Archaeology in the Middle Fraser Canyon, British Columbia: Changing Perspectives on Paleoecology and Emergent Cultural Complexity

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Abstract. Archaeological research in the Middle Fraser Canyon of British Columbia offers significant opportunities for advancing our knowledge of the development of dense aggregate villages and complex social relations among hunter-gatherer-fisher peoples. Our research indicates that these villages developed after 2000 cal B.P., grew in size during the subsequent millennium, and developed patterns of inter-household wealth-based inequalities in approximately the final three centuries prior to abandonment. These findings contrast with conclusions drawn by Hayden primarily during the 1980s. Hayden and Mathewes (2009) now offer a broad critique of these results. Given that a new generation of archaeologists is initiating research in the Mid-Fraser, it seems time to review the current state of knowledge and to outline new theoretical models, hypotheses, and methodological approaches (e.g., application of applied geophysics to Mid-Fraser village investigations) to help guide the development of research in the twenty-first century.

Résumé. Les données archéologiques du canyon de la rivière Fraser en Colombie-Britannique offrent des opportunités considérables d'accroître nos connaissances à propos de la densification de villages agrégés ainsi que les relations sociales complexes parmi leurs populations de chasseurs-cueilleurs-pêcheurs. Nos recherches dans la région démontrent d'abord que ces villages apparurent peu après 2000 ans avant le présent et qu'ensuite ils augmentèrent de taille durant le millénaire subséquent. De plus, certaines disparités matérielles entre unités domestiques se manifestèrent au cours des trois siècles qui précèdent l'abandon des sites. Ces trouvailles sont en contraste avec les conclusions élaborées par Hayden durant les années 80. Hayden et Mathewes (2009) offrent à présent une vaste critique des résultats récents. Face à une nouvelle génération d'archéologues qui entame des projets dans cette région de la rivière Fraser, l'heure est non seulement propice pour prendre compte de l'état actuel des connaissances mais aussi pour souligner de nouveaux modèles théoriques, hypothèses, et approches méthodologiques (ex. méthodes géophysiques appliquées) afin de guider le développement de la recherche archéologique au vingt-et-un siècle.

British Columbia's Middle Fraser Canyon is an important place to study the evolution and organization of complex hunter-gatherer societies

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(Arnold 1996; Cannon 1999; Prentiss and Kuijt 2004; Sassaman 2004). Archaeological research in the Lillooet area has defined numerous villages featuring exceptionally large housepits and deep stratigraphic sequences dating to the past 2,000 years (Lenert 2001; Prentiss et al. 2003, 2008). The sites contain abundant artifacts and often well-preserved organic materials. The region is characterized by a rich ethnographic record and vibrant contemporary First Nations groups, many now engaged in research partnerships with professional archaeologists (Prentiss and Kuijt 2011). Archaeological research in the Middle Fraser Canyon (Mid-Fraser) began decades ago and developed through four major projects. Sanger (1970) developed the area's first well-defined cultural chronology based upon his work at the Lochnore-Nesikep locality. Stryd's (1972, 1973, 1974, 1980; Stryd and Baker 1968; Stryd and Lawhead 1978) Lillooet Archaeological Project resulted in mapping and excavations at two major villages (Bell and Bridge River) along with nine smaller sites in the area and led to a significant refining of the cultural chronology. More recent research projects have been led by Hayden at Keatley Creek and Prentiss at both Keatley Creek and the Bridge River.

Hayden (1997a, 1997b, 2000a, 2000b; Hayden and Spafford 1993) initiated his now well-known Fraser River Investigations into Corporate Group Archaeology Project, focused on the Keatley Creek site in the mid-1980s. Hayden's work was innovative in its goal of reconstructing socio-economic and political organization in a Plateau village. To accomplish this he effectively replicated the excavation approach taken at the famous Northwest Coast site, Ozette, by fully excavating houses of different sizes in hopes of using variability in artifacts, animal and plant remains, and feature assemblages to determine household differences in rank and economic status. In recent years, Hayden has turned his attention to smaller houses located on the village margin, with the goal of reconstructing ritual activities he believes were conducted by village elites (e.g., Hayden and Adams 2004). Hayden's studies have been highly influential; Keatley Creek is often held up as an excellent example of a complex hunter-gatherer society (e.g., Bowles et al. 2010). Hayden (1994, 1995, 1998) used his Keatley Creek results to back his theories on how complexity emerges in hunter-gatherer societies. Prentiss conducted studies at Keatley Creek between 1999 and 2002 to clarify important details regarding the establishment of early occupations at Housepit 7[1] and to use these results to refine the chronology of demographic, economic and social developments within the village between its establishment and abandonment (Prentiss et al. 2003, 2007). Prentiss et al.'s (2003) chronology contradicted earlier findings by Hayden (2000c), which led to debate over chronological details and associated implications for understanding the development of social complexity in the Mid-Fraser villages (Hayden 2005a; Prentiss et al. 2005). In 2003–2004 and again from 2007–2009, Prentiss and her colleagues tested the refined Keatley Creek chronology with independent field research at the Bridge River site, another large housepit village (Prentiss et al. 2008, 2009a). To date, they have run 105 radiocarbon dates from this village, making it one of the best-dated sites in western North America (Prentiss et al. 2008; Prentiss et al. 2009a). Results of this dating process have, so far, strongly supported the key elements of the revised chronology Prentiss et al. (2003) developed at Keatley Creek, indicating that a number of Hayden's conclusions regarding development and operation of complex hunter-gatherer societies in the Mid-Fraser may be incorrect. On the basis of these findings, Prentiss et al. (2007, 2008; see also Kuijt 2001; Kuijt and Prentiss 2004) have offered alternative perspectives on village establishment, growth, emergent inequality, and abandonment.

Recently, Hayden and Mathewes (2009) have sought to re-establish Hayden's original chronology and explanatory models through a wide-ranging critique of published research by Prentiss and colleagues. Their critique comes at a time when a new generation of researchers is initiating studies in the Mid-Fraser (e.g., Morin et al. 2008/2009). Perhaps it is a good time to take stock of current knowledge and to consider a range of research questions that are critical for future investigations. In the following discussion we respond to Hayden and Mathewes (2009), and review data and debates concerning the establishment of villages and their consequent socio-economic and political developments. We review paleoecology first before delving into details of Mid-Fraser Canyon archaeology because variability in access to subsistence resources is likely to have been an important influence on all of the major cultural developments in this area over the past 2,000 years. Thus, paleoecological research helps to "set the stage" for appreciating our arguments for village emergence, emergent inequality, subsistence change, and village abandonment. Ultimately, we seek to promote an updated agenda for Mid-Fraser archaeology as we move forward in the twenty-first century.

Paleoecological Context: Stable or Variable Environments?

Human foragers of the Mid-Fraser area were supported by a wide range of wild food resources, especially salmonid fishes, deer, berries, and geophytes (Alexander 1992; Romanoff 1992a, 1992b; Teit 1906; Turner 1992). Survival throughout the year depended on careful planning to position collectors in the right places as these foods came available and, where possible, to harvest surplus quantities to provide food for seasons when fresh food was less easily obtained (Alexander 1992). This implies that, although salmonids seem to have been the key resource for these populations, a significant loss in any of these four subsistence sectors could have had major effects on human behavior and even populations. Geographical positioning strategies, settlement size and density, conflict, and social organization are among the behaviors ecological changes might affect. Consequently, it is important for archaeologists to look carefully at the effects of fluctuating regional paleoecological conditions as well as the impacts of human predators on the availability of food resources when modeling the histories of human populations in this area. Prentiss et al. (2003, 2007, 2008) followed this reasoning when they posited that climate change had affected cultural developments in the Mid-Fraser region. In particular, citing evidence from palynology, alluvial stratigraphy, paleo-oceanography, and studies of fire history, they suggest that pithouse villages first arose in the Mid-Fraser during a dry interval between 2200 and 1600 cal B.P., when Plateau people elsewhere turned to ungulates in response to a decline in salmon abundance. Cool moist conditions between 1600 and 1200 cal B.P. allowed salmon to flourish and the pithouse villages to grow to their maximum size. A return to warmer, drier conditions of the Medieval Climatic Optimum caused decline in salmon populations and in part led to the abandonment of many villages following the emergence of institutionalized inequality.

Hayden and Mathewes (2009) disagree with this scenario, asserting that no such climatic fluctuations occurred. In so doing they make four categorical statements:

1. "*… continuous cool and wet climates are indicated from c. 2,350-2,000 BP to the present* by lake sediments and mollusc species." In fact, "water temperatures have been generally colder in the southwestern interior during the last three millennia," as seen at Phair Lake near Lillooet (Hayden and Mathewes 2009:286–287; italics original). They cite a glacial advance in the Coast and Northern Cascade Mountains between "1,820–1,180 cal BP" as further evidence that no warmer-drier episode occurred (Hayden and Mathewes 2009:286–287).
2. *"Pollen analysis from a number of lakes in the Lillooet region indicate only minor climatic changes in the last 3,000 years with dubious cultural impacts for resident hunter-gatherers."* (Hayden and Mathewes 2009:289; italics original).
3. The Fraser River Fire Period identified by Hallett et al. (2003; see also Lertzman et al. 2002) between 2400 and 1300 cal BP, occurring as it does during what other records indicate was a generally cool, moist part of the Holocene, are more likely to result from high fuel loads, seasonal drought, and controlled burning to support increasing human populations than from warm, dry climatic conditions[2].
4. Salmon populations in the Fraser system easily supported the historic populations of the Mid-Fraser, so any decline in salmon numbers is unlikely to have been felt by human foragers in the past.

Four issues are central to the disagreement between scholars in this instance. These are the timescale at which climatic variability should be viewed, the environments (and therefore also the paleoecological proxies) that should be given the greatest attention, the geographic scale of paleoecological analysis that is pertinent to the issues at hand, and the impact of human foragers on their resource base.

Temporal Scale

People do not live on the scale of centuries or millennia, they must survive year-to-year. Therefore, to understand climate's impact on societies, we need to investigate it at the scale important to those societies' survival. Hayden and Mathewes (2009) base their denial that climate fluctuated sufficiently to influence cultural events on a series of palynological and paleolimnological studies conducted in the Lillooet vicinity, including work at Blue, Cabin, Chilhill, Finney, Horseshoe, Pinecrest, and Phair Lakes. Studies at all of these sites were focused on understanding millennial-scale changes in postglacial climate and forest communities, not on the more subtle variations within climatic periods (Hebda 1982; Mathewes and King 1989; Mathewes and Rouse 1975; Pellatt et al. 2000). The same is true of a more recent study of Lake of the Woods (Heinrichs et al. 2004). All show cooler, moister conditions during the last 3,000–5,000 years than existed before that time, but none of these studies was designed to reveal finer scale temporal variation in climate.

At only Phair Lake was a radiocarbon date obtained above the Bridge River Tephra (2400 B.P.) and no sediment younger than 1950 cal B.P. was dated. The record is, therefore, not chronologically precise enough for changes at the scale of centuries, let alone decades, to be documented with confidence.

Even if the sampling interval were smaller and the chronology better controlled, the methods for inferring climate and the sites chosen for analysis were suited to the larger time-scale investigation the researchers were pursuing. All of these studies drew inferences by observing variations in percentage or influx among all terrestrial pollen types, an approach best applied to defining large-scale climatic episodes. A more suitable approach for understanding variation *within* a climatic episode is to investigate ratios between climatically sensitive pollen types in well-dated samples taken at close intervals, as researchers have done in investigating the relationship of climate to fire in the Northern Rocky Mountains (e.g., Brunelle and Whitlock 2003; Brunelle et al. 2005; Chatters and Leavell 1994, 1995a, 1995b; Hallett and Walker 2000). Those studies have consistently observed evidence of drought and associated higher frequencies of stand-replacing fires during the first few centuries A.D. and again between 650 and 1100 cal B.P. (Medieval Warm Period).

Dendroecology provides another avenue for understanding change at the human time scale. Using this method, Wilson and Luckman (2003; Luckman 2010) have found that temperature changes across south-central and southeastern British Columbia during the last thousand years were synchronous, indicating that the Mid-Fraser probably experienced the same warm conditions during the Medieval Warm Period that resulted in drought and fire in the Northern Rockies. Tree-ring studies on Vancouver Island, although methodologically strained, have shown evidence for multiple drought episodes during the first millennium A.D., an interval corresponding to the Fraser Valley Fire Period (Zhang and Hebda 2005).

Glacial advances did indeed occur in the Coast Range during the first millennium A.D., as Hayden and Mathewes (2009) assert, but Reyes et al. (2006; see also Allen and Smith 2007; Reyes and Clague 2004) conclude that the advance was primarily confined to the period between 1550 and 1250 cal B.P. This advance, too, was widespread; it has been documented as far north as the St Elias Range of Alaska. Thus, conditions during this interval were indeed cooler and moister than the periods before and after.

In short, studies at the appropriate time scale and using methods capable of observing subtle climatic variations do indeed provide evidence, albeit most of it distant from the Mid-Fraser area, of warmer, drier conditions at the times cited by Prentiss et al. (2003, 2007, 2008). More local research at these time scales is needed, however, if hypotheses about the impact of climate on Mid-Fraser societies can be effectively evaluated.

Critical Environment

Proxy records do show climatic variations in southern British Columbia during the last two millennia, but most of the evidence cited thus far pertains to terrestrial environments. The environment that was most critical to Plateau subsistence systems during that same time period was, however, aquatic. Changes in temperature and precipitation are likely to have had both direct and indirect effects on the Fraser River and its tributaries, in which salmonid fishes spawn and rear.

Late Holocene stratigraphy in the upper Columbia River Basin, which is fed primarily from the same Northern Rocky Mountain ice fields as the Fraser, shows marked fluctuations in the frequency of severe floods over the last two millennia. These changes have been documented at two localities. At Site 45OK197, just below Grand Coulee Dam on the Columbia main stem, during the last 2,000 years, the mean interval between severe floods was 84 years before 930 cal B.P. and 142 years after 560 cal B.P., but declined to only 30 years during the Medieval Warm Period (Chatters and Hoover 1986). Harding Lake, which is located on the floodplain of the Yaak River, a tributary of the Kootenay, experienced episodes of siltation from overbank floods during the Medieval Warm period (Chatters and Leavell 1995a). Floods in the Columbia system most often result from rain-on-snow events (Boucher 1970), a sign of winter warmth. Forest fire also denuded landscapes and increased erosion in the Northern Rocky Mountains during warm intervals in the last two millennia (Pierce et al. 2004), raising the sediment loads of streams. Floods scour or cause siltation of salmon redds in river main stems and smaller, affected streams, which impact rearing success by displacing fry and suffocating smolts (McNeil and Ahnell 1964; Phillips et al. 1975). Thus, increased flooding and siltation, if they also occurred in the Fraser system, are likely to have produced conditions unfavorable for salmon recruitment.

Geographic Scale

From an ecological standpoint, anadromous fishes, the keystone (meaning dominant food item) of late Holocene human subsistence on the Mid–Fraser (Kew 1992; Kennedy and Bouchard 1992), are an un-earned resource. They depend little, if at all, on the primary productivity or climate of the land through which flows the trunk stream in their spawning basin. They depend on the smaller streams for spawning and rearing, the trunk stream for in and out migration, and the ocean for maturation. In the case of the Fraser (as well as the Columbia), changes in temperature and precipitation in the northern Rocky Mountains and small watersheds, most of them far upstream of the Bridge River and Keatley Creek, alter rates of flow and the strength of spring floods, which can affect availability of channels for spawning and the out migration of smolts. Warm conditions and increased frequencies of fire denude watersheds, increasing sediment loads, as already noted, and reducing thermal cover for small streams, none of which are good for spawning or rearing success of salmonids (Gilhousen 1990; Heard 1991; MacDonald 2000; Quinn 2005). Variability in oceanic conditions also has significant impacts on salmon numbers (Benson and Trites 2002; Chavez et al. 2003; Mueter et al. 2002; Quinn 2005). In particular, sea surface temperatures have been found to significantly affect the numbers of returning sockeye and spring chinook salmon (Mueter et al. 2002; Peterson et al. 2010), the two species that have been recovered from the middens at Bridge River and Keatley Creek (Speller et al. 2005). Contrary to Hayden and Mathewes' (2009) assertions, salmon returns to the Fraser River just in the last 30 years have varied from as few as 3,000,000 to as many as 34,000,000 fish; spring Chinook ranged from as few as 120,000 to nearly 300,000

(Bernton 2010; English et al. 2006; Fraser Basin Council 2011). Variability in the conditions of oceans and spawning streams, and changes in stream flows associated with climatic fluctuations during the last 2,000 years of the Holocene probably produced even greater variability (e.g., Hay et al. 2007; Patterson et al. 2005), and thus could have affected the access of Mid-Fraser human populations to their most important resource.

Very little direct evidence for variability in salmon populations during the Holocene has been developed for the Fraser River system. However, we can use evidence from the Columbia as a proxy measure. Chatters et al. (1995) demonstrate a decline in the proportion of salmon to resident fishes in Upper Mid-Columbia villages after ca. 1100 cal B.P. Preliminary evidence from the Mid-Fraser (Prentiss et al. 2007; Prentiss et al. 2009a) suggests a similar pattern, but much more research is needed on the history of the salmon resource in the Fraser River system. Work of the kind conducted by Finney et al. (2002) on sockeye resources in the Gulf of Alaska could be applied to sockeye rearing lakes in the Fraser system to generate a model of sockeye abundance during the past 2,000 years.

Human Influence on the Environment

Even if Hayden and Mathewes (2009) are correct that there was no notable climate change in the Mid-Fraser (despite change in the surrounding region), changes in the availability of the keystone resource would have local effects on human ecology. If higher oceanic and stream temperatures did indeed reduce salmon returns during the Medieval Warm Period, the dense human population of the Mid-Fraser at 1200 cal B.P. would have been forced to look to other resources for protein, fat, and particularly carbohydrates—resources such as deer and geophytes. Increased cropping of these resources could depress them locally (especially mammalian resources like deer) and necessitate exploitation of ever-larger geographic ranges. This is the same impact that we would expect to see if climate alone depressed the local resource base. If the Medieval Warm Period did in fact depress local resources, declines in both earned and unearned resources would occur, exacerbating the problem.

Rising human populations in Mid-Fraser villages may have had significant adverse impacts on local deer numbers even before the climate warmed, cocking the ecological trigger in advance of any local ecological effects of the Medieval Warm Period. Faunal assemblages from Bridge River and Keatley Creek indicate that the local deer population was indeed under stress as villages reached their peak sizes ca. 1200–1300 cal B.P. The anatomical composition of the deer assemblages evinces a transition from whole carcass to limb-focused transport (Prentiss et al. 2007), which indicates hunters were forced to transport game greater distances from kill and butchery sites to villages (e.g., Binford 1978; Broughton 1994; Janetski 1997). Further, recent data from the Bridge River site suggest increased degrees of bone processing in housepits dating to ca. 1150–1300 cal B.P. which may be evidence that fat and/or carbohydrates were in short supply, as might be expected with resource depression in ungulates, geophytes, and potentially, reductions in salmon, whose heads were an important source of oil (Kennedy and Bouchard 1992; Romanoff 1992). We see evidence that the pattern of increasingly wide ranging foraging activities is also reflected in the paleoethnobotanical data, but research on that dataset is still in its infancy (Lepofsky and Peacock 2004; Prentiss et al. 2007).

Contrary to Hayden and Mathewes' (2009) assertions, there is evidence that the climate of south-central British Columbia changed during the last 2,000 years and that climatic events and cultural events coincided. Paleoecological research at finer timescales, using sensitive ecological measures, and giving more attention to the spawning and rearing habitats will refine the ability of future scholars to determine if socio-political changes that occurred during that time span were triggered by or entirely independent of fluctuations in the regional climate.

Dating the Emergence of the Mid-Fraser Villages: Early or Late?

An essential area of debate between Prentiss et al. (2003, 2007, 2008) and Hayden and Mathewes (2009) concerns the timing of village emergence in the Mid-Fraser Canyon, which is essential to the confirmation or rejection of alternative explanatory models. Hayden's excavations at Keatley Creek were not initially designed to provide detailed information on chronology, although his teams accumulated enough material to develop an argument regarding village chronology. Hayden postulated that Mid-Fraser villages emerged by at least 2600 B.P., after which they underwent very little change. To Hayden (1994) the Mid-Fraser village pattern was made possible by access to inexhaustible resources and appropriate harvesting and storage technologies and facilitated by actions of self-interested aggrandizers and their followers. It was, therefore, essential for Hayden to demonstrate that the Mid-Fraser villages had their start close to a period of high salmonid productivity, as in the peak Neoglacial period of ca. 3000 cal B.P., that coincided with the advent of semi-sedentary storage-based adaptations on the Canadian Plateau (Rousseau 2004). However, as we outline below, Hayden's start-date for the Keatley Creek village is probably too old by about 800–1,000 years, calling into question his other conclusions regarding the timing and nature of cultural phenomena.

Hayden relied upon radiocarbon dates from deep trenches excavated through housepits to define the earliest occupations at Keatley Creek, selectively accepting or rejecting in a manner that lent support to his model. For example, Hayden (2000c:38) explicitly rejected a date of 1970 ± 60 B.P. on wood charcoal from a non-feature context in Housepit 1 as too early given its association with normally later-dating Kamloops arrow points (although Hayden and Mathewes [2009] now cite this date as evidence for early occupation at Keatley Creek). He accepted a date of 2170 ± 60 B.P. from a loose piece of wood charcoal in a pit associated with a small housepit (105) despite the association of the feature with a floor dated to only 270 ± 55 B.P. and the fact that Housepit 105 is situated within a cluster of other small housepits that all date to the terminal prehistoric or early contact period. An important series of dates, which ranged from 980 ± 60 B.P. to 6470 ± 90 B.P., was derived from wood charcoal pieces found in rim sediments (re-deposited roof and floor material) from Hayden's major trench through the north rim of Housepit 7. Hayden (2000c) rejected the oldest date but accepted most of the others. The accepted group included a 2620 ± 50 date from near the base of the rim deposit despite the fact that all dates were from secondary contexts (meaning not derived from *in situ* features or collapsed roof beams lying on house floors). Hayden (2005) also obtained old dates (2016 ± 30, 2156 ± 35, and 2160 ± 60 B.P.) on dog bones from a pit in Housepit 7. While Hayden claimed that these resulted from *in situ* activities of very early Housepit 7 occupants, Prentiss, Lenert, Foor and Goodale (2005: Figure 1) demonstrated that this was impossible, given the fact that the bones were secondarily deposited in a pit (P31) that clearly bisected much younger strata. In fact, the date on dog bones cannot be taken at face value because of the marine reservoir effect. Mid-Fraser dogs consumed large amounts of salmon (e.g., Cail et al. 2010). This normally has the effect of reducing the estimated age by 300 to 600 years. Hayden, thus far, has not produced dates older than 1600 cal B.P. from any primary context. This stands in stark contrast to his post 1600 cal B.P. dates, which uniformly come from charred roof beams lying on housepit floors.

In order to clarify the chronology of the Keatley Creek Site, Prentiss et al. (2003) collected samples from a series of hearth features carefully exposed in new trenches that bisected the Housepit 7 rim on its north and west sides. Most critically, these excavations revealed small housepit floors *beneath* the western rim of Housepit 7. AMS dates on hearth features in these floors ranged from 1270 ± 60 B.P. to 1361 ± 41 B.P. (1176 ± 116 cal B.P. to 1263 ± 82 cal B.P. at 2σ). A small *in situ* hearth found in clay-rich floor-like sediments at the base of the north rim dated to 1695 ± 45 B.P. (1614 ± 96 cal B.P. 2σ). A small house structure, interpreted as a semi-subterranean mat lodge (Harris 2004) was located and excavated directly beneath Housepit 7's floor and dated to 1636±67 to 1710 ± 71 B.P. (1528 ± 175 cal B.P. to 1628 ± 190 cal B.P. at 2σ). These investigations provided dates from three contexts buried under the rim, roof, and floor sediments of Housepit 7, all pointing to an initial deposition date for the first sediments associated with what we would now term Housepit 7 of no earlier than 1600–1700 cal B.P. Since no other reliable early dates have so far come from other housepits at Keatley Creek, we cannot assume that the aggregated village featuring large housepits dates to any earlier than this time. However, given the presence of scattered old charcoal and early projectile points, people undoubtedly did periodically occupy Keatley Creek before 1700 cal B.P. We do not know if those early occupants created housepits or resided in open camps without formal house structures.

One of the major problems with dating Keatley Creek has been the limited and non-systematic sampling of housepits. Prentiss designed investigations of the nearby Bridge River village as an independent test to resolve this issue. Rather than excavate a few selected houses, Prentiss (Prentiss et al. 2008) chose to conduct an extensive geophysical survey of much of the 80 housepit core area in order to better define the locations of housepit floors, cache pits, hearths and roasting pits. Test excavation units were placed over strong magnetic anomalies, often over deep rim deposits, to locate features on the floor of every surveyed housepit. Subsequently, 77 radiocarbon samples were collected primarily from hearth features and roof beams on house floors. Dates on these samples formed two sets, one beginning 1864 ± 36 B.P. (1797 ± 82 cal B.P. 2σ) and ending prior to the well-known Mid-Fraser abandonment of 1139 ± 38 B.P. (1067 ± 103 cal B.P. 2σ) and a second ranging from 638 ± 36 B.P. (610 ± 58 cal B.P. 2σ) to 167 ± 34 B.P. (145 ± 145 cal B.P. 2σ) (Prentiss et al. 2008:Figure 10). Hayden and Mathewes (2009:283) assert that Prentiss concealed one older date of 2470 ± 37 B.P. (2538 ± 175 cal B.P. 2σ), but that finding is plainly presented in Prentiss et al. (2008:Table 1, Figure 10) and discussed in the accompanying text. This date is anomalous compared to all others, but review of its context demonstrated that it was on charcoal from a gravelly clay-loam similar to the deposit into which housepits had been excavated. Given the anomalously early date, lack of association with a feature, and derivation from a poorly understood sedimentary context, Prentiss et al. (2008) chose to discount this date as a marker of the beginnings of the aggregated settlement at Bridge River.

Hayden and Mathewes (2009:283) argue that Prentiss et al. (2008) must have missed older deposits by targeting features on floors. A close look at published profiles from the early field seasons (Prentiss, Clarke, Markle, Bochart, Foss, and Mandelko 2005; Prentiss et al. 2008), however, reveals that many of the excavation units were placed over rim deposits because many of the best features lie around the margins of the floors, buried by significant amounts of roof and rim materials, much as they did at Keatley Creek (Prentiss et al. 2003). Investigations conducted in 2008 and 2009 were designed in part to test the validity of the original dating sequence by excavating trenches connecting inner and outer segments of floors. This required examination of many contexts buried deeply in rim sediments. This research to date has resulted in an additional 15 radiocarbon dates (Prentiss, Carlson, Crossland, Schremser, and Reininghaus 2009) that fully confirm the chronology of Bridge River outlined in Prentiss et al. (2008). Hayden and Mathewes also ignore the fact that the archaeological deposits in Bridge River housepits formed differently from those at Keatley Creek. Whereas Keatley Creek houses typically feature one final floor, with all previous floors and roofs redeposited on rims, Bridge River houses are more often characterized by multiple stratified floors, each separated from the others by collapsed roof material. This permits us to reconstruct the histories of individual households using *in situ* floor materials that sometimes span hundreds of years of occupation and reoccupation (Prentiss et al. 2008).

Research at Bridge River and Keatley Creek make it clear that chronology-building must be completed carefully, with close attention to stratigraphic context and the source of radiocarbon samples. It is clear that, despite occasional outlier dates in all of the Mid-Fraser villages (including Bell [Stryd 1973]), the overwhelming majority of the dates fall after ca. 1800 cal B.P. If this is the case, then it would appear that the Mid-Fraser village phenomenon occurred late and apparently developed rapidly. Research outside the Lillooet area reveals that large villages were not limited to that one area. Indeed, it is now known that substantial villages occur on terraces of the Fraser River and adjacent drainages from the Lytton vicinity to the mouth of the Chilcotin River (e.g., Angelbeck and Hall 2008; Matson and Magne 2007; Morin et al. 2008/2009). Limited radiocarbon dating and collection of diagnostic artifacts reveals much the same pattern as seen around Lillooet; dates span about 800 to 1800 cal B.P. and projectile points are stylistically the small styles characteristic of the Late Plateau and Kamloops horizons (e.g., Richards and Rousseau 1987), which normally postdate 1600 cal B.P. Canadian Plateau archaeologists should be prepared to investigate the Mid-Fraser villages not as a series of independent events attributable to localized activities of ambitious aggrandizers, but from a wider standpoint as the result of a more complex process that involved elements of cultural transmission and population expansion. This could have been accomplished by one or more groups that spread throughout much of the Fraser Canyon during a short period of time, subsequently growing and diversifying economically, socially, and politically before temporarily abandoning their largest villages several hundred years later.

Our knowledge of chronology will not advance without large-scale mapping and extensive excavation and radiocarbon dating of housepits in additional Mid-Fraser villages (e.g., Kelly Creek, McKay Creek, and Upper Seton Lake). We acknowledge that this will take time, given the cost of archaeological research. However, future investigators will be able to generate better chronologies at lower costs by relying more heavily upon geophysical investigations of these sites to focus smaller-scale excavations on key research issues (Prentiss et al. 2008).

Inequality: A Defining Characteristic or Later Development?

Hayden's Keatley Creek excavations were designed to explore variability in household socio-economic and political status. He sought to demonstrate that small, medium and large housepits were indicative of the occupants' social status. He also suggested that inter-housepit variability in artifacts and faunal remains marked social distinctions that began early in the life of the village and persisted until its abandonment by ca. 1,000 years ago (Hayden 1997a; Hayden et al. 1996). He is undoubtedly correct in some elements of his conclusions. However, a close examination of the Keatley Creek data reveals significant problems with his argument that such inequities existed in the village from the time it was founded. On the contrary, our research suggests that material wealth-based inequality probably evolved at Keatley Creek and Bridge River after 1200–1300 cal B.P.

To accomplish his goal of developing a thorough understanding of the complex hunter-gatherer culture at Keatley Creek, Hayden (1997a, 1997b, 2000d) excavated floors from large (Housepit 7), medium (Housepit 3), small (Housepit 12), and very small (Housepit 90) housepits. He then proceeded to examine artifacts and features from these contexts to uncover indicators of status variation. He seemed to achieve a high degree of success, as many data sets, including cache pit volume, proportions of salmon remains, and the presence of non-local raw materials and prestige objects did seem to be associated with the largest house, indicating its occupants held high rank. During the analytical process, Hayden worked from the assumption that occupation dates of the different housepit floors had little relevance, since he also assumed that the system of status ranking had been in operation for over a millennium. Thus, he could compare the floor of a 1,000 year old house with that of a 1,500 year old house and as if they were, effectively, contemporary.

Prentiss et al. (2007) recognized that 500 years provides enough time for socio-economic and political change to occur. Floors from Housepits 12 and

90 date to 1550 ± 60 and 1410 ± 60 B.P., respectively, whereas the final floors of Housepits 3 and 7 date to 1080 ± 70 B.P. (Hayden 2000c). The only way to compare materials from earlier times at Housepit 7 to equivalent dating materials at Housepits 12 and 90 was to rely upon artifacts derived from dated rim sediments. Unfortunately, Hayden's rim materials were excavated in such a way that deriving precise periods of sediment accumulation was impossible (Prentiss 2000). Consequently, Prentiss et al. (2007) had to rely on smaller samples from their more precisely excavated and dated contexts. Materials, derived from trenches transecting the north, northwest, and southwest rims of Housepit 7, indicated a coherent linear trend from no prestige objects or materials (prestige objects as defined by Hayden 1998, 2000d) in the earliest deposits to more abundant occurrences of both classes of items in the latest occupations. But when dating was controlled for, Housepit 7 actually had fewer prestige artifacts per unit of excavated sediment than either of the smallest housepits. The only tentative conclusion possible was that early Housepit 7 did not have measurably higher material wealth-based status than other houses. This pattern was not achieved until late in its history (post 1200 cal B.P.) and it was likely not due to the "innovation" of the steatite pipe after 1200 B.P. (Hayden and Mathewes 2009:284). Steatite pipes actually predate 1200 B.P. at both Keatley Creek and Bridge River. These observations also cast into doubt Hayden's conclusions regarding the lower status ranking of Housepits 12 and 90. Indeed, Housepit 90, a very small housepit with a comparatively large assemblage of ungulate bones and associated hunting-related gear could actually reflect a non-winter occupation or some special function beyond a simple winter residence.

Hayden and Mathewes (2009:283–284) state that Prentiss omitted discussion of the so-called button blanket from Housepit 105 and dog sacrifices from early sediments at Housepit 7. However, as we have already pointed out (above), the buttons from Housepit 105, while remarkable, were acquired from a cache pit within a very late-dating floor context. It is not clear whether the charcoal fragment associated with the buttons in that pit dates the actual depositional event. The Housepit 7 dog remains are even more problematic. Hayden (1997a) argued that the dog remains from Housepit 7 are the result of ceremonies involving dogs that likely required the actions of high ranking persons from important households. However, much like the buttons, the dog bones in Pit 31 derive from secondary context in a pit and, as we have already noted, the dating of the dog remains is highly suspect because of the marine reservoir effect. Also, it is not clear if these bones reflect an actual sacrifice event or some other explanation such as disposal of problem dogs (Crellin 1994). Given these facts, it is very difficult to sustain the argument they derive from the activities of high ranking persons over 2,000 years ago.

Hayden and Mathewes (2009:284) assert that the simultaneous occupation of large and small houses must somehow demonstrate the early presence of a competitively ranked society. With a potentially wide range of reasons for which people might live in and/or use large structures including larger houses for larger families and kin groups (e.g., Banning 1996; Binford 1990; Marcus and Flannery 1996) this argument is simply not sustainable. Finally, Hayden and Mathewes (2009:284) offer early dates on "ritual structures" (9, 105, 107, 108, 109, 116) as the final proof that complex society existed before 2,000 years ago. Unfortunately, very little evidence (see our comments on Housepit 105 above) has been presented to suggest that these housepits were ever occupied at such early dates. Indeed, nearly all the radiocarbon evidence points to Protohistoric period occupation, well after the abandonment of the core village (Hayden and Adams 2004). Even if some of these small structures were used prior to 2,000 years ago, they were not peripheral to a large aggregated village because the village likely did not yet exist. Therefore, it is improbable that they could reflect elite ritual activities.

Recent results of excavations at the Bridge River site (Prentiss et al. 2009a; Prentiss and Foor 2010) bolster conclusions drawn by Prentiss et al. (2007) regarding potentially late emergent inequality in Mid-Fraser villages. Given the presence of multiple houses with stratified floors, it has been possible to examine variability through time in a wide range of data sets including mammal remains, non-local lithic raw materials, prestige raw materials (e.g., nephrite, steatite, obsidian), and prestige items (e.g., beads, pipes, nephrite tools). Results to date indicate that significantly high numbers of these items occur exclusively within select housepits in deposits post-dating 1300 cal B.P. We tentatively interpret these results to mean that material wealth-based ranking did not emerge until Bridge River 3 times or ca. 1300–1100 cal B.P., nearly the same time that Prentiss et al. (2007) determined that it developed at Keatley Creek.

That said there is much that we do not know about changing social organization in the Mid-Fraser villages. How were the Mid-Fraser villages organized prior to 1200–1300 cal B.P.? It is clear there was wide variability in house size and placement but there is little evidence for material wealth-based status distinctions. Outdoor cooking was apparently a common event at Keatley Creek during its earlier stanza (Hayden and Cousins 2004; Lepofsky and Peacock 2004), whereas the reverse is true at Bridge River (Dietz 2004). There was also some variability in the use of preferred lithic raw materials within and between villages. While Hayden et al. (1996) argue for the early establishment of inherited rights to quarry sources at Keatley Creek, we suggest that this pattern could also be understood as the consequence of variation in long-lived trade partnerships and foraging ranges. Clearly there was significant diversity in early community approaches to residential life, cooking and food sharing, and land-use. It is possible that more subtle status distinctions may have existed in the early villages, leaving limited archaeological indicators if they were based upon health, social networking, and socio-religious prowess (e.g., Bowles et al. 2010).

Indicators of material wealth-based inter-household distinctions appear after ca. 1300 cal B.P., but we still lack a complete understanding of many details. Most archaeologists, drawing from the ethnographies (e.g., Teit 1906), assume some form of ascribed ranking was present during the late period, but few can conclusively point to when this ranking actually began. There are hints that 1200–1300 cal B.P. could be the start date, given strong inter-household socioeconomic differences, but the best indicators of this social phenomenon tend to come from burial data (e.g., Burley and Knüsel 1989) and there is little of this in the Mid-Fraser (Schulting 1995). Recent studies at Bridge River indicate that the houses containing the best evidence for significant material wealth have the shortest occupation spans. This could cast doubt on the possibility that wealth was inherited prior to 1100–1200 cal B.P. Consequently we are left with many questions. Was material wealth ever inherited prior to the period of European contact? What was the role of debt creation and management in the establishment of inequalities? What was the role of social networks in the emergent system of inequalities after 1300 cal B.P.?

Probably the most difficult problem is to define inter-village relationships. Again drawing from the ethnographic record, archaeologists have assumed an autonomous village model (no multi-village polities) for the Mid-Fraser and surrounding region (Prentiss and Kuijt 2004). But in a rare moment of agreement, Hayden and Prentiss both assert that it may be time to question this assumption. At 1200–1300 cal B.P. the Mid-Fraser featured villages ranging in size from a few structures likely up to 30–40 simultaneously occupied houses arranged in geometric designs (at least at Bridge River, but likely elsewhere). The settlement pattern that is most like this is found in the mid-continent, associated with terminal Woodland and Mississippian polities (e.g., Milner 2004; Pauketat 2007). It is time we moved past the "tyranny" of an ethnographic record (e.g., Wobst 1978) created after extensive bio-cultural losses suffered by Native Peoples of the Plateau and be prepared to recognize that past cultural systems may have been organized differently from those known in the recent past (Prentiss 2008). If this is the case, then we may also need to construct theoretical approaches to explanation that are better able to cope with more complex histories than have been heretofore imagined (e.g., PrentissPrentiss, Kuijt, and Chatters 2009).

Village Growth and Subsistence Change

To develop complete histories of the Mid-Fraser villages it is critical to pay attention to processes of population growth (for example, as measured by changing frequencies of housepits of different sizes) and its impacts on subsistence activities. Hayden (e.g., 1997a) has generally assumed that the social groups of Keatley Creek changed little for 1,600 years or more. However, our research suggests significant demographic and socio-economic change characterized the Mid-Fraser villages across a shorter period of time. Two lines of evidence from the Mid-Fraser area indicate significant growth in population beginning around 1800 cal B.P., when the villages were young and sparsely occupied. Additional evidence is accumulating to suggest that changes in subsistence and technological organization occurred during the same time span.

Studies of compiled radiocarbon dates from multiple sites in the Lillooet area (Lenert 2001; Prentiss, Chatters, Lenert, Clarke, and O'Boyle 2005) have demonstrated a period of growth beginning just after 2000 cal B.P., peaking at ca. 1100–1200 cal B.P., and declining ca. 1000–500 cal B.P. Populations then rose again in the final centuries prior to the coming of Europeans. Prentiss et al. (2008) demonstrate this pattern at the Bridge River site, where housepit numbers rose from about seven houses at ca. 1600–1800 cal B.P. to 29 houses at ca. 1100–1300 cal B.P. This implies approximately 300 percent growth and a peak population size of well over 600 persons (based upon Hayden's [1997a:46] assumption of "2–3 square meters of floor-space per person" in Mid-Fraser pithouses). If Keatley Creek developed at a similar rate, its peak population was likely 20–30 percent above that of the Bridge River site (Prentiss et al. 2007).

When growing human populations are tethered in permanent towns or villages for long periods of time they often are forced to cope with declining access to subsistence resources (e.g., Redman 1999). It is well known that population/resource imbalances will create conditions whereby human groups are forced to work harder to maintain parity with previous conditions, resulting in a net loss of energetic efficiency (e.g., Boserup 1966; Broughton 1994; Janetski 1997). Given the longevity of the Mid-Fraser villages, it seems likely that local populations faced these contingencies. Prentiss et al. (2007) conducted a preliminary test of this hypothesis using data generated from Keatley Creek by both Prentiss' and Hayden's teams. Despite Hayden's two decades of work on 25 structures, most of the faunal and floral data he generated were unusable due to either poor provenience information (unstratified rim contexts) or lack of chronological control. Consequently, Prentiss et al. (2007) relied substantially upon more precisely dated samples from their excavations in the rim of Housepit 7. Contrary to Hayden and Mathewes' contention that they ignored formation processes, Prentiss et al (2007) confirmed nearly all trends using assemblages from rim middens for which many formation processes could be held relatively constant. They consistently tested faunal samples for sample size bias (richness is not quantified as a ratio to excavated sediment volume [Lepofsky and Lertzman 2005]). Multiple data sets drawing from artifacts, botanical items, and faunal remains were developed in order to avoid problems of ambiguity and equifinality associated with overreliance on limited classes of archaeological data. Comparisons between houses were made with the most reliable data available.

Results of all analyses converged on one distinct pattern at Housepit 7 (Prentiss et al. 2007). Over time, reliance on animal resources appears to have shifted from an overwhelming emphasis on salmon and limited use of a few mammal species to a pattern that included a much wider range of mammals utilized more evenly. The abundance and anatomical representation of ungulate remains (see paleoecology, above) suggest that later occupants of Housepit 7 may have engaged in more extensive searches for game, accompanied by more elaborate field butchery and meat processing activities. Hayden and Mathewes' (2009) calculations regarding modern game populations around Keatley Creek only reinforce the likelihood that, over time, successful hunts would have required progressively more distant travel. This rising emphasis on mammalian prey was also marked by increased frequencies of bifacial knives and projectile points as well as shifts in the organization of flake tool production and use (Prentiss and Clarke 2008). The botanical data indicated an increased willingness to collect lower ranked nut and seed foods[3] (compared to most geophytes), including pine nuts (Prentiss et al. 2007). Further, the pattern of berry harvesting appears to have shifted from a reliance on more local species to more intensive harvest of species found in wetter soils at higher elevations farther from the village.

A number of investigators have noted the decline in numbers of root roasting ovens at Keatley Creek during the years preceding its abandonment in contrast to the rapid increase in the same activity in more distant sites at such places as Hat Creek Valley (Kuijt and Prentiss 2004; Lepofsky and Peacock 2004; Prentiss et al. 2007). Prentiss et al. (2007) argued that this pattern was understandable in light of other trends that suggested reduction in local access to critical food sources, requiring people to spend more time far from the village, hunting, gathering berries, and collecting and roasting roots to be processed and transported back to the villages for (presumably) winter consumption. All told, while few houses from Keatley Creek have been investigated, current data indicate subsistence diversification and landscape extensification, which could be explained by local resource depression.

The Keatley Creek results were provocative enough to require independent testing with samples drawn from multiple housepits. Although studies are still in progress, similar patterns are becoming evident among the Bridge River faunal remains (Carlson 2010; Smith et al. 2010). Here, there is evidence from larger multi-housepit samples for a shift from bringing in whole (or nearly so) carcasses to more frequently transporting select parts (usually limbs) coupled with a decline in the frequency of salmon remains between the Bridge River 2 (ca. 1300–1600 cal B.P.) and Bridge River 3 (ca. 1100–1300 cal B.P.) periods. While salmon fluctuations during the early part of the Medieval Warm Period may have caused significant stress in these villages, the impact of these fluctuations may have been exacerbated by the stress placed on local terrestrial resources after 1300 cal B.P.

Future investigators will need to explore issues of resource intensification in far greater depth than has been attempted to date if we are to fully understand the demographic and economic factors that influenced the emergence of social complexity and the subsequent decline of Mid-Fraser villages. A range of useful archaeological approaches and models drawn from human behavioral ecology, which have been applied elsewhere (e.g., Bright et al. 2002; Broughton 2002; Grimstead 2010; Prendergast et al. 2009; Stutz et al. 2009; Ugan 2005), could have potentially profound implications for our understanding of subsistence systems in the Mid-Fraser.

Catastrophic Abandonment or Reorganization?

There has been significant debate over when and why Mid-Fraser villages were abandoned. The issue of abandonment and cultural collapse remains important in archaeological circles given not only its implications for understanding elements of human behavior and cultural evolution but also for its modern implications (e.g., McAnany and Yoffee 2010). Hayden and Ryder (1991) argued that the Mid-Fraser villages were abruptly abandoned at about 1000 B.P. when a massive landslide blocked the Fraser River, choking off salmon runs, causing large scale subsistence stress in the area above the dam, and forcing large scale relocation of the human population. Kuijt (2001) challenged this argument, pointing out that the slide was not adequately dated and indeed could have occurred thousands of years earlier. He also argued that sediments of the Lillooet terraces dating less than 2,000 years ago are entirely fluviatile; there are none of the lacustrine deposits one would expect to form when a river is dammed. A critical implication of Kuijt's (2001) argument is that the rise and fall of the Mid-Fraser villages is more likely to have been the consequence of a history of human decision making that was also affected by climatic factors outside of human control.

Holly (2011) argues that archaeologists have failed to consider the human dimension in the economic collapse and demographic abandonment of hunter-gatherer communities. Nowhere is this more evident than in the Mid-Fraser landslide hypothesis where Hayden and Ryder (1991) pay virtually no attention to the possibility that crowded communities may have had adverse impacts on their local subsistence resources. It is well known that while salmon were critical to Mid-Fraser peoples, winter survival also required stores of dried meat, berries, and root foods. Significant reduction in access to any of these items could have caused serious hardship. Kuijt and Prentiss (2004) raised the possibility that crowding could have triggered over-exploitation of a variety of resources, possibly including root foods[4] and deer. Prentiss et al. (2007) provided preliminary data supporting this contention and implicated local resource depression as a significant culprit in the abandonments. Data from Bridge River (Prentiss et al. 2009a) offer similar patterns. Drawing from Tainter (1988) and examining the Mid-Fraser chronologies in comparison to subsistence histories of villages in California (Broughton 1994), Utah (Janetski (1997), the Canadian Arctic (Betts and Friesen 2004), the Northwest Coast (Butler and Campbell 2004, 2010; Croes and Hackenberger 1988), and elsewhere (e.g., Munro 2004), it is clear that early socio-economic successes may have led to rapid population growth, with adverse economic implications in the long term. Declining Eastern Pacific salmon populations in the early Medieval Warm Period, coming at a time when large populations were already stressing non-salmonid resources may have finally tipped the balance triggering economic collapses and local abandonments.

There are many elements to the Mid-Fraser abandonment that remain unclear. While we are beginning to understand the economic underpinnings of this process, we have far to go in answering the attendant social questions. Were village growth and resource intensification associated with socio-political demands by emergent elites after 1200–1300 B.P.? Was the late period leading up to the abandonment characterized by increased warfare that is evident elsewhere in the Plateau (Chatters 2004)? What happened to the large Mid-Fraser populations after village abandonment? Large numbers of root roasting ovens in nearby valleys post-dating the abandonment of aggregated Mid-Fraser villages (Lepofsky and Peacock 2004) could imply a temporary return to dispersed settlement and/or greater residential mobility.

Theorizing Change in the Middle Fraser

The rich archaeological record of the Mid-Fraser implicates complex cultural and ecological processes spanning thousands of years. Investigators working in this area have the opportunity to study change in technology, subsistence, settlement, exchange, and social relations. Hayden and Mathewes (2009) seek to explain socio-cultural change in the Mid-Fraser using a neo-evolutionary model that posits technology as the simple prime mover. They draw from Burley's (1980) model of Marpole emergence (see also Hayden 1981) that asserts technology as the independent variable directly affecting all other cultural elements. In essence, once the technology for mass harvesting and processing food resources like salmon is in place then the classic Northwest Coast system of semi-sedentism, cooperation, and surplus production is initiated. The model then predicts that once technology and resource conditions are right, ambitious (presumably male) individuals will act to establish corporate groups and create debt relationships through potlatching and marriage practices, thus adding the final characteristics of complex societies (see also Hayden 1990, 1994, 1995, 1998, 2009; Hayden and Mathewes 2009). However, a large number of studies demonstrate that the logical consequences of the model simply do not hold up, whether in the Mid-Fraser or other parts of the world. Technology is unlikely to have been the universal prime mover in cultural evolution (Chatters 2009; Eldredge 2009; Kuijt 2009; Kuijt and Prentiss 2009; Prentiss 2011; Spencer 1997, 2009; Spencer and Redmond 2001; Zeder 2009) and aggrandizer personalities were probably not the major movers of social evolution (Bettinger 1999; Kelly 1995, 2010; Kuijt 2009; Prentiss et al. 2007; Rosenberg 2009; Zeder and Smith 2009).

Hayden and Mathewes (2009:293) mischaracterize models developed by Prentiss et al. (2003, 2007, 2008) as environmental determinist. They miss the critical point made by Prentiss et al. (2007) that the Darwinian approaches to culture change employed in these papers require action of human agents as well as selective feedback on that action. Recent studies have shown that Darwinian macroevolutionary approaches can provide effective solutions to problems of ancient culture change while avoiding neo-evolutionary assumptions of simple techno-environmental determinism (Chatters and Prentiss 2005; Prentiss and Chatters 2003; Prentiss, Kuijt, and Chatters 2009 and chapters therein; Rosenberg 1994; Spencer 1997; Spencer and Redmond 2001). This is accomplished by recognizing that culture is a complex inheritance system operated by active contributing agents (whether individual persons or groups). Consequently it avoids problematic assumptions of neo-evolution that views culture as a thermodynamic system evolving in response to select internal and external "kicks" (see critique in Dunnell 1980).

The macroevolutionary framework has generated a number of significant insights that will help us better understand ancient Mid-Fraser history in the coming years. (1) Human agency is a critical source of cultural variation and often provides the foundation for the development of new cultural strategies (Kuijt and Prentiss 2009; Spencer 2009; Zeder 2009). The sudden origin and rapid dispersal of the Mid-Fraser villages or "Lillooet Phenomenon" (Matson and Magne 2007) could imply that the unique socio-economic strategy behind the wider cultural phenomenon may have been developed by just one group, subsequently dispersing from one place via population expansion and/or the transmission of ideas (Prentiss 2009). (2) Selection acts on human behavior in the form of social, economic, and/or reproductive payoffs for engagement in particular actions, with the result that some cultural characters will become common and others vanish over time. If the Lillooet Phenomenon developed by a sudden dispersal that established many villages within a short time frame and led to rapid demographic growth, this implies that cultural evolution in the Mid-Fraser may have been substantially conditioned by the kind of multi-level selection recognized by Spencer and Redmond (2001) in the Pre-Classic and

Classic period history of Monte Alban, in Oaxaca, Mexico. If so, villages like Bridge River and Keatley Creek should provide evidence for correlated change in certain technologies, housepit occupation patterns, village demography, and interactions with neighbors (Prentiss et al. 2007, 2008). (3) Actions taken by persons or factions in ancient villages can have unintended consequences, setting the stage for unexpected evolutionary developments or exaptations later in time (Prentiss 2011; Rosenberg 2009). The exaptation concept is particularly useful as we seek to explain emergent inequality in the Mid-Fraser villages and elsewhere. Most fundamentally, inherent non-material inequalities may have had the opportunity to evolve into material wealth-based inequality under conditions of terrestrial resource depression and unpredictable access to salmon after 1200–1300 cal B.P. Under this scenario, hereditary inequality could have evolved as an unintended by-product of house groups (e.g,. Ames 2006) competing for longevity under harsh subsistence resource conditions after 1300 cal B.P. (Prentiss 2011; Prentiss et al. 2007).

Concurrent with the new directions in housepit village archaeology, there is a clear need to expand our empirical knowledge base regarding non-winter village contexts in both economic and social dimensions. Up to now, our understanding of warm season activities and changing resource relationships over time has been drawn from a combination of ethnographic data and indirect evidence of warm season activities from winter house contexts, rather than from directly examining change in, or at, the procurement sites themselves. By expanding the scope of research to include resource procurement sites and other non-winter contexts, we can begin to provide an independent check on our interpretations of such issues as resource intensification and localized resource depression. Perhaps more importantly, the identification and study of larger scale warm season encampments or mat lodge villages associated with root harvesting or salmon fishing grounds will provide the opportunity to explore whether the developing social structures we trace in the winter villages were maintained and expressed throughout the year.

Summary

The Mid-Fraser region offers nearly limitless possibilities for developing and testing of models concerning village emergence and growth, subsistence intensification, evolution of social inequality, collapse, and, undoubtedly, many other topics. Our research has shown the history of the Mid-Fraser villages to be complex, and suggests that history was affected by climate change, resource relationships, local innovations, and intra- and interregional interactions.

In their assessment of the state of archaeological research in the Mid-Fraser, Hayden and Mathewes (2009) seek to maintain Hayden's long-lived assumptions that the villages emerged very early (e.g., ca. 2600 cal B.P. or earlier) and remained little changed until forced into abandonment by a local landslide. Hayden (1997a) envisions a society, organized around competition between presumably male aggrandizers for control of debt capital that persisted largely unchanged for over 1,500 years. Indeed, Hayden (1994) implies that the aggrandizers were actually the force that gave rise to these societies and their villages.

In this review we have responded to a critique from Hayden and Mathewes

(2009) and sought to illuminate the state of the art in Mid-Fraser Canyon archaeology, pointing to areas of strength and weakness in current knowledge. We have outlined a range of new research hypotheses that build upon our current understanding of the archaeological and paleoecological records. To understand short-term changes that occur at a human time scale, future paleoecological research needs to utilize methods capable of measuring such change, both in the local terrestrial environment and in the habitats of salmon, the keystone of the Mid-Fraser subsistence base. Extensive radiocarbon dating analysis at Bridge River indicates that the Mid-Fraser villages emerged after 2,000 years ago. The Bridge River site data also suggest that village populations were small at first but grew rapidly from likely less than 100 to possibly over 600 persons, a pattern apparently matched at Keatley Creek. We have also learned that material wealth-based inequality was probably not an initial characteristic of the villages that have thus far been studied, but instead emerged much later under conditions of competition for declining subsistence resources. Finally, it appears the famous collapse resulted not from a single catastrophic event, but, more likely, from the cumulative effects of population growth, human decision making and climate change. These inferences are, however, based on work at just two of the many villages and should be tested through focused, well-dated, technologically assisted research at other villages in the region.

As we have discussed, there are many questions still to be addressed in Mid-Fraser archaeology. We have encouraged innovation in theoretical and methodological approaches to this research.

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Notes

1. Housepit 7 was chosen for excavations by The University of Montana team in order to examine early housepit and pre-housepit occupations at the village. Excavations in 1989 revealed an early housepit floor buried beneath the rim of Housepit 7. The assumption at the time was that it should date to sometime before 2600 B.P. and thus reflect an occupation of Shuswap horizon peoples. Excavations in 1999 and 2001 revealed that it actually dated to ca. 1350 cal B.P.
2. In fact, Hallett et al. (2003) infer that the Fraser Valley Fire period was indeed one of greater warmth and drought relative to the last centuries of the Holocene.

3. Hayden and Mathewes (2009:285) misinterpret the commonly used notion of 'food seeds'. They take Prentiss et al.'s (2007) use of the term to literally mean seeds were collected as food, which is a rare case in the Pacific Northwest. The term 'food seeds,' is commonly used to denote seeds whose fleshy outer fruits were consumed by past populations (with rare exceptions like pine nuts), often seeds and all. While the fruits do not survive in the archaeological record, their seeds persist in hearths, rims and other archaeological contexts where they were discarded (Lepofsky 2000; Lepofsky and Lertzman 2008; Minnis 1981).
4. Significant additional research is required regarding questions of geophyte exploitation as it is not yet clear whether patches of geophyte plants (e.g., spring beauty and balsamroot) could be catastrophically overexploited.

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