laboratory Methods

The current Bridge River research is the second phase of a comprehensive test of the models outlined above. Overall, the project is designed to test for archaeological signatures reflecting the expectations of these models. Specific elements of Hayden's aggrandizer model have been rejected (e.g. the early date of ca. 2600 B.P., for village emergence and stable persistence of that entrepreneur society for 1500 years). However, many of the basic tenets could still be feasible. If the aggrandizer model is correct then the village will feature from its inception evidence for inter-household inequality in the form of correlations between house size and accumulation of prestige-associated foods and artifacts. Thus, the earliest strata from larger housepits should feature evidence indicative of ability of that household to accumulate surplus foods and other goods. In particular, they should reflect control of prestige-linked foods such as Chinook salmon and deer, lithic raw materials such as nephrite, high labor investment artifacts such as stone beads, pipes, and adzes, and finally, non-local trade items such as shell ornaments (Hayden 1997a). If the alternative model is correct it should be indicated by two or more periods of change within the Bridge River Village. Once present, the early aggregated village should contain evidence for occupation of houses in multiple size ranges, but evidence for status differentiation or ranking should be lacking (other than in differences in house size and relative storage capacity). Persistent socio-economic egalitarianism should be indicated by high degrees of similarity between houses (and between hearth groups within houses) in subsistence items consistently emphasizing fish over mammals, shared lithic raw material types or quarry sources for chipped stone items, low numbers of prestige items (Hayden 1998) and extramural food caches and roasting pits indicative of food sharing (Flannery 2002). Given the apparent complexity in settlement patterns within the village it may be that manifestations of wealth and power may vary in other ways. For example, if the village was ranked only at the clan or social group level (e.g. Feinman's "corporate" form of organization), then variation in wealth could exist only on a broader spatial scale, perhaps within aggregates of households, as is suggested by household positioning (Prentiss et al. 2008). If institutionalized inequality did emerge at Bridge River and is a byproduct of similar processes seen at Keatley Creek, only the final house floors from Bridge River 3 should manifest this pattern. Subsistence data should indicate a shift towards significantly increasing quantities of medium to large game in the diet, particularly in the largest houses (and likely with specific hearth groups). Lithic data from largest houses should reflect control of quarry locations and production of steatite and nephrite trade goods. Largest houses should, late in their life spans also begin to intensify harvest of a wider range of salmon species to be used as surplus in exchange relationships and in competitive feasting (Hayden 1997a). The frequency of feasting events should increase during Bridge River 3 as manifested by rising numbers of unusually large intra- and extra-mural roasting pits. Current data on external pit features strongly support this prediction (Dietz 2004).

Testing these hypotheses requires extensive sampling of house floors associated with occupation periods BR1-3 at the Bridge River site followed by interdisciplinary laboratory studies. Project goals require examination of variation in a variety of archaeological data within and between different sized households at Bridge River. Based upon ethnographies (Teit 1906), Hayden's extensive excavations at Keatley Creek and the first phase of investigations at Bridge River, it is clear that hearth-associated activity areas most likely reflect the locations and activities of individual family units on housepit floors (Hayden 1997a). Therefore, to understand variability in the socio-economic status of these domestic units and to extrapolate that understanding to the level of household socio-economy, it is paramount that excavations focus on gaining a substantial sample of materials from the activity area contexts. Hayden (1997a) accomplished this task by excavating entire house floors in order to expose activity areas of domestic units. While Hayden's data are superb the lengthy time required to excavate entire houses was costly and it limited the number of houses that could be explored. Further, it effectively prevented future field investigations associated with these housepit floors. These problems can be avoided by using geophysical methods to identify activity zones associated with major hearth and cache pit features and subsequent excavation sampling.

Choice of housepits to study is dictated by several factors. First, housepits must be excavated from the earlier (Bridge River 1 and 2) and later (Bridge River 3) time frames in order to evaluate socio-economic changes in the village prior to the ca. 1100 cal. B.P. abandonment. Second, data from larger and smaller houses are necessary to explore status variation as conditioned by house size during the early and late periods. Third, in order to explore variation in households by spatial location, houses need to be chosen from the north and south clusters. Finally, in order to assure quality data that can be used for socioeconomic analysis, only those housepits with clearly delineated floors can be excavated (e.g. Hayden 1997a). Several houses were chosen from each time period based upon their size, spatial location, and floor. The 2008 field season focused on housepits with known BR 3 occupations (Housepits 20, 24, and 54). However, BR 2 and 4 components in Housepits 20 and 54 were also excavated. The 2009 field season included excavations of BR 2 occupations in HPs 11 and 20 and BR 3 occupations in HPs 16 and 20. Excavations were undertaken in HP 25 with the intent of sampling a BR 1 house. However, as outlined in Chapter Three, the major occupation of this housepit turned out to be during BR 3 times. Finally limited additional excavations were done in HP 24 Area 3 with the goal of extracting additional canid faunal remains from a large cache pit feature encountered in 2008.

Dr. Guy Cross directed geophysical investigations in 2007-2008 focused on high-resolution mapping of selected housepits, utilizing a combination of magnetic, electromagnetic (EM), resistivity and ground penetrating radar (GPR) technologies (Scollar et al., 1990; Cross 2004; 2005; Prentiss et al., 2008). Results of 2007 and 2008 geophysical investigations are outlined in detail in Appendix C.

Excavations within each housepit focused on exposing the hearth and cache pit associated activity areas defined by the geophysical investigations. Hayden's (1997a) excavations at Keatley Creek defined variation in activity areas based upon their location within the housepit floors. Housepit 7 (a very large house) offered the highest number of activity areas (about 10) with also the highest diversity of activities including food preparation concentrated on the south and west sides of the floor. Those on the east side of the floor tended to indicate special activities such as wood working or hide preparation. Smaller housepits had fewer activity areas (3-5), but similar arrangements around the floors. Similar patterns have been confirmed at the Bridge River site during excavations in 2003, 2004, 2008, and 2009. The 2008 and 2009 excavations at Bridge River sampled three activity areas from each investigated housepit (Appendix A). Trenches bisecting probable domestic activity areas (as indicated by geophysical anomalies) were still excavated in 50x50 cm units for maximum control. All excavations were taken to culturally sterile substrate with the exception of Areas 1 and 3 in Housepit 11 where excavations exposed upper portions of the BR 2 floor sequence. All in all this sampling approach provided artifacts, faunal remains and feature materials (including macrobotanicals) from each area to permit examination of intra- and especially inter-household socio-economic variation similar to the analyses conducted of the Keatley Creek housepits (Hayden 1997a, 2000a, 2000b, 2000c; Hayden and Spafford 1993; Lepofsky et al. 1996; Prentiss 2000).

Housepit stratigraphy is complex (e.g. Prentiss et al. 2003, 2005a, 2007, 2008) including complex deposits interpreted as floor, roof, and rim. Floors have generally fine bedded sediments transported to the site from elsewhere. Roof and rim sediments tend to have more unconsolidated mixtures of redeposited smaller and larger sized sedimentary particles, charcoal, plant and animal remains, and artifacts. While Keatley Creek floors were generally thin, Bridge River floors vary widely. Some floors are similar to those of the Keatley Creek context, while others are substantially thicker. In addition, the Bridge River village often has multiple stratified floors, whereas Keatley Creek housepits generally contain only the final occupation floors. Bridge River floors are often separated by what appear to be roof layers, some containing burned support beams. The very thick floors appear to have accreted over long periods by simply adding new floor material over the old.

Stratigraphy at Bridge River was studied using two strategies. Field observations of deposits (e.g., color, texture, structure, and consistence) are commonly used to describe archaeological sediments and to make tentative inferences about relevant depositional and post-depositional processes, including geogenic, pedogenic and anthropogenic processes. Field observations were backed up be selective application of micromorphological research design to provide a more fine grained assessment of formation process at Bridge River (Appendix D).

The project maintained the basic 50x50 cm excavation units used during the original 2003 and 2004 field seasons. Each square was individually hand excavated using trowels and dustpans and where necessary, smaller tools including bamboo sticks. All sediments were be sieved through 1/8 inch mesh screens. Sediments were excavated in natural strata. Some zones (e.g. roofs and rims) are complex containing multiple natural levels. Where larger zones or levels are thicker than 10 cm, but otherwise homogeneous, excavation preceded in arbitrary 10 cm levels. Excavation of floor sediments included point proveniencing and individual bagging of artifacts and bone above 1 cm in maximum diameter whenever possible. Articulated fish were collected in aggregate. Excavation of floors proceeded in arbitrary 5 cm levels. One-liter soil samples for flotation and additional sedimentary analyses were taken systematically features on housepit floors. A detailed profile was drawn from at least one major wall for each trench. Sediments larger than 1 cm maximum diameter were individually drawn and general sedimentary zones demarcated. Digital photographs were taken of each profiled wall and exposed floors. All mapping and unit placement was accomplished using a survey instrument (EDM) and prism.

A limited number of radiocarbon samples were collected from excavated features to be submitted for AMS dating from the NSF AMS Laboratory at the University of Arizona. These data are essential for further defining the village chronology. Radiocarbon dating of charcoal recovered only from *in situ* features and roof beams avoids the problems of ambiguous associations between strata and dated material encountered by Hayden (2000d) in his attempts at dating some rim and pit strata at Keatley Creek. Details regarding analysis of artifacts and zooarchaeological and paleoethnobotanical remains are described in later chapters and appendices of this report.

## Report Outline

Results of the 2009 investigations are presented in chapters covering dating and stratigraphy (Chapter 3), lithic artifacts (Chapter 4), and faunal remains (Chapter 5). Appendices include the maps (Appendix A), photographs and other illustrations (Appendix B), geophysical report (Appendix C), micromorphology report for 2008 investigations (Appendix D), lithic artifact typology (Appendix E), and paleoethnobotanical report (Appendix F). Artifact and faunal remains data are available upon the web (University of Montana Website, Anna Prentiss page).

# CHAPTER TWO

# ENVIRONMENT AND CULTURE CHRONOLOGY

Nathan Goodale, Michael Lenert, and Anna Marie Prentiss

This chapter provides a brief review of the Canadian Plateau cultural chronology and places the Bridge River site in its local and regional environmental context. We do not provide a review of Plateau paleoenvironments (see Chatters 1998).

## The Canadian Plateau Culture Area

The Canadian Plateau geographic culture area lies within British Columbia between the great bend in the Fraser River to the north, the Rocky Mountains to the east, the Coast Mountains to the west, and 50 miles above the border with the United States to the south (Richards and Rousseau 1987). There are a number of geographic subdivisions within this greater area, This review is concerned with the Mid-Fraser Canyon subdivision because it contains the Keatley Creek site (EeRl7). The Mid-Fraser Canyon includes the river valley itself and its surrounding drainages stretching from Big Bar to just south of Lytton.

The Mid-Fraser Canyon area is semi-arid and located in the rain-shadow of the Coast Range. The average annual amount of precipitation is only 25-30 cm (Pokotylo and Mitchell 1998). This region supports the Interior Douglas Fir Bioclimatic Zone which is dominated by the presence of Douglas Fir, sagebrush, and various bunch grasses.

Linguistically speaking, the Plateau culture area includes Sahaptian, Interior Salish, Kutenai, Chinook, and Athapaskan speaking peoples. The inhabitants of the Mid-Fraser included Interior Salish groups. Ethnographically identified and also contemporary groups include the Upper or Fraser River Lillooet (*St'át'imc*) and the Shuswap (*Secwepemc*). The Thompson or *Nlaka7pamux* also used the Middle Fraser area at its southern portion. Hayden (1992; see also Alexander 1992, 2000; Teit 1900, 1906, 1909) provides an ethnographic overview of contemporary and recent land use by the *St'át'imc* people in the Mid-Fraser area, who are the indigenous people of the Bridge River area.

## Cultural Chronology

This section reviews the culture history of the Canadian Plateau in southern British Columbia between the time of 3,500-250 BP. It relies heavily on the culture historical concepts outlined by Richards and Rousseau (1987) and Stryd and Rousseau (1996).

## Shuswap Horizon (3,500-2,400 BP)

The earliest cultural horizon fully belonging to the Plateau Pithouse tradition is the Shuswap horizon. However, with the enigmatic presence of the Baker pithouse site that dates to the Lochnore Phase (5,500-3,500 BP), Stryd and Rousseau (1996) were forced to reevaluate the initial use of pithouses in the Plateau Region. Nevertheless, the Shuswap horizon represents the first major distribution of pithouse communities in this region. The architectural characteristics of the pithouses in the Shuswap horizon include an average size of 10.7 meters in diameter, a circular and oval plan, steep walled, and flat bottomed (Richards and Rousseau 1987). The houses have side entrances, central hearths, and internal storage and cooking pits. The presence of large postholes indicates that there was a substantial wooden superstructure that was most likely covered with earth (Hayden 1997, 2000; Richards and Rousseau 1987).

Lithic assemblages associated with the Shuswap horizon are less complex in workmanship, composition, and technological sophistication as compared to the later horizons of the Plateau Pithouse tradition (Richards and Rousseau 1987). Low to medium quality materials were used to make many of the tools and this resulted in their crude appearance. More finely made tools out of dacite (a form of fine-grained basalt), jasper, and chalcedony appear in the Shuswap horizon. Shuswap horizon projectile points have a mean length of 4cm, width of 1.8cm, and an average neck of 1.10cm. These points were most likely used as atlatl or spear tips (Richards and Rousseau 1987). Shuswap point variations resemble Hanna, Duncan, McKean, and Oxbow points of the Northern Plains and may indicate some form of contact between the two regions (Richards and Rousseau 1987).

Other lithic items associated with the Shuswap horizon include: key-shaped unifaces and bifaces, unformed unifacial and bifacial tools, microblades, and cores. Lithic technology that requires more hours to produce such as groundstone, formal scrapers, and artwork is very rare in the Shuswap horizon. The lithic technology during this horizon represents a more expedient organization.

Subsistence was logistically organized (per Binford 1980) in the Shuswap horizon and was focused on deer, elk, black bear, sheep, muskrat, beaver, snowshoe hare, red fox birds, fresh water mussels, trout and salmon, and trumpeter swans (Richards and Rousseau 1987). There is evidence that salmon procurement was becoming more important during the Shuswap than in earlier horizons. However, salmon was not considered to be a main dietary source until later traditions in the Plateau Pithouse tradition.

Trade with the coastal regions becomes evident in the Shuswap horizon with the presence of dentalium shells. Several Shuswap projectile points also resemble Locarno Beach phase points, indicating that some form of contact existed between the two regions.

## Plateau Horizon (2,400-1,200 BP)

The Plateau horizon is the next cultural component of the Plateau Pithouse tradition and relates to a time period that reflects a climatic shift from cool and moist conditions to warmer and dryer conditions that are still present today (Hebda 1982). The housepits of the Plateau horizon are characteristically smaller than those of the previous Shuswap horizon with an average diameter of 6.14 meters (though generally larger in the Mid-Fraser area). Housepits are circular to oval in plan often containing a central hearth feature, and a few small cooking, storage, and refuse pits (Richards and Rousseau 1987; Carlson 1980; and Wilson 1980). The walls tend to be steep and the floors are flat with a basin shaped profile. There is evidence for large postholes, earth roofing insulation, and benches lining the edges. Eldridge and Stryd (1983) and Hayden (1997) give evidence for both side entrances and roof entrances being employed at this time.

The lithic technology employed during the Plateau horizon shares characteristics with the Northern Plains and North West Coast. The Plateau horizon projectile points were most likely used as dart and arrow points. The dart points have an average of 4.10cm in length and an average width of 2.60cm. Arrow points have an average length of 2.48cm and an average width of 1.73cm (Richards and Rousseau 1987). The larger dart points were used continually throughout the Plateau horizon. However, the smaller arrow points were only used after ca. 1,500 BP (Richards and Rousseau 1987). Plateau points have convex bases, small barbs, and corner notches and are similar to Pelican Lake corner notched points suggesting continuing contact between the Plateau and Northern Plains (Dyck 1983).

Incised and groundstone tools are uncommon during this time with chipped stone tools making up the significant percentage of lithic assemblages. Chipped unifacial and bifacial implements are the most common during this time and an increase in the use of key-shaped scrapers is also evident.

Bone tools are more common in the Plateau horizon than the earlier cultural traditions. These tools include: harpoons, bone points, beads, and gaming pieces. This may be due to a greater degree of bone preservation or to a higher degree of logistically collecting marine resources.

The subsistence focus of the people of the Plateau horizon was on marine resources (salmonids), and roots. Stable carbon isotope analysis of human bone suggests that 60% of all dietary protein had a marine origin (Pokotylo and Froese 1983; Richards and Rousseau 1987).

The evidence for a trans-Rocky Mountain exchange network involving the Plateau, the Northern Plains, the Eastern Kootenay, and Rocky Mountain Regions is represented by the presence of nephrite, argillite, top of the world chert, Dentalium and Olivella shells. These artifacts represent prestige or trade goods coming into the Plateau from their respective places of origin.

During the later stages of the Plateau horizon the "Big Village Pattern" (Lenert 2001) or Lillooet Phenomenon arises in the western Canadian Plateau Region at ca. 1800-1600 cal. BP (Lenert 2001). The Lillooet Phenomenon employs the existence of small, medium, and large pithouses organized into communities. This time period also reflects a probable height of social complexity (as defined by Arnold 1996) and population aggregation.

Kamloops Horizon (1,200-200 BP)

The Kamloops horizon is the last prehistoric cultural phase in the Canadian Plateau Region. Architecturally, the housepits in this phase have an average diameter of

8.66 meters, but range in size from 5 meters to 22 meters in diameter. The housepits are oval, round, rectangular, and square in plan and usually have raised earth rims. Central hearths, storage pits, and both side and roof entrances are associated with Kamloops Housepits (Richards and Rousseau 1987).

Kamloops side-notched points are the most common projectile points employed during this time period. These points are small and triangular and have small, narrow, opposing side notches with straight to slightly convex or concave basal margins. The points have an average length of 2.04 cm, and an average width of 1.32 cm (Sanger 1970). In the later stages of the Kamloops horizon (ca. 400-100 BP) multi-notched points are found, but rare. These points have up to four additional notches along one lateral blade margin and are slightly larger than Kamloops side-notched varieties (Richards and Rousseau 1987).

Lithic technology employing bifacial reduction is quite similar in the Kamloops horizon when compared to earlier cultural traditions. It is dominated by fine, pressure-finishing of both points and knives. There is an increase in the quantity, quality, and variety of ground stone artifacts made of nephrite, slate, and steatite and these raw materials were often carved into anthropomorphic and zoomorphic forms. These items are representative of a high degree of workmanship and craft specialization. There is evidence that these items were trade goods and may have been one of their main functions.

Non-lithic artifacts that are associated with the Kamloops horizon include: birch bark containers and woven blankets (Teit 1909). There is an increase in the variety and frequency of antler, bone, and tooth artifacts. These items were often highly decorated using a series of geometric patterns.

Subsistence strategies during the Kamloops horizon were logistically organized with a focus on aquatic resources in addition to terrestrial resources including deer, roots and berries. Stable isotope analysis, from a limited number of human remains, indicates that 40-60% of the dietary caloric intake was from salmon (Lepofsky et al. 1996).

## The Bridge River Site

The Bridge River site lies on the western edge of the British Columbia Plateau region within a deep valley (Bridge River) that divides the Coast Mountains from the Camelsfoot Range (Ryder 1978). The site lies on a broad terrace on the north side of the Bridge River and is underlain by alluvial and colluvial sediments. From a vegetative standpoint, the site is located within the Ponderosa Pine-Bunchgrass biogeoclimatic zone (Mathewes 1978). Current site vegetation includes a variety of grasses (e.g. wild rye and various wheat grasses), Saskatoon berry bushes, rabbitbrush, big sagebrush, and Ponderosa pine. The Bridge River site was occupied during the Plateau and Kamloops horizons (Prentiss et al. 2008).

# CHAPTER THREE

# STRATIGRAPHY, FEATURES, AND DATING

(Anna Marie Prentiss)

This chapter describes the stratigraphic contexts excavated during the 2009 field season at the Bridge River site. The chapter also describes all features and reviews results of radiocarbon dating associated with the 2009 field season. This chapter provides an overview of all strata from housepits 11, 16, 20, 24 and 25.

## Stratigraphic Codes

The following codes were used to designate different stratigraphic contexts at Bridge River:

I. Surface sediments. These normally included the uppermost portion of the roof strata and the humic zone with extensive plant materials.
II. Floor. Floor sediments were likely transported to the site from nearby silt/clay deposits. In some cases they may also have been acquired from substrate within the bounds of the site. Floors tend to dominated by clay and silt sized clasts and have evidence for *in situ* artifact discard and the presence of features like hearths and cache pits.
III. Rim deposit. These are secondarily deposited sediments deriving primarily from redeposited roof and hearth materials. They tend to have a high content of charcoal, unburned wood (in some contexts), and fire-cracked rock. Some contexts also produce large numbers of artifacts possibly reflecting clean-up and discard of materials from activity areas
IV. Clay loam substrate.
V. Roof. Roof sediments vary from silt to clay dominated. Older roofs have a higher likelihood of clay dominance. Roof deposits often contain large numbers of fire-cracked rock reflecting clean-out of cooking features. They also produce variable quantities of artifacts reflecting secondary disposal of materials from activity areas. Contexts with exceptionally high artifact counts could also reflect roof-top activity areas.
XI. Gravel substrate.

We rely upon sub-designations in lower case letters (e.g. IIa, IIb, etc.) to define earlier dated strata in a sequence of similar strata. We use numbers in parentheses (e.g. V(1)) to define variation in a single stratigraphic context but not necessarily from a different occupation. Stratigraphy is discussed below and illustrated in Appendix A.

## Stratigraphy and Dating

Radiocarbon dates from 2009 are provided in Tables 3.1 and 3.2. They support results of previous dating (Prentiss et al. 2008) indicating two major periods of occupation. Bridge River 1-3 falls in the range of approximately 1800 to 1100 cal. BP. Bridge River 4 generally postdates 400 cal. B.P. Prentiss et al. (2008) mark separations between periods as follows: BR 1 and 2 break is ca. 1600 cal. BP; BR 2 and 3 break is ca. 1300 cal. B.P. Dates are discussed in context of individual excavation units.

Table 3.1. Radiocarbon dates from the 2009 field season at the Bridge River site.

| Lab Number | ID# | Material | $d^{13}C$ | Date (yrs. BP) | Context |
|---|---|---|---|---|---|
| AA86973 | 18 | wood charc. | -24.0 | 805±35 | see below |
| AA86974 | 23 | wood charc. | -21.0 | 1304±35 | see below |
| AA86975 | 42 | wood charc. | -22.0 | 1670±35 | see below |
| AA86980 | 25 | wood charc. | -22.9 | 1591±36 | see below |
| AA86981 | 5 | wood charc. | -23.7 | 1785±36 | see below |
| AA86976 | 37 | wood charc. | -22.4 | 184±34 | see below |
| AA86977 | 27 | wood charc. | -24.6 | 1525±39 | see below |
| AA86978 | 32 | wood charc. | -22.1 | 1201±36 | see below |
| AA86979 | 12 | wood charc. | -22.4 | 1206±36 | see below |
| AA86982 | 15 | wood charc. | -27.0 | 1300±36 | see below |

Table 3.2. Radiocarbon dates in context from 2009.

| Sample ID# | Housepit/Area | Stratum | Feature | Date | Cal. Date BP[1] (Mean)+Max 2σ dist. |
|---|---|---|---|---|---|
| 18 | 25/1 | II | 1 | 805±35 | 779 (727) 675 |
| 15 | 25/3 | II | 1 | 1300±36 | 1295 (1234) 1173 |
| 12 | 16/1 | VII | 1 | 1206±36 | 1260 (1124) 1013 |
| 23 | 16/1 | IIc | 6 | 1304±35 | 1292 (1235) 1177 |
| 37 | 11/1 | II | 1 | 184±34 | 301 (142) 0 |
| 25 | 11/2 | IIa | 1 | 1591±36 | 1551 (1475) 1399 |
| 42 | 11/2 | IIa | 3 | 1670±35 | 1694 (1531) 1424 |
| 32 | 20/3 | IIb | 4 | 1201±36 | 1258 (1123) 1009 |
| 27 | 20/3 | IId | 3 | 1525±39 | 1521 (1431) 1340 |
| 5 | 20/3 | IId | 1 | 1785±36 | 1818 (1715) 1612 |

[1]Dates calibrated using Calib 6.0 (Stuiver et al 2010)

Housepit stratigraphy at Bridge River was, as always, complex in 2009. Consequently, analysis of strata after the excavations were completed resulted in many re-designations. Tables 3.3 through 3.26 summarize those re-designations. These tables also associate dates with strata and designate major occupation periods.

Housepit 11 featured two major periods of occupation. There is a deep and thick IIa floor capped by a VA roof deposit. This sequence is complex in Area 2 given establishment of a cache pit and hearth in rim and floor deposits which was subsequently capped by more rim before the Va roof buried all. There was also a BR 4 occupation at HP 11that created the extra depression and evident side entrance in the center of the housepit. Stratigraphically, the BR 4 occupation left a thin single floor (II) capped by a final roof deposit (V). The burial deposit found in 2004 is probably associated with this latter context.

Table 3.3. Housepit 11, Area 1, Stratigraphic Summary.

| Excavation Designations | Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 4 |
| V | V | V | | 4 |
| II | II | II | | 4 184±34 |
| V(2) | II | II | | 4 |
| II/Va | II | II | 7 | 4 |
| Va | Va | Va[2] | | 2 |
| IIa | IIa | IIa | 1, 2, 3, 4, 5, 6 | 2 1619±36[3] |
| | IIa(1) | IIa | | 2 |
| | IIa(2) | IIa | | 2 |
| | IIa(3) | IIa | | 2 |
| IIb | IIb | IIb | | 2 1646±38[3] |
| V/III lvl. 1 | III(1) | III(1) | | 2/4[1] |
| V/III lvl. 2 | III(2) | III(2) | | 2 |

[1]Origin of some of this deposit is not clear as to association with BR 2 or 4 occupations.
[2]In unit 4, Va level 1 is probably II; In unit 5, VA levels 1 and 2 are substantially II.
[3]Dates from 2004 field season (Prentiss et al. 2005).

Table 3.4. Housepit 11, Area 2, Unit 1, Stratigraphic Summary.

| Original Strat. | | Updated Strat. | |
|---|---|---|---|
| Strat. | Level | Strat. | Level |
| I | 1 | I | 1 |
| III | 1 | III | 1 |
| III | 2 | III | 2 |
| III | 3 | III | 3 |
| III | 4 | III | 4 |
| III | 5 | III | 5 |
| III | 6 | III | 6 |
| IIa | 1 | IIa/F1 | 1 |
| IIb | 1 | IIa/F1 | 2 |
| Va | 1 | III | 6 |
| Va | 2 | IIIa | 1 |
| Va | 3 | IIIa | 2 |
| Va | 4 | IIIa | 3 |
| Va | 5 | IIIa | 4 |
| Va | 6 | IIIa | 5 |
| Features 1, 2, 3 | | Feature 1 | |

Table 3.5 Housepit 11, Area 2, Unit 2, stratigraphic summary.

| Original Strat. | | Updated Strat. | | |
|---|---|---|---|---|
| Strat. | Level | Strat. | Level | |
| I | 1 | I | 1 | |
| Va | 1 | Va | 1 | |
| Va | 2 | Va | 2 | |
| Va | 3 | III | 1 | |
| Va | 4 | III | 2 | |
| Va | 5 | III | 3 | |
| Va | 6 | III | 4 | |
| Va | 7 | Va/III | 1 | |
| Va | 8 | Va/III | 2 | |
| Va/F1 | 1 | IIa/F1 | 1 | |
| Va/F1 | 2 | IIa/F1 | 2 | |
| Va/F1 | 3 | IIa/F1 | 3 | |
| Va/F1 | 4 | IIa/F1 | 4 | |
| Va/F1 | Base | IIa/F1 | 5 | |
| F1 | 1 | IIa/F1 | 6 | |
| F1 | 2 | IIa/F1 | 7 | |
| IIa | 3 | IIa/F1 | 8 | |
| IIa | 4 | IIa/F1 | 9 | |
| IIa | 5 | IIa/F1/IIa(2/3) | 1 | |
| IIa | 6 | IIa/F1/IIa(2/3) | 2 | $1591 \pm 36$ |

Table 3.6. Housepit 11, Area 2, Unit 6, stratigraphic summary.

| Original Strat. | | Updated Strat. | |
|---|---|---|---|
| Strat. | Level | Strat. | Level |
| I | 1 | I | 1 |
| I | 2 | Va | 1 |
| I | 3 | Va | 2 |
| Va | 1 | Va | 3 |
| Va | 2 | Va | 4 |
| Va | 3 | Va | 5 |
| Va | 4 | IIa/F1 | 1 |
| Va | 5 | IIa/F1 | 2 |
| Va | 6 | IIa/F1 | 3 |
| Va | 7 | IIa(1) | 1 |
| F1 | 1 | IIa(2/3) | 1 |
| F2 | 2 | IIa(2/3) | 2 |
| IIa | 1 | IIa(2/3) | 3 |
| IIa | 2 | IIa(2/3) | 4 |
| IIa | 3 | IIa(2/3) | 5 |
| IIa | 4 | IIa(2/3) | 6 |

Table 3.7. Housepit 11, Area 2, Unit 7 stratigraphic summary.

| Original Strat. | | Updated Strat. | |
| --- | --- | --- | --- |
| Strat. | Level | Strat. | Level |
| I | 1 | I | 1 |
| V | 1 | V | 1 |
| V | 2 | V | 2 |
| II | 1 | II | 1 |
| Va | 1 | Va | 1 |
| Va | 2 | Va | 2 |
| Va | 3 | Va | 3 |
| IIa | 1 | IIa(1) | 1 |
| IIa | 2 | IIa(1) | 2 |
| IIa | 3 | IIa(1) | 3 |
| IIa | 4 | IIa(2/3) | 1 |
| IIa | 5 | IIa(2/3) | 2 |
| IIa | 6 | IIa(2/3) | 3 |
| IIa | 7 | IIa(2/3) | 4 |
| IIa | 8 | IIa(2/3) | 5 |
| IIa | 9 | IIa(2/3) | 6 |
| IIa | 4(6/14) | IIa(2/3) | 7 |

Table 3.8. Housepit 11, Area 2, Unit 8 stratigraphic summary.

| Original Strat. | | Updated Strat. | |
|---|---|---|---|
| Strat. | Level | Strat. | Level |
| I | 1 | I | 1 |
| V | 1 | V | 1 |
| V | 2 | V | 2 |
| Va | 1 | V | 3 |
| Va | 2 | V | 4 |
| Va | 3 | II | 1 |
| Va | 4 | II | 2 |
| Va | 5 | Va | 1 |
| Va | 6 | Va | 2 |
| IIa | 1 | IIa(2/3) | 1 |
| IIa | 2 | IIa(2/3) | 2 |
| IIa | 3 | IIa(2/3) | 3 |
| IIa | 4 | IIa(2/3) | 4 |
| IIa | 5 | IIa(2/3) | 5 |
| IIa | 6 | IIa(2/3) | 6 |
| IIa | 7 | IIa(2/3) | 7 |
| IIa | 8 | IIa(2/3) | 8 |
| IIa | 9 | IIa(2/3) | 9 |

Table 3.9. Housepit 11, Area 2, Unit 9 stratigraphic summary.

| Original Strat. | | Updated Strat. | | |
|---|---|---|---|---|
| Strat. | Level | Strat. | Level | |
| I | 1 | I | 1 | |
| V | 1 | V | 1 | |
| V | 2 | V | 2 | |
| V | 3 | V | 3 | |
| Va/II | 1 | II | 1 | |
| Va/II | 2 | II | 2 | |
| Va/II | 3 | II | 3 | |
| Va | 1 | Va | 1 | |
| Va | 2 | Va | 2 | |
| Va | 3 | Va | 3 | |
| IIa | 1 | IIa(2/3) | 1 | |
| IIa | 2 | IIa(2/3) | 2 | |
| IIc | 1 | IIa(2/3) | 3 | |
| IIc | 2 | IIa(2/3) | 4 | |
| Va/F2 | 1 | IIa(2/3) | 5 (Feature 2) | |
| Va/F2 | 2 | IIa(2/3) | 5 (Feature 2) | |
| IIc | 3 | IIa(2/3) | 5 | |
| IIa | 3 | IIa(2/3) | 4 | |
| IIa | 4 | IIa(2/3) | 4 | |
| IIa | 5 | IIa(2/3) | 5 | |
| IIa | 6 | IIa(2/3) | 6 | |
| IIa | 7 | IIa(2/3) | 7 | |
| IIa | 8 | IIa(2/3) | 8 | |
| IIa | 9 | IIa(2/3) | 9 | |
| | | IIa (2/3) | 9 (Feature 3) | 1670$\pm$35 |

Table 3.10. Housepit 11, Area 2, stratigraphic summary.

| Final Stratigraphic Code | Features | Date/Occupation Period | |
|---|---|---|---|
| I | | 4 | |
| V | | 4 | |
| II | | 4 | |
| III | | 2 | |
| Va | | 2 | |
| Va/III[1] | | 2 | |
| IIa(1) | 1 | 2 | |
| IIa/F1[1] | 1 | 2 | |
| IIa/F1/IIa(2/3)[1] | 1 | 2 | 1591±36 |
| IIa(2/3) | 2, 3 | 2 | 1670±36 |
| III | | 2 | |
| IIIa | | 2 | |

[1]In each of the cases the excavator inadvertently mixed strata. Fortunately, all are from BR 2 context.

Table 3.11. Housepit 11, Area 3, Stratigraphic summary.

| Excavation Designations | Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 4 |
| V | V(1) | V | | 4 |
| V | V(2) | V | | 4 |
| V | V(3) | V | | 4 |
| II/Va | II | II | | 4 |
| Va | Va | Va | | 2 |
| IIa | IIa | IIa | 1 | 2 |

Excavations of Housepit 20 confirmed and refined results of those conducted in 2008 documenting seven floor and four roof deposits, along with multiple features. Roof and floor could not be separated in the deepest strata resulting in the designation Vc/IIf.

Table 3.12. Housepit 20, Area 3, Stratigraphic summary.

| Excavation Designations | Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I/V | I/V | I/V | | 4 |
| II | II | II | | 4 328±31[1] |
| Va | Va | Va | | 3 |
| IIa | IIa | IIa | | 3 1284±36[1] |
| Vb | Vb | Vb | | 3 1581±39[2] |
| IIb | IIb | IIb | 4 | 3 1201±36 |
| IIc | IIc | IIc | | 2 |
| IId | IId | IId | 1, 2, 3, 5 | 2 1525±39<br>1 785±36[4] |
| IIe | IIe | IIe | | 2 |
| Vc/IIf | Vc/IIf | Vc/IIf | | 2 1462±37[3] |

[1]Dates from test unit near area 2 from 2003 field season (Prentiss et al. 2004, 2005)
[2]Date from area 2 excavated in 2008 field season (Prentiss et al. 2009). Given its position between younger dates relatively high in the stratigraphic sequence this data may reflect some form of systematic bias (e.g. “old wood”).
[3]Date from area 1 excavated in 2008 field season (Prentiss et al. 2009). The excavator identified a basal floor (IId in 2008) below a thin roof (Vb in 2008) that parallels stratigraphy in area 3 excavated in 2009.
[4]Given its stratigraphic position, this older date likely reflects old wood bias.

New radiocarbon dates from Housepit 16 confirmed results of 2004 excavations defining this housepit as entirely dominated by BR 3 period occupations. The clearest floor sequence was evident in Area 3 with six floors and two roofs. Addition roof deposits were evident in Area 2 though only four floors could be recognized in this area. Area 1 was stratigraphically most complex in that its upper strata (V, II, Va) were truncated by the establishment of a large roasting pit (F1), likely after the abandonment of this housepit as a residence but still during BR 3 times. A sequence of four floors and two roofs were evident below the roasting pit.

Table 3.13. Housepit 16, Area 1, Stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| F1/VII[1] | F1(L1) | F1(L1)[5] | 1 | 3 1206±36 |
| F1/VII(L1)[2] | F1(L1) | F1(L1) | 1 | 3 |
| F1/VII(L2) | F1(L2) | F1(L2) | 1 | 3 |
| F1/VII(L3) | F1(L3) | F1(L3) | 1 | 3 |
| IIa | IIa | IIa[6] | 10[3], 7 | 3 |
| IIa (level 3) | V | Vb[4] | | 3 |
| IIb (unit 1 only) | V | Vb | | 3 |
| IIb (all other units) | IIb | IIb | 5 | 3 |
| V | IIc | IIC | 6 | 3 1304+/-35 |
| IIc | Va/IId | Vc/IId | 8, 9 | 3 |
| III | III | III | | 3 |

[1]Strat. VII cancelled and replaced with simple designation of Feature 1 fill.
[2]F1(L1-3) refer to distinct layers in Feature 1 context (see feature descriptions).
[3]Feature not recognized during excavation – need to add feature form to record.
[4]Roof sequence starts with Vb as elsewhere in HP 16 this roof follows IIa.
[5]Stratum II is replaced by Feature 1 fill. No floor material was found in this context though it or a surface like it likely exists in surrounding sediments not excavated.
[6]No Va roof was located and we presume that it was removed during excavation of original feature 1 roasting pit.

Table 3.14. Housepit 16, Area 2, Stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V | V | V | | 3 |
| II | II | II | | 3 |
| Va | Va | Va | | 3 |
| Va/IIa | Va/IIa | Va/IIa | | 3 |
| Vb | Vb | Vb | | 3 |
| Feature 2 | Vb | Vb | | 3 |
| IIb | IIb | IIb[1] | 4 | 3 |
| Feature 1 | Vc | Vc | | 3 |
| IIc | IIc | IIc[1] | 3, 5 | 3 |

[1]Some sediments excavated as lower IIb and upper IIc may in fact represent a thin veneer of Vc.

Table 3.15. Housepit 16, Area 3, Stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I/V | I/V | I/V | | 3 |
| V | V | V | | 3 |
| II | II | II | | 3 |
| Va | Va | Va | | 3 |
| IIa | IIa | IIa | | 3 |
| IIb | IIb | IIb | | 3 |
| IIc | IIc | IIc | 1 | 3 1305$\pm$36[2] |
| IId | IId | IId | 2, 3 | 3 |
| IIe | IIe | IIe | | 3 |
| IV | IV | IV | | 3[1] |

[1] Sediments in stratum IV likely pre-date any Bridge River occupation; cultural materials found here probably result from BR 3 occupations.
[2]Date from test unit in area 3 excavated during the 2004 field season (Prentiss et al. 2005)

The 2004 excavations of Housepit 25 revealed a BR 1 floor located beneath rim and roof deposits. Our expectation in 2009 was that this would be further confirmed across the rest of the floor. However, this was not the case as thin floors outside the south rim were dated to BR 3 times. The older floor under the south rim is capped by rim deposits and much like Housepit 7 at Keatley Creek could reflect a remnant of earlier occupations (e.g. Prentiss et al. 2003). In the tables below were draw a distinction between the younger II(1) and potentially older II(2) floors.

Table 3.16. Housepit 25, Area 1, Stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V | V | V | | 3 |
| II | II | II[2] | 1, 2, 3 | 3 805+/-35[1] |
| IIa | IIa | IIa[2] | | 3 |
| II/VI | IIa/XI | IIa/XI | | 3 |

[1]Charcoal for this date was derived from a likely disturbed context (Feature 1) and probably does not accurately reflect the final occupation date range of Housepit 25 (see dating in HP 25, Area 3 [Table 3.26]).
[2]II and IIa sequence in Area 1 is equivalent respectively to II(1) and II(1)a sequence in Areas 2 and 3.

Table 3.17. Housepit 25, Area 2, Unit 1, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V levels 1 and 2 | V(1) | V(1) | | 3 |
| V levels 3-7 | III(1) | III(1) | | 3 |
| II | II(1)/IV | II(1)/IV[1] | | 3 |

[1]This stratum represents bioturbated occupation materials lying on basal sediments pre-dating human occupation at BR.

Table 3.18. Housepit 25, Area 2, Unit 2 stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V levels 1-4 | V(1) | V(1) | | 3 |
| V levels 5-6 | III(1 and 2)/V(2) | III(1/2)/V(2) | | 3 |
| II | II(1)/IV | II(1)/IV[1] | | 3 |

[1]This stratum represents bioturbated occupation materials lying on basal sediments pre-dating human occupation at BR.

Table 3.19. Housepit 25, Area 2, Unit 3, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V levels 1 and 2 | V(1) | V(1) | | 3 |
| V level 3 | V(2) | V(2) | | 3 |
| II | V(2) | V(2)/II[1] | | 3 |
| IIa | II(1) | II(1) | | 3 |
| IV | IV | IV[2] | | 3 |

[1]This context is bioturbated (roots), mixing lower roof or V(2) with some floor materials or II.
[2]Stratum IV undoubtedly predates human occupation of the Bridge River site but contains BR 4 materials either pressed in from II(1) or resulting from BR 4 occupation directly on this more ancient surface.

Table 3.20. Housepit 25, Area 2, Unit 4, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V level 1 | V(1) | V(1) | | 3 |
| V level 2 | V(2) | V(2) | | 3 |
| V level 3 | V(3) | V(3) | | 3 |
| II | II(1) | II(1) | | 3 |
| IIa level 1 | II(1) | II(1)a | | 3 |
| IIa level 2 | II(1) | II(1)b | 1 | 3 |
| IIb level 1 | II(1) | II(1)c | | 3 |
| IIb level 2 | II(1) | II(1)c | | 3 |

Table 3.21. Housepit 25, Area 2, Unit 5, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V level 1 | V(2) | V(2) | | 3 |
| V levels 2 and 3 | V(3) | V(3) | | 3 |
| II | II(1) | II(1) | | 3 |
| XI | XI | XI | | |

Table 3.22. Housepit 25, Area 2, Unit 6, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V level 1 | V(2) | V(2) | | 3 |
| V levels 2 and 3 | V(3) | V(3) | | 3 |
| II level 1 | II(1) | II(1) | 2, 3 | 3 |
| II levels 2 and 3 | II(1) | II(1)a | 4 | 3 |
| IIa | II(1)/IV | II(1)a/IV[1] | | 3 |

[1]This stratum represents occupation materials lying on basal sediments pre-dating human occupation at BR.

Table 3.23. Housepit 25, Area 2, Unit 7, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V | V(3) | V(3) | | 3 |
| II level 1 | II(2) | II(2)[2] | | 3 |
| II level 2 | II(2) | II(2) | | 3 |
| IIa | II(1) | II(1) | | 3 |
| IIb | II(1) | II(1)a | 5 | 3 |
| IIc | II(1) | II(1)b | | 3 |
| IId | II(1)/IV | II(1)b/IV[1] | | 3 |

[1]This stratum represents occupation materials lying on basal sediments pre-dating human occupation at BR.
[2]II(2) in Area 2 is a clay lens on surface of II(1). It is not the same context or date as II(2) in Area 3.

Table 3.24. Housepit 25, Area 2, stratigraphic summary.

| Final Designations | Features | Occupation Period/Dates |
|---|---|---|
| I | | 3 |
| V(1) | | 3 |
| V(2) | | 3 |
| V(3) | | 3 |
| II(2) | | 3 |
| II(1)/IV[1] | | 3 |
| II(1)[1] | 2, 3 | 3 |
| II(1)a | 4, 5 | 3 |
| II(1)a/IV | | 3 |
| II(1)b | 1 | 3 |
| II(1)b/IV | | 3 |
| IV | | |
| XI | | |

[1]These represent the same living surface.

Table 3.25. Housepit 25, Area 3, stratigraphic summary.

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V | V | V | | 3 |
| Va (unit 6) | III | III | | 1 |
| III | III | III | | 1 |
| II | II(1) | II(1) | 1 | 3 1300±36 |
| IIa | II(1)a | II(1)a | | 3 |
| IIb | II(1)b | II(1)b | | 3 |
| IIc | II(1)c | II(1)c | | 3 |
| II (units 7, 9, 11) | II(2) | II(2) | 2, 3 | 1 1864+/-36[1] |
| IIa (units 6, 7, 9, 11) | II(2) | II(2)a | 4 | 1 |

[1]Date from test unit excavated in 2004(Prentiss et al. 2005)

The 2009 excavation of Housepit 24, Area 3 was designed to add additional data on Feature 5, ideally enlarging our sample of dog remains. Excavations confirmed the stratigraphy mapped in 2008 as outlined Table 3.26.

Table 3.26. Housepit 24, Area 3, 2009 stratigraphic summary

| Excavation Designations | Original Profile Designations | Final Designations | Features | Occupation Period/Dates |
|---|---|---|---|---|
| I | I | I | | 3 |
| V | V | V | | 3 |
| V/III | V/III | V/III | | 3 |
| III | V/III | III | | 3 |
| II | II | II | | 3 1199±37[1]<br>1296±36[2] |
| Feature | Feature 5 | Feature 5 | 5 | 3 |

[1]Date from 2008 excavations in area 2 (Prentiss et al. 2009)
[2]Date from test unit excavated in 2004 (Prentiss et al. 2005)

## Sediment Characteristics

Tables 3.27 to 3.37 contain data on sediment composition, excavation volume, and fire-cracked rock (FCR) count from each excavation area. Sediment data were field-collected and represent estimates of sediment content quantified on the Wentworth Scale. Since they derive field data (rather than laboratory calculations) the intent is to provide a general estimate of variability in site sediment content. Results are internally consistent demonstrating floor sediments with generally higher clay content than most roof or rim sediments. Also, deeper floors tend have highest clay content, not an unsurprising conclusion given the high clay content of Stratum IV, the substrate underlying most of the Bridge River site. FCR is quantified in several ways. FCR were counted in the field at pebble and cobble sizes (Wentworth scale) and are presented that way in the following tables. To facilitate comparative analysis FCR are also presented as a ratio to total volume of excavated sediment from that stratum. Results suggest a general trend of higher FCR ratios in roof and rim contexts compared to floors as would be expected under a scenario of periodic cleaning after cooking events associated with stone boiling or roasting. There are some exceptions as at Housepit 20 where FCR ratios remain relatively high throughout the stratigraphic sequence. Stratum IIa(1) at HP 11, Area 2 also has an unexpectedly high FCR count and it may be that this is actually a lobe of rocky rim deposits covering the actual floor (see profile in Appendix A).

Table 3.27. Housepit 11, Area 1 sediment characteristics.

| | I | V | II | Va | IIa | IIb | III |
|---|---|---|---|---|---|---|---|
| Cob. | 1 | 5 | 3 | 6 | 2 | 3 | 10 |
| Peb. | 6 | 9 | 7 | 9 | 6 | 5 | 10 |
| Grav. | 4 | 6 | 6 | 5 | 6 | 6 | 5 |
| Sand | 12 | 14 | 8 | 10 | 7 | 6 | 10 |
| Silt | 65 | 34 | 38 | 33 | 22 | 16 | 20 |
| Clay | 12 | 32 | 38 | 37 | 57 | 64 | 45 |
| Color | 10YR 4/2 | 10YR 4/2 | 10YR 3/1 | 10YR 4/2 | 10YR 4/2 | 10YR 5/3 | 10YR 5/3 |
| Com. | L | M | M | M | H | H | L |
| Char. | L | M | M | M | M | M | M |
| FCR: | | | | | | | |
| Peb. | 90 | 695 | 107 | 520 | 194 | 53 | 64 |
| Cob. | 3 | 48 | 21 | 59 | 34 | 11 | 14 |
| Total FCR | 93 | 743 | 138 | 579 | 228 | 64 | 78 |
| $m^3$ | .175 | .38 | .1 | .38 | .26 | .07 | .05 |
| FCR/ $m^3$ | 531 | 1955 | 1380 | 1524 | 877 | 914 | 1560 |

Table. 3.28. Housepit 11, Area 2 sediment characteristics.

| | I | V | II | III | Va | Va/III | IIa(1) | IIa/F1 | IIa(2/3)[1] |
|---|---|---|---|---|---|---|---|---|---|
| Cob. | 1 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 2 |
| Peb. | 4 | 4 | 5 | 2 | 4 | 4 | 3 | 3 | 4 |
| Grav. | 4 | 4 | 5 | 3 | 4 | 5 | 3 | 3 | 5 |
| Sand | 30 | 23 | 31 | 27 | 24 | 47 | 28 | 29 | 23 |
| Silt | 31 | 36 | 28 | 27 | 26 | 16 | 27 | 29 | 21 |
| Clay | 30 | 32 | 36 | 40 | 41 | 27 | 37 | 34 | 45 |
| Color | 10YR 3/2 | 10YR 4/2 + 3/2 | 10YR 3/1 | 10YR 4/2 | 10YR 4/2 | 10YR 4/2 | 10YR 5/2 | 10YR 3/1+ 5/2 | 10YR 4/2+ 3/2 |
| Com. | L | M | H | L | M | L | H | H | H |
| Char. | L | H | H | M | M | M | L | H | M |
| FCR: | | | | | | | | | |
| Peb. | 159 | 171 | 107 | 48 | 589 | 26 | 119 | 162 | 402 |
| Cob. | 19 | 7 | 2 | 5 | 7 | 1 | 10 | 13 | 21 |
| Total FCR | 178 | 178 | 109 | 53 | 596 | 27 | 129 | 175 | 423 |
| $m^3$ | .08 | .08 | .08 | .25 | .475 | .05 | .05 | .49 | .43 |
| FCR/ $m^3$ | 2225 | 2225 | 1363 | 212 | 1255 | 540 | 2580 | 357 | 984 |

[1]Stratum IIa(2/3) represents a thick floor with alternating bands of lighter and darker sediments. It is possible that the darker zones may reflect actual living surfaces with accumulated charcoal staining.

Table 3.29. Housepit 11, Area 3 sediment characteristics.

| | I | V | II | Va | IIa |
|---|---|---|---|---|---|
| Cob. | 3 | 4 | 1 | 1 | 0 |
| Peb. | 9 | 8 | 3 | 5 | 2 |
| Grav. | 12 | 12 | 6 | 9 | 4 |
| Sand | 13 | 12 | 14 | 7 | 3 |
| Silt | 57 | 53 | 35 | 34 | 14 |
| Clay | 6 | 11 | 41 | 44 | 77 |
| Color | 10YR 3/2 | 10YR 4/2 | 10YR 3/1 | 10YR 2/1 | 10YR 5/2 |
| Com. | L | M | M | L | H |
| Char. | L | L | L | L | L |
| FCR: | | | | | |
| Peb. | 103 | 401 | 111 | 226 | 32 |
| Cob. | 12 | 37 | 12 | 11 | 2 |
| Total FCR | 115 | 438 | 123 | 237 | 34 |
| $m^3$ | .1 | .22 | .1 | .13 | .13 |
| FCR/ $m^3$ | 1150 | 1991 | 1230 | 1823 | 261 |

Table 3.30. Housepit 20, Area 3 sediment characteristics.

| | I/V | II | Va | IIa | Vb | IIb | IIc | IId | IIe | Vc/IIf |
|---|---|---|---|---|---|---|---|---|---|---|
| Cob. | 4 | 5 | 6 | 3 | 0 | 0 | 4 | 5 | 4 | 1 |
| Peb. | 23 | 20 | 18 | 19 | 14 | 17 | 17 | 21 | 19 | 5 |
| Grav. | 14 | 19 | 13 | 17 | 15 | 19 | 18 | 21 | 24 | 26 |
| Sand | 8 | 19 | 23 | 20 | 14 | 13 | 15 | 8 | 7 | 2 |
| Silt | 48 | 21 | 30 | 17 | 18 | 17 | 15 | 33 | 7 | 3 |
| Clay | 3 | 16 | 10 | 24 | 39 | 34 | 31 | 22 | 39 | 60 |
| Color[1] | | | | | | | | | | |
| Com. | M | M | M | M | M | M | M | M | M | H |
| Char. | L | L | M | M | M | M | M | M | L | H |
| FCR: | | | | | | | | | | |
| Peb. | 89 | 162 | 188 | 407 | 78 | 339 | 390 | 411 | 481 | 27 |
| Cob. | 4 | 5 | 13 | 6 | 0 | 1 | 16 | 16 | 9 | 1 |
| Total FCR | 93 | 167 | 201 | 413 | 78 | 340 | 406 | 417 | 490 | 28 |
| $m^3$ | .1 | .1 | .06 | .13 | .08 | .09 | .11 | .11 | .14 | .04 |
| FCR/ $m^3$ | 930 | 1670 | 3350 | 3176 | 975 | 3777 | 3690 | 3791 | 3500 | 700 |

[1]Color measurements were inadvertently not taken.  See Prentiss et al. (2009) for HP 20 stratigraphic color data.

Table 3.31. Housepit 16, Area 1 sediment characteristics.

| | I | F1(L1) | F1(L2) | F1(L3) | IIa | IIb | Vb[1] | IIc | Vc/IId | III[2] |
|---|---|---|---|---|---|---|---|---|---|---|
| Cob. | 0 | 1 | 4 | 9 | 3 | 0 | 0 | 0 | 0 | 0 |
| Peb. | 4 | 5 | 6 | 10 | 4 | 6 | 4 | 3 | 2 | 18 |
| Grav. | 3 | 3 | 3 | 4 | 2 | 3 | 3 | 3 | 2 | 18 |
| Sand | 20 | 22 | 23 | 21 | 18 | 16 | 8 | 19 | 13 | 20 |
| Silt | 61 | 59 | 55 | 42 | 26 | 33 | 50 | 25 | 18 | 30 |
| Clay | 12 | 10 | 9 | 14 | 47 | 42 | 35 | 50 | 65 | 14 |
| Color | 10YR 3/1 | 10YR 3/1 | 10YR 4/2 | 10YR 2/1 | 10YR 5/2+ | 10YR 4/3 4/2, 4/3 | 10YR 5/4 | 10YR 4/3 | 10YR 4/3+ | 10YR 5/3 3/1 |
| Com. | L | L | L | L | M | H | M | H | H | L |
| Char. | L | H | M | H | M | M | M | M | M | M |
| FCR: | | | | | | | | | | |
| Peb. | 49 | 463 | 539 | 2504 | 259 | 255 | 52 | 173 | 43 | 243 |
| Cob. | 0 | 18 | 27 | 136 | 12 | 3 | 0 | 0 | 1 | 3 |
| Total FCR | 49 | 481 | 566 | 2640 | 271 | 258 | 52 | 173 | 44 | 246 |
| $m^3$ | .05 | .12 | .08 | .26 | .2 | .1 | .03 | .06 | .05 | .08 |
| FCR/ $m^3$ | 980 | 4008 | 7075 | 10,153 | 1355 | 2580 | 1733 | 2883 | 880 | 3075 |

[1]Data are drawn from unit 1 only.
[2]Data drawn from unit 4 only.

Table 3.32. Housepit 16, Area 2 sediment characteristics.

| | I | V | II | Va[1] | IIa[1] | Vb | IIb | Vc[2] | IIc |
|---|---|---|---|---|---|---|---|---|---|
| Cob. | 3 | 4 | 4 | 1 | 0 | 3 | 2 | 0 | 3 |
| Peb. | 2 | 5 | 4 | 6 | 3 | 4 | 4 | 2 | 5 |
| Grav. | 2 | 4 | 2 | 6 | 13 | 3 | 3 | 3 | 4 |
| Sand | 7 | 6 | 13 | 18 | 22 | 17 | 20 | 17 | 24 |
| Silt | 83 | 61 | 40 | 29 | 20 | 30 | 20 | 19 | 20 |
| Clay | 3 | 20 | 37 | 40 | 42 | 43 | 51 | 59 | 44 |
| Color | 10YR 3/1 | 10YR 3/1 | 10YR 3/2 | 10YR 3/3 | 10YR 3/3 | 10YR 3/2 | 10YR 4/3 | 10YR 3/2 | 10YR 5/3 |
| Com. | L | L | M | M | H | H | H | M | H |
| Char. | L | L | L | M | L | M | M | H | L |
| FCR: | | | | | | | | | |
| Peb. | 37 | 339 | 135 | 127 | 32 | 774 | 130 | 20 | 90 |
| Cob. | 21 | 102 | 33 | 18 | 1 | 109 | 13 | 0 | 4 |
| Total FCR | 58 | 441 | 168 | 145 | 33 | 883 | 143 | 20 | 94 |
| $m^3$ | .08 | .08 | .08 | .03 | .03 | .19 | .08 | .005 | .09 |
| FCR/ $m^3$ | 725 | 5513 | 2100 | 4833 | 1100 | 4647 | 1788 | 4000 | 1044 |

[1]Strata Va and IIa could only be separated confidently in units 1 and 2. These data are drawn from those two units.
[2]Data derived from materials defined in the field as Feature 1, originally thought to be a diffuse hearth, but later determined to be a thin burned roof deposit. Specific data derive from unit 1.

Table 3.33. Housepit 16, Area 3 sediment characteristics.

| | I[2] | V[2] | II | Va | IIa[3] | IIb | IIc | IId | IIe[4] |
|---|---|---|---|---|---|---|---|---|---|
| Cob. | 0 | 1 | 2 | 5 | 3 | 1 | 3 | 2 | 0 |
| Peb. | 4 | 3 | 6 | 9 | 6 | 7 | 8 | 7 | 4 |
| Grav. | 3 | 4 | 5 | 6 | 5 | 4 | 5 | 4 | 1 |
| Sand | 13 | 10 | 8 | 10 | 12 | 11 | 9 | 10 | 7 |
| Silt | 61 | 62 | 39 | 39 | 33 | 34 | 34 | 37 | 30 |
| Clay | 19 | 20 | 40 | 31 | 41 | 43 | 41 | 40 | 58 |
| Color[1] | | | | | | | | | |
| Com. | L | L | M | L | M | H | H | M | H |
| Char. | L | L | L | L | L | M | M | M | M |
| FCR: | | | | | | | | | |
| Peb. | 12 | 28 | 175 | 329 | 131 | 76 | 79 | 97 | 48 |
| Cob. | 0 | 0 | 15 | 40 | 0 | 2 | 9 | 7 | 1 |
| Total FCR | 12 | 28 | 190 | 369 | 131 | 78 | 88 | 104 | 49 |
| $m^3$ | .03 | .02 | .1 | .12 | .08 | .1 | .08 | .07 | .03 |
| FCR/ $m^3$ | 400 | 1400 | 1900 | 3075 | 1638 | 780 | 1100 | 1485 | 1633 |

[1]Color data inadvertently not collected. See Prentiss et al. 2005 for color data from HP 16, area 3.
[2]Strata I and V data could only be collected separately from units 3 and 4. These data are drawn from these two units.
[3]Data drawn from units 1, 3, and 4. Strata IIa and Va were not clearly separated in unit 2.
[4]Stratum IIe was not evident in Units 3 and 4.

Table 3.34. Housepit 25, Area 1 sediment characteristics.

| | I | V | II | IIa |
|---|---|---|---|---|
| Cob. | 1 | 0 | 1 | 1 |
| Peb. | 9 | 5 | 4 | 9 |
| Grav. | 16 | 17 | 18 | 23 |
| Sand | 8 | 13 | 16 | 13 |
| Silt | 57 | 55 | 38 | 21 |
| Clay | 9 | 20 | 23 | 33 |
| Color | 10YR 3/2 | 10YR 3/2 | 10YR 4/2 | 10YR 5/2 |
| Com. | L | L | M | H |
| Char. | L | L | L | L |
| FCR: | | | | |
| Peb. | 128 | 149 | 40 | 15 |
| Cob. | 2 | 0 | 0 | 2 |
| Total FCR | 130 | 149 | 40 | 17 |
| $m^3$ | .09 | .18 | .18 | .08 |
| FCR/ $m^3$ | 1444 | 828 | 222 | 213 |

Table 3.35. Housepit 25, Area 2 sediment characteristics.

| | I[7] | V[7] | II(2)[1] | II(1)[2] | II(1)/IV[3] | II(1)a&b[4] | II(1)a/IV[5] | II(1)c[6] |
|---|---|---|---|---|---|---|---|---|
| Cob. | 4 | 2 | 0 | 2 | 0 | 0 | 1 | 0 |
| Peb. | 6 | 7 | 1 | 5 | 1 | 4 | 5 | 5 |
| Grav. | 9 | 11 | 9 | 9 | 5 | 7 | 10 | 10 |
| Sand | 5 | 11 | 1 | 9 | 0 | 3 | 9 | 10 |
| Silt | 74 | 55 | 20 | 24 | 5 | 25 | 10 | 5 |
| Clay | 2 | 14 | 69 | 51 | 89 | 61 | 65 | 70 |
| Color | 10YR 3/2 | 10YR 4/2 | 10YR 5/2 | 10YR 3/2 | 10YR 5/2 | 10YR 5/2 | 10YR 5/2 | 10YR 5/2 |
| Com. | L | L | H | H | H | H | H | H |
| Char. | L | M | L | L | L | L | L | L |
| FCR: | | | | | | | | |
| Peb. | 131 | 561 | 5 | 45 | 2 | 16 | 4 | 8 |
| Cob. | 19 | 71 | 0 | 6 | 0 | 0 | 2 | 0 |
| Total FCR | 150 | 632 | 5 | 51 | 2 | 16 | 6 | 8 |
| $m^3$ | .09 | .68 | .008 | .06 | .003 | .03 | .008 | .01 |
| FCR/ $m^3$ | 1667 | 929 | 625 | 850 | 666 | 533 | 750 | 800 |

[1]Unit 7 only
[2]Units 3-7
[3]Units 1 and 2
[4]Units 4 and 7
[5]Unit 5 only
[6]Unit 4 only
[7]All units

Table 3.36. Housepit 25, Area 3 sediment characteristics.

| | I | V | II(1) | II(1)a | II(1)b | II(1)c | II(2) | II(2)a | III |
|---|---|---|---|---|---|---|---|---|---|
| Cob. | 3 | 7 | 2 | 1 | 2 | 0 | 0 | 1 | 6 |
| Peb. | 5 | 7 | 5 | 4 | 11 | 15 | 10 | 14 | 6 |
| Grav. | 8 | 10 | 12 | 15 | 24 | 35 | 10 | 6 | 18 |
| Sand | 12 | 14 | 14 | 17 | 11 | 4 | 17 | 27 | 21 |
| Silt | 61 | 38 | 22 | 20 | 10 | 13 | 10 | 5 | 15 |
| Clay | 11 | 24 | 45 | 43 | 42 | 33 | 53 | 47 | 34 |
| Color | 10YR 3/2 | 10YR 4/2 | 10YR 5/2 | 10YR 4/2 | 10YR 6/2 | 10YR 4/2 | 10YR 4/2 | 10YR 4/2 | 10YR 4/2 |
| Com. | L | L | H | H | H | H | M | H | L |
| Char. | L | L | L | L | L | L | L | M | M |
| FCR: | | | | | | | | | |
| Peb. | 155 | 210 | 66 | 40 | 13 | 4 | 32 | 2 | 111 |
| Cob. | 16 | 29 | 11 | 5 | 1 | 0 | 1 | 0 | 8 |
| Total FCR | 171 | 239 | 77 | 45 | 14 | 4 | 33 | 2 | 119 |
| $m^3$ | .15 | .42 | .14 | .12 | .07 | .02 | .11 | .01 | .09 |
| FCR/ $m^3$ | 1140 | 569 | 550 | 375 | 200 | 200 | 300 | 200 | 1322 |

Table 3.37. Housepit 24, Area 3 (2009 field season) sediment characteristics.

| | I | V | III | II[2] |
|---|---|---|---|---|
| Cob. | 0 | 0 | 1 | 3 |
| Peb. | 8 | 8 | 6 | 10 |
| Grav. | 5 | 6 | 4 | 8 |
| Sand | 9 | 8 | 8 | 8 |
| Silt | 70 | 61 | 45 | 30 |
| Clay | 8 | 17 | 36 | 41 |
| Color[1] | | | | |
| Com. | L | L | L | M |
| Char. | L | L | L | L |
| FCR: | | | | |
| Peb. | 75 | 104 | 122 | 216 |
| Cob. | 0 | 1 | 2 | 1 |
| Total FCR | 75 | 105 | 124 | 217 |
| $m^3$ | .03 | .05 | .1 | .23 |
| FCR/ $m^3$ | 2500 | 2100 | 1240 | 943 |

[1]See Prentiss et al. 2009 for HP 24 Area 3 sediments colors.
[2]Floor mixed with upper sediments from feature 5 (designation from 2008 field season).

## Features

The following tables (3.38-3.48) provide data on feature type, sediments, volume, FCR counts, and occupation context. Plan views and profiles of features are found in Appendix A. Feature numbers represent original field designations. Missing numbers are feature designation later cancelled. Cache pits were excavated in arbitrary 10 cm levels permitting us to present data on variability in sediments and FCR counts on that basis.

Housepit 11, Area 1 produced a very large cache pit feature (F4) with evidence for four independent fill events. While data are presented in arbitrary levels, these correspond to feature layers (Layer 1=Levels 1-3; Layer 2=Levels 4-6; Layer 3=Level 7). Variability in depositional history is evident in sediments and FCR counts. Layer two offers highest counts of FCR and also higher clay content than upper or lower layers. F4 is so large that also has multiple features (1-2, 5-6) excavated into its sediments. F1 contains evidence for significant bioturbation. F3 is a horizontal roof beam hole with a portion of the roof beam burned and still in place, surrounded by large cobbles originally used as a collar to hold the beam in place. F7 is a small hearth on the Stratum II floor. Its radiocarbon date places in solidly in BR 4 times. Given the lack of historic period artifacts in this housepit we consider it unlikely that the house was still in use during the Protohistoric or Colonial period. Thus, the calibrated mean of 142 cal. BP is probably too young. The actual date may be closer to the older limit (ca. 300 cal. B.P.). This suggests that the human burial and burial cache partially exposed in 2004 (see Prentiss et al. 2005) that included a large number of finely made Kamloops style projectile points probably dates to this time period rather than the original estimation of BR 2 times.

Table. 3.38. Feature data from Housepit 11, Area 1 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; FCR count: pebbles/cobbles; N/A=data not available; L1-N=levels).

| Feature | | Sediments | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|
| # Type Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 1 PH 30 | 3 | 2 | 10 | 15 | 40 | 2649 | 1/1 | 2 |
| 2 PH 0 | 10 | 10 | 10 | 20 | 50 | 1208 | 0 | 2 |
| 3 BH 30 | 10 | 10 | 25 | 20 | 5 | 49,062 | 34/40 | 2 |
| 4 CP | | | | | | 1,148,063[1] | | 2 |
| 4-L1 3 | 8 | 5 | 4 | 23 | 57 | | 67/8 | |
| 4-L2 6 | 8 | 5 | 8 | 25 | 48 | | 62/9 | |
| 4-L3 9 | 7 | 7 | 7 | 30 | 40 | | 64/21 | |
| 4-L4 3 | 8 | 7 | 5 | 23 | 54 | | 52/3 | |
| 4-L5 2 | 8 | 6 | 5 | 17 | 62 | | 52/4 | |
| 4-L6 2 | 8 | 6 | 5 | 17 | 62 | | 55/10 | |
| 4-L7 0 | 6 | 6 | 5 | 20 | 37 | | 30/0 | |
| 5 SP 5 | 5 | 5 | 5 | 20 | 60 | N/A | 3/1 | 2 |
| 6 PH 0 | 5 | 5 | 10 | 30 | 50 | 6358 | | 2 |
| 7 H N/A | | | | | | 5539 | N/A | 4 |

[1]Estimated actual excavated volume is 525,000.

Housepit 11 , Area 2 generated three features. Feature 1 (F1) is a deep but relatively narrow cache pit dug into rim sediments on the original margin of the housepit. After partial in-filling with refuse sediments, the pit was converted to a roasting pit or deep hearth. Feature strata reflect three distinct periods of use prior to capping with more rim and subsequent burial under the Va roof. F2 is a small post-hole in BR 2 floor contexts. F3 is a very ephemeral hearth deposit associated with what appears to be the earliest floor at Housepit 11. Thus, the radiocarbon date of this feature marks the beginning of sediment deposition in this complex housepit. Only one ephemeral hearth feature was located in HP 11, Area 3.

Table 3.39. Feature data from Housepit 11, Area 2 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; FCR count: pebbles/cobbles; N/A=data not available).

| Feature # | Type | Sediments Cob. | Peb. | Grav. | Sand | Silt | Clay | Estimated Vol. ($cm^3$) | FCR Count | BR Period |
|---|---|---|---|---|---|---|---|---|---|---|
| 1[1] | H/CP | N/A | | | | | | 192,683[2] | N/A | 2 |
| 2[3] | PH | N/A | | | | | | N/A | N/A | 2 |
| 3[4] | H | N/A | | | | | | N/A | N/A | 2 |

[1]Data were not adequately collected from this feature. The upper 30 cm reflect three episodes of hearth construction and use within the cache pit. Lower sediments are associated with the filled-in cache pit.
[2]Estimated actual excavated volume is 112,860.
[3]Data not adequately collected for this feature.
4This was a very ephemeral surface hearth. There were not adequate sediments to describe characteristics or estimate volume (west edge of feature was located on east margin of unit and sediments were no more than 1-2 cm deep).

Table 3.40. Feature data from Housepit 11, Area 3 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; FCR count: pebbles/cobbles; N/A=data not available).

| Feature # | Type | Cob. | Peb. | Sediments Grav. | Sand | Silt | Clay | Estimated Vol. ($cm^3$) | FCR Count | BR Period |
|---|---|---|---|---|---|---|---|---|---|---|
| 1[1] | H | | N/A | | | | | N/A | N/A | 2 |

[1]This is a portion of a very ephemeral surface hearth located on IIb surface (IIb not excavated).

The 2009 excavations of Housepit 20, Area 3 resulted in identification of a series of hearth, post-hole, and cache pit features. Many of these produced dateable materials permitting us to further flesh out the radiocarbon chronology of this long-lived housepit (Tables 3.2 and 3.12). Feature 2 was a very deep cache pit (about 115 cm) shaped liked a cylindrical jar. Arbitrary level excavation revealed some variability in sediments. Upper contexts (Levels 1-7) have higher percentages of larger clasts as well as higher clay content. Deeper sediments (Levels 8-12) are the opposite with fewer large clasts and reduced clay. Deepest deposits also contain a large amount of birch bark possibly reflecting remnants of bark lining when the pit was actually in use as a storage facility (see Appendix A).

Table 3.41. Feature data from Housepit 20, Area 3 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature # Type | Cob. | Peb. | Sediments Grav. | Sand | Silt | Clay | Estimated Vol. ($cm^3$) | FCR Count | BR Period |
|---|---|---|---|---|---|---|---|---|---|
| 1 H | 0 | 25 | 25 | 2.5 | 45 | 2.5 | 707 | 7/0 | 2 |
| 2 CP | | | | | | | 7,640,876[2] | | 2 |
| 2-L1 | 4.5 | 16.8 | 18.8 | 6.8 | 15.8 | 37 | | 107/8 | |
| 2-L2 | 1 | 15 | 18 | 8 | 13 | 45 | | 93/3 | |
| 2-L3 | 1.6 | 21 | 17.4 | 10.5 | 13.5 | 45 | | 135/3 | |
| 2-L4 | 1.3 | 10.8 | 23 | 8.2 | 16.8 | 40 | | 62/0 | |
| 2-L5 | 1 | 4 | 18.5 | 12.5 | 24 | 40 | | 93/0 | |
| 2-L6 | 0 | 8 | 12 | 17.5 | 22.5 | 40 | | 60/0 | |
| 2-L7 | 8.5 | 8.5 | 10.5 | 7.5 | 25 | 40 | | 82/6 | |
| 2-L8 | 3 | 5 | 2 | 15 | 40 | 35 | | 77/1 | |
| 2-L9 | 5 | 6 | 4 | 15 | 40 | 30 | | 26/3 | |
| 2-L10 | 1 | 5 | 4 | 15 | 40 | 30 | | 94/1 | |
| 2-L11 | 0 | 3 | 2 | 20 | 40 | 25 | | 102/0 | |
| 2-L12 | 5 | 8 | 5 | 13 | 38 | 23 | | 42/0 | |
| 3 H | 25 | 25 | 0 | 5 | 5 | 40 | 5722 | 16/4 | 2 |
| 4 CP | | | | | | | 50,000[1] | | 3 |
| 4-L1 | | 0 | 10 | 20 | 10 | 25 | 35 | 13/0 | |
| 4-L2 | | 1 | 13 | 23 | 8 | 23 | 32 | 26/1 | |
| 4-L3 | | 0 | 22.5 | 32.5 | 4 | 18.5 | 22.5 | 27/0 | |
| 4-L4 | | 0 | 15 | 25 | 15 | 5 | 40 | 37/0 | |
| 5 PH | 0 | 15 | 35 | 7 | 8 | 35 | 19,625 | 32/0 | 2 |

[1]Feature extends substantially beyond the bounds of the excavation unit. It is impossible to estimate total volume. This figure reflects estimated volume actually excavated.
[2]Estimated actual excavated volume is 430,000 $cm^3$.

Housepit 16, Area 1 had very complex stratigraphy that included seven features. Most obvious was Feature 1, a large roasting pit filled with charcoal and large burned cobbles and pebbles. The feature was used at least twice leaving two distinct oven zones and a fill zone in between. Given the BR 3 radiocarbon date (Table 3.2), it would appear that immediately after HP16 ceased being used for residential purposes it was co-opted as a place for large scale roasts. Establishment of the roasting oven required excavation of upper strata (probably V, II, and Va identified in other areas of this house) to create the pit. Then, use, cleanout, and reuse resulted in accumulated sediments in this context, artificially raising the elevation of the west side of HP 16 evident on contour maps (Appendix A). Dense concentrations of rocks in F1 are different from roasting pits excavated elsewhere at Bridge River (Dietz 2005) and may imply a different focus than the other pits more likely associated with meat and/or fish roasts. Other features included small cache pits, a post hole and two hearths. The F6 cache pit was filled with Stratum III rim material rather than the usual dark/greasy pit fill. The Feature 10 hearth sat stratigraphically directly below the F1 roasting pit and was inadvertently excavated as level 4 of F1. As is evident in the profile (Appendix A) this feature was deeper and contained more rocks than the usual ephemeral hearths in Bridge River housepits. It suggests that it may have been used for more extended cooking or heating needs.

Table 3.42. Feature data from Housepit 16, Area 1 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature | | Sediments | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|
| # Type | Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 1 RP | Sediment data listed on stratigraphy table | | | | | | 525,000[1] | 3506/181 | 3 |
| 5 H | 0 | 3 | 2 | 10 | 50 | 35 | 2826 | 35/0 | 3 |
| 6 CP | 0 | 30 | 20 | 25 | 15 | 10 | 21,875[2] | 7/0 | 3 |
| 7 CP | 3 | 5 | 2 | 25 | 55 | 10 | 90,000[3] | 72/0[4] | 3 |
| 8 PH | 0 | 3 | 2 | 25 | 45 | 25 | 1588 | 2/0 | 3 |
| 9 CP | 0 | 3 | 2 | 10 | 40 | 45 | 4800[5] | 17/0 | 3 |
| 10 H[6] | 5 | 8 | 2 | 10 | 70 | 5 | 12,500 | 96/0 | 3 |

[1]The roasting pit feature is very large and it is impossible to estimate its total volume. This figure is actual excavated volume inclusive of all three layers.
[2]This feature was located in the SW corner of unit 4 and not enough was exposed to accurately estimate total volume. This figure is estimated actual excavated volume.
[3]This another potentially large feature from which we cannot estimate total volume. This figure is estimated actual excavated volume from units 6 and 7 (feature fills entire IIa floor context in unit 7 and a large portion of 6).
[4]FCR count derived only from unit 6 where estimated Feature 7 volume is 40,000 $cm^3$.
[5]This is the western edge of a much larger feature. Consequently, this is the estimated actual volume excavated.
[6]Sediment contents and FCR count reconstructed from field notes as feature was inadvertently excavated originally as level 4 in Feature 1.

Housepit 16, Area 2 contained few features (Table 3.43). Most prominent were a large hearth and a rock pile located in deeper floor contexts.

Table 3.43. Feature data from Housepit 16, Area 2 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature | | Sediments | | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|---|
| # Type | Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 3 PH | 0 | 1 | 3 | 5 | 36 | 55 | 2925 | 2/0 | 3 |
| 4 RC[1] | | | | | | | | 6/0 | 3 |
| 5 H | 3 | 3 | 2 | 17 | 18 | 43 | 11,250[2] | 17/3 | 3 |

[1]This is a cluster of pebble (6 of these are FCR) and cobble sized rocks capped by a boulder.
2Potentially large hearth feature extending into adjacent unit.  This is the estimated actual excavated volume.

Housepit 16, Area 3 produced two hearths (one of these was previously recognized and dated in 2004 [Prentiss et al. 2005]) and a very large cache pit (Table 3.44).   The F3 cache pit does not show obvious stratigraphic change in sediments or FCR.  Regardless we have reason to believe that there still may be change through time given variability in botanical and faunal remains from the feature.

Features from Housepit 25 consist of a variety of post-holes, shallow hearths, and one rock pile (Tables 3.45-3.47).    Most of these features are associated with the BR 3 floor (II(1) and are not expected for that context.   The lack of cache pit features is perplexing given their consistent presence in all other BR 3 contexts and our purposeful excavation in areas with strong negative geophysical anomalies that previously always produced these features.  We are left to conclude that either such features were rare to nonexistent on the BR 3 floor of HP 25 or that for some unknown reason the geophysical signatures could not take us to the right position in this housepit.

Table 3.44. Feature data from Housepit 16, Area 3 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature | | Sediments | | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|---|
| # Type | Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 1 H | 5 | 11 | 6 | 14 | 44 | 30 | 1583 | 52/2 | 3 |
| 2 H[1] | | | | | | | 500 | | 3 |
| 3 CP | | | | | | | 2,260,800[2] | | 3 |
| 3-L1 | 5 | 10 | 5 | 5 | 50 | 25 | | 5/0 | |
| 3-L2 | 1 | 12 | 7 | 10 | 35 | 35 | | 53/0 | |
| 3-L3 | 0 | 7 | 3 | 15 | 35 | 40 | | 27/0 | |
| 3-L4 | 3 | 6 | 2 | 12 | 40 | 37 | | 35/2 | |
| 3-L5 | 1 | 9 | 5 | 10 | 40 | 35 | | 49/1 | |
| 3-L6 | 0 | 15 | 5 | 15 | 40 | 20 | | 61/0 | |
| 3-L7 | 0 | 12 | 6 | 12 | 40 | 30 | | 44/0 | |
| 3-L8 | 0 | 11 | 4 | 17 | 35 | 33 | | 26/0 | |

[1]This is a very ephemeral floor surface hearth. Thus it was not possible to collect sediment content data.
[2]This is a very large cache pit. Excavations appear to have revealed approximately 25% of total volume. Estimated actual excavated volume is 565,200 $cm^3$.

Table 3.45. Feature data from Housepit 25, Area 1 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature | | Sediments | | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|---|
| # Type | Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 1 SP[1] | 1 | 20 | 20 | 20 | 20 | 19 | N/A | 2/0 | 3 |
| 2 PH | 0 | 15 | 50 | 15 | 10 | 10 | 100,480 | 7/0 | 3 |
| 3 PH | 0 | 1 | 10 | 20 | 59 | 10 | 785 | 0 | 3 |

[1]This is an amorphous pit filled with loose gravel, charcoal and smaller clasts sediment. It may reflect a non-cultural disturbance.

Table 3.46. Feature data from Housepit 25, Area 2 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature # Type | Cob. | Peb. | Sediments Grav. | Sand | Silt | Clay | Estimated Vol. (cm$^3$) | FCR Count | BR Period |
|---|---|---|---|---|---|---|---|---|---|
| 1 RC | 75 | 2 | 2 | 1 | 5 | 15 | N/A | 0/20 | 3 |
| 2 PH | 0 | 0 | 10 | 5 | 83 | 2 | 10,852 | 0 | 3 |
| 3 PH | 0 | 0 | 10 | 5 | 82 | 3 | 1356 | 0 | 3 |
| 4 PH | 3 | 7 | 10 | 5 | 63 | 12 | 16,611 | 15/3 | 3 |
| 5 PH | N/A | | | | | | 308 | 0 | 3 |

Table 3.47. Feature data from Housepit 25, Area 3 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature # Type | Cob. | Peb. | Sediments Grav. | Sand | Silt | Clay | Estimated Vol. (cm$^3$) | FCR Count | BR Period |
|---|---|---|---|---|---|---|---|---|---|
| 1 H | 0 | 0 | 1 | 13 | 8 | 78 | 10,563[1] | 0 | 3 |
| 2 H | N/A[2] | | | | | | 9671[3] | N/A | 1 |
| 3 PH | 0 | 0 | 6 | 35 | 20 | 45 | 1725 | 0 | 1 |
| 4 PH | 0 | 4 | 4 | 20 | 10 | 62 | 10,382 | 3/1 | 1 |

[1]This is a potentially large floor surface hearth feature. Estimated excavated volume is 5280 cm$^3$.
[2]All sediment collected in soil sample. No sediment data available. In general this was a shallow pit filled with burned sediment, charcoal and FCR. It appears to have been a shallow hearth used on multiple occasions.
[3]Approximately one half of this feature was excavated. Estimated excavated sediment is therefore 4836 cm$^3$.

Limited excavations were undertaken in Housepit 24 to further expose the F5 cache pit in order to expand our understanding of the unique faunal remains from that context. Excavation data suggest a gradual transition from floor to feature fill implying active use of the transition zone during the original occupation. Excavated levels from the feature do not indicate multiple independent periods of in-filling.

Table 3.48. Feature data from Housepit 24, Area 3 (PH=Post hole; BH=Beam hole; CP=Cache Pit; SP=Shallow pit; H=Hearth; RP=Roasting Pit; RC=Rock Cluster; FCR count: pebbles/cobbles; N/A=data not available; L1-N=level).

| Feature | | Sediments | | | | | Estimated | FCR | BR |
|---|---|---|---|---|---|---|---|---|---|
| # Type | Cob. | Peb. | Grav. | Sand | Silt | Clay | Vol. ($cm^3$) | Count | Period |
| 5 CP | | | | | | | 125,000[1] | | 3 |
| 5-L1 | 4 | 22 | 9 | 2 | 23 | 30 | | 64/1 | |
| 5-L2 | 9 | 23 | 8 | 6 | 16 | 38 | | 49/0 | |
| 5-L3 | 0 | 30 | 10 | 5 | 15 | 40 | | 16/0 | |
| 5-L4 | 0 | 30 | 10 | 5 | 15 | 40 | | 12/0 | |
| 5-L5 | 0 | 14 | 11 | 5 | 20 | 50 | | 8/0 | |

[1]Volume of excavated Feature 5 strata from 2009. Additional data from this feature can be found in Prentiss et al. (2009).

## Conclusions

Radiocarbon dating of excavated Bridge River strata reconfirmed results of previous investigations and allowed refinement of age and occupation in specific contexts. Significantly, despite a significant investment in excavating trenches through rim contexts this did not appreciably change our conclusions regarding occupation patterns generated during the original testing phase in 2003 and 2004. This stands in strong contrast to assertions by Hayden and Mathewes (2009) that our earlier excavation program did not produce an accurate history of the site. The 2009 investigations also resulted in identification and full or partial excavation of 42 features that included hearths, post-holes, a beam-hole, a roasting pit, rock piles, and cache pits. A future outcome of these investigations will be more detailed assessment of variability in feature deposition as an indicator of variation in household activities through time.

# CHAPTER FOUR

# LITHIC ARTIFACTS

(Anna Marie Prentiss, Lee Reininghaus, Maggie Schirack and Michael Wanzenried)

## Introduction

This chapter describes the 8995 lithic artifacts (8033 flakes and 962 tools and cores) recovered from Housepits 11, 16, 20, 24, and 25 during the 2009 field season at the Bridge River Site, British Columbia. The chapter also provides preliminary analyses of assemblage variability that incorporates a variety of data drawn from studies of faunal remains, fire-cracked rock and features.

## Debitage and Tool Analysis

Debitage were sorted by raw material, thermal alteration, size, technological type, cortex, and when feasible, fracture initiation. A total of about 40 raw material types were defined during the debitage and tool analysis. Thermal alteration was marked as present or absent, and defined by a suite of characteristics. Lithic artifacts that had flake scars with a smooth or soapy texture when compared to older surfaces with a grainier or duller texture were likely heat-treated (Whittaker 1994:73). Another defining characteristic for heat-treated lithics was color. Lithics that had a greasy luster, crazing, and or a pink to reddish color were likely to have been heat-treated. Debitage and tools were sorted by size into five categories, extra small (<.64 sq cm), small (.64 to 4 sq cm), medium (4 to 16 sq cm), large (16 to 64 sq cm), and extra large (>64 sq cm) (Prentiss 1998, 2001:148). Completeness-related types were defined and sorted using a modified Sullivan and Rozen typology (MSRT) (Prentiss 1998; Sullivan and Rozen 1985).

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

Tools recovered were sorted using a wide range of characteristics. Size on certain tools, such as projectile points, was determined using calibers. Size on other tools such as bipolar cores was determined using the debitage size scale. All tools were drawn and when necessary, some tools such as projectile points were drawn showing multiple faces and margins. Macroscopic as well as microscopic techniques were employed to determine use-wear on tools. Macroscopic techniques utilized the naked eye as well as hand lenses 4x, 8x, and 12x. Microscopic techniques utilized Motic SMZ-168-BP; .75x – 50x zoom microscopes. Use-wear analysis defined such things as polish, rounding, striations, crushing, etc. Measurements were taken on tools to determine edge angle when necessary. Edge angle measurements were determined using Wards Contact Goniometer. When tools had more than one distinctive edge, the tool was termed as an employable unit or EU (Knudson 1983). Edge retouch characteristics were recorded including retouch face (normal, inverse, bifacial), retouch invasiveness (abrupt, semi-abrupt, invasive), and retouch form (scalar, step, hinge). All tools were drawn in profile and plan view to permit future analyses. The Bridge River lithic tool typology (originally based on Hayden's Keatley Creek typology) was applied to all lithic artifacts recovered in 2009. 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 2009). 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.

## Lithic Artifacts Recovered in 2009

(Lee Reininghaus, Maggie Schirack and Michael Wanzenried)

**Housepit 11**

There are a total of 2632 lithic artifacts recovered from Housepit 11. These include 2285 pieces of debitage and 347 tools.

*Housepit 11, Area 1*

There are a total of 1857 lithic artifacts recovered from HP 11, Area 1. These include 1607 pieces of debitage and 250 tools.

Stratum I

Stratum I consists of 40 pieces of debitage and 6 tools. These tools consist of one single scraper, two utilized flakes, one miscellaneous ground stone, one slate scraper, and one miscellaneous cut stone.

Stratum II

Stratum I is comprised of 102 pieces of debitage and 8 tools. These tools include one late Plateau point made from dacite, one expedient knife, one bipolar core, two single scrapers, one utilized flake, one miscellaneous ground stone, and one miscellaneous cut stone.

Stratum IIA

Stratum IIA includes 169 pieces of debitage and 31 tools. These tools consist of one point on a flake, one Plateau corner-notched point with convex base, one bifacial knife with convergent edges, one bifacial knife, point perform, one scraper retouch flake, five pieces esquillees, two single scrapers, one notch, one unifacial knife, two inverse scrapers, one double scraper, one expedient knife, six utilized flakes, one steatite stone bead, two slate scrapers, and two slate knives. Of special note is one bifacial knife on a Plateau straight-based point made from dacite.

Stratum IIA(1)

Stratum IIA(1) contains 1 tool and zero pieces of debitage. The tool is a piece esquillees.

Stratum IIA(2)

Stratum IIA(2) is comprised of 1 tool and zero pieces of debitage. The tool is a slate knife.

Stratum IIB

Stratum IIB includes 454 pieces of debitage and 63 tools. These tools consist of one biface fragment, one Plateau corner-notched point with a straight base, one stage 4 biface fragment, one bifacial perforator, two pieces esquillees, five bipolar cores, four single scrapers, four small piercers, one notch, three unifacial knives, one inverse scraper, one double scraper, one convergent scraper, one expedient knife, twenty utilized flakes, one multidirectional core, one stage 3 biface, one ground slate, one abraded cobble with polish, one slate borer, three slate scrapers, one slate knife, one used truncation on a biface, two miscellaneous sawed stone, and one chopper on cobble. Of special note is a steatite bead.

Stratum IIC

Stratum IIC consists of 14 pieces of debitage and zero tools.

Stratum III(1)

Stratum III(1) consists of 20 pieces of debitage and 3 tools. These tools are comprised of one utilized flake, one miscellaneous groundstone, and one miscellaneous cut stone.

Stratum III(2)

Stratum III(2) includes 17 pieces of debitage and 2 tools. These tools are composed of one single scraper with polish and one miscellaneous cut stone.

Stratum III(3)

Stratum III(3) contains 0 pieces of debitage and 3 tools. These tools consist of one bifacial knife with polish, one utilized flake, and one miscellaneous ground stone.

Stratum IV

Stratum IV consists of 2 pieces of debitage and zero tools.

Stratum V

Stratum V consists of 321 pieces of debitage and 81 tools. These tools include two biface fragments, two flakes utilized on a thin edge, one lightly retouched expedient knife, one Kamloops side-notched point with a concave base, four bifacial knives, one bifacial drill, five bipolar cores, eight single scrapers, small piercer, end scraper, one inverse scraper, twenty-one utilized flakes, one stage 2 biface fragment, sixteen miscellaneous ground and cut stones, nine slate scrapers, and two choppers on a cobble.

Stratum VA

Stratum VA consists of 468 pieces of debitage and 51 tools. These tools are comprised of one biface fragment, one late Plateau point, one point fragment, two Kamloops side-notched points with concave bases, two bifacial knives, one scraper-like biface, one pieces esquillees, three bipolar cores, six bipolar cores, six single scrapers, one small piercer, one notch, two unifacial knives, one end scraper, one inverse scraper, one convergent scraper, three expedient knives, nine utilized flakes, two multidirectional cores, one hammerstone, one incised steatite fragment, two ground slate fragments,, one abraded block, one steatite stone bead, two slate knives, and one slate side-notched point with a straight base. Of special note is one steatite tubular pipe fragment.

*Housepit 11, Area 2*

There are a total of 456 lithic artifacts recovered from Housepit 11, Area 2. These include 404 pieces of debitage and 50 tools.

Stratum I

Stratum I consists of 59 pieces of debitage and 3 tools. These tools include one pieces esquillees, one single scraper, and one utilized flake.

Stratum II

Stratum II is comprised of 37 pieces of debitage and 6 tools. These tools consist of one pieces esquillees, one small piercer, one unifacial knife, and three utilized flakes.

Stratum IIA

Stratum IIA is comprised of 37 pieces of debitage and 3 tools. These tools consist of one stage 2 biface and one slate scraper. Of special note is one steatite ornament with notching,

Stratum IIA(2/3)

Stratum IIA(2/3) consists of 81 pieces of debitage and 11 tools. These tools are comprised of one biface fragment, one bifacial knife with cortex, one stage 4 biface, one pieces esquillees, two bipolar cores, one notch on a bipolar core, one unifacial knife, one convergent scraper, one utilized flake, and one slate scraper with polish.

Stratum IIB

Stratum IIB is comprised of 9 pieces of debitage and one tool. This tool is a late Plateau point made from dacite.

Stratum IIC

Stratum IIC includes zero pieces of debitage and one tool, a utilized flake.

Stratum III

Stratum III is comprised of 26 pieces of debitage and one tool. This tool is a single scraper.

Stratum IIIA

Stratum IIIA consists of 26 pieces of debitage and one tool. This tool is a utilized flake.

Stratum V

Stratum V is comprised of 42 pieces of debitage and 10 tools. These tools consist of one miscellaneous point, one Kamloops point with a straight base, one pieces esquillees, four bipolar cores, two slate scrapers, and a piece of chipped slate.

Stratum VA

Stratum VA is comprised of 87 pieces of debitage and 13 tools. These tools consist of two pieces esquillees, two bipolar cores, two single scrapers, one small piercer, one inverse unifacial knife, one utilized flake, and one slate knife. Of special note is one steatite tubular pipe fragment, one steatite bead, and one steatite ornament with notching.

*Housepit 11, Area 3*

There are a total of 321 lithic artifacts recovered from Housepit 11, Area 3. These are comprised of 274 pieces of debitage and 47 tools.

Stratum I

Stratum I is comprised of 15 pieces of debitage.

Stratum I/V

Stratum I/V consists of 13 pieces of debitage and zero tools.

Stratum IIA

Stratum IIA consists of 42 pieces of debitage and 15 tools. These tools are comprised of one bifacial drill, one bipolar core, one slate scraper, two bipolar cores, four unifacial knives, one utilized flake, one stage 2 biface, one slate scraper, and one Kamloops point with base slope unknown. Of special note is one steatite bead.

Stratum II

Stratum II is comprised of 44 pieces of debitage and 4 tools. These tools consist of three utilized flakes and one slate scraper.

Stratum V

Stratum V consists of 65 pieces of debitage and 8 tools. These tools include one bifacial knife, one bifacial drill, two pieces esquillees, one small piercer, one utilized flake, one stage 2 biface, and one slate scraper.

Stratum VA

Stratum VA is comprised of 95 pieces of debitage and 20 tools. These tools include one Kamloops side-notched point with a concave base, one bifacial knife, one Kamloops point perform, one scraper retouch flake, one pieces esquillees, seven bipolar cores, one single scraper, one unifacial borer, one alternate scraper, one unifacial knife, one utilized slate flake, one small flake core, and one slate scraper with facial striations.

**Housepit 16**

There are a total of 1786 lithic artifacts recovered from HP 16. These include 1508 pieces of debitage and 278 tools.

*Housepit 16, Area 1*

There are a total of 855 lithic artifacts recovered from HP 16, AA 1. These include 693 pieces of debitage and 162 tools.

Stratum I

Stratum I consists of 24 pieces of debitage and 6 tools. These tools are comprised of one small piercer, one sandstone abrader, one slate scraper, and one slate knife. In addition, there are two tools with multiple use edges. They include one single scraper also utilized as a unifacial knife and one slate scraper with two use edges.

Stratum FI(L1)

Stratum F1(L1) is comprised of 154 pieces of debitage and 12 tools. Of these tools there are two utilized flakes, one piece esquillee, one bipolar core, one single scraper, one small piercer, one convergent scraper, one piece of ochre, two slate scrapers and a slate knife. In addition, one single scraper has also been utilized as a used flake.

Stratum F1(L2)

Stratum F1(L2) contains 53 pieces of debitage and 12 tools. These tools consist of one late Plateau point, one corner-notched point, one Shuswap side-notched point, one bipolar core fragment, one single scraper, one alternate scraper, two slate scrapers, one abruptly retouched truncation on a used flake, and two utilized flakes. In addition, one bifacial knife has also been utilized as a used flake.

Stratum F1(L3)

Stratum F1(L3) is comprised of 6 pieces of debitage and 20 tools. These tools consist of one biface fragment, one bifacial drill, three bipolar cores, one piece esquillee, one single scraper, two double scrapers, one convergent scraper, five utilized flakes, one slate scraper, one extra-large metate, and one piece of chipped slate. In addition, there is one utilized flake with two use edges and one slate knife also utilized as a slate scraper.

Stratum IIa

Stratum IIa contains 189 pieces of debitage and 54 tools. Of these tools, there are one expedient knife, one Plateau corner-notch point, two bifacial knives, five piece esquillees, three bipolar cores, six single scrapers, one notch tool, two alternate scrapers, one unifacial knife, one thumbnail scraper, four inverse scrapers, one double scraper, seven utilized flakes, nine slate scrapers, one sawed adze preform, and four pieces of miscellaneous ground slate. In addition, there are several tools with multiple tool functions. These include, one expedient knife also used as a single scraper, one unifacial knife also used as a bifacial knife, one abrupt retouch on a truncation of a flake also utilized as a single scraper, and one additional abrupt truncation on a flake used as an alternate scraper. Of special interest is one ground ornamental object crafted from steatite.

Stratum Vb

Stratum Vb is comprised of 31 pieces of debitage and 3 tools. The tools consist of one utilized flake, one slate scraper, and one hafted scraper made from dacite.

Stratum IIb

Stratum IIb consists of 111 pieces of debitage and 31 tools. Of these tools, there are two piece esquillees, three bipolar cores, five single scrapers, one unifacial borer, one small piercer, two alternate scrapers, two unifacial knives, two inverse scrapers, one convergent scraper, three utilized flakes, one core rejuvenation flake, one piece of miscellaneous ground slate, two slate scrapers, and three abruptly retouched truncations on a flake. In addition, there are two tools with multiple functions. These include, one single scraper also utilized as a small piercer and one inverse scraper also used as a bifacial knife.

Stratum IIc

Stratum IIc contains 42 pieces of debitage and 7 tools. These tools are comprised of one scraper retouch flake, one single scraper, one unifacial knife, one inverse scraper, one expedient knife, and one utilized flake. In addition, there is one single scraper also utilized as a unifacial knife.

Stratum Vc/IId

Stratum Vc/IId consists of 43 pieces of debitage and 7 tools. Of these tools, there are one piece esquillee, two single scrapers, one unifacial knife, one double scraper, one slate scraper, and one bifacially-chipped cobble (net weight).

Stratum III

Stratum III is comprised of 40 pieces of debitage and 10 tools. These tools consist of one piece esquillee, one small piercer, a notch tool, one convergent scraper, four utilized flakes, and two slate scrapers.

*Housepit 16, Area 2*

There are a total of 374 lithic artifacts recovered from HP 16, AA 2. These include 322 pieces of debitage and 52 tools.

Stratum I

Stratum I contains 5 pieces of debitage and 0 tools.

Stratum V

Stratum V consists of 34 pieces of debitage and 10 tools. Of these tools, there are three utilized flakes, two slate scrapers, two slate knives, one expedient knife, one single scraper, and one unifacial knife.

Stratum II

Stratum II contains 39 pieces of debitage and 2 tools. The tools are both slate scrapers.

Stratum Va

Stratum Va is comprised of 48 pieces of debitage and 10 tools. These tools consist of four utilized flakes, four slate scrapers, and one single scraper. Of special note is the presence of one non-culturally modified quartz crystal.

Stratum Va/IIa

Stratum Va/IIa contains 11 pieces of debitage and 6 tools. These tools consist of one bipolar core, one utilized flake, one slate scraper, one slate knife, and one single scraper. In addition, there is one bifacial knife that has also been utilized as a small piercer.

Stratum Vb

Stratum Vb contains 81 pieces of debitage and 15 tools. These tools are comprised of one point preform, one single scraper, three slate scrapers, one piece of chipped slate, one piece esquillee, one utilized flake, one stage 2 biface, one small piercer, and one inverse scraper. In addition, there are several tools with multiple tool characteristics. These include one single scraper also utilized as a used flake, one unifacial knife also used as an abruptly retouched truncation on a flake, one inverse scraper also utilized as a unifacial knife, and one slate scraper with two use edges.

Stratum IIb

Stratum IIb contains 54 pieces of debitage and 7 tools. These tools consist of one piece esquillee, one utilized flake, one core rejuvenation flake, one multi-directional core, two slate scrapers, and one anvil stone.

Stratum Vc

Stratum Vc contains 6 pieces of debitage and 0 tools.

Stratum IIc

Stratum IIc contains 44 pieces of debitage and 2 tools. These tools contain one Plateau corner-notched point and one piece esquillee.

*Housepit 16, Area 3*

There are a total of 557 lithic artifacts recovered from HP 16, AA 3. These include 493 pieces of debitage and 64 tools.

Stratum I/V

Stratum I/V consists of 14 pieces of debitage and 1 tool. The tool is a piece esquillee fragment.

Stratum V

Stratum V contains 9 pieces of debitage and 1 tool. The tool is a slate scraper.

Stratum II

Stratum II is comprised of 58 pieces of debitage and 11 tools. The tools consist of one scraper retouch flake, one single scraper, one small piercer, one inverse scraper, five utilized flakes, and one bipolar core. In addition, there is one scraper-like biface with three used edges.

Stratum Va

Stratum Va consists of 61 pieces of debitage and 5 tools. The tools are comprised of four bipolar cores and one utilized flake.

Stratum IIa

Stratum IIa contains 60 pieces of debitage and 8 tools. The tools consist of one biface fragment, one piece esquillee, two bipolar cores, one single scraper, and two expedient knives. In addition, there is one bipolar core also utilized as a used flake.

Stratum IIb

Stratum IIb is comprised of 29 pieces of debitage and 8 tools. Of these tools, there are one single scraper, one key-shaped unifacial fragment, one unifacial knife, one convergent scraper, one utilized flake, and one piece of chipped slate. In addition there is one convergent scraper that has also been utilized as a unifacial borer. Of special interest is the presence of one extra-small steatite bead.

Stratum IIc

Stratum IIc consists of 27 pieces of debitage and 3 tools. These tools are comprised of one hammerstone and two slate scrapers.

Stratum IId

Stratum IId contains 172 pieces of debitage and 15 tools. These tools consist of one single scraper, three utilized flakes, one hammerstone, one stage 3 biface, two miscellaneous pieces of ground slate, one piece of ocre, two slate scrapers, and one piece of chipped slate. In addition there are several tools with multiple tool characteristics. These include one single scraper also utilized as a small piercer, one unifacial knife also used as a single scraper, and one expedient knife with two use edges.

Stratum IIe

Stratum IIe consists of 63 pieces of debitage and 12 tools. Of these tools there are two piece esquillees, one expedient knife, three utilized flakes, three slate scrapers, one abruptly retouched truncation on a flake, one unifacial knife, and one chopper on a cobble.

Stratum IV

Stratum IV consists of 0 pieces of debitage and 0 tools.

**Housepit 20**

*Housepit 20, Area 3*

There are a total of 1662 lithic artifacts recovered from HP 20, AA 3. These include 1518 pieces of debitage and 144 tools.

Stratum I/V

Stratum I consists of 90 pieces of debitage and 6 tools. Of these tools there are two piece esquillees, one slate knife, one utilized flake, and one slate scraper. Of special interest is the presence of one extra-small steatite bead.

Stratum II

Stratum II contains 54 pieces of debitage and 3 tools. The tools are comprised of two distal tips of a biface and one piece esquillee.

Stratum Va

Stratum Va is comprised of 28 pieces of debitage and 1 tool. The tool is a scraper retouch flake.

Stratum IIa

Stratum IIa contains 96 pieces of debitage and 13 tools. Of these tools there are one expedient knife, one inverse scraper, one utilized flake, one piece esquillee, one bifacial knife, one Kamloops side-notched point, two slate scrapers, and two pieces of chipped slate. In addition, there is one unifacial knife also utilized as a single scraper. Of special note is the presence of two fragments of ground nephrite.

Stratum Vb

Stratum Vb contains 32 pieces of debitage and 3 tools. The tools consist of one small piercer, one utilized flake, and one slate scraper.

Stratum IIb

Stratum IIb consists of 266 pieces of debitage and 23 tools. Of these tools there are one bifacial knife, one bifacial drill, two piece esquillees, one notch tool, one end scraper, one expedient knife, seven utilized flakes, two slate scraper fragments, two pieces of chipped slate, one single scraper, and one scraper retouch flake. In addition, there is one slate scraper with two use edges. Of special importance is the presence of a small bead crafted from copper.

Stratum IIc

Stratum IIc contains 221 pieces of debitage and 17 tools. These tools consist of one biface fragment, two piece esquillees, one bipolar core, five utilized flakes, one stage 3 biface, two slate scrapers, one slate knife, one notch tool, one expedient knife fragment, one core rejuvenation flake, and one alternate scraper.

Stratum IId

Stratum IId contains 425 pieces of debitage and 54 tools. Of these tools, there are one corner-notched late Plateau point, one expedient knife, one Kamloops side-notched point, one Plateau corner-notched point, one point preform, one scraper-like biface, two piece esquillees, five bipolar cores, two single scrapers, one notch tool, one alternate scraper, three unifacial knives, one end scraper, three inverse scrapers, two expedient knives, nine utilized flakes, one small flake core, one hammerstone, one miscellaneous piece of groundstone, one abraded cobble, eight slate scrapers, one small triangular point, one piece of chipped slate. In addition, there are several tools with multiple use edges and multiple tool functions. These include one abruptly retouched truncation on a flake also utilized as a small piercer and two unifacial knives with two use edges. Of special note is one fragment of a steatite pipe and one extra-small bead crafted from copper.

Stratum IIe

Stratum IIe is comprised of 296 pieces of debitage and 21 tools. These tools include three biface fragments, one utilized flake, one point preform, two piece esquillees, two bipolar cores, three single scrapers, one small piercer, one double scraper, two utilized flakes, one miscellaneous piece of ground slate, and one slate knife. In addition there are several tools with multiple functions. These include one abruptly retouched truncation on a flake also utilized a small piercer, one unifacial knife also used as a small piercer, and one inverse scraper also used as an expedient knife.

Stratum Vc/IIf

Stratum Vc/IIf contains 10 pieces of debitage and 3 tools. These tools consist of one bipolar core, one slate scraper and one utilized flake.

**Housepit 24**

*Housepit 24, Area 3*

There are a total of 336 lithic artifacts recovered from HP 24, AA 3. These include 318 pieces of debitage and 18 tools.

Stratum I

Stratum I contains 17 pieces of debitage and 0 tools.

Stratum V

Stratum V consists of 59 pieces of debitage and 2 tools. These tools include one Kamloops side-notched point and one slate scraper.

Stratum V/III

Stratum V/III contains 29 pieces of debitage and 1 tool. The tool is a piece esquillee made from dacite.

Stratum III

Stratum III is comprised of 61 pieces of debitage and 6 tools. These tools consist of one single scraper, one inverse scraper, three utilized flakes, and one piece esquillee.

Stratum II

Stratum II contains 152 pieces of debitage and 9 tools. Of these tools there are one Plateau corner-notched point, two bipolar cores, one single scraper, one utilized flake, one slate scraper, one slate knife, and one Shuswap point. In addition there is one hafted scraper also utilized as an abruptly retouched truncation on a flake. Of special interest is the presence of one extra-small steatite bead.

**Housepit 25**

There are a total of 2599 lithic artifacts recovered from HP 25, AA 1. These include 2414 pieces of debitage and 175 tools.

*Housepit 25, Area 1*

There are a total of 187 lithic artifacts recovered from HP 25, AA 1. These include 149 pieces of debitage and 38 tools.

Stratum I

Stratum I consists of 64 pieces of debitage and 3 tools. The tools contain one Plateau corner-notched point and two slate knives.

Stratum V

Stratum V contains 29 pieces of debitage and 11 tools. Of these tools there are one bifacial knife, one bipolar core, and six utilized flakes. In addition, there is one biface fragment also utilized as a piece esquillee, one slate scraper with two use edges, and one bifacial knife also used as a slate scraper.

Stratum II

Stratum II is comprised of 33 pieces of debitage and 18 tools. These tools consist of one point tip, one Kamloops side-notched point, one piece esquillee, four bipolar cores, one single scraper, one notch tool, one unifacial knife, six utilized flakes, one retouched spall tool, and one slate scraper.

Stratum IIa

Stratum IIa contains 23 pieces of debitage and 6 tools. These tools consist of three piece esquillees, one single scraper, and two utilized flakes.

Stratum IIa/XI

Stratum IIa/XI consists of 0 pieces of debitage and 0 tools.

*Housepit 25, Area 2*

There are a total of 1085 lithic artifacts recovered from HP 25 AA2. These include 1022 pieces of debitage and 53 tools.

Stratum I

Stratum I contains 182 pieces of debitage and 4 tools. The tools consist of one jasper bipolar core, two utilized flakes, one made from obsidian, and of special note, a steatite pipe mouthpiece fragment.

Stratum V(1)

Stratum V(1) consists of 267 pieces of debitage and 20 tools. The tools are comprised of one biface fragment, one piece esquillee, one chalcedony bipolar core, one large microblade, two single scrapers, one crafted from chalcedony, one small piercer, one convergent scraper, six utilized flake tools, one miscellaneous piece of groundstone, three slate scrapers, and one slate knife with a single ground face. Of special interest is an additional slate scraper with red residue and a single ground face.

Stratum V(2)

Stratum V(2) contains 145 pieces of debitage and 7 tools. The tools are comprised of three utilized flakes, one miscellaneous piece of groundstone, and two slate knives. Of special note is an ornamental object crafted from a small river cobble, ground with phallic representation.

Stratum III(1)

Stratum III(1) is comprised of 144 pieces of debitage and 6 tools. The tools consist of three utilized flakes, one single scraper, one slate scraper and one slate knife.

Stratum V(3)

Stratum V(3) consists of 139 pieces of debitage and 6 tools. The tools contain two bipolar cores, one crafted from jasper, one single scraper, one flake utilized as a scraper, one miscellaneous piece of groundstone, and one slate scraper with polish sheen.

Stratum II(2)

Stratum II(2) consists of 11 pieces of debitage and 0 tools.

Stratum II(1)/IV

Stratum II(1)/IV contains 9 pieces of debitage and 0 tools.

Stratum II(1)

Stratum II(1) consists of 71 pieces of debitage and 1 tool. The tool is a utilized flake made from dacite.

Stratum II(1)a

Stratum V(1) consists of 12 pieces of debitage and 5 tools. The tools are comprised of one bifacial knife fragment, and one Kamloops side-notched point with a concave base. In addition, there is one small piercer with two use edges, and one retouched spall tool also with two use edges. Of special note is a ground and sculpted steatite ornament with perpendicular cut marks along the margins.

Stratum II(1)a/IV

Stratum II(1)a/IV contains 15 pieces of debitage and 0 tools.

Stratum II(1)b

Stratum II(1)b consists of 7 pieces of debitage and 3 tools. The tools are comprised of one abraded cobble, one unifacial perforator, and on utilized flake tool.

Stratum II(1)b/IV

Stratum II(1)b/IV is comprised of 0 pieces of debitage and 1 tools. The tool is a utilized flake.

Stratum IV

Stratum IV consists of 20 pieces of debitage and 0 tools.

*Housepit 25, Area 3*

There are a total of 1327 lithic artifacts recovered from HP 25 AA3. These include 1243 pieces of debitage and 84 tools.

Stratum I

Stratum I consists of 170 pieces of debitage and 13 tools. The tools contain one bifacial knife fragment, three bipolar cores, one single scraper crafted from chert, one alternate scraper, two utilized flakes with polish sheen, one miscellaneous piece of cut slate, 2 slate scrapers, and one slate knife with a single ground face and bright polish. One lithic artifact has been utilized as both a unifacial knife and a single scraper.

Stratum V

Stratum V contains 548 pieces of debitage and 34 tools. The tools are comprised of one bifacial fragment, one small notch tool, one Kamloops side-notched point with a concave base, one distal tip of a biface, three piece esquillees, four bipolar cores, one single scraper fragment, one single scraper made of pisolite, eight utilized flakes, one miscellaneous piece of ground slate, one slate scraper, one slate scraper fragment, three slate knives, and one miscellaneous piece of ground stone. Three lithic artifacts display multiple tool characteristics. One artifact is a lightly retouched expedient knife and a utilized flake, the second is a utilized flake with two working edges, and the third is a small piercer also used as piece esquillee and a utilized flake. Of special interest is the presence of a large nephrite adze with polish and a broken edge, a single ground nephrite fragment, and an extra small steatite bead.

Stratum III

Stratum III consists of 82 pieces of debitage and 0 tools.

Stratum II(1)

Stratum II(1) consists of 173 pieces of debitage and 18 tools. The tools are comprised of two bipolar cores, one distal tip of a biface, one small piercer, two unifacial knives, five utilized flakes, one burin with haft wear and a broken use edge, a miscellaneous piece of ground slate and a miscellaneous piece of cut stone. Four tools have been utilized in multiple fashions. One, a bifacial knife, has also been utilized as a single scraper, the second is a bifacial knife with two use-edges, the third is a bipolar core also used as a small piercer, and the fourth is a lightly retouched expedient knife with two working edges..

Stratum II(1)a

Stratum II(1)a contains of 112 pieces of debitage and 7 tools. The tools consist of three bipolar cores, three utilized flakes, and one dacite microblade with polish.

Stratum II(1)b

Stratum II(1)b consists of 36 pieces of debitage and 5 tools. The tools are comprised of one expedient knife, one distal tip of a biface, and one utilized flake. Of special note is a small triangular point utilized as a scraper, and one extra-small steatite bead.

Stratum II(1)c

Stratum II(1)c is comprised of 46 pieces of debitage and 4 tools. The tools consist of three utilized flakes and a small piercer.

Stratum II(2)

Stratum II(2) consists of 58 pieces of debitage and 1 tools. The tool is a single utilized flake.

Stratum II(2)a

Stratum II(2)a contains 18 pieces of debitage and 2 tools. The tools consist of one large scraper-like biface with two working edges and a miscellaneous piece of cut stone.

## Preliminary Analysis of BR 2-3 Materials

(Anna Marie Prentiss)

A major issue driving research at the Bridge River site concerns the emergence of wealth-based status inequality between housepits. As outlined in the introduction chapter there has been significant debate over the timing of emergent inequality in the Mid-Fraser villages (Hayden 1997a, 2005; Prentiss et al. 2003, 2007, 2008). The Bridge River project was originally proposed as a formal test of competing hypotheses. To briefly recapitulate, Hayden contends that the villages emerged early (pre-2100 B.P.) and featured inter-household ranking from the start (or at least near-so). In contrast, Prentiss and colleagues have presented data to support a much later emergence of the villages and even later development of inequality. The 2008 and 2009 Bridge River project provides data with which to test these opposing models. Further, data provide the opportunity to explore the nature of emergent inequality. Ethnographic records (e.g. Teit 1906) suggest that during early European contact times, villages featured ascribed social inequality with elite families and persons owning rights to fishing sites, quarries, and possibly even deer hunting landscapes. Archaeologists remain unclear as to the advent of this system. Drawing from burials some researchers have speculated that it was fully present after ca. 1300-1400 B.P. (Prentiss et al. 2007; Schulting 1995). However, up until this point there has been no way to testing this as a formal hypothesis. Indeed it is possible that earliest inequality may not have been inherited.

The following multivariate statistical analysis provides a preliminary test of hypotheses regarding the timing of emergent inequality and the nature of that inequality once present. Data are derived from analyses of features, fire-cracked rock, lithic artifacts, and faunal remains. It is a preliminary assessment since incomplete site data were used to derive some indices (Housepit 11 lithics come from two of three activity areas [1 and 3] excavated). Results of index development are provided in Table 4.1. Variable 2 (Variable one [house diameter] was excluded) measures number of prestige items per cubic meter excavated. Prestige items include costly artifacts often made from prestigious raw material types. Examples of prestige items include copper ornaments, nephrite jade tools, steatite jewelry, and ground stone bowls (typically highly fragmentary). Variable three is non-local raw material, again measured as counts per cubic meter. Lithic raw materials are highly diverse in the Mid-Fraser area and include a wide range of cherts, volcanic, and metamorphic rocks found in primary and secondary contexts. For purposes of this study, three distinct raw materials were used: pisolite known to be found only in Fountain valley, Hat Creek Valley jasper, and obsidian potentially from multiple sources at significant distances from the Bridge River valley. The prestige raw material index measured counts of nephrite jade, steatite and obsidian artifacts (including debitage) per cubic meter excavated. The biface index was developed as a crude measure of technological investment in curated gear typically used in hunting and butchering situations (Prentiss et al. 2007). It is measured as the summation of total bifaces and projectile divided by total chipped stone tools. The mammal index was modeled after Broughton (2004) as indicator of relative contributions of mammals over fish and is measured as summation total mammal NISP divided by summation total mammals plus fish NISP (Prentiss et al. 2007). The cache pit volume index is a measure of cache pit volume relative to excavated floor area and is measured as excavated cache pit volume divided by excavated square meters per house component. The fire-cracked rock (FCR) index is an indirect measure of cooking frequency. Assuming a relatively constant rate of food preparation per person per household it is also an indirect measure of relative population density within each house. It is measured as total as total cobble and pebble (Wentworth scale) sized FCR count divided by excavated cubic meters. Cases consist of major occupation components (BR 2 and 3) from Housepits 11, 16, 20, 24, 25, and 54. All except that Cache Pit index include both roof and floor data assuming that roofs reflect accumulated debris from clean-up of floors (Alexander 2000).

Table 4.1. Data measuring variability in material wealth and relative population density.

| | Variables | | | | | | |
|---|---|---|---|---|---|---|---|
| Cases | 2. Prest. Items | 3. N-L RM | 4. Prest. RM | 5. Biface Index | 6. Mam. Index | 7. CP Vol. | 8. FCR Index |
| HP25/3 | 2.10 | 44.90 | 3.80 | 15.00 | 16.00 | 0.00 | 751.00 |
| HP 24/3 | 21.40 | 92.50 | 15.70 | 46.00 | 26.00 | 15.60 | 2103.00 |
| HP 20/3 | 3.40 | 6.80 | 3.40 | 30.00 | 12.00 | 11.20 | 1689.00 |
| HP 54/3 | 1.60 | 38.80 | 15.20 | 29.00 | 13.00 | 15.10 | 872.00 |
| HP 16/3 | 1.70 | 14.30 | 3.90 | 5.00 | 1.00 | 17.10 | 2247.00 |
| HP 20/2 | 8.00 | 19.30 | 15.90 | 36.00 | 6.00 | 19.40 | 2659.00 |
| HP 54/2 | 0.00 | 15.20 | 0.00 | 14.00 | 9.00 | 0.10 | 555.00 |
| HP11/2 | 3.90 | 17.00 | 10.70 | 13.00 | 7.00 | 14.20 | 1162.00 |

A principal components analysis (PCA) was undertaken to explore interaction among variables and cases. The correlation matrix (Table 4.2) suggests significant interactions among many of the variables. The PCA extracted two significant factors accounting for nearly 86% of the variance (Table 4.3). The varimax rotated component matrix (Table 4.4) indicates high correlations between variables 2-6 on factor one and high correlations between variables 7 and 8 on factor two. We interpret this in several ways. Factor one results indicate a strong relationship between mammal predation and accumulation of material wealth, a not so surprising result given previous research and theorizing (Hayden 1997a; Prentiss et al. 2007). Factor two results link cache pit creation and use with cooking frequency and potentially household population size. The separation of demographic indicators from wealth markers suggests that demographics may not be the best predictor of household wealth (this will require further study).

Table 4.2. Correlation matrix.

**Correlation Matrix**

| | | VAR00002 | VAR00003 | VAR00004 | VAR00005 | VAR00006 | VAR00007 | VAR00008 |
|---|---|---|---|---|---|---|---|---|
| Correlation | VAR00002 | 1.000 | .805 | .614 | .774 | .695 | .406 | .527 |
| | VAR00003 | .805 | 1.000 | .506 | .592 | .876 | .057 | .071 |
| | VAR00004 | .614 | .506 | 1.000 | .695 | .318 | .715 | .424 |
| | VAR00005 | .774 | .592 | .695 | 1.000 | .675 | .388 | .407 |
| | VAR00006 | .695 | .876 | .318 | .675 | 1.000 | -.184 | -.141 |
| | VAR00007 | .406 | .057 | .715 | .388 | -.184 | 1.000 | .781 |
| | VAR00008 | .527 | .071 | .424 | .407 | -.141 | .781 | 1.000 |

Table 4.3. Initial statistics.

**Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 3.985 | 56.924 | 56.924 | 3.985 | 56.924 | 56.924 | 3.343 | 47.758 | 47.758 |
| 2 | 2.003 | 28.614 | 85.538 | 2.003 | 28.614 | 85.538 | 2.645 | 37.779 | 5.538 |
| 3 | .526 | 7.520 | 93.058 | | | | | | |
| 4 | .338 | 4.833 | 97.891 | | | | | | |
| 5 | .078 | 1.107 | 98.999 | | | | | | |
| 6 | .057 | .813 | 99.812 | | | | | | |
| 7 | .013 | .188 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis.

Table 4.4. Rotated component matrix.

**Rotated Component Matrix[a]**

| | Component | |
|---|---|---|
| | 1 | 2 |
| Prestige Item | .824 | .454 |
| NL Raw Mat. | .938 | .029 |
| Prestige RM | .512 | .688 |
| Biface Index | .768 | .446 |
| Mam. Index | .965 | -.204 |
| C. Pit Vol. | .003 | .963 |
| FCR Index | .030 | .893 |

Factor scores were extracted, saved as variables, and subjected to hierarchical cluster analysis in order to explore relationships between cases (Figure 1). Results indicate two major clusters. Most significantly, Housepit 24 stands out strongly from all others. An examination of raw data in Table 4.1 clearly indicates that this house had significant wealth accumulation and access to mammals compared to all others. In contrast, most other houses from BR 2 and 3 times had far lower rates of wealth accumulation and highly variable demographics. This implies that inter-household inequality was a late development at Bridge River, similar to the process recognized at Keatley Creek (Prentiss et al. 2007).

```
* * * * * H I E R A R C H I C A L   C L U S T E R   A N A L Y S I S * *
* * * * * * * * * * * * * * * * *


 Dendrogram using Average Linkage (Between Groups)

                         Rescaled Distance Cluster Combine

   C A S E      0         5        10        15        20        25
  Label  Num  +---------+---------+---------+---------+---------+

HP 20/3    3   -+-+
HP 11/2    8   -+ +-------+
HP 54/3    4   ---+       +---+
HP 16/3    5   -----------+   +-------------+
HP 20/2    6   ---------------+             +-------------------+
HP 25/3    1   ---+-------------------------+                   |
HP 54/2    7   ---+                                             |
HP 24/3    2   -------------------------------------------------+
```

Figure 4.1. Dendrogram illustrating results of hierarchical clustering of factor scores.

Archaeologists do not know when ascribed inequality developed in the Mid-Fraser villages. Hayden (1997a, 2005; Hayden and Ryder 1991) believes it to be relatively early, perhaps prior to 2000 years ago. Prentiss et al. (2007, 2008) suggest a later date. Neither has been able to find adequate data to demonstrate their positions. Results of this study have implications for this question. Since factor one measures wealth exclusively, factor one scores can be used to rank the houses by relative material wealth. If that is the case then we can test the hypothesis that accumulation of material wealth was most likely to occur in long-lived, demographically stable households maintaining inherited rights to corporeal and non-corporeal property (e.g. Ames 2006). Factor scores were plotted against maximum floor thickness (Figure 2) and number of excavator identified floors (Figure 4.3). Results are inverse to expectations of the latter hypothesis. House floor thickness does predict wealth indicators but in the inverse. In other words, thicker the floor or the longer lived the household, the lower the rate of wealth accumulation.

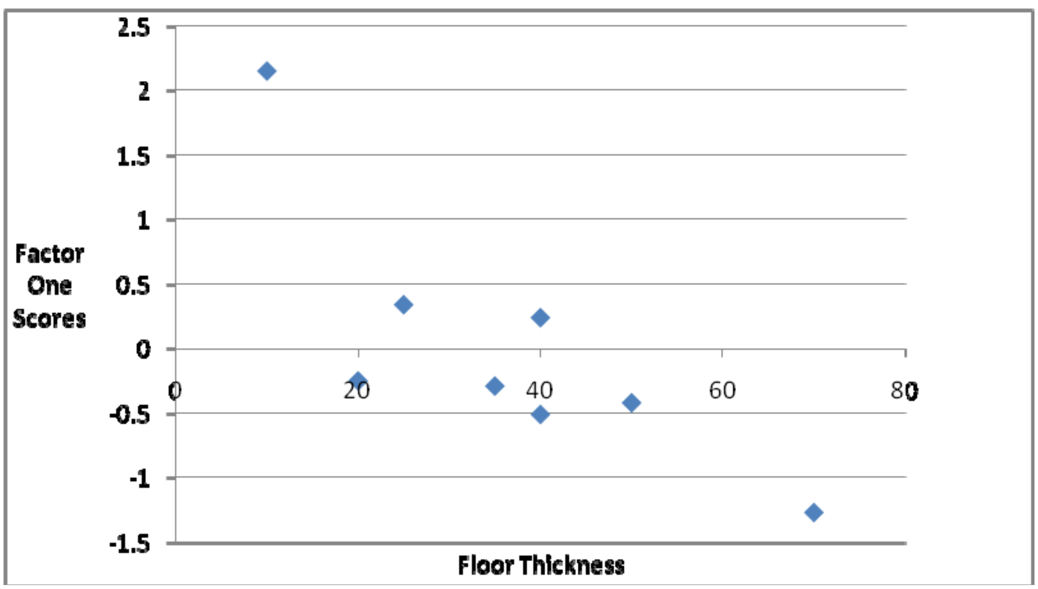

Figure 4.2. Plot of Factor one scores by floor thickness.

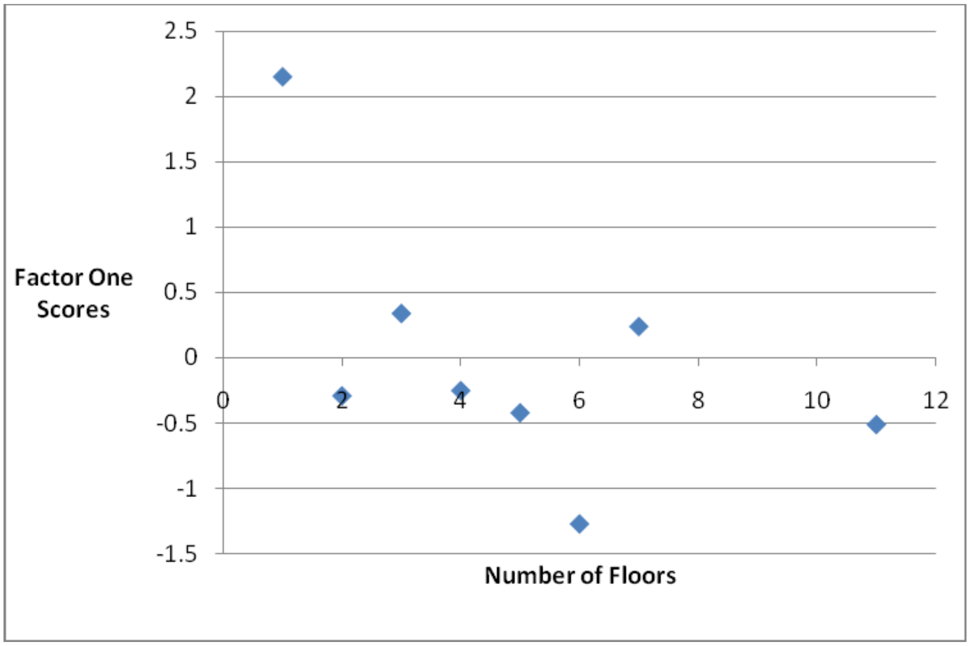

Figure 4.3. Plot of factor one scores by number of excavator identified floors.

The Figure 4.2 and 4.3 results suggest at least two alternative scenarios. Since dating of HP 24 falls squarely within BR 3 times it could mark a process by which select households began to depart from traditional rule systems not favoring wealth accumulation. In this case it could be an effect of altered social conditions brought on by demographic packing whether by virtue of *in situ* growth and/or emigration by new groups. Higher numbers of people in the Bridge River village could have had several impacts. Food resources could have been affected leading to localized resource depression and competition for control of foraging patches. Community leadership might have been strained as well favoring new tactics for organizing mass numbers of persons. Another alternative is that climate change affected resources. Research elsewhere suggests that salmon populations likely peaked and declined after about 1200 cal. B.P. (e.g. Chatters et al. 1995; Prentiss et al. 2007). If that is the case, the burgeoning BR 3 populations at Bridge River may have faced declining access to fish leading to increased pressure on other terrestrial resources. If this was the case then there would have been even more intense competition between houses for access to those resources that could have led to variability in success and differences in markers of household status. This latter scenario seems likely given the subsequent abandonment of the village marking the beginning of a major regional abandonment.

Future research will be necessary to further explore the process of emergent inequality. It is clear from these results that the wealthiest houses were also the most short-lived. It is possible that these could have been emigrants from elsewhere but perhaps even more likely that they represented splinter groups within the village asserting themselves in new ways. If this is the case it is fair to ask how these groups achieved their ends. We need studies of how wealth was mobilized in these select elite households and how they differed from those less successful. We know (see faunal analysis chapter) that wealthy households had the best access to game and domesticated dogs. But we do not yet know how these households differed in terms of social networks or how they achieved their ends in terms of variability in labor investments in the acquisition and disbursement of wealth items.

**A Preliminary Analysis of the Proto-historic Occupation at the Bridge River Site**
(Lee Reininghaus)

This chapter highlights a preliminary analysis of proto-historic archaeological data from three housepits derived from the 2008 and 2009 excavations at the Bridge River site (EeRl4) in British Columbia. The purpose of this analysis is to explore socioeconomic variability as represented in the proto-historic occupational component of three individual households. Archaeologists commonly work within theoretical frameworks that regard household economic status in hunter-gatherer populations as dependent on the ability of a household to provide labor for production (Hayden 1997a; Hayden and Schulting 1997; Netting 1983; Prentiss et al. 2008; Wilk and Rathje 1983). Elite households would be expected to have greater labor pools, and as a result could produce a larger array of subsistence and craft items, which can be used to gain access to prestige items such as non-local lithic raw material and other valuables of significant cultural and social importance (Arnold 1996; Hayden 1997a; Netting 1983; Prentiss et al. 2007; Wilk and Rathje 1983). To facilitate the understanding of socioeconomic variability during the proto-historic component of the Bridge River occupation, this analysis represents a test concerning three hypotheses derived from ethnographic data and ecological theory that are commonly employed to predict household material wealth in hunter-gatherer societies (Ames 2006; Hayden 1997; Netting 1982; Prentiss et al. 2008; Teit 1906; Wilk and Rathje 1982).

- Hypothesis 1: House size predicts household material wealth.
- Hypothesis 2: Household demographics predict household material wealth.
- Hypothesis 3: Household longevity predicts household material wealth.

The sample utilized for this research consists of three proto-historic period households, each with a single floor and roof stratum. Of these housepits, HP 11 is considered a small house, measuring approximately 9.5 meters in diameter, HP 20 is a large house, measuring 16.6 meters in diameter, and HP 54, measuring 12.2 meters in diameter, is medium in size. During the 2008 and 2009 field seasons, three activity areas (see Prentiss et al. 2008) were excavated in each housepit, resulting in comparable samples from each housepit.

The results of my research have been obtained by testing independent variables used to infer socioeconomic status against several dependent variables commonly used as archaeological evidence of household material wealth (Arnold 1996; Ames 2006; Hayden 1997a; Hayden and Schulting 1997; Prentiss et al. 2007).

The dependent variables consist of archaeological data consistent with material wealth items. These include prestige items, exotic raw material, and household mammal consumption (bifacial tool production and mammal remains). The use of these items as representative of material wealth items has been utilized by archaeologists as valid approaches to the analysis of socioeconomic systems in hunter-gatherer societies.

Hunting as a proxy for elite status households derives from ethnographic accounts of the Lillooet regarding the importance of hunting chiefs as well as the use of deer hides for trade purposes (Romanoff 1992; Teit 1900, 1906). As a result, evidence of hunting has subsequently been utilized by Plateau archaeologists when exploring socioeconomic variability between prehistoric households (Hayden 1997a; Prentiss et al. 2007). The quantity, diversity and exoticism of household material artifacts, regardless of functional category, are also common predictors of wealth, as elite households would tend to accumulate greater amounts and increased variability of goods and higher rates of nonlocal material than poorer households (Smith 1985). Exotic items recovered from household contexts can be good indicators of wealth, by indicating participation in long-distance trade relations, formation of possible political alliances, and social connections which may increase access to wealth accumulation (Arnold 1996; Blake 2004; Hayden 1997a, 1997b; Lightfoot and Feinman 1982; Smith 1985).

The independent variables consist of housepit diameter, used to infer house size, FCR data as representative of household demographics, and maximum floor thickness to infer household persistence through time. Archaeologists commonly utilize house size as a predictor of wealth for cross-cultural analysis and it has been a common model employed in the archaeological analysis of social inequality and diachronic aspects of social complexity. The use of house size and household demographics as models to interpret status differentiation in archaeological research has been largely influenced by the use of ecological models, which view wealth as a factor dependent on the ability to accumulate labor for resource procurement and production. This approach views the household as directly connected to ecological, economic, and political processes, and the need for increased household labor results in the formation of large residential units, and consequently the need for large residential structures (Netting 1982; Wilk and Rathje 1982). The concept of household persistence as a predictor of household material wealth is derived from a similar theoretical perspective, with increased household demographics as a coping strategy for economic risk (Ames 2006).

A series of indices were developed (Tables 4.5 and 4.6; Figures 4.4-4.9) for each independent and dependent variable to effectively compare measures of variation between households by compensating for differences in sample size between each housepit (see also Prentiss et al. 2007). The indices developed for the dependent variables consist of a prestige item index, an exotic raw material index, a mammal index, and a bifacial tool index.

The prestige item index has been obtained through quantification of the total number of prestige items, with the total number of prestige items for each housepit divided by the total excavated sediment in meters cubed per each housepit. This produces results that can be effectively utilized in comparison between households by representative sample regardless of amount of excavated sediment within the households (Ewen 2003). The exotic raw material index has been developed in a similar fashion, utilizing items made from raw material (same as BR 2 and 3 analyses above) not located within the immediate parameters of the Bridge River Site, indicating the development of logistical forays for procurement or extensive trade networks for the acquisition of these exotic raw materials. The index has been developed by quantifying the total number of items produced from exotic raw material divided by the total excavated sediment in meters cubed for each individual household (Prentiss et al. 2007). The mammal and bifacial tool indices have been developed to predict household material wealth by measuring household productivity in hunting practices, an indicator of household wealth derived from the ethnographies (Teit 1906). The mammal index consists of a quantification of total mammal fauna remains by the total mammal and fish fauna remains from each individual household. The calculation of the mammal index by dividing the total mammal remains by the combination of the total mammal and fish remains allows for comparison between households by compensating for sampling differences and household demographic biases. The same concept has been utilized in the development of the bifacial tool index, which was obtained through quantification of the total bifacial tools uncovered by the total tool assemblage derived from each household.

The indices for the independent variables consist of house size index, fire-cracked rock (FCR) index, and a maximum floor thickness index. The house size index consists of the diameter of the housepits in meters, an effective approach due to the circular nature of the residential structures. The FCR index, utilized to measure household demographics, has been obtained through quantification of the total amount of FCR per each household by the total volume of excavated sediment from each household to compensate for sampling differences between households. The maximum floor thickness index has been obtained through the measuring of the maximum floor thickness in centimeters per each household, inferring residential persistence of the household.

Table 4.5. Independent and dependent variables and indices.

| **Dependent Variables** | | | **Independent Variables** | | |
|---|---|---|---|---|---|
| **Prestige Items** | **Exotic Raw Material** | **Mammal Consumption** | **House Size** | **Demographics** | **Household Persistence** |
| **Prestige Index (total prestige divided by total excavated sediment)** | **Exotic RM Index (total exotic raw material divided by total excavated sediment** | **Mammal and Biface Indices (total mammal divided by total fish and mammal; total bifacial tools divided by total tools** | **Housepit diameter in meters** | **FCR Index (total FCR divided by total excavated sediment)** | **Maximum Floor Thickness in centimeters** |

Table 4.6. Index data.

| **House Pit** | **Prestige Index** | **Exotic RM Index** | **Mammal Consumption** | | **House Size** | **FCR Index** | **Maximum Floor Thickness** |
|---|---|---|---|---|---|---|---|
| | | | **Mammal Index** | **Biface Index** | | | |
| **54** | **13.98** | **51.61** | **0.9** | **0.156** | **12.2** | **1633** | **45** |
| **20** | **1.02** | **8.16** | **0.81** | **0.151** | **16.6** | **1456** | **20** |
| **11** | **0** | **3.8** | **0.82** | **0.108** | **9.5** | **1608** | **10** |

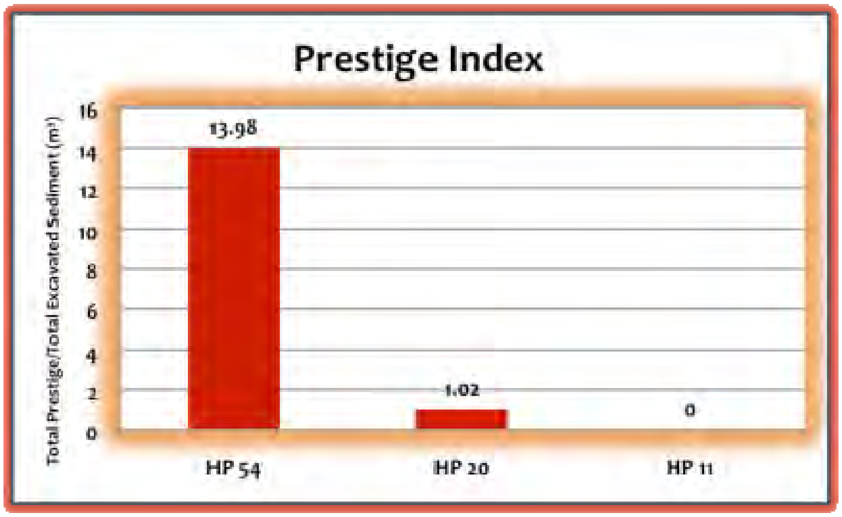


Figure 4.4. Variation in performance of the prestige objects index.

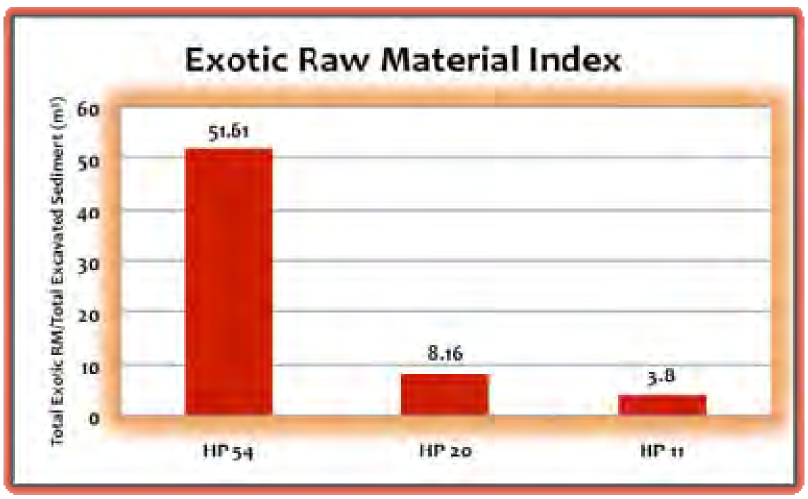


Figure 4.5. Variability in performance of the exotic raw material index.

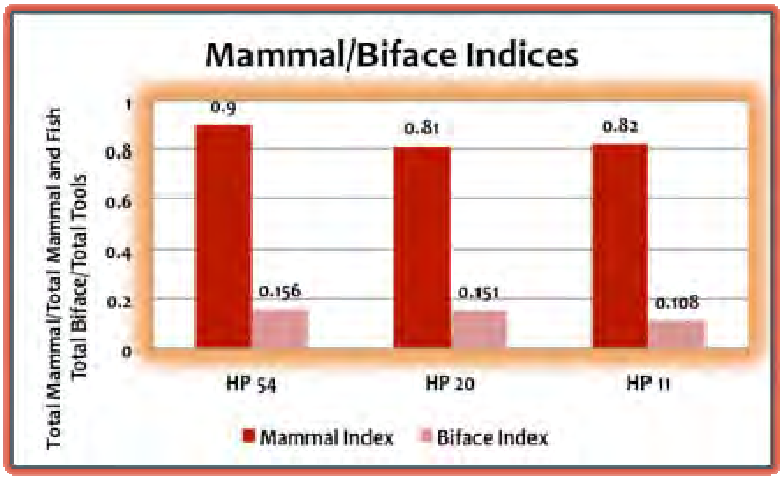


Figure 4.6. Variability in performance of the mammal and biface indices.

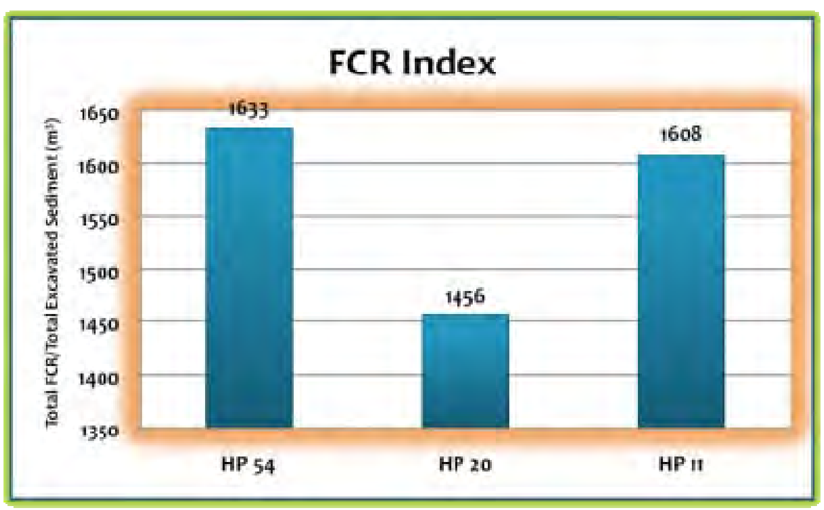


Figure 4.7. Variability in performance of the FCR index.


Figure 4.8. Variability in performance of the house size index.


Figure 4.9. Variability in maximum house floor thickness.

A principal components analysis was also utilized to understand the relationships between all of the above variables (Tables 4.7-4.9). Different from the BR 2/3 analysis (above), wealth indices do correlate with floor thickness. However, they generally do not correlate strongly with house size. The FCR index correlates with most wealth measures.

Table 4.7. Correlation matrix.

**Correlation Matrix[a]**

| | | Prestige Index | House Size | FCR Index | Exotic RM Index | Mammal Index | Biface Index | Max Floor Thick |
|---|---|---|---|---|---|---|---|---|
| Correlation | Prestige Index | 1.000 | -.072 | .556 | 1.000 | .977 | .632 | .986 |
| | House Size | -.072 | 1.000 | -.869 | -.055 | .143 | .728 | -.237 |
| | FCR Index | .556 | -.869 | 1.000 | .541 | .365 | -.293 | .686 |
| | Exotic RM Index | 1.000 | -.055 | .541 | 1.000 | .980 | .645 | .983 |
| | Mammal Index | .977 | .143 | .365 | .980 | 1.000 | .783 | .928 |
| | Biface Index | .632 | .728 | -.293 | .645 | .783 | 1.000 | .494 |
| | Max Floor Thick | .986 | -.237 | .686 | .983 | .928 | .494 | 1.000 |

Table 4.8. Initial Statistics.

**Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** | **Total** | **% of Variance** | **Cumulative %** |
| Prestige Index | 4.639 | 66.278 | 66.278 | 4.63 | 66.278 | 66.278 | 4.623 | 66.049 | 66.049 |
| House Size | 2.361 | 33.722 | 100.000 | 2.36 | 33.722 | 100.000 | 2.377 | 33.951 | 100.000 |

Extraction Method: Principal Component Analysis.

Table 4.9. Rotated component matrix.

Rotated Component Matrix[a]

| | Component | |
|---|---|---|
| | 1 | 2 |
| Prestige Index | .996 | -.092 |
| House Size | .020 | 1.000 |
| FCR Index | .477 | -.879 |
| Exotic RM Index | .997 | -.075 |
| Mammal Index | .992 | .123 |
| Biface Index | .700 | .714 |
| Max Floor Thick | .967 | -.256 |

Based upon the presence of prestigious material items, exotic raw material and mammal consumption, the socioeconomic status of the three proto-historic households are relatively ranked from wealthiest to poorest with HP 54 as the wealthiest, and HP 11 representative of the poorest. If each independent variable were an effective predictor of household material wealth, then each test should display results that correlate strongly with those of the dependent variables. Two of the three independent variables correlate with measures of household material wealth, and include the maximum floor thickness and FCR indices.

Hypothesis 2 (household demographics) and hypothesis 3 (household persistence) can be effectively utilized to predict household material wealth for the proto-historic component of the Bridge River site. Hypothesis 1 (house size) does not appear to accurately predict household material wealth. House size does not correlate with any of the above indices suggesting that house size is not an adequate variable to predict material wealth and socioeconomic variation during the proto-historic occupation of the Bridge River Site. This is contrary to the standard ethnographic assumption. However, the results of this test are consistent with several models derived from the ethnographies, suggesting that household demographic density and household persistence through time are both conditioning factors for increased relative wealth. This supports previous claims from other hunter-gatherer studies, illustrating that household wealth is closely correlated with a households' ability to gain members and persist through time. Further, the results of this analysis indicate that the use of alternative lines of evidence to predict household material wealth should be tested on a site-specific or temporally restricted basis rather than just assumed as accurate measures of material wealth in hunter-gatherer populations.

## Conclusions

The 2009 excavations at the Bridge River site resulted in recovery of 8995 lithic artifacts, of which, 8033 were debitage (or chipping debris) and 962 were used items (tools). Analyses of data developed from these items are ongoing. However, two preliminary studies were undertaken with the goal of exploring relationships between variability in lithics measures of household wealth, predation behavior, house size, longevity, and relative demographics. Results of these studies are provocative and will stimulate significant additional research in the near future. To summarize, analysis of BR2 and 3 data sets indicated a strong relationship between measures of household wealth in lithic artifacts and deer predation. No strong relationship with potential household demographics could be found however. Further, there was an inverse relationship between potential household rank and longevity measured as thickness of accumulated floor sediments. Households with greatest accumulated wealth had the thinnest floors and potentially the most brief occupations. In contrast, BR 4 data indicate that household demographics and longevity do play a potentially important role in the ability of a household to accumulate wealth. Interestingly neither study confirmed house size as playing a highly significant role in wealth variability. These studies suggest that the BR 2-3 village may have been organized socially following rule systems that were significantly different from those of more recent times. Indeed, inequality between houses may not have emerged until some time during the BR 3 occupation, thus confirming a similar chronology at nearby Keatley Creek (Prentiss et al. 2007). The BR 4 occupation may have featured patterns of social relationships much like those described by ethnographers (e.g. Teit 1906).

# CHAPTER FIVE

# FAUNAL ANALYSIS

(Lisa Smith and Ogden Ward)

## Introduction

Five housepits were excavated at the Bridge River site during the 2009 field season. The house-pits (11, 16, 20, 24 and 25) represent a broad range of house hold size and occupation periods. Analysis of the faunal remains demonstrates the diversity of the animals that the occupants of the Bridge River site depended on for food and other uses. Preservation of the assemblages was good, particularly in the older, deeper stratigraphic contexts (see stratigraphy chapter). Poorer preservation in later phases, such as BR4, may be attributed to the lack of clay floor surfaces that are present in the earlier phases. The over-laying clay floors may have acted as a sealant that protected deposits of earlier phases. BR4 surfaces are more susceptible to surface leaching of water, as well as other taphonomic processes such as activity from small mammals and plant roots.

Analysis of the remains provides information on the taxa that predominately make up the assemblages. Identified fish remains belong exclusively to various salmon species (*Onchorhynchus sp*.), which is not surprising given the close proximity of the Bridge River site to a number of optimal fishing sites in the Fraser River system. In addition, prior to dam construction in the 1950s, the Bridge River was a major salmon fishery. A significant portion of the mammal remains consist of deer (*Odocoileus sp*.), with the remainder consisting of dog (*Canis familiaris*), and smaller mammals such as beaver (*Castor sp*.). A much smaller portion of the assemblages are made up of birds along with elements that could not be identified as to taxon.

## Methodology

The faunal remains were analyzed at the lab facilities of the Department of Anthropology at the University of Montana, Missoula. The comparative collections utilized during the analysis were provided by David Dyer, curator of the Philip L. Wright Zoological Museum, at the University of Montana. Professional assistance in specimen identifications was also provided by David Dyer. All faunal material was analyzed for class, genera, and element. Where it was possible, the specimens were identified to genus, and at times, species classifications. The presence of human modification was assessed by recording indicators of butchering and processing techniques, such as cut marks, abrasions, burning, chopping, and fragmenting morphology. Other additional evidence for human modification was recorded including the alteration of bone for tools or ornaments in the various stages of production. Fragmented mammal bone was categorized into six size grades, to demonstrate differences in butchering techniques and the intensity of processing. Heavy fragmentation is generally indicative of marrow and grease extraction from various elements. Higher frequencies of smaller bone fragments may point toward more intensive use of particular prey items, specifically large mammals during later phases of occupation.

All elements were weighed by taxonomic class for each context, which is useful in determining relative frequencies of taxonomic classes, such as fish to mammal. In addition, the various effects of taphonomic processes were recorded, including the degree of bone weathering based on Behrensmeyer's (1978) five stages. As noted above, elements deposited in later phases at the Bridge River site, display more advanced stages of weathering, likely as a result of the absence of over-laying clay floor surfaces. All data resulting from the analysis of the faunal remains were recorded and catalogued on hard copies, as well as entered into a data base.

## Faunal Remains

This section gives a summary of the overall faunal composition broken down by housepit, activity area, period, and strata. In total there were 7393 bone specimens recovered, 2855 of which were *mammalia*, 4474 were *Osteichthyes*, 9 were *aves*, 9 were *mullosca*, and 46 were indeterminate class. Sixty-five humanly worked or modified specimens were recovered, 14 of which were formally modified into beads, ornaments, or tools.

### Housepit 11

A total of 2064 identified specimens were recovered from HP 11, 922 of which were recovered from Area 1, 1080 from Area 2, and 62 from Area 3. Eleven stratigraphic layers were identified spanning BR 2 and BR 4 (Table 5.1).

*Area 1, BR 2 Fauna*

Fauna from BR 2 (Stratum Va, II a, II b, III(1), III(2)) includes a total of 831 specimens—390 mammal, 434 Osteichthyes, 2 aves, and 5 indeterminate taxa (Table 5.2). Mammal index is calculated at .38 (mammals/mammals+fish) (Table 3). One carved bone ornament of large mammal bone was recovered. Bone fragmentation is high, with majority specimens broken down to less than 9 millimeters (Figure 5.1). Area 1, BR 2 contained a relatively high amount of *Canis sp*.

Stratum III(1) contained no fauna. Stratum III(2) contained a total of 22 specimens—2 mammal and 20 Osteichthyes. Mammalian specimens include 2 unidentifiable fragments of large mammal. Osteichthyes specimens are all *Onchorhynchus sp.* These include 2 cranial and 18 post cranial elements.

Table 5.1. Stratigraphic summary of Housepit 11.

| Area | Stratum | Phase | Dates (cal) |
|---|---|---|---|
| 1 | Va, II a, II b, III(1), III(2) | BR 2 | 1619±36, 1646±38 |
| 2 | III, V a, Va/III, II a(1), II a/F1, II a/F1(2/3), II a(2/3), III a | BR 2 | 1591±36, 1670±36 |
| 3 | Va, II a | BR 2 | |
| 1 | I,V,II | BR 4 | 184±34 |
| 2 | I,V,II | BR 4 | |
| 3 | I,V,II | BR 4 | |

Stratum IIb contained a total of 43 specimens—30 mammal and 13 Osteichthyes. Mammalian specimens include 1 diaphysis, 1 antler (cf. *Odocoileus sp*.), and 23 unidentifiable fragments of large mammal, and 5 unidentifiable fragments of medium/large mammal. Osteichthyes specimens are all *Onchorhynchus sp.* These include 9 cranial and 4 post cranial elements.

Stratum IIa contained a total of 626 specimens—262 mammal, 357 Osteichthyes, 2 aves, and 5 indeterminate taxa. Mammalian specimens include 1 calcaneus, 8 phalanx, 1 vertebra, 4 metapodial, 1 distal femur, 1 cervical vertebra fragments, along with 6 complete caudal vertebra of *Canis sp*., 2 tooth fragments of *Castor canadensis*, 4 diaphysis, 2 metacarpal, 1 innominate (cf *Odocoileus sp*.), 1 metapodial (cf *Odocoileus sp*.), 1 rib, 1 scapula (cf *Odocoileus sp*.), 19 antler (cf *Odocoileus sp*. MNI 1), and 5 unidentifiable fragments of large mammal, 1 cranial, 3 diaphysis, and 146 unidentifiable fragments of medium/large mammal, 1 cranial and 1 rib (cf. *Canis sp*.) fragment of medium mammal, 1 mandible with 2 teeth, 1 tooth row with 2 teeth, 1 scapula, and 1 occipital fragment of *Neotoma cindera*, and 1 zygomatic and 1 lumbar fragment of *Odocoileus sp*. Aves include 1 radius of small/medium and 1 first phalanx of medium. Osteichthyes specimens are all *Onchorhynchus sp.* These include 18 cranial, 333 post cranial and 6 unidentifiable elements. One human modified bone was recovered. It tool/ornament carved from a metapodial of a large mammal (cf. *Odocoileus sp*.). Animal gnawing was evident on 1 metacarpal fragment of large mammal.

Stratum Va contained a total of 140 specimens—96 mammal and 44 Osteichthyes. Mammalian specimen include 1 tibia (cf *Odocoileus* sp.), 2 diaphysis, and 1 unidentifiable fragment of large mammal, 3 diaphysis and 83 unidentifiable fragments of medium/large mammal, 4 unidentifiable fragments of indeterminate mammal, and 1 complete astragalus of *Odocoileus sp*. Osteichthyes specimens are all *Onchorhynchus sp.* These include 1 cranial and 43 post cranial elements.

Table 5.2. Faunal summary of Housepit 11, Area 1.

| *Stratum* | *Ind. Mammal* | *Med, Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Odocoileus Sp.* | *Canis Sp.* | *neotoma cindera* | *aves* | *Castor Canadensis* | *unk* | *Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | | | | 2 | | | | | | | | 2 |
| V | 3 | 1 | 59 | 2 | 11 | 1 | | | 1 | | 1 | 79 |
| II | | | 10 | | | | | | | | | 10 |
| V a | 4 | | 87 | 4 | 44 | 1 | | | | | | 140 |
| II a | 46 | 2 | 150 | 23 | 357 | 13 | 22 | 4 | 2 | 2 | 5 | 626 |
| II b | | | 5 | 24 | 13 | 1 | | | | | | 43 |
| III (1) | | | | | | | | | | | | |
| III (2) | | | | 2 | 20 | | | | | | | 22 |

*Area 1, BR 4 Fauna*

Fauna from BR 4 (Stratum I,V,II) includes a total of 91 specimens—78 mammal, 11 Osteichthyes, 1 aves, and 1 indeterminate taxa. Mammal index is calculated at .95 (mammals/mammals+fish) (Table 5.3). Worked bone specimen includes a tool fragment carved from a medium mammal element. Bone fragmentation is high, with the majority of specimens broken down to less than 9 millimeters (Figure 5.1).

Stratum II contained a total of 10 specimens—all of which are mammal. Mammalian specimens include 1 diaphysis and 9 indeterminate fragments of medium/large mammal.

Stratum V contained a total of 79 specimens—66 mammal, 1 aves, 11 Osteichthyes, and 1 indeterminate taxa. Mammalian specimens include 4 unidentifiable fragments of indeterminate mammal, 1 rib fragment of large mammal (cf. *Odocoileus sp*.), 59 unidentifiable fragments of medium/large mammal, 1 unidentifiable fragment of medium mammal, and 1 metacarpal fragment of *Odocoileus sp*. Aves include 1 carpometacarpus, of medium size. Indeterminate include 1 unidentifiable bone fragment. Osteichthyes are all *Onchorhynchus sp*. These include 11 cranial and 10 post-cranial elements. Human modified bones include 1 metacarpal fragment of *Odocoileus sp*. with chop marks, and most notably, 1 tool fragment of an unidentifiable medium mammal element. One unidentifiable fragment of medium/large mammal shows signs of pitting due to digestion.

Stratum I contained a total of 2 specimens, both of which are mammal. Mammalian specimens include 1 metacarpal and 1metapodial fragments of large mammal. Both specimens display evidence of chop marks.

*Area 2, BR 2 Fauna*

Fauna from BR 2 (Stratum III,Va,Va/III,IIa(1),IIa/F1,IIa/F1(2/3),IIa(2/3),III a) include a total of 1036 specimens—282 mammal, 749 Osteichthyes, 1 aves, 1 mollusca, and 3 indeterminate taxa (Table 5.4). Mammal index is calculated at .40 (mammals/mammals+fish) (Table 5.5). One carved bone ornament of large mammal was recovered, along with an awl fragment carved from a metapodial of *Odocoileus sp.*, and 2 tool fragments carved from a diaphysis of medium/large mammal. Bone fragmentation is high, with majority specimens broken down to less than 19 millimeters (Figure 5.2).

Table 5.3. Mammal index of Housepit 11, Area 1.

| **Mammal Index HP 11 Area 1** | **BR 4** | | | **BR 2** | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | V | II | V a | II a | II b | III (1) | III (2) |
| Mammal/Mammal+Fish | 1 | 0.86 | 1 | 0.69 | 0.42 | 0.7 | n/a | 0.09 |
| Combined Period | .95 | | | .38 | | | | |

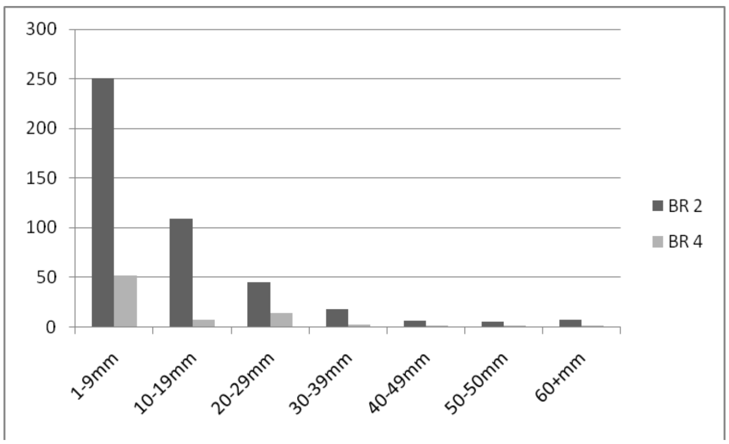

Figure 5.1. Housepit 11, Area 1 bone fragment size-grades.

Stratum IIIa contained a total of 30 specimens—14 mammal and 16 Osteichthyes. Mammalian specimens include 1 vertebra and 1 diaphysis fragment of large mammal, 1 diaphysis and 2 unidentifiable fragments of medium/large mammal, and 9 diaphysis fragments of medium mammal, Osteichthyes are all *Onchorhynchus sp*. These include 1 cranial and 1 post-cranial elements. Human modified bones include 1 diaphysis fragment of large mammal with cut marks. One unidentifiable fragment of medium/large mammal shows signs of animal gnawing.

Stratum IIa(2/3) contained 691 specimens—130 mammal, 1 aves, 557 Osteichthyes, and 3 indeterminate taxa. Mammalian specimens include 29 unidentifiable fragments of indeterminate mammal, 1 rib, 1 vertebra, 2 diaphysis and 2 unidentifiable fragments of large mammal, 1 tooth, 3 diaphysis, and 70 unidentifiable fragments of medium/large mammal, 1 unidentifiable fragment of medium mammal, 1 distal rib and 1 unidentifiable fragment of small mammal, 1 metatarsal (digit 1) of *Ondatra zibethicus*, and 2 distal humerus (1 left, 1 right MNI 1), 3 rib, 1 innominate, 1 vertebral epiphysis, 1 scapula, 1 lumbar, 1 distal phalanx and 1 distal metatarsal fragments of *Odocoileus sp*. Osteichthyes specimens are all *Onchorhynchus sp*. These include 114 cranial, 429 postcranial and 14 unidentifiable specimens. Human modified bones include 1 rib fragment with cut marks, and most notably, 1 tool fragment of an unidentifiable fragment indeterminate mammal. One unidentifiable fragment of a medium/large mammal, and 1 scapula and 1 rib fragment of *Odocoileus sp*. show signs of animal gnawing.

Stratum IIa/F1/IIa(2/3) contained a total of 14 specimens—5 mammal and 9 Osteichthyes. Mammalian specimens include 1 indeterminate fragment of large mammal, 3 unidentifiable fragments of indeterminate mammal, and 1 distal humerus of *Odocoileus sp*. Osteichthyes are all *Onchorhynchus sp*. These include 2 cranial, 6 post-cranial, and 1 unidentifiable fragment.

Stratum IIa/F1 has no faunal remains. Stratum IIa(1) contained 204 specimens—58 mammal, 1 mollusca and 145 Osteichthyes. Mammalian specimens include 5 unidentifiable fragments of indeterminate mammal, 1 ulna (cf *Odocoileus*), 1 diaphysis, and 1 unidentifiable fragment of large mammal, 4 diaphysis and 45 unidentifiable fragments of medium/large mammal, and 1 mid-incisor of *Odocoileus sp*. Osteichthyes specimens are all *Onchorhynchus sp*. These include 44 cranial and 95 postcranial specimens. Human modified bones include 1 complete ornament made from an unidentifiable large mammal bone and 1 tool fragment made from a diaphysis fragment of a medium/large mammal.

Table 5.4. Faunal summary of Housepit 11, Area 2.

| *Stratum* | *Ind. Mammal* | *Small Mammal* | *Med. Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Ondatra zibethicus* | *cf Odocoileus* | *Odocoileus Sp.* | *Canis Sp.* | *aves* | *mullosca* | *Castor canadensis* | *unk* | *Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | | | | 1 | | | | | | | | | | | 1 |
| V | 4 | | | 8 | 12 | 6 | | 1 | 2 | | | | | | 33 |
| II | | | | 10 | | | | | | | | | | | 10 |
| III | | | | 27 | 1 | 5 | | | | | | | 1 | | 34 |
| V a | 14 | | | 19 | 3 | 11 | | 1 | 3 | | | | | | 51 |
| Va/III | | | | 4 | 1 | 7 | | | | | | | | | 12 |
| II a (1) | 5 | | | 49 | 2 | 145 | | 1 | 1 | | | 1 | | | 204 |
| II a/F1 | | | | | | | | | | | | | | | |
| II a/F1/ IIa(2/3) | 3 | | | | 1 | 9 | | | 1 | | | | | | 14 |
| II a(2/3) | 29 | 2 | 2 | 74 | 6 | 556 | 1 | 5 | 11 | 1 | 1 | | | 3 | 691 |
| III a | | | 9 | 3 | 2 | 16 | | | | | | | | | 30 |

Stratum Va/III contained a total of 12 specimens—5 mammal and 7 Osteichthyes. Mammalian specimens include 1 vertebra fragment of large mammal, and, 3 unidentifiable and 1 diaphysis fragments of medium/large mammal. Osteichthyes specimens are all *Onchorhynchus sp*. These include 5 postcranial and 2 unidentifiable elements. One human modified bone recovered is a tool fragment made from a diaphysis of medium/large mammal.

Stratum IIa contained 204 specimens—58 mammal, 1 mollusca and 145 Osteichthyes. Mammalian specimens include 5 unidentifiable fragments of indeterminate mammal, 1 ulna (cf *Odocoileus*), 1 diaphysis, and 1 unidentifiable fragment of large mammal, 4 diaphysis and 45 unidentifiable fragments of medium/large mammal, and 1 mid-incisor of *Odocoileus sp*. Osteichthyes specimens are all *Onchorhynchus sp*. These include 44 cranial and 95 postcranial specimens. Human modified bones include 1 complete ornament made from an unidentifiable large mammal bone and 1 tool fragment made from a diaphysis fragment of a medium/large mammal.

Stratum Va contained 51 specimens—40 mammal and 11 Osteichthyes. Mammalian specimens include 14 unidentifiable fragments of indeterminate mammal, 1 metapodial (cf *Odocoileus*), 2 diaphysis, and 1 vertebra fragment of large mammal, 4 diaphysis and 2 diaphysis and 17 unidentifiable fragments of medium/large mammal, and 1 innominate and 2 metapodial fragments of *Odocoileus sp*. Osteichthyes specimens are all *Onchorhynchus sp*. These include 11 postcranial specimens. Human modified bones include 1 metapodial fragment of large mammal (cf. *Odocoileus*) with cut marks. Most notable is 1 awl fragment made from a metapodial of *Odocoileus sp*. One diaphysis fragment of medium/large mammal shows signs of animal gnawing.

Stratum III contained a total of 34 specimens—29 mammal and 5 Osteichthyes. Mammalian specimens include 1 diaphysis fragment of large mammal, 27 unidentifiable fragments of medium/large mammal, and 1 tooth fragment of Castor Canadensis. Osteichthyes are all *Onchorhynchus sp*. These include 4 post-cranial and 1 unidentifiable elements.

*Area 2, BR 4 Fauna*

Fauna from BR 4 (Stratum I,V,II) includes a total of 44 specimens—38 mammal and 6 Osteichthyes (Table 5.4). Mammal index is calculated at .94 (mammals/mammals+fish) (Table 5.5). One polished scapula of large mammal (cf. *Odocoileus sp*.) was recovered. Bone fragmentation is high, with majority of specimens broken down to less than 19 millimeters (Figure 2).

Stratum II contained 10 total specimens, all of which are unidentifiable fragments of medium/large mammal.

Stratum V contained 33 total specimens—27 mammal and 6 Osteichthyes. Mammalian bones include 1 scapula (cf. *Odocoileus sp*.), 2 antler and 10 unidentifiable fragments of large mammal, 1 diaphysis and 7 unidentifiable fragments of medium/large mammal, 4 unidentifiable fragments of indeterminate mammal, and 2 distal metapodial of *Odocoileus sp*. Osteichthyes are all *Onchorhynchus sp*. These include 5 post-cranial and 1 unidentifiable elements. One modified bone is a polished scapula of a large mammal (cf *Odocoileus sp*.), which may be a tool fragment.

Stratum I contained 1 diaphysis fragment of medium/large mammal.

*Area 3, BR 2 Fauna*

Fauna from BR 2 (Stratum Va, IIa) includes a total of 36 specimens— 32 mammal and 4 Osteichthyes (Table 5.6). Mammal index is calculated at .8 (mammals/mammals+fish) (Table 5.7). Bone fragmentation is high, with majority specimens broken down to less than 9 millimeters (Figure 5.3).

Stratum IIa contained 10 total specimens—6 mammal and 4 Osteichthyes. Mammalian bones include 1 vertebra and 2 indeterminate fragments of large mammal and 3 unidentifiable fragments of medium/large mammal. Osteichthyes are

*Onchorhynchus sp*., all 4 being post-cranial elements.

Stratum Va contained 26 total specimens—all of which are mammal. Mammalian bones include 1 unidentifiable fragment of medium/large mammal, 19 unidentifiable fragments of indeterminate mammal, and 6 tooth enamel fragments of medium mammal (cf. *Castor Canadensis*).

Table 5.5. Mammal index of Housepit 11, Area 2.

| **Mammal Index HP 11 Area 2** | **BR 4** | | | **BR 2** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | V | II | III | V a | V a/III | II a (1) | II a/F1 | II a/F1/II a(2/3) | II a(2/3) | III a |
| Mammal/Mammal+Fish | 1 | 0.82 | 1 | 0.85 | 0.79 | 0.42 | 0.29 | n/a | 0.18 | 0.19 | 0.47 |
| Combined period | .94 | | | .40 | | | | | | | |

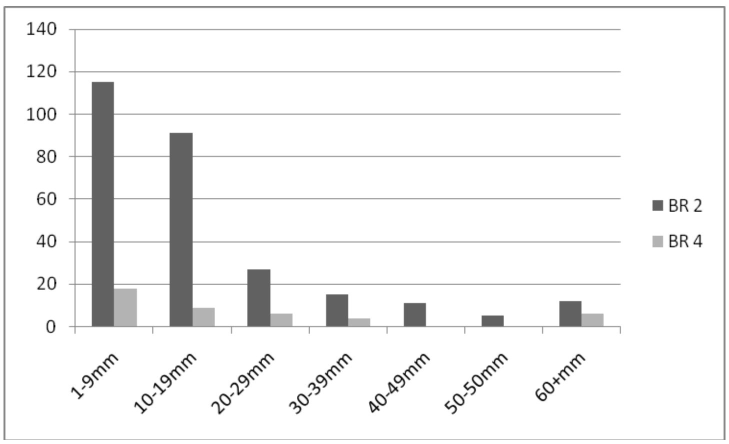


Figure 5.2. Housepit 11, Area 2 bone fragment size-grades.

*Area 3, BR 4 Fauna*

Fauna from BR 2 (Stratum I,V) includes a total of 26 specimens— 20 mammal and 6 Osteichthyes (Table 5.6). Mammal index is calculated at .58 (mammals/mammals+fish) (Table 5.7). Bone fragmentation is high, with majority specimens broken down to less than 19 millimeters (Figure 5.3).

Stratum V contained 24 total specimens—18 mammal and 6 Osteichthyes. Mammalian bones include 4 unidentifiable fragments of indeterminate mammal and 14 unidentifiable fragments of medium/large mammal. Osteichthyes are *Onchorhynchus sp*., all 6 being post-cranial elements.

Stratum I contained a total of 2 specimens, all of which are mammal. Mammalian bones include 1 first and 1second phalanx of *Odocoileus sp*., both of which are from a single specimen.

*Summary*

Evenness of Housepit 11 during BR 2 is .11, relatively low compared to Housepit

20, the other house with a BR 2 component excavated during this field season. Richness measures of Housepit 11 reflect taxonomic decline from BR 2 into the proto-historic period of BR 4 (6 to 2 taxa) (Figure 5.4). Mammal indices of Area 1 and 2 are similar; both demonstrating increased reliance on mammals from BR 2 to BR 4 (Tables 5.3 and 5.5). Conversely Area 3 shows decreased reliance on mammals from BR 2 to BR 4 (Table 5.7), however, this number could be biased due to low numbers of bones recovered from this particular excavation.

**Housepit 16**

A total of 2132 identified specimens were recovered from HP 16, 173 of which were recovered from Area 1, 284 from Area 2, and 1675 from Area 3. Eleven stratigraphic layers were identified spanning BR 2 and BR 4 (Table 5.8).

Table 5.6. Faunal summary of Housepit 11, Area 3.

| *Stratum* | *Ind. Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Odocoileus Sp.* | *cf Castor canadensis* | *Total* |
|---|---|---|---|---|---|---|---|
| I | | | | | 2 | | 2 |
| V | 4 | 14 | | 6 | | | 24 |
| II | | | | | | | |
| V a | 19 | 1 | | | | 6 | 26 |
| II a | 2 | 3 | 1 | 4 | | | 10 |

*Area 1, BR 3 Fauna*

Fauna from BR 3 (Stratum I, F1, IIa, Vb, IIb, IIc, Vc/IId, III) included a total of 173 specimen—168 mammal and 5 Osteichthyes (Table 5.9). Mammal index is calculated at .9
(mammals/mammals+fish) (Table 5.10). Bone fragmentation is high, with majority of specimens broken down to less than 19 millimeters (Figure 5.4).

Stratum III contained a total of 2 specimens—both of which are unidentifiable fragments of medium/large mammal.

Stratum Vc/IId contained a total of 5 specimens—4 mammal and 1 Osteichthyes. Mammalian specimens include 4 unidentifiable fragments of medium/large mammal. The Osteichthyes specimen is a post-cranial of *Onchorhynchus sp.*

Stratum IIc contained a total of 10 specimens—6 mammal and 4 Osteichthyes. Mammalian specimens include 6 unidentifiable fragments of medium/large mammal. Osteichthyes are all *Onchorhynchus sp.* These include 3 cranial, 1 post cranial.

Stratum IIb and Vb contain no faunal remains.

Stratum IIa contained a total of 2 specimens—both of which are unidentifiable fragments of medium/large mammal.

Stratum F1 contained a total of 146 specimens—all of which are mammal, including 20 radius fragments (MNE 1), 2 first phalanges, 1 second phalanx, and 2 first or second phalanges fragments of *Odocoileus sp*., 1 diaphysis and 52 unidentifiable fragment of large mammal, and 62 unidentifiable fragments of medium/large mammal.

Stratum I contained a total of 5 specimens—all of which are mammal, including 1 unidentifiable fragments of indeterminate mammal and 4 unidentifiable fragments of medium/large mammal.

Table 5.7. Mammal index of Housepit 11, Area 3.

| **Mammal Index HP 11 Area 3** | **BR 4** | | | **BR 2** | |
|---|---|---|---|---|---|
| | I | V | II | V a | II a |
| Mammal/Mammal+Fish | 1 | 0.75 | n/a | 1 | 0.6 |
| Combined period | 0.58 | | | 0.8 | |

*Area 2, BR 3 Fauna*

Fauna from BR 3 (Stratum I, V, II, Va, Va/IIa, Vb, IIb, Vc, IIc) included a total of 285 specimen—all of which were mammal (Table 5.11). Mammal index is calculated at 1 (mammals/mammals+fish) (Table 5.12). Bone fragmentation is high, with majority of specimens broken down to less than 9 millimeters (Figure 4). Occurrence of burning is unusually high, with 94 percent of all specimens burned, and 90 percent of all specimens calcined.

Stratum IIc contained a total of 56 specimens—all of which are mammal, including 1 3$^{rd}$ phalanx of *Odocoileus sp*., 1 lumbar fragment (cf. *Odocoileus sp.*) and 10 unidentifiable fragment of large mammal, 41 unidentifiable fragments of medium/large mammal, and 3 unidentifiable fragments of indeterminate mammal.

Stratum Vc contained 1 unidentifiable fragment of indeterminate mammal.

Stratum IIb contained a total of 13 specimens—all of which are mammal, including 1 unidentifiable fragment of indeterminate mammal and 12 unidentifiable fragments of medium/large mammal.

Stratum Vb contained a total of 156 specimens—all of which are mammal, including 4 unidentifiable fragment of large mammal and 152 unidentifiable fragments of medium/large mammal.

Stratum Va/IIa contained a total of 24 specimens—all of which are unidentifiable fragments of medium/large mammal.

Stratum Va contained a total of 13 specimens—all of which are unidentifiable fragments of medium/large mammal.

Stratum II contained a total of 6 specimens—all of which are unidentifiable fragments of medium/large mammal.

Stratum V contained a total of 14 specimens—all of which are mammal, including 4 unidentifiable fragment of indeterminate mammal and 10 unidentifiable fragments of medium/large mammal.

Stratum I contained no fauna.

*Area 3, BR 3 Fauna*

Fauna from BR 3 (Stratum I/V,V,II,Va,IIa,IIb,IIc,IId,IIe,IV) included a total of 1675 specimens—481 mammal and 1185 Osteichthyes, 1 aves and 5 mollusca (Table 5.13). Mammal index is calculated at .25 (mammals/mammals+fish) (Table 5.14). Worked fauna include 2 *Dentalium sp*. shell beads and one possible ornament carved from aves. Bone fragmentation is high, with majority of specimens broken down to less than 9 millimeters (Figure 4).

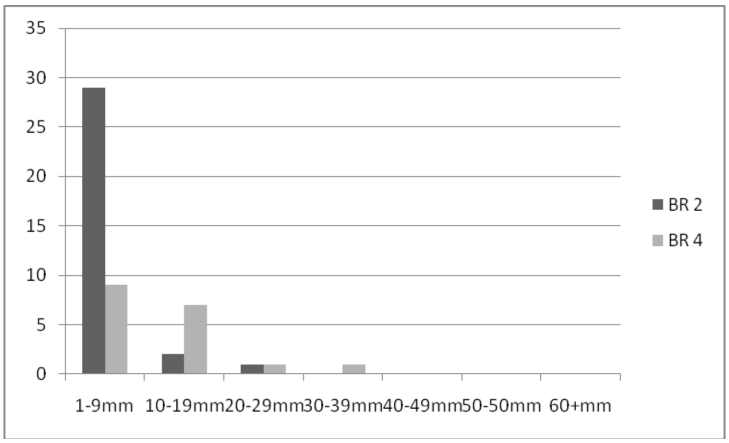

Figure 5.3. Housepit 11, Area 3 bone fragment size-grades.

Stratum IV contained a total of five specimens—2 mammal and 5 Osteichthyes. Mammalian specimens include 2 unidentifiable fragments of medium/large mammal. Osteichthyes include 3 cranial bones of *Onchorhynchus sp.*

Stratum IIe contained a total of 122 specimens—29 mammal, 92 Osteichthyes, and 1 indeterminate taxa. Mammalian specimens include 5 unidentifiable fragments of indeterminate mammal, 19 unidentifiable and 1 diaphysis fragment of medium/large mammal, 1 vertebra, 1 proximal radius (cf *Odocoileus sp*.), and 1 sternal cartilage (cf *Odocoileus sp*.) fragment of large mammal, and 1 sternal rib fragment of *Odocoileus sp*.

Stratum IId contained a total of 705 specimens—214 mammal, 489 Osteichthyes, and 2 mollusca. Mammalian specimens include 2 distal tibiae and 1 phalanx of small mammal, 135 unidentifiable fragments of medium/large mammal (1 with pitting), 1 diaphysis, 1 antler fragment (cf. *Odocoileus sp*.) with chop marks, 1 vertebra fragment (cf. *Odocoileus sp*.) and 1 unidentifiable fragment of large mammal, 68 complete *Peromyscus sp*. elements (1 MNI), 1 tooth fragment of *Odocoileus sp*.,1 tooth fragment of *Castor canadensis*, and 2 tooth fragments that are cf *Castor canadensis*. Mollusca include 1 indeterminate shell fragment (likely fresh water clam) and 1 *Dentalium sp.* shell bead. Osteichthyes include 42 cranial and 444 post-cranial elements of *Onchorhynchus sp.* The *Dentalium sp.* shell bead is the only worked fauna from this component.

Stratum IIc contained a total of 126 specimens—26 mammal, 99 Osteichthyes, and 1 aves. Mammalian specimens include 8 unidentifiable fragments of indeterminate mammal, 1 unidentifiable fragment of large mammal, and 17 unidentifiable fragment of medium/large mammal. Osteichthyes include 9 cranial, 83 post-cranial, and 7 indeterminate fragments of *Onchorhynchus sp.* A possible ornament is carved from a medium aves diaphysis fragment.

Stratum IIb contained a total of 207 specimens—46 mammal, 160 Osteichthyes, and 1 mollusca. Mammalian specimens include 1 diaphysis fragment of large mammal, 39 unidentifiable, and 1 diaphysis fragment of medium/large mammal, 2 unidentifiable fragment of medium mammal, 1 femur of rodentia, along with, 1 distal femur, and 1 canine of *Canis sp*. Mollusca is 1 *Dentalium sp.* shell bead. Osteichthyes include 11 cranial, 141 post-cranial, and 8 indeterminate fragments of *Onchorhynchus sp.* The *Dentalium sp.* shell bead is the only worked fauna from this component.

Stratum IIa contained a total of 185 specimens—46 mammal, 138 Osteichthyes, and 1 mollusca. Mammalian specimens include 3 unidentifiable fragments of indeterminate mammal, 1 phalanx and 1 femur of small mammal, 37 unidentifiable fragment, 1 distal tibia with cut marks, and 1 tooth fragment of medium/large mammal, 1 unidentifiable fragment of large mammal, and 1 3$^{rd}$ premolar of *Canis sp*. Mollusca is 1 unidentifiable shell fragment (cf. fresh water clam). Osteichthyes include 11 cranial, 116 post-cranial, and 11 indeterminate fragments of *Onchorhynchus sp.*

Stratum Va contained a total of 240 speciemens—55 mammal, 183 Osteichthyes, 1 mollusca, and 1 indeterminate taxon. Mammalian specimens include1 tibia and 1 femur of small mammal, 48 unidentifiable fragments of medium/large mammal (1 with pitting), 1 diaphysis and 1 unidentifiable fragment of large mammal, 1 femur of rodentia, 1 premolar fragment of Canis sp. and 1 fibula diaphysis fragment of *Canis sp*. Mollusca is 1 unidentifiable shell fragment (cf fresh water clam). Indeterminate taxon is 1 diaphysis fragment (cf. Aves) Osteichthyes include 5 cranial, 171 post-cranial, and 7 indeterminate fragments of *Onchorhynchus sp.*

Stratum II contained a total of 85 specimens—63 mammal, 21 Osteichthyes, and 1 indeterminate taxon. Mammalian specimens include 1 unidentifiable fragment of indeterminate mammal, 2 unidentifiable fragments of small/medium mammal, 58 unidentifiable fragment of medium/large mammal, along with, 1 proximal L-radius and 1 proximal R-radius (with cut marks)—1 MNI—of *Canis sp*. Indeterminate taxon is 1 unidentifiable fragment. Osteichthyes are all post-cranial elements of *Onchorhynchus sp.*

Strata V and I/V contained no fauna.

*Summary*

Housepit 16 has a richness measure of 6. Evenness measure is .18, relatively high compared to HP 20, but low compared to HP 25. The mammal index shows similarities between Areas 1 and 2—both indicate increased focus on mammals. Area 3 has a significantly lower mammal index, suggesting higher reliance on salmon.

**Housepit 20**

A total of 2,150 identified specimens were recovered from HP 20 Area 3. Ten stratigraphic layers were identified spanning early BR 2, BR 3, and BR 4 (Table 5.15).

Area 3, BR 2 Fauna

Fauna from BR 2 (Stratum IIc, IId, IIe, Vc/IIf) includes a total of 1896 specimen—359 mammal, 2 Aves, 3 Mollusca, 1523 Osteichthyes, and 9 indeterminate taxa (Table 5.16). Mammal index is calculated at .24 (mammal/mammals+fish) (Table 5.17). Worked bone

Table 5.8. Stratigraphic summary of Housepit 16.

| Area | Stratum | Phase | Dates (cal) |
|---|---|---|---|
| 1 | I, F1, II a, Vb, II b, II c, Vc/II d, III | BR 3 | 1206±36, 1304±35 |
| 2 | I, V, II, Va, Va/II a, Vb, II b, Vc, II c | BR 3 | |
| 3 | I/V, V, Va, II a, II b, II c, II d, II e, IV | BR 3 | 1305±36 |

Table 5.9. Faunal summary of Housepit 16, Area 1 (excluding fish remains).

| *Stratum* | *Ind. Mammal* | *Med./lg Mammal* | *Large Mammal* | *Odocoileus* | *Total* |
|---|---|---|---|---|---|
| I | 1 | 4 | | | 5 |
| F1 | 6 | 62 | 53 | 25 | 146 |
| II a | | 3 | | | 3 |
| V b | | | | | |
| II b | | | | | |
| II c | | 7 | 1 | 4 | 12 |
| Vc/II d | | 4 | | 1 | 5 |
| III | | 2 | | | 2 |

specimens include a bone/ornament carved from an *Odocoileus* sp. rib, and a bead from a *Dentalium* sp. element. Bone fragmentation is high, with majority specimens broken down to less than 19 millimeters (Figure 5.5).

Stratum Vc/IIf contained a total of 310 specimens—12 mammal, and 298 Osteichthyes. Mammalian specimens include 1 cranial vertebral disk of *Odocoileus* sp., 1 rib, and 2 unidentifiable fragments of indeterminate mammal, 1 rib fragment of a large mammal, along with 2 cranial and 5 unidentifiable fragments of medium/large mammal.

Osteichthyes are all *Onchorhynchus sp*. These include 54 cranial and 244 post-cranial elements.

Stratum IIe contained 777 specimens—63 mammal, 2 mollusca, and 712 Osteichthyes. Mammalian specimens include 16 unidentifiable fragments of indeterminate mammal, 1 innominate, 2 rib, 1 vertebral epiphysis, and 5 unidentifiable fragments of large mammal, 1 costal cartilage, 1 diaphysis, and 28 unidentifiable fragments of medium/large mammal, 1 unidentifiable and 1 diaphysis fragment of small/medium mammal, 2 unidentifiable fragments of medium mammal, and 1 thoracic, 1 vertebra, 1 innominate, and 1 lumbar fragment of *Odocoileus sp*. Mollusca include 1 *Dentalium sp*., and 1 Bivalvia fragment (likely freshwater clam). Osteichthyes specimens are all *Onchorhynchus sp*. These include 125 cranial and 587 postcranial bones. Human modified bones include 1 innominate fragment of large mammal and 2 unidentifiable fragment of medium/large mammal with cut marks. Most notable of human modified bones is a *Dentalium sp*. shell bead. One diaphysis fragment of a medium/large mammal shows signs of animal gnawing.

Stratum IId contained a total of 638 specimens—195 mammal, 1 mollusca, 2 aves, 438 Osteichthyes, and 2 indeterminate taxa. Mammalian specimens include 1 lumbar, 1 metatarsal, 1 rib, and 1 proximal tibia fragment of *Canis sp*., 1 tooth fragment of *Castor canadensis*, 1 rib, 1 sternal, 1 thoracic, 2 lumbar and 1 scapula fragment, along with 1 lower left incisor of *Odocoileus sp*., 2 diaphysis, 1 metatarsal, 1 rib, 1 scapula (cf. *Odocoileus sp*.), 1 thoracic (cf. *Odocoileus sp*.), and 10 unidentifiable fragments of large mammal, 4 diaphysis and 118 unidentifiable fragments of medium/large mammal, 1 diaphysis and 2 unidentifiable fragments of medium mammal, and 1 diaphysis and 1 unidentifiable fragment of small mammal. Mollusca include 1 bivalvia fragment. Aves include 1 diaphysis of medium size and 1 humerus of small size. Osteichthyes specimens are all *Onchorhynchus sp.* These include 45 cranial, 315 post cranial and 78 indeterminate. Human modified bones include 1 metatarsal fragment of *Canis sp*., 1 diaphysis fragment, 1 metatarsal, 1 scapula (cf. *Odocoileus sp.),* and 1 unidentifiable fragments of large mammal with cut marks, 1 diaphysis fragment of medium/large mammal with cut marks, 1 unidentifiable fragment of medium/large mammal with chop marks, 1 thoracic fragment of *Odocoileus sp*. with puncture marks and 1 scapula fragment of the same species with chop marks. Most notable of all human modified bones is a tool/ornament carved from a rib of *Odocoileus sp*. Bones with animal gnawing include 1 metatarsal and 1 scapula fragment of large mammal, 1 unidentifiable fragment of medium/large mammal. Pitting was evident on 3 unidentifiable bone fragments of medium/large mammal.

Stratum IIc contained a total of 171 bones—89 mammal, 75 Osteichthyes, and 7 indeterminate taxa. Mammalian specimens include 52 antler fragments of *Cervus sp*., for 1 MNI, one metatarsal fragment of *Odocoileus sp.,* 16 unidentifiable fragments of indeterminate mammal, 1 unidentifiable fragment of large mammal, and 19 unidentifiable fragments of medium/large mammal. Osteichthyes are all *Onchorhynchus sp*. These include 1 cranial, 29 post cranial, and 45 indeterminate. One unidentifiable bone of medium/large mammal shows evidence of cut and gnaws marks.

*Area 3, BR 3 Fauna*

Fauna from BR 3 (Stratum Va,IIa,Vb,II b) includes a total of 238 specimens—122 mammal, 238 Osteichthyes, and 24 indeterminate taxa. Mammal index is .85 (mammals/mammals+fish) (Table 5.17). No worked bone was found in this phase. Bone fragmentation is high, with majority of bones broken down to less than 19 millimeters (Figure 5.5).

Stratum IIb contained a total of 205 specimens—91 mammal, 90 Osteichthyes, and 24 indeterminate taxa. Mammalian specimens include 1 lumbar fragment and 1 fused 3$^{rd}$ and 4$^{th}$ tarsal of *Odocoileus sp*., 1 vertebral epiphysis, 2 diaphysis, 1 scapula, and 1 unidentifiable fragment of large mammal, 3 diaphysis and 31 unidentifiable fragments of medium/large mammal, 4 unidentifiable fragments of small mammal, and 46 unidentifiable fragments of indeterminate mammal. Osteichthyes are all *Onchorhynchus sp.* These include 5 cranial, 61 post- cranial, and 24 indeterminate.

Table 5.10. Mammal index of Housepit 16, Area 1.

| **Mammal Index HP 16 Area 1** | **BR 3** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | F1 | II a | V b | II b | II c | Vc/ II d | III |
| Mammal/Mammal+Fish | 1 | 1 | 1 | n/a | n/a | .6 | .8 | 1 |
| Combined period | .9 | | | | | | | |

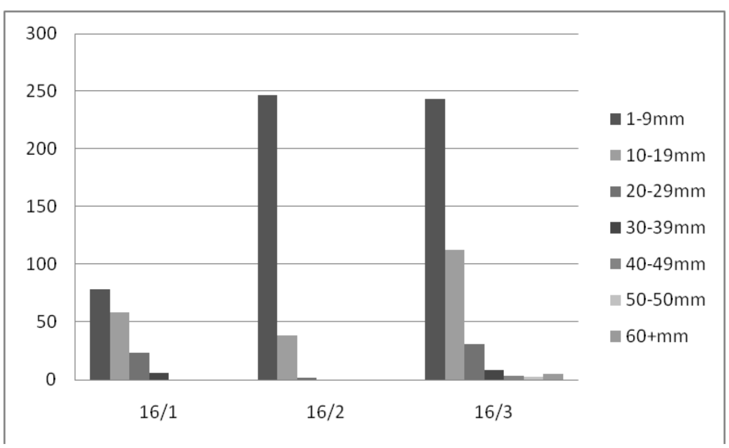

Figure 5.4. Housepit 16, Areas 1, 2, and 3 bone fragment size-grades.

Stratum Vb contained a total of 16 specimens—14 mammal and 2 Osteichthyes. Mammalian specimens include 1 developing premolar and 1 distal phalanx and tooth fragment of Odocoileus sp.,1 diaphysis fragment of large mammal, 1 diaphysis and 7 indeterminate fragments of medium/large mammal, and 1 cranial fragment of small/medium mammal. Osteichthyes are all *Onchorhynchus sp.* These include 1 cranial and 1 post cranial fragment.

Stratum IIa contained a total of 12 specimens—all of which are mammal. These include 1 humerus fragment of Odocoileus sp., 1 lateral vertebral spine and 1 indeterminate fragment of large mammal, 1 diaphysis and 5 unidentifiable fragments of medium/large mammal, and 3 unidentifiable fragments of indeterminate mammal.

Stratum Va contained a total of 5 specimens—all of which are mammal. These include 1 unidentifiable bone fragment of large mammal, 2 unidentifiable bone fragment of small/medium mammal, and 2 unidentifiable bone fragments of indeterminate mammal.

*Area 3, BR 4 Fauna*

Fauna from BR 4 (Stratum I/V, II) includes a total of 14 mammal bones and 2 specimens of indeterminate taxa (Table 16). Mammal index is 1 (mammals/mammals+fish) (Table 17). No worked bone was recovered from this phase. Bone fragmentation was high, with majority of bones broken down to less than 19 millimeters (Figure 5.5).

Stratum II contained a total of 14 bones, 2 of which are unidentifiable elements of indeterminate mammal, and 12 of which are unidentifiable elements of medium/large mammal.

Stratum I/V contain a total of 2 bones, both of which are unidentifiable elements of indeterminate taxa.

*Summary*

Housepit 20 shows a decline in taxonomic richness through time, starting with 7 identifiable taxa in the BR 2 component, and declining to 2 identifiable taxa in the BR 3 component (Figure 5.6). There were no identifiable taxa in the BR 4 component. Evenness experienced a decline from .14 in BR 2 to .13 in BR 3. During BR 2 Housepit 20 had the highest evenness score, and then it declined to the lowest by BR 3. The mammal index (mammal/mammal+fish) suggests that reliance on mammals increased from BR 2 to BR 3. Mammal index of BR 4 was 1, indicating a high reliance on mammals, however, there could be taphonomic issues contributing to the lack of fish bones (Table 5.17).

## Housepit 25

A total of 922 identified specimens were recovered from HP 25, 67 of which were recovered from Area1, 427 from Area 2, and 428 from Area 3. Eighteen stratigraphic layers were identified, most of which span BR 3, however; Area 3 contained a deep component dating to BR 1 (Table 5.18).

*Area 1, BR 3 Fauna*

Fauna from BR 3 (Stratum I,V,II,IIa,IIa/XI) include a total of 67 specimen—60 mammal and 7 Osteichthyes (Table 5.19). Mammal index is calculated at .94 (mammals/mammals+fish) (Table 5.20). With the majority of bones broken down to 10-29 mm bone fragmentation is relatively low in comparison to other areas (Figure 5.6). Worked bone includes one tool with polish made from indeterminate medium/large mammal.

Stratum IIa/XI contained no fauna. Stratum IIa contained a total of 2 bones, both of which were mammal. One was an unidentifiable fragment of large mammal. The other was an unidentifiable fragment of medium/large mammal. Both specimens displayed cut marks.

Stratum II contained a total of 24 specimens—all of which were mammal. These included 1 3rd premolar, 1 2nd premolar, 1 zyphoid, 1 mandible, 1 humerus, and 1 femur fragment of Odocoileus sp., 13 unidentifiable fragments of medium/large mammal, 1 of which has abrasions, and 1 of which has cut marks, 1 unidentifiable, 1 diaphysis, and 2 rib fragments of large mammal, and 1 unidentifiable fragments of indeterminate mammal.

Table 5.11. . Faunal summary of Housepit 16, Area 2.

| *Stratum* | *Ind. Mammal* | *Med. Mammal* | *Med./lg Mammal* | *Large Mammal* | *cf Odocoileus* | *Odocoileus Sp.* | *Total* |
|---|---|---|---|---|---|---|---|
| I | | | | | | | |
| V | 4 | | 10 | | | | 14 |
| II | | | 6 | | | | 6 |
| V a | | | 13 | | | | 13 |
| V a/II a | | | 25 | | | | 25 |
| V b | | | 152 | 4 | | | 156 |
| II b | 1 | 12 | | | | | 13 |
| V c | | | 1 | | | | 1 |
| II c | 3 | | 41 | 10 | 1 | 1 | 56 |

Table 5.12. Mammal index of Housepit 16, Area 2.

| **Mammal Index HP 16 Area 2** | **BR 3** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | I | V | II | V a | V a/II a | V b | II b | V c | II c |
| Mammal/Mammal+Fish | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Combined period | 1 | | | | | | | | |

Stratum V contained a total of 11 specimens—all of which were mammal. These included 1 R-scapula fragment of *Odocoileus sp*., 3 unidentifiable (1 with cut marks), and 4 cranial fragments of medium/large mammal, and 1 unidentifiable (with abrasion marks), 1 cervical, and 1 lumbar fragment of large mammal.

Stratum I contained a total of 30 specimens—23 mammal and 7 Osteichthyes. Mammalian specimens included 1 metacarpal, 2 cuneiform, 1 trapezoid, 1 scaphoid, and 1 lunate with cut marks of *Odocoileus sp*.,12 indeterminate fragments of medium/large mammal, 1 of which is a tool with polish, and, 2 thoracic and 3 unidentifiable fragments (1 with cut marks) of large mammal. Osteichthyes specimens are all post-cranial—4 have been identified as *Onchorhynchus sp.* and 3 as Salmonidae.

*Area 2, BR 3 Fauna*

Fauna from BR 3 (Stratum I,V,V(1),V(2)/II,V(3),III(1),III1/2/V(2), II(2),II(1)a,II(1)b,II(1)c, II(1)/IV,II(1)a/IV,II(1)b/IV,IV,XI) include a total of 427 specimen—277 mammal and 150 Osteichthyes (Table 5.21). Mammal index is calculated at .5 (mammals/mammals+fish) (Table 5.22). Majority of bones are broken down to 10-19 mm, relatively more fragmented than those from area 1 (Figure 5.7). Worked specimens include 1 tool made from an unidentifiable fragment of large mammal, 1 tool made from an antler fragment of *Odocoileus*, and 1 ornament made from a *Castor canadensis* incisor.

Strata XI and IV contained no fauna. Stratum II(1)b/IV contained a total of 3 specimens, all of which were post-cranial elements of Salmonidae.

Stratum II(1)a/IV contained a total of 4 specimens, all of which are unidentifiable fragments of indeterminate mammal.

Stratum II(1)/IV contained a total of 36 specimens—30 mammal and 6 Osteichthyes. Mammalian specimen include 6 unidentifiable fragments of indeterminate mammal, 1 unidentifiable, 1 rib, 1 vertebra, and 5 diaphysis fragments of large mammal, and 1 patella, 1 1$^{st}$ phalanx, 1 calcaneus with cut marks, 1 tibia with crushing, 1 fibula, 1 thoracic, 1 scapula, 1 atlas, 1 radius, 5 indeterminate phalanges, 1 L-humerus, and 1 antler tool of *Odocoileus sp*. Osteichthyes are all post-cranial elements of *Onchorhynchus sp.*

Stratum II(1)c contained a total of 17 specimens—5 mammal and 12 Osteichthyes. Mammalian specimens include 3 unidentifiable fragments of indeterminate mammal. Osteichthyes include 8 Salmonidae and 4 *Onchorhynchus sp*. post cranial elements.

Stratum II(1)b contained a total of 69 specimens—10 mammal and 59 Osteichthyes. Mammalian specimens include 3 unidentifiable fragments of indeterminate mammal, 5 unidentifiable fragments of medium/large mammal, along with, 1 rib with a cut mark and 1 unidentifiable fragment of large mammal. Osteichthyes include 6 Salmonidae and 53 *Onchorhynchus sp*. post cranial elements.

Table 5.13. Faunal summary of Housepit 16, Area 3.

| Stratum | Ind. Mammal | Small Mammal | Sm/Med Mammal | Med, Mammal | Med./lg Mammal | Large Mammal | Osteichthyes | cf Odocoileus | Odocoileus Sp. | cf Canis Sp. | Canis Sp. | Peromyscus sp | rodentia | aves | mullosca | cf Castor canadensis | Castor canadensis | unk | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I/V | | | | | | | | | | | | | | | | | | | |
| V | | | | | | | | | | | | | | | | | | | |
| II | 1 | | 2 | | 58 | | 21 | | | | 2 | | | | | | | 1 | 85 |
| V a | | 2 | | | 48 | 2 | 183 | | | 1 | 1 | | 1 | | 1 | | | 1 | 240 |
| II a | 3 | 2 | 1 | | 38 | 1 | 138 | | | | 1 | | | | 1 | | | | 185 |
| II b | | | | 2 | 40 | 1 | 160 | | | | 2 | | 1 | | 1 | | | | 207 |
| II c | 8 | | | | 17 | 1 | 99 | | | | | | | 1 | | | | | 126 |
| II d | | 3 | | | 135 | 2 | 489 | 2 | 1 | | | 68 | | | 2 | 2 | 1 | | 705 |
| II e | 5 | | | | 20 | 1 | 92 | 2 | 1 | | | | | | | | | 1 | 122 |
| IV | | | | | 2 | | 3 | | | | | | | | | | | | 5 |

Stratum II(1)a contained a total of 46 specimens—19 mammal and 27 Osteichthyes. Mammalian specimens include 11 unidentifiable fragments of indeterminate mammal, along with, 7 unidentifiable and 1 diaphysis fragment with cut marks of large mammal. Osteichthyes are all *Onchorhynchus sp*. These include 1 cranial and 26 post cranial elements.

Stratum II(1) contained a total of 46 specimens—28 mammal and 18 Osteichthyes. Mammalian specimen include 9 unidentifiable fragments of indeterminate mammal, along with, 8 unidentifiable (1 with cut marks), 4 diaphysis fragment, 1 cervical fragment, 1 humerus fragment with cut marks, 2 vertebral epiphyses, and 1 carpal/tarsal fragment of large mammal. Osteichthyes include 16 Salmonidae and 2 *Onchorhynchus sp*. post-cranial elements.

Stratum II(2) contained a total of 5 specimens—1 mammal and 5 Osteichthyes. Mammalian specimen is 1 unidentifiable fragment of indeterminate mammal. Osteichthyes are all post-cranial elements of Salmonidae.

Stratum III(1/2)/V(2) contained a total of 4 specimens, all of which are unidentifiable fragments of indeterminate mammal.

Stratum III(1) contained a total of 14 specimens—14 mammal and 2 Osteichthyes. Mammalian specimens include 4 unidentifiable fragments of indeterminate mammal, along with, 6 diaphysis and 2 unidentifiable fragments of large mammal. Osteichthyes are all post-cranial elements of *Onchorhynchus sp.*

Stratum V(3) contained a total of 120 specimens—107 mammal and 14 Osteichthyes. Mammalian specimens include 1 incisor of Castor Canadensis carved into an ornament, 1 metatarsal, 1 calcaneus, 1 1$^{st}$ phalanx, 4 thoracic, 2 lumbar, 3 ischium, 2 ulna, 1 femur, 1 pubis, and 1 radius fragment with a cut mark, along with 1 complete axis of Odocoileus sp., 20 unidentifiable fragments of indeterminate mammal, 23 unidentifiable fragments of medium/large mammal, and 1 sesimoid, 6 vertebra, 34 diaphysis, 3 unidentifiable fragments of large mammal. Osteichthyes include 2 Salmonidae and 10 *Onchorhynchus sp.* post-cranial elements, as well as, 2 unidentifiable fragments of indeterminate Osteichthyes.

Stratum V(2)/II contained a total of 47 specimens—44 mammal and 3 Osteichthyes. Mammalian specimens include 7 unidentifiable fragments of indeterminate mammal, 1 sesimoid, 7 unidentifiable fragments, 1 of which is a tool, 6 vertebra, 1 rib, and 8 diaphysis fragments of large mammal, along with, 1 temporal, 1 ulna, 1 radius, 2 1$^{st}$ phalanges, 1 2$^{nd}$ phalanx, 1 3$^{rd}$ phalanx, 1 ischium, 1 1$^{st}$ rib, 1 maxilla, 1 fibula, 1 tibia, and scapula fragment of *Odocoileus sp.* Osteichthyes include 3 post-cranial elements of *Onchorhynchus sp.*

Stratum V(2) contained a total of 10 specimens—8 mammal and 2 Osteichthyes. Mammalian specimens include 7 unidentifiable and 1 vertebra fragment of large mammal. Osteichthyes include 2 post-cranial elements of *Onchorhynchus sp.*

Stratum V(1) contained no fauna. Stratum V contained 6 specimens, all of which are mammal, including 5 unidentifiable and 1 femur fragment of large mammal.

Stratum I contained no fauna.

*Area 3, BR 1 Fauna*

Fauna from BR 1 (Stratum II(2),II(2)a,III) include a total of 57 specimen—15 mammal and 42 Osteichthyes (Table 5.23). Mammal index is calculated at .09 (mammals/mammals+fish) (Table 24). Majority of bones are broken down to 10-19 mm (Figure 8). No worked bones were recovered from this component.

Stratum III contained a total of 57 specimens—15 mammal and 42 Osteichthyes. Mammalian specimens include 9 unidentifiable fragments of indeterminate mammal, 1 vertebra fragment of large mammal, and 5 vertebra fragments of medium/large mammal. Osteichthyes include 20 post-cranial elements of *Onchorhynchus sp*., along with, 13 post-cranial and 9 unidentifiable fragments of indeterminate Osteichthyes.

Table 5.14. Mammal index of Housepit 16, Area 3.

| **Mammal Index HP 16 Area 3** | **BR 3** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | I/V | V | II | V a | II a | II b | II c | II d | II e | IV |
| Mammal/Mammal+Fish | | | 0.73 | 0.23 | 0.25 | 0.22 | 0.21 | 0.23 | 0.24 | 0.4 |
| Combined period | .25 | | | | | | | | | |

Table 5.15. Stratigraphic summary of Housepit 20.

| Stratum | Phase | Dates (cal) |
|---|---|---|
| I/V, II | BR 2 | 1525±39, 1785±36, 1462±37 |
| Va, II a, Vb, II b | BR 3 | 1201±36, 1284±36, 1581±39 |
| II c, II d, II e, Vc/II f | BR 4 | 328±31 |

*Area 3, BR 3 Fauna*

Fauna from BR 3 (Stratum I,V,II(1),II(1)a,II(1)b,II(1)c) include a total of 371 specimen—135 mammal, 234 Osteichthyes, and 2 aves (Table 5.22). Mammal index is calculated at .42 (mammals/mammals+fish)(Table 5.23). Majority of bones are broken down to 10-19 mm (Figure 5.8). Worked bone is 1 tool of unidentifiable fragment of large mammal.

Stratum II(1)c contained a total of 139 specimens—25 mammal, 113 Osteichthyes, and 2 aves. Mammalian specimens include 25 unidentifiable fragments of indeterminate mammal. Osteichthyes include 5 cranial, 65 post-cranial, and 26 unidentifiable fragments of *Onchorhynchus sp*., along with, 17 unidentifiable and 1 post-cranial fragment of indeterminate Osteichthyes. Aves include 1 unidentifiable fragment of indeterminate taxon.

Stratum II(1)b contained 34 specimens—2 mammal, 31 Osteichthyes, and 1 aves. Mammalian specimens include 1 unidentifiable and 1 tooth fragment of large mammal. Osteichthyes include 4 cranial and 25 post-cranial elements of *Onchorhynchus sp*., along with, 2 unidentifiable fragments of indeterminate Osteichthyes. Aves include 1 unidentifiable fragment of indeterminate taxon.

Stratum II(1)a contained a total of 8 specimens—4 mammal and 4 Osteichthyes. Mammalian specimen include 2 unidentifiable fragments of indeterminate mammal, 1 diaphysis fragment with cut marks of large mammal, and 1 rib fragment of small mammal. Osteichthyes include 1 unidentifiable fragment of Salmonidae, 2 post-cranial of indeterminate Osteichthyes, and 1 cranial fragment of *Onchorhynchus sp*.

Stratum II(1) contained a total of 68 specimens—38 mammal and 30 Osteichthyes. Mammalian specimens include 26 unidentifiable fragments of indeterminate mammal, 6 unidentifiable (1 with cut marks), 2 diaphysis (1 with cut marks), and 1 metacarpal fragment of large mammal, 1 caudal fragment of medium/large mammal, along with, 1 R-premaxilla and 1 thoracic spinuous process of *Odocoileus sp*. Osteichthyes include 10 unidentifiable fragments of indeterminate Osteichthyes, along with, 6 cranial and 20 post-cranial fragments of *Onchorhynchus sp.*

Stratum V contained a total of 119 specimens—64 mammal and 55 Osteichthyes. Mammalian specimens include 20 unidentifiable fragments of indeterminate mammal, 21 unidentifiable (1 tool with cut marks), 4 diaphysis (1 with cut marks), and 11 vertebra fragments of large mammal, and 1 L-calcaneus with cut marks, 1 L-astragalus, 1 1$^{st}$ phalanx with cuts, 1vertebra, 1 R-distal humerus, 1 R-distal radius, 1 R-proximal radius with cut marks, and 1 L-proximal ulna fragment.

Stratum I included a total of 3 specimens—2 mammal and 1 Osteichthyes. Mammalian specimens include 1 diaphysis fragment of medium/large mammal, and 1 diaphysis fragment of large mammal.

Table 5.16. Faunal summary of Housepit 20, Area 3.

| *Stratum* | *Ind. Mammal* | *Small Mammal* | *Sm/Med Mammal* | *Med, Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes Sp* | *Cervus canadensis* | *cf Odocoileus* | *Odocoileus Sp.* | *Canis Sp.* | *aves* | *mullosca* | *Castor canadensis* | *unk* | *Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I/V | | | | | | | | | | | | | | | 2 | 2 |
| II | 2 | | | | 12 | | | | | | | | | | | 14 |
| V a | 2 | | 2 | | | 1 | | | | | | | | | | 5 |
| II a | 3 | | | | 6 | 2 | | | | 1 | | | | | | 12 |
| V b | | | 1 | 1 | 8 | 1 | 2 | | | 3 | | | | | | 16 |
| II b | 46 | 4 | | | 34 | 5 | 90 | | | 2 | | | | | 24 | 205 |
| II c | 16 | | | | 19 | 1 | 75 | 52 | | 1 | | | | | 7 | 171 |
| II d | 40 | 2 | | 3 | 122 | 14 | 438 | | 2 | 7 | 4 | 2 | 1 | 1 | 2 | 638 |
| II e | 16 | | 2 | 2 | 30 | 9 | 712 | | | 4 | | | 2 | | | 777 |
| Vc/II f | 3 | | | | 7 | 1 | 298 | | | 1 | | | | | | 310 |

*Summary*

Housepit 25 shows slight increase in taxonomic richness through time, from 1 in BR 1 to 4 during BR 3. Evenness score during BR 3 was .24, which was the highest of all housepits during that time. Mammal indices indicate similar reliance on mammals during BR 3, however, area 1 shows more targeting of mammalian species than areas 2 and 3 (Table x). BR 1 has a very low mammal index, suggesting low reliance on mammals; however, the data may be biased due to a small sample size, all of which was recovered from one area (Area 3).

**Housepit 24**

Although excavation of this housepit was completed during the 2008 field season, a 50x50cm test unit was added to Area 3 to recover additional *Canis sp*. bones from a partially excavated cache pit feature. This unit uncovered three strata (I,V,III), all of which date to BR 3.

Area 3, Unit 1, BR 3

Fauna from BR 3 (Stratum I,V,III) include a total of 202 specimens—157 mammal and 45 Osteichthyes.). Majority of bones are broken down to 10-19 mm. No worked bones were recovered from this unit.

Stratum III contained 14 unidentifiable fragments of indeterminate mammal. All but 1 specimens were calcined.

Stratum V contained 21 unidentifiable fragments of indeterminate mammal. All specimens were calcined.

Stratum II contained a total of 167 specimens—122 mammal and 45 *Osteichthyes*. Mammalian specimens include 105 unidentifiable fragments of indeterminate mammal, 1 vertebra and 1 rib fragment of medium mammal, 9 unidentifiable and 1 vertebra fragment of large mammal, 1 thoracic of a sub-adult *Odocoileus sp*., and 1 complete atlas, 1 cervical, 1 axis and 1 humerus fragment of *Canis sp*.

Table 5.17. Mammal index of Housepit 20, Area 3.

| **Mammal Index HP 20 Area 3** | **BR 2** | | **BR 3** | | | | **BR 4** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | V c/II f | IIe | II d | II c | II b | V b | II a | Va | II | I/V |
| Mammal/Mammal+fish | 0.04 | 0.08 | 0.31 | 0.54 | 0.5 | 0.88 | 1 | 1 | 1 | 1 |
| Combined period | .24 | | .85 | | | | 1 | | | |

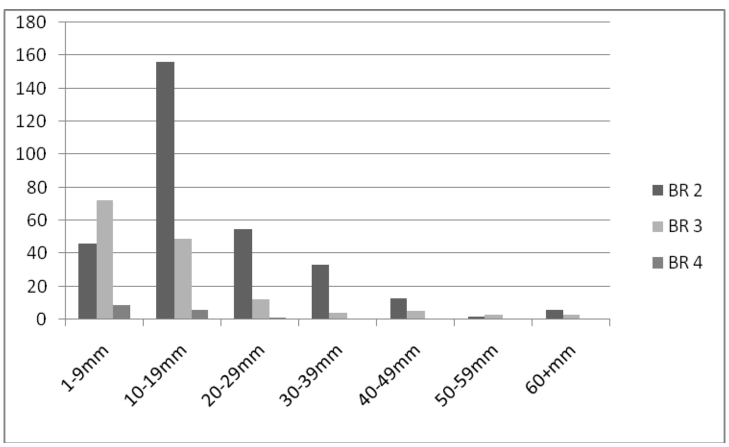


Figure 5.5. Housepit 20, Area 3 bone fragment size-grades.

Table 5.18. Stratigraphic summary of Housepit 25.

| Area | Stratum | Phase | Dates (cal) |
|---|---|---|---|
| 3 | II(2), II(2)a, III | BR 1 | 1864±36 |
| 1 | I,V,II,II a,II a/XI | BR 3 | 805±35 |
| 2 | I, V, V(1), V(2)/II, V(3), III(1), III1/2/V(2), II(2), II(1)a, II(1)b, II(1)c, II(1)/IV, II(1)a/IV, II(1)b/IV, IV, XI | BR 3 | |
| 3 | I, V, II(1), II(1)a, II(1)b, II(1)c, II(2), II(2)a, III | BR 3 | 1300±36 |

Table 5.19. Faunal summary of Housepit 25, Area 1.

| *Stratum* | *Ind. Mammal* | *Med. Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Odocoileus Sp.* | *Total* |
|---|---|---|---|---|---|---|---|
| I | | | 12 | 5 | 7 | 6 | 30 |
| V | | | 7 | 3 | | 1 | 11 |
| II | 1 | 13 | | 4 | | 6 | 24 |
| II a | | | 1 | 1 | | | 2 |
| II a/XI | | | | | | | |

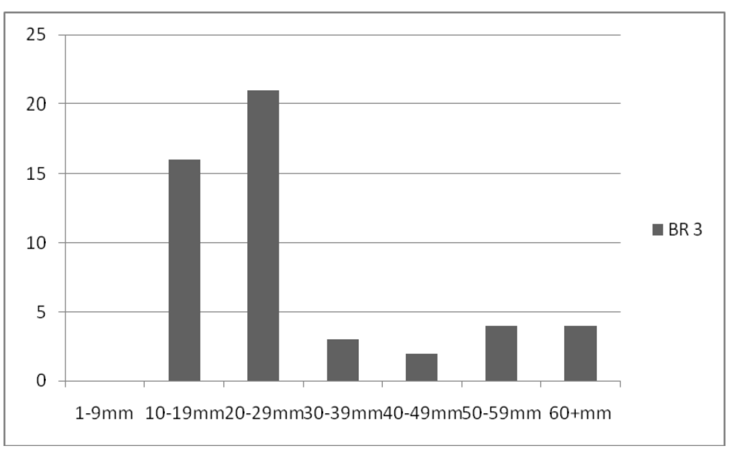


Figure 5.6. Housepit 25, Area 1 bone fragment size grades.
Table 5.21. Faunal summary of Housepit 25, Area 2.

| *Stratum* | *Ind. Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Odocoileus Sp.* | *Castor canadensis* | *Total* |
|---|---|---|---|---|---|---|---|
| I | | | | | | | |
| V | | | 6 | | | | 6 |
| V(1) | | | | | | | |
| V(2) | | | 8 | 2 | | | 10 |
| V(2)/II | 7 | | 24 | 3 | 13 | | 47 |
| V(3) | 20 | 23 | 44 | 14 | 18 | 1 | 120 |
| III(1) | 4 | | 8 | 2 | | | 14 |
| III(1/2)/V(2) | 4 | | | | | | 4 |
| II(2) | 1 | | | 4 | | | 5 |
| II(1) | 9 | | 17 | 18 | 2 | | 46 |
| II(1)a | 11 | | 8 | 27 | | | 46 |
| II(1)b | 3 | 5 | 2 | 59 | | | 69 |
| II(1)c | 3 | | 2 | 12 | | | 17 |
| II(1)/IV | 6 | | 8 | 6 | 16 | | 36 |
| II(1)a/IV | 4 | | | | | | 4 |
| II(1)b/IV | | | | 3 | | | 3 |
| IV | | | | | | | |
| XI | | | | | | | |

Table 5.22. Mammal index Housepit 25, Area 2.

| **Mammal Index (HP 25) Area 2** | **BR 3** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | V | V(1) | V(2) | V(2)/II | V(3) | III(1) | III(1/2)/V(2) | II(2) | II(1) | II(1)a | II(1)b | II(1)c | II(1)/IV | II(1)a/IV | II(1)b/IV | IV | XI |
| Mammal/ Mammal+fish | n/a | 1 | n/a | 0.8 | 0.94 | 0.88 | 0.86 | 1 | 0.2 | 0.61 | 0.41 | 0.15 | 0.29 | 0.83 | 1 | 0 | n/a | n/a |
| Combined period | 0.5 | | | | | | | | | | | | | | | | | |

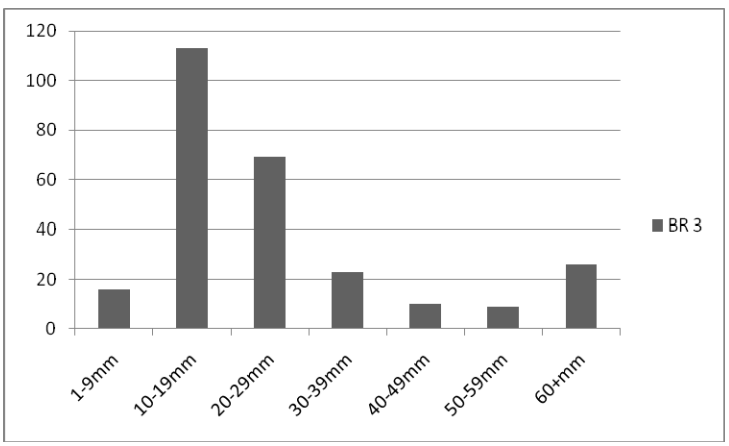


Figure 5.7. Housepit 25, Area 2 bone fragment size grades.

Table 5.23. Faunal summary of Housepit 25, Area 3.

| *Stratum* | *Ind. Mammal* | *Small Mammal* | *Med./lg Mammal* | *Large Mammal* | *Osteichthyes* | *Odocoileus Sp.* | *aves* | *Total* |
|---|---|---|---|---|---|---|---|---|
| I | | | 1 | 1 | 1 | | | 3 |
| V | 20 | | | 36 | 55 | 8 | | 119 |
| II(1) | 26 | | 1 | 9 | 30 | 2 | | 68 |
| II(1)a | 2 | 1 | | 1 | 4 | | | 8 |
| II(1)b | 1 | | | 1 | 31 | | 1 | 34 |
| II(1)c | 25 | | | | 113 | | 1 | 139 |
| II(2) | | | | | | | | |
| II(2)a | | | | | | | | |
| III | 9 | | 5 | 1 | 42 | | | 57 |

Table 5.24. Mammal index Housepit 25, Area 3.

| **Mammal Index (HP 25) Area 3** | **BR 3** | | | | | | | | **BR 1** |
|---|---|---|---|---|---|---|---|---|---|
| | I | V | II(1) | II(1)a | II(1)b | II(1)c | II(2) | II(2)a | III |
| Mammal/Mammal+fish | 0.67 | 0.54 | 0.56 | 0.5 | 0.06 | 0.18 | n/a | n/a | 0.26 |
| Combined period | .42 | | | | | | | | 0.09 |

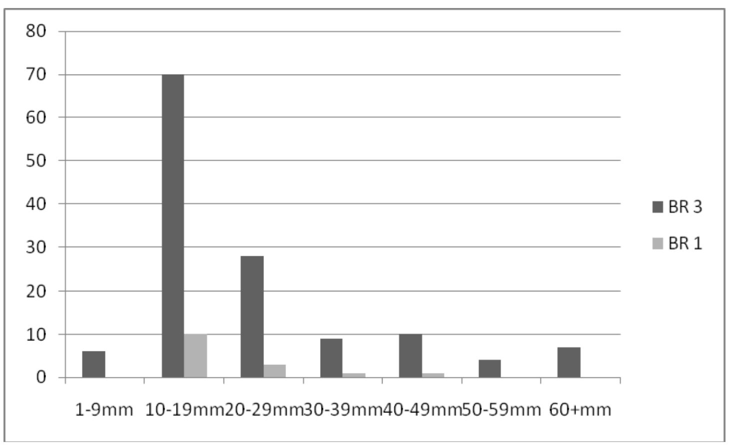


Figure 5.8. Housepit 25, Area 3 bone fragment size grades.

## Analysis and Discussion

(Lisa Smith)

This research analyzed data collected during the 2009 field season. Three units from housepits, 11, 16, and 25 were excavated, focusing on activity areas and cache pits defined through negative anomalies using magnetometry. Additionally one activity area from HP 20 was excavated, concluding data recovery of this house which began in 2008, along with one 50x50 cm unit from HP 24, which allowed collection of additional *Canis sp*. specimens from a partially excavated cache pit. Housepits contained stratified deposits spanning BR 2 and 3 periods. Two houses—HP 11 and 20—also contained proto-historic period or BR 4 components, and one house—HP 25—contained a BR 1 component. Data recovery strategies targeted separate domestic areas within houses as a way to understand subsistence change and emergent inequality through time, allowing spatial and diachronic analysis village-wide. This was especially important for understanding changes in subsistence trends overall, as well as, variation in subsistence between households.

Faunal analyses indicate that there was change in subsistence practices through time. Overall there was a rise in the village-wide mammal index (mammal/mammal+fish) from BR 2 to 3 (.38 to .7), suggesting that people may have been supplementing their salmon-based diet with more mammalian resources during that latter period (Table 25). Of this excavation, Housepit 20, Area 3 was the only one with both a BR 2 and BR 3 components. In this house the index increased from .24 to .85. Housepits without BR 2 components were 16 and 25, which had BR 3 mammal index measures of .75 and .5 respectively. Mammal indices from proto-historic, BR 4 components were even more pronounced than the previous periods. Housepit 11 had an index measure of .82 and HP 20 had an index measure of 1, which may be reflecting increased focus of mammalian resources during that time. However, lack of salmon bones in the assemblage could also be result of taphonomic processes taking place near the ground surface. In Housepit 20 total NISP of deer show a marked decline during BR 3, which reflects similar trends to housepits excavated during the 2008 field season (Prentiss et al. 2009). The overall decrease in axial deer elements during BR 3 suggests that at the time people may have had to travel farther to hunt (Figure 5.9). These data point to the possibility that there was depression of local deer resources in the BR 3 period, perhaps because of increasing population density.

Overall occupants of Bridge River were overwhelmingly targeting salmon throughout both BR 2 and BR 3 periods. Distribution of salmon, village-wide, was relatively even during both periods, suggesting that houses had similar access to this important resource. Pielou's, (1966) richness and evenness measures (tests for sample size effects proved insignificant) were used to analyze further the total faunal assemblage; including the number of taxa occurring in each period and how evenly they were distributed between housepits. Preliminary results of site wide assessment of richness and evenness are somewhat ambiguous (Figure 5.9) implying a higher rate of inter-household variability. Overall evenness goes up slightly from BR 2 to 3 (.1 to .13), while richness slightly declines (10-13), perhaps suggesting that during BR 3 occupants had a narrower diet-breadth, and that faunal resources were slightly more evenly distributed. More interesting is variation of richness and evenness between houses during BR 2 and 3, which imply inter-household variability of subsistence strategies, and perhaps differential access to resources. Richness and evenness measures of Housepit 20 during BR 2 were much higher than those at Housepit 11, suggesting that the former household was incorporating more low-ranked resources into the diet, and that the latter household had a narrower-diet breadth, perhaps focusing more on high-ranked resources. However, Housepit 20 is a much larger house than 11 and had a higher total of deer specimens, so it is possible that expanded diet-breadth is based on need to feed more people, rather than differential access to high-ranked resources. Richness and evenness measures from Housepit 20 decrease from BR 2 to 3, indicating possible development of resource specialization in that household. Perhaps through control of deer, Housepit 20 could maintain a narrower diet-breadth, which focused on high-ranked resources, and excluded low-ranked resources. During BR 3 relatively high richness and evenness of Housepit 16 suggests that this household was targeting the highest number of taxa, and that they were also relatively evenly distributed. Of all the houses this one contained the lowest number of deer elements. Results suggest that Housepit 16 may have had to expand its diet-breadth to include more low-ranked resources, perhaps due to lack of access to deer, the resource secondary only to salmon in importance. Housepit 25 had the second highest richness and highest evenness of the three housepits during BR 3, which implies that perhaps Housepit 25 had an expanded diet-breadth including more low-ranked resources, due to lack access of those that are high-ranked. However the raw data do not support that. In fact of all the BR 3 houses in this analysis Housepit 25 had the highest number of deer specimens. So it is possible that this household had access to primary and secondary resources, and also included a wide-variety of tertiary resources, perhaps reflecting individual taste preferences not often revealed through the archaeological record. Of course this will require further testing.

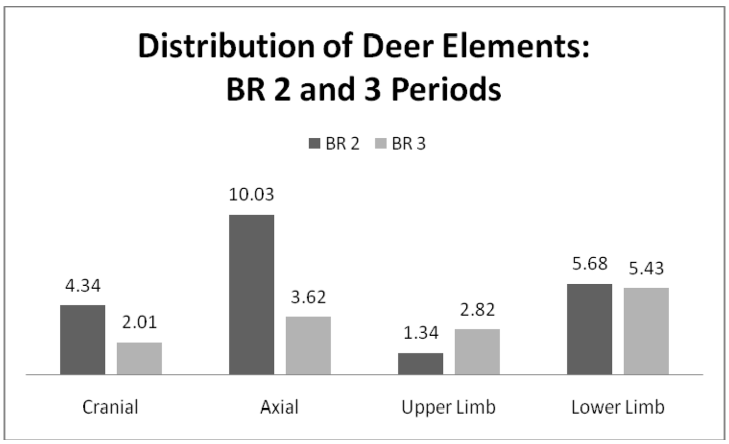


Figure 5.9. Distribution of deer elements.

Table 5.25. Mammal index for Housepits, Areas Combined.

| **Mammal Index<br>HP 16 Areas 1,2, and 3** | **BR 3** |
|---|---|
| Combined period | .75 |

| **Mammal Index HP 25<br>Areas 1, 2, and 3** | **BR 3** | **BR 1** |
|---|---|---|
| Combined period | .5 | 0.26 |

| Mammal Index HP 20 Area 3 | BR 4 | | BR 3 | | | | BR 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | I/V | II | V a | II a | V b | II b | II c | II d | II e | V c/II f |
| Mammal/Mammal+fish | 1 | 1 | 1 | 1 | 0.88 | 0.5 | 0.54 | 0.31 | 0.08 | 0.04 |
| Combined period | 1 | | .85 | | | | .24 | | | |

| Mammal Index HP 11 Area 1,2, and 3 | BR 4 | BR 2 |
|---|---|---|
| Combined period | .82 | .52 |

**The Role of Faunal Resources in Emergent Inequality**

Ultimately the goal of this research was to understand the process of emergent inequality at the Bridge River site. In this analysis faunal data from the 2008 and 2009 field season were combined to understand the role of animal resources in this phenomenon. The rise of inequality is evident though changes of subsistence over time, most notably, differential access to resources between households. To test variability in subsistence between households principal components analysis (PCA) was used to examine correlates between faunal variation and prestige items. Other variables used included house pit size, FCR count, and cache pit volume (Table 5.26). Component one loaded heavily on prestige items and was used to generate a wealth score for each housepit. Put differently, factor or component scores derived from component one could be used as a system for ranking houses on the basis of comprehensive measures of wealth accumulation and access to prestige resources (see similar results of PCA in Chapter Four). This simplified interpretations of the data by downplaying variables that did not correlate with wealth measures, creating a clearer understanding of how wealth was defined at Bridge River through time.

Principal component analysis of all variables for BR 2 resulted in two significant components (Table 5.27). Variables with a PC score over .6 are considered to be significantly loaded. Highly loaded with prestige items during BR 2 are housepit size, FCR counts, cache pit volume, richness, evenness, and upper limb bones of deer. Component one scores for individual housepits are: HP 11= -.19, HP 20= 1.08, and HP 54= -.9. BR 3 resulted in four significant components (Table 5.28). Highly loaded with prestige items (PC 1) are *Onchorhynchus* sp. (salmon), *Canis* sp. (dog), cache pit volume, and axial elements of deer. Component one scores for individual housepits are: HP 16= -.38, HP 20= -.81, HP 24= 1.69, HP 25= .07, and HP 54= -.56.

Principal component analysis revealed distinct prestige signatures during both periods. Although house size, FCR, and cache pit volume prove not to be strong independent predictors of wealth, during BR 2 they were significant contributors to the overall prestige signature (Table 5.27). Deer, dog, and salmon, are not strongly loaded with wealth, suggesting that elite households were not in control of these important resources. Faunal ornaments and beads do not contribute to the prestige signature either, hinting at the possibility that shell beads and carved bones were ornamental items enjoyed by all, and not considered to be prestigious during that time. Richness and evenness are strongly loaded with prestige variables; therefore, households able to have prestige items also had access to a large number and a wide variety of food resources.

Upper limb bones of deer are the last variable that loads strongly with prestige. Research suggests that of large mammals, axial and upper limb elements have the highest protein and caloric return (e.g. Binford 1978). Large numbers of upper limb parts with very few axial parts reflect long distance travel for hunting and butchering in the field (Binford 1978). PC 1 indicates that houses with the most prestige items also had greatest access to highly prized upper limb bones. However, these results are a little ambiguous because total NISP of deer elements in BR 2 show a high amount of axial elements, suggesting that people were hunting locally during that time. Consequently if deer parts were a factor, axial elements should also load strongly with prestige. However, instead they correlate with all other fauna in PC 2 (Table 27).

The house with the highest wealth score during BR 2 was HP 20 (Figure 10). This house was the largest of the three houses excavated, and also has the highest evenness and richness score, likely meaning that its occupants were eating a variety of animal resources, and those resources were consumed relatively evenly. Cache pit volume is also highest in HP 20 (Prentiss et al 2009), indicating that its occupants had potentially the largest amount of surplus resources. At first glance these data support the hypothesis that at Bridge River, during the BR 2 period; elites were living in the largest houses (HP 20) with highest population densities. However, one of the major markers of inequality—control over food resources (e.g. Arnold 2001; Hayden 1997a; Marcus and Flannery 1996)—is not reflected in the data. Moreover, previous research suggests that all houses had similar access to the two most important resources, salmon and deer (Carlson 2010). This research concludes that HP 20 was not a high ranked house. Rather, relatively high abundance of "prestige items" in this house reflects accumulations as a result of high population densities and not actual prestige. Therefore it is likely that social inequality was non-existent during this time.

Principal components analysis of BR 3 data revealed a much different prestige signature than BR 2. Here housepit size does not contribute strongly to the overall signature, which contradicts the hypothesis that large houses equal high rank (Hayden 1997a). Dog and salmon are strongly loaded with wealth markers, making it reasonable to argue that houses with access to prestige items also had control over some food resources. Perhaps it was during this time that households developed ownership of fishing rocks and platforms, and were harvesting and distributing salmon throughout the village (Hayden 1997a; Teit 1906). Previous research indicates that households at Bridge River had similar access to salmon (Carlson 2010), thus if elites controlled this resource they were distributing it relatively evenly. Unlike salmon, dog makes up a very small percentage of the overall faunal assemblage, and is extremely unevenly distributed. Other archaeological research proposes dog to have been a prestige item and perhaps even used for sacred ceremonies (Hayden 1997a). Consequently it would have been controlled by the most powerful households in the community.

Axial elements of deer also correlate with prestige items; and overall deer became much more unevenly distributed between houses during BR 3 (Carlson 2010; Smith et al. 2010). This is interesting because of extreme decrease in axial parts from BR 2 to BR 3. According to Binford's (1978) research, decrease in axial parts can reflect travelling longer distances to hunt. Butchering would have been out in the field therefore elements such as the upper limbs would have been selected for high return of protein and calories, and easy transportability. Raw data of deer elements from BR 3 support this long distance hunting strategy. Generally it is proposed that hunters travelled longer distances when there was stress on, or lack of, access to localized resources. Correlation of axial parts to wealth measures, coupled with overall decrease in axial parts village-wide may reflect control of local deer populations by elites through strategies such as ownership of deer fences (Hayden 1997a; Teit 1906). Research by Carlson (2010) proposes that deer became a prestige item during BR 3 and other researchers connect deer to feasting activities throughout the region (Hayden 1997a; Romanoff 1992a, b; Teit 1906). Like BR 2, during BR 3, faunal ornaments and beads were not significant contributors to the prestige signature suggesting that these were never prestige items in the first place. Of all the independent variables, cache pit volume is the only one that contributes significantly to the prestige signature during BR 3. Thus, houses that were most wealthy were not necessarily densely populated; however, they did potentially have the most stored surplus and consequent ability to throw community potlatches (Hayden 1997a; Teit 1906).

The house with the highest wealth score during BR 3 is Housepit 24 (Figure 5.14). Housepit 24 is a medium size house. It contained the highest number of dog bones (total NISP 78), all of which were excavated from a large cache pit (Prentiss et. al 2009). Of all the housepits during BR 3 Housepit 24 also had the highest number of salmon bones (total NISP 3,654), and also the highest percentage of axial deer elements (Prentiss et al. 2009). All data point to the conclusion that of the five houses excavated from the BR 3 period, Housepit 24 was the most-wealthy. Research suggests that wealth-based social ranking emerged during this period. Total counts of prestige items display a sharp increase from BR 2 to 3 (Figure 5.16). Prestige signatures during BR 3 show that elites were not defined by large houses and high population densities, but by independent variables not yet understood. It is very possible that Housepit 24 acquired prestige items through its ability to gain salmon surplus and host potlatches (Hayden 1997a). According to Teit (1906) and Romanoff (1992a), one deer was acquired for the price of three-hundred salmon. Data suggest Housepit 24 had higher access to resources such as axial deer elements and dog, and may have attained them by trading surplus salmon, which also may have been distributed among other houses in the village. Distribution of salmon would have maintained a sense of equilibrium amongst the Bridge River occupants and allowed people of Housepit 24 to have differential access to other resources with little resistance. Moreover, evidence indicates that concepts of inequality based upon wealth did not develop until BR 3. Unequal distribution of lithic and faunal material during BR 2 was a result of differential population densities between houses, and not social inequality.

Table 5.26. Definitions of variables used in principal components analysis.

1. *Housepit size*: the diameter of each house in meters. This measure will be used to determine small, medium, and large size house categories. It is also one of the testable independent variables for prestige.
2. Phase: used to separate housepits according to BR 2 and BR 3.
3. *Onchorynchus sp.*: salmon, which was one of the most important resources at Bridge River (Prentiss et al. 2008; Teit 1906). (All artifact counts will be divided by

maximum amount of soil excavated per each component (m3) to control for bias created by varying sizes of excavation units

4. *Odocoileus sp.*: deer, which was an important resource, and also proposed to be a prestige food during BR 3 (Carlson 2010). This is a good measure of household access to resources and prestige goods.
5. *Canis sp.*: is dog. This, like deer, is believed to have been a prestige food (Hayden 1997). (possible for both BR 2 and 3).
6. *Faunal tools*: All humanly modified bones used for utilitarian purposes, such as awls and wedges.
7. *Faunal Ornaments*: All humanly modified fauna, including sculptured bone and shell beads, which may have been a symbol of prestige (Hayden 1997a; Teit 1906).
8. **Prestige Items*: All lithic items, such as stone beads, ornaments, pipes, and adzes, which may have been a symbol of prestige (Hayden 1997a; Teit 1906).
9. **Non-local Raw Material:* Traded raw material, such as steatite and obsidian. Access to non-local raw material (trade goods) is proposed to be a sign of prestige (see Chapter Four).
10. **Prestige Raw Material:* Nephrite, pisolite, and Hat Creek jasper. Local raw material suggested to be controlled by local elite populations (Hayden 1997a; Prentiss et al. 2009).
11. **FCR*- Fire-cracked rock. Created as a result of cooking activities. Used as a relative measure of population density.
12. **Excavated Cache Pit Volume:* Another measure of relative population density (i.e. the more people, the more cached food in a house). It is also used to infer the ability to acquire surplus, and throw feasting events (Hayden 1997a; Prentiss et al. 2009).
13. *Richness:* The N of taxa in an assemblage.
14. *Evenness:* How evenly those taxa are distributed across a landscape (Pielou 1966). Richness and evenness measures (∑pi(log)pi/logN) are used to analyze distribution of resources. For example if a household has less access to high-ranked resources, they may have to diversify their diet to include more low-ranked resources. The signature of this house will be high evenness and high richness. The house with access to high-ranked resources will have less diverse diet reflected by low richness and evenness signatures.
15. *Deer Elements, Cranial, Axial, Upper and Lower Limb:* Used to analyzed hunting patterns. If local deer populations are stressed, people may have to travel farther to hunt, therefore, faunal assemblages will have show a decrease in axial parts, and an increase in limb parts (reflecting strategic butchering). It is also a measure of differential access to resources, such that elites may have had more access to high-utility meat portions (axial and upper limb parts) (Binford 1978).

Table 5.27. Loadings matrix for BR 2 period.

| | Component | |
|---|---|---|
| | 1 | 2 |
| Stryd Size | .824 | .567 |
| Onchorychus sp./m3 | -.232 | .973 |
| Odocoileus sp./m3 | .443 | .897 |
| Canis sp/m3. | .247 | -.969 |
| faunal tools/m3 | -.715 | .699 |
| faunal ornaments/beads/m3 | .409 | .913 |
| prestige items/m³ | .996 | .094 |
| Non-local Raw material/m³ | .989 | .149 |
| Prestige Raw Materials/m³ | .993 | -.117 |
| FCR/m³ | .950 | .314 |
| Exc. Cache pit vol/cm2 excavated per Housepit | .984 | -.180 |
| Richness | .964 | .266 |
| Evenness w/salmon | .946 | -.323 |
| Deer element Cranial | -.148 | .989 |
| Deer element Axial | -.490 | .872 |
| Deer element upper limb | .824 | .567 |
| Deer element lower limb | .394 | -.919 |

Table 6. Loadings matrix for BR 3 period.

| | Component | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Stryd Size | .008 | .844 | -.417 | .337 |
| Onchorychus sp./m3 | .927 | .074 | .040 | .365 |
| Odocoileus sp./m3 | -.787 | .500 | .184 | .311 |
| Canis sp/m3. | .886 | .252 | -.027 | .388 |
| faunal tools/m3 | .327 | .338 | .279 | -.837 |
| faunal ornaments/beads/m3 | -.176 | -.258 | -.851 | -.422 |
| prestige items/m³ | .865 | .359 | -.102 | .337 |
| Non-local Raw material/m³ | .725 | .500 | .396 | .260 |
| Prestige Raw Materials/m³ | .824 | .146 | .397 | -.376 |
| FCR/m³ | .507 | -.495 | -.523 | .474 |
| Exc. Cache pit vol/cm2 excavated per Housepit | .677 | -.680 | -.183 | -.216 |
| Richness | .401 | -.770 | .436 | .236 |
| Evenness w/salmon | -.900 | -.022 | .417 | .128 |
| Deer element Cranial | -.261 | .153 | -.951 | .068 |
| Deer element Axial | .656 | .644 | .090 | -.384 |
| Deer element upper limb | -.786 | .414 | .389 | .245 |
| Deer element lower limb | -.103 | -.867 | .441 | .207 |

# CHAPTER SIX

# CONCLUSIONS

**(Anna Marie Prentiss)**

As in 2008, the 2009 excavations at the Bridge River site focused on household domestic activity areas as defined by geophysical signatures. Excavation units were placed in three such areas in Housepits 11, 16, and 25. The 2008 excavations in Housepit 20 resulted in two areas excavated. Consequently, following our research design, we completed a third area in 2009. Limited additional excavations were completed in Housepit 24, Area 3, with the goal of extracting additional materials from a large cache pit feature containing dog remains. A variety of materials were recovered including 8995 lithic artifacts, 7393 faunal remains, and 15,835 paleoethnobotanical remains (1146 seeds, 14,465 needles, and 224 other items). Ten new radiocarbon dates were run, helping to further define occupational sequences in individual housepits.

Geophysical studies are detailed in Appendix C and resulted in definition of a range of feature contexts. Generally, speaking dark negative anomalies tended to signal the presence of cache pit features. This was especially evident in results from Housepits 11, 16, and 20. In each of these cases, substantial cache pits were found in the locations of strong negative magnetic anomalies. In contrast, trenching through negative anomaly areas in Housepit 25 failed to turn up any cache pits at all. This will remain a subject for future investigations. Strong positive magnetic anomalies were best associated with cooking features. The best example of this comes from Area 1 in Housepit 16 where a very strong positive anomaly effectively predicted the presence of the Feature 1 roasting oven. In general geophysical signals were an effective guide to indentifying household domestic activity areas that included cache pits, but also remains of ephemeral hearths often associated or even capping the cache pits. A good example of the latter was found in Housepit 11, Area 2 (Feature 1).

Excavations revealed in a range of variation in housepit stratigraphy. Housepit 11 contained a lengthy series of Bridge River (BR) 2 period floors, capped by a single roof deposit. Later occupants excavated and established a BR 4 floor and roof on the surface of the final BR 2 roof. Housepit 16 was occupied entirely during BR 3 times producing a series of floors and several roof deposits. Once the final roof was collapsed, a large roasting oven was excavated in those roof sediments and used on at least two occasions. Housepit 25 was built upon an uneven substrate surface that preserved remnants of several BR 3 floors. A much older (BR1) floor was found deep under the rim deposits (identified in 2004). Based upon our current understanding of stratigraphy it would appear that this earlier floor (Stratum II(2)) had been constructed and lived upon prior to the construction of Housepit 25, which subsequently buried this floor/housepit under a massive accumulation of rim and roof material. Excavations in Housepit 20 confirmed and further clarified the sequence of BR 2, 3 and 4 occupations found in 2008.

A total of 42 features were exposed, tested or fully excavated during 2009. Two large cache pits were uncovered in the BR 2 occupation of HP 11. Feature 4 in Area 1 was a very large bell-shaped cache pit with several fill events. Smaller features including post-holes had been at times excavated into its fill layers. Feature 1 in Area 2 was a cylindrical pit taping towards its based and capped by a hearth feature characterized by several episodes of use. Housepit 16 included one particularly large bell-shaped cache pit (Feature 3) from Area 3. This feature included partial remains of birch bark lining and rolls of birch bark containing salmon bones at its base. As mentioned above, Feature 1 from Area 1 was a very large roasting oven excavated into the final roof deposit and upper floor material of HP 16. Large numbers of berry seeds and animal bones suggest that this was not a root roasting oven, but rather a meat/fish cooking feature. Additional Housepit 16 features included shallow hearths, post-holes, and smaller cache pits. Housepit 20, Area 3 produced a variety of features, the most distinctive of which was Feature 2, a “jar-shaped” BR 2 cache pit, also with remnants of birch bark lining and abundant faunal remains. Housepit 25 did not produce any cache pits. However, there were hearth features, post-holes (including one very large post-hole from Area 1), and clusters of feature material (e.g. fire-cracked cobble cluster in Area 2).

Features can be good indicators of variability in activity areas. Activity areas tested in HP 11 appear to represent standard domestic zones, given the presence of cache pits and hearth features in the BR 2 contexts. Only one BR 4 feature was found in Area 1. Given the small size of the BR 4 house in HP 11 and the sparse presence of features, this house may not have been organized as a series of redundant family activity areas. Rather it might have featured a single cooking area, a separate sleeping area, and other zones for other special activities. Associated hearths and cache pits in each of Areas 1 and 3 in HP 16 suggest redundant domestic activity areas. Much of the Area 2 trench was in the center of the house where little in the way of feature material was found. However, hearth materials were found at the north end of the trench closer to the north wall of the house confirming the possibility of a third domestic activity area. Consistently recurring hearths and cache pits in Area 3 of HP 20 confirm this location as another domestic activity locus. Despite extensive trench operations, Housepit 25 failed to yield a standard arrangement of domestic areas. Only two shallow hearths were found in close proximity to one another in Area 3. Area 2 had dense clusters of deer bones and a cluster of hearth-related rocks, but no *in situ* hearth feature. Given a fairly normal array of faunal remains, stone tools, and debitage it does appear to have been occupied domestically like other houses. Yet it does not appear to have been organized in the same way. Rather the house appears to have been partitioned into activity specific loci including hearth-related cooking and deer butchery. If the house has few or no cache pits then we can only infer that household storage was done in a different manner including the possibility of outdoor storage structures and cache pits and/or the use of indoor platforms, boxes, etc. for storage of food. Our perception of the organization HP 24 did not change based upon the limited excavation done in 2009.

A large sample of plant materials were derived from paleoethnobotanical analysis of features. These data are outlined in Appendix F but have not yet been subject to extensive analysis. Preliminary assessment is possible however. Three food species dominated the seeds data: Saskatoon, kinnikinick, and heather. The most impressive numbers of berries were derived from the Feature 1 roasting pit from HP 16, Area 1 and from the hearth context of Feature 1 in HP 11, Area 2. The former was dominated by kinnikinick while the latter featured heather in greatest numbers. Saskatoon berries were relatively ubiquitous in lower numbers in many of the features excavated in 2009. Lesser numbers of rose, elderberries, raspberries, grass, and mint seeds were also recovered. It would appear that berries were a common component of meals cooked in BR 2 and 3 households. Extensive quantities of needles likely indicate tinder used to start fires. They were probably also used as bedding though we did not examine soil samples outside of hearths to test for this phenomenon. Ongoing studies in paleoethnobotany focus on better understanding variability in berry harvest and processing and its implications for wider assessments of resource intensification and extensification.

Zooarchaeological studies have defined a range of prey species in the BR 2, 3, and 4 occupations. Salmon remains the dominant item followed by deer, dog, birds, and a range of smaller fur-bearing animals. Interestingly, salmon decline when measured as a ratio of NISP to cubic meters excavated, whereas numbers of mammals rise. Also, there is significant variability in density of salmon remains during the BR 3 occupations of individual houses. Consequently there are several possible scenarios to explain the pattern. First, as recognized at Keatley Creek (Prentiss et al. 2007), it could mean that salmon had just become less accessible thus resulting in generally lower numbers. Another scenario suggests that inter-household variability could explain the overall lower numbers and inter-household variability could be the result of differences in favored food species. Combining these, variation in salmon remains could reflect variation in household economies under stressful conditions of the early Medieval Warm period salmon runs became less predictable in timing and densities of fish. Under this scenario, perhaps some households now claimed ownership over optimal fishing areas and obtained adequate supplies of food for winter consumption whereas others did not. A variation on this theme would suggest that it was not access to fish that varied but access to mammals. In this case, those with less deer, dog or other sources of red meat, had to process their salmon further (e.g. grinding the bones for soup) leading to variation in salmon bone counts. As documented in Chapter Five, there is some evidence for resource depression in deer populations. Testing these hypotheses remains an important priority in on-going analyses of these data.

Lithic artifacts recovered in 2009 reflect a wide range of activities and are similar in overall patterns to housepit assemblages described elsewhere. Bipolar cores are common and are found on exhausted free-hand percussion cores as well as flakes and discarded tools. The high frequency of bipolar cores implies the need to produce tools from limited supplies of raw material. This possibility is supported by the debitage assemblages, which tend to fall in the smaller size ranges. A wide range of tools were recovered, typically dominated by scrapers, knives, and piercers on flakes. Many tools have multiple use-edges and functions implying regular recycling and use. Ground and chipped slate tools remained relatively frequent in all deposits. A particularly large number were recovered from deposits in Housepit 16. However, few of these had been sawed or ground whereas there was a higher frequency of ground and sawed tools recovered from Housepits 20, 24, and 54 in 2008 and 2009. Projectile points were less common in Housepits 11, 16, and 25 compared to the larger numbers previously recovered in Housepits 24 and 54. Ongoing research associated with lithic artifacts is focused on lithics signatures for changes in subsistence tactics including indicators or resource intensification and extensification. Additional research continues to examine the role of stylistic variability as an indicator of inter-household and inter-village social networks.

Multivariate analysis of lithics data along with fauna and features permitted a number of conclusions. Lee Reininghaus' study (Chapter Four) of the BR 4 data suggested that markers of wealth accumulation could be associated with specific housepits. In her study, HP 54 stood out as having the greatest frequency of wealthy items, correlating with thickest floor sequence and greatest density of fire-cracked rock. This suggests the possibility that by early European contact times it was not house size that predicted greatest wealth accumulation but household longevity (floor thickness) and population density (fire-cracked rock density). In general, the results corroborate predictions drawn from the ethnographic literature about important correlates of wealth and status in Mid-Fraser households (e.g. Teit 1906). Similar multivariate analyses of BR 2 and 3 materials (Chapters Four and Five) suggests that house size did not necessarily play a significant role in the development of household material wealth. Further, household longevity appeared not to play a major role either as the houses with the thinnest floors featured the greatest density of wealth markers.

From a temporal standpoint, inter-household variability in wealth does not emerge until BR 3 times and it is indicated by variability in a wide range of data sets. From this standpoint there appears to be little doubt that wealth-based inequality evolved during the occupation of the Bridge River site. However, it does not appear to have fully emerged until after ca. 1300 years ago following approximately 500 years of occupation and significant village growth (Prentiss et al. 2008). Once inequality was present it appears to have been associated with "new" houses rather than long lived households. This may suggest that access to material wealth was not predicated on inheritance within households. Combining these results with zooarchaeological assessments, inequality appears to have developed under socio-economic conditions of declining access to favored prey species such as deer and possibly salmon. Continued study of these data will be necessary to clarify the significant variables involved in the development of social inequality at Bridge River.

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**Appendix A**
**Maps**

# Appendix B
# Photographs

# Appendix C
# Geophysical Research Report

# Appendix D
# Micromorphology Research Report

# Appendix E
# Lithic Artifact Typology

# Appendix F
# Paleoethnobotanical Report

# Bridge River Excavation 2009: Archaeobotanical Analysis
(Naoko Endo)

This report presents the results of archaeobotanical analysis of 44 bulk samples collected from a range of contexts at the archaeological site known as Bridge River (EeRl-4) on the Interior Plateau of British Columbia. These samples 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". 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 from 2009 excavations were processed by flotation at the University of Montana subsequent to the field season. 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. 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 used to sort the samples 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.

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, and are thus noted as present/absent. Unidentifiable seeds are fragments do not have diagnostic features that indicate their identity, given the use of a binocular microscope. Also, samples with abundant needles (100+) in .425mm screen, one quarter of the sample was sorted exclusively for conifer needles and the number recovered was simply multiply by four to get an estimate number.

Wood charcoal identification follows standard methods set out by Hoadley (1990) and Pearsall (1989). Wood charcoal was randomly selected from 4.0mm and 2.0mm fractions and identified using a reflected light microscope (100-500x). Ten wood charcoal specimens were identified per sample. Criteria for the wood charcoal are based on morphological comparison with reference specimens and published sources (Friedman 1978; Hoadley 1990). Charcoal identification involved the recognition of anatomical features from the cross, tangential and radial sections of specimens.

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 weights, 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 (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).

**Results:**

The assemblage of charred macroremains from EeRl-4 is summarised in Table 1. A total of 24 taxa representing 16 plant families were identified, in the form of seeds, needles, wood, buds, fruit and other macrobotanical remains. Of the 1146 seeds recovered, 1133 have been identified and are classified into 17 known taxa. Fleshy berries are represented by the seeds of Saskatoon, kinniknnick, hawthorn, raspberry, elderberry, Heath family and Rose family. Other herbaceous species identified from seeds are: grass family, mint family, sedges, chenopod, bedstraw, nettle, prickly pear, lemonweed, and waterleaf. Seven charred Ponderosa pine seed fragments were identified. Fir, Ponderosa pine, Douglas-fir and Hemlock are represented by needles. Most of the needle base bundles are represented by Ponderosa pine whereas partly charred birch bark fragments were recognized along with other species of charred bark fragments. Douglas-fir, hard pine, maple, alder, and cottonwood were recovered from wood charcoal samples.

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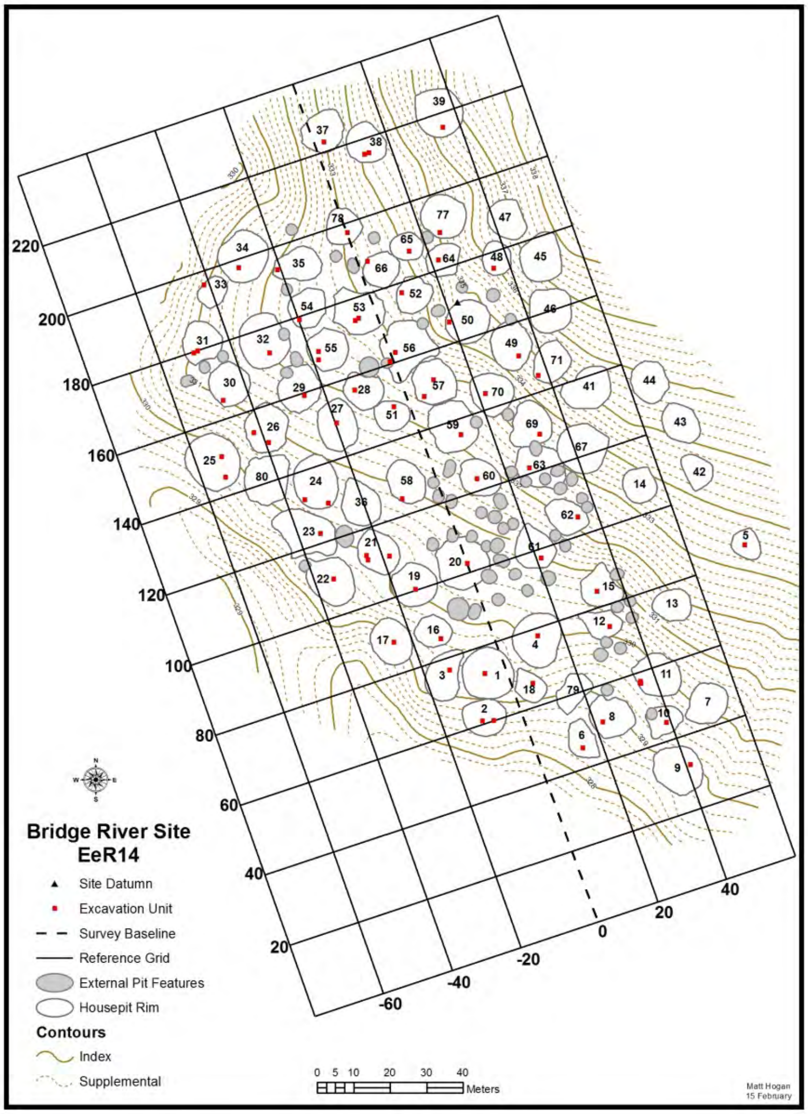
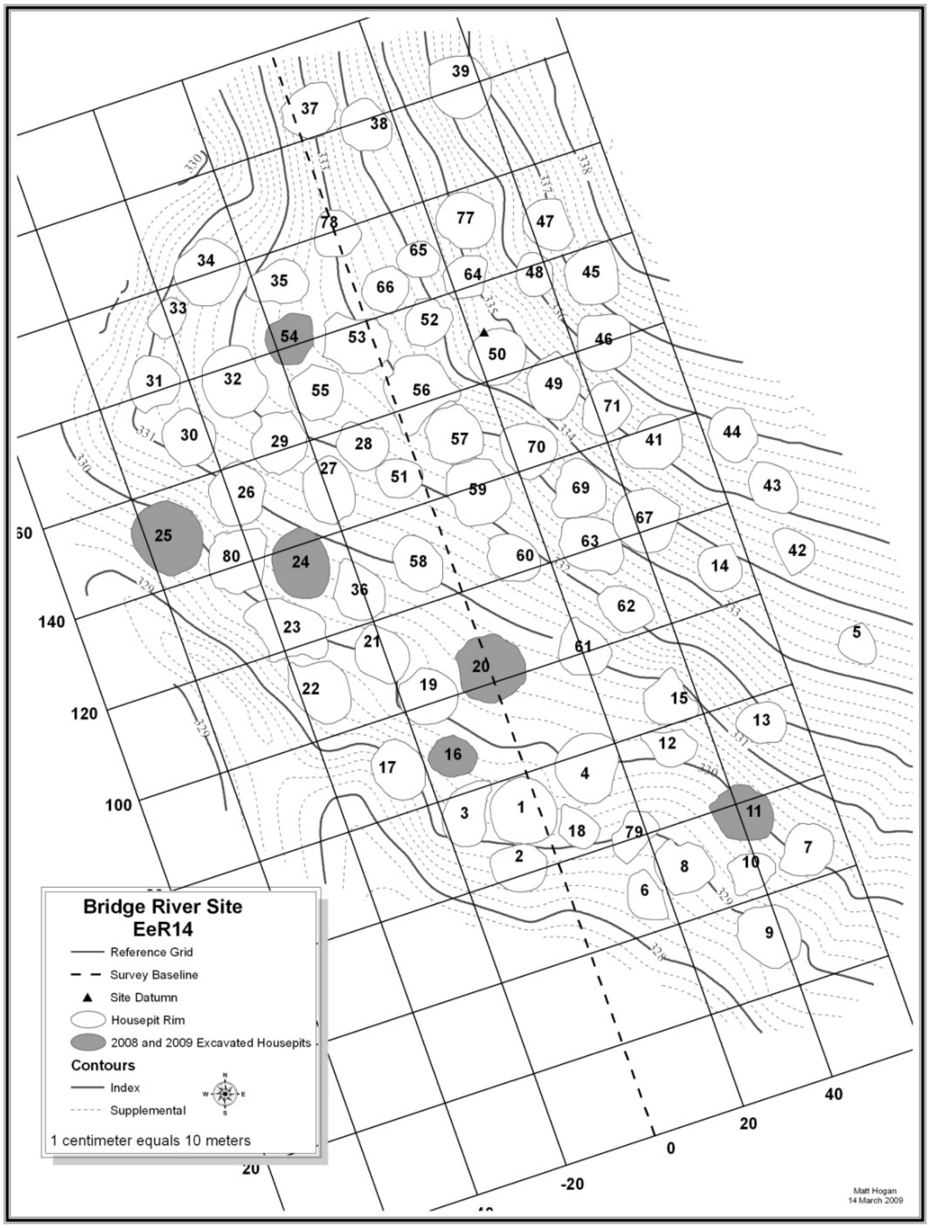


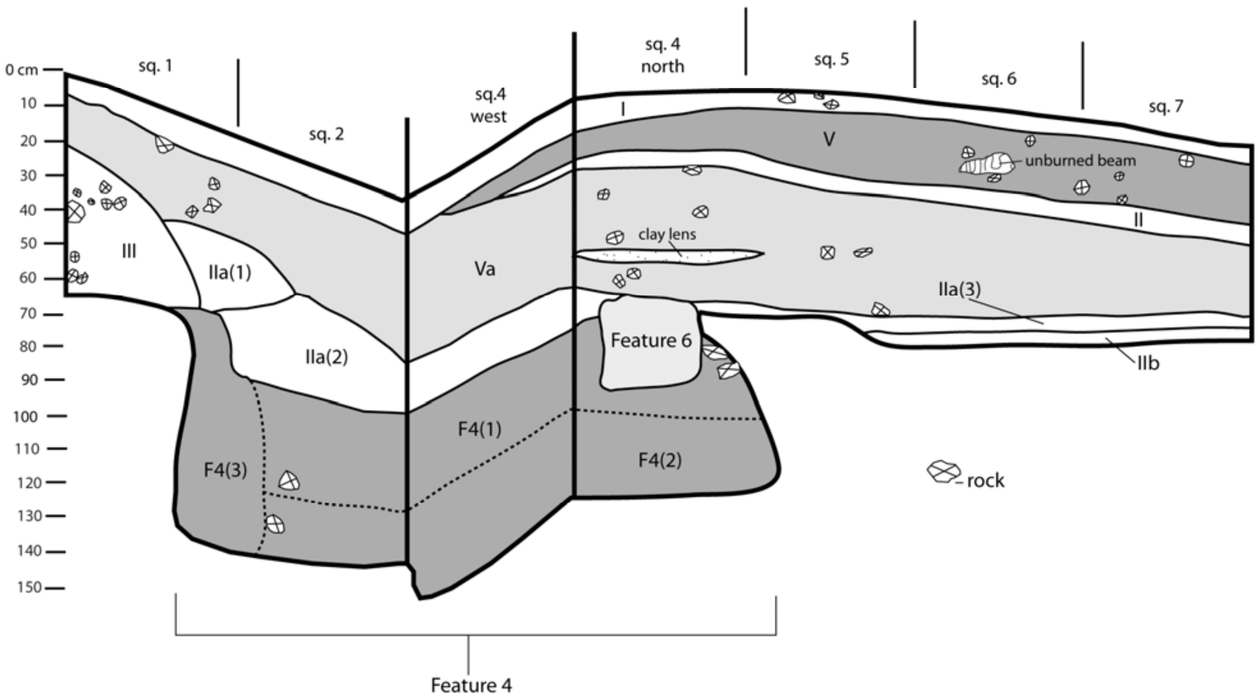

Simplified contour map with grid system.

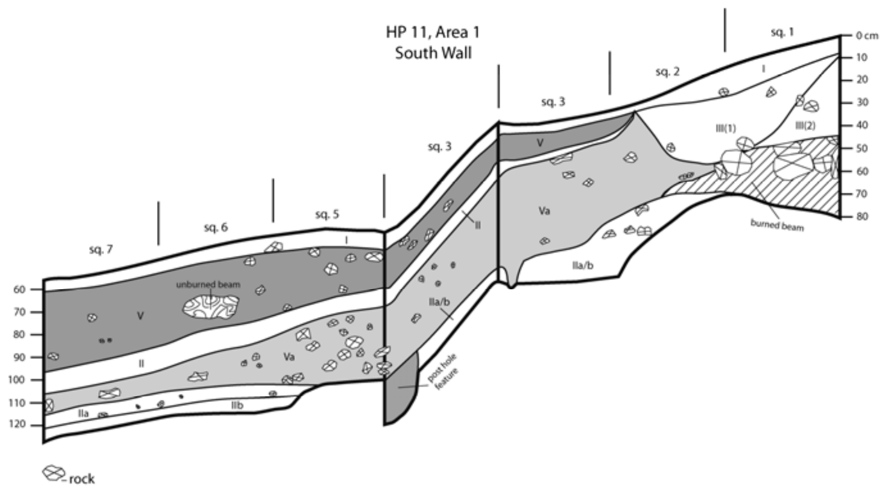



Bridge River site map showing housepits excavated in 2008 and 2009.

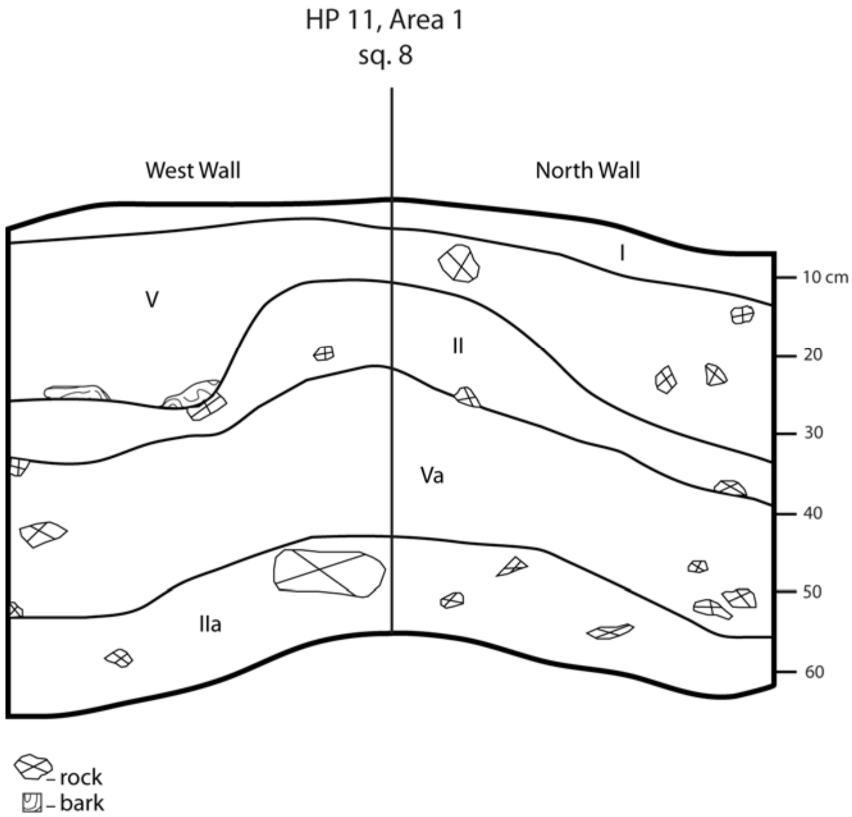
Housepit 11 showing contours and position of excavations (Area 1 left, Area 2 upper, Area 3 lower right).  Note side-extrance in upper left area.

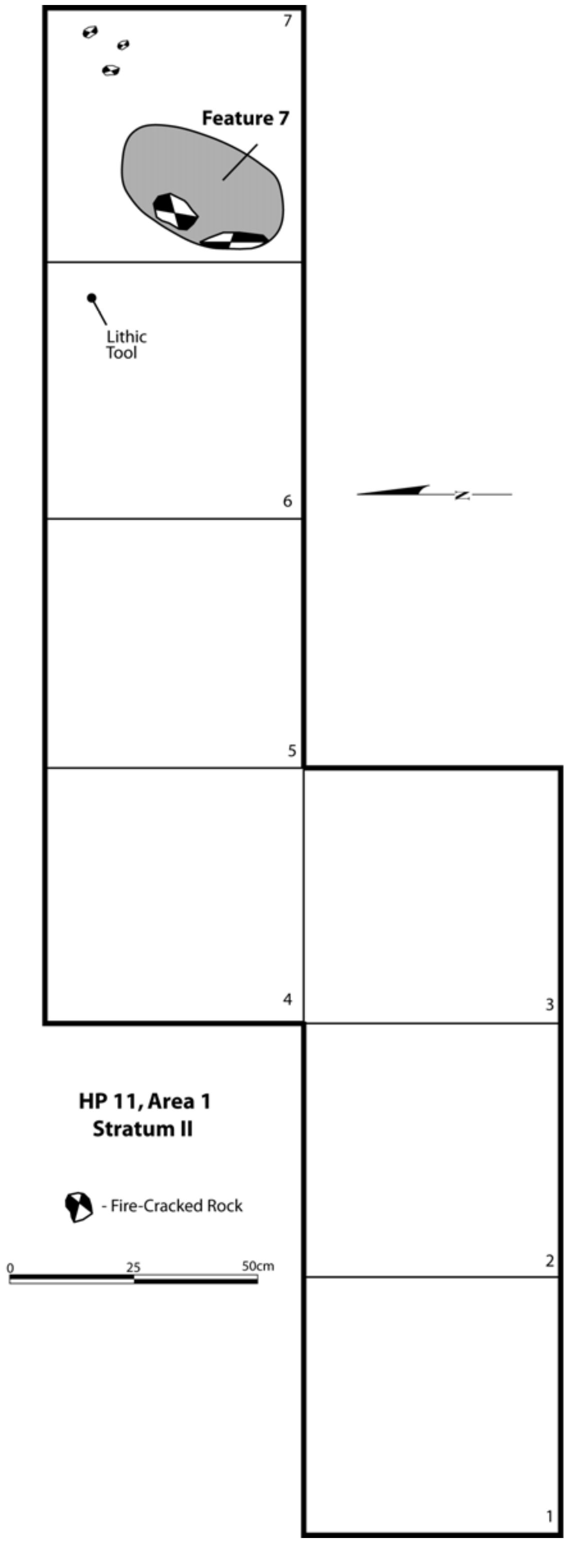
Housepit 11, Area 1
North Wall Profile



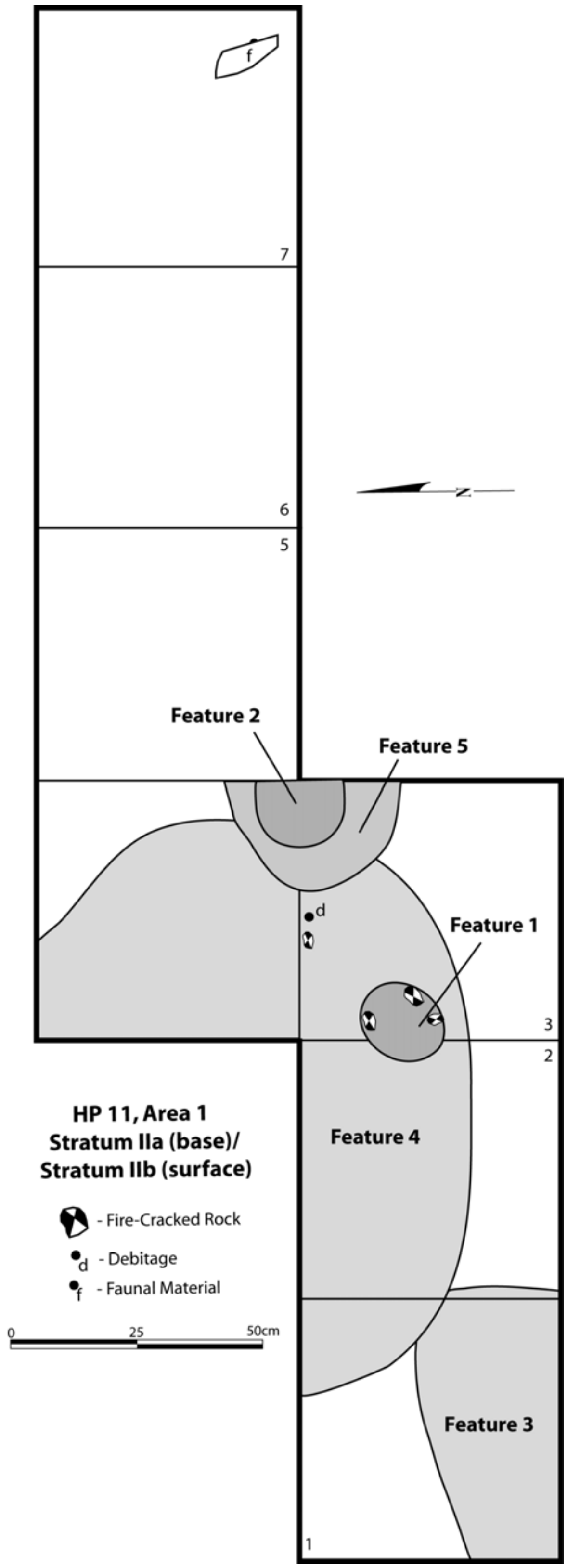


HP 11, Area 1
South Wall
sq. 7
sq. 6
sq. 5
sq. 3
sq. 3
sq. 2
sq. 1
0 cm
10
20
30
40
50
60
70
80
60
70
80
90
100
110
120
I
V
Va
II
IIa/b
IIa
IIb
III(1)
III(2)
unburned beam
burned beam
post hole feature
- rock

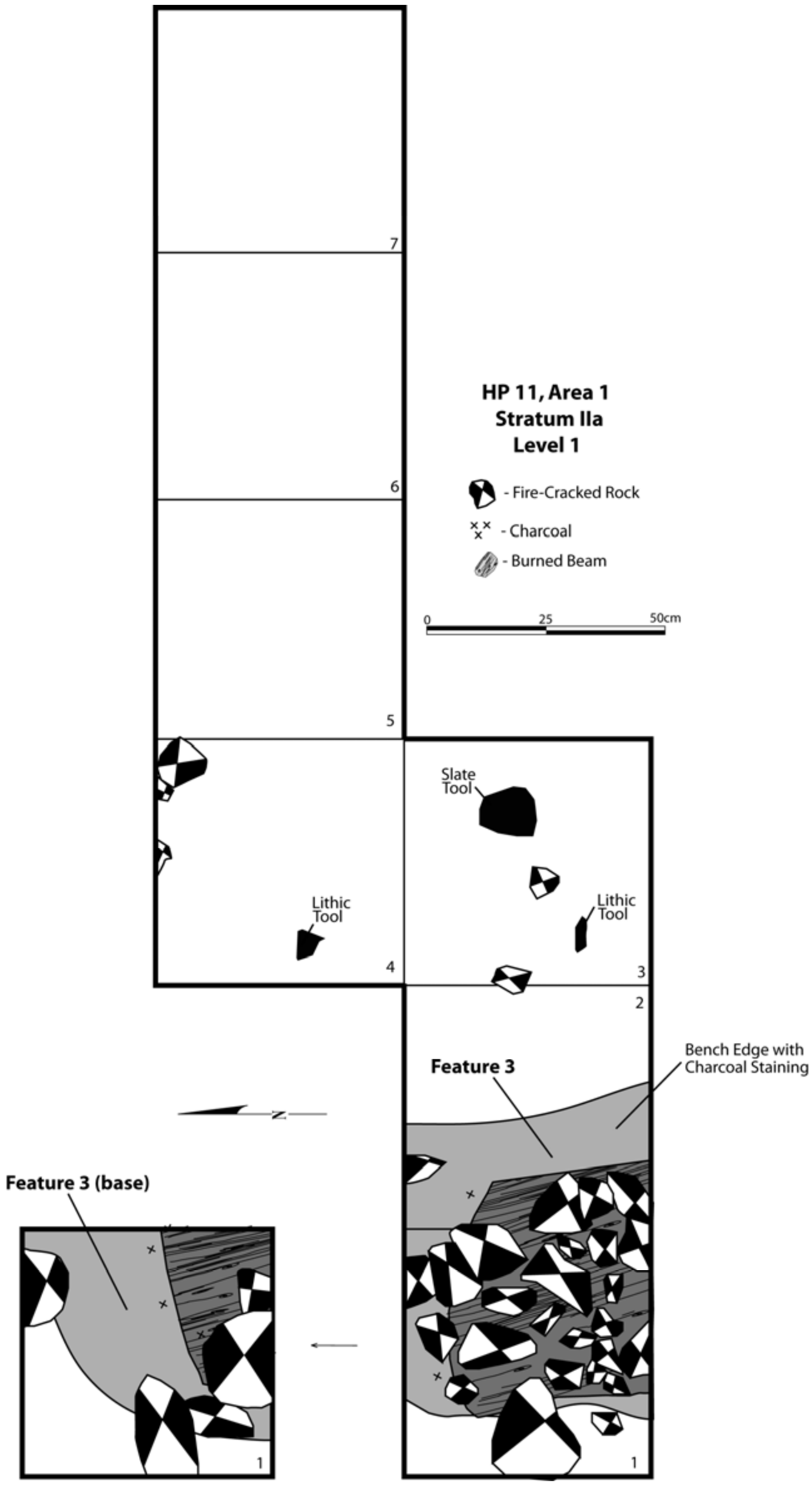

HP 11, Area 1
sq. 8
West Wall
North Wall
I
V
II
Va
IIa
10 cm
20
30
40
50
60
– rock
– bark

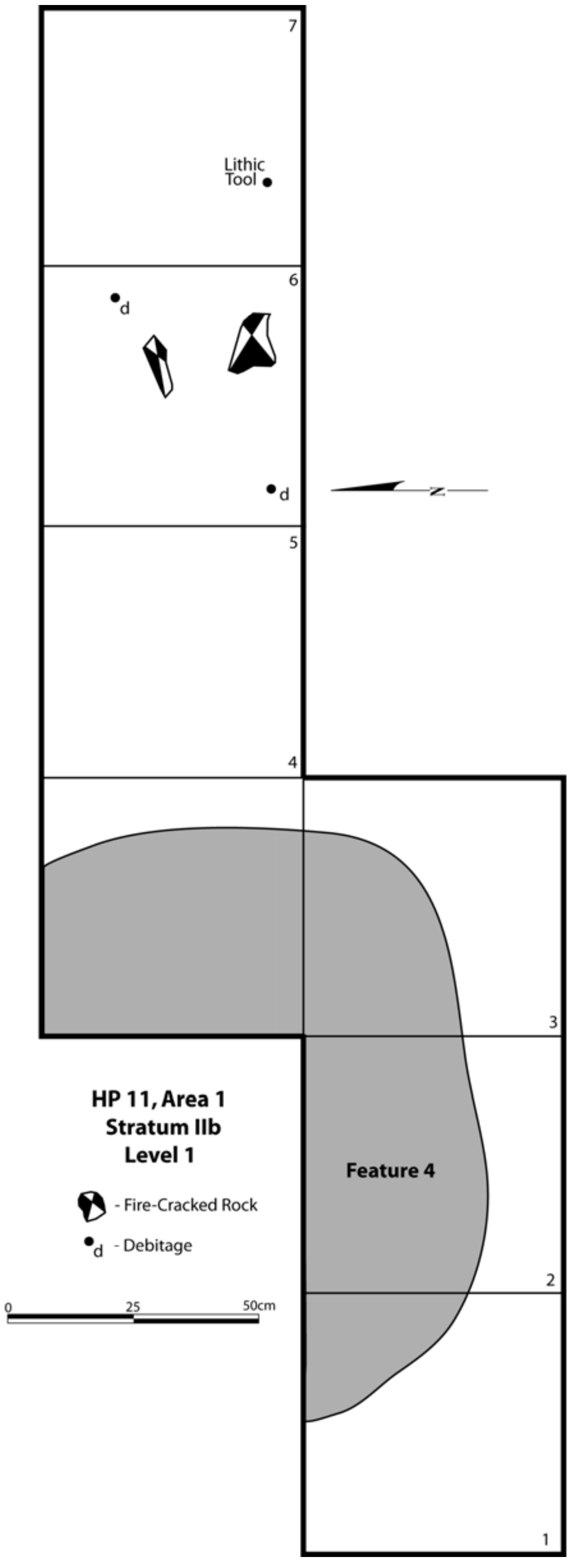


7
Feature 7
Lithic
Tool
6
5
4
3
2
1
N
HP 11, Area 1
Stratum II
- Fire-Cracked Rock
0
25
50cm

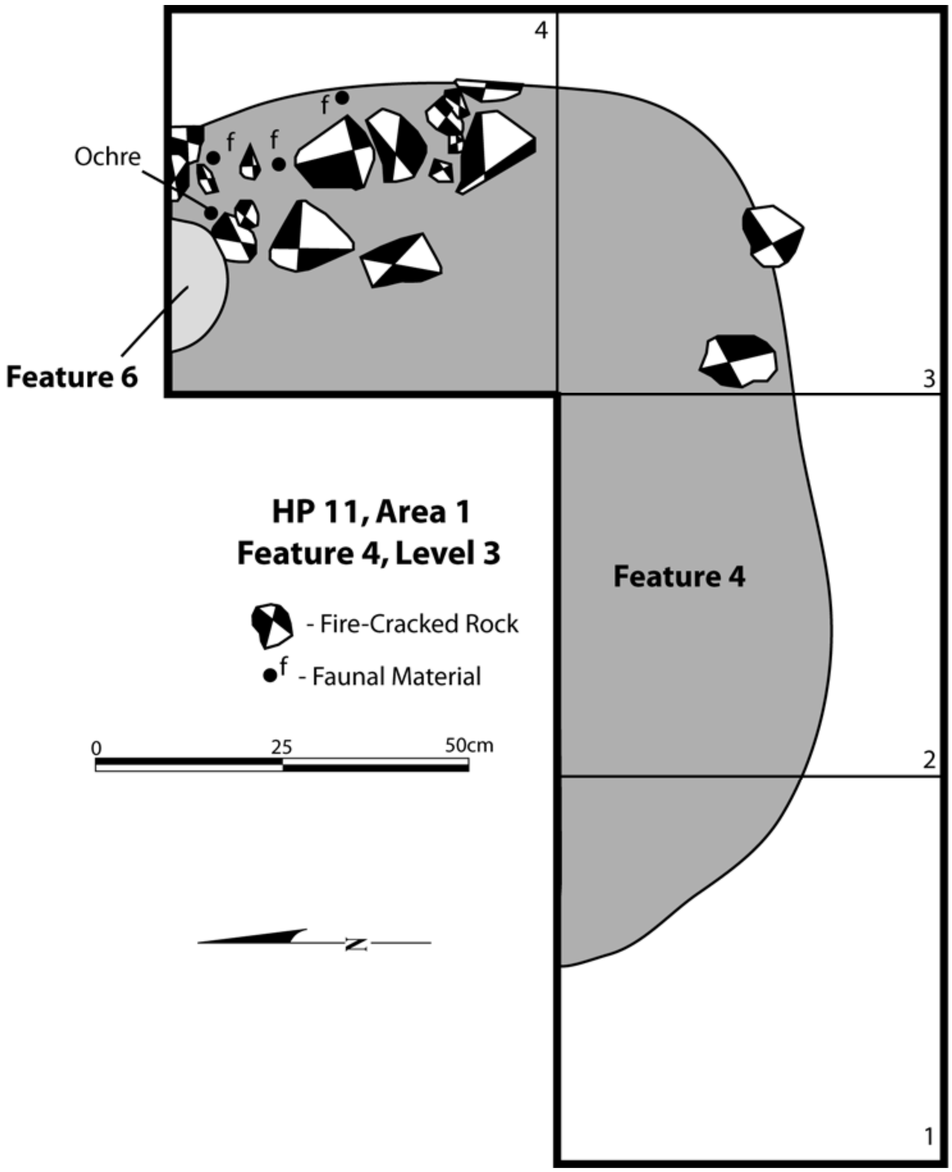


f
7
6
5
Z
Feature 2
Feature 5
d
Feature 1
3
2
Feature 4
Feature 3
1
HP 11, Area 1
Stratum IIa (base)/
Stratum IIb (surface)
- Fire-Cracked Rock
d - Debitage
f - Faunal Material
0
25
50cm

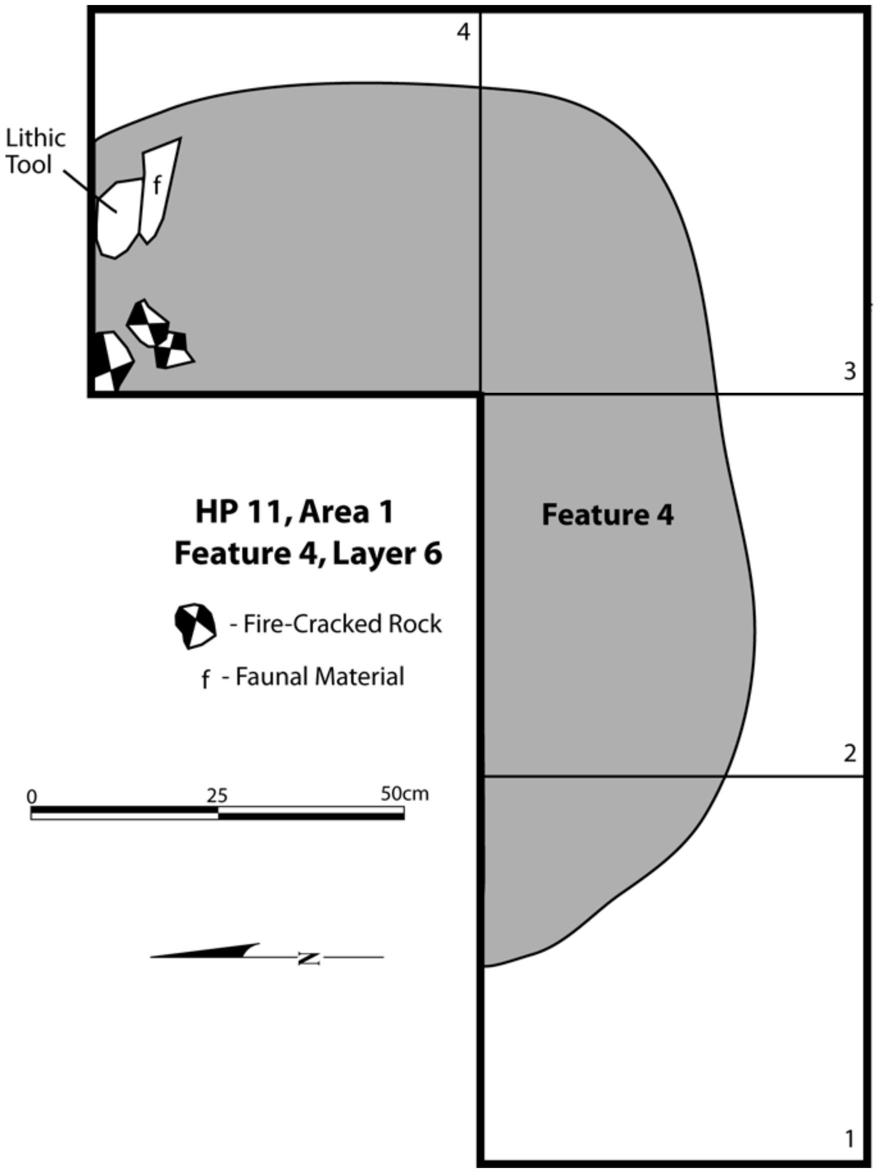

HP 11, Area 1
Stratum IIa
Level 1
- Fire-Cracked Rock
- Charcoal
- Burned Beam
0
25
50cm
7
6
5
4
3
2
1
Slate Tool
Lithic Tool
Lithic Tool
Feature 3
Bench Edge with Charcoal Staining
N
Feature 3 (base)
1

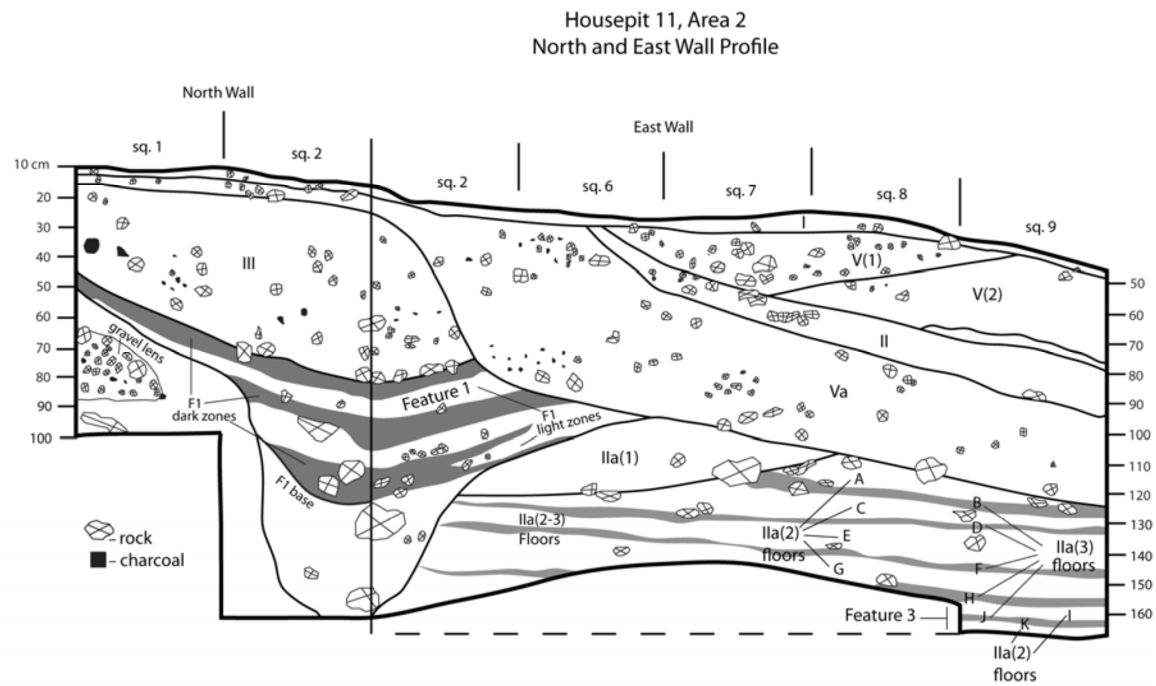


7
Lithic
Tool
6
d
d
N
5
4
3
HP 11, Area 1
Stratum IIb
Level 1
Feature 4
- Fire-Cracked Rock
d - Debitage
2
0
25
50cm
1

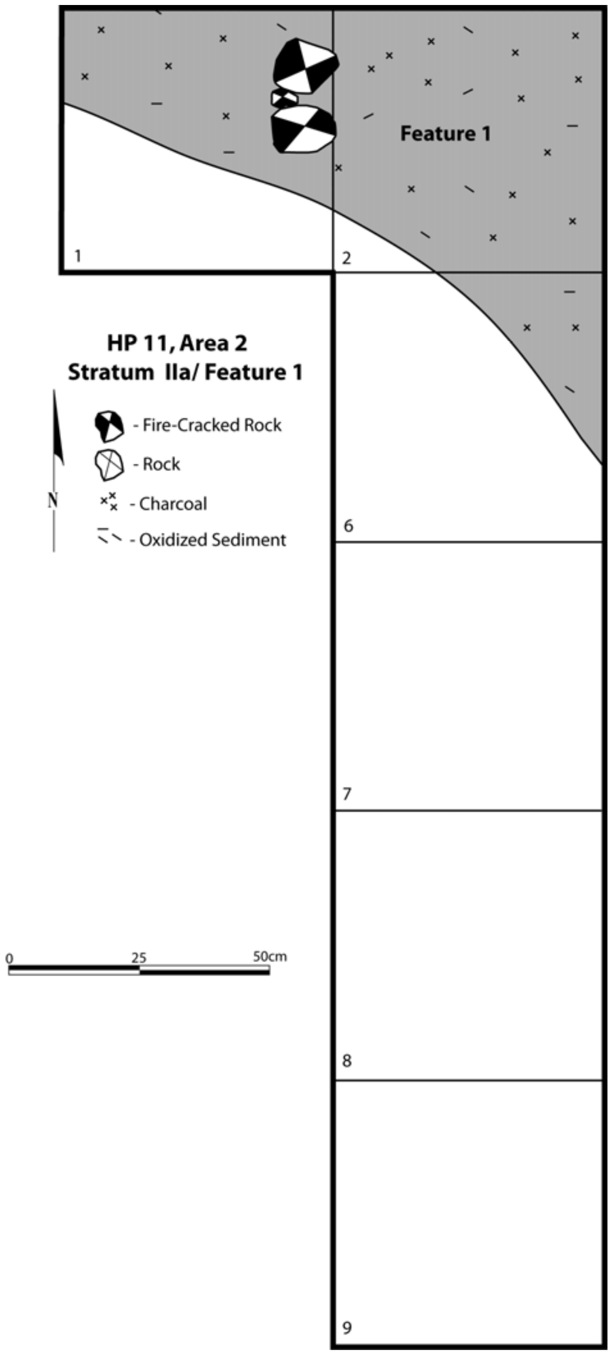


4
3
2
1
Ochre
f
f
f
Feature 6
HP 11, Area 1
Feature 4, Level 3
Feature 4
- Fire-Cracked Rock
f - Faunal Material
0
25
50cm
N

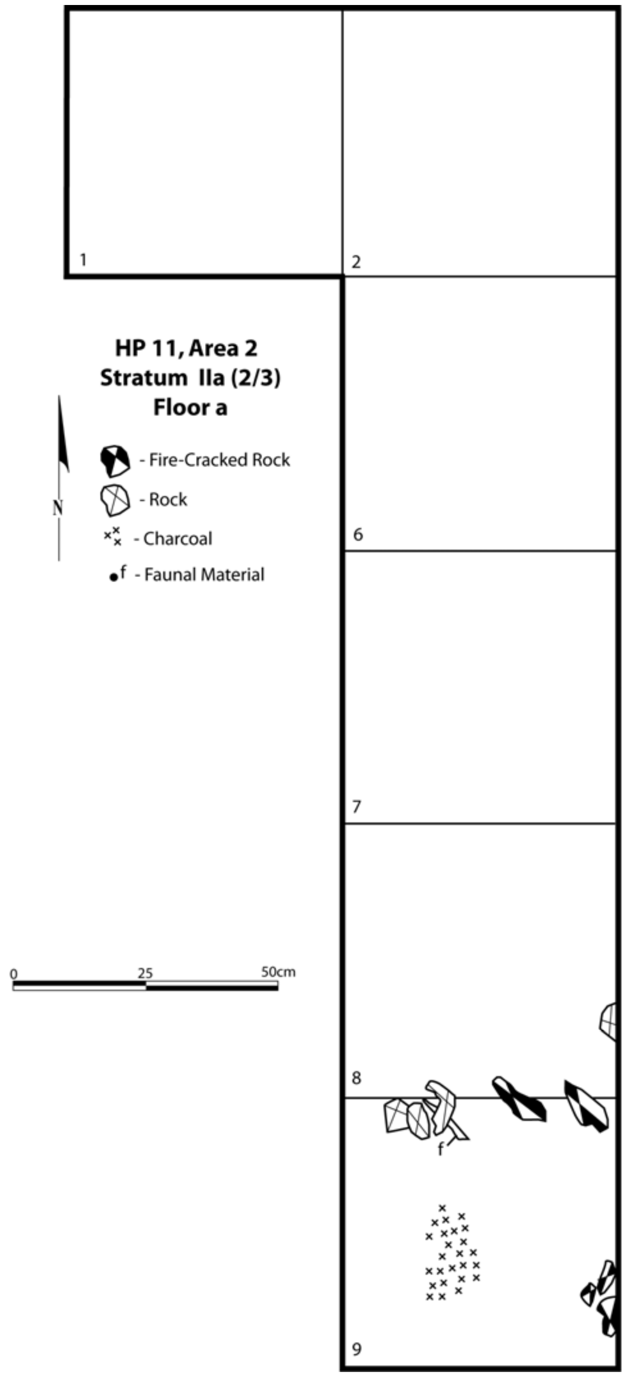

4
Lithic
Tool
f
3
HP 11, Area 1
Feature 4, Layer 6
Feature 4
- Fire-Cracked Rock
f - Faunal Material
2
0
25
50cm
N
1

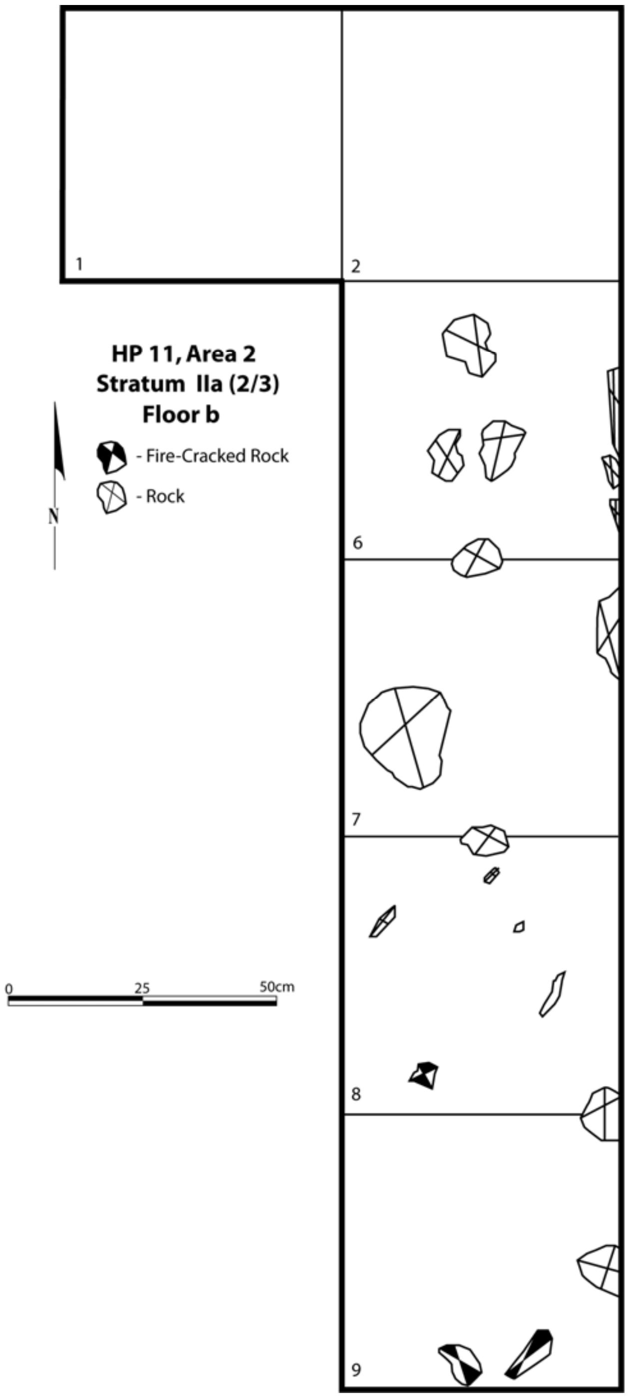


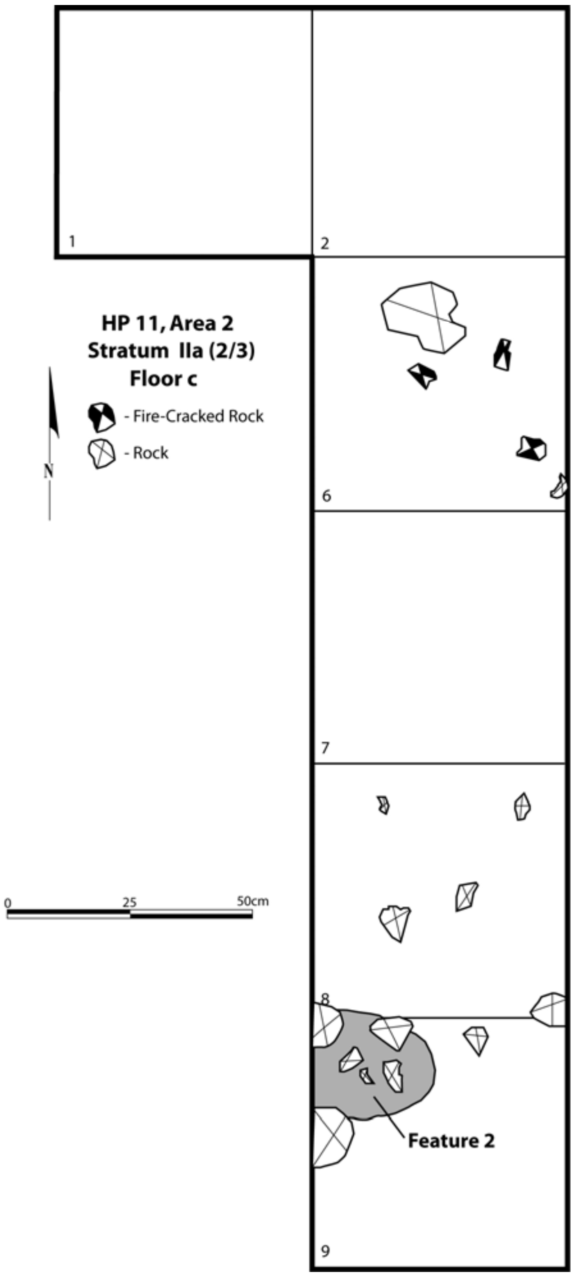
Housepit 11, Area 2
North and East Wall Profile
North Wall
East Wall
sq. 1
sq. 2
sq. 2
sq. 6
sq. 7
sq. 8
sq. 9
10 cm
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
I
III
V(1)
V(2)
II
Va
gravel lens
F1
dark zones
Feature 1
F1
light zones
F1 base
IIa(1)
IIa(2-3)
Floors
IIa(2)
floors
IIa(3)
floors
A
B
C
D
E
F
G
H
J
K
I
Feature 3
IIa(2)
floors
– rock
– charcoal



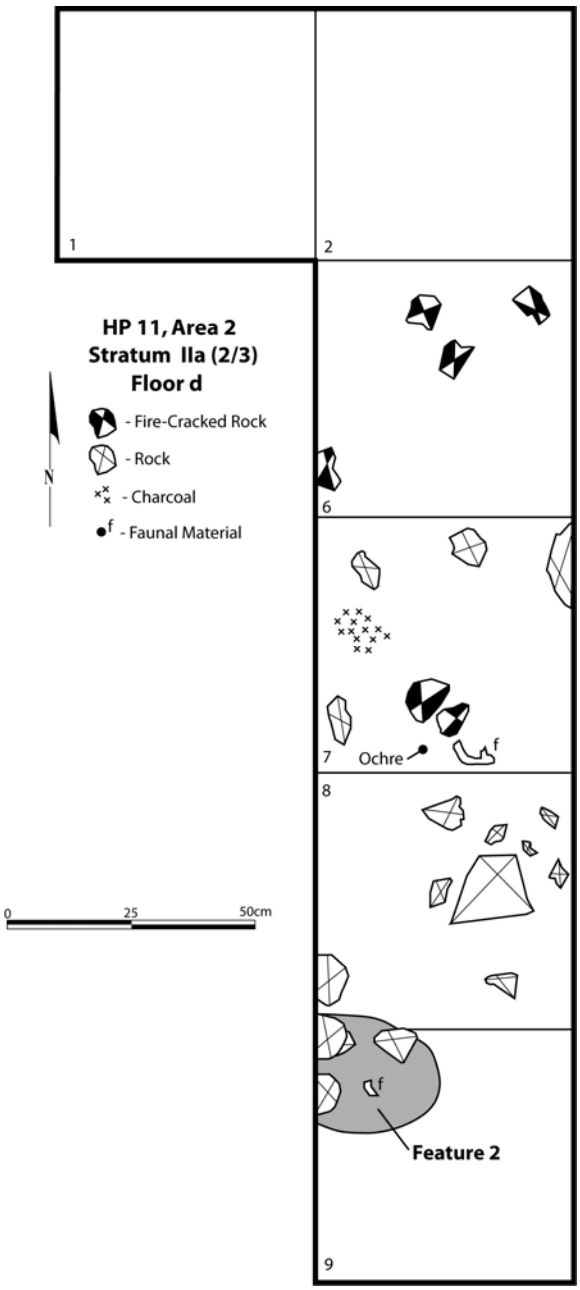
Feature 1
1
2
6
7
8
9
HP 11, Area 2
Stratum IIa/ Feature 1
- Fire-Cracked Rock
- Rock
- Charcoal
- Oxidized Sediment
N
0
25
50cm

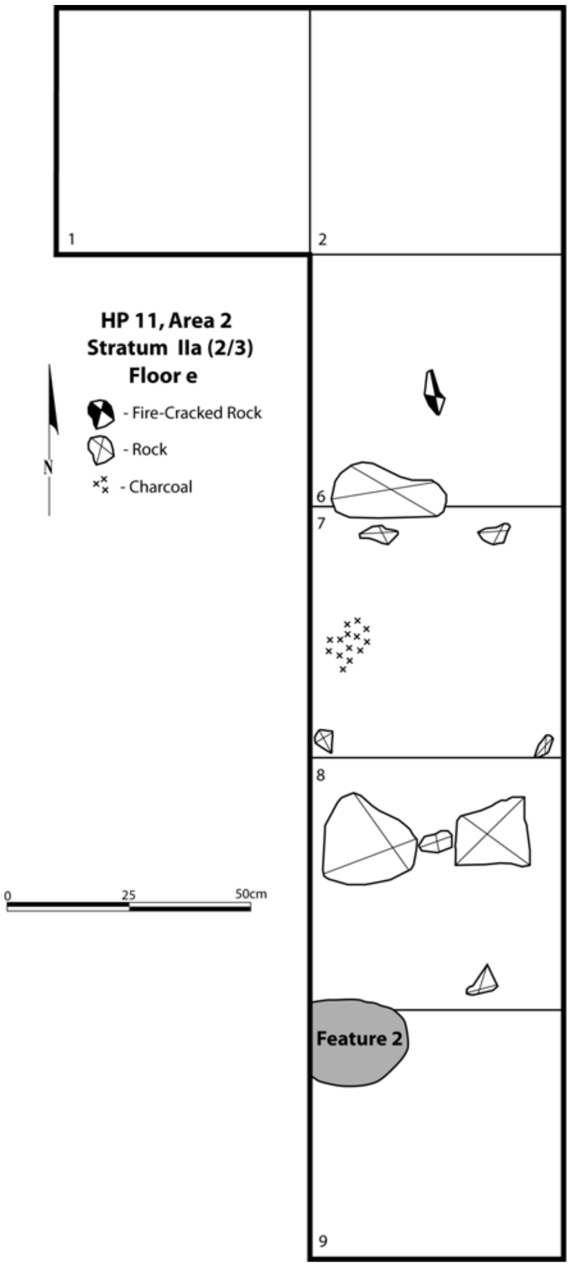

HP 11, Area 2
Stratum IIa (2/3)
Floor a
N
- Fire-Cracked Rock
- Rock
- Charcoal
f - Faunal Material
0
25
50cm
1
2
6
7
8
9
f

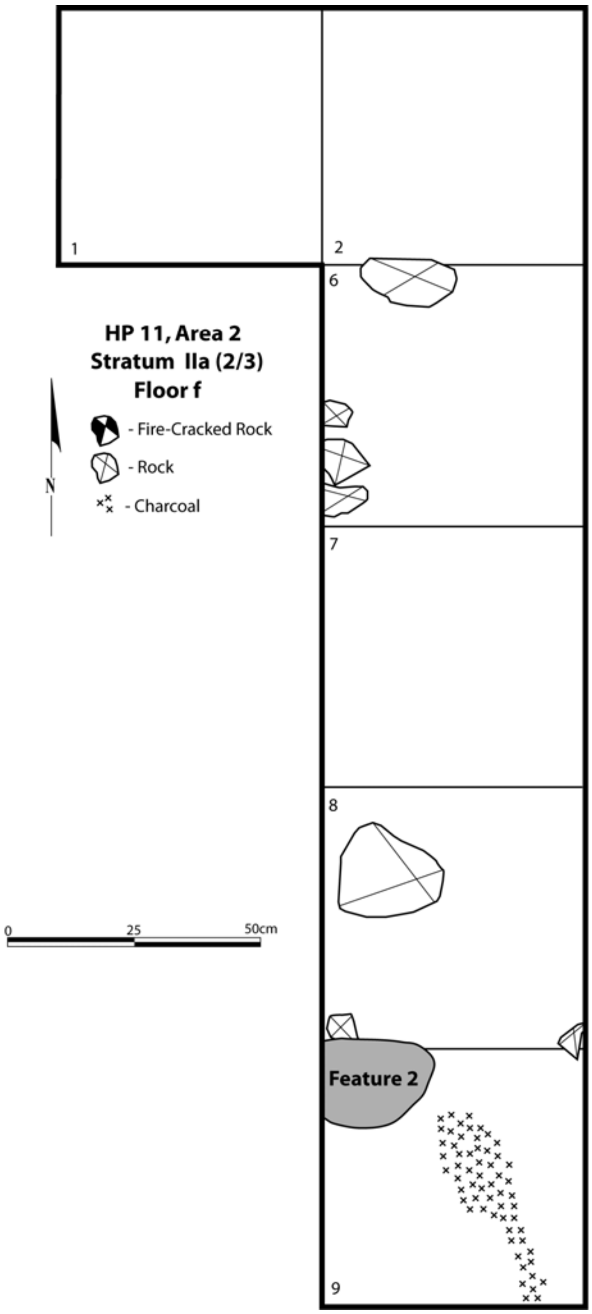

1
2
HP 11, Area 2
Stratum IIa (2/3)
Floor b
- Fire-Cracked Rock
- Rock
N
6
7
8
9
0
25
50cm



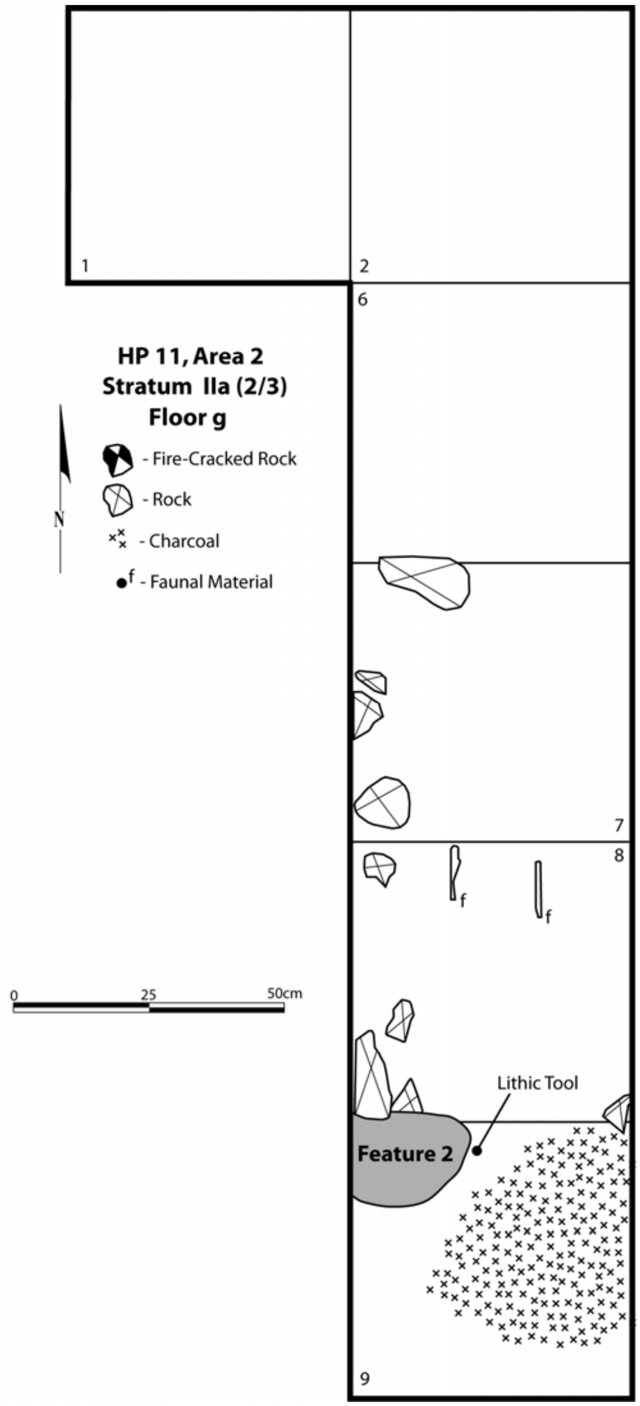
1
2
HP 11, Area 2
Stratum IIa (2/3)
Floor c
N
- Fire-Cracked Rock
- Rock
6
7
0
25
50cm
8
Feature 2
9


HP 11, Area 2
Stratum IIa (2/3)
Floor d
- Fire-Cracked Rock
- Rock
- Charcoal
- Faunal Material
N
0
25
50cm
1
2
6
7
8
9
Ochre
f
Feature 2

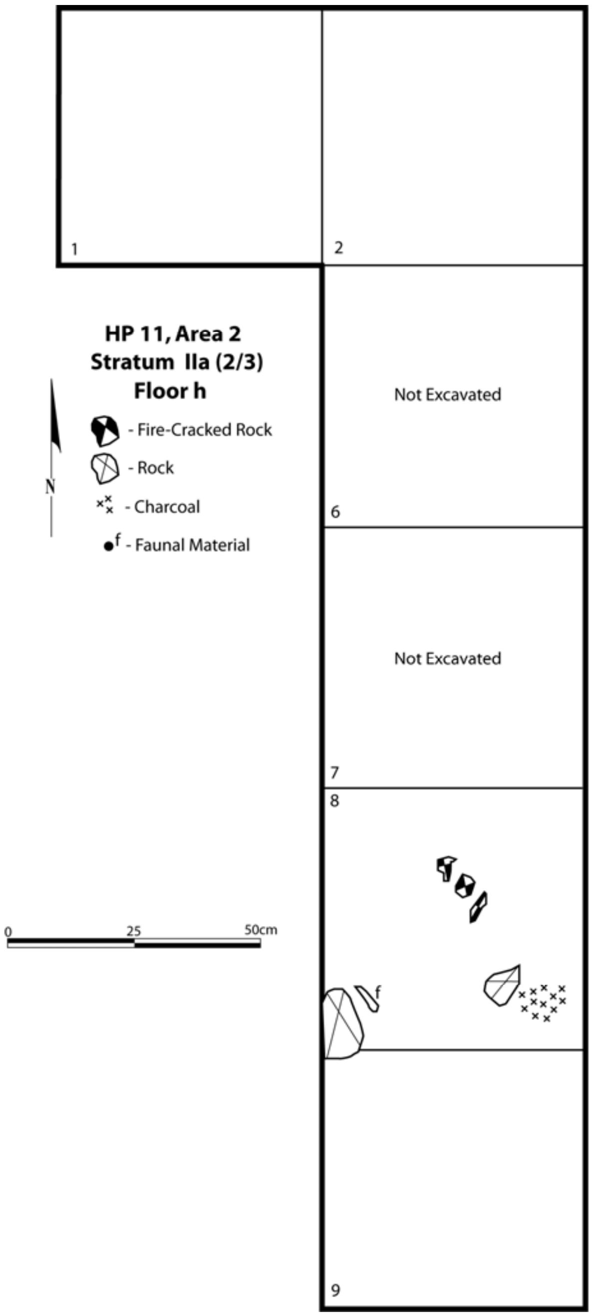

HP 11, Area 2
Stratum IIa (2/3)
Floor e
- Fire-Cracked Rock
- Rock
- Charcoal
N
0
25
50cm
1
2
6
7
8
9
Feature 2

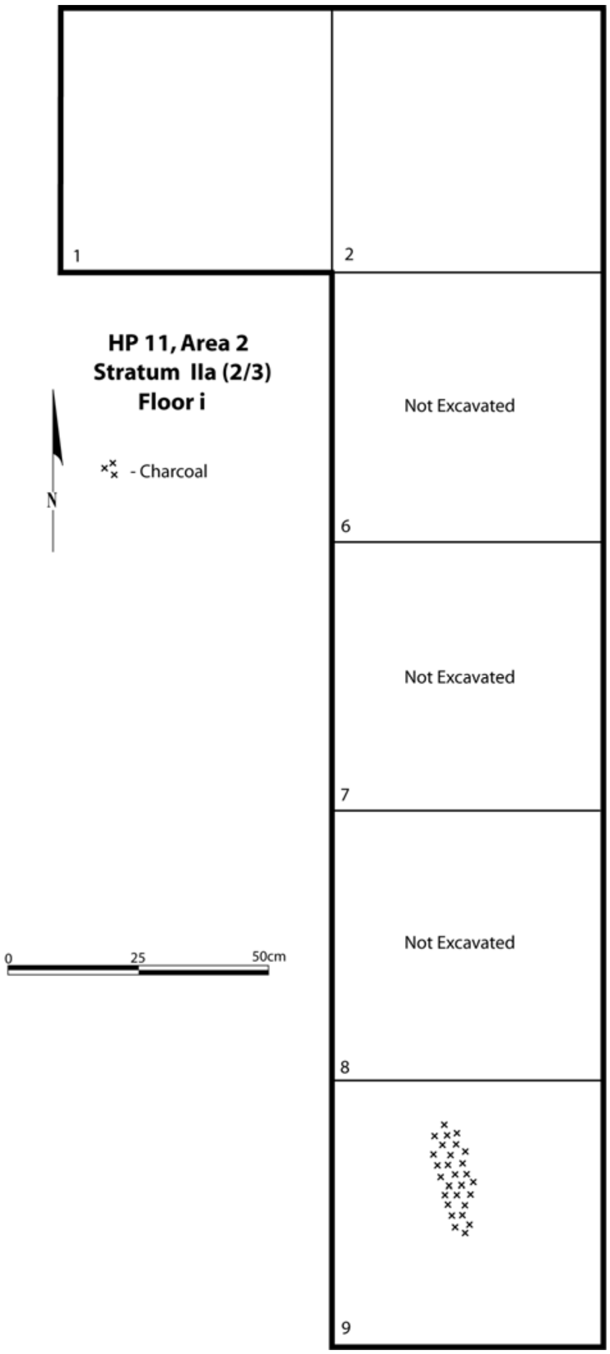


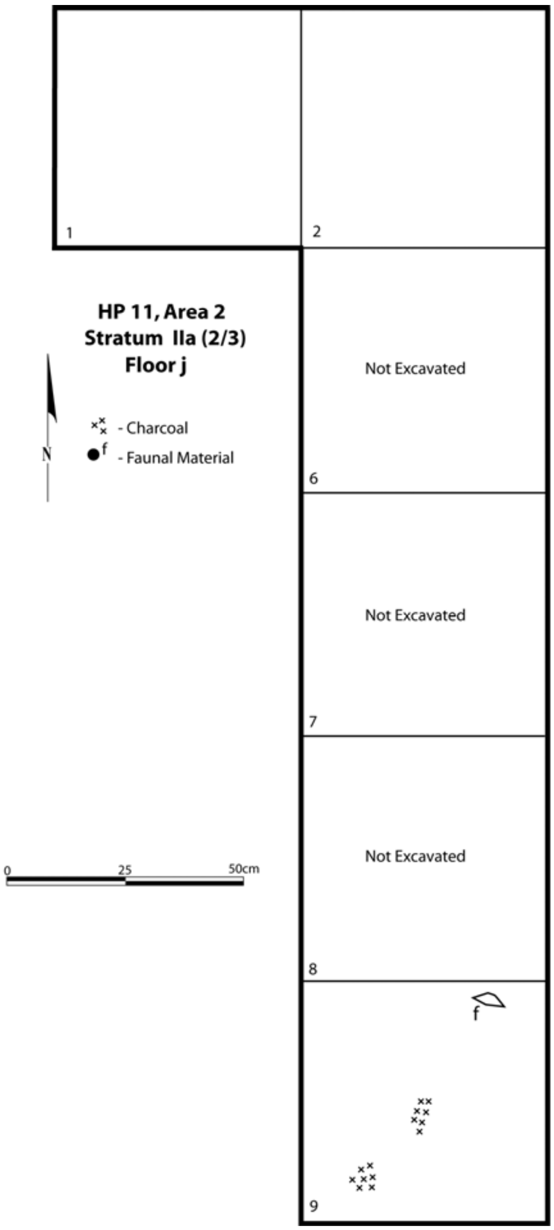
HP 11, Area 2
Stratum IIa (2/3)
Floor f
N
- Fire-Cracked Rock
- Rock
- Charcoal
0
25
50cm
1
2
6
7
8
9
Feature 2



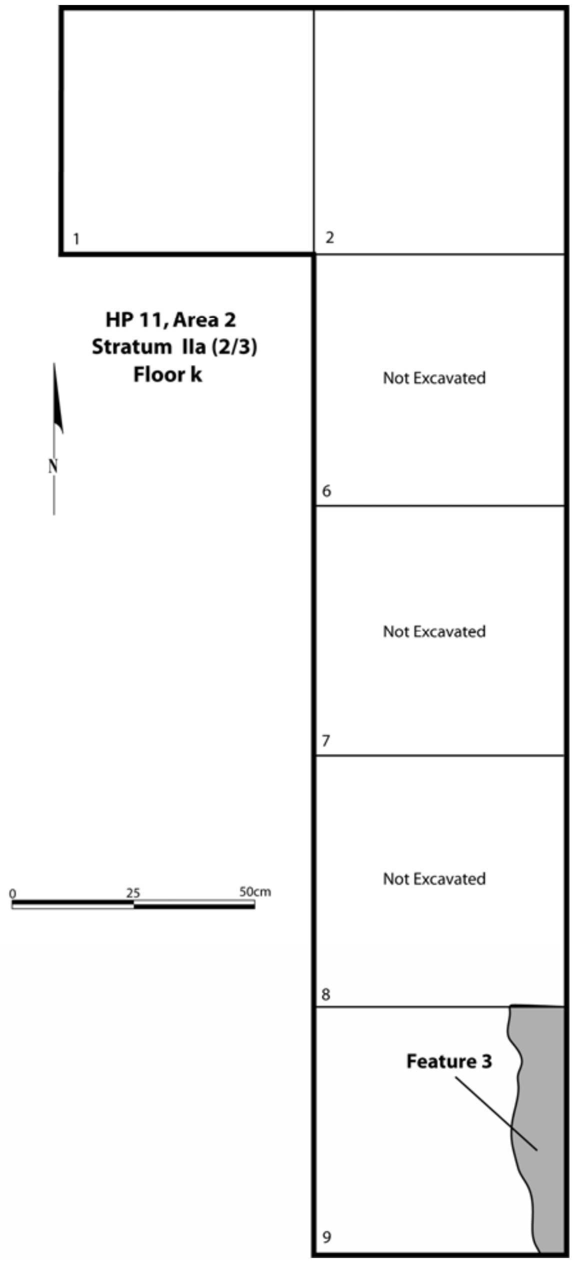
HP 11, Area 2
Stratum IIa (2/3)
Floor g
- Fire-Cracked Rock
- Rock
- Charcoal
- Faunal Material
N
0
25
50cm
1
2
6
7
8
9
f
f
Lithic Tool
Feature 2

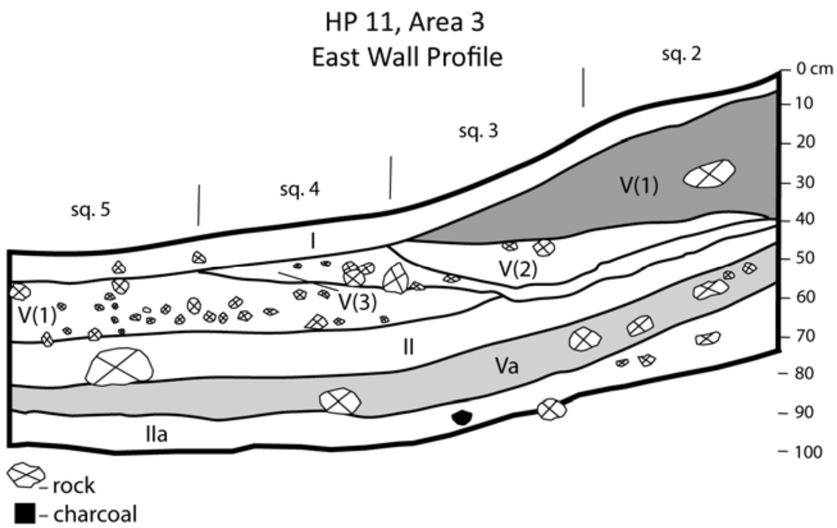

HP 11, Area 2
Stratum IIa (2/3)
Floor h
N
- Fire-Cracked Rock
- Rock
- Charcoal
f - Faunal Material
0
25
50cm
1
2
Not Excavated
6
Not Excavated
7
8
f
9

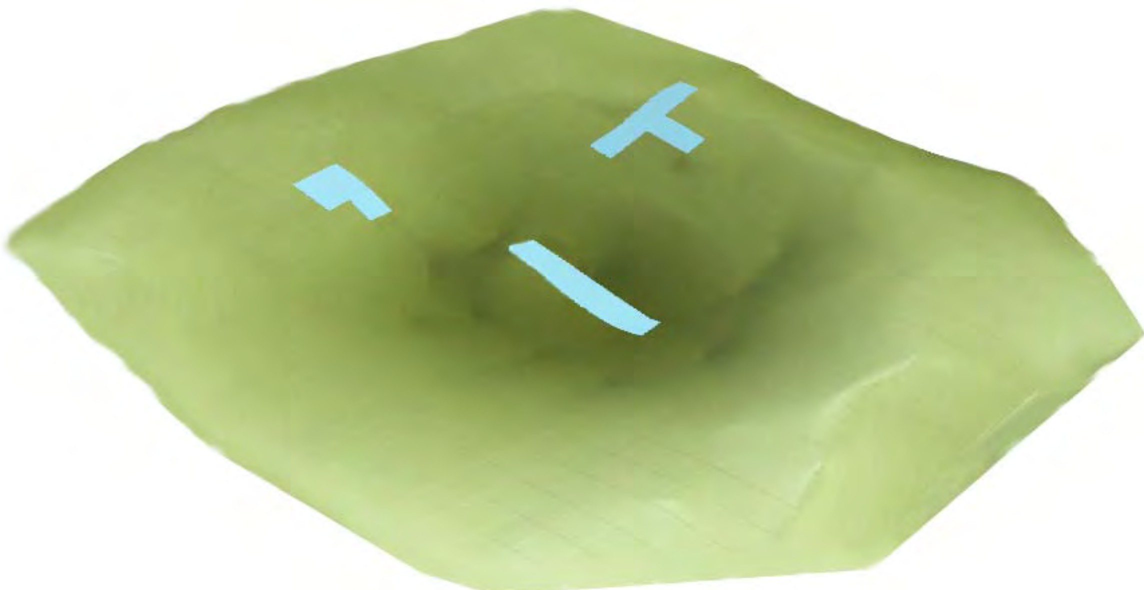

HP 11, Area 2
Stratum IIa (2/3)
Floor i
N
- Charcoal
0
25
50cm
1
2
Not Excavated
6
Not Excavated
7
Not Excavated
8
9



HP 11, Area 2
Stratum IIa (2/3)
Floor j
N
- Charcoal
f
- Faunal Material
0
25
50cm
1
2
Not Excavated
6
Not Excavated
7
Not Excavated
8
f
9

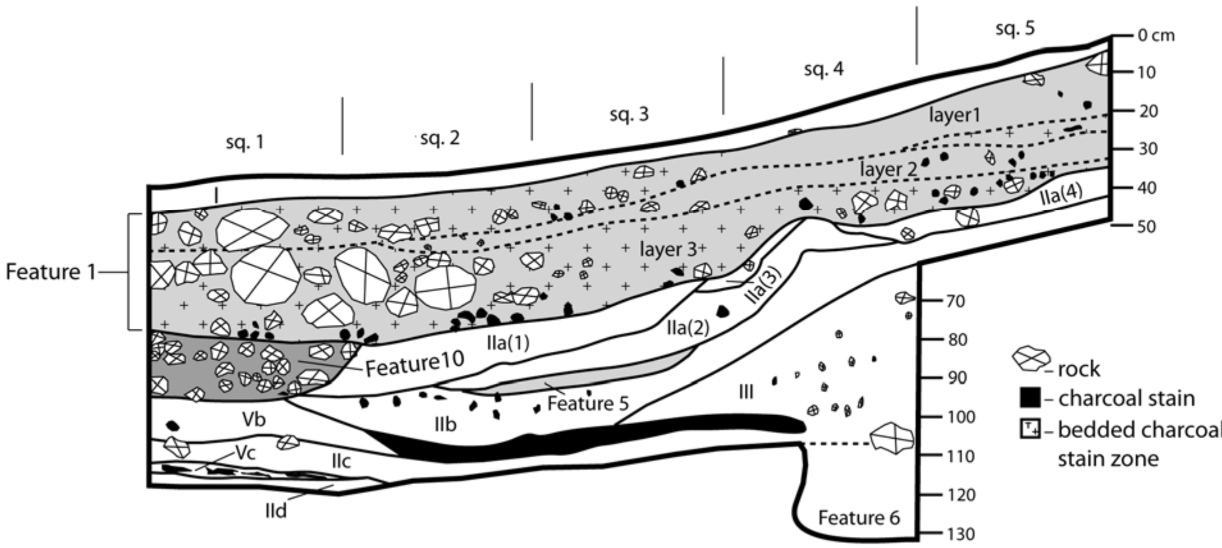

HP 11, Area 2
Stratum IIa (2/3)
Floor k
N
0
25
50cm
1
2
Not Excavated
6
Not Excavated
7
Not Excavated
8
Feature 3
9

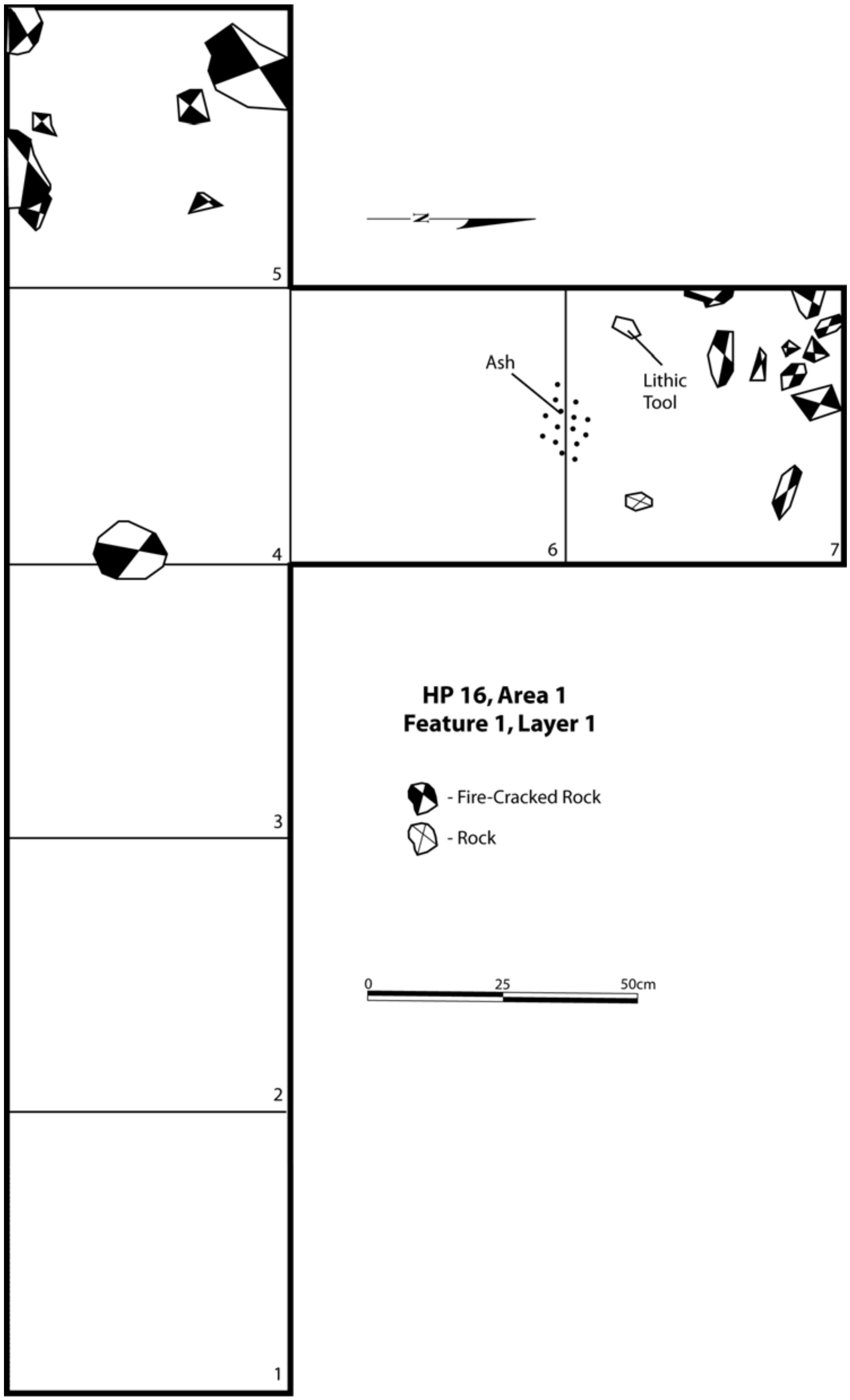

HP 11, Area 3
East Wall Profile
sq. 5
sq. 4
sq. 3
sq. 2
0 cm
10
20
30
40
50
60
70
80
90
100
I
V(1)
V(2)
V(3)
V(1)
II
Va
IIa
– rock
– charcoal



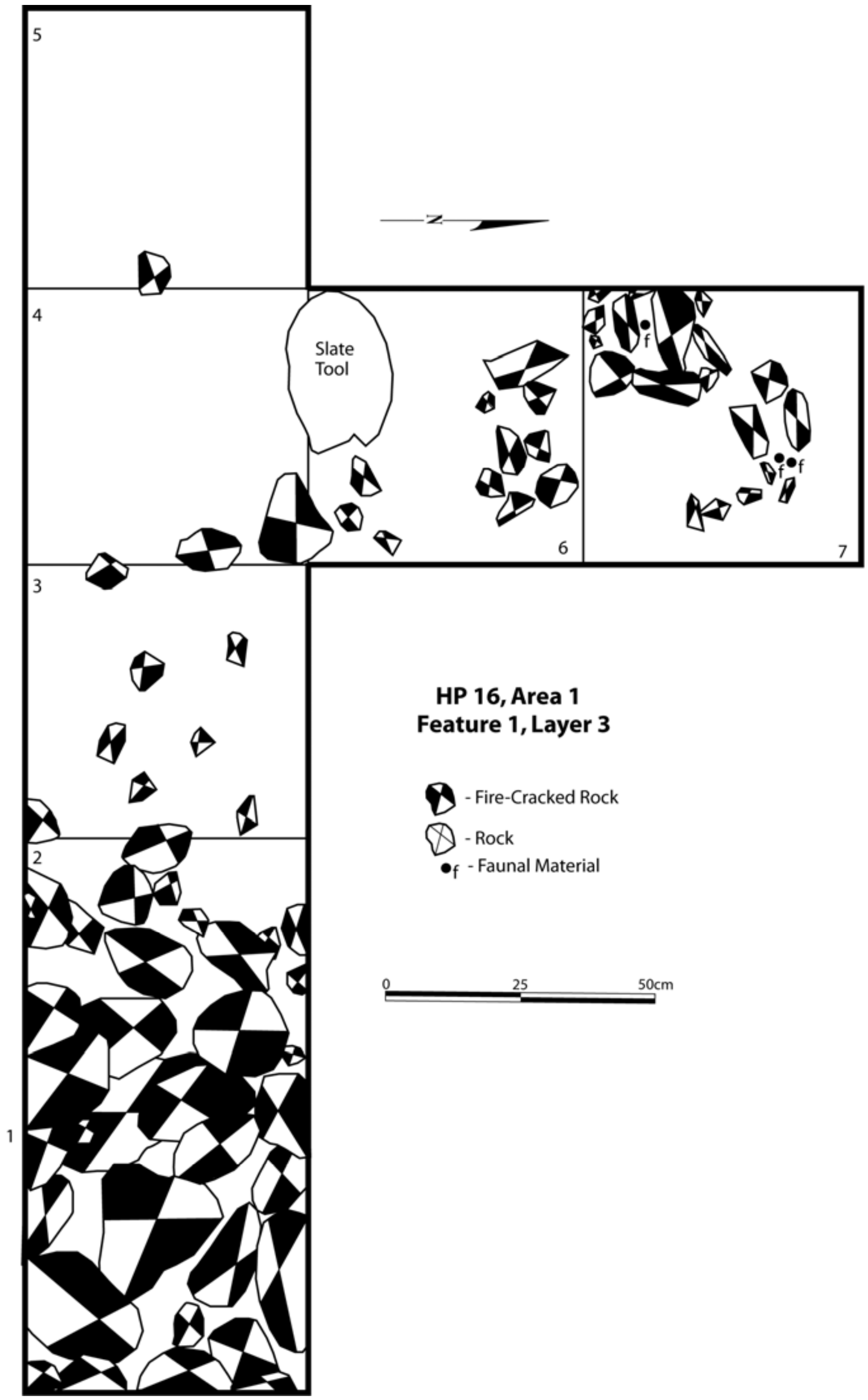
Housepit 16 contour map (Area 1 upper right; Area 2, lower right; Area 3 left)

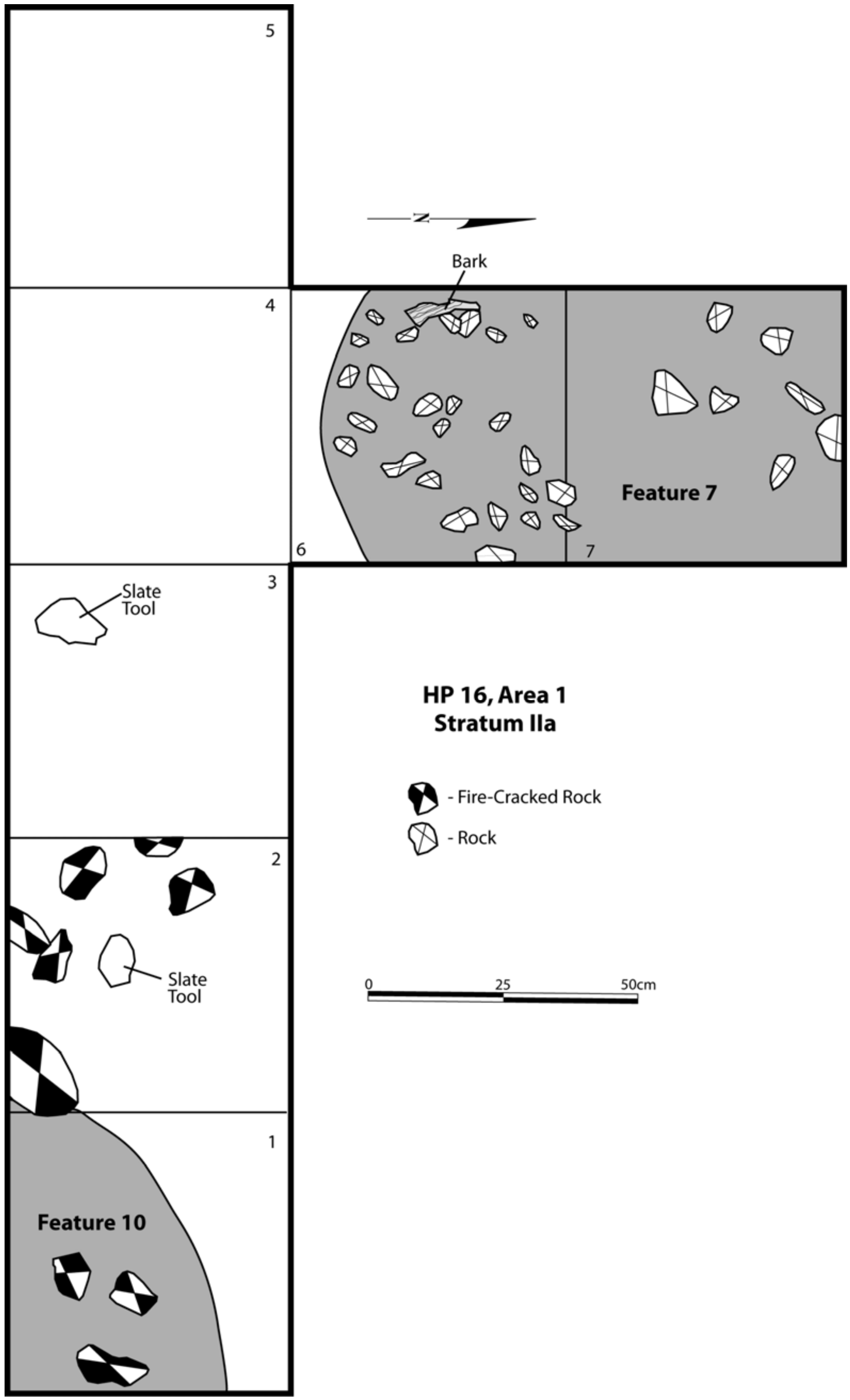
HP 16, Area 1
South Wall Profile

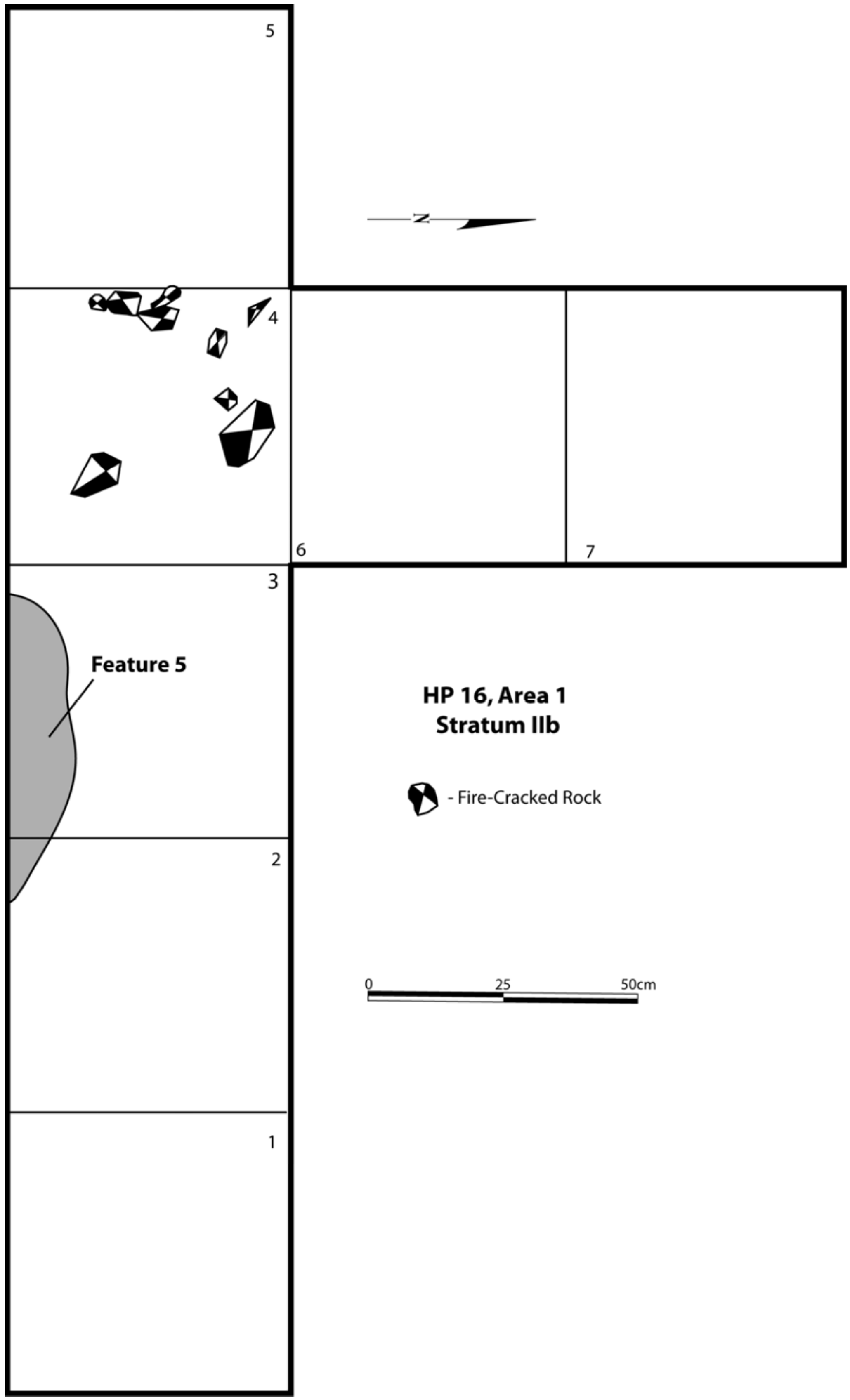


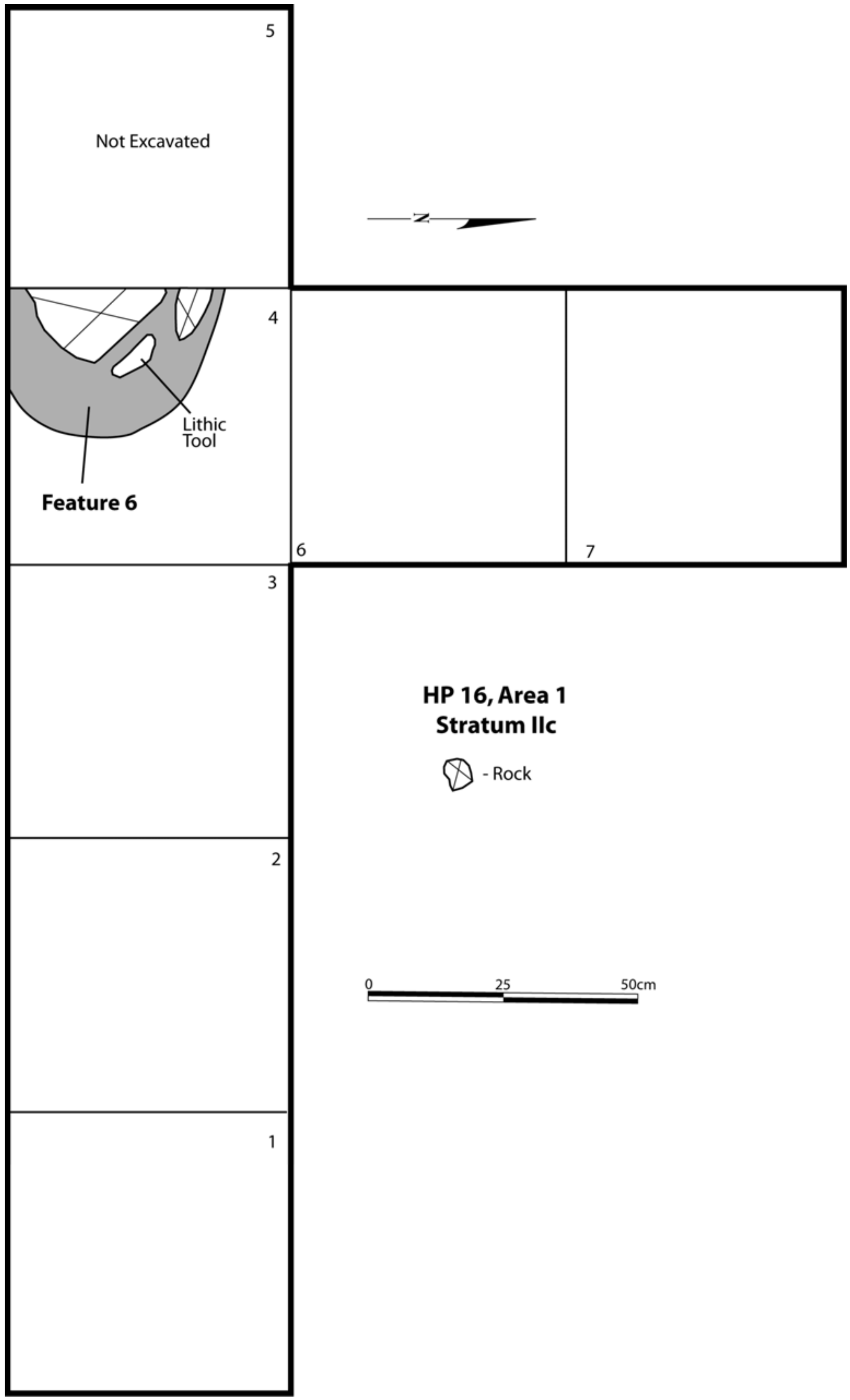


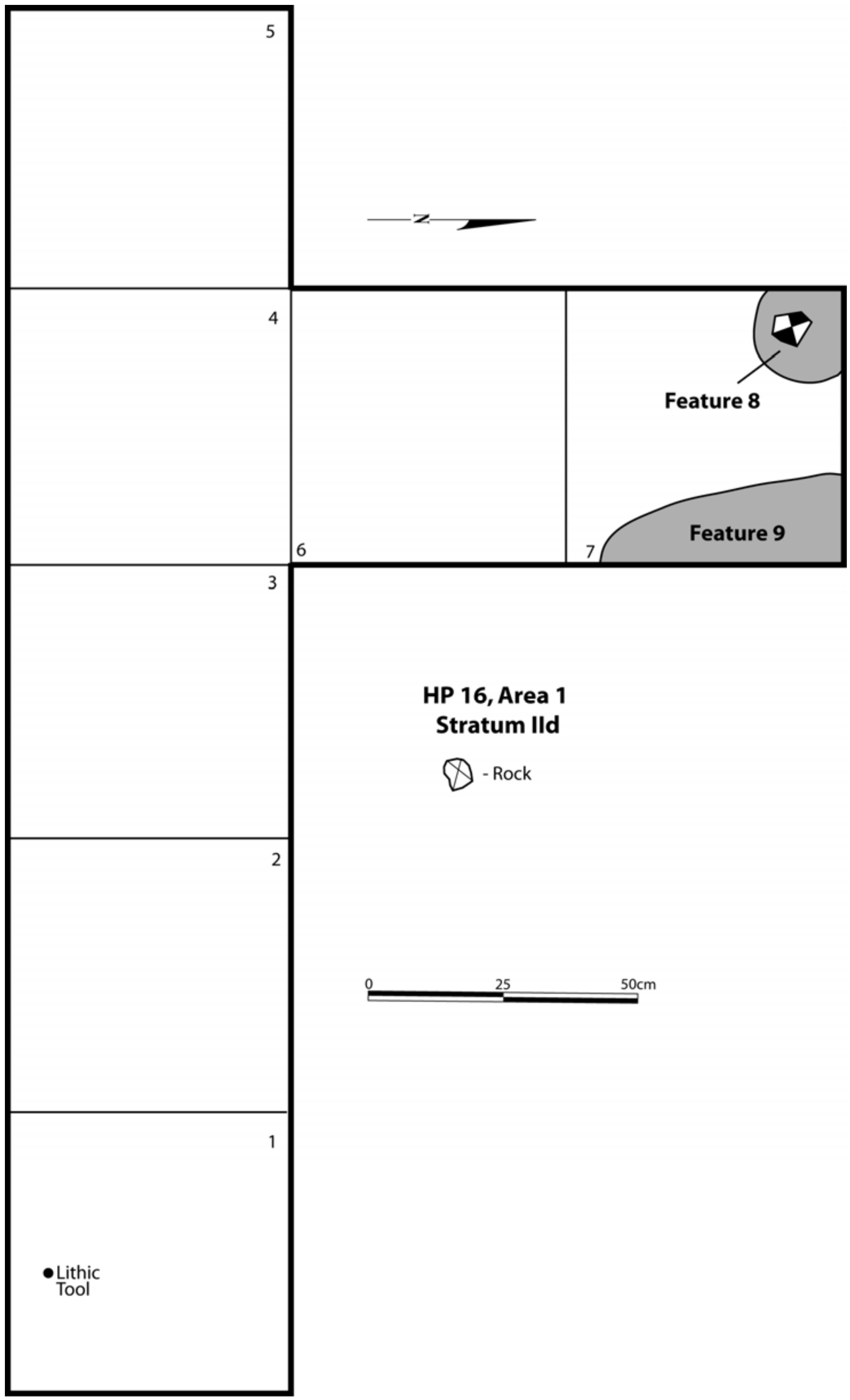

**HP 16, Area 1**
**Feature 1, Layer 1**

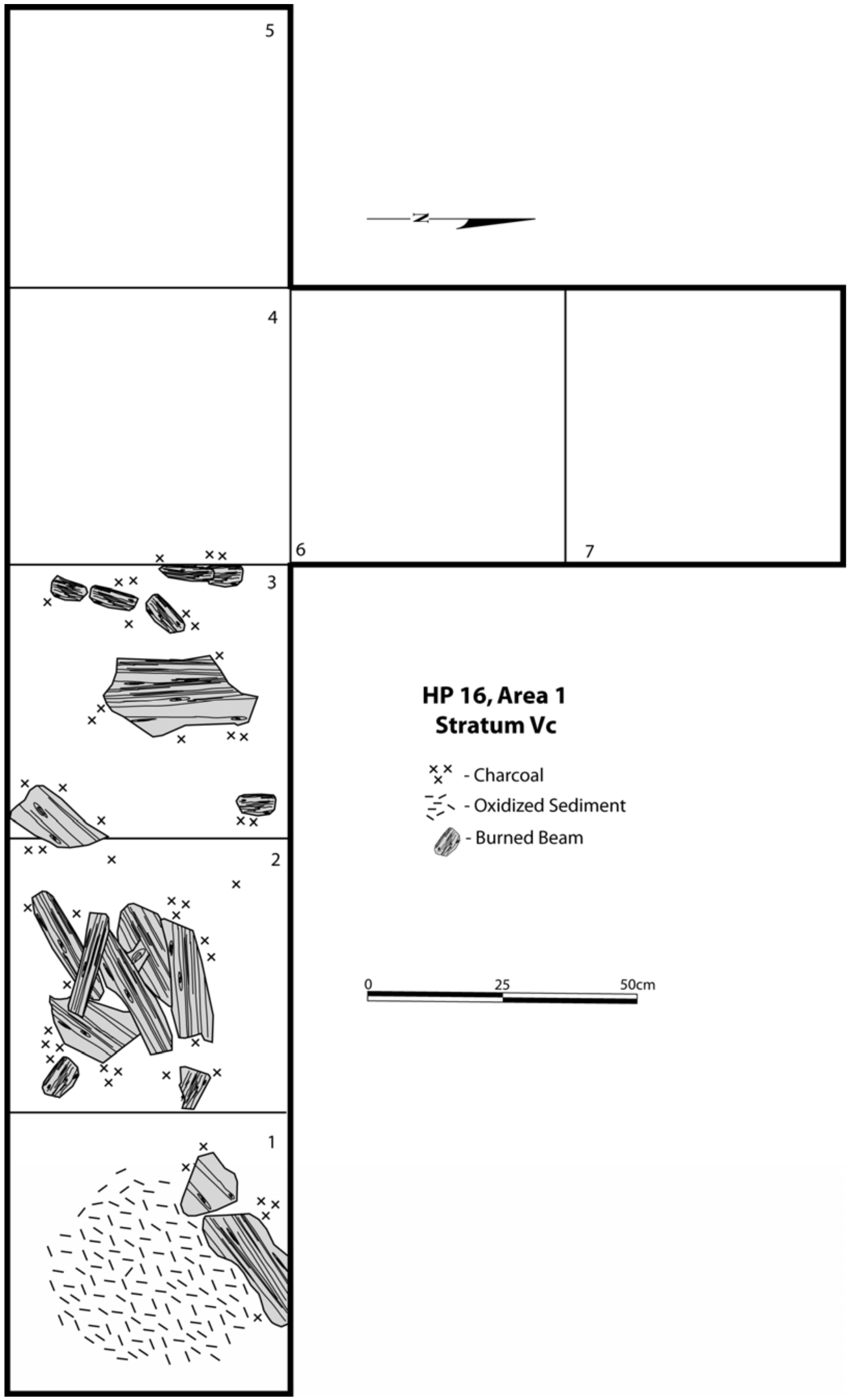

5
4
3
2
1
6
7
Slate
Tool
f
f
f
N
HP 16, Area 1
Feature 1, Layer 3
- Fire-Cracked Rock
- Rock
- Faunal Material
0
25
50cm


N
Bark
5
4
3
2
1
6
7
Feature 7
Feature 10
Slate Tool
Slate Tool
HP 16, Area 1
Stratum IIa
- Fire-Cracked Rock
- Rock
0
25
50cm

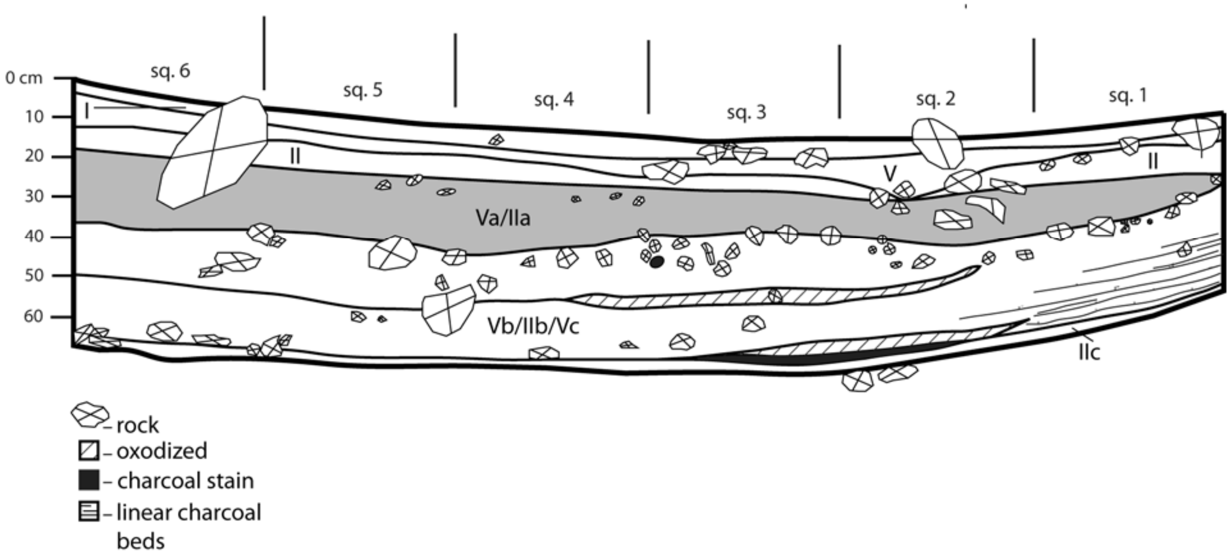

5
N
4
6
7
3
Feature 5
HP 16, Area 1
Stratum IIb
- Fire-Cracked Rock
2
0
25
50cm
1

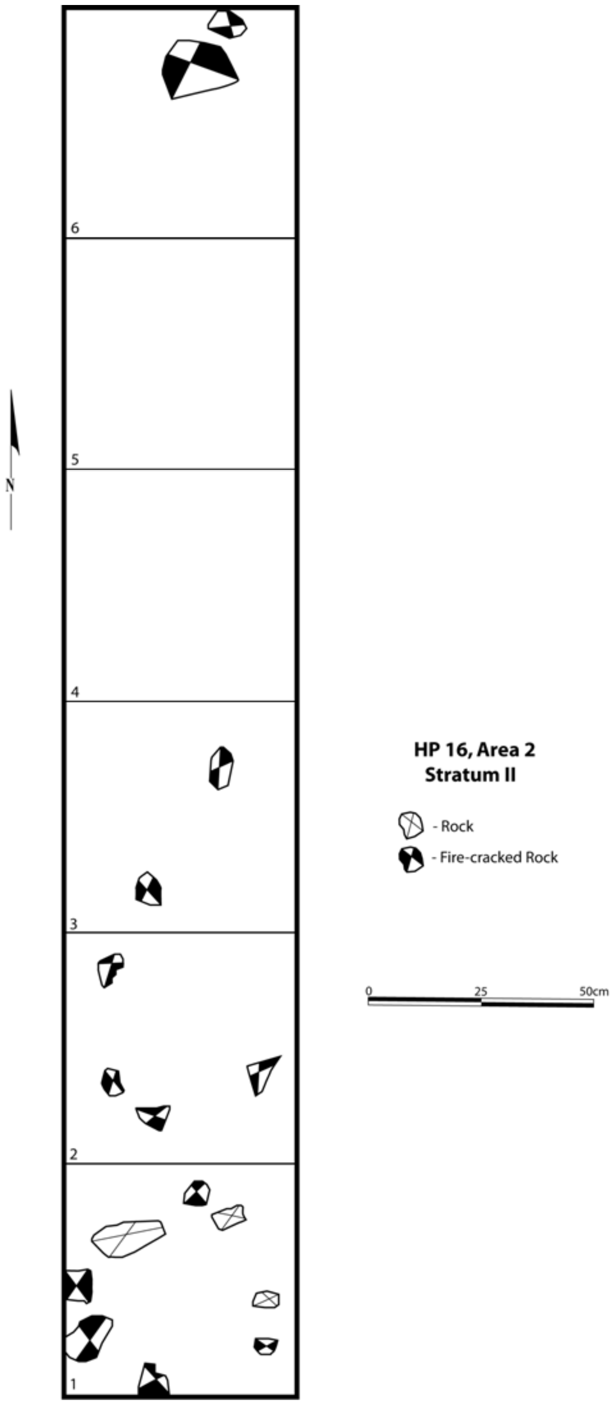

5
Not Excavated
N
4
Lithic
Tool
Feature 6
6
7
3
HP 16, Area 1
Stratum IIc
- Rock
2
0
25
50cm
1

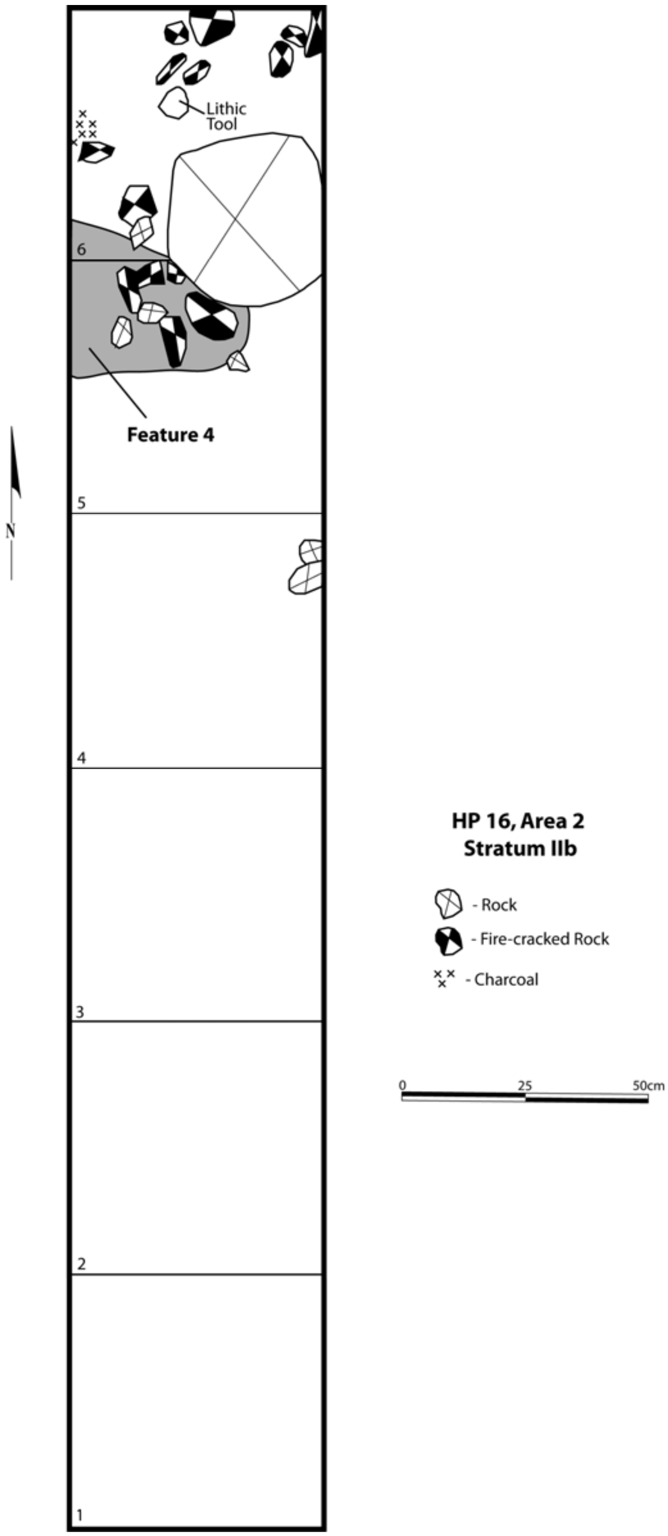

5
N
4
Feature 8
Feature 9
6
7
3
HP 16, Area 1
Stratum IId
- Rock
2
0
25
50cm
1
Lithic
Tool


5
4
6
7
3
2
1
N
HP 16, Area 1
Stratum Vc
- Charcoal
- Oxidized Sediment
- Burned Beam
0
25
50cm

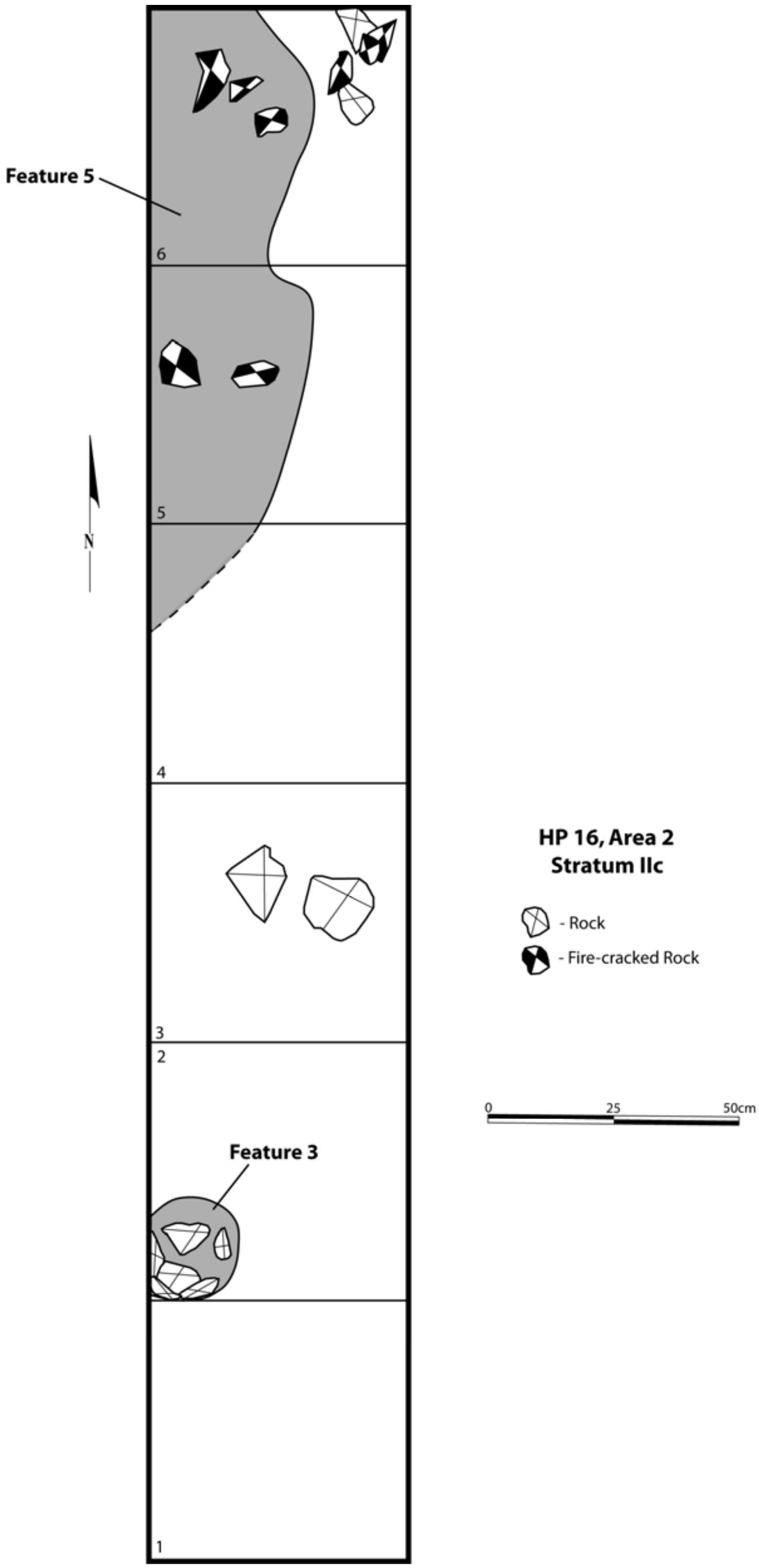
HP 16, Area 2
East Wall



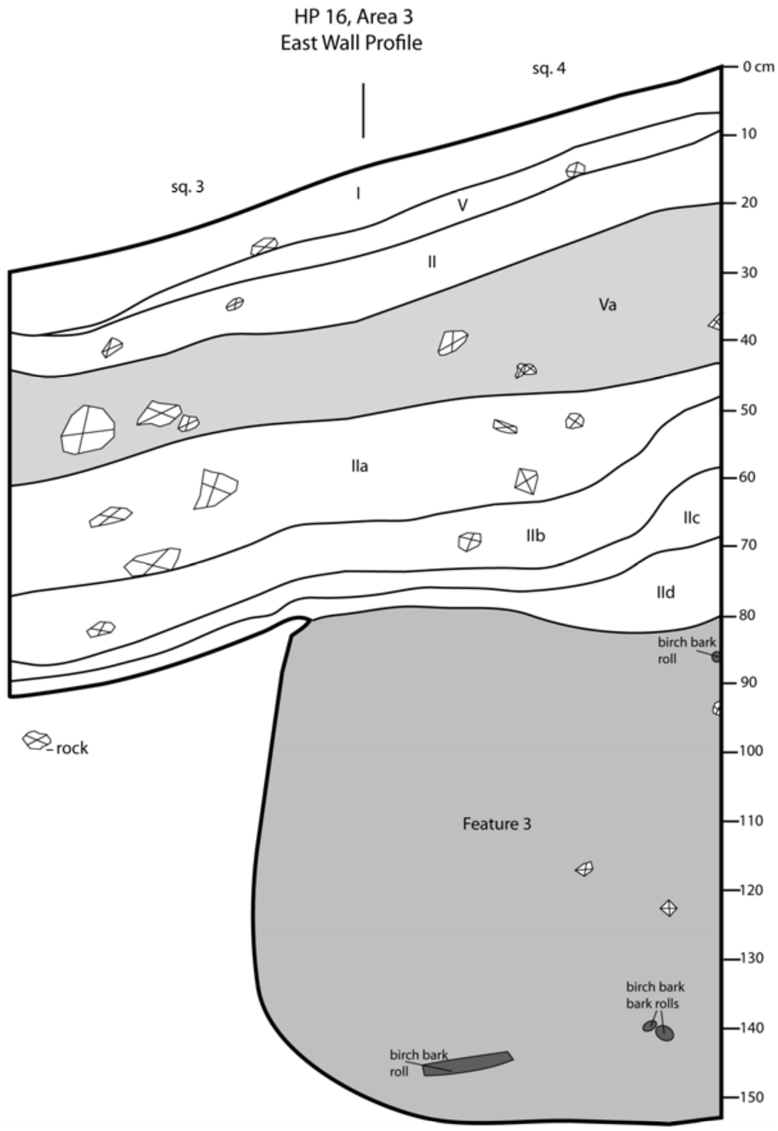

HP 16, Area 2
Stratum II
- Rock
- Fire-cracked Rock
0
25
50cm
N
1
2
3
4
5
6



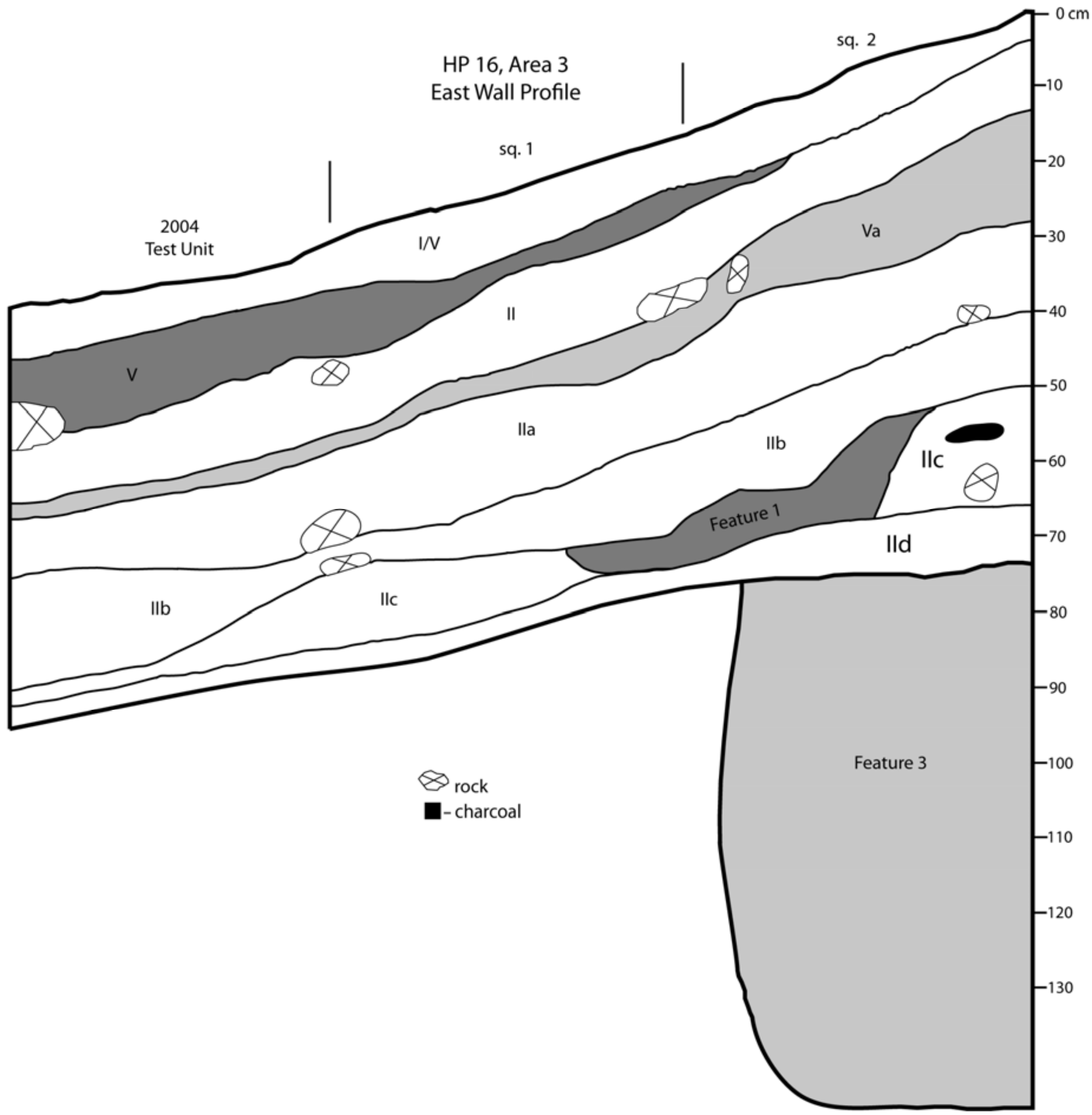
Lithic
Tool
6
Feature 4
5
N
4
3
2
1
HP 16, Area 2
Stratum IIb
- Rock
- Fire-cracked Rock
- Charcoal
0
25
50cm

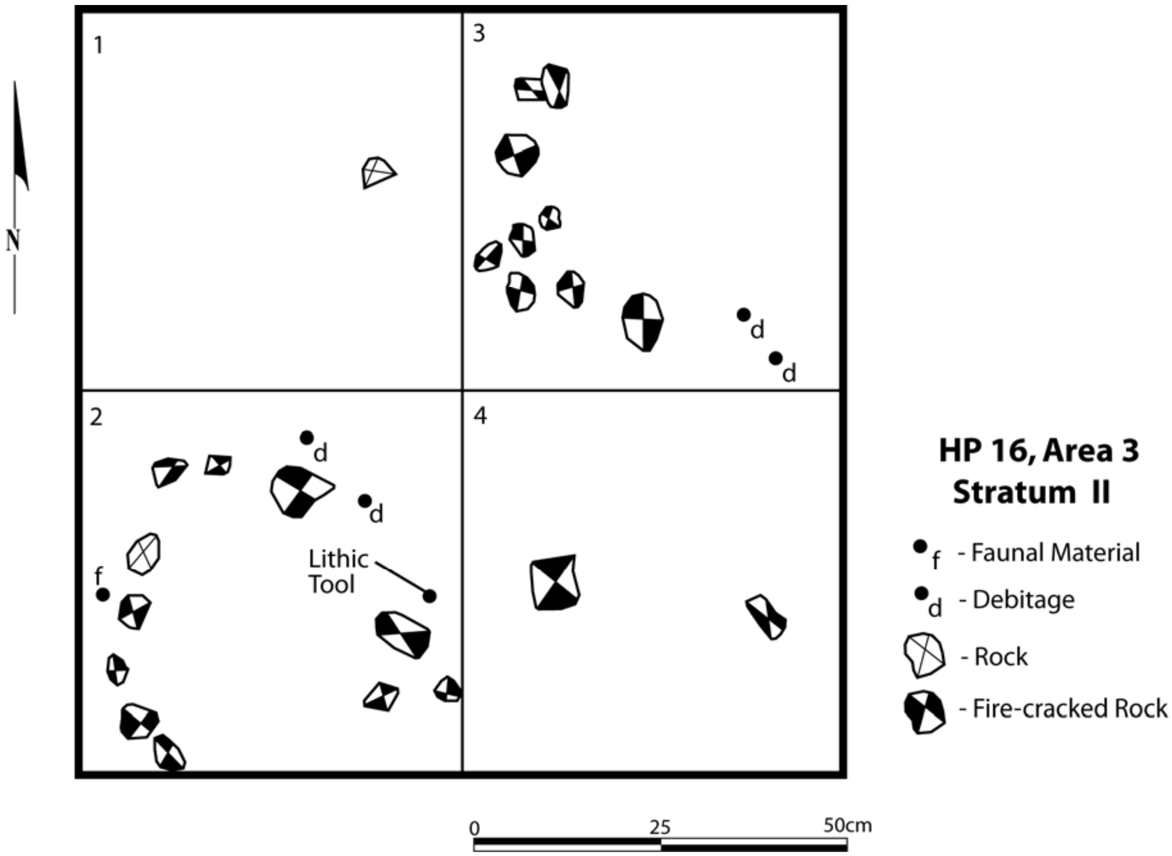


Feature 5
6
5
N
4
HP 16, Area 2
Stratum IIc
- Rock
- Fire-cracked Rock
3
2
0
25
50cm
Feature 3
1

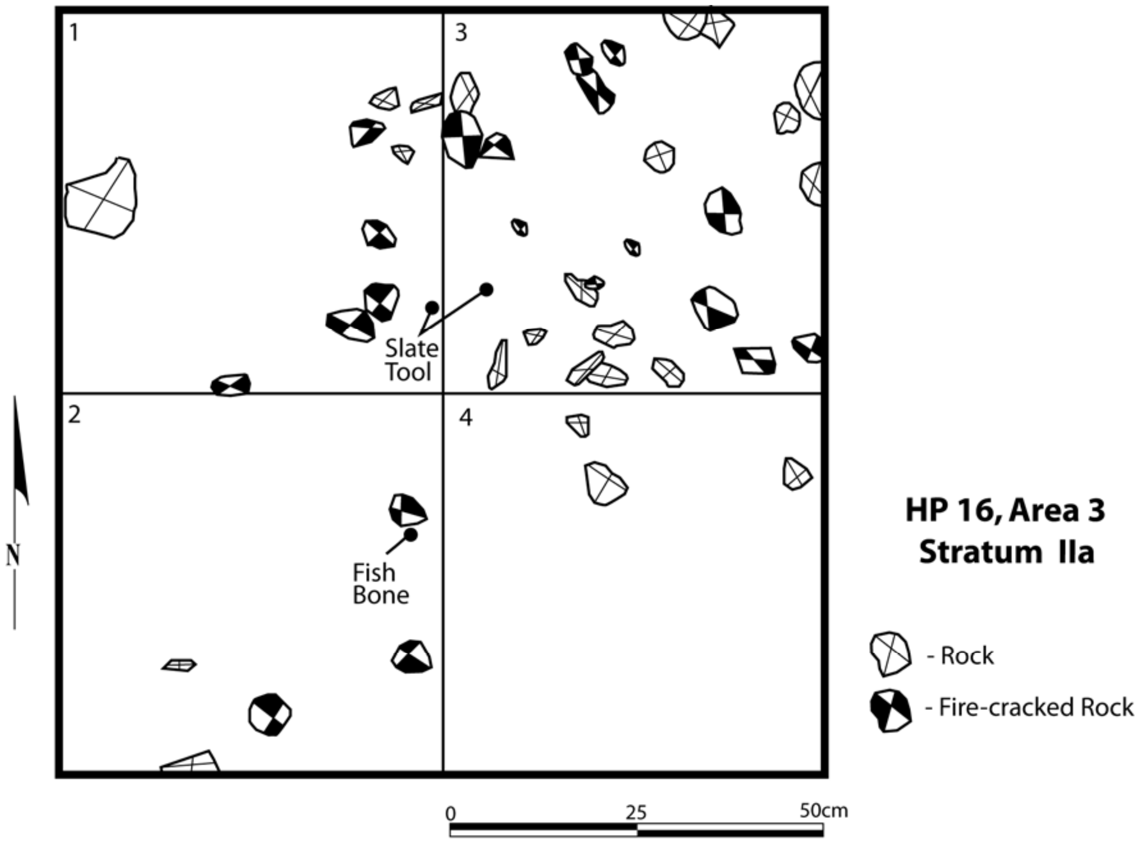


HP 16, Area 3
East Wall Profile
sq. 3
sq. 4
I
V
II
Va
IIa
IIb
IIc
IId
Feature 3
birch bark roll
birch bark bark rolls
birch bark roll
rock
0 cm
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

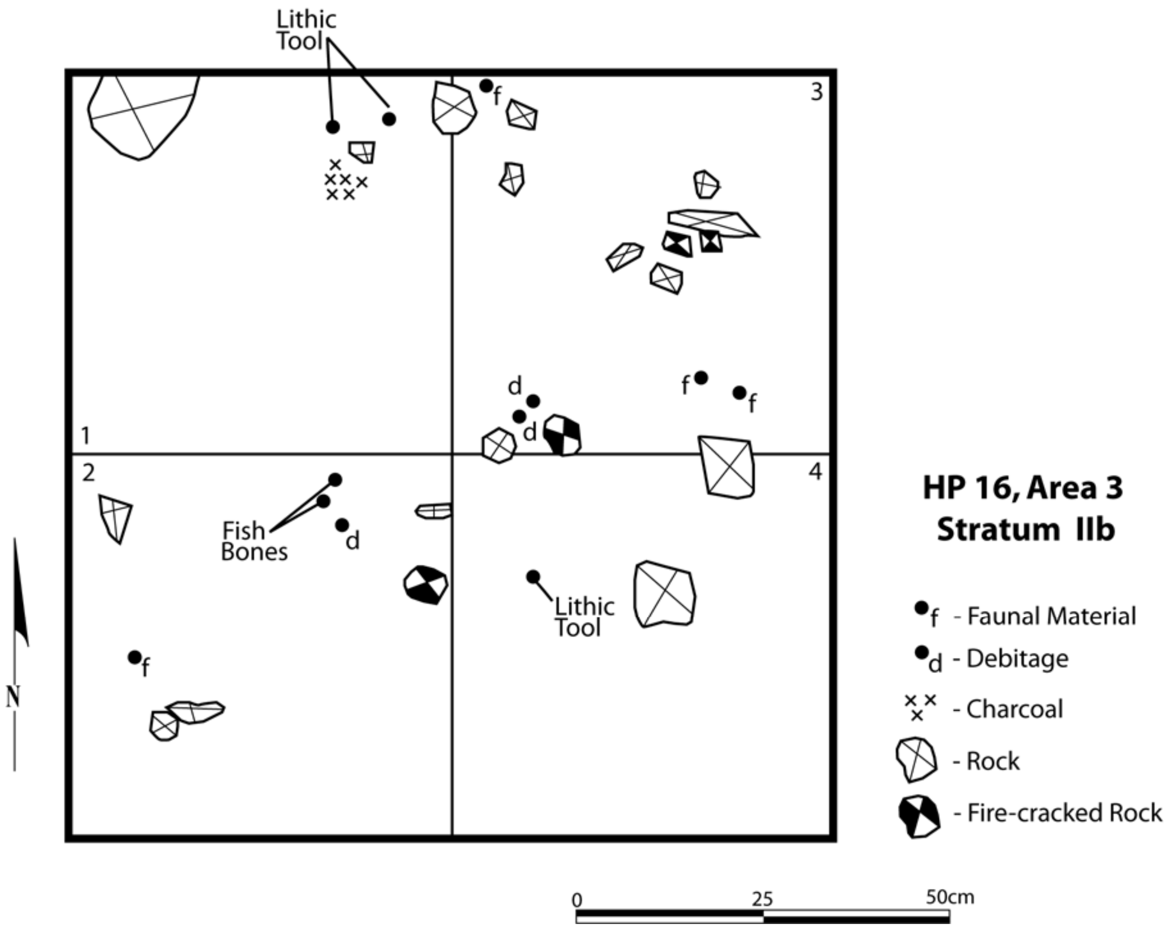

HP 16, Area 3
East Wall Profile
sq. 2
sq. 1
2004
Test Unit
I/V
V
II
Va
IIa
IIb
IIc
Feature 1
IId
IIb
IIc
Feature 3
rock
- charcoal
0 cm
10
20
30
40
50
60
70
80
90
100
110
120
130



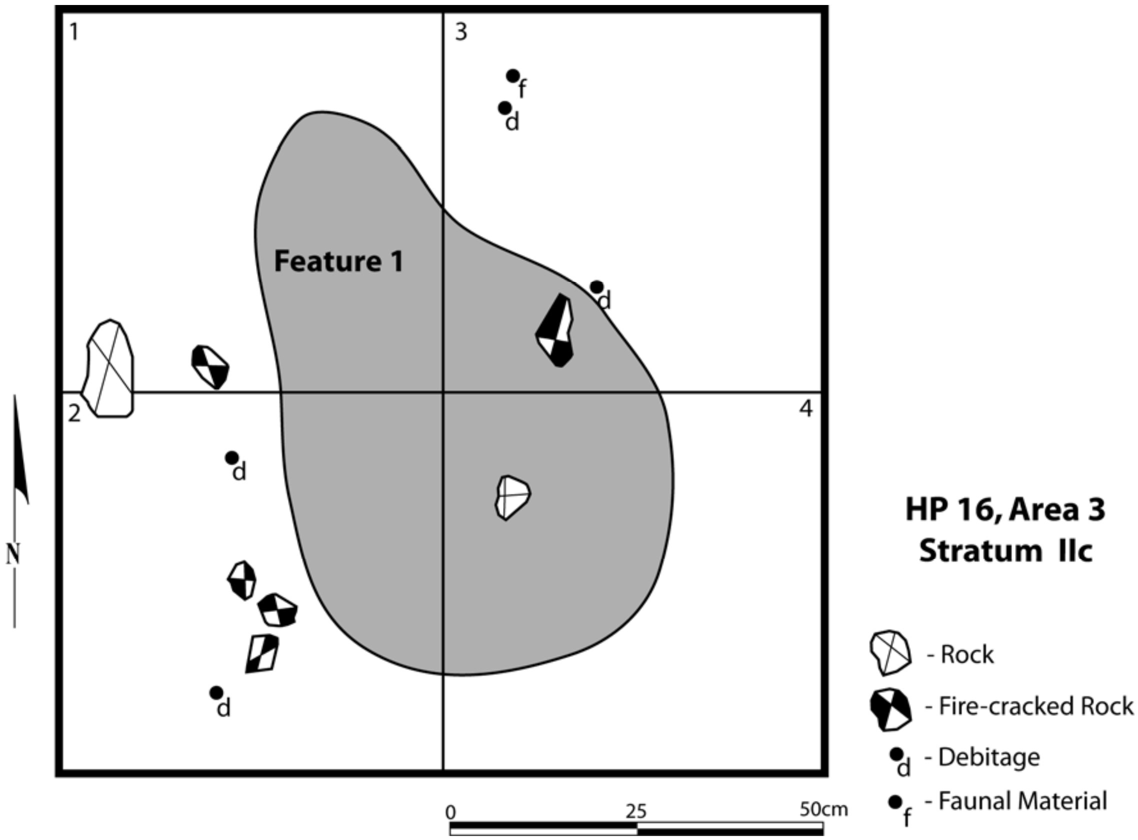
N
1
3
2
4
d
d
d
d
f
Lithic
Tool
0
25
50cm
HP 16, Area 3
Stratum II
f - Faunal Material
d - Debitage
- Rock
- Fire-cracked Rock

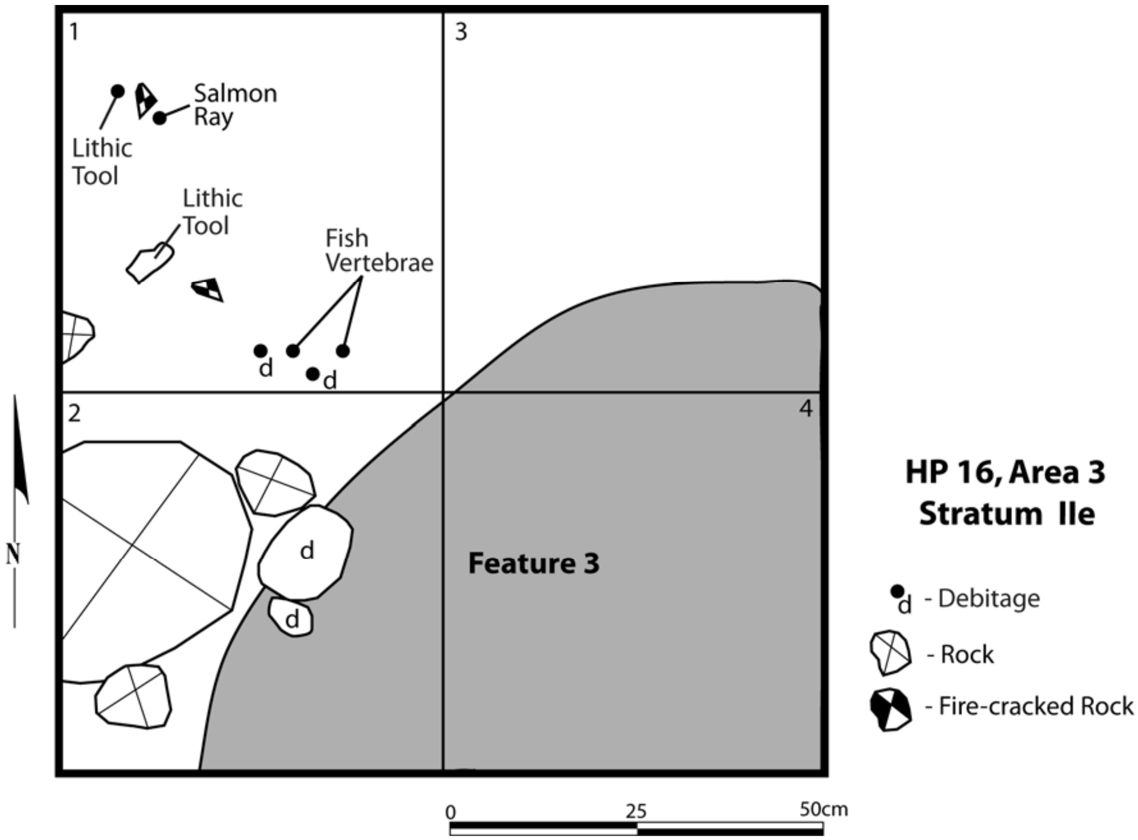



**HP 16, Area 3**
**Stratum IIa**

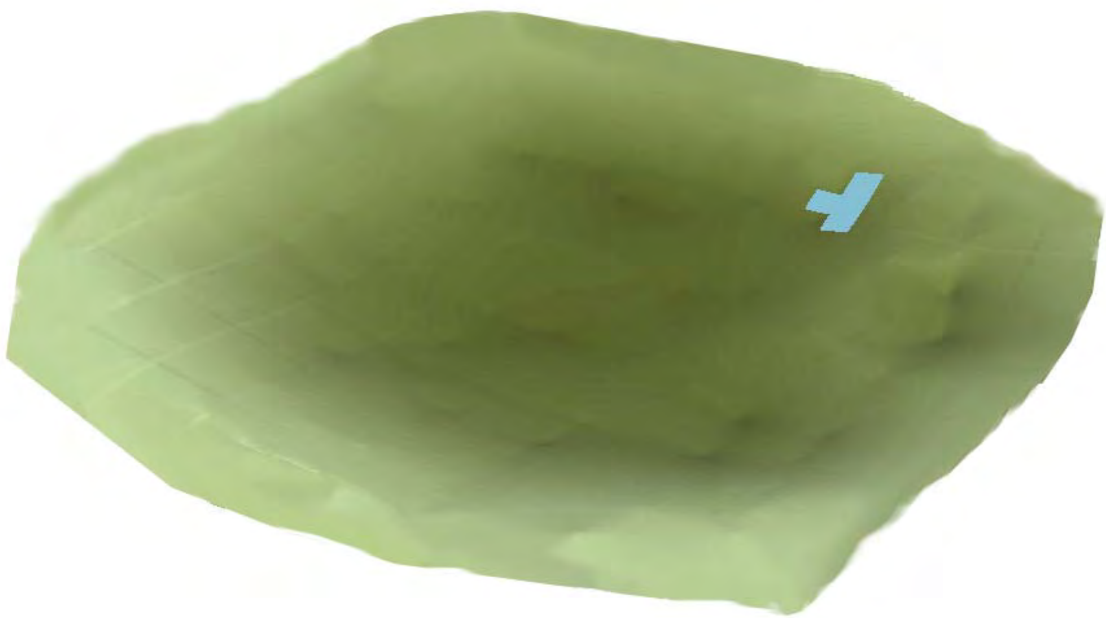


Lithic Tool
f
3
1
d
d
f
f
2
4
Fish Bones
d
Lithic Tool
f
N
HP 16, Area 3
Stratum IIb
f - Faunal Material
d - Debitage
- Charcoal
- Rock
- Fire-cracked Rock
0
25
50cm

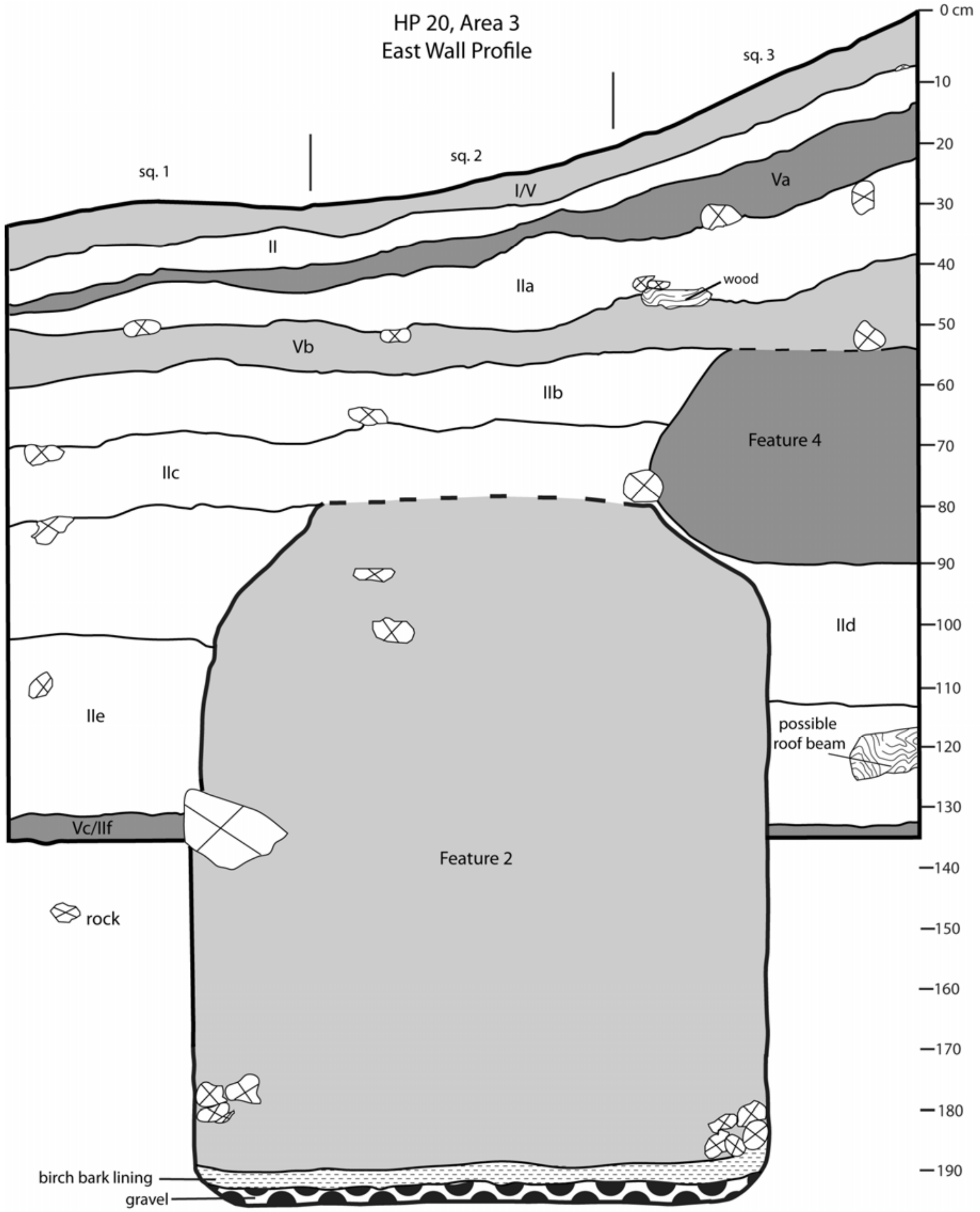

1
3
2
4
Feature 1
f
d
d
d
d
N
0
25
50cm
HP 16, Area 3
Stratum IIc
- Rock
- Fire-cracked Rock
d - Debitage
f - Faunal Material



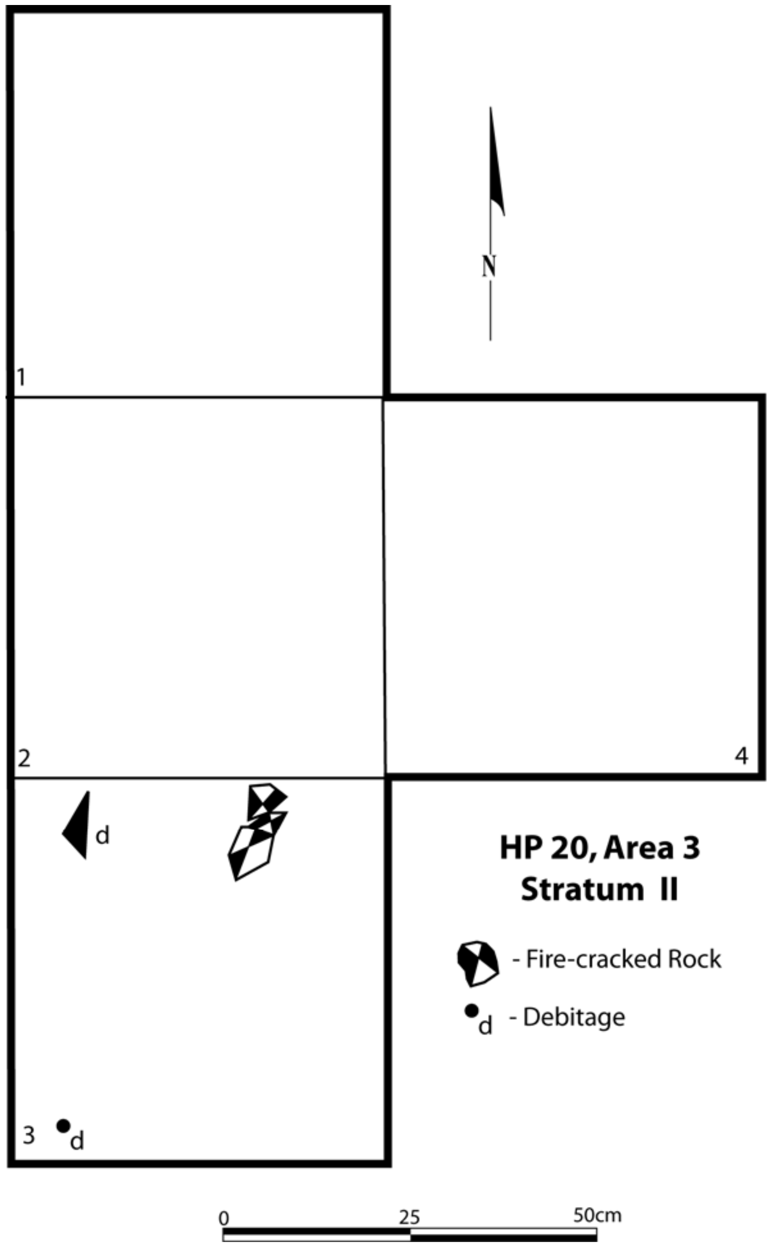
1
3
2
4
Salmon
Ray
Lithic
Tool
Lithic
Tool
Fish
Vertebrae
d
d
d
d
Feature 3
N
HP 16, Area 3
Stratum IIe
d - Debitage
- Rock
- Fire-cracked Rock
0
25
50cm

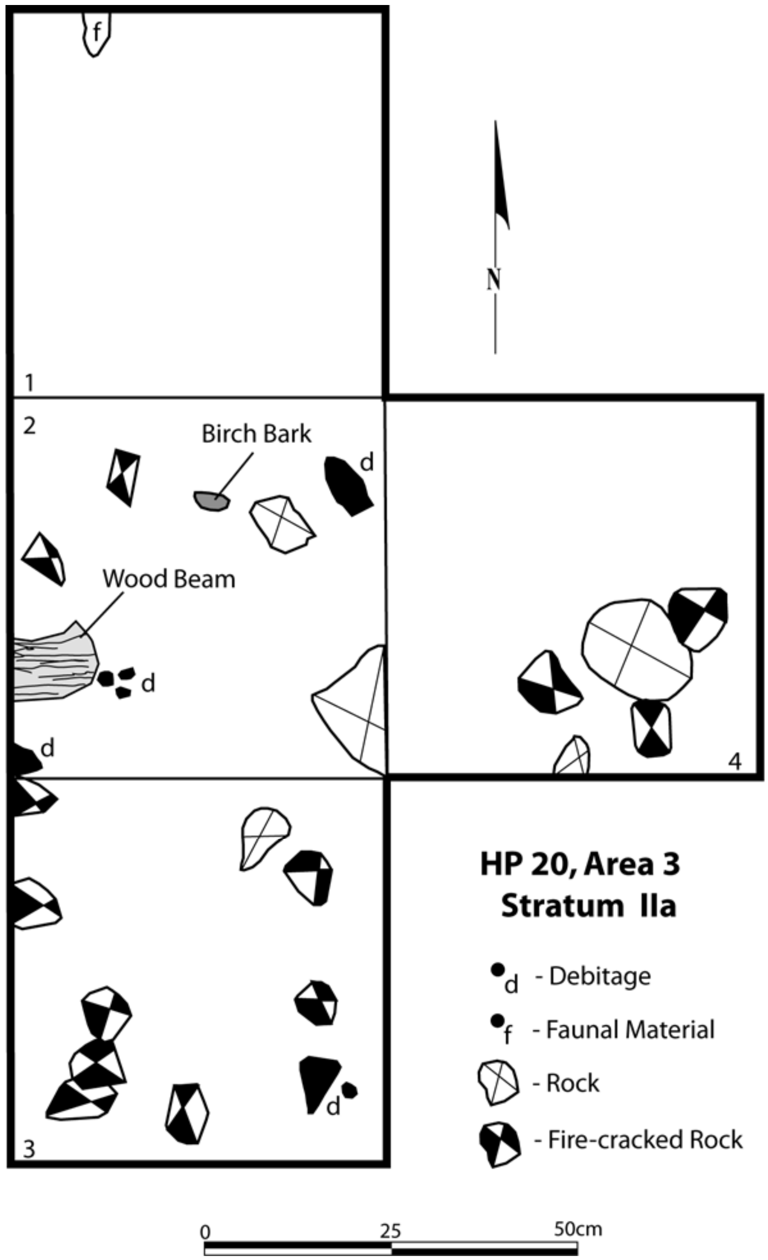


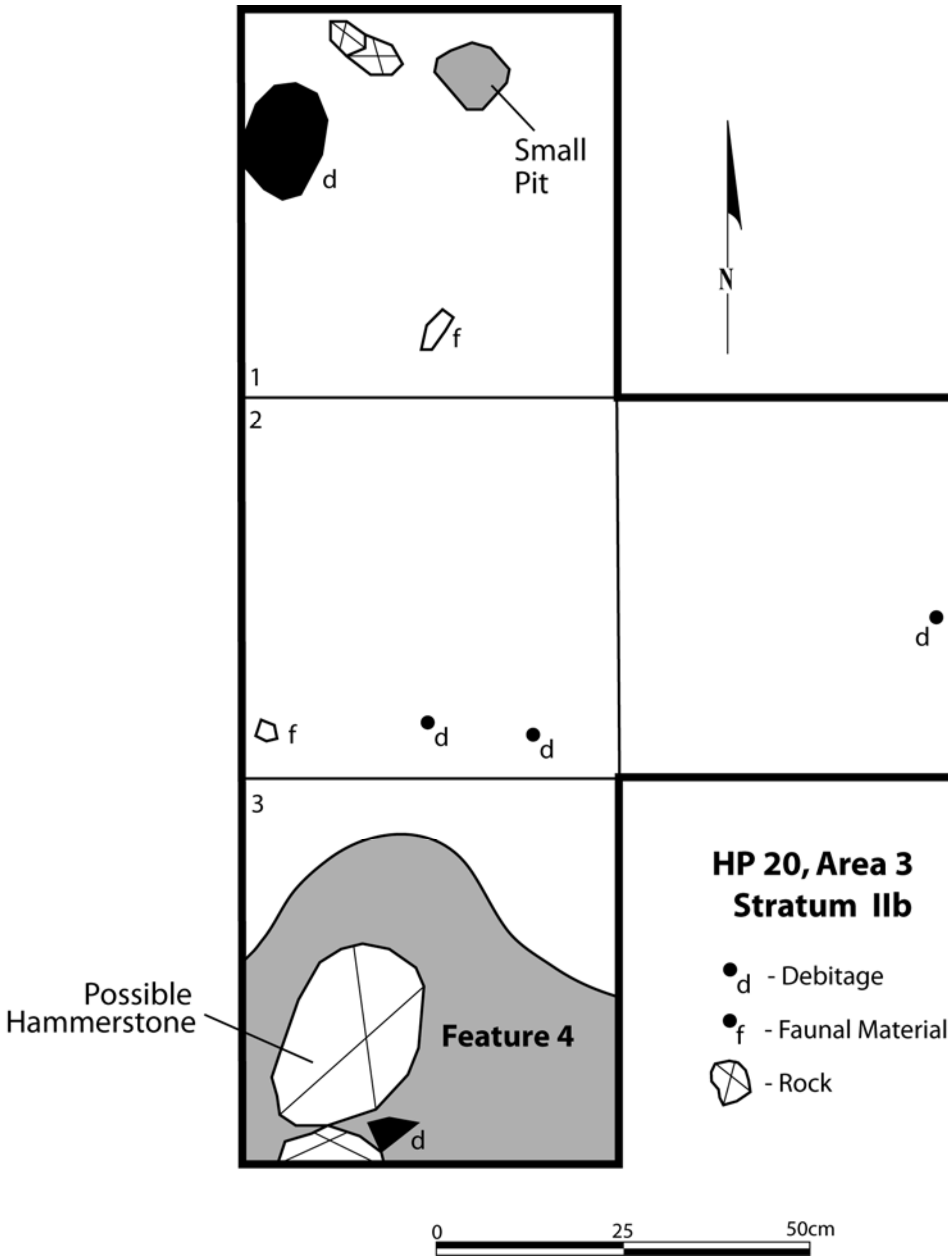
Housepit 20 contour map showing position of Area 3 excavations.



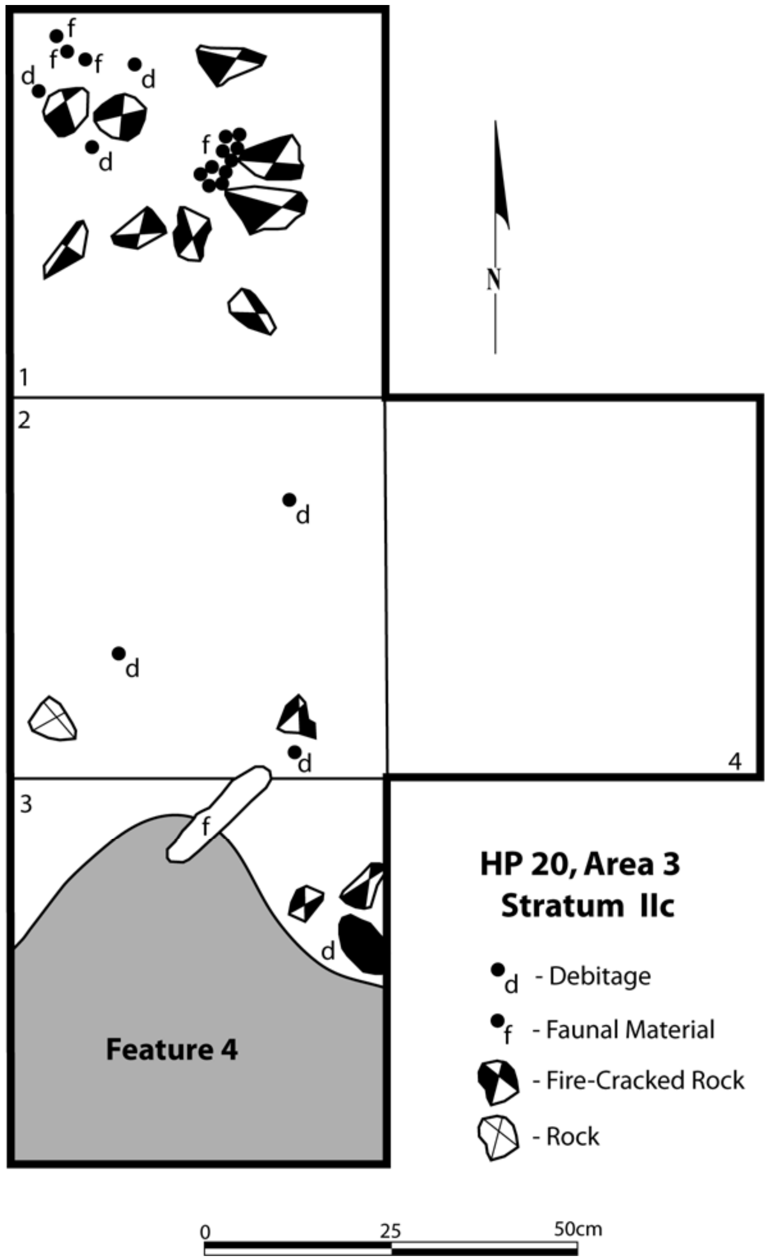
HP 20, Area 3
East Wall Profile
sq. 1
sq. 2
sq. 3
0 cm
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
I/V
Va
II
IIa
wood
Vb
IIb
Feature 4
IIc
IId
IIe
possible
roof beam
Vc/IIf
Feature 2
rock
birch bark lining
gravel


N
1
2
3
4
d
d
HP 20, Area 3
Stratum II
- Fire-cracked Rock
d - Debitage
0
25
50cm

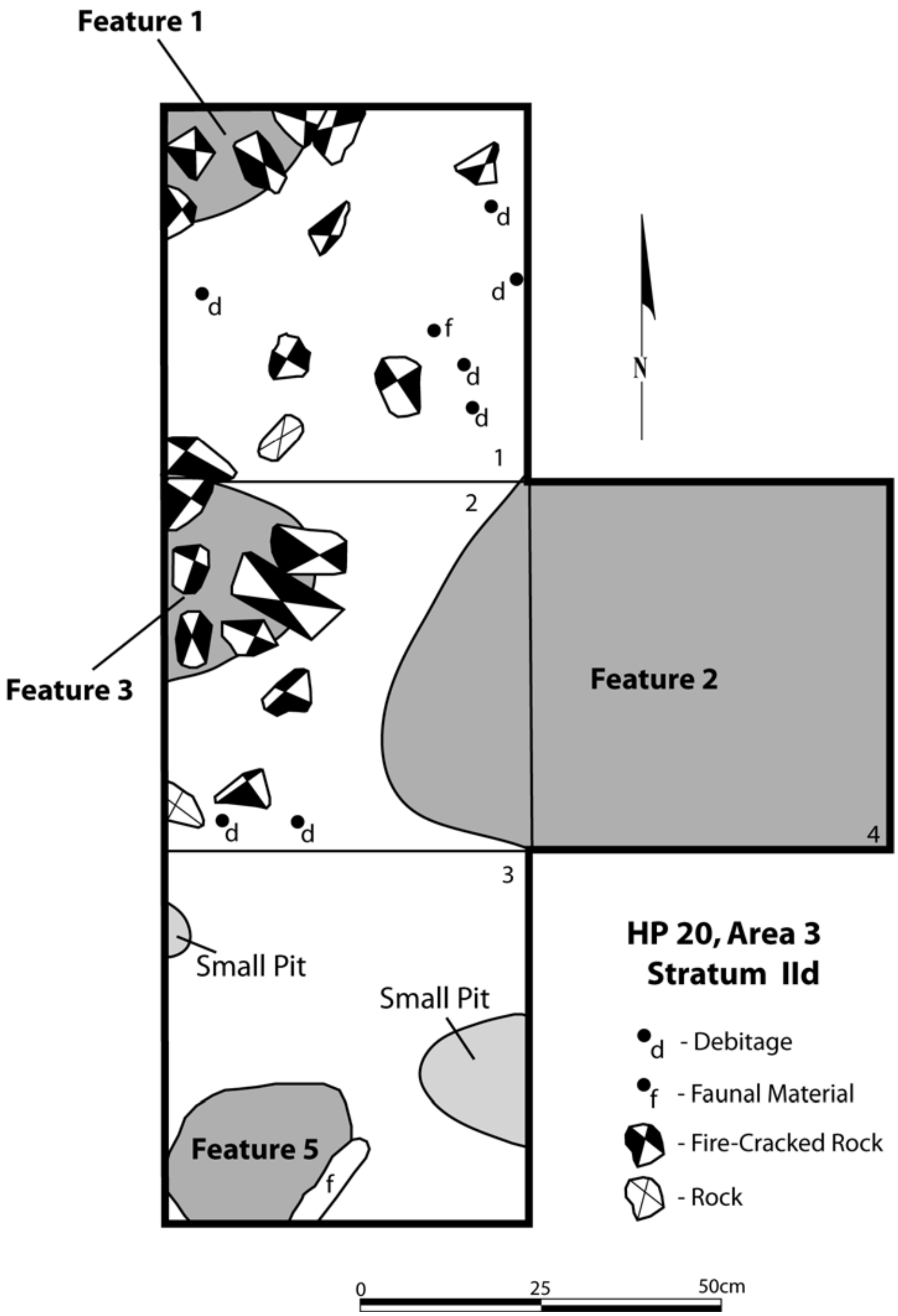

f
N
1
2
Birch Bark
d
Wood Beam
d
d
4
3
d
HP 20, Area 3
Stratum IIa
d - Debitage
f - Faunal Material
- Rock
- Fire-cracked Rock
0
25
50cm

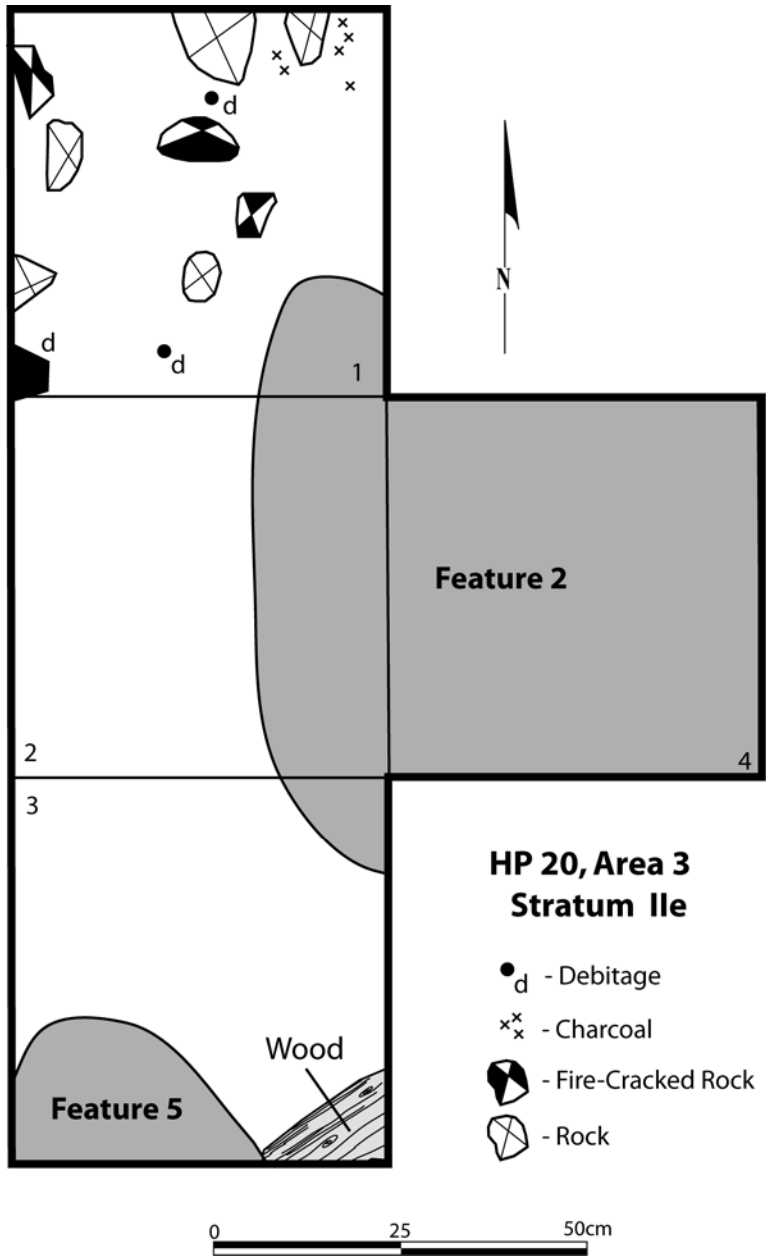


Small
Pit
d
f
1
2
3
4
N
d
f
d
d
Possible
Hammerstone
Feature 4
d
HP 20, Area 3
Stratum IIb
d - Debitage
f - Faunal Material
- Rock
0
25
50cm

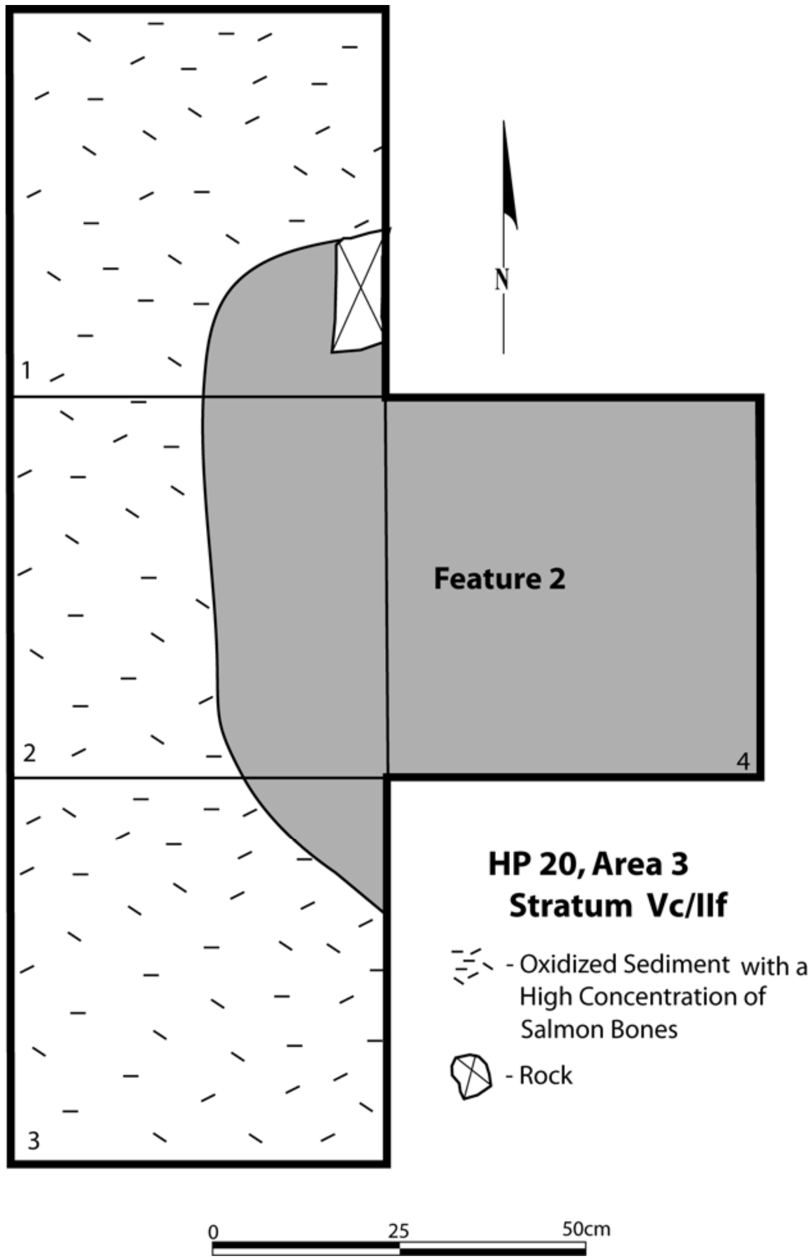


N
1
2
3
4
f
d
Feature 4
HP 20, Area 3
Stratum IIc
d - Debitage
f - Faunal Material
- Fire-Cracked Rock
- Rock
0
25
50cm


Feature 1
d
d
d
f
d
d
1
2
Feature 3
Feature 2
d
d
4
3
Small Pit
Small Pit
Feature 5
f
N
HP 20, Area 3
Stratum IId
d - Debitage
f - Faunal Material
- Fire-Cracked Rock
- Rock
0
25
50cm

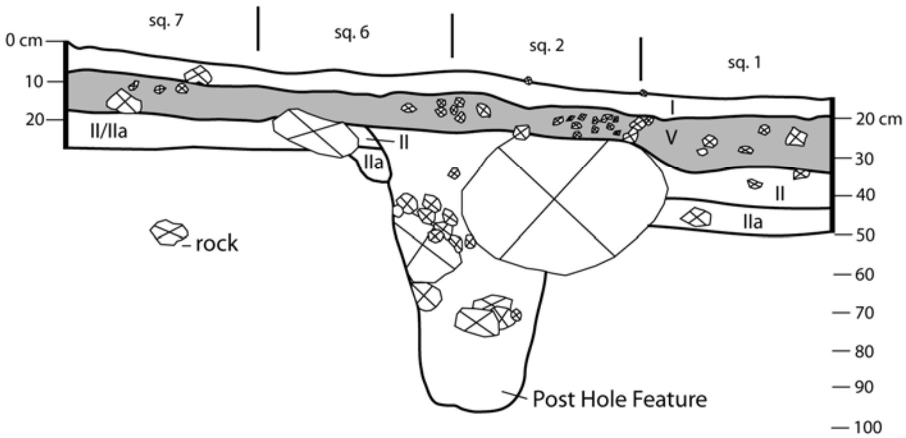


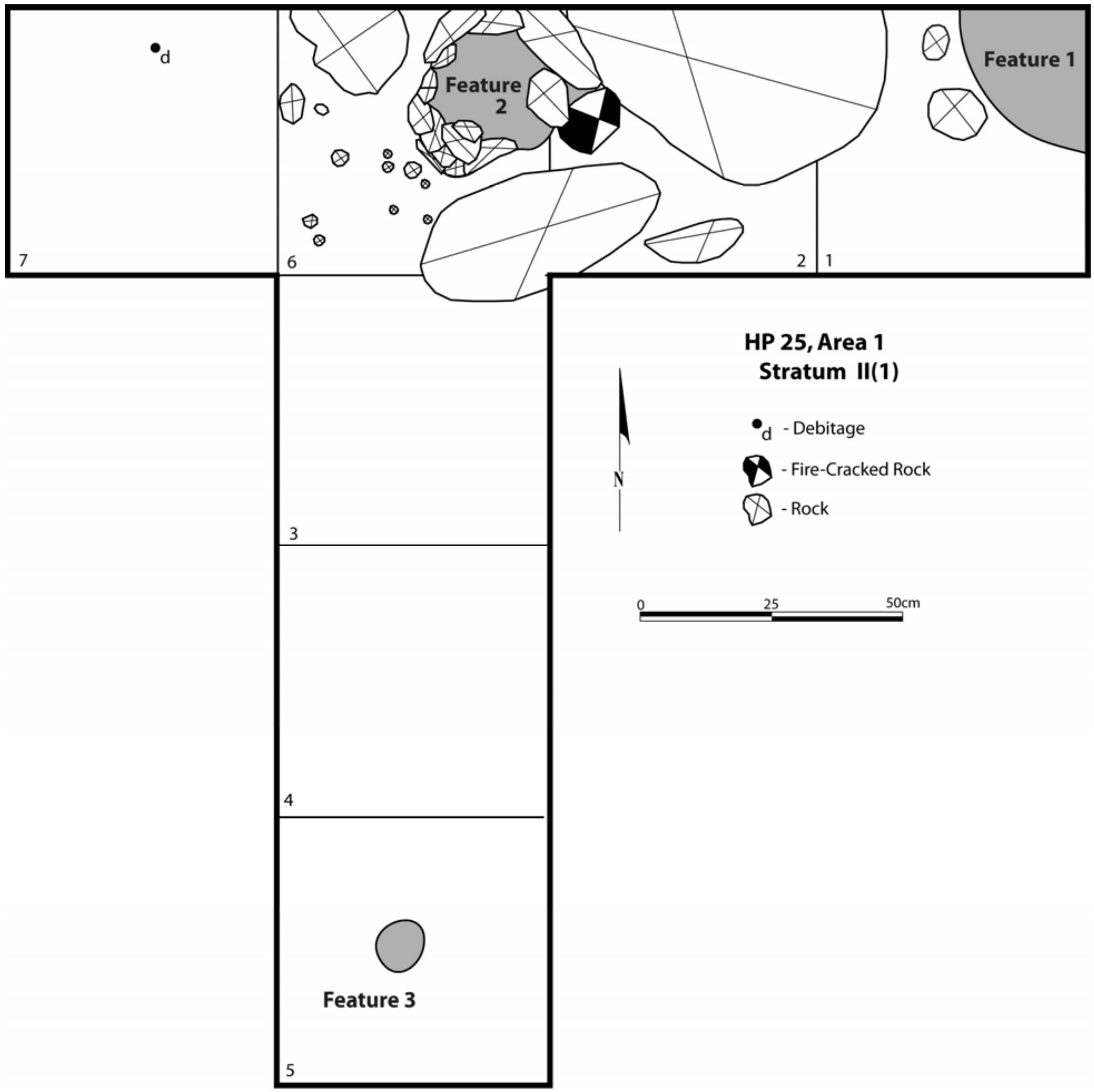
d
d
d
1
N
Feature 2
2
4
3
HP 20, Area 3
Stratum IIe
d - Debitage
- Charcoal
- Fire-Cracked Rock
- Rock
Wood
Feature 5
0
25
50cm

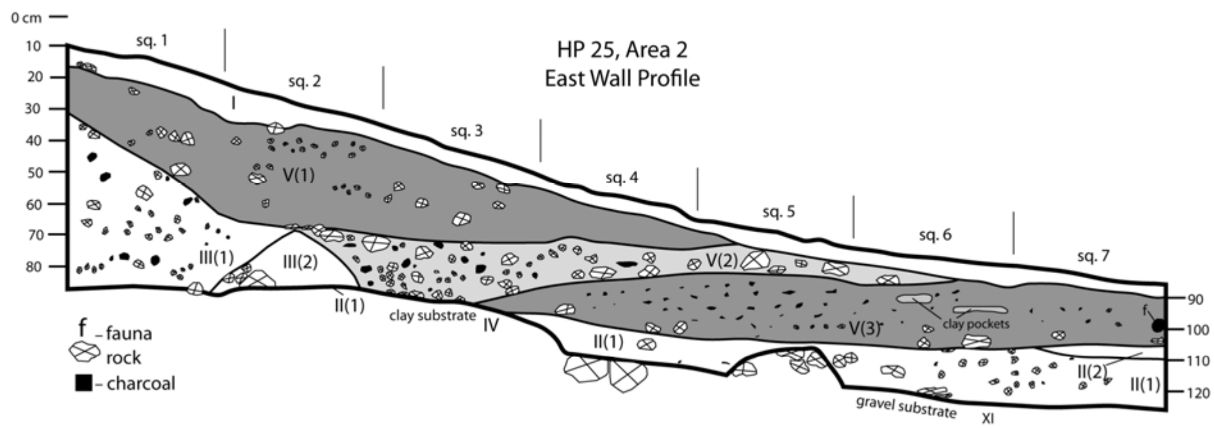

1
2
3
4
N
Feature 2
HP 20, Area 3
Stratum Vc/IIf
- Oxidized Sediment with a
High Concentration of
Salmon Bones
- Rock
0
25
50cm

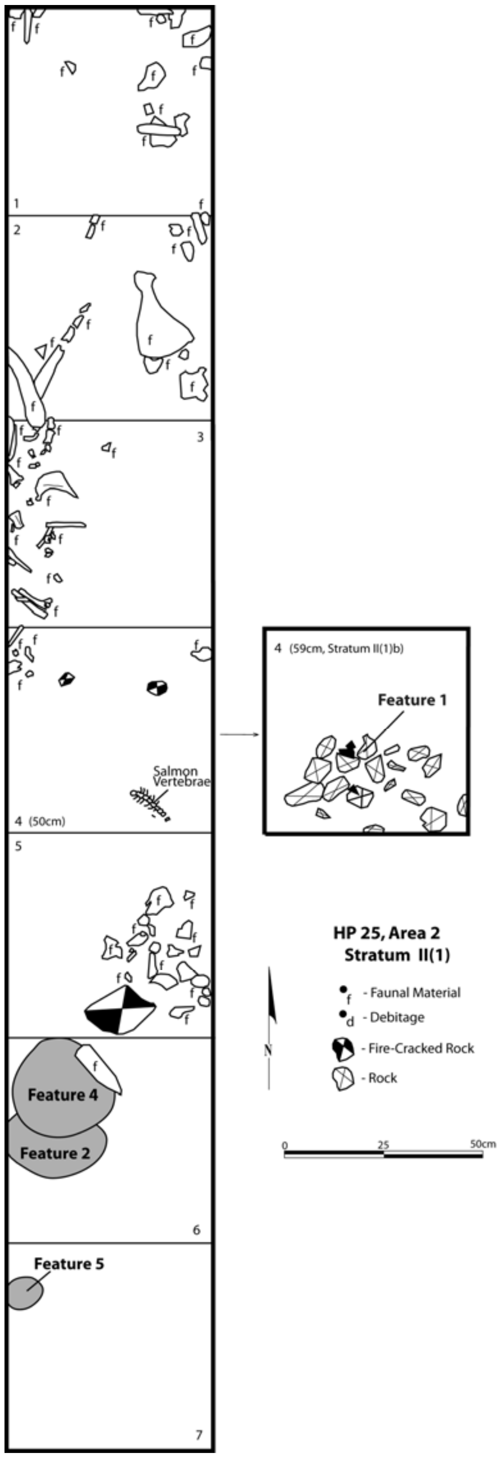
Housepit 25 contour map with Areas 1-3 (Area 1 lower left; Area 2 upper; Area 3 lower right) excavations

HP 25, Area 1
North Wall

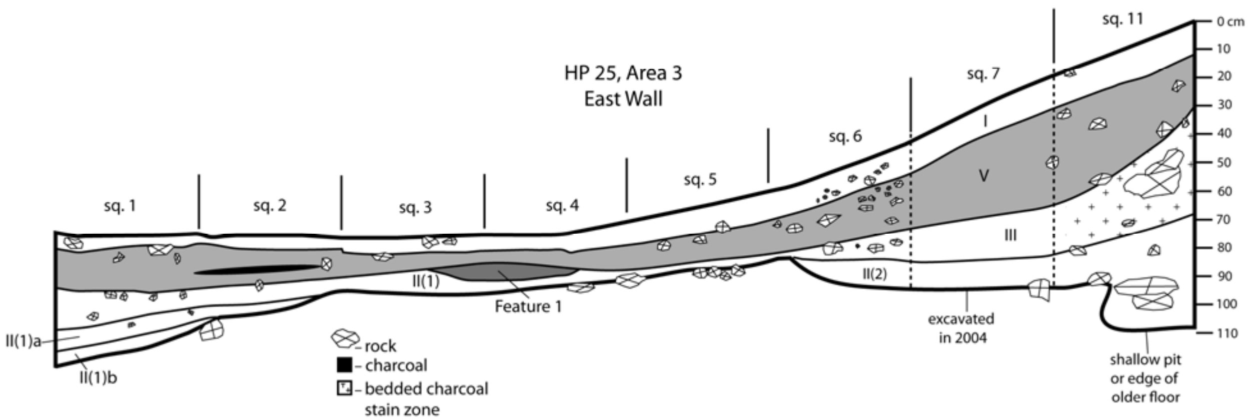


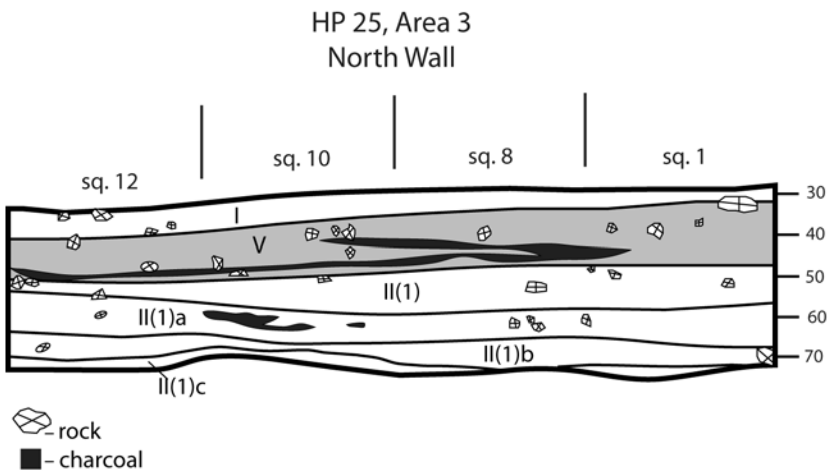

d
Feature 2
Feature 1
7
6
2
1
HP 25, Area 1
Stratum II(1)
N
d - Debitage
- Fire-Cracked Rock
- Rock
0
25
50cm
3
4
Feature 3
5

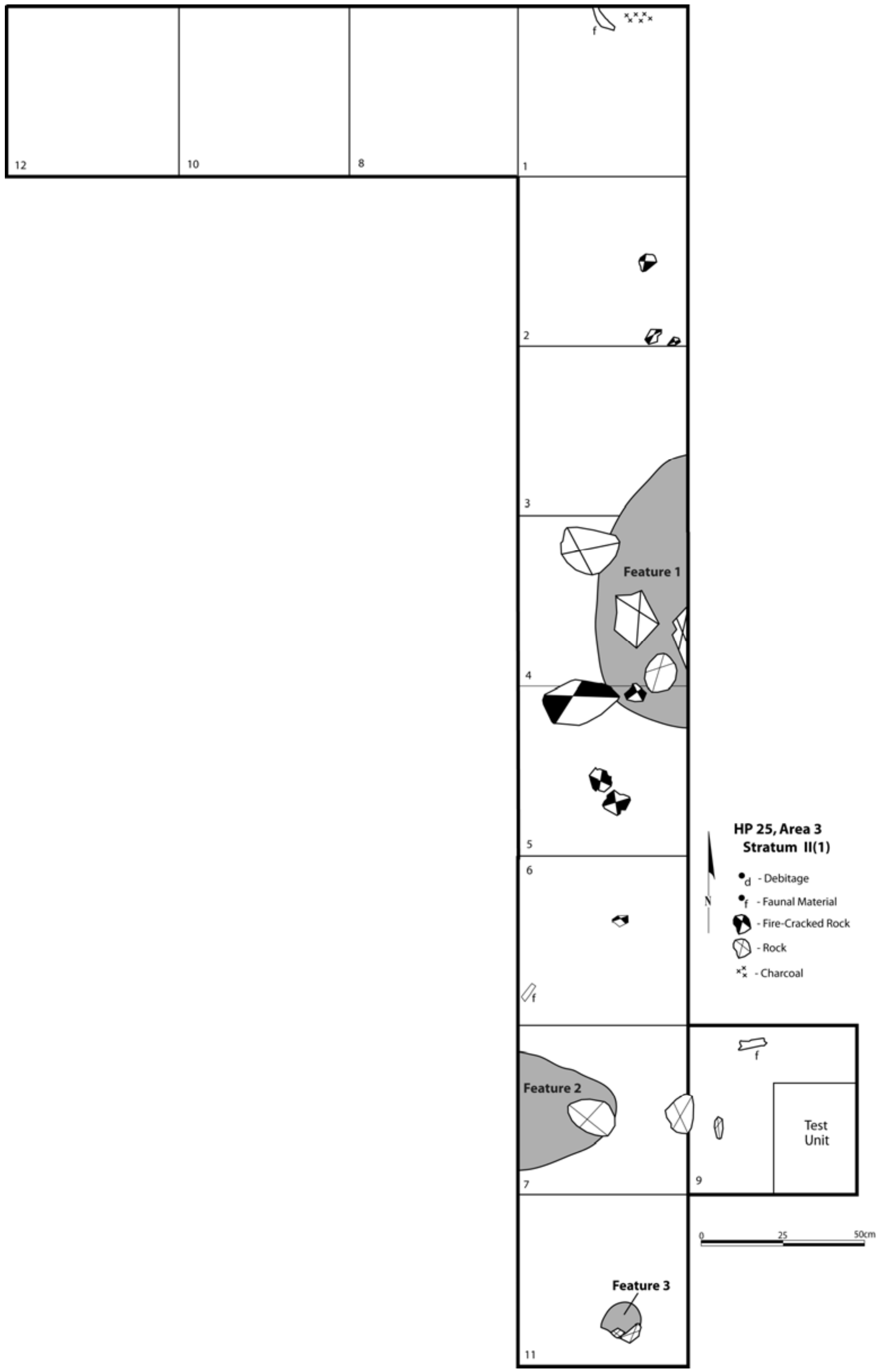

HP 25, Area 2
East Wall Profile
0 cm
10
20
30
40
50
60
70
80
90
100
110
120
sq. 1
sq. 2
sq. 3
sq. 4
sq. 5
sq. 6
sq. 7
I
V(1)
V(2)
V(3)
III(1)
III(2)
II(1)
II(2)
IV
XI
clay substrate
clay pockets
gravel substrate
f
f – fauna
rock
– charcoal



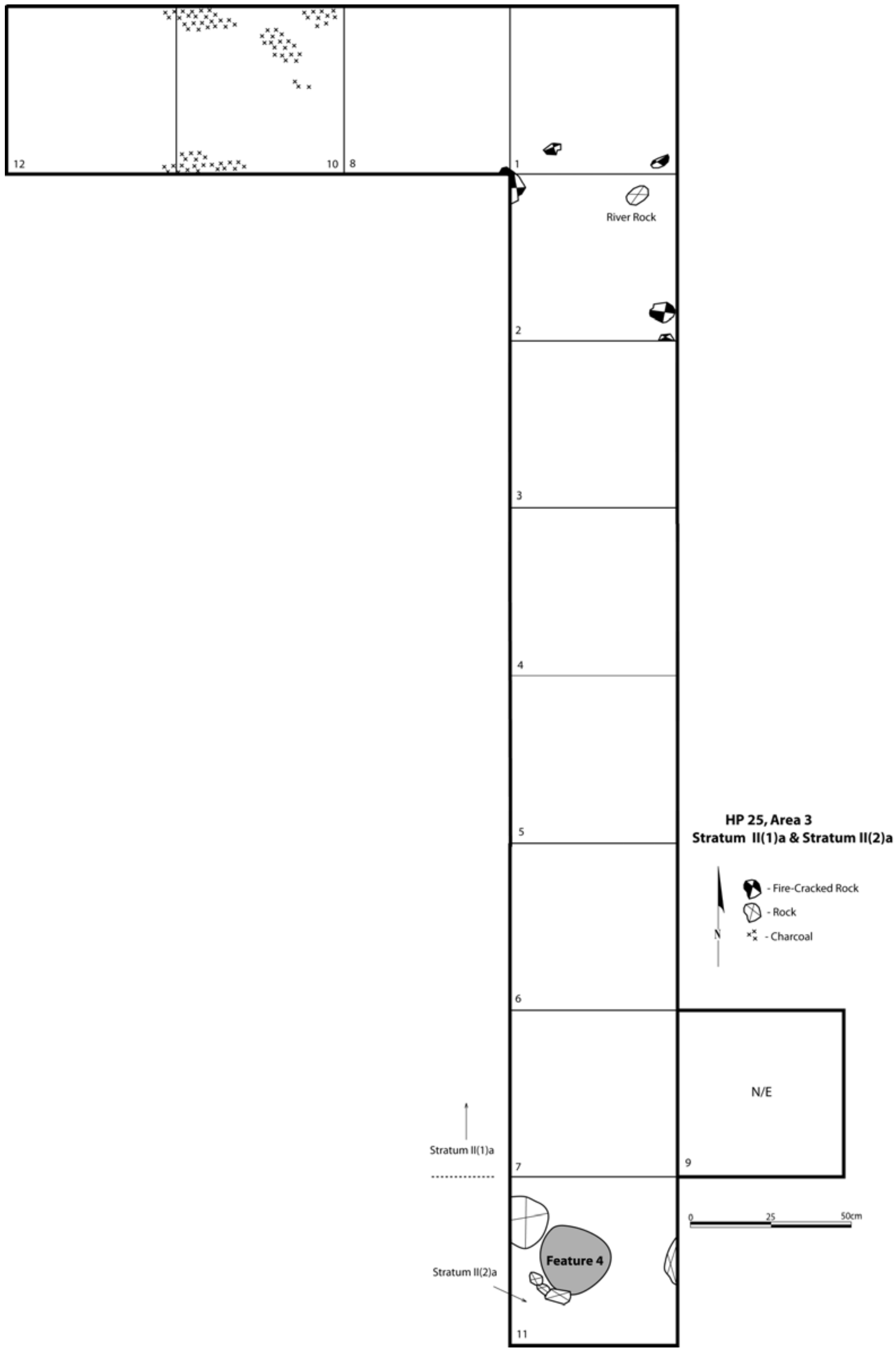
1
2
3
4 (50cm)
Salmon Vertebrae
5
Feature 4
Feature 2
6
Feature 5
7
4 (59cm, Stratum II(1)b)
Feature 1
HP 25, Area 2
Stratum II(1)
f - Faunal Material
d - Debitage
- Fire-Cracked Rock
- Rock
N
0
25
50cm


HP 25, Area 3
East Wall
sq. 1
sq. 2
sq. 3
sq. 4
sq. 5
sq. 6
sq. 7
sq. 11
0 cm
10
20
30
40
50
60
70
80
90
100
110
I
V
III
II(1)
II(2)
Feature 1
II(1)a
II(1)b
excavated in 2004
shallow pit or edge of older floor
- rock
- charcoal
- bedded charcoal stain zone


HP 25, Area 3
North Wall
sq. 12
sq. 10
sq. 8
sq. 1
30
40
50
60
70
I
V
II(1)
II(1)a
II(1)b
II(1)c
- rock
- charcoal

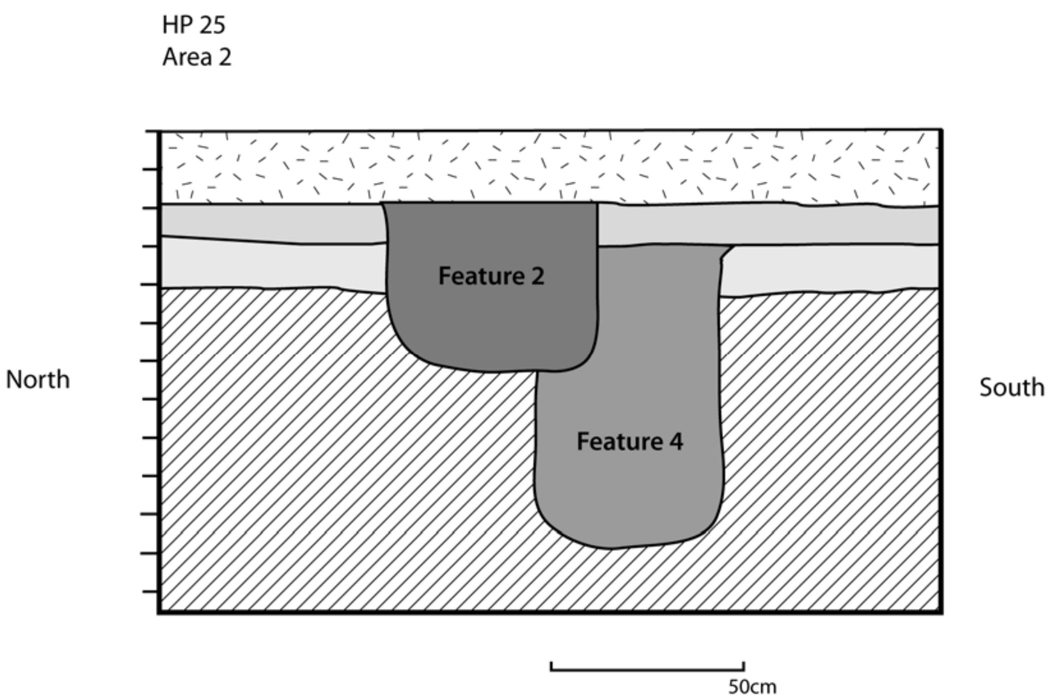


12
10
8
1
f
2
3
Feature 1
4
5
6
f
Feature 2
7
f
Test Unit
9
Feature 3
11
HP 25, Area 3
Stratum II(1)
N
d - Debitage
f - Faunal Material
- Fire-Cracked Rock
- Rock
- Charcoal
0
25
50cm

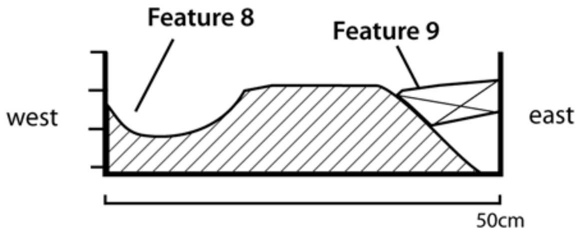


HP 25, Area 3
Stratum II(1)a & Stratum II(2)a
- Fire-Cracked Rock
- Rock
- Charcoal
N
River Rock
N/E
Feature 4
Stratum II(1)a
Stratum II(2)a
0
25
50cm
12
10
8
1
2
3
4
5
6
7
9
11

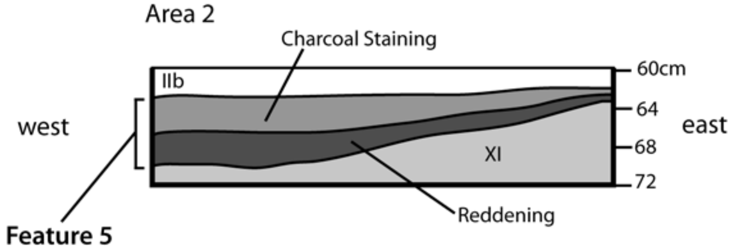
Housepit 24 contour map with 2009 excavations in Area 3



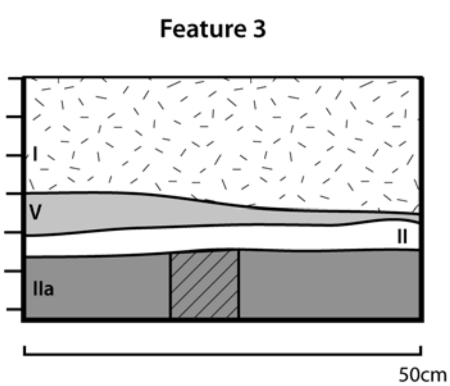
HP 16
Area 1



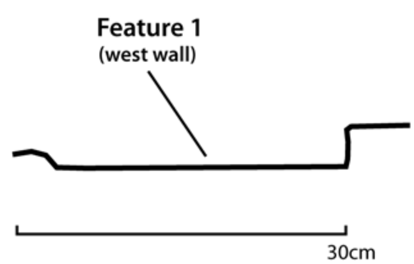

HP 16
Area 2

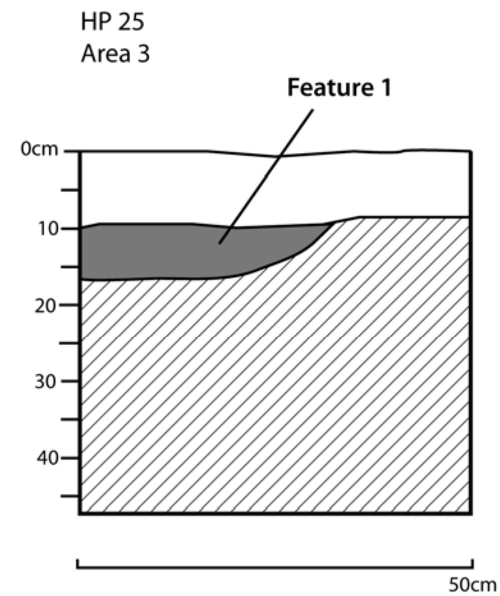


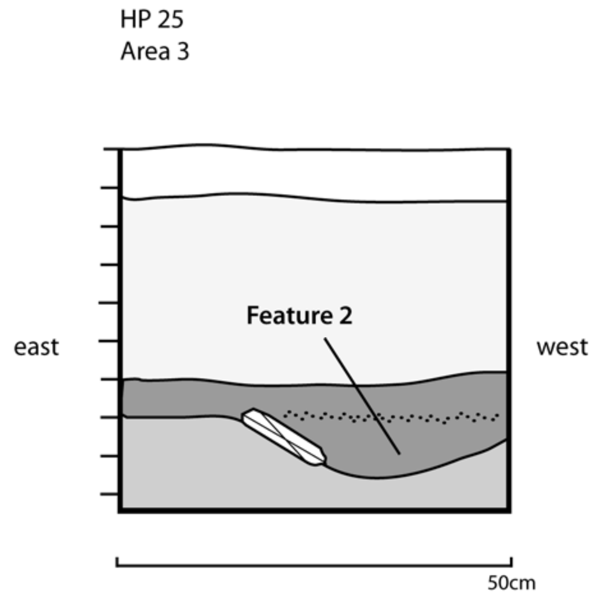

HP 25
Area 1

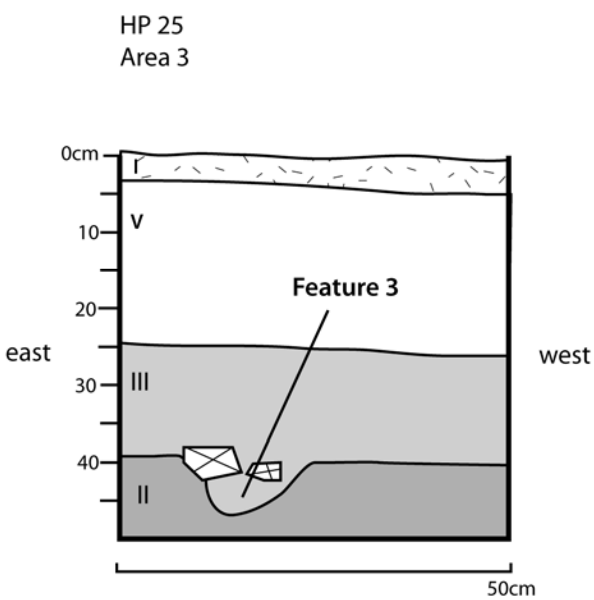


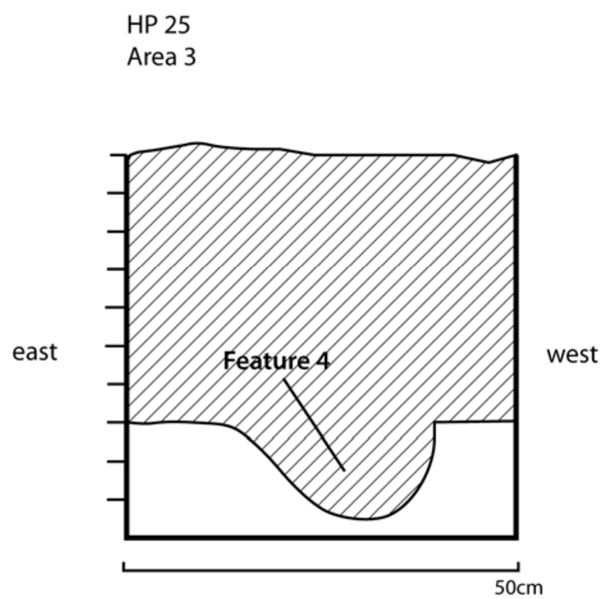

HP 25
Area 1

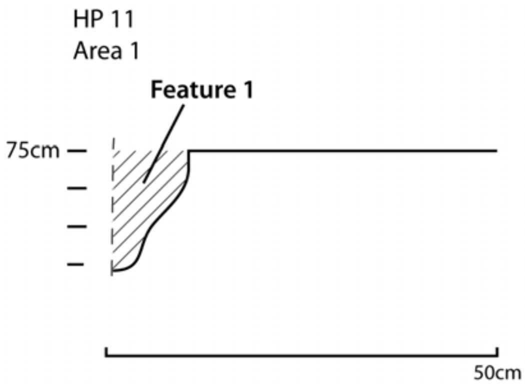


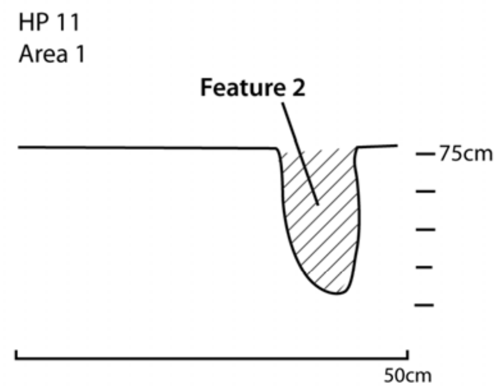

HP 25
Area 3
Feature 1
0cm
10
20
30
40
50cm

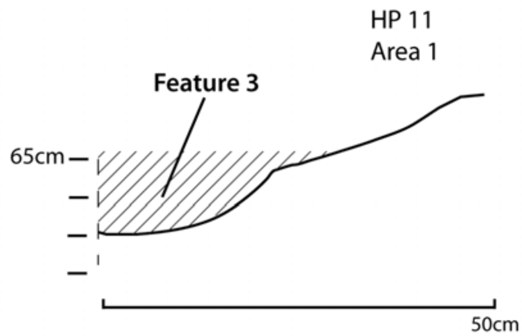

HP 25
Area 3
Feature 2
east
west
50cm

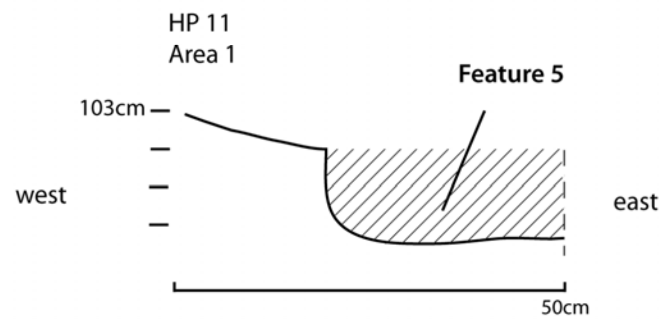

HP 25
Area 3
0cm
I
V
10
20
Feature 3
east
west
30
III
40
II
50cm

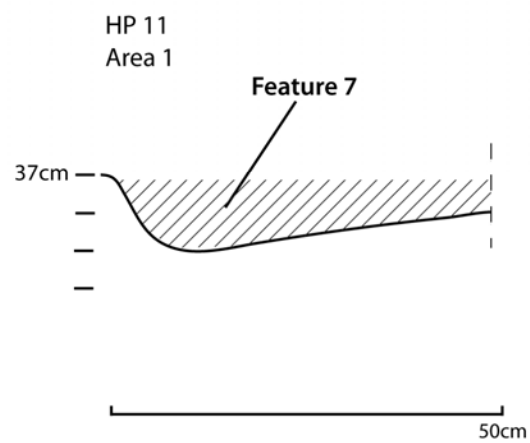

HP 25
Area 3
east
Feature 4
west
50cm


HP 11
Area 1
Feature 1
75cm
50cm


HP 11
Area 1
Feature 2
75cm
50cm


HP 11
Area 1
Feature 3
65cm
50cm


HP 11
Area 1
Feature 5
103cm
west
east
50cm


HP 11
Area 1
Feature 7
37cm
50cm

Excavations in Housepit 11.


Housepit 11, Area 1, Feature 1, plan view.


Housepit 11, Area 1, Features 1 and 2, plan view.


Housepit 11, Area 1, plan view showing Feature 3 at lest on IIa floor/bench area; Feature 4 is on lower right.


Housepit 11, Area 1, Feature 3, Beam hole with collar on Strat. IIa bench.


Housepit 11, Area 1, Features 4 (unexcavated in Unit 3) and 5 (excavated – upper portion of photo).


HP 11
Area 1
SQ.1,2,3
ST. IIB
L-1
F-4,5,7,2
(Bottom)
6-7-09
N

Housepit 11, Area 1, Plan view, Feature 4 in units 1-3.


Housepit 11, Area 1, Feature 4 plan view (excavated).


Housepit 11, Area 1, north wall profile (west end).


Housepit 11, Area 1, north wall profile, east end.


Housepit 11, Area 1, south wall profile.


Housepit 11, Area 1, Unit 8, north wall profile.


Housepit 11, Area 2, Feature 1 in profile (note dark bands in walls) and in situ materials in unit 2 on right.  The latter represents FCR incorporated into the hearth strata capping the deeper pit.


Housepit 11, Area 2, plan view Feature 2, base.

Housepit 11, Area 2, east wall profile.


Housepit 11, Area 2, east wall (south end) profile.


Housepit 11, Area 2, east wall (north end) profile.


Housepit 11, Area 2, north wall profile.


Housepit 11, Area 3, east wall profile.

Excavations in Housepit 16.

Excavations in Housepit 16.


Housepit 16, Area 1, Feature 1, plan view unit 1.


Housepit 16, Area 1, Feature 1 plan view unit 2.


Housepit 16, Area 1, Stratum Vb (label in photo is incorrect) roof beam.


Housepit 16, Area 1, Feature 6, plan view.


Housepit 16, Area 1, Feature 6, plan view (excavated).


Housepit 16, Area 1, Feature 7, plan view.


Housepit 16, Area 1, Features 8 and 9, plan view (excavated).


Housepit 16, Area 1, completed excavation showing plan views of Features 6, 8, and 9.


Housepit 16, Area 1, south wall profile.


Housepit 16, Area 1, close-up west end of south wall profile.


Housepit 16, Area 2, Feature 3 plan view.

Housepit 16, Area 2, completed excavation.


Housepit 16, Area 2, east wall profile.


Housepit 16, Area 3 (area label in photo is incorrect), Feature 1, plan view.


Housepit 16, Area 3, east wall profile of units 1 and 2 with test unit (note oxidation of Feature 1 in profile).


House 16, Area 3, Feature 3, plan view partially excavated.


Housepit 16, Area 3, Feature 3, plan view, fully excavated.


Housepit 16, Feature 3, plan view base with in situ lithic artifacts and birch bark rolls.


Housepit 16, Area 3, Feature 3, excavated plan view with in situ stone artifacts and birch bark rolls.


Housepit 16, Area 3, Feature 3 base, close-up, birch bark.

Housepit 25


Housepit 25, Area 1, Feature 1 plan view.


Housepit 25, Area 1, Feature 2 (feature label in photo is incorrect) plan view.


Housepit 25, Area 1, north wall profile.


Housepit 25, Area 2, Feature 1, Plan view.


Housepit 25, Area 2, Unit 3, faunal remains in situ on Stratum II(1) floor.

Housepit 25, Area 2, Unit 2, in situ faunal remains (note articulated lower limb on left) on Strat. II(1) floor.


Housepit 25, Area 2, in situ faunal remains on Stratum II floor in unit 5.


Housepit 25, Area 2, Feature 1, plan view (base).


Housepit 25, Area 2, Features 2 and 4, plan view.


Housepit 25, Area 2, east wall profile.

Housepit 25, Area 3, under excavation.


Housepit 25, Area 3, Feature 1 plan view (base).


Housepit 25, Area 3, Feature 2, Strat. II(2), plan view.


Housepit 25, Area 3, Feature 4 plan view, base.


Housepit 25, Area 3, North wall profile.


Housepit 25, Area 3, center-east wall profile showing oxidation associated with Feature 1.

Housepit 20.

Excavations in Housepit 20


Housepit 20, Area 3, Plan View of Features 2 and 3.


Housepit 20, Area 3, Unit 3, Feature 4, plan view.


Housepit 20, Area 3, plan view, Feature 4, base.


Housepit 20, Area 3, plan view, Feature 2 (excavated).

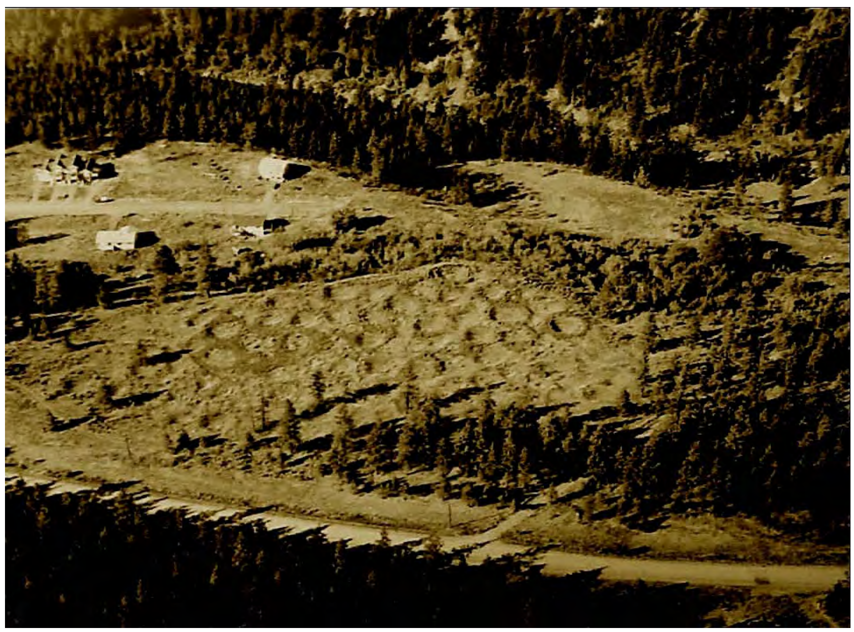
Housepit 20, Area 3, fully excavated showing east wall profile.


Housepit 20, Area 3, Features 5 and 6.


Housepit 24, Area 3, test units excavated in 2009 (right and upper) attached to 2008 trench.

# Bridge River Archaeological Project Geophysical Investigations

## Phase IIc – Final Report



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**University of Montana**
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**Project: 09-23**
**26 December, 2009**

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# Bridge River Archaeological Project Geophysical Investigations

## Phase IIc – Final Report

**Prepared for:**

Department of Anthropology
University of Montana
Missoula, MT 59812-1001

**Attention:**

Dr. Anna Prentiss

**Distribution:**

**26 December, 2009**

1 copy – University of Montana
1 copy – Bridge River Band
1 copy – Terrascan Geophysics

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Figure 2 Site Plan
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Figure 6 HP16 – Magnetic Gradient / EM Conductivity

## 1.0 BACKGROUND - SCOPE OF WORK

A multiphase geophysical investigation of the Bridge River site (EeRI 4 – Figures 1 and 2) was initiated in June 2003 in coordination with preliminary archaeological excavations and related dating of recovered materials. As previously reported (Cross, 2004; Prentiss et al., 2008), an initial phase of geophysical investigations entailed site-wide surveys to map known and previously unidentified features and to guide subsequent archaeological sampling and interpretation. Phase I results are summarized in Figures 3 and 4, depicting the spatial variability of electrical conductivity and vertical magnetic gradient, respectively.

In addition to establishing a generally consistent pattern of geophysical signatures in connection with a typical pithouse, preliminary investigations also revealed potentially significant and meaningful variability from house to house. To further resolve and define the patterned distribution and variability of smaller-scale and more subtle features, Phase II geophysical investigations were initiated in 2004 and involve focussed acquisition of higher-density measurements within selected house floors. High-resolution surveys, utilizing electromagnetic (EM) conductivity, gradient magnetic and ground penetrating radar (GPR) methods have already been carried out within Housepits 11, 20, 24, 36 and 54 (dashed outline) with results reported in Cross (2005) and Cross (2008). The current report describes a further expansion of Phase II investigations to include Housepits 16 (HP16) and 25 (HP25), with related survey areas outlined in Figures 2, 3 and 4.

Following clearance of surface vegetation within delineated survey areas, temporary reference marks were placed at 1.0 m x 1.0 m intervals. High-density conductivity and gradient magnetic measurements were subsequently acquired at 0.5 m x 0.5 m intervals. Fieldwork was carried out during the first week of May, 2009.

Subsequent sections provide a factual description of procedures and findings related to current investigations. For more detailed discussion of geophysical methodologies see (Cross, 2004, 2005).

## 2.0 METHODS - PROCEDURES

### 2.1 Electromagnetic Terrain Conductivity

To provide enhanced spatial resolution, Phase II EM conductivity measurements were acquired utilizing a Geonics EM-38 terrain conductivity meter. In contrast with the Geonics EM-31 (employed for Phase I site-wide reconnaissance), the horizontal offset between transmitter and receiver coils is substantially reduced, providing a more focused subsurface measurement and related improvement in spatial resolution. The measurement frequency is 14.6 kHz compared with 9.8 kHz for the larger-scale EM-31.

EM conductivity measurements were acquired at 0.5 m intervals, with the instrument at ground level. As for previous Phase-II investigations, the EM-38 was operated parallel to east-west transects initiated from the southeast grid corner and separated by 0.5 m.

Measurements and associated grid coordinates were digitally recorded via an Omnidata DL-720 data logger and subsequently downloaded to a portable field computer for processing and analysis.

### 2.2 Magnetic Gradient

Magnetic measurements within and surrounding HP16 and HP25 were acquired using a Scintrex-EDA OMNI IV proton precession gradiometer. Total field sensors were centered at approximately 0.3 m and 0.8 m above grade with related vertical gradient readings acquired at 0.5 m intervals along east-west transects separated by 0.5 m. As for coincident conductivity measurements, data acquisition was initiated from the local southeast grid corner.

Measurements and associated grid coordinates were digitally recorded via the magnetometer's integrated memory and subsequently downloaded to a portable field computer for processing and analysis.

## 3.0 RESULTS

Plans displaying measured vertical magnetic gradient and apparent electrical conductivity are presented in Figures 5 and 6, respectively. Indicated colour levels are based on interpolation and extrapolation from discrete measurements at 0.5 m x 0.5 m intervals.

Results provide an interesting comparison and contrast between a well-defined and prominent pithouse (HP25), displaying roughly typical geophysical signatures, and a comparatively subtle and irregular depression (HP16) with atypical geophysical expression.

### 3.1 HP25

HP25 is a nearly circular housepit with larger than average diameter of approximately 20 m and with roughly typical electrical and magnetic signatures as established by site-wide reconnaissance depicted in Figures 3 and 4.

In particular, the nominal conductivity signature of an individual pithouse is a generally conductive central floor area surrounded by relatively resistive rim deposits. The pattern is presumably in large part the expression of predictable soil moisture variation associated with topographic relief and is generally accentuated during summer months due to preferential evaporation and related drying of rim deposits. In many cases (including HP25) there is also indication of a localized resistive zone near the center of the housefloor.

Interestingly, although site-wide survey yielded the typical pithouse signature for HP25, the pattern of electrical conductivity variation as delineated by higher density Phase IIc measurements (Figure 5) is significantly different. Specifically, it is observed that rim deposits are relatively conductive compared with the floor area. Although it is tempting to presume that the change in pattern might be attributable to relatively moist ground conditions in April of 2009 compared with July of 2003, it is important to appreciate that site-wide survey was carried out with a larger-scale instrument. In particular, the Geonics EM-31 employed for site-wide reconnaissance has roughly three times the effective investigation depth the more compact EM-38 device.

It is notable that previous Phase II investigation of other pithouses using the EM-38 yielded results generally consistent with the typical response pattern established site-wide reconnaissance. Significant deviation in the case of HP25, however, serves to illustrate the potential for substantial variation and related complexity of soil electrical characteristics as a function of moisture level and short-term precipitation history.

In contrast, soil magnetic susceptibility and related response are largely insensitive to soil moisture level as evidenced by close agreement between site-wide (Phase I – Figure 4) and Phase IIc (Figure 5) surveys.

In both instances, HP25 displays the typical pithouse magnetic signature. Rim deposits are clearly delineated by anomalous positive-valued gradients surrounding interior floor areas that are largely characterized by negative-valued gradients. Typically, one or more positive magnetic features are indicated within the central area of the house floor, surrounded by mainly negative gradients that are particularly strong over southern-southwestern areas of the house floor and extending into the interior flank of adjacent rim deposits.

In the case of HP25 (Figure 5), magnetic gradient readings acquired over the central floor area reveal a particularly interesting pattern of anomalously positive gradients and there is evident correlation between these features and apparently related conductivity features.

### 3.2 HP16

In contrast with HP25, HP16 is characterized by relatively irregular geometry and surface morphology. Similarly, related geophysical expressions as mapped by both site-wide (Phase I) and Phase IIc (Figure 6) surveys are generally inconsistent with typical housepit signatures.

Although Phase IIc results in Figure 6 give some suggestion of a rectangular floor area, the nature and distribution of related localized features (magnetic and electrical) are not consistent with established patterns. On the basis of geophysical evidence, there would appear to be some basis for questioning whether HP16 is in fact a pithouse or potentially an open area between surrounding pithouses dated principally to the Bridge River 3 occupation phase.

## 4.0 CONCLUDING REMARKS

As for previous Phase II investigations, increased spatial sampling density has yielded improved detection and resolution of smaller-scale house-floor features, particularly within HP25. Although meaningful and confident interpretation of these features requires further investigation and assessment in connection with subsequent archaeological excavations, observed spatial distribution and patterning of geophysical signatures suggests that these features are potentially significant.

A number of target features were identified in advance of 2009 excavations with the specific aim of investigating a broader range of geophysical signatures. Although it is our understanding that a sample of these identified features was excavated, we have yet to assess related findings.

Laboratory geophysical measurements (electrical and magnetic) have again been carried out (as per 2008) on intact soil samples collected for purpose of micromorphological examination. As funding permits, it is our expectation that further analysis of laboratory measurements and assessment in connection with related archaeological data will provide a basis for establishing specific associations between archaeological deposits and related geophysical signatures.

We trust that this report of expanded Phase-II geophysical investigations satisfies your current requirements and look forward to reviewing results of related excavations. Should you require additional information or clarification regarding geophysical investigations or findings presented herein, please contact the undersigned at your convenience.

Yours truly,
*Terrascan Geophysics*

Guy Cross, Ph.D.
Geophysicist

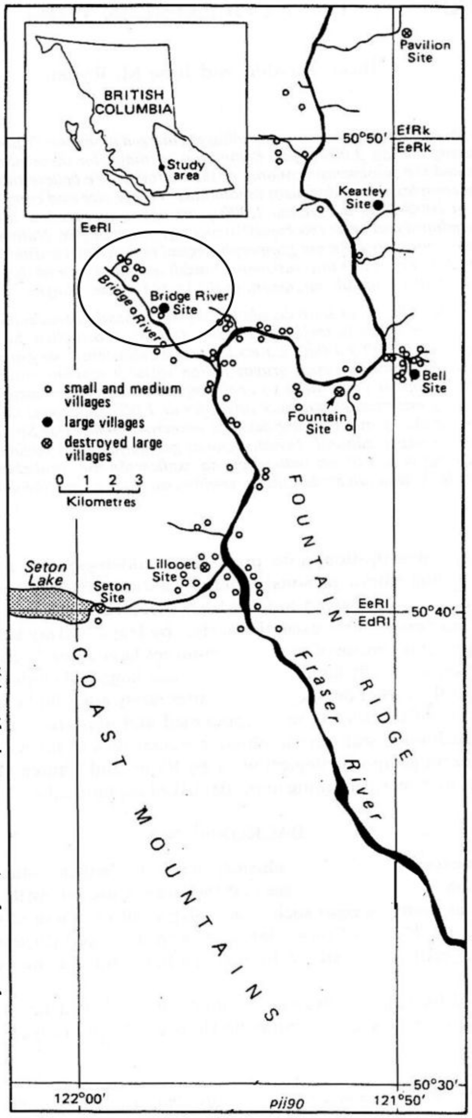
## 5.0 REFERENCES

Cross, G., 2004, Bridge River archaeological project – geophysical investigations, Phase I – Final Report, Department of Anthropology, University of Montana, Missoula.

Cross, G., 2005, Bridge River archaeological project – geophysical investigations, Phase II – Final Report, Department of Anthropology, University of Montana, Missoula.

Cross, G., 2008, Bridge River archaeological project – geophysical investigations, Phase IIb – Final Report, Department of Anthropology, University of Montana, Missoula.

Prentiss, A., Cross, G., Foor, T.A., Hogan, M, Markle, D., Clarke, D.S., 2008, Evolution of a late prehistoric winter village on the Interior Plateau of British Columbia: geophysical investigations, radiocarbon dating and spatial analysis of the Bridge River site, American Antiquity, vol. 73, 59-81.

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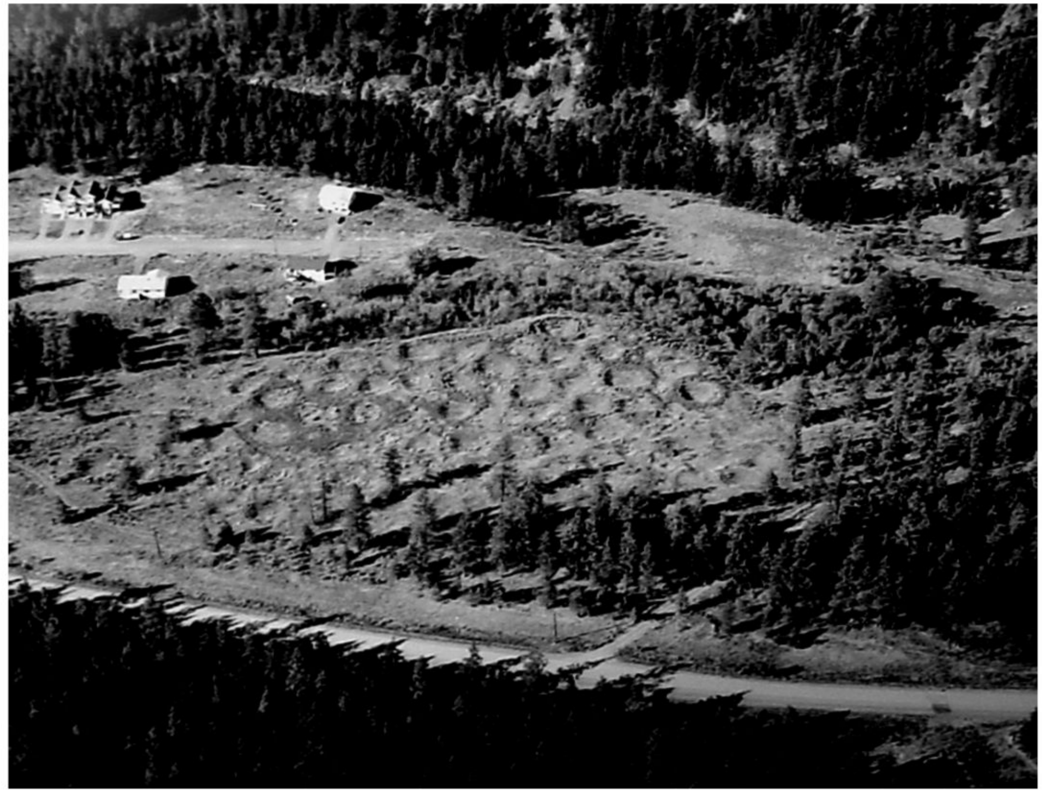

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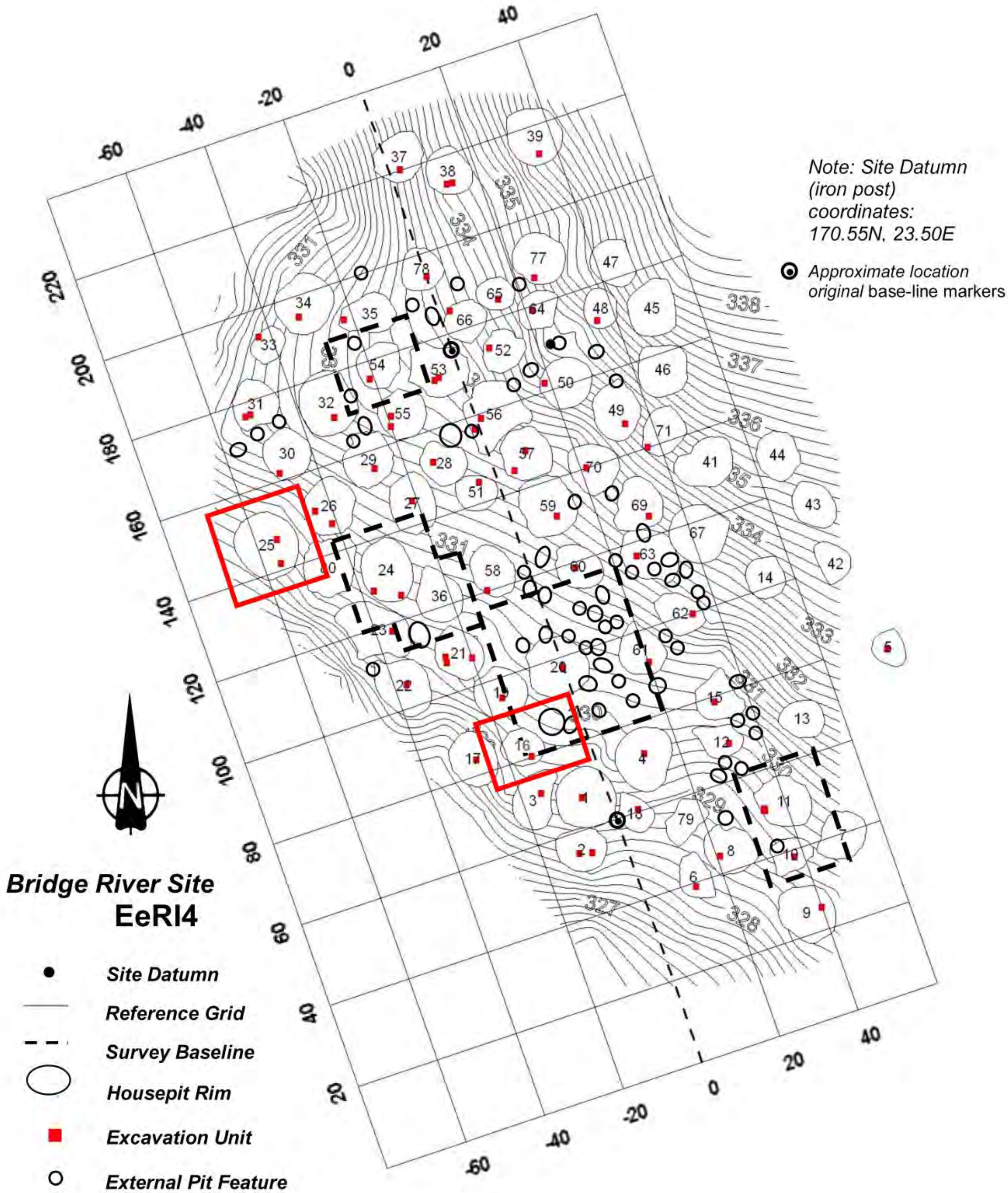
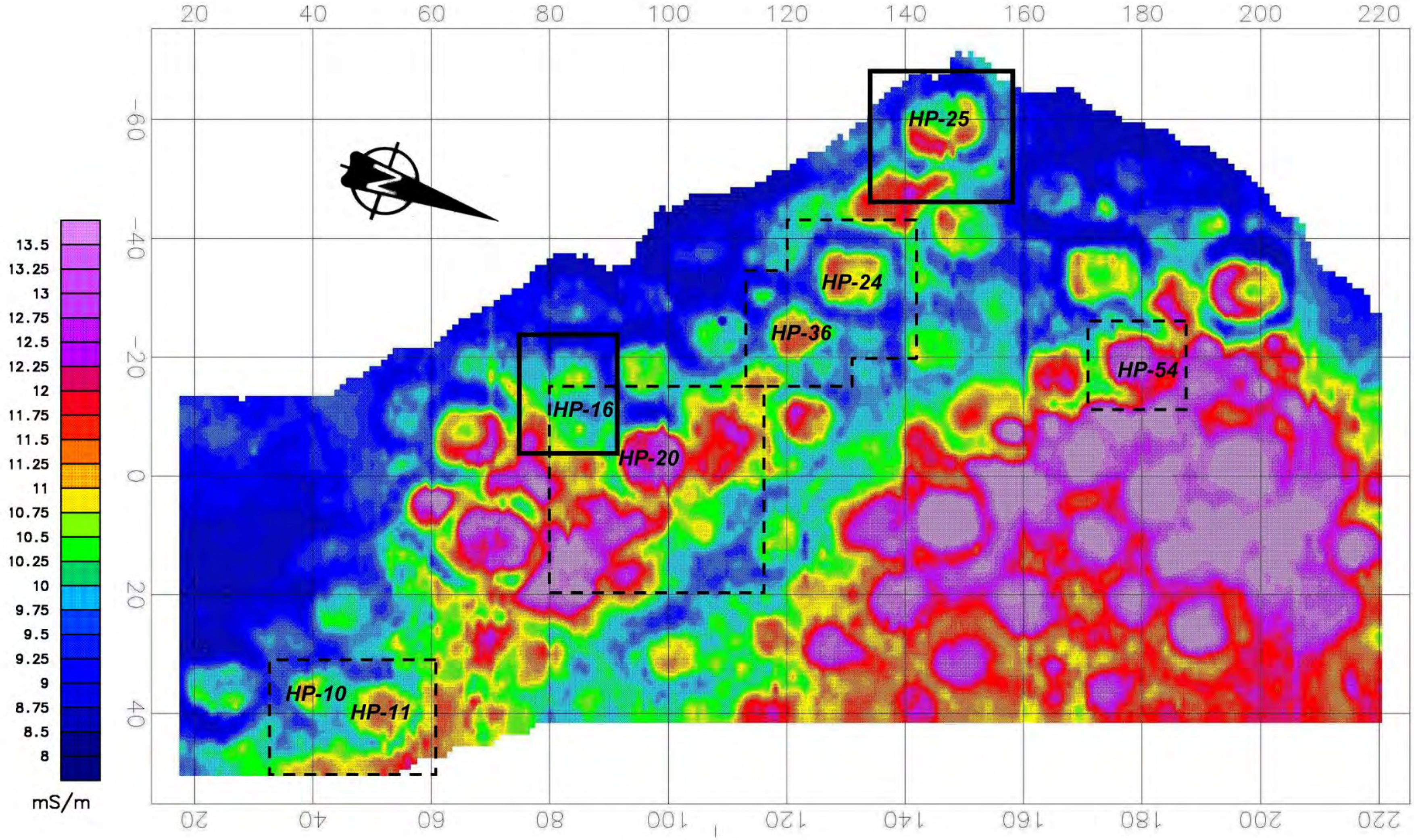
**BRIDGE RIVER SITE (EeRl-4)**
**LOCATION PLAN – AERIAL SITE PHOTO**

| PROJECT: | DRAWN BY: | DATE: | FIGURE: |
|---|---|---|---|
| Univ. Montana – Bridge River | GMC | 27 December, 2009 | 1 |




## SITE PLAN – HP16/HP25 SURVEY GRID AREAS

| Terrascan Geophysics | PROJECT: Univ. Montana – Bridge River | | FIGURE: 2 |
|---|---|---|---|
| | DRAWN BY: GMC | DATE: 27 December, 2009 | |

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## BRIDGE RIVER SITE (EeRI-4) – APPARENT CONDUCTIVITY PHASE IIc INVESTIGATION AREAS

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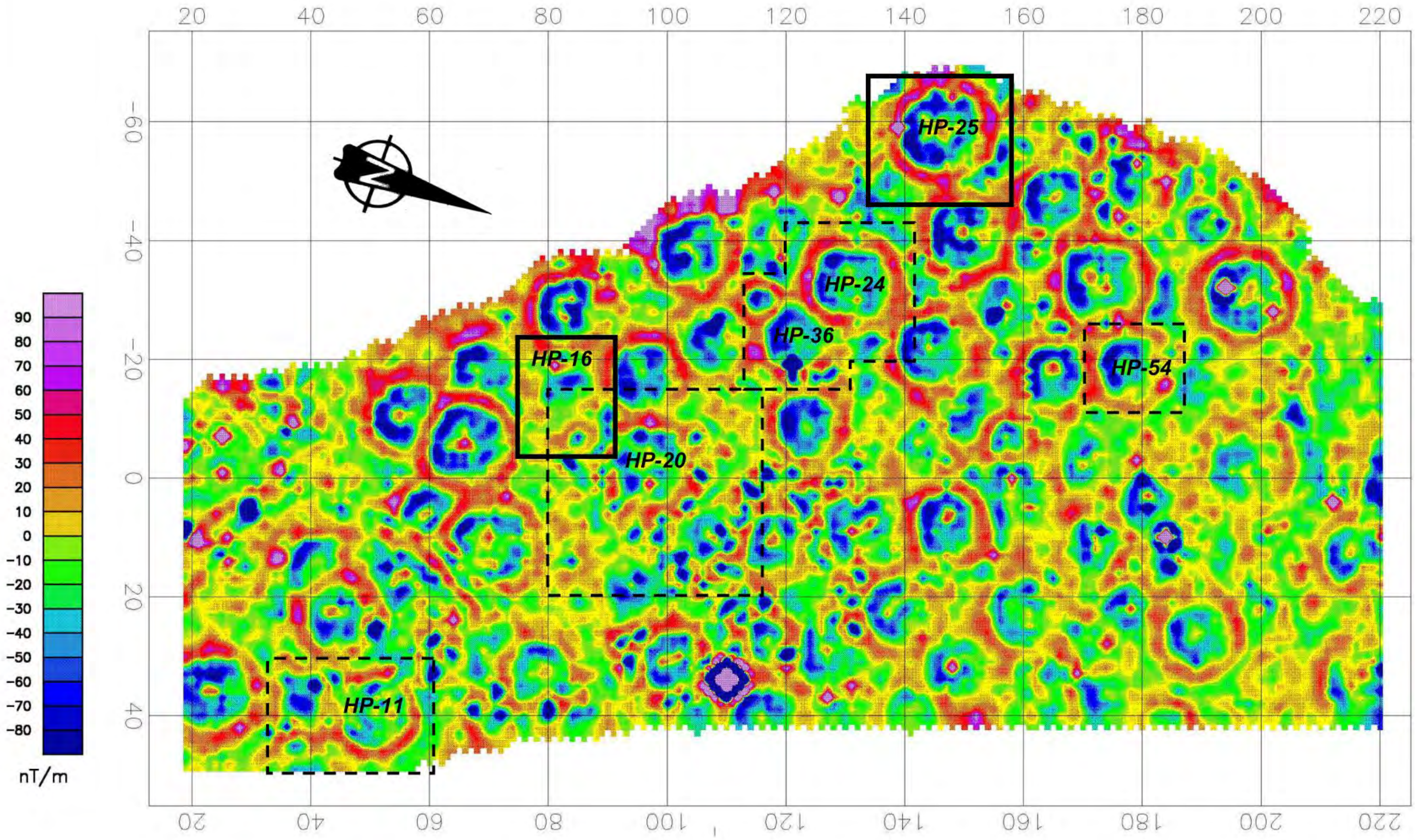
| Univ. Montana – Bridge River | GMC | 27 December, 2009 | 3 |

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**BRIDGE RIVER SITE (EeRI-4) – MAGNETIC GRADIENT PHASE IIc INVESTIGATION AREAS**

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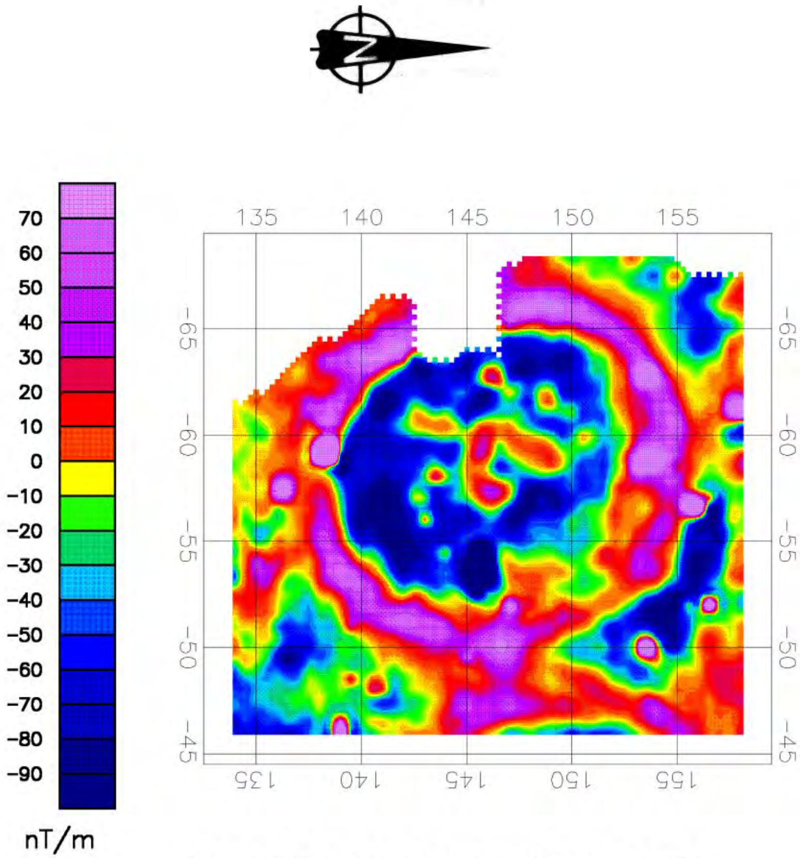
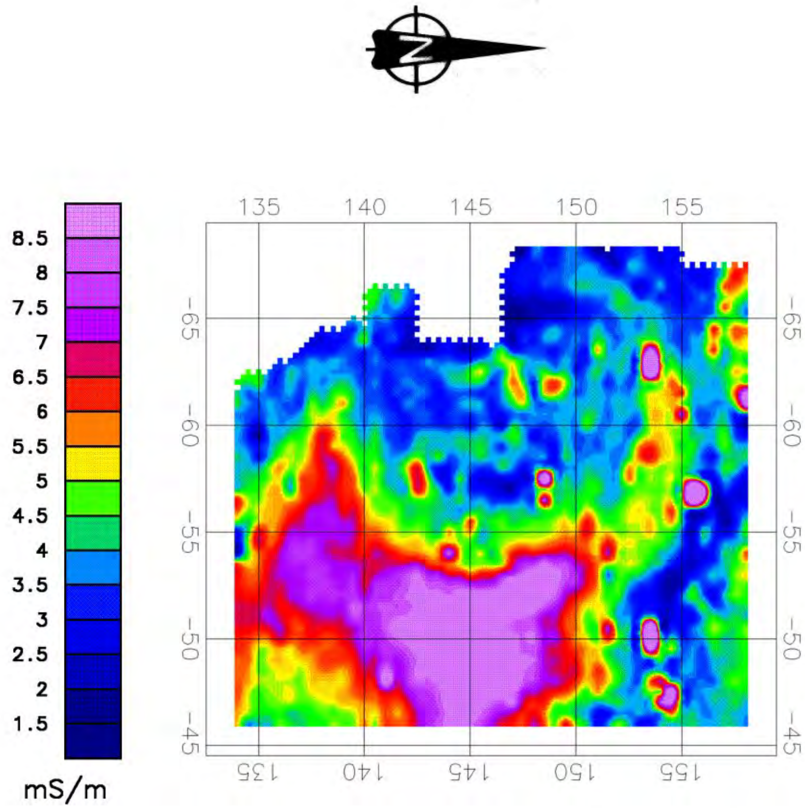
|---|---|---|---|
| Univ. Montana – Bridge River | GMC | 27 December, 2009 | 4 |



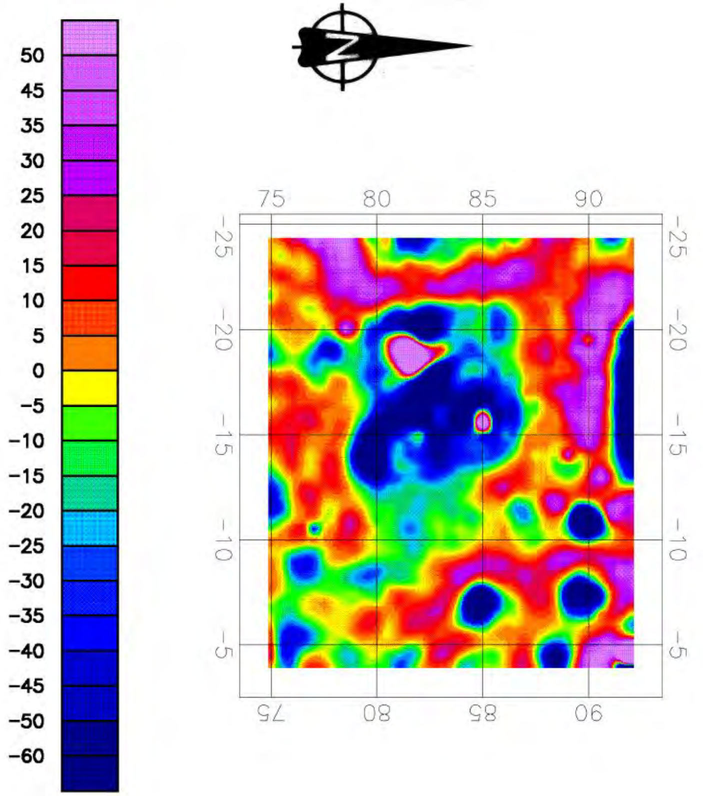

**VERTICAL MAGNETIC GRADIENT**




**APPARENT ELECTRICAL CONDUCTIVITY**

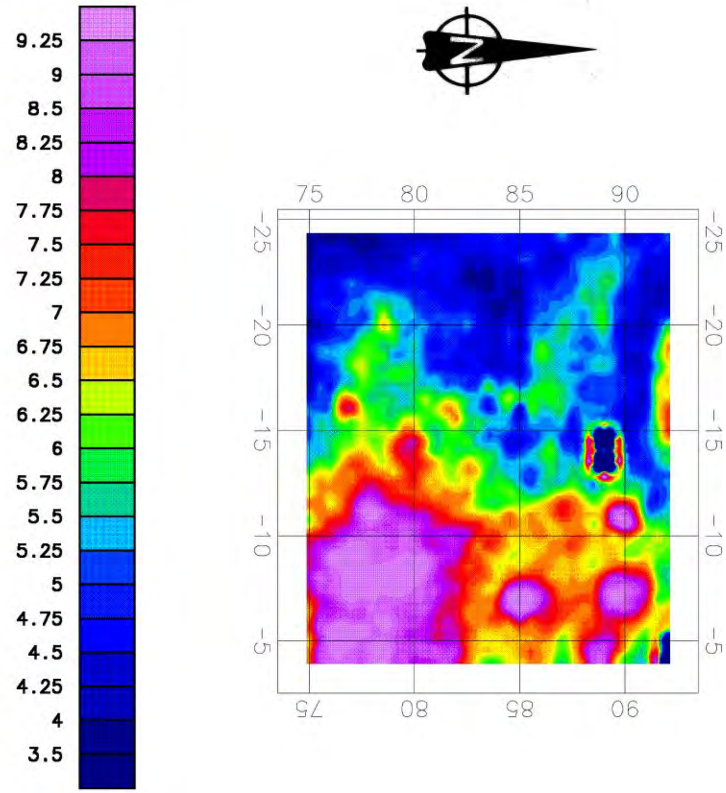
***NOTE:** Colour scale distributions are approximate and based on interpolation-extrapolation from discrete data.*

| | | | |
|---|---|---|---|
| Terrascan Geophysics | **BRIDGE RIVER SITE (EeRI-4) – PIT HOUSE 25**<br>**VERTICAL MAGNETIC GRADIENT – APPARENT CONDUCTIVITY** | | FIGURE: **5** |
| | PROJECT: *Univ. Montana – Bridge River* | DRAWN BY: *GMC* | DATE: *27 December, 2009* |




nT/m

**VERTICAL MAGNETIC GRADIENT**




mS/m

**APPARENT ELECTRICAL CONDUCTIVITY**

***NOTE:** Colour scale distributions are approximate and based on interpolation-extrapolation from discrete data.*

**Terrascan Geophysics**

**BRIDGE RIVER SITE (EeRI-4) – PIT HOUSE 16**
**VERTICAL MAGNETIC GRADIENT – APPARENT CONDUCTIVITY**

| PROJECT: | DRAWN BY: | DATE: | FIGURE: |
|---|---|---|---|
| *Univ. Montana – Bridge River* | *GMC* | *27 December, 2009* | **6** |

**Bridge River Micromorphology**

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Boston, MA 02215

With field, lab, and editorial assistance from Suzanne Villeneuve

Samples were collected during the 2008 season by Suzanne Villeneuve who carefully documented the context, including photograph of the field, impregnated blocks, and profile drawings. The location of samples is given in Table 1a and 1b. Samples were taken in the field as intact blocks of various dimensions (see Table 1), and wrapped with toilet paper and packaging tape. These blocks were then transported to the Geoarchaeology laboratory at Simon Fraser University, where they were oven dried and impregnated with polyester resin diluted with styrene. The hardened blocks were then sliced and trimmed to size (roughly 75x50x10 mm) with a rock saw. The chips were then sent to Spectrum Petrographics (Vancouver, WA) where they were processed into large (75x50 mm) or standard (46x26 mm) petrographic thin sections. Thin sections were examined with binocular and petrographic microscopes in plane-polarized (PPL), cross-polarized (XPL), and oblique incident (OIL) light. Thin section observations and descriptions follow standard procedures (Courty et al., 1989)(Stoops, 2003).

**Table 1a – Location of Samples by House Pit**

| HP | Sample No. | A.A. | Wall | Top [*=BS (versus BD)] | Base | Length | Width | Strata | Comments |
|---|---|---|---|---|---|---|---|---|---|
| **20** | **5** | 2 | E | 41 | 64 | 22 | 11 | II/Va | |
| | **6** | 2 | E | 59 | 81 | 18 | 10 | XII/IIa/Vb | |
| | **8** | 2 | E | 90 | 115 | 25 | 10 | Vb/IIb2/Vc/Iic | |
| | **46** | **1** | **S?** | **26.5** | **52.5** | **28** | **13** | **See profile** | |
| **24** | **20** | 1 | S | 50 | 76 | 23 | 11 | III/II/F3 L.1/F3 L.2 | Originally sample #21, changed to #20 |
| | **23** | 3 | N | 62 | 82 | 21.5 | 10 | IIa3/Vb | |
| | **24** | 3 | N | 77 | 98 | 24.5 | 10 | IIa4/Vb/IIb | |
| | **26** | 3 | N | 106 | 138 | 29.5 | 10.5 | IIc/IId2/IId1/IIe/Vd/IIg | Sample moved 12cm east |
| | **30** | 1 | N | 78 | 100 | | | V/V2/II | |
| | **31** | 1 | N | 92.5 | 114 | 18 | 10.5 | II/IIa/Va3/IIb | |
| | **32** | 1 | N | 109 | 125 | 17.5 | 11.5 | IIb/Vb/Iic | |
| | **34** | 1 | N | 144 | 164 | 20.5 | 11.5 | IId/Vc/IIe | |
| | **35** | 1 | N | 157 | 175 | 20.5 | 12 | Vc/IIe/Iif | |
| | **42** | 2 | E | 86 | 104 | 19 | 11.5 | IIa/Va/IIb | |
| | **43** | 2 | E | 101 | 118 | 24.5 | 14 | IIb/Vb/F4 | |
| | | | | | | | | | |

Table 1b – Location of Samples by Thin Section Number[1]

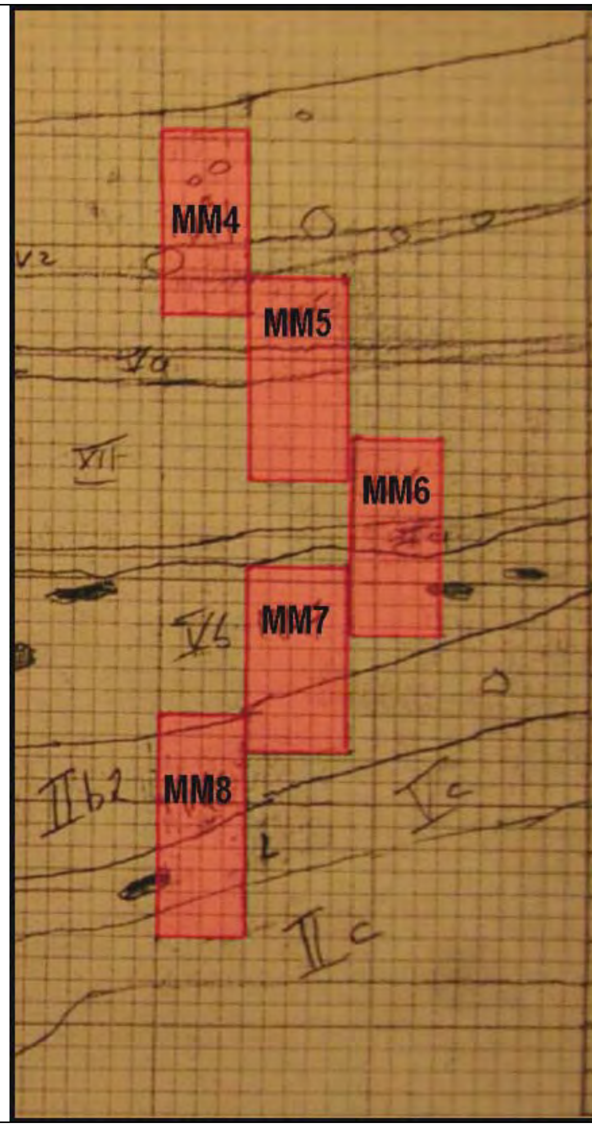
| Thin Section No. | Thin section size[2] | HP | A.A. | Wall | Top [*=BS (versus BD)] | Base | Length | Width | Strata | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| **5A** | s | **20** | 2 | E | 41 | 64 | 22 | 11 | II/Va | |
| **5B** | L | | | | | | | | | |
| **5C** | L | | | | | | | | | |
| **6A** | L | | 2 | E | 59 | 81 | 18 | 10 | XII/IIa/Vb | |
| **6B** | L | | | | | | | | | |
| **8A** | L | | 2 | E | 90 | 115 | 25 | 10 | Vb/IIb2/Vc/Iic | |
| **8B** | L | | | | | | | | | |
| **8C** | L | | | | | | | | | |
| **20A** | s | **24** | 1 | S | 50 | 76 | 23 | 11 | III/II/F3 L.1/F3 L.2 | Originally sample #21, changed to #20 |
| **20B** | L | | | | | | | | | |
| ~~**20C**~~ | ~~s~~ | | | | | | | | | |
| **20D** | L | | | | | | | | | |
| **23A** | L | **54** | 3 | N | 62 | 82 | 21.5 | 10 | IIa3/Vb | |
| **23B** | L | | | | | | | | | |
| **24A** | L | | 3 | N | 77 | 98 | 24.5 | 10 | IIa4/Vb/IIb | |
| **24B** | L | | | | | | | | | |
| **24C** | s | | | | | | | | | |
| **26A** | L | | 3 | N | 106 | 138 | 29.5 | 10.5 | IIc/IId2/IId1/IIe/Vd/IIg | Sample moved 12cm east |
| **26B** | L | | | | | | | | | |
| **26C** | s | | | | | | | | | |
| **30A** | L | | 1 | N | 78 | 100 | | | V/V2/II | |
| **30B** | L | | | | | | | | | |
| **31A** | L | | 1 | N | 92.5 | 114 | 18 | 10.5 | II/IIa/Va3/Iib | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **31B** | L | | | | | | | | | |
| **32A** | L | | 1 | N | 109 | 125 | 17.5 | 11.5 | IIb/Vb/Iic | |
| **32B** | L | | | | | | | | | |
| **34A** | L | | 1 | N | 144 | 164 | 20.5 | 11.5 | IId/Vc/Iie | |
| **34B** | L | | | | | | | | | |
| **35A** | L | | 1 | N | 157 | 175 | 20.5 | 12 | Vc/IIe/Iif | |
| **35B** | L | | | | | | | | | |
| **35C** | L | | | | | | | | | |
| **42A** | L | | 2 | E | 86 | 104 | 19 | 11.5 | IIa/Va/Iib | |
| **42B** | L | | | | | | | | | |
| **43A** | L | | 2 | E | 101 | 118 | 24.5 | 14 | IIb/Vb/F4 | |
| **43B** | L | | | | | | | | | |
| **43C** | L | | | | | | | | | |
| **46A** | L | **20** | 1 | S? | 26.5 | 52.5 | 28 | 13 | See profile | |
| **46B** | L | | | | | | | | | |
| **46C** | L | | | | | | | | | |

1. NB: a field sample commonly has several thin sections made from it (e.g., 26A, 26B, 26C).
2. Thin section size: Large (L) = 50x75 mm; small (s) = 26x46 mm.

**House Pit 20**

**AA2 - Samples 5, 6, 8**




<u>BR-5A</u>:

♦ Generally granular structure but with some compact lenses of matrix in the lower part of the slide.

♦ Charcoal occurs as mm-sized pieces as well as fine microcharcoals. Some of the fragments are dark reddish brown and appear to be humified and not burned.

♦ Some modern roots occur

♦ Bones are generally angular and chunky in shape; some small coprolite fragments were observed.

♦ Rubefied grain of poorly sorted sandy clay can be seen at the base of the thin section.


Macro scan of small thin section of BR-5A. Length of all small thin sections is 46 mm.


Photomicrograph of part of sample BR-5A showing granular structure. Plane-polarized light (PPL) [File: *BR-05A ppl 2.5x - granular structure with scale.tif*]

<u>BR-5B</u>:

- Extensively bioturbated with wasp nest in the lower right-hand corner, along with likely cicada burrows (circular features there).
- Charcoal and dark reddish brown organic matter is found throughout the slide, but there seems to be a slightly higher concentration in the central part of the slide.
- Traces of angular bone occur within the central band of the thin section


Macro scan of large thin section BR-5B; note the dark angular lithoclasts in the center and the presence of bioturbation, particularly as a circular hole (wasp nest) in lower right, as well as circular passage features next to it, likely caused by cicadas. Length of all large thin sections is 75 mm.

<u>BR-5C</u>:

- This is quite homogeneous and finer grained than the overlying subsamples in -5.
- Bioturbation is extensive.

♦ Charcoal is conifer (pers. comm. Katleen Deckers) and is variable in size, from sand-size to cm-size pieces that are generally angular and are relatively more abundant in the lower part of the slide. In PPL, they are not black but have a dark reddish brown color suggesting humification rather than burning (pers. comm. Katleen Deckers and Simone Riehl, University of Tübingen).

♦ The matrix material is finely divided, but locally, appears to be pale yellow clay.


Macro scan of large thin section BR-5C. Note the finer nature of the material in this section, as well as the size and the relative abundance of charcoal in the lower third of the slide. Many of these are conifers (pers. comm. Katleen Deckers).

<u>BR- 6A</u>:

♦ Two different units can be seen. A lighter unit occurs at the top and exhibits lighter-colored silty clay, which is essentially sterile.

♦ The lower part is a bit coarser and contains bones and pebbles, as well as some large (~1 cm) pieces of bone.

♦ In fact, the lower part contains a relatively high abundance of bone, which is concentrated in the lower part of the sample.

Macro scan of large thin section BR-6A. The lighter domains are sterile silty clay.

<u>BR- 6B</u>:

♦ This is extremely rich in charcoal, particularly in the middle part of the slide; the upper and lower ~1 cm is less rich.

♦ Charcoal occurs in many sizes and this variety seems to be a result of bioturbation, which has finely comminuted the original pieces of charcoal.

♦ The lower ~1-2 cm contains convoluted domains of lighter-colored sandy/silty clay, which locally seems rubefied.

♦ The charcoal-rich layer in this slide seems to document proximity to in situ fire, judging from the abundance of charcoal and the partial reddening of the silty clay matrix material (lower left-hand side of thin section.

Macro scan of large thin section BR-6B showing the relative abundance of charcoal with the sample. Note the higher proportion of lighter silty clay in the upper and lower parts of the section, owing their presence to biological inworking of this sterile material into the charcoal-rich layer.

BR- 8A:

♦ Generally lighter colored and finer than above samples (but ~5C), with abundant rounded and angular mm-size pieces of charcoal scattered throughout the slide.

♦ The material has been well mixed by bioturbation as in all samples.

♦ Some aggregates of the silty clay matrix appear reddened by fire, previously to having been deposited here.

♦ Some yellow, angular, isotropic (phosphatic) coprolitic grains were found in the central part of the slide, along with some sand-sized bone fragments, some of which have been burnt.

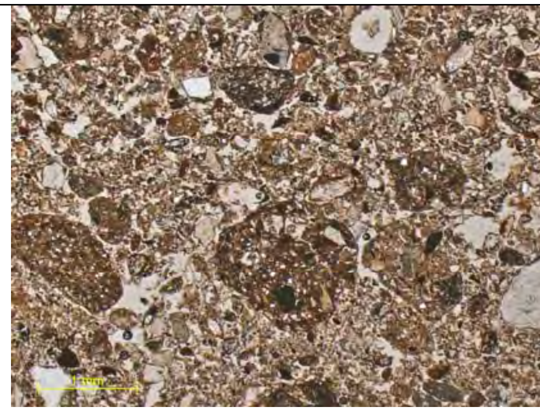

Macro scan of large thin section BR-8A. Note the rounding of the charcoal.

BR- 8B:

♦ The lower part of the section is not only finer grained than the upper part but is clearly fire reddened as was observed in the field. The reddening is expressed principally in iron-bearing rock and sediment particles that have been affected by bioturbation. The marked contrast and sharp contact between the rubefied layer and the overlying deposits suggest that the latter are not genetically related to them and that they were emplaced after removal of the combusted materials. This contrast cannot be due to bioturbation as both above and below the contact the deposits are equally bioturbated.

♦ Some coprolite grains as well as bones are found in the center of the slide.


Macro scan of large thin section BR-8B. Note the distinct contact between reddish sediments in the lower third of the slide and overlying greyer deposits; the contact is partly demarcated by a subhorizontal fissure in the right-hand side of the slide.



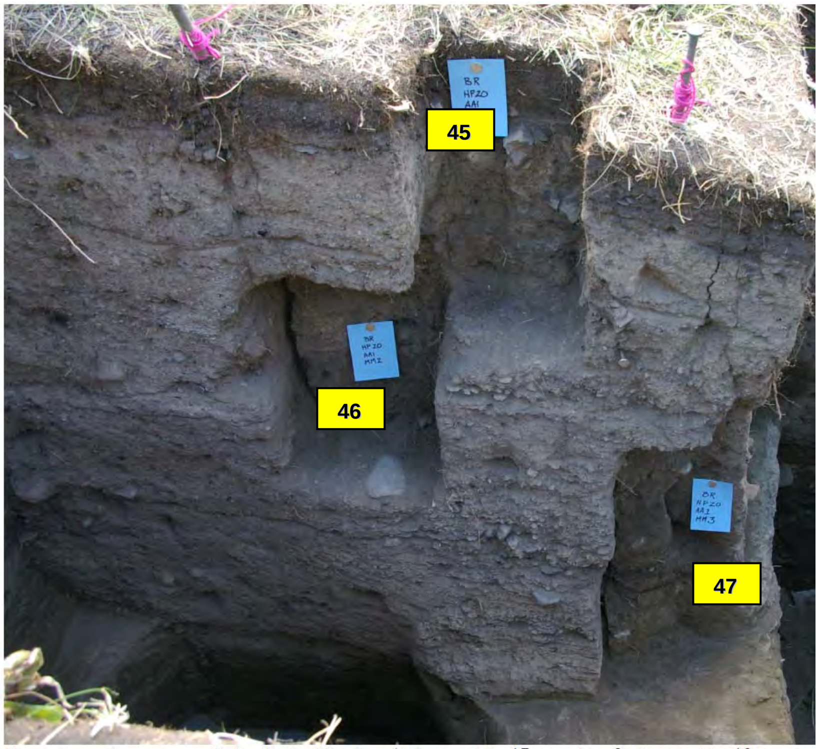
Photomicrograph showing rounding of silty clay aggregates, some of which are reddened due to heating. PPL. [File*: BR-08B ppl 2.5x - rubefied grains copy.ti*f]

<u>BR- 8C:</u>

- ♦ This is a generally fine grained sediment that shows a band of fine and coarse charcoal in the center of the slide. Although the upper part of the slide does contains some coarse pieces of angular charcoal, there is little finely comminuted pieces of charcoal within the finer fraction as is the case in the center of the slide.
- ♦ The lowermost part of the slide contains less charcoal overall and has a lighter color, as was suggested in the field.
- ♦ The central part also contains some rubefied soil and mineral grains, as well as some bone and coprolites, which are absent in the lower part.
- ♦ All parts of the slide exhibit a loosely aggregated, granular structure resulting from bioturbation.
- ♦ As elsewhere, black charcoal and reddish brown woody materials can be seen, the latter seemingly representing humification rather than charring.


Macro scan of large thin section BR-8C with large pieces of charcoal in the upper part. The lower ¼ of the slide is lighter in color and is composed of more sterile silty clay.

## AA1 – Sample 46




*Ignore numbers on cards in photo. Number 1 changed to 45, number 2 changed to 46, number 3 changed to 47.

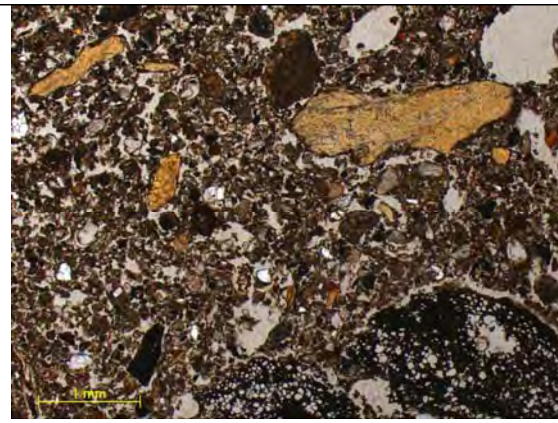
BR-46A:

♦ This slide is almost completely bioturbated and composed entirely of aggregated material. Remains of a cm-wide passage feature - presumably cicada - as well as roots and associated channels testify to this bioturbation.

♦ Millimeter- and sand-size grains of charcoal are scattered through the slide, as are bone fragments. One ~1 mm wide yellow brown coprolite fragment was observed.

♦ Some heating is evidenced in the occurrence of rubefication of a few silty clay aggregates, which occur dispersed throughout the slide.


Macro scan of large thin section BR-46A. Ellipse defines an area of a filled burrow.



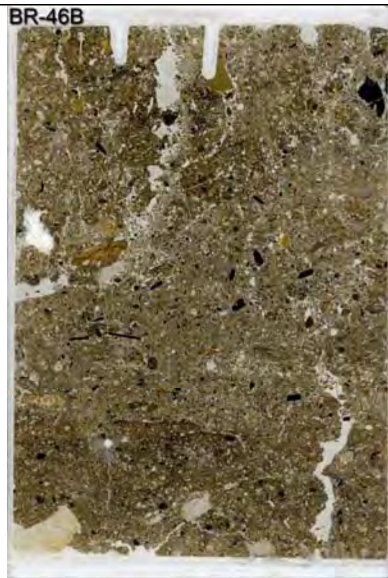
Photomicrograph of material within ellipse at left, consisting of rounded yellow bone fragments, charcoal, and rounded silty clay aggregates. PPL. [File*: BR-46A ppl 2.5x grains in passage feature copy.tif*]

BR-46B:

♦ This is similar to -46A, but there is a greater incidence of pale yellow silty clay aggregates.

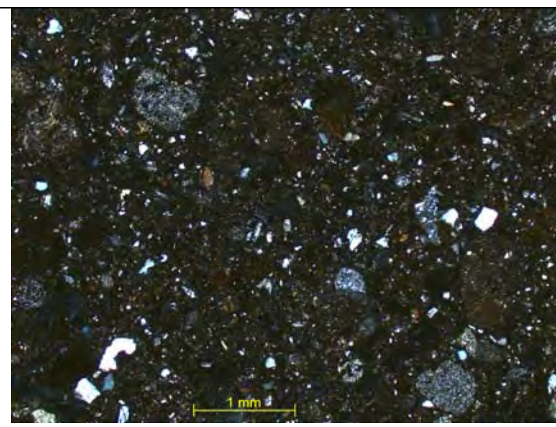
♦ Generally angular bone fragments are relatively abundant in the upper part of the slide.

♦ The lower ¼ of the slide appears to be slightly redder than above. This color difference is reflected in the presence of slightly rubefied silty clay and bedded clay aggregates, as well as some reddish brown plant tissues.



Macro scan of large thin section BR-46B. Note the extensive burrowing in the middle part of the thin section, which is reflected in the appearance of fine aggregates.

Photomicrograph of sample -46B showing rounded aggregates, some of which are reddened (arrow). PPL. [File: *BR-46B ppl 2.5x rounded clay aggs copy.tif*]



Same as at left but in XPL. [File*: BR-46B xpl 2.5x rounded clay aggs copy.tif*]

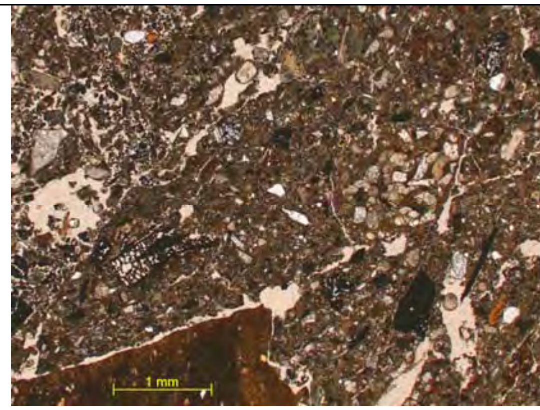
<u>BR-46C</u>:

♦ This lowermost sample in the sequence is virtually identical to sample -46B above it. Only in the lower part do there appear to be mm-size fragments of intact silty clay with charcoal inclusions.

♦ Plant remains occur as pieces of black charcoal and dark reddish brown (humified?) tissues.

♦ Bones occur throughout and both angular and sub-rounded sand sized fragments were observed.


Macro scan of large thin section BR-46C. Note the scatter of angular charcoal throughout the slide.

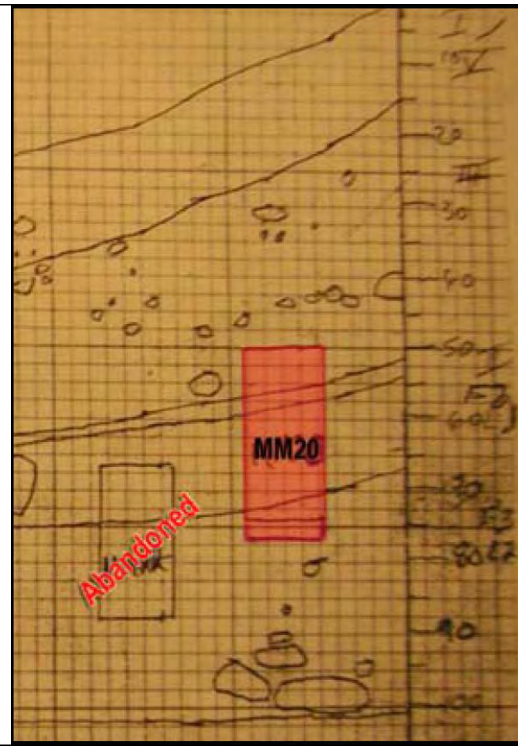



Compact nature of the sediments is visible in the center of the photograph, which appears to represent a passage feature (burrow) of some insect. A portion of the original, non-burrowed sediment is visible in the lower right-hand corner. PPL. [File*: BR-46C ppl 2.5x - intact sediment compact copy.tif*]

*Comments about HP 20*:

- Charcoal is present in all samples and is represented as black, burned pieces, as well as reddish brown humified material.
- Reddening of the deposits is evident only in sample 8A toward the bottom and becomes noticeable in 8B.
- Coprolites or phosphatic material is rare but some irregular pieces appear in sample 8A and 8B. They seem to co-occur with bone fragments suggestive of carnivore (e.g., dogs) activity, such as gnawing.
- Thin sections from AA2 (sample 46) are overall comparable to those in AA1 (5, 6, 8) but the former are possibly more extensively bioturbated that the latter.

**House Pit 24**



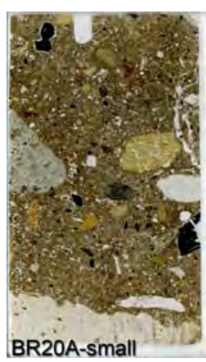

<u>BR- 20A</u>:

♦ This is generally compact fine granular material including charcoal, which is distributed uniformly throughout the slide as silt-size and mm-size grains; they are commonly rounded.

♦ Some rubefied soil and rock fragments were observed across the slide.

♦ Bone fragments – generally rounded, sand-size grains – are relatively rare; one calcined bone fragment was observed, which is very rare in all the thin sections examined.

♦ Traces of grass phytoliths occur but these need detailed and intensive observation in order to locate them.




Macro scan of small thin section BR-20A.

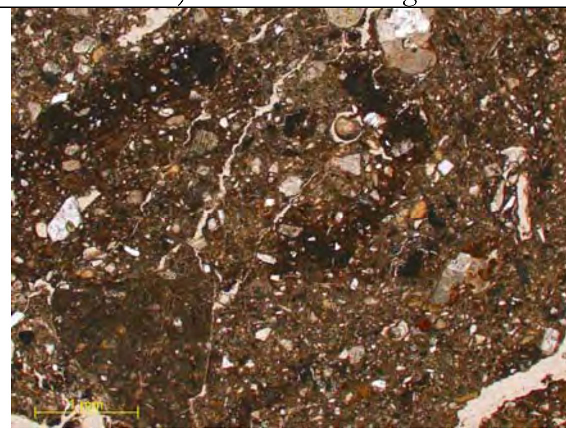
<u>BR- 20B</u>:

♦ This is one of the very few samples with intact deposits that have partially escaped burrowing. This material consists of tightly packed sandy and silty clay with inclusions of rock fragments, charcoal/organic matter

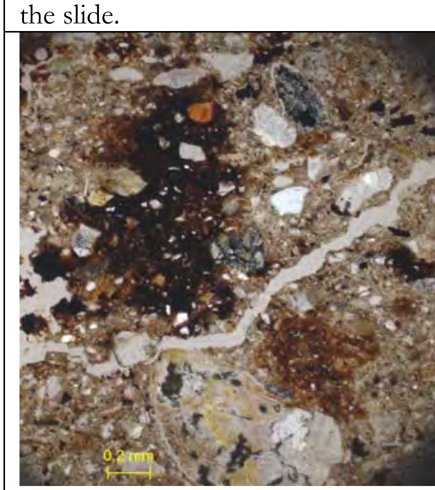
♦ This material has been burrowed particularly in the central part of the slide.

♦ Striking in the undisturbed matrix material is widespread occurrence of redoximorphic features resulting in iron depletion and accumulation within the matrix. This phenomenon signals the presence of poor drainage associated with either water ponding at the surface (although this sample seems to be ~30 cm below the surface) or the effects of groundwater.

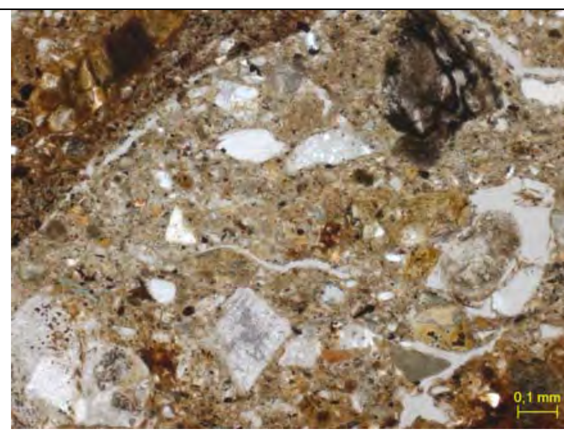

Macro scan of large thin section BR-20B showing extensive bioturbation in the center of the slide.



Oxidation/reduction is shown here by the dark concentrations of iron. PPL[File: *BR-20B ppl 2.5x - iron staining and depletion copy.tif*]




Detailed view of iron concentration and pale area where iron has been depleted. PPL. [File: *BR-20B ppl 5x - iron staining and depletion cropped copy.tif*]




Higher magnification showing pale, iron-depleted area. PPL. [File: *BR-20B ppl 10x - iron staining and depletion 8 bit copy.tif*]

<u>BR-20D</u>:

♦ This is mainly similar to -20B, but exhibits less burrowing and fewer redoximorphic features.

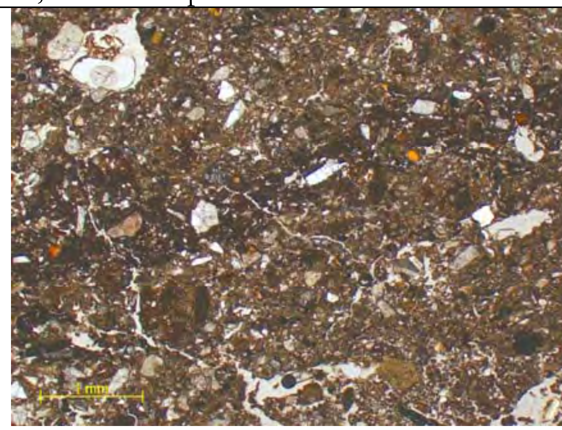
♦ Charcoal occurs particularly in the upper part of the slide.

♦ Notable is not only the compaction of the matrix material but its roughly subhorizontal organization, which is difficult to characterize. Particularly prominent in the lower part of the slide are darker colored stringers (= thin lenses), which are about 1 mm thick and are composed of organic (humus?)-rich clay.

♦ Elsewhere the bedded nature of the deposit represents differences in proportions of lithoclasts and finer matrix material.

♦ Some channels are filled with modern roots, as at the top of the slide

<table>
<tr>
<td>

Macro scan of large thin section BR-20D with generally dense but bedded matrix, which is particularly apparent in the lower half of the slide. The upper and middle portions exhibit a higher degree of biological disturbance as can be seen by the lighter colored, 'amoeboid' domains. Arrow points to a lens or organic-rich clay.</td>
<td>

Photomicrograph of dark stringer shown at left. PPL. [File: *BR-20D ppl 2.5x - dark stringer copy.tif*]</td>
</tr>
<tr>
<td>

Detail of dark stringer showing fine organic-rich aggregates of clay. PPL. [File: *BR-20D ppl 10x - dark stringer detail copy.tif*]</td>
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</tr>
</table>

*Comments on House Pit 24*:

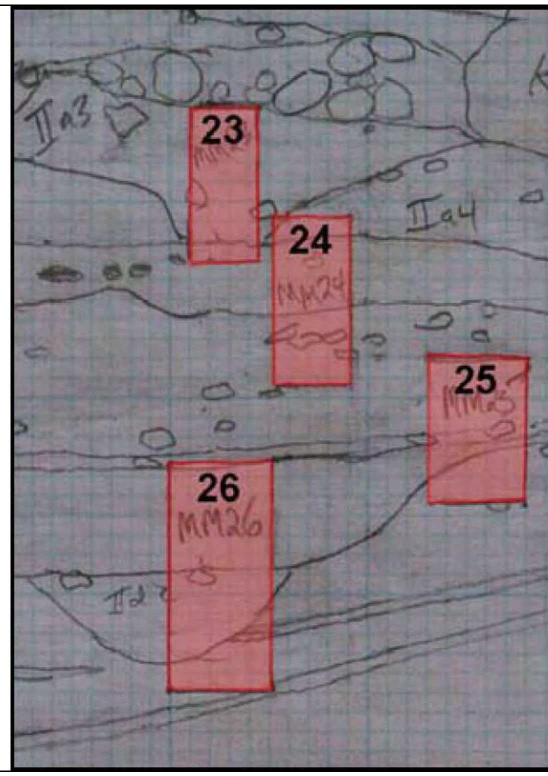
♦ The matrix is relatively intact and only partially burrowed. It is compact and composed of silty clay, which locally (e.g., sample -20B) exhibits iron depletion and concentration features associated with periodic water saturation. The clayey and compact aspect of the sample may be the explanation for markedly less bioturbation in this sample.

♦ Some bedding is evident in the lower part of the sample (-20D), which is expressed as slight differences in texture; some darker stringers on the other hand, are composed of organic clay, perhaps associated with living 'floors' and human activity.

♦ Such bedding likely represents different surfaces of occupation, in spite of their thinness (<1 mm).

**House Pit 54**

**AA3 - Samples 23, 24, 26**


BR-23A:

♦ These deposits are similar to those from House Pit 20, being extensively bioturbated, with little left of the intact matrix.

♦ Anthropogenic components are typically sand to mm in size and include rounded but mostly angular charcoal and humified wood grains, as well as some irregular bone fragments.


Macro scan of large thin section BR-23A with open, bioturbated appearance.

<u>BR-23B</u>:

♦ This slide is virtually identical to -23A, except for the greater abundance and presence of larger pieces of charcoal (e.g., base of thin section as shown in the scan).


Macro scan of large thin section BR-23B showing large chunk of charcoal at the base.

<u>BR-24A</u>:

♦ This sample has a higher proportion of bone fragments than in most other samples. They tend to be sand-size angular blocky pieces; some rounded fragments were observed but these are in the minority.

♦ Charcoal occurs in relatively low abundance.

♦ Striking is the general reddish color of the sample, although the upper left-hand corner is darker and coarser. The reddish color appears in the thin section as reddened rock, soil, and mineral grains and clasts. This reddening coincides with field observations and those made on slabs of impregnated sediment.


Macro scan of large thin section BR-24A, with reddish material in the lower part, cut diagonally by a darker, more organic rich accumulation with charcoal.

BR-24B:

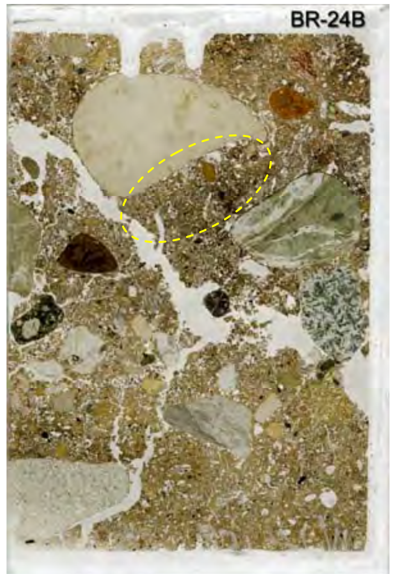
♦ This sample is highly fragmented by bioturbation and also some slight disturbance during sampling or transport, prior to being impregnated.

♦ Nevertheless, it is still possible to observe some bone fragments (particularly in the upper part)

♦ Charcoal is dispersed throughout as small, sand-sized fragments that are locally incorporated into the matrix.

♦ Localized domains of possibly intact sediment occur between two pebbles shown in the scan below. It is possible that these two pebbles help deter bioturbation.

♦ Slight rubefication is evident in the upper, right-hand part of the slide.




Macro scan of large thin section BR-24B. Much of the material is bioturbated with somewhat fewer effects in the area denoted by the ellipse. The darker grains are rock fragments and not charcoal.

BR-24C:

♦ This lowermost part of sample 24 is quite similar to -24B but contains a higher proportion of charcoal, which is typically well rounded and sand size.

♦ Bone occurs in roughly the same proportion as in -24B.

♦ Bioturbation is extensive, and the remains of some modern roots exhibit soil microfauna excrements attesting to ongoing biological activity.


Macro scan of small thin section BR-24C with modern root oriented vertically in the center of the slide.

BR-26A:

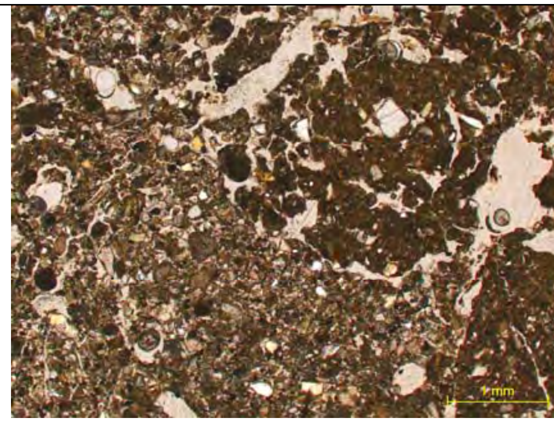
♦ This sample is considerably more clayey than others so far examined. Even though bioturbation is widespread it is possible to observe fragments of bedded clayey material (slaking crusts), which originally had formed in standing water and are now in secondary position.

♦ These clayey areas are mixed in a chaotic fashion with silty domains and particles in a chaotic fashion.

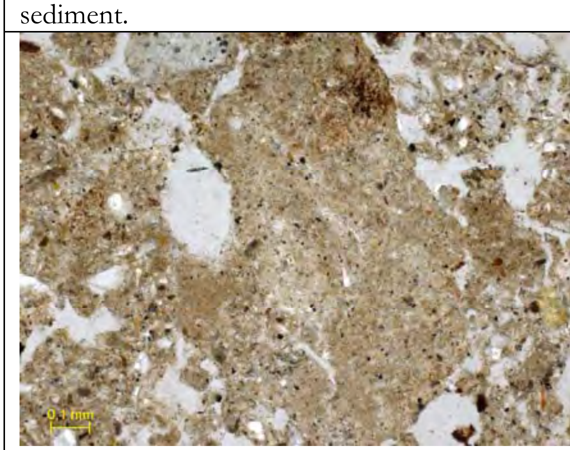
♦ This sample is also noteworthy for its presence of calcium carbonate. It occurs as sand sized clumps of secondarily cemented ashes, as well as carbonate hypocoatings. The latter represent weakly developed secondary impregnations of the matrix surrounding a void.

♦ Commonly mixed with the ashes are finely comminuted, fine silt-sized fragments of charcoal.

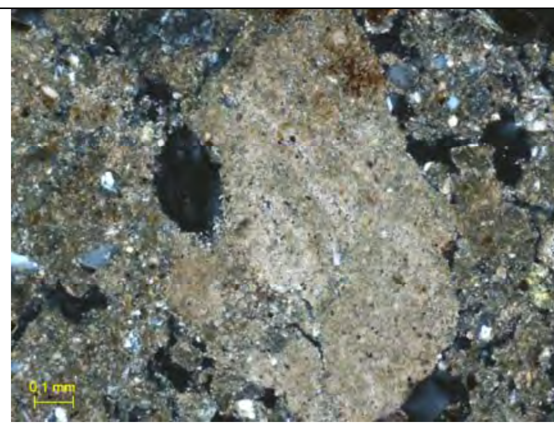
Macro scan of large thin section BR-26A showing generally fine grained nature of the sediment.



Photomicrograph showing circular passage feature of insect in upper right-hand side. PPL. [File: *BR-26A ppl 2.5x - passage feature and chaotic fabric copy.tif*]



Detailed view of cemented ashes within sample BR-26A. The dark flecks are finely comminuted pieces of charcoal. PPL. File: *BR-26A ppl 10x - cemented ashes copy.tif*]



Same as at left but in XPL. [File: *BR-26A xpl 10x - cemented ashes copy.tif*]

<u>BR- 26B</u>:

♦ There are two types of deposits in this section, separated with a sharp contact [see thin section scan].

♦ The lower part is comprised of aggregated grains of charcoal; rock fragments; aggregates of yellowish silty clay; flecks of reddish brown organic tissues, possibly representing macerated plant material (wood, bark?). One irregular, fragmented, and apparently crushed bone fragment occurs at the top of this lower unit, just below the contact with the overlying, lighter part.

♦ The upper part is much lighter in color and contains aggregates of bedded clay and silt as in -26A, as well as yellow clumps of bedded coarser calcareous silt.

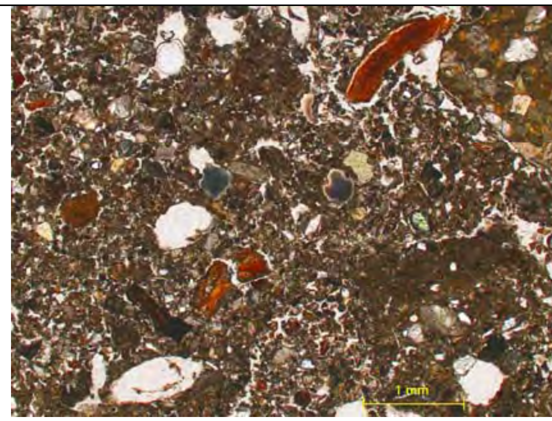
♦ The lighter color of the upper part is due to the presence of calcite and yellow silty clay, despite the presence of small amounts of charcoal that occurs in the upper part.

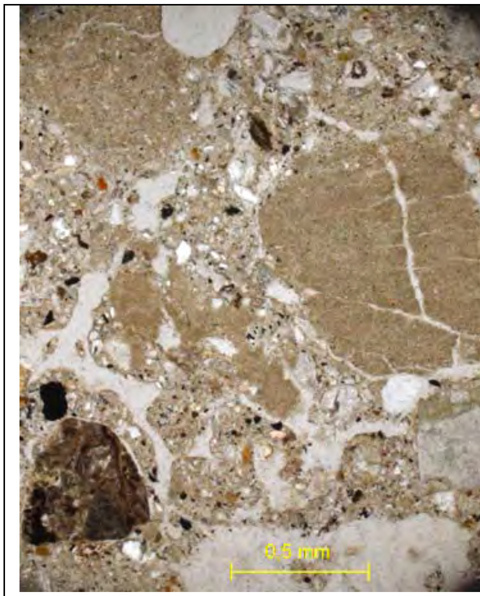
♦ The fabric of the upper part is quite complex and resembles that of -26A, being chaotically mixed domains with different textures.

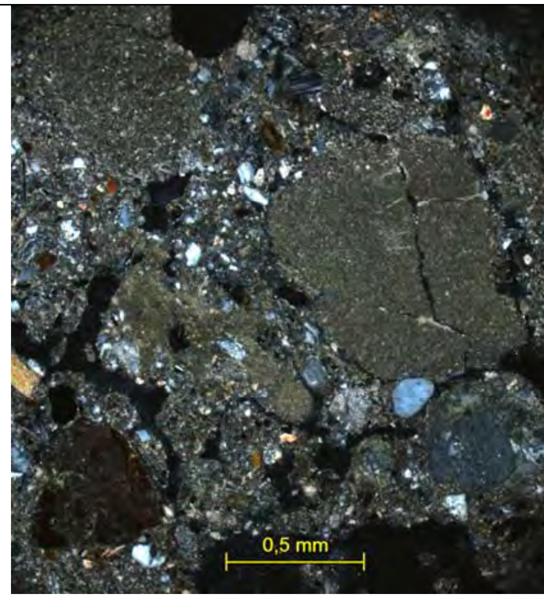
♦ Some bone fragments occur in the upper part, but they are relatively rare and sand size. A sand-size, rounded phosphatic coprolite fragment was observed close to the top of the section.

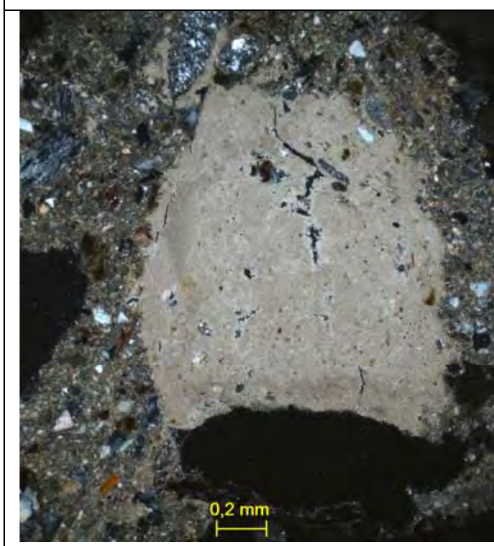
♦ Platy grains and irregularly shaped masses of ashes are scattered throughout the upper part.

Macro scan of large thin section BR-26B with sharp contact between upper and lower units. The latter is somewhat richer in charcoal, whereas the former is richer in calcite that imparts a lighter color to the sediment.


Reddish brown tissues within the bottom part of the thin section, which is locally calcareous. [File: *BR-26B ppl 2.5x - reddish brown plant tissue copy.tif*]

<table>
<tr>
<td>

Rounded clump of bedded clay at the right. PPL. [File: *BR-26B ppl 5x - clay clumps copy.tif*]</td>
<td>

Same as at left but in XPL and slightly wider field. The speckled nature of the clay grains is evident here. [File: *BR-26B xpl 5x - clay clumps copy.tif*]</td>
</tr>
<tr>
<td>

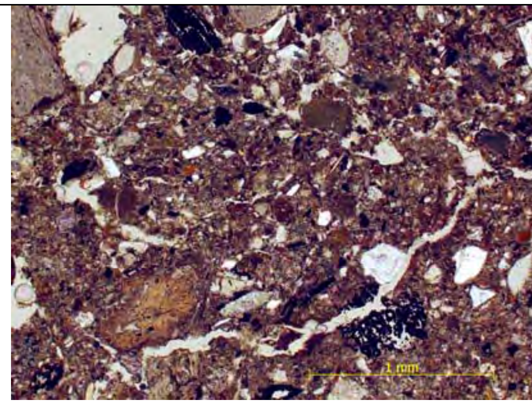
Clump of cemented calcitic ash. [File: *BR-26B xpl 5x - ash clump copy.tif*]</td>
<td></td>
</tr>
</table>

<u>BR- 26C</u>:

♦ This is rather heterogeneous material with complex fabrics as above and perforated by numerous mm-sized burrows (see scan below).

♦ Grains include charcoal and humified wood (sand-sized pieces as well as finely comminuted fine silt sized ones), traces of bone, reddish brown plant tissues, rubefied silty clay aggregates, traces of phytoliths, rare clumps of ash, or areas where ashes have been mixed into the silty clay matrix.

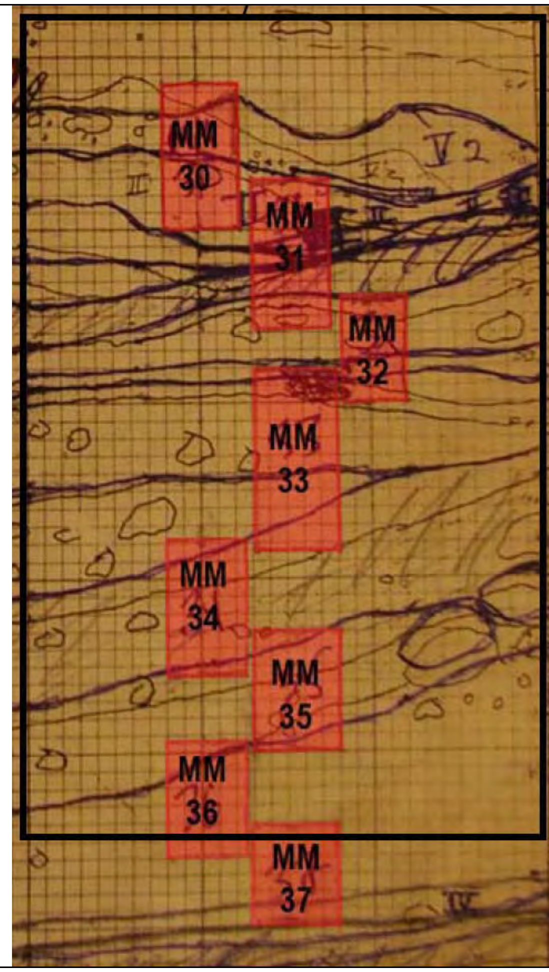

Macro scan of small thin section BR-26C with enhanced porosity resulting from bioturbation..




Chaotic mixture of charcoal, bone and silty clay material.  PPL.  [File: *BR-26C ppl 5x chaotic material copy.tif*]

*Comments on BR-26:* this sample contains evidence for the presence of water activity, which is associated not only with bedded clays and slaking crusts, but recrystallized ashes; the latter are rare in the thin sections from the site, and sample 26 is the sole occurrence. Bioturbation appears to be a result of smaller insect fauna than that observed in sample -5B for example.

**AA1, North Wall - Samples 30, 31, 32, 34, 35**




<u>BR-30A</u>:

♦ This is an extensively biologically worked sample composed of many loose aggregates and grains, including charcoal, pale yellow silty clay, and slightly rubefied brown silty clay.

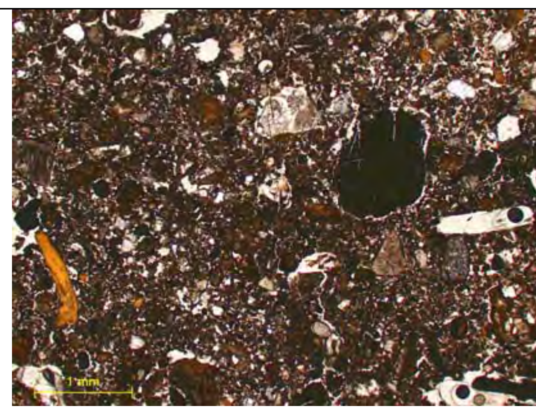

Macro scan of large thin section BR-30A.

<u>BR-30B</u>:

♦ This is finely aggregated dark brown material relatively rich in charcoal, both as mm-size pieces, but more commonly as finely comminuted, silt-size grains. Similarly macerated fragments of reddish brown plant tissues form part of the aggregated nature of this sample.

♦ Rounded, sand-sized slightly rubefied grains of silty material are visible at higher magnifications.

<table>
<tr>
<td>

Macro scan of large thin section BR-30B. The overall dark color of the sediment is due to the presence of finely comminuted charcoal. Note the latest phase of bioturbation, which is expressed as loose, open areas, particularly in the center of the slide.</td>
<td>
Photomicrograph showing packed rounded aggregates, some of which are reddened; note the bone fragment at the left. [File: BR-30B ppl 2.5x - finely comminuted and rounded cc copy.tif]</td>
</tr>
</table>

BR-31A:

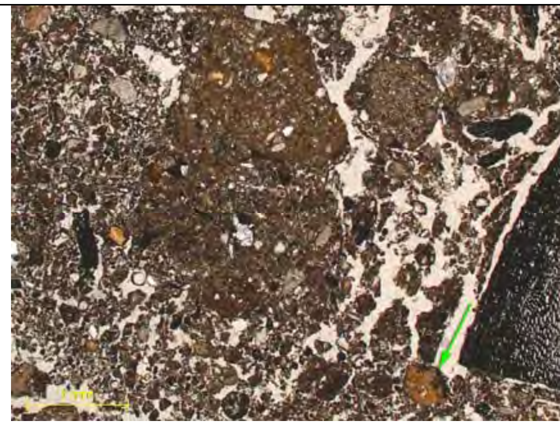
♦ Abundant coarse pieces of charcoal are prominent in this sample.

♦ Some pieces of bone occur, of which a few appear to have been burned.

♦ Aggregates consist of yellowish silty clay grains with weakly developed granostriated birefringence fabrics (b-fabrics) developed around inclusions of quartz silt; some of these grains are rubefied, as are a few of the mineral-rich rock fragments. In addition, many of the aggregates and individual mineral/rock grains exhibit reddish brown very dusty clay coatings, likely associated with the churning effects of bioturbation.

♦ Traces of sand-size, yellowish phosphatic grains with quartz inclusions appear to be fragments of coprolites.


Macro scan of large thin section BR-31A with numerous large pieces of charcoal.



Rounded slightly rubefied aggregate of silty clay surrounded by finer aggregates. Arrow points to yellow brown, phosphatic coprolite. PPL. [File: *BR-31A ppl 2.5x - compact pre burrowed sed - aggs copy.tif*]

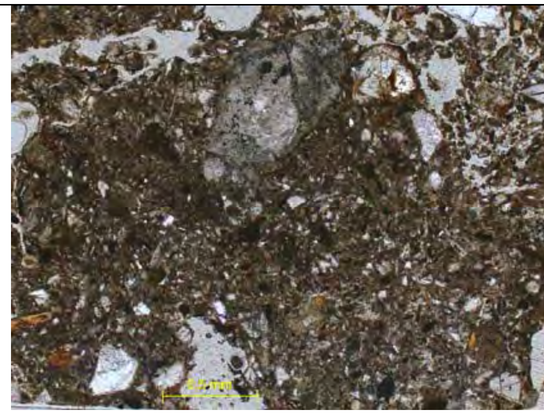
BR-31B:

♦ This section is somewhat similar to the overlying -31A but contains considerably less charcoal. It is equally composed of finely aggregated material with charcoal, bone, and some rubefied silty clay aggregates.

♦ Although as above it is extensively rubefied, localized domains of what appear to be original, pre-burrowed sediment can be observed. These domains consist of dense, dark brown silty clay with inclusions of mineral grains, charcoal (sand and silt-size pieces), and some bone. In addition, these areas exhibit speckled, granostriated, and monostriated b-fabrics; some possible iron depletion was observed as in sample -20B.

♦ A few rounded fragments of bedded clay were observed in the base of the sample, an occurrence which matches that in sample -20B as well.


Macro scan of large thin section BR-31B with outline of sediment exhibiting original fabrics that have not been burrowed.



Detail of dense silty clay matrix that appears to represent original, non-burrowed material; note, however, the small size of this aggregate. PPL. [File: *BR-31B ppl 5x - detail of compact pre burrowed sed - aggs copy.tif*]

<u>BR- 32A</u>:

♦ Extensive bioturbation has modified this material, yet some stratigraphic differences can be seen within the slide.

♦ Overall, the upper third of the slide is somewhat richer in charcoal and consequently darker than the sediment below it, although charcoal can be observed throughout the slide.

♦ Bone is relatively common in this sample, particularly in the upper half of the slide, although it is present below this part, but in reduced amounts.

♦ Very pale yellow aggregates of silty clay occur in the center of the slide and these resemble the deferrified ones discussed above. Here the aggregates are sand size.

♦ The lowermost ¼ of the slide is somewhat greyer than the overlying part and reflects a greater amount of burrowing and inclusion of fine charcoal and humified wood tissues. The material in this lower part is looser than that above it and is related to the greater burrowing here.

♦ Some rubefication of the silty clay aggregates is noted in this lower part of the sample, and perhaps it is associated with the increase in charcoal in this part of the slide.

♦ A few sand-size coprolite fragments were observed in the very lower part of the slide.


Macro scan of large thin section BR-32A. The upper line separates a more charcoal-rich zone from redder sediment in the center; the red elliptical zone designates a looser, more charcoal-rich area with some bone and coprolites.

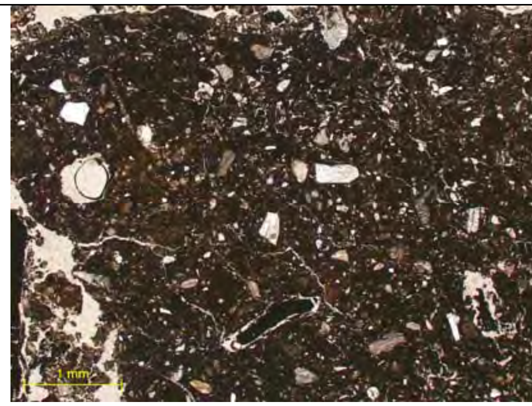
BR-32B:

♦ Again, although much of the slide is burrowed, some areas appear to be roughly intact and not disturbed by the burrowing. A large grain of silty clay with charcoal occurs near the top of the slide and appears to have been burnt (see macro scan below). Additional intact sediments consist of pale yellow silty clay with inclusions of charcoal and bedded clay clasts. In some aggregates of this material, reddish brown organic tissues can be seen.

♦ In one aggregate a snapped bone occurs, indicating trampling of the original sediment, prior to being reworked by burrowing.

♦ Some yellow coprolites with silt inclusions were found in the lower part of the thin section.

♦ A band of sediment richer in charcoal is visible within the upper half of the slide.

| | |
|---|---|
|  Macro scan of large thin section BR-32B. Area surrounded by the box is a burnt fragment of what appears to be intact original sediment (silty clay with inclusions of charcoal). The blue ellipse delineates another undisturbed area, but this consists of pale yellow silty clay. Red lines delineate a band of sediment richer in charcoal, both as mm-size pieces, as well as finely comminuted fragments mixed with aggregates. |  Photomicrograph of material in box at left. It consists of silty clay with charcoal and appears to have been heated. PPL. [File: *BR-32B ppl 2.5x - square burned fragment copy.tif*] |

<u>BR-34A</u>:

♦ This sample is extremely rich in charcoal throughout, although the lower third of the slide is slightly richer, which renders a darker color to this part of the slide.

♦ Many of the rounded silty clay aggregates are slightly rubefied, although many are not and are pale yellow brown in color. Both burned and unburned types can be found next to each other.

♦ Some angular bone fragments were found but bone is generally rare.


Macro scan of large thin section BR-34A showing an abundance of large and small charcoal fragments, particularly in the lower half of the slide.

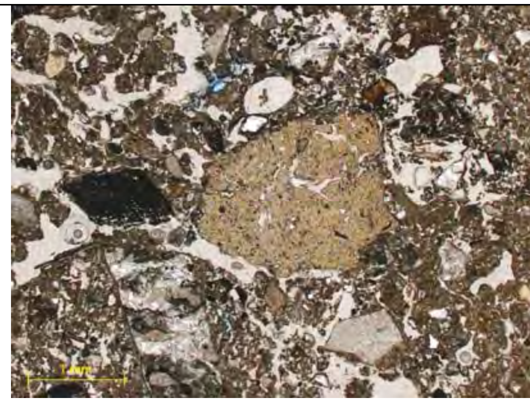
<u>BR-34B</u>:

♦ The basal part of the slide, beneath the large lithoclast consists of pale yellow silty clay that is generally aggregated and bioturbated, although some original domains can be observed.

♦ Present within this basal sediment are inclusions of charcoal, bone, coprolites, and a large piece of reddish brown plant tissue.

♦ Overlying the rock, the sediments are richer in charcoal, bone, and a relatively high number of coprolite pieces.

♦ Traces of original, intact pale yellow silty clay occur in the upper part of the slide but generally the material is burrowed; rubefied rounded clay aggregates also occur in this upper portion.

| | |
|---|---|
| <br>Macro scan of large thin section BR-34B. Note the lighter color below the rock fragment and the more charcoal-rich sediment above it. Also note in the upper part of the slide the domains of lighter colored silty clay mixed with the charcoal-rich part. This mixing is due to bioturbation, which affected the basal material to a lesser extent. | <br>Relatively large piece of yellow rounded coprolite. PPL. [File: *BR-34B ppl 2.5x - coprolite copy.tif*] |

<u>BR-35A</u>:

♦ Although subjected to considerable bioturbation, it is possible to observe that much of the original sediment appears to be pale yellow silty clay and bedded clay aggregates, which are common in the slide.

♦ This pale yellow material constitutes much of the sediments in sample 35 and may reflect the proximity to sterile silty clay sediments at the base of the structure. [Thin sections -35B and -35C show similar trends in the abundance of pale yellow silty clay].

♦ Charcoal is relatively uncommon in this slide, although some rubefied silty and clayey aggregates are visible.

♦ Two rounded void coatings of microspar and micrite were observed. These are about 20 µm thick and are the only such coatings observed in any of the thin sections.


Macro scan of large thin section BR-35A. Note the overall lighter color of this material, suggesting an increase in natural sediment as one approaches the base of the structure.

BR-35B:

♦ Overall, this is quite similar to the lower part of -35A, but contains a greater abundance of rounded aggregates of bedded yellow brown clay, particularly in the lower part (arrows in macro scan).

♦ The middle part of the slide is somewhat darker and contains somewhat finer charcoal, which gives the darker appearance; it also burrowed.

♦ Some silty clay aggregates and an iron-rich pebble in the upper left-hand part of the slide are rubefied.

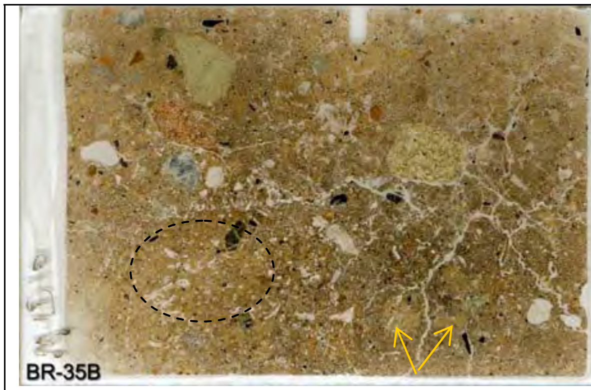
♦ Bone fragments tend to subrounded and are generally rare and scattered throughout the slide.

♦ This sample shows a particularly high abundance of modern roots and channels.

♦ Charcoal is not particularly abundant, and toward the top of the slide several fragments of reddish brown plant tissues occur.

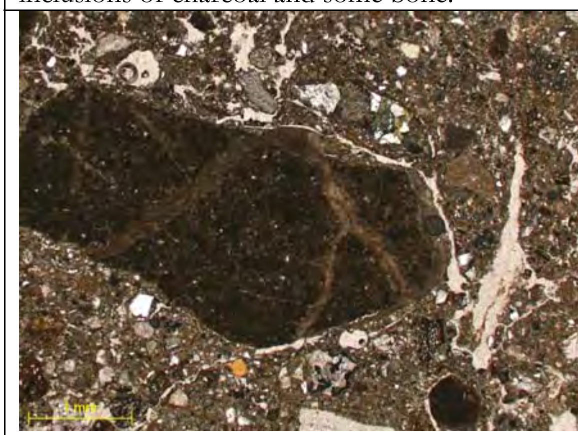
♦ A number of domains, particularly in the lower part of the slide, appear to be the remains of undisturbed sediment, composed of pale yellow brown silty clay with inclusions of charcoal and some bone. Some iron impregnations and staining can be observed.

♦ Some evidence of secondary soil carbonate is present in the form of micritic hypocoatings, pendants on rock clasts, and incipient nodule formation and impregnation of the matrix. These appear to be remnants of natural soil formation features that have been worked into the deposits by bioturbation or human activity within the house pit.

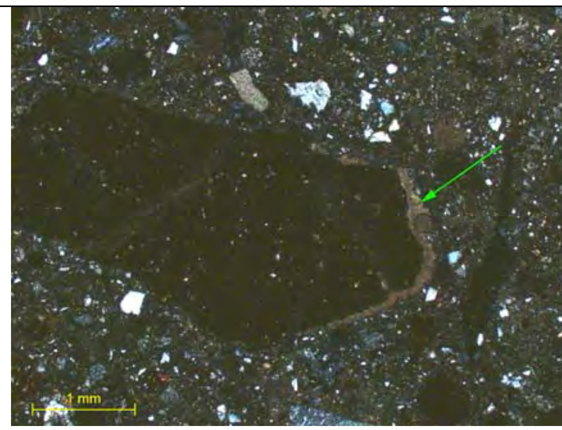



Macro scan of large thin section BR-35B. Arrows point to rounded aggregates of yellow brown clay. The area outlined by the ellipse is composed of what appears to be intact sediment, consisting of pale yellow brown silty clay with inclusions of charcoal and some bone.


Large charcoal fragment along with reddish brown plant tissue fragment (arrow). PPL. [File: *BR-35B ppl 2.5x - cc and red brown plant tissue copy.tif*]




Rock clast with carbonate pendat on right side. PPL. [File: *BR-35B ppl 2.5x - carbonate pendant copy.tif*]



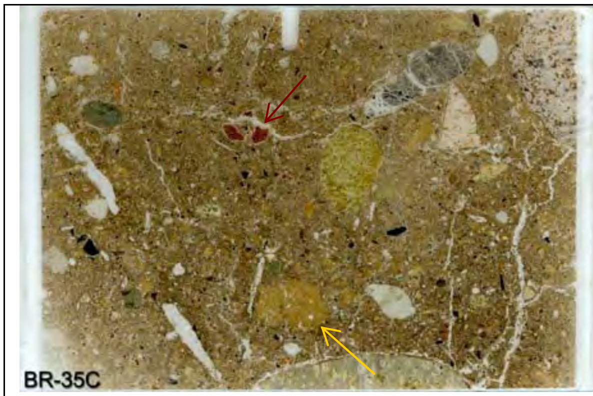

Same as at left but in XPL. Arrow shows location of brighter, carbonate pendant. [File: *BR-35B xpl 2.5x - carbonate pendant copy.tif*]

BR-35C:

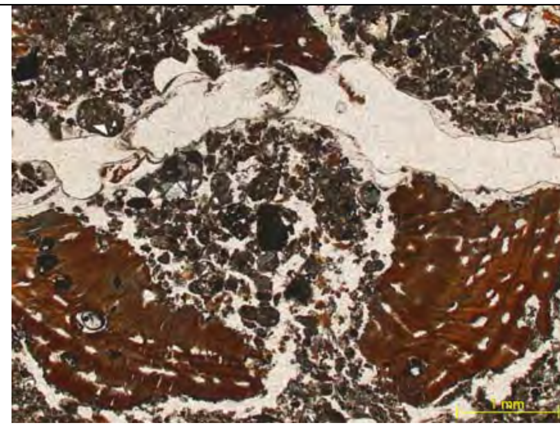
♦ This sample has been extensively worked by bioturbation, resulting in the formation of generally fine aggregates, many of which are comprised of brown bedded clay.

♦ Some sand sized-charcoal is present throughout the slide as well as two mm-sized pieces of reddish brown plant tissue.

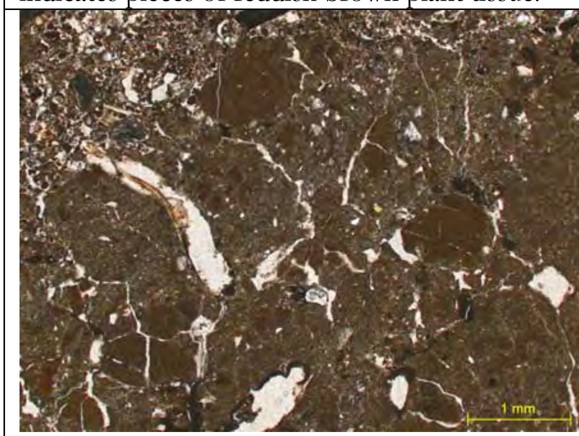
♦ Traces of splintered bone and some yellow coprolites were noted; the latter are characteristically rounded.



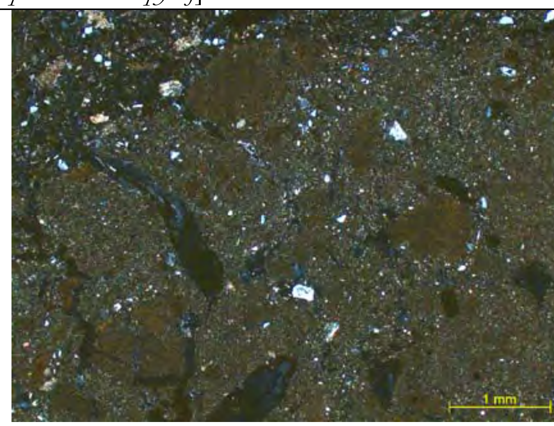

Macro scan of large thin section BR-35C with yellow arrow pointing to large clast composed of numerous brown clay aggregates. Red arrow indicates pieces of reddish brown plant tissue.




Detail of reddish brown plant tissues shown at left. PPL. [File: *BR-35C ppl 2.5x - reddish brown plant tissue copy.tif*]



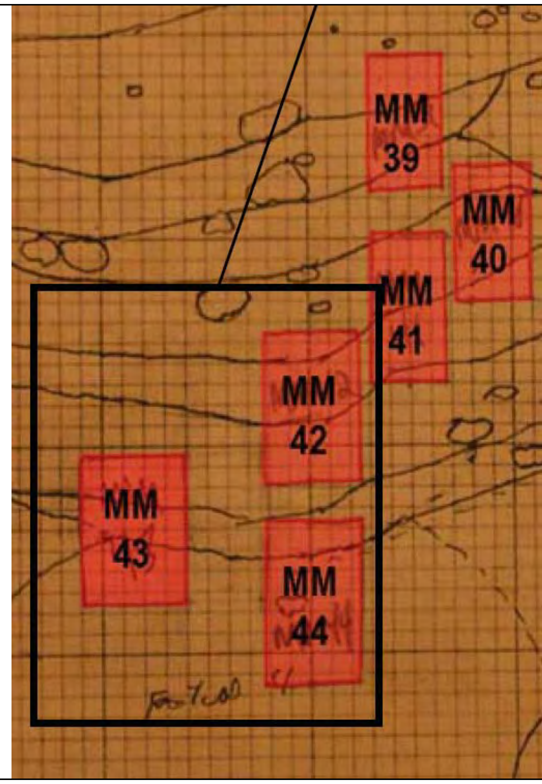

Aggregates of reddish brown bedded clay. PPL. [File: *BR-35C ppl 2.5x - bedded clay copy.tif*]




Same as at left but in XPL. [File: *BR-35C xpl 2.5x - bedded clay copy.tif*]

*Comments on House Pit 54, AA1:* The upper, loose organic-rich deposits at the top of the column give way successively to lighter colored silty clays, which appear to represent the composition of the material into which the house pit was originally excavated. Toward the bottom of the profile we encounter some soil carbonate features, which again seem to have been derived from the original soil/sediment. Samples rich in charcoal (e.g., -31A, -34A) could relate to the presence of burnt beams by which large pieces of wood would have escaped the prevalent effects of bioturbation at the site. Whereas charcoal is visible in the lowermost sediments, it is dispersed and occurs in relatively low concentrations. Overall, there is not much bone in samples from this profile, and rounded yellow sand-sized coprolites occur in very low numbers in several of the slides.

**AA2, East Wall – Samples 42, 43**




BR-42A:

♦ This rather heterogeneous sediment is composed of quite compacted fine, well rounded grains of charcoal and reddish brown (humified) woody organic matter; bone and coprolites; and rounded silty clay aggregates, some of which is rubefied. The compact nature of the material – not commonly seen in the thin sections from the site – possibly reflects trampling of the deposits.

♦ The very upper part is somewhat darker than below, resulting from a slight increase in the amount of sand- and silt-sized charcoal that appears to have been worked into the deposits by bioturbation.

Macro scan of large thin section BR-42A with compacted fine aggregates along with cm-size frock fragments.


Compacted fine aggregates, including some rounded rubefied clay grains. PPL. [File: *BR-42A ppl 2.5x - rubefied rounded clay aggs copy.tif*]

<u>BR-42B</u>:

♦ This is very similar to sample -42A and is composed of compact, finely aggregated material as well as rock fragments.

Macro scan of large thin section BR-42B.

<u>BR-43A</u>:

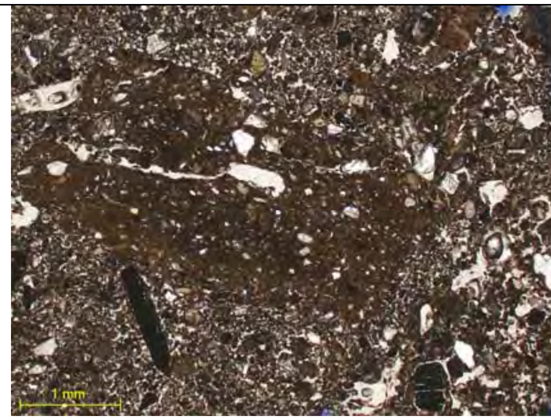
♦ In overall composition and porosity, this is very similar to the slides in sample -42, being comprised of compact, finely aggregated material.

♦ There does seem to be an increase in pale yellow silty clay aggregates, some of which are clearly rubefied.

♦ Charcoal is more abundant in the upper half of the slide, rendering it somewhat darker; charcoal also increases slightly along the bottom edge of the slide.

♦ Bone fragments are somewhat more abundant in this section than elsewhere, particularly in the lower half of the slide. They tend to be sand-size splinters and rounded pieces, as is the case elsewhere.


Macro scan of large thin section BR-43A with its compact aggregated nature that resembles that found in thin sections from sample 42.




PPL. [File: *BR-43A ppl 2.5x - rubefied large clay clast copy.tif*]

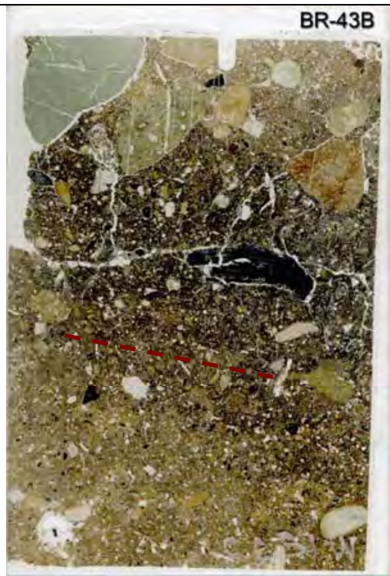
BR-43B:

♦ A clear contact is visible in the lower third of the sample. The upper part is rich in both angular and rounded sand-size pieces of charcoal, along with finely comminuted pieces that constitute a considerable part of the matrix. Rounded bone and silty clay aggregates are also common in this part.

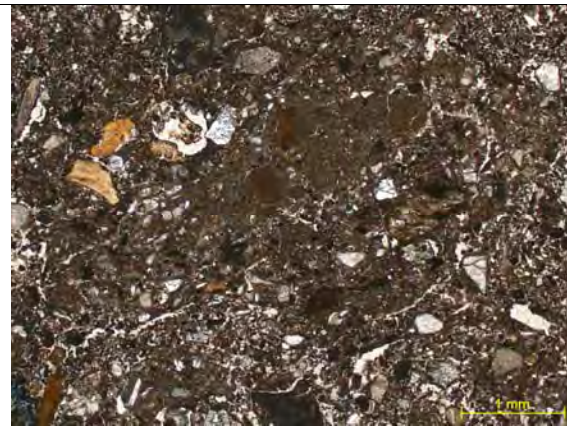
♦ Some rubefication of the silty clay aggregates is visible. A particularly large one (~8 mm long) exhibits a black rim that apparently points to reducing conditions when it was heated.

♦ Some of the grains exhibit thin (~20-30 μm) coatings of yellow brown silt (and some silty clay).

♦ The lower part contains less charcoal, both as sand-sized pieces and also finely divided fragment as the matrix. It also has a higher proportion of pale yellow silty clay, as well as brown bedded clay aggregates.



Macro scan of large thin section BR-43B. Note the color change from dark brown in the upper half to lighter brown below.



Rubefied rounded clay aggregates in the center and two pieces of bone at left. PPL. [File: *BR-43B ppl 2.5x - rubefied clay aggs copy.tif*]

Lare rubefied piece of silty clay with sand inclusions. PPL. [File: *BR-43B ppl 2.5x - rubefied silty clay clast copy.tif*]

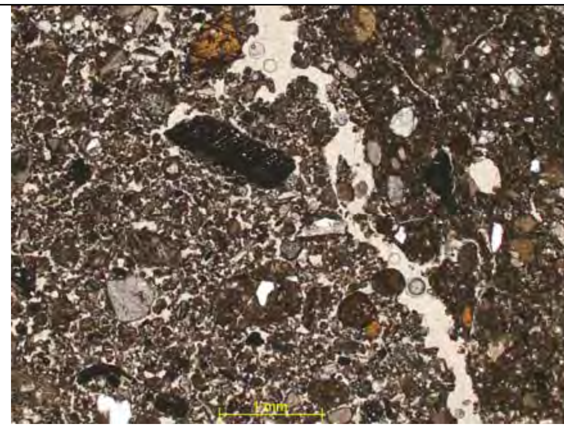
<u>BR-43C</u>:

♦ Striking here is the presence of a cm-wide burrow in the center of the slide, presumably made by a cicada. The fill is comprised of characteristically finely aggregated material that resembles the aggregated sediments found in sample -42 for example.

♦ Other areas in the slide, not in clear burrows, show similar finely aggregated material.

♦ On the other hand, the basal part of the section appears to contain relatively intact sediment, which is composed of dense sandy and silty clay with inclusions of charcoal and virtually no bone. It resembles the sediments in sample -32B.


Macro scan of large thin section BR-43C showing a large (cicada?) burrow in the center of the slide.  The lowermost deposits are somewhat more compact than the upper, extensively burrowed ones.



Detail of burrow shown at left, showing looser aggregated fill at left and dense edges of the burrow at right.  PPL. [File:  *BR-43C ppl 2.5x - aggregated cicada burrow fill copy.tif*]

*Comments on samples 42 and 43 from AA2:* These deposits are more finely aggregated than many of the other deposits.  Burrowing is evident, especially in -43C. However, even in this sample there are some domains that appear to be the remains of intact deposits.  They consist of sandy silty clay with inclusions of charcoal that appear to have been trampled into the mineral matrix.

**Final Comments**

Most of the sediments examined in this study exhibit widespread effects of bioturbation, and as a consequence, it is difficult to evaluate comprehensively the complete history of the sediments since so much of the original context is missing.

Although the presence of certain micromorphological features do provide some clues to some aspects of the depositional history of the sediments, not much can be offered in the way of insights into anthropogenic aspects of the sediments and site function, for example.  To do this, one would need intact, undisturbed sediments.

Some of the observations and their implications include the following points:

- Only one thin section (-20D) seemed to show evidence of the remains of intact living surfaces.  Presumably such bedded material might be present in other structures and slides if it were not for the effects of bioturbation.
- Much of the original sediment in the housepits – where preserved – is composed of dense, pale yellow silty clay which displays a variety of b-fabrics, such as granostriated, parallel striated and speckled.  Mixed into this dense sediment are charcoal and some traces of bone.  It seems that this material might represent clayey floor material, into which was trampled charcoal and bone.

- Phytoliths were not noted in most of the thin sections and their absence may be significant (e.g., lack of grass roofing).
- Bone generally occurs in relatively low amounts and angular and rounded sand-size grains. They are commonly found with similarly sized grains of yellow, phosphatic (isotropic in XPL) coprolites that contain inclusions of mostly quartz silt.
- The presence of coprolites – which appear to be from carnivores (e.g., dogs, wolves has been noted in the Keatley Creek sediments (Goldberg, 2000), although their significance remains to be determined. Such carnivore activity may show up in the faunal analysis.
- Charcoal occurs in highly variable amounts and its size at present appears to be a function in part of the degree of bioturbation that the sediment has undergone. In many thin sections, silt-size grains of charcoal are the result of intense maceration stemming from bioturbation. As a consequence, anthracological studies might be severely hampered in the efforts to identify charcoal as only large pieces are preserved. Perhaps techniques can be developed to observe charcoal in the context of the thin section as was suggested a while ago for the Keatley Creek material (Goldberg et al., 1994); much of the fine charcoal would have little value even if floatable.
- Finally, it should be noted that stratification as visible in the field is not nearly as detectable in thin section. The reasons for this are not clear but could relate to the blurring effects of bioturbation. Unlike other sites where bioturbation by rodents, for example, have completely obliterated the physical integrity of the stratigraphy, resulting in relatively complete homogenization of the profile, that does not appear to be the case here. Rather, bioturbation at Bridge River took place at the mm to cm scale (insects, such as cicadas; roots) resulting in only small size disruptions of the stratification. It seems unlikely that such bioturbation would displace most artifacts, except for small items, such as beads, which could easily be incorporated into a cicada burrow.
- At this point, the extent to which additional micromorphological research at Bridge River should be undertaken is not clear. The results so far are successful in demonstrating caution in attempting carry out analyses of fine objects and ecofacts at the site (e.g., microfauna, small finds, pollen and seed analysis), but they are limited in depicting and interpreting past human activities as their effects are so poorly preserved at the micro scale. It is interesting to note that for the other end of the archaeological spectrum, caves are commonly thought to be terrible recorders of past human activities, particularly at the microscale. Yet, recent work at Sibudu Cave in South Africa, shows this conception to be completely erroneous (Goldberg et al., 2009).

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Bridge River lithics Database Key (originally adapted from Brian Hayden's Keatley Creek lithic typology with added artifact types):

Unifacially Retouched Artifacts

143 - Scraper retouch flake
150 - Single Scraper
155 – Keeled Scraper
156 – Alternate Scraper
158 – Key Shaped uniface
163 – inverse scraper
164 – Double scraper
165 – convergent scraper
70 – expedient knife
74 – lightly retouched expedient knife
148 – flake with polish sheen
170 expedient knife normal retouch
171 – flake with trampling retouch
180 - used flake
71 – used flake on break
72 – used flake on thin flake edge
73 – used flake on strong flake edge
157 – miscellaneous uniface
161 – thumbnail scraper
162 – end scraper
153 – small piercer
152 – unifacial borer
160 – unifacial denticulate
159 – unifacial knife
151 – unifacial perforator
50 – unifacial blade tool
188 – retouched backed tool
154 – notch
54 – small notch
88 – Dufour bladelet
183 – spall tool
184 – retouched spall tool
1 – miscellaneous
232 – stemmed scraper
255 – Abruptly retouched truncation on a flake
272—hafted (notched) scraper

Bifacial Artifacts

192 – Stage 2 biface
193 – Stage 3 biface

131 – Stage 4 biface
139 – fan tailed biface
140 – knife-like biface
141 – scraper-like biface
144 – convergent knife-like biface
6 – biface fragment
135 – Distal tip of a biface
4- biface retouch flake with hide polish
130 – bifacial knife
8 – large biface reduction flake
132 – bifacial perforator
133 – bifacial drill
145 – piece esquillees
2 – miscellaneous biface
225 "Tang" knife
240 – chipped wedge tool on angular slate or shale
258 – Hafted knife on a spall
262 – Side notched bifacial drill (drill on Kamloops point)
269—Used truncation on a bifaces
273—cobble with bifacial flake removals at opposite ends (net weight)

Points

191 – blank
91 – small blank
134 – preform
36 – point fragment
35 – point tip
99 – misc. point
109 – side-notch point no base
102 – Lehman point
101 – Lochnore point
137 – Kamloops preform
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
274—Kamloops point with broken base (prohibiting accurate assessment of shape)
136 – Plateau preform
115 – Plateau corner-notched point concave base
116 – Plateau corner-notched point straight base
117 – Plateau corner-notched point convex base
118 – Plateau corner-notched point no base
119 – Plateau basally-notched point straight base
19 – Late Plateau point

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
231 – ground/sawed slate projectile point
244 – small triangular point
245 – large straight to concave base side-notch point
229 – Shuswap 10: Stem/eared with concave base
237 – “El Khiam” style point: side notched point on a triangular blade-like flake
251 – slate side-notched point with a straight base
236 – limestone or marble projectile point
256 – Kamloops split base corner notched
254 – Large square stemmed dart point
270—Bifacial knife on a reworked Plateau Point with straight base

Cores

186 – multidirectional core
187 – small flake core
189 – unidirectional core
146 – bipolar core
149 – microblade core
147 – microblade
182 – core rejuvenation flake
221 – core on slate tool

Groundstone

218 – celt
209 – ornamental ground nephrite
203 – ground slate
219 – groundstone maul
211 – groundstone mortar
190 – hammerstone
204 – steatite tubular pipe
202 – sandstone saw
200 – misc. groundstone
207 – abraded cobble or block
208 – abraded cobble spall
201 – abrader

205 – abrader/saw
185 – wedge-shaped bifacial adze
206 – anvil stone
220 – ground slate piercer/borer with chipped edges
228 – groundstone adze on a natural break
250 – ground nephrite scraper
235 – metate
234 – burnishing/polishing stone
242 – ochre grinding stone
222 – slate scraper
226 – sawed gouge (two converging sawed edges forming a robust point)
230 – slate knife
233 – nephrite adze
241 – sawed adze
246 – slate knife with bored hole
257 – Ground slate adze, without cutting
259 – Groundstone cube
260 – Mano
261 – Groundstone effigy
263 – Ground slate chopper
264 – sawed adze perform
265 – Shallow ground stone bowl
266 – sawed scraper on an igneous spall
267 – Miscellaneous groundstone base, possible effigy or bowl
238 – groundstone spike
239 – small stone bowl

Ornaments

217 – copper artifact
212 – mica ornament
216 – ground or sculpted ornament
214 – stone bead
210 – ochre
215 – stone pendant or eccentric
252 – copper bead
253 – copper pendant
243 – sawed/sliced bead (early stage in production)

Other

213 – metal artifact
254 – debitage
255 – bipolar debitage
247 – misc. drilled object
248 – misc. sawed stone

249 – painted stone tool
227 – sawed stone disk
223 – burin spall tool
224 – burin
269—Dacite cobble
271—chipped slate (no use wear)

Size

XSM – extra small
SM – small
MED – medium
LRG – large
XLRG – extra-large

SRT

N/O – nonorientable
M/D – Medial-distal
S – split
P – proximal
C – complete

Cortex

T – tertiary (0% cortex)
S – secondary (1-98% cortex)
P – primary (99-100 % cortex)

Fracture Initiation

C – Cone
B – Bend
W – Wedge

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 (shades of green)
14 - chert (white to shades of brown, yellow)
15 – jasper (shades of red, orange, gray; can be banded)
16 – jasper (Hat Creek variety: shades of butterscotch/brown/orange; mottled with dendrites)
17 – chalcedony – (all colors except yellow variants)
18 – chalcedony (yellow variants)
19 – igneous intrusives
20 – granite/diorite
21 – white marble
22 – green siltstone
23 – sandstone
24 – graphite
25 – conglomerate
26 – andesite
27 – vesicular basalt
28 – phylite
29 – limestone
20 – mica- black
31 – porphory
32 – silicified wood
33 – soapstone
34 – schist
35 – misc.
36 – serpentenite/serpentine
37 – gray vitric tuff
38 – gypsum
39 – mudstone
40 – galena
41 – quartz crystal
42 – metal/iron

Table 1: Macroremains from 2009 excavation at Bridge River

| CONTEXT | | | | | | | | | SEEDS (N) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Housepit# | Occupation perioid | Activity Areas | Flotation# | Unit/Square | Strat/Level | Feature# | Layer | Volume(l) | *Amelanchier alnifolia* | *Arctostaphylos uva-ursi* | *Chenopodium* sp. | *Cratagus* sp. | Ericaceae[1] | *Galium* sp. | Lamiaceae | *Opuntia* sp. | *Phacelia* sp. | *Pinus* sp. | Poaceae | Rosaceae | *Rubus* sp. | *Sambucus* sp. | *Scirpus* sp. | *Urtica* sp. | Unidentifiable[3] | TOTAL |
| HP11 | 4 | AA1 | 20 | 1 | II/1 | | | 1.0 | | | | | | | | | | | | | | | | | | 0 |
| | | | 58 | 7 | Va/II | | | 2.5 | 9 | | 5 | | 3 | | | | 5 | | 1 | | | | | 6 | | 29 |
| | 2 | | 44 | 4 | II b | 4 | 3 | 1.0 | 2 | | | | | | | | | | | | | | | | 1 | 3 |
| | | | 18 | 2 | II b/1 | 5 | | 1.25 | | 1 | 2 | | 1 | | | | | | | | | | | | 1 | 5 |
| | | | 14 | 2 | II b/1 | 4 | 1 | 1.5 | | | 5 | | 1 | | | | | | | | | | | | | 6 |
| | | | 28 | 3 | II b/1 | 5 | 1 | 1.25 | | | | | | | | | | | | | | | | | | 0 |
| | | | 21 | 1 | II a | 3 | | 1.5 | | 1 | 2 | | 3 | | | | | | | | | | | | | 6 |
| | | | 37 | 4 | II b | 4 | 1 | 1.0 | | | 5 | | | 1 | | | | | | | | | | | | 6 |
| | | | 13 | 2 | II a/1 | 3 | | 1.5 | 1 | | 3 | 1 | 1 | | | | | | | | | | | | | 6 |
| | | | 31 | ? | II b/6 | 4 | 6 | 2.0 | 1 | | | | | | | | | | | | | | | | | 1 |
| | | AA2 | 8 | 1 | II a/F1 | 2 | 1 | 1.25 | | 1 | | | 6 | 1 | | | | | | | | | | | | 8 |
| | | | 17 | 2 | II a/F1 | 1 | | 1.0 | 1 | | 4 | | 273 | 18 | | | | | 3 | | | 6 | | | 3 | 308 |
| | | | 47 | 8 | II a/3 | | | 1.0 | 2 | 8 | 1 | | 1 | | | | | | | | | | 1 | | | 13 |
| | | | 46 | 8 | II a/4 | | | 1.0 | | | | | | | | | | | | | | | | | | 0 |
| | | | | | | | TOTAL: | 18.80 | 16 | 11 | 27 | 1 | 289 | 20 | 0 | 0 | 5 | 0 | 4 | 0 | 0 | 6 | 1 | 6 | 5 | 391 |
| HP16 | 3/4 | AA1 | 1 | 1 | F1(L1) | 1 | | 2.0 | | 1 | 1 | | 9 | | | | | | | | | | | | | 11 |
| | | | 11 | 2 | F1(L1) | 1 | 1 | 2.0 | 39 | 82 | 356 | 4 | 31 | 1 | 1 | | 2 | | 20 | | 1 | | | | 1 | 538 |
| | 3 | | 59a | 7 | Vc/II d/1 | 9 | 1 | 1.25 | | 1 | 1 | | 4 | | | | | | 1 | | | | | | | 7 |
| | | | 56 | 7 | II a/1 | 7 | 1 | 1.25 | 1 | | 1 | | 2 | | | | | | | | | | | | | 4 |
| | | | 4 | 1 | Vc/II d/1 | | | 2.0 | 1 | | 2 | | 1 | | | | 1 | | | | | | | | 4 | 9 |
| | | | 3 | 1 | Vc/II d | | | 2.4 | | 3 | 1 | | 2 | 1 | | | | | 1 | | | | | | | 8 |
| | | | 38 | 4 | Vc/II d | 6 | 1 | 2.0 | 15 | 8 | 3 | 1 | 9 | 2 | | | | | | | | | 1 | | | 39 |
| | | AA2 | 22 | 2 | Va/II a/1 | | | 1.5 | | 4 | 2 | | 7 | | | | | | | | | | | | 1 | 14 |
| | | | 64 | 6 | II c/1 | 5 | 1 | 1.0 | | | | | | | | | | | | | | | | | | |
| | | | 53 | 4 | II b/1 | | | 1.75 | 1 | 1 | | | 2 | | | | | | | | | | | | | 4 |
| | | | 57 | 5 | II c/1 | 5 | | 1.0 | | 3 | 1 | | 1 | | | | | | | | | | | | | 5 |
| | | AA3 | 9 | 1 | II d/1 | 2 | 1 | 1.0 | | | | | 3 | 3 | | | | | 1 | | | | | | | 7 |
| | | | 45 | 4 | II d | 3 | 8 | 1.5 | 2 | 3 | 2 | | 3 | | | 1 | | | 2 | | | | | | | 13 |
| | | | 40 | 4 | II d/1 | 3 | 3 | 1.5 | | 2 | | | 2 | | | | | | 4 | | | | | | | 8 |
| | | | 26 | 3 | II e/1 | 3 | 5 | 1.75 | 1 | | 1 | | 1 | | | | | 1 | 1 | | | | | | | 5 |
| | | | 39 | 4 | II d/1 | 3 | 5 | 1.5 | 1 | 2 | 2 | | 2 | | | | | | 1 | | | | | | | 8 |
| | | | 32 | 4 | II d/1 | 3 | 1 | 1.25 | 1 | 1 | 1 | | 1 | | | | 1 | | 4 | | | | | | | 9 |
| | | | 75 | 3 | II e/1 | 3 | 1 | 1.0 | | | | | | | | | | 6 | | | | | | | | 6 |
| | | | | | | | TOTAL: | 25.65 | 62 | 111 | 374 | 5 | 80 | 7 | 1 | 1 | 4 | 7 | 35 | 0 | 1 | 0 | 1 | 0 | 6 | 695 |
| HP20 | 4 | AA3 | 43 | 2 | II | 5 | 1 | 1.25 | | | | | 1 | | | | | | | | | | | | | 1 |
| | 3 | | 34 | 3 | II b/1 | 4 | 2 | 2.5 | 5 | 6 | | | 4 | 1 | | | | | | | | | | | 1 | 17 |
| | 2 | | 23 | 2 | II e | 3 | | 1.25 | | | | | | | | | | | | | | | | | | 0 |
| | | | 52 | 1-3 | II e/3 | 2 | | 1.5 | 1 | 3 | 4 | | | | | | | | | | | | | | 1 | 9 |
| | | | 27 | 2 | II e | 2 | | 2.5 | 2 | | 3 | | | | | | | | 2 | | | | | | | 7 |
| | | | 65 | 1-4 | II d/1 | 2 | 11 | 1.2 | | 1 | | | | 1 | | 1 | | | | | | | | | | 3 |
| | | | 51 | 1-3 | II e/1 | 2 | 6 | 1.1 | | 2 | | | 1 | | | 1 | | | | | | | | | | 4 |
| | | | | | | | TOTAL: | 11.3 | 8 | 12 | 7 | 0 | 6 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 41 |
| HP24 | 3 | AA3 | 55 | 09-1 | II/3 | 5 | 4 | 1.0 | | 2 | | | | | | | | | | | | | | | | 2 |
| | | | | | | | TOTAL: | 1.0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| HP25 | 4 | AA1 | 15 | 4 | II/1 | 1 | 1 | 1.75 | | | | | | | | | | | | | | | | | | 0 |
| | | AA2 | 10 | 4 | II(1)b/1 | 1 | 1 | 1.75 | | | | | | | | | | | 1 | | | | 1 | | | 2 |
| | | | 35 | 6 | II(1)/1 | 2 | 1 | 2.0 | 3 | 1 | 3 | | 4 | | | | | | 3 | 1 | | | | | | 15 |
| | | AA3 | 29 | 7 | II(1)/2 | 2 | | 2.0 | | | | | | | | | | | | | | | | | | 0 |
| | | | | | | | TOTAL: | 7.50 | 3 | 1 | 3 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 17 |
| | | | | | | | GRAND TOTAL: | 64.25 | 89 | 137 | 411 | 6 | 379 | 29 | 1 | 3 | 9 | 7 | 45 | 1 | 1 | 6 | 3 | 6 | 13 | 1146 |
| | | | | | | | UBIQUITY(%): | | 43 | 50 | 54 | 6 | 63 | 20 | 2 | 6 | 9 | 4 | 31 | 2 | 2 | 2 | 6 | 2 | 18 | |

Ericaceae[1]--- These are roughly 1.2mm by 0.7mm in size, oblong in long section and obovate to triangular in cross section (like a shape of a banana).
Sample#s in colour indicate the needle count from 0.425mm sieve is sorted for 1/4 sub sample; thus the total # of needles for each species is an estim
Birch bark[2] --- These are partly charred fragments.
Unidentifiable[3] ---These are fragments do not have diagnostic features that indicate their identity, given the use of a binocular microscope.

| NEEDLES (N) | | | | | | OTHER | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Abies* | *Pinus ponderosa* | *P. menziesii* | *Tsuga* | Unidentifiable | TOTAL | Cone parts(N) | Conifer bud(N) | Needle base(N) | Needle stem(N) | Grass stem(N) | cf. *Amelanchier* | flake frag.(g) | Fish bone/fauna(g) | Birch bark frag.(g)[2] | Bark fragment(g) | Wood Charcoal Wt.(g) |
| | | 3 | | | 3 | | | 1 | | | | | | | | 0.33 |
| | 35 | 33 | 17 | 5 | 90 | | 1 | 5 | | 2 | | | | | | |
| | 3 | 3 | | | 6 | | 2 | | 1 | | | | nil. | | 0.06 | 1.82 |
| | 7 | 1 | | | 8 | | | | | | | | | | 0.34 | 3.42 |
| | 11 | 5 | 3 | | 19 | | | | | | | | 0.32 | 0.02 | | 9.41 |
| | 7 | 4 | | 1 | 12 | | 1 | 1 | | | | | | 0.08 | 0.05 | 1.14 |
| | 210 | 15 | 8 | 6 | 239 | | 8 | | | | | | nil. | | 0.06 | 29.34 |
| | 3 | 20 | | | 23 | | | | | | | | | | | 0.74 |
| | 6 | 1 | | | 7 | | | | 3 | | | | | | | 23.9 |
| | 3 | 4 | | 6 | 13 | | | | | | | | | 0.08 | | 3.72 |
| 3 | 3 | 21 | 11 | 3 | 41 | | | 4 | 1 | | | | | nil. | 0.03 | 3.02 |
| | 40 | 48 | 38 | 24 | 150 | | | 1 | | | 3 | | | | | 3.11 |
| | | 10 | | 2 | 12 | | | 1 | | | | | 0.02 | | | 4.27 |
| | 2 | 7 | 1 | | 10 | | | | | | | | | | | 2.68 |
| 3 | 330 | 175 | 78 | 47 | 633 | 0 | 12 | 13 | 5 | 2 | 3 | 0 | 0.35 | 0.18 | 0.54 | 86.9 |
| | 8 | 12 | | 3 | 23 | | | | 1 | | | 0.4 | | | | 16.2 |
| 53 | 87 | 249 | 170 | 36 | 595 | 1 | | 6 | | 7 | | | nil. | | | 2.35 |
| | 6 | 33 | 3 | | 42 | | | | 1 | | | | | | | 7.92 |
| | 5 | 47 | 10 | | 62 | | | 2 | | | | | | | | |
| | 29 | 1524 | 416 | 18 | 1987 | | 5 | 6 | 26 | 4 | | | | | | 18.18 |
| 230 | 124 | 2301 | 1374 | 80 | 4109 | | 9 | 5 | 14 | 1 | | | | | | |
| | 369 | 1735 | 786 | 47 | 2937 | 1 | 3 | 5 | 5 | 3 | | | 0.01 | 0.06 | 0.16 | 12.05 |
| | 1 | 13 | 3 | | 17 | | 1 | | | | | | | nil. | | 1.85 |
| | | | | | | | | | | | | | | | | 0.6 |
| | 7 | 10 | 3 | 4 | 24 | | | | 1 | | | | | nil. | | 4.09 |
| | 8 | | | | 8 | | | 3 | | 1 | | | | | | 2.71 |
| | 2 | 16 | | 2 | 20 | | | 1 | | | | | | nil. | | 0.59 |
| | 88 | 156 | 40 | 4 | 288 | | 1 | 11 | 2 | 2 | | | 0.1 | 1.76 | 0.02 | 4.49 |
| 8 | 80 | 162 | 44 | 10 | 304 | | 4 | 3 | 1 | | | | | 0.02 | 0.08 | 2.9 |
| | 318 | 786 | 18 | 7 | 1129 | 8 | 2 | 7 | 2 | | | | | 1.25 | | 6.89 |
| 15 | 75 | 50 | 11 | 24 | 175 | | 4 | 9 | 2 | | | | | | 0.1 | 3.48 |
| 12 | 71 | 77 | 11 | 7 | 178 | 3 | | 8 | | 1 | | | | 0.02 | | 2.75 |
| 15 | 160 | 80 | 8 | 3 | 266 | 76 | 1 | 4 | | | | | | | | 1.43 |
| 333 | 1438 | 7251 | 2897 | 245 | 12164 | 89 | 30 | 70 | 55 | 19 | 0 | 0.4 | 0.11 | 3.11 | 0.36 | 88.48 |
| 1 | 18 | 5 | | 1 | 25 | | | | | | | | nil. | | | 2.62 |
| | 34 | 41 | 18 | | 93 | | | 3 | 1 | 1 | | | 0.02 | 0.03 | 0.02 | 3.98 |
| | | 1 | 2 | | 3 | | | | | | | | | | | 3.64 |
| 11 | 44 | 35 | 20 | 5 | 115 | | | 2 | | | | | | | nil. | 3.8 |
| | 156 | 256 | 60 | | 472 | | 1 | 5 | 3 | 1 | | | nil. | | | 9.85 |
| | 45 | 78 | 29 | | 152 | | | 6 | | | | | | | | 4.07 |
| | 29 | 38 | 9 | 4 | 80 | | | 2 | | | | | | | | 2.35 |
| 12 | 326 | 454 | 138 | 10 | 940 | 0 | 1 | 18 | 4 | 2 | 0 | 0 | 0.02 | 0.03 | 0.02 | 30.31 |
| | 1 | | | | 1 | | | 1 | 3 | 2 | | | 0.12 | | | 0.11 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 2 | 0 | 0 | 0.12 | 0 | 0 | 0.11 |
| | | | | | 0 | | | | | | | 0.1 | | | 0.01 | 0.05 |
| 3 | 22 | 6 | 3 | 1 | 35 | | 1 | 2 | 1 | | | | 0.08 | | 0.12 | 0.7 |
| | 278 | 337 | 34 | 41 | 690 | 2 | 3 | 8 | 5 | | | | 0.3 | | | 8.35 |
| | | | 2 | | 2 | | | | | | | | | | | 9.48 |
| 3 | 300 | 343 | 39 | 42 | 727 | 3 | 4 | 4 | 6 | 0 | 0 | 0.1 | 0.38 | 0 | 0.13 | 18.58 |
| 351 | 2395 | 8223 | 3152 | 344 | 14465 | 92 | 47 | 106 | 73 | 25 | 3 | 0.5 | 0.98 | 3.32 | 1.05 | 224.38 |
| 22 | 86 | 88 | 65 | 56 | | 13 | 36 | 61 | 40 | 25 | 2 | 4 | 30 | 30 | 30 | 100 |

ıate.