LATE PREHISTORIC SETTLEMENT PATTERNS AND POPULATION DYNAMICS ALONG THE MID-FRASER

Jesse Morin, Ryan Dickie, Takashi Sakaguchi, and Jamie Hoskins

This article provides an overview of current knowledge of late prehistoric (~2500 BC – AD 1800) settlement patterns in the Mid-Fraser region from just south of Lillooet in the south to Kelly Lake in the north (Figure 1). We survey current understandings of indigenous subsistence and settlement patterns, and then discuss the radiocarbon dating of these settlements. Our purpose is to provide context for the major archaeological debates in the region, which hinge primarily on interpretations of changes in subsistence and on radiocarbon evidence. Several of our maps of large village sites are original, as is our summary of all radiocarbon evidence and our use of such evidence to interpret regional population dynamics.

Along the middle reaches of the Fraser River, prehistoric habitation sites are well preserved and relatively intact. Most Late Prehistoric habitation sites in this region are identified by the presence of housepits, the collapsed remains of pithouses, the semi-subterranean winter habitations used by most Interior Salish peoples at contact. Housepits are crater-like depressions 5-22 m in diameter (from rim crest to rim crest) and from 10 cm to 2 m in depth. Archaeologists use the presence of housepits to define the Late Prehistoric Period and the Plateau Pithouse Tradition (PPT) in the Mid-Fraser region.

After about 1500 BC, the PPT is characterized by winter aggregation in sedentary seasonal villages and by the intensive use and storage of salmon, deer, roots (geophytes), and berries (Pokotylo and Mitchell 1998; Rousseau 2004). In the Canadian or Northern Plateau, a culture area encompassing most of the Fraser River watershed and much of

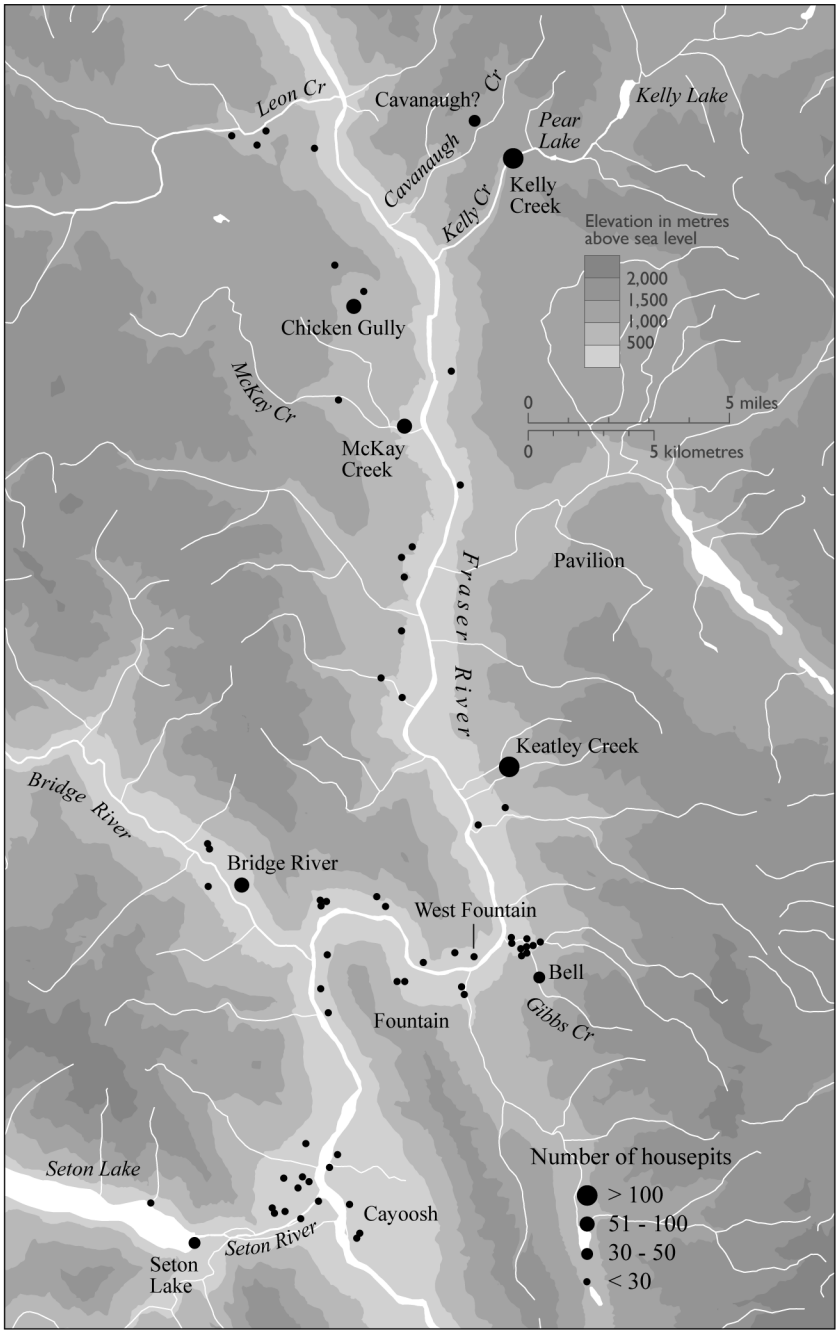


Figure 1. Plateau Pithouse Tradition housepit village settlement patterns in the Mid-Fraser region. Cartography by Eric Leinberger.

the Upper Columbia River watersheds, most prehistoric villages were small clusters of up to five pithouses. However, along the Mid-Fraser (Hayden 2000a), the Upper Chilcotin (Matson and Magne 2007, 17, 55, 94), the South Thompson (Mohs 1981; Rousseau 2004), and the Slocan River (Goodale et al. 2004), there are remains of villages with up to 130 housepits, some of them unusually large. Such sites along the Mid-Fraser have been a major focus of archaeological research. There have been several regional archaeological surveys (Pokotylo 1978; Stryd and Hills 1972), many smaller scale or contract excavations, and three major excavation projects (Hayden 2000a and 2000b; Prentiss et al. 2008; Stryd 1973), including the most sustained archaeological research project in Canada at Keatley Creek (Hayden 2000a and 2000b).

It is widely accepted that these large villages were associated with high population densities and socially complex societies (Hayden 1997, 2000c; Prentiss et al. 2003; Prentiss et al. 2008). This zenith in population densities – large villages and associated large houses – is called the Classic Lillooet Phase (Hayden and Ryder 1991; Hayden 2000c, 2005) or Lillooet Phenomenon (Matson and Magne 2007, 17) within the PPT. Geographically, the Classic Lillooet Phase extends approximately from Lytton in the south (Anglebeck and Hall n.d.; Muir et al. 1992) to the Chilcotin drainage in the northwest (Matson and Magne 2007, 17). It is variously dated: by Hayden (2005) to between 500 BC and AD 1000, and by Prentiss (Prentiss et al. 2003; Prentiss et al. 2007) to between AD 400 and AD 1200. Behind the study of these large villages is one of the most significant questions in Pacific Northwest prehistory: when and how did complex hunter-gatherer societies develop on the Canadian Plateau (Hayden 2000a and 2000c; Prentiss and Kuijt 2004)?

Drawing on this research, we briefly describe the subsistence practices and settlement patterns associated with the Classic Lillooet Phase along the Mid-Fraser. We then discuss the occupation chronologies proposed by Hayden and Prentiss before turning to our own analysis of population dynamics along the Mid-Fraser throughout the PPT.

BACKGROUND AND SUBSISTENCE

At contact, the Mid-Fraser region was inhabited by the Interior Salish-speaking Lillooet (Stl'atl'imx) on the west bank of the Fraser River, the Shuswap (Secwepemc) on the east bank, and perhaps some Thompson (Nlaka'pamux) in the south (Kennedy and Bouchard 1998). James Teit's rich ethnographic accounts of these peoples (1900, 1906, 1909) provide

a superb body of data for applying the direct historic approach to many aspects of the archaeological record of the Mid-Fraser; however, there are no ethnographic descriptions of very large communities resembling those occupied during the Classic Lillooet Phase.

Plateau Pithouse Tradition settlement patterns were closely tied to seasonally structured patterns of subsistence. By 1500 BC, groups were markedly semi-sedentary (Pokotylo and Mitchell 1998). In economic terms, they were fishers, gatherers, and hunters in that order. The annual settlement pattern of groups living in the Mid-Fraser region over at least the last 3500 years was transhumant, marked by periods of dispersal and aggregation as well as by periods of high and low mobility. During the winter months, settlement was aggregated and essentially sedentary; families lived close together in clusters of pithouses (Teit 1906, 213-15). Summer months were generally marked by dispersal and residential mobility as groups of families exploited varied resources in different locations. Summer months could also be marked by aggregations of hundreds of individuals at particularly productive root-harvesting locations (as in the Upper Hat Creek Valley) or at salmon fishing stations (such as The Fountain/6-Mile fishery).

During spring and summer, when groups of people dispersed to the uplands, their subsistence depended on game and a variety of plants. In mid-elevation areas such as Upper Hat Creek, root species were intensively harvested and processed in earth ovens (Lepofsky and Peacock 2004; Pokotylo and Froese 1983). Subsistence during the winter, when people lived in pithouse villages, was overwhelmingly based on stored or cached food, primarily dried salmon, dried Saskatoon berries, and salmon oil. The salmon fisheries around Lillooet, especially at The Fountain or 6-Mile fisheries, were exceedingly productive at contact (Teit 1906, 228). Properly dried salmon could last for two years in underground storage pits or in raised caches and was the primary winter staple in the region (Kennedy and Bouchard 1992; Kew 1992). During the later part of the PPT, adults in the Lillooet region obtained some 60-70% of their protein from salmon, an average level of consumption higher than elsewhere on the Plateau (Chisholm 1986; Lovell et al. 1986). Recent analysis of DNA from salmon remains in several Classic Lillooet Phase housepits at Keatley Creek has determined that sockeye (*O. nerka*) was the primary species taken (Speller et al. 2005, 1385-86). While a history of salmon abundance in the Fraser watershed before AD 1800 would be highly desirable, it is not available (Hobbs and Wolfe 2007 and 2008). It is virtually impossible, therefore, to evaluate the effects of

variability in salmon populations on local human populations. Certainly, the subsistence base of the PPT and Classic Lillooet Phase along the Mid-Fraser comprised dried salmon fillets, salmon oil, roots, berries, and game. Pithouse villages were situated to maintain access to all of these foods but primarily to salmon in the Fraser River.

SETTLEMENT PATTERNS DURING THE PLATEAU PITHOUSE TRADITION

Settlement sites along the Mid-Fraser range in size from 1 to 130 visible housepits. For the purposes of this article, housepit villages with fewer than 30 visible housepits are classed as "small" villages, those with between 30-50 are classed as "large" villages, those with 51-100 are classed as "very large," and those with more than 100 are classed as "centres" or "mega-villages" (Table 1 and Figure 1). We have integrated all the published radiocarbon dates from small villages into our cumulative radiocarbon frequency curve for the region, but we do not discuss these small villages. The Mid-Fraser region is known to have much larger housepits than other regions on the Plateau (Hayden 1997; Richards and Rousseau 1987), for example HP 1 at Keatley Creek with a diameter of 22 m (Hayden 1997, 47), or HP 1 at McKay Creek with a diameter of 19 m. Large houses (i.e., those greater than 15 m in diameter) are always associated with large, very large, or mega-villages belonging to the Classic Lillooet Phase: they never occur in isolation or in small villages (Hayden 2000a; Stryd 1973). On the other hand, some large villages that are clearly associated with neighbouring Classic Lillooet communities do not have large housepits.

All small and large housepit villages are on terraces with good access to the Fraser River, although most large villages are not immediately adjacent to it. Other factors influencing winter village location were access to water and wood, relatively level land, shelter from winter winds, and, perhaps, ease of defence (Alexander 2000; Sakaguchi 2006). Nearly all large village sites are located immediately adjacent to small, year-round streams (Figure 1). The two exceptions are the West Fountain site, which has no ready access to fresh water other than the Fraser River, and the Aker's/Chicken Gully site, which is located around a small unnamed spring. Even creeks with very small flows supported large communities, as at Keatley Creek. All the large winter villages, with the exception of West Fountain, are located at or above the modern tree line. Proximity to structural timber and fuel

TABLE 1
Large housepit villages in the Mid-Fraser region

Site Name	Number of Housepits	Dating	Number of Large HP (>15 m)	Notes	Reference
Seton Lake	36	limited C14 dating	0	largely destroyed	Stryd and Hills 1972
Bell	31	well dated	8	major excavations	Stryd 1973, Hills 1961
Bridge River	80	well dated	20	major excavations	Prentiss et al. 2008
West Fountain	36	limited C14 dating	0	largely unknown	Hills 1961; Stryd and Hills 1972
Keatley Creek	>120	well dated	28	major excavations	Hayden 2000d
McKay Creek	46	undated	2	largely unknown	Stryd and Hills 1972, Morin et al. 2007
Chicken Gully /Akers	>75	undated	3 minimum	largely unknown	Stryd and Hills 1972
Cavanaugh Creek	30	undated	unknown	largely unknown	Hills 1961
Kelly Lake/ Pear Lake	>130	undated	3 minimum	largely unknown	Hills 1961

were likely major locational considerations (Alexander 2000; Hayden 2000c). Large villages in flat, sheltered locations usually fill nearly all the available space.

Some have argued that large villages occupied defensive locations. Teit (1900, 263-71; 1906, 234-47; 1909, 538-63) was explicit about endemic warfare and raiding in Canadian Plateau societies before contact (Cannon 1992; Chatters 2004). Recent analysis of late prehistoric Plateau skeletal remains indicates that lethal violence was then more common on the Plateau than along the adjacent Northwest Coast – a region noted for high levels of prehistoric warfare (Cybulski 2006). It is probable, therefore, that defensive considerations did influence the placement of villages and cached food. Sakaguchi (2006) suggests that the location of the Bell site on a mountainside surrounded by steep terrain makes little sense unless its founders feared attacks. Both Hayden (2000a) and Sakaguchi (2006) have suggested that the tucked-away location of Keatley Creek may reflect defensive considerations. Schaepe (2006) describes an example of an intervisible defensive network of fortified sites on the Lower Fraser Canyon, and Sakaguchi (2006) suggests that the intervisibility of sites was a common defensive strategy. There is a direct site line from the terrace in front of Keatley Creek to Bell (Sakaguchi 2006), and recent fieldwork (re)identifying the location of the West Fountain site suggests that an intervisibility network extends from Keatley Creek to Bell, West Fountain, and Fountain Flats (a badly disturbed site not discussed herein). We suggest that the location of the West Fountain site makes little sense if not intended for defence. There, housepits are tightly clustered along a steep scarp to its east and easily could have been palisaded on the low terrace slope to the west. Teit (1900, 270) mentioned such fortified settlements; Simon Fraser noted a palisaded compound near Lillooet (Lamb 1960, 82).

Apparently the major influences on the location of large villages were: (1) access to Fraser River fisheries; (2) access to potable water; (3) access to wood; (4) flat, sheltered terrain; and (5) defensibility. Undoubtedly their relative importance varied through time.

Overview of Villages Containing More Than 30 Housepits

The thoroughly investigated Keatley Creek, Bell, and Bridge River sites have large, well-described, Classic Lillooet Phase occupations. The relatively unknown McKay Creek, Akers/Chicken Gully, and Kelly Lake sites (each with large numbers of housepits and large housepits) probably also belong to this phase but remain undated and unexcavated.

Two other Classic Lillooet sites (Seton Lake and West Fountain) have no houses larger than about 10 m in diameter.

Seton Lake (EeRl 21)

The Seton Lake (or Seton) site is at the eastern end of Seton Lake towards Lillooet, where it drains into the Seton River (Figure 1). In 1973, the site had 36 housepits, some 12 of which remained in 2007 (Bussey 1982). Dates from Seton Lake span the period from 500 BC to AD 1100 (Figure 2) (Bussey 1982; Stryd 1980).

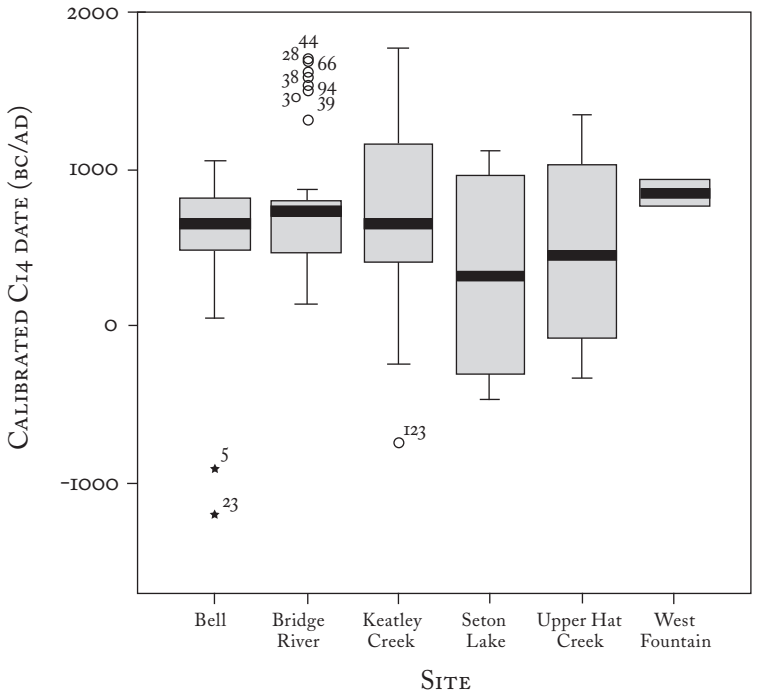


Figure 2. Box plots of calibrated radiocarbon dates for large village sites and Upper Hat Creek Valley sites (combined) in the Lillooet region. The thick black bars indicate the median date for each site, and the shaded boxes represent 25% of the dates above and 25% of those below the median. The dates indicated by circles and stars are outliers. Note that dates BC are indicated as negative in this plot. Dates calibrated using Calpal.

Bridge River (EeRl 4)

This is one of the largest housepit villages in the Mid-Fraser region, with approximately 80 housepits clustered on a terrace above and adjacent to the Bridge River (Figures 1 and 3). The site was originally excavated by Stryd (1973) and recently has been more thoroughly investigated by Prentiss (Prentiss et al. 2008), making Bridge River the most fully dated large prehistoric habitation site in Western Canada. The major occupation phase of this site is around AD 800, with a minimum of 29 houses occupied roughly simultaneously and a population of between six hundred to one thousand (Prentiss et al. 2008, 79). Twenty housepits at this site are 15 m or larger in diameter, but most are in the range of 10-14 m.

Bell (EeRk 4)

The Bell site contains 31 housepits (Figures 1 and 4) located on a small terrace on the side of a steep hill overlooking all the smaller villages near Gibbs Creek (Lower Bell, Gibbs Creek, Mitchell, Ollie). Intensively excavated by Stryd (1973) in the early 1970s, the Bell site is comparatively well documented. It contains a high proportion of large houses and a long occupation chronology that includes some of the earliest dates for PPT occupations along the Mid-Fraser. Most dates fall between AD 500-900; the site does not appear to have been occupied after AD 1000 (Figure 2).

West Fountain (EeRl 6)

The West Fountain site comprises three clusters of small housepits, uniformly 6-7 m in diameter. One set of 15 small housepits is near the west bank of the Fraser River opposite Fountain Creek, and the other two sets (N=15 and 6) are on the edge of a terrace approximately 200 m above the river (Hills 1961; Stryd and Hills 1972, 193-95). This site was occupied between about AD 800-900 (Stryd 1980). Its atypical location – on an exposed terrace, below the tree line, without access to water other than from the Fraser River, and visible from the Bell site – suggests that defensive considerations influenced its location.

Keatley Creek (EeRl 7)

Keatley Creek is the most thoroughly excavated and documented site on the Canadian Plateau (Hayden 1997, 2000c, 2005; Prentiss et al. 2003, in press) and is probably the most visually impressive archaeological site in northwestern North America. It consists of over 120 housepits, several very large (~20 m in diameter) and at least 28 over 15 m (see Figures 5 and 6). The estimated population at Keatley Creek c. AD 700 is twelve hundred to fifteen hundred (Hayden 1997, 45). The duration of the Classic Lillooet Phase occupation of Keatley Creek is disputed (see below), beginning according to Hayden about 500 BC and according to Prentiss et al. about AD 100-400 and continuing until AD 1000-1200 (Hayden 2005; Prentiss et al. 2007). Our summary of radiocarbon dates from Keatley Creek indicates that 50% fall between AD 500-1100, although several dates are much earlier and others considerably later.

McKay Creek (EfRl 3 and 13)

This site is on a heavily wooded terrace on the west bank of the Fraser River approximately 41 km north of Lillooet (Hills 1961; Stryd and Hills 1972) (Figures 1 and 7). It contains 46 housepits, two over 15 m and the largest approximately 19 m in diameter (Figure 7). The McKay Creek site was mapped by one of the authors (Hoskins) as part of the 2006 SFU archaeological field school directed by Dr. Robert Muir. This site has not been excavated and there are no associated radiocarbon dates. The size and number of housepits suggest that it belongs to the Classic Lillooet Phase. The only temporal markers from the site include surface-collected projectile points belonging to Shuswap, Plateau, and Kamloops horizons – points that, together, represent almost the entire PPT (Hills 1961).

Aker's/Chicken Gully (EfRl 5)

The Aker's/Chicken Gully site is on the west bank of the Fraser River approximately 47 km north of Lillooet (Figure 1). It has not been mapped, has no associated radiocarbon dates, and is unexcavated (Hills 1961; Stryd and Hills 1972). The site has at least 75 housepits, a few of which are up to 20 m in diameter. Like McKay Creek, the size of the settlement and the size of some of the houses suggest that it was occupied during the Classic Lillooet Phase. Again, the only temporal indicators at this site are surface-collected projectile points belonging to Shuswap, Plateau, and Kamloops horizons (Hills 1961).

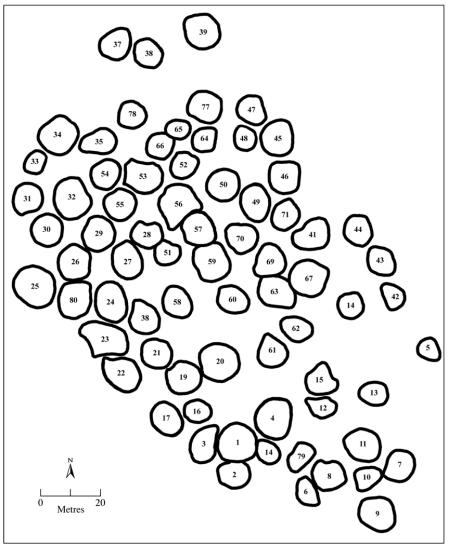
Kelly Lake/Pełtêqet (EfRk 1 and EfRl 25)

The Kelly Lake/*Pełtêqet* site (sometimes known as the Cold Springs or Pear Lake site) is 17 km west of Clinton (Figures 1 and 8) (Hills 1961; Teit 1909, 458). It is located at the foot of a hill in a heavily forested valley bottom alongside Kelly Creek. There are approximately 130 housepits, most of them small, but at least three are more than 15 m and the largest is about 17 m in diameter (Figure 8). The two senior authors of this article and Nicole Gavac mapped the "core" of this site in the summer of 2008. About 200–250 m to its west are two clusters of about 15 housepits each. There has been no archaeological investigation of any of these clusters. Surface-collected points reported by Hills (1961) include examples belonging to both Plateau and Kamloops horizons. Teit (1909, 458) states that this site was the headquarters of the Clinton band in proto-historic times.

Cavanaugh Creek/Łenłan'iten (EfRl 4)

This site consists of 30 housepits along Cavanaugh Creek approximately 2 km north of the Kelly Lake/*Pełtêqet* site (Hills 1961; Teit 1909, 458) (Figure 1). No large housepits have been identified (Hills 1961). The site has not been mapped or excavated, and neither radiocarbon dates nor datable artefacts have been reported. It is the only large site that we have not verified. Teit (1909, 458) indicates that it was the headquarters of the Big Bar band.

Together, McKay Creek, Akers/Chicken Gully, Kelly Lake, and Cavanaugh Creek contain some 300 undated housepits. Until these sites receive some preliminary dating, we suggest that all the chronologies discussed below be used cautiously.



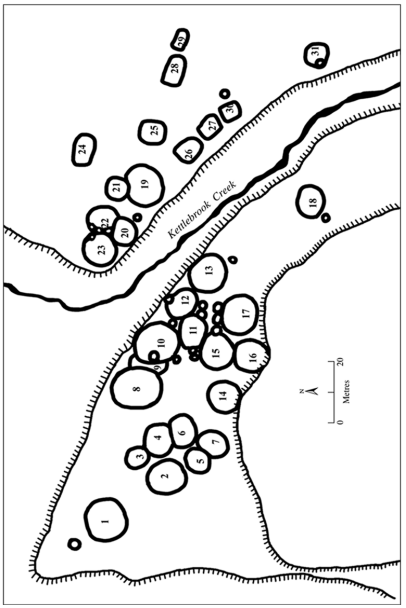


Figure 3 (TOP LEFT). The Bridge River site (EeRl 4). Housepits indicated by black outline. Map adapted with permission from Prentiss et al. 2006.

Figure 4 (TOP RIGHT). The Bell site (EeRk 4). Housepits and small cultural depressions indicated by black outline. Map adapted with permission from Stryd (1973).

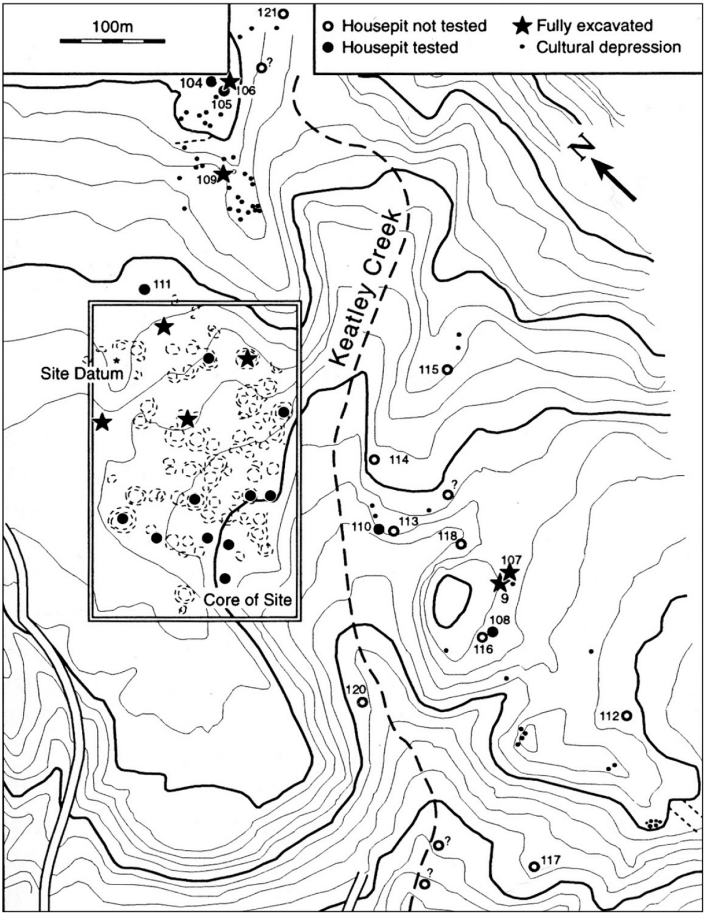
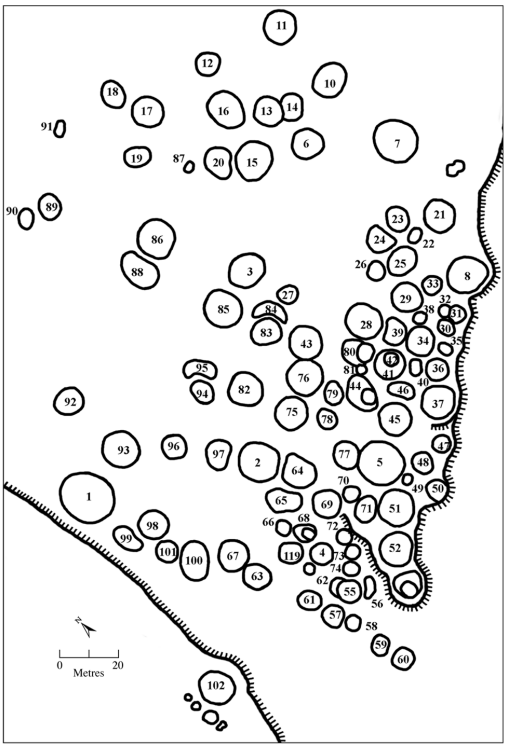
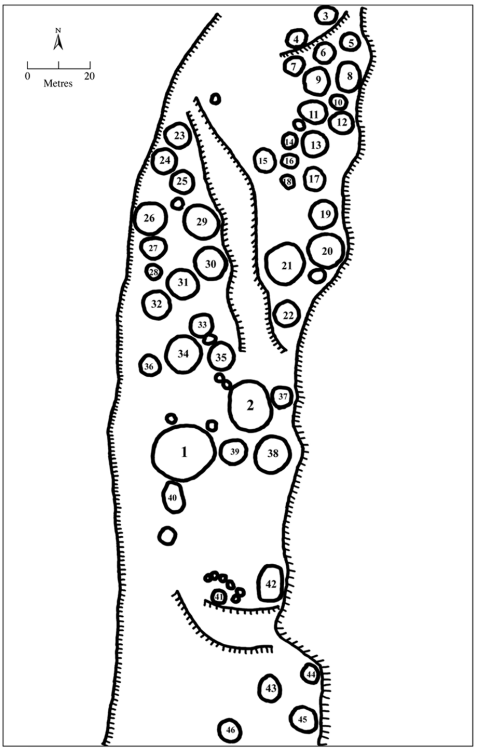


Figure 5 (BOTTOM). The entire Keatley Creek site. (Courtesy of SFU Archaeology Press, originally in Hayden 2000a).





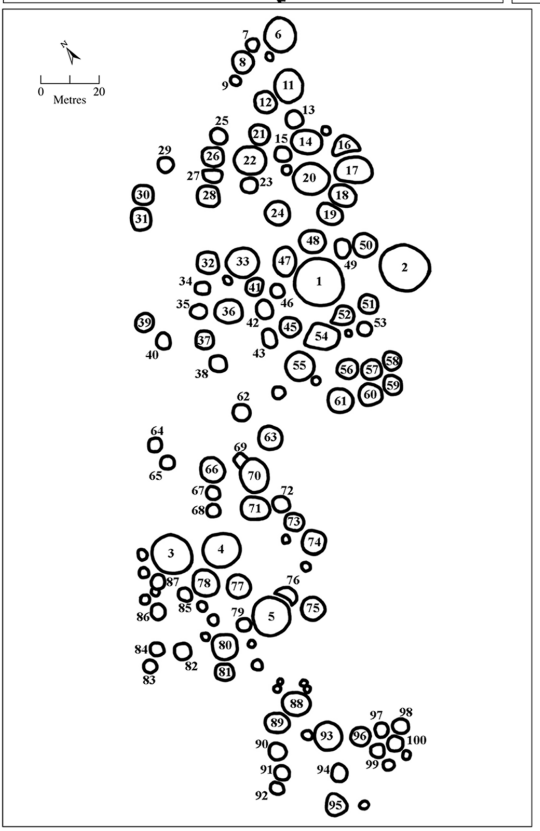


Figure 6 (TOP LEFT). The core of the Keatley Creek site (Courtesy of SFU Archaeology Press, originally in Hayden 2000a).

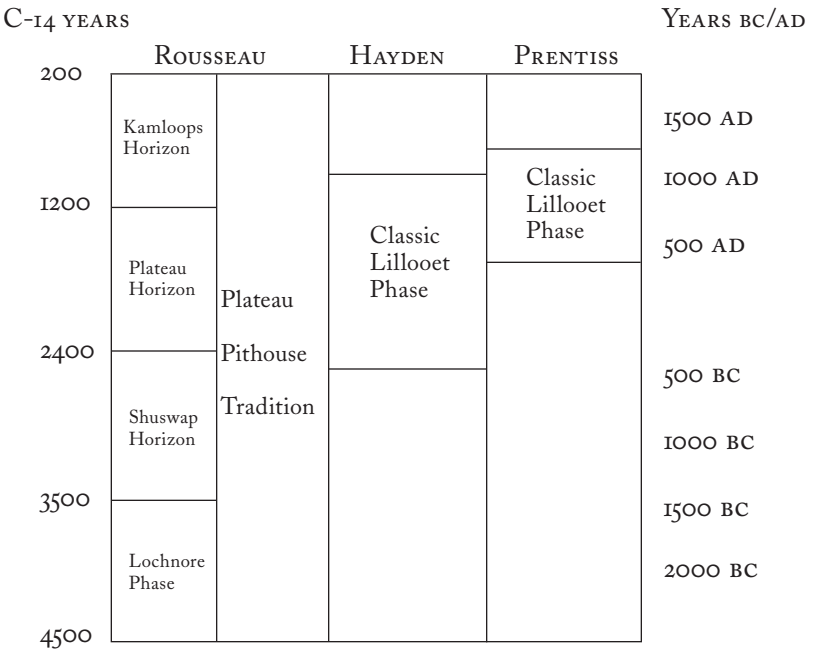
Figure 7 (TOP RIGHT). The McKay Creek site (EfRl 3). Housepits and small cultural depressions indicated by black outline; housepits are numbered. Cartography by Jamie Hoskins.

Figure 8 (BOTTOM LEFT). The Kelly Lake/Pełtêqet site (EfRk 1 and EfRl 25). Housepits and small cultural depressions indicated by black outline; housepits are numbered. Cartography by Jesse Morin, Nicole Gavac, and Ryan Dickie.

THE HAYDEN AND PRENTISS CHRONOLOGIES

All reconstructions of demographic trends in the Mid-Fraser region present dynamic population histories (Hayden and Ryder 1991; Prentiss and Kuijt 2004; Prentiss et al. 2007; Richards and Rousseau 1987, 55). There is general agreement that the peak occupation of the large village sites was approximately contemporaneous and that it was associated with the development of social complexity (Hayden 1997, 2000c; Prentiss et al. 2007). There is considerable disagreement about when villages and individual houses were occupied (Table 2).

TABLE 2
Various interpretations of the culture history of the Lillooet region



Hayden's research at Keatley Creek over the past twenty years has overseen the partial excavation of over 30 housepits and the nearly complete excavation of eight (Hayden 2000a and 2000b, 1997). His investigations in large houses (~20 m in diameter) at Keatley Creek revealed a stratigraphic sequence of artefact types and radiocarbon dates spanning the entire PPT (Hayden 2005; Henry and Hayden 2000). For the large houses at Keatley Creek, Hayden (2005, 2000b) infers a major occupation sequence from approximately 500 BC to AD 1000. Smaller houses were all occupied for shorter periods but were also abandoned around AD 1000 (Hayden and Ryder 1991; Hayden 2005). Hayden (2005, 1992) suggests that local populations grew as local salmon fisheries became more intensive. He and Ryder (1991, 2001) argue that about AD 1000 a rock slide dammed the Fraser River at Texas Creek, downstream from Lillooet, creating a 45-m-high dam that devastated salmon runs, probably triggered famine, and greatly reduced regional populations. They suggest that this event triggered the abandonment of the large Classic Lillooet communities (Hayden and Ryder 1991, 2001).

Relying on data from Keatley Creek and Bridge River, Prentiss et al. have suggested another chronology (Prentiss et al. 2003, Prentiss et al. 2007, Prentiss et al. 2008). Their interpretation of radiocarbon dates suggests that large villages were established around AD 100-400, with a major occupation of Keatley Creek from about AD 400-1200 (Prentiss et al. 2007), and a major occupation of Bridge River from about AD 100-1000 (Prentiss et al. 2008). Before about AD 100, villages such as Keatley Creek, Bell, and Bridge River are held to have been much smaller and to have had no large housepits. Thereafter, villages grew rapidly and large houses appeared (Prentiss et al. 2003, 2007, 2008). Prentiss and Kuijt (2004) suggest that the abandonment of the large villages was a gradual process that was completed by around AD 1200. They posit that climatic deterioration (the Little Ice Age) lowered the regional biotic capacity (Kuijt and Prentiss 2004, 157; Prentiss and Kuijt 2004). More recently, Prentiss (Prentiss et al. 2008) describes population decline beginning around AD 800, followed from AD 1000-1200 by the sequential abandonment of large villages.

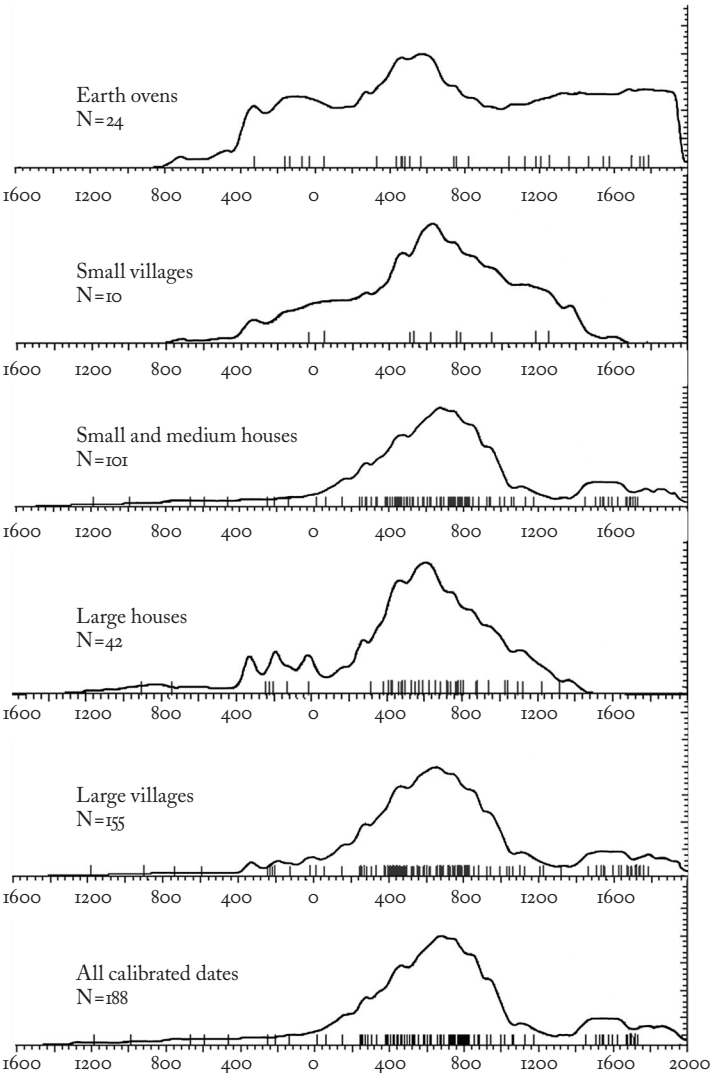


Figure 9. Cumulative plot of calibrated radiocarbon intervals. The short lines on the X-axis are individual radiocarbon dates, and the curve summarizes the combined probability intervals of all the individual dates. Note X-axis is in solar years BC/AD, and the Y-axis intervals vary for each plot. Produced using Calpal. All radiocarbon dates are derived from Hayden 2000a, 2005; Hayden and Cousins 2004; Pokotylo and Froese 1983; Prentiss et al. 2003; Prentiss et al. 2008; and Stryd 1980.

A CHRONOLOGY BASED ON CALIBRATED RADIOCARBON DATES

In order to describe regional population change, we have collected and calibrated all published radiocarbon dates derived from housepits and earth ovens in the Mid-Fraser, including the Upper Hat Creek Valley (N=188). We present our data graphically as a cumulative probability plot (Figure 9) and as a series of box plots for large individual villages (Figure 2), and we report dates in calendar years BC/AD. Using CalPal, a calibration software package provided by the University of Cologne, we have calibrated all radiocarbon dates. We have added a one hundred-year margin of error to every C14 sample from charcoal or wood because local conifers were likely "old wood" when harvested. Thus, an uncalibrated date of 1000 + –100 BP derived from wood charcoal is transformed to 1000 + –200 BP and then is calibrated into a probability range of calendar years. More than 95% of our radiocarbon dates are derived from unidentified wood, most of it probably "old wood." As Michczynski (2007) has demonstrated, it is not possible to identify a specific few years (i.e., a point estimate) from a calibrated radiocarbon date. Calibrated radiocarbon dating yields only a probability range. The twenty-year intervals Prentiss et al. (2003, 2007) have used, and the fourteen-year occupation phase they identify at Bridge River (Prentiss et al. 2008, 73), assume more accuracy than is warranted.

Using radiocarbon dates derived from habitation sites as evidence of human activity is standard archaeological practice. Recently, it is becoming common to use such data to infer changes in human population (Chatters 1995; Goodale et al. 2008; Shennan and Edinborough 2007). As the vast majority (~85%) of the radiocarbon dates obtained from sites along the Mid-Fraser are from housepits, the frequency of dates at particular periods should approximate the number of domestic residences then in use –which, in turn, should serve as a crude measure of population. Although, of necessity, our sample was collected non-randomly, it is very large for a small area (N=188) and is derived from twenty one different archaeological sites, 106 housepits, and twenty earth ovens. It should provide a rough chronology of human activity at the southern sites in the study area.

The method is biased against early dates because older organic materials are less likely to be preserved. The Lochnore Phase components (2500-1500 BC) at Keatley Creek, for example, contain essentially no original organic material and cannot be radiocarbon dated (Henry and Hayden 2000). Yet, from the number of Lochnore points recovered from

Keatley Creek, we can be relatively certain that Lochnore-point-using peoples seasonally occupied the site (Henry and Hayden 2000, 49). Another source of bias against early dates is introduced by sampling procedures that tend to focus on terminal floor deposits rather than on housepit rim middens (Hayden n.d.; Prentiss et al. 2008). If housepits have very short life-spans, samples of terminal floor deposits are not problematic. However, along the Mid-Fraser, many housepits have very long and complex occupation sequences. At Keatley Creek floors are rarely stratified; there, one of the few contexts that contain evidence of Lochnore, Lehman, and Shuswap occupations are the deeply stratified rim midden deposits of the large housepits (Hayden 2000b, n.d.). Because dates from rim middens make up a small portion of our database, these early periods may be inadequately represented. It is not clear, therefore, that the low frequency of radiocarbon dates before about AD 200 actually indicates low populations.

After AD 200, we are more confident about dating. Our data are more numerous and are derived from four different research programs, each with its own biases (Hayden 2000b, Hayden and Cousins 2004; Pokotylo 1978, Pokotylo and Froese 1983; Prentiss et al. 2003, Prentiss et al. 2008; Stryd 1973, 1980). For example, while Hayden (2000b; Henry and Hayden 2000) and Prentiss et al. (2003) investigated deeply stratified rim sequences at Keatley Creek, Prentiss et al.'s (2008) more recent work at Bridge River has focused entirely on terminal floor deposits (Hayden n.d.). Housepit floor deposits often represent only the last few seasons of household occupation, while rim deposits may span more than a millennium (Hayden 2005). Multiple samples from the same feature would introduce another source of bias. However, most of our samples were taken from separate housepit floors (especially Prentiss et al. 2008) or from a series of stratified rim deposits (spanning about fifteen hundred years) within housepit 7 at Keatley Creek (Hayden 2000a; Prentiss et al. 2003).

Given that many important sites have no radiocarbon dates, that our method contains inherent biases, and that dated remains of human activity (from pithouses and earth ovens in this case) are rough relative measures of human population, no more than coarse population estimates can be inferred from our graphs (Figure 9). That said, no more accurate method is currently available. The graphs summarize the combined probability intervals of the calibrated radiocarbon dates in our dataset. Each plot represents the summed area (the integral) of all radiocarbon dates 2-sigma intercepts on the calibration curve (Calpal,

see Chatters 1995). The bottom plot summarizes all radiocarbon dates from the PPT sites in the Mid-Fraser region, while the others represent discrete categories of dated features: large villages (more than 30 housepits), large housepits (greater than 15 m in diameter), small and medium housepits (under 15 m), small villages (fewer than 30 housepits), and earth ovens (both from upland and lowland contexts). Radiocarbon evidence for occupation of the region is very limited before 400 BC, but from about 400 BC-AD 200 the frequency of dates increases. Following AD 200, the number of dated features in the Mid-Fraser region increases dramatically, peaking at around AD 700. From about AD 900-1100, there are many fewer dated features. By AD 1300 there are almost none.

These data suggest a dynamic population history. Slow population growth occurred from 400 BC-AD 200, followed by a period of marked growth peaking around AD 700. After about AD 900, population levels appear to drop dramatically, reaching a nadir around AD 1300. This dramatic demographic contraction reduced the population to levels not seen since AD 200. After about AD 1400, the population increased slightly, but probably not to more than a quarter of the level attained around AD 700. Population densities during the Classic Lillooet Phase appear to have been some four times higher than those during the proto-historic period.

All categories on the graphs (Figure 9) share approximately the same shape and modal peak. The graphs from large houses, large villages, and small villages are approximately the same shape as the plot for all dates combined (Figure 9). The data provide no evidence of a shift from many small to a few large villages or from many small to few large houses. Instead, both large villages and small villages, and large houses and medium/small houses appear to share a modal distribution peak around AD 700. There is a notable reduction in dates from large housepits after about AD 900 and no dates after AD 1300. These largest housepits must have been abandoned by AD 1300, probably by AD 1100, and were not occupied thereafter. While occupations rebounded somewhat after AD 1300, large houses were never again used. Only the plot of radiocarbon dates from earth ovens displays a shape notably different from that of the combined plot. The use of earth ovens appears to have increased rapidly after 400 BC and to have remained relatively constant to the historic period. There may have been a slight peak in the intensity of

earth oven use around AD 500, roughly contemporary with the peak in regional populations.

Based on our graphs of radiocarbon dates from large villages and large housepits, we suggest that the Classic Lillooet Phase falls between AD 400-900. Within the 4,000-year-long PPT, 50% of all dates fall within these 500 years. However, given the present dataset, we would not object seriously to arguments that adjusted the terminal dates of this phase by a century in either direction. Further, we anticipate that more research may push back the beginnings of this phase, perhaps to as early as ~500 BC, as Hayden has argued (2005).

Although the results from this analysis are generally consistent with previous models of the demographic history of the region, they differ in several respects. First, our data suggest that the Classic Lillooet Phase, as defined by large villages and large houses, has little archaeological visibility until about AD 400. Although there is some evidence for large houses and population growth as early as 500 BC (Hayden 2005), such evidence is sparse. At present it is not clear whether the period from 500 BC-AD 400 reveals evidence of absence or simply an absence of evidence. Second, we observe a peak or modal distribution of dates at around AD 700. This is slightly earlier than the occupation peak suggested by both Hayden (1997b, 2000c) and Prentiss (Prentiss et al. 2003, 2007) for Keatley Creek but very similar to the occupation peak inferred much earlier by Stryd (1973) for the Bell site and by Prentiss et al.'s (2008) recent analysis of Bridge River. Finally, we observe a reduction in population immediately after AD 800, some two centuries before the Texas Creek slide. However, the wide margins of error associated with radiocarbon dates make it difficult to evaluate rapid (within a few years) and gradual (over two centuries) models of population decline. By AD 1000, populations appear to have already dropped by about half from levels achieved three centuries before. Perhaps the Texas Creek event occurred closer to AD 850-900 than to AD 1000 (it has not been directly dated) or perhaps climatic deterioration, as suggested by Kuijt and Prentiss (2004), stimulated population reduction following AD 700.

Alternatively, we suggest that (1) endemic warfare, (2) diseases associated with densely aggregated settlement, and (3) variability in salmon populations resulting from climatic changes may have contributed to regional population dynamics. Although we think it unlikely, the apparent reduction in the number of dated housepits after AD 700 may represent a shift from overwintering in housepits to overwintering in mat lodges or other more ephemeral structures that are not represented

in our data. This shift, if it existed, might have been a response to regional deforestation, poor access to timber, or perhaps to warmer winters over the several centuries preceding the Little Ice Age. However, the outstanding trend in these data is clearly that population peaked around AD 700 and was drastically reduced over the following centuries.

CONCLUSION

The pithouse villages along the Mid-Fraser are among the largest hunter-gatherer settlements recorded anywhere in the world for any period. They are much larger than most, if not all, prehistoric villages on the adjacent Northwest Coast. The only precontact settlements of comparable size within the modern borders of Canada were the horticultural Iroquoian villages of southern Ontario. The Classic Lillooet communities defy most anthropological generalizations about typical hunter-gatherer behaviour. Yet the existence of these remarkable communities is rarely acknowledged beyond relatively limited archaeological discussions and certainly has not permeated the public consciousness.

Archaeological research has revealed a markedly dynamic history of these Classic Lillooet communities. Rather than a static, timeless picture of the Aboriginal past, research in the Mid-Fraser offers a glimpse of the rich history of these peoples and their settlements. Briefly, this history included the development of many large villages with population densities along the Mid-Fraser greatly exceeding those at contact or even today and the abandonment of such settlements at least six centuries before contact. The history of these communities was undoubtedly marked by the founding of new villages; the rise and fall of powerful lineages and chiefs; the shifting of alliances between chiefs, lineages, villages, and distant trading partners; the spread of new technologies and rituals; periods of strife and peace; and others of plenty and dearth. Although archaeology can illuminate no more than an outline of this rich and varied history, researchers will continue to question current understandings of and add information about the long and extraordinary human past of this remarkable region.

REFERENCES

Alexander, Diana. 2000. "Pithouses on the Interior Plateau of British Columbia: Ethnographic Evidence and Interpretation of the Keatley Creek Site." In *The Ancient Past of Keatley Creek. Vol. 2. Socioeconomy*, ed. B. Hayden, 29-66. Burnaby: Simon Fraser University, Archaeology Press,

Angelbeck, Bill, and Dave Hall. N.d. *Archaeological Impact Assessment of the Kwoiek Creek Hydroelectric Project*. Heritage Inspection Permit 2006-94. Prepared on behalf of the Kanaka Bar Indian Band and Innergex. Arrowstone Archaeological Consulting, Limited.

Bussey, J. 1982. *EeRl 21 Impact Evaluation for B.C. Hydro 1982, Points West Heritage Consultants*. Archaeology Branch, Victoria.

Cannon, Aubry. 1992. Conflict and Salmon on the Interior Plateau of British Columbia. In *A Complex Culture on the British Columbia Plateau*, ed. B. Hayden, 506-24. Vancouver: UBC Press.

———. 1995. "The Ratfish and Marine Resource Deficiencies on the Northwest Coast." *Canadian Journal of Archaeology* 19(1): 49-60.

Chatters, James. 1995. "Population Growth, Climatic Cooling, and the Development of Collector Strategies on the Southern Plateau, Western North America." *Journal of World Prehistory* 9(3): 341-400.

———. 2004. "Safety in Numbers: Conflict and Village Settlement on the Plateau." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 67-83. Salt Lake City: University of Utah Press.

Chisholm, Brian. 1986. "Reconstructions of Prehistoric Diet in British Columbia Using Stable-Carbon Isotopic Analysis." PhD dissertation, Simon Fraser University, Burnaby.

Cybulski, Jerome. 2006. "Skeletal Biology: Northwest Coast and Plateau." In *Handbook of North American Indians*. Vol. 3: *Environment, Origins, and Population*, ed. Douglas Ubelaker, 532-47. Washington: Smithsonian Institution Press.

Finney, B.I. Gregory-Eaves, M.S.V. Douglas, J.P. Smol. 2002. "Fisheries Productivity in the Northeastern Pacific Ocean Over the Past 2,200 Years." *Nature* 416: 729-33.

Goodale, Nathan, William Prentiss, and Ian Kuijt. 2004. "Cultural Complexity: A New Chronology of the Upper Columbia Drainage Area." In *Complex Hunter-Gatherers: Evolution and Organization of Complex Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 36-48. Salt Lake City: University of Utah Press.

Goodale, Nathan, Ian Kuijt, and Anna Prentiss. 2008. "The Demography of Prehistoric Fishing/Hunting People: A Case Study of the Upper Columbia Area." In *Recent Advances in Palaeodemography*, ed. Jean-Pierre Bocquet-Appel, 179-207. Amsterdam: Springer.

Hayden, Brian. n.d. "A Response to Prentiss et al. (2008)".

———. 1992. "Conclusions: Ecology and Complex Hunter-Gatherers Resource Use." In *A Complex Culture of the British Columbia Plateau: Traditional Stl'atl'imx*, ed. Brian Hayden, 525-64. Vancouver: UBC Press.

———. 1997. "Observations on the Prehistoric Social and Economic Structure of the North American Plateau." *World Archaeology* 29: 242-61.

———. 2000a. "The Opening of Keatley Creek." In *The Ancient Past of Keatley Creek Vol. 1: Taphonomy*, ed. B. Hayden, 1-34. Burnaby: Simon Fraser University, Archaeology Press.

———. 2000b. "Dating the Deposits at Keatley Creek." In *The Ancient Past of Keatley Creek. Vol. 1: Taphonomy*, ed. B. Hayden, 35-40 . Burnaby: Simon Fraser University, Archaeology Press.

———. 2000c. "An Overview of the Classic Lillooet Occupation at Keatley Creek." In *The Ancient Past of Keatley Creek. Vol. 2*: *Socioeconomy*, ed. B. Hayden. vol. 27, 225-86. Burnaby: Simon Fraser University, Archaeology Press.

———. 2005. "The Emergence of Large Villages and Large Residential Corporate Group Structures Among Complex Hunter-Gatherers at Keatley Creek." *American Antiquity* 70: 169-174.

Hayden, Brian, and Sara Mossop Cousins. 2004. "The Social Dimension of Roasting Pits in a Winter Village Site." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 140-54. Salt Lake City: University of Utah Press.

Hayden, Brian, and June Ryder. 1991. "Prehistoric Cultural Collapse in the Lillooet Area." *American Antiquity* 56(1): 50-65.

———. 2001. "Cultural Collapses in the Northwest: A Response to Kuijt." *American Antiquity* 68:157-160.

Hayden, Brian, Morley Eldridge, Anne Eldridge, and Aubery Cannon. 1985. "Complex Hunter-Gatherers in Interior British Columbia." In *Prehistoric Hunter-Gatherers: The Emergence of Cultural Complexity*, ed. D. Price and J. Brown, 181-199. Orlando: Academic Press.

Henry, Andrew, and Brian Hayden. 2000. "Mixing of Projectile Point Types within Housepit Rim and Floor Strata at Keatley Creek." In *The Ancient Past of Keatley Creek*. Vol. 1: *Taphonomy*, ed. B. Hayden, 41-58. Burnaby: Simon Fraser University, Archaeology Press

Hills, Leonard. 1961. "A Preliminary Archaeological Survey of the Fraser River From Lillooet to Big Bar, BC." Report held in the Laboratory of Archaeology at the University of British Columbia.

Hobbs, William, and Alexander Wolfe. 2007. "Caveats On the Use Paleolimnology to Infer Pacific Salmon Returns." *Limnology and Oceanography* 52: 2053-61.

———. 2008. "Recent Paleolimnology of Three Lakes in the Fraser River Basin (BC, Canada): No Response to the Collapse of Sockeye Salmon Stocks Following the Hells Gate Landslides." *Journal of Paleolimnology* 40(1): 295-308.

Kennedy, Dorthy, and Randy Bouchard. 1992. "Stl'atl'imx Fishing." In *A Complex Culture of the British Columbia Plateau.*, ed. B. Hayden, 266-354. Vancouver: UBC Press.

———. 1998. "The Lillooet." In *Handbook of North American Indians.* Vol. 12: *Plateau*, ed. Deward Walker Jr., 174-90. Washington: Smithsonian Institution Press.

Kew, Michael. 1992. "Salmon Availability, Technology and Cultural Adaptation on the Fraser River Watershed." In *A Complex Culture of the British Columbia Plateau*, ed. B. Hayden, 177-221. Vancouver: UBC Press.

Kuijt, Ian, and Prentiss, William. 2004. "Villages on the Edge: Pithouses, Cultural Change, and the Abandonment of Aggregate Pithouse Villages." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 155-69. Salt Lake City: University of Utah Press.

Lamb, Kaye ed. 1960. *The Letters and Journals of Simon Fraser, 1806-1808.* Toronto: Macmillan.

Lepofsky, Dana, and Sandra Peacock. 2004. "A Question of Intensity: Exploring the Role of Plant Foods in Northern Plateau Prehistory." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 112-39. Salt Lake City: University of Utah Press.

Lovell, N., Brian Chisholm, Earle Nelson, and H. Schwartz. 1986. "Prehistoric Salmon Consumption in Interior British Columbia." *Canadian Journal of Archaeology* 10: 99-106.

Matson, R.G., and Martin Magne. 2007. *Athabaskan Migrations: The Archaeology of Eagle Lake, British Columbia*. Tucson: University of Arizona Press

Michczynski, Adam. 2007. "Is It Possible to Find a Good Point Estimate of a Calibrated Radiocarbon Date?" *Radiocarbon* 49: 393-401.

Mohs, Gordon. 1981. *An Assessment and Evaluation of Heritage Resources in the South Thompson River Valley of British Columbia*. Victoria: Heritage Conservation Branch.

Muir, Robert, Mike Rousseau, and Peter Merchant. 1992. *An Archaeological Impact Assessment for the Proposed Stein River Water Pipeline Project (Phase I), Lytton, British Columbia*. Victoria: Heritage Conservation Branch, Antiquus Archaeological Consultants Ltd.

Pokotylo, David. 1978. "Lithic Technology and Settlement Patterns in the Upper Hat Creek Valley, British Columbia." PhD dissertation, University of British Columbia, Vancouver.

Pokotylo, David, and Donald Mitchell. 1998. "Prehistory of the Northern Plateau." In *Handbook of North American Indians*. Vol. 12, *Plateau*, ed. Deward Walker Jr., 81-102. Washington: Smithsonian Institution Press.

Pokotylo, David, and Patricia Froese. 1983. "Archaeological Evidence for Prehistoric Root Gathering on the Southern Interior Plateau of British Columbia: A Case Study from the Hat Creek Valley." *Canadian Journal of Archaeology* 7: 127-157

Prentiss, Anna Marie, Guy Cross, Thomas Foor, Mathew Hogan, Dirk Markle, and David Clarke. 2008. "Evolution of a Late Prehistoric Winter Village on the Interior Plateau of British Columbia: Geophysical Investigations, Radiocarbon Dating, and Spatial Analysis of the Bridge River Site." *American Antiquity* 73: 59-81.

Prentiss, Anna Marie, Natasha Lyons, Lucille Harris, Melisse Burns, and Terrence Godin. 2007. "The Emergence of Status Inequality in Intermediate Scale Societies: A Demographic and Socio-Economic History of the Keatley Creek site, British Columbia." *Journal of Anthropological Archaeology* 26(2): 299-327.

Prentiss, William, and Ian Kuijt. 2004. "The Evolution of Collector Systems on the Canadian Plateau." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 49-66. Salt Lake City: University of Utah Press.

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

Richards, Thomas, and Michael Rousseau. 1987. *Late Prehistoric Cultural Horizons on the Canadian Plateau*. Burnaby: Simon Fraser University, Department of Archaeology Publication 16.

Romanoff, Steven. 1992a. "The Culture Ecology of Hunting and Potlatches Among the Lillooet Indians." In *A Complex Culture of the British Columbia Plateau: Traditional Stl'atl'imx Resource Use*, ed. B. Hayden, 470-505. Vancouver: UBC Press.

———. 1992b. "Fraser Lillooet Fishing." In *A Complex Culture of the British Columbia Plateau*, ed. B. Hayden, 222-65. Vancouver: UBC Press.

Rousseau, Michael. 2004. "A Culture Historic Synthesis and Changes in Human Mobility, Sedentism, Subsistence, Settlement and Population on the Canadian Plateau, 7000-200 BP." In *Complex Hunter-Gatherers: Evolution and Organization of Prehistoric Communities on the Plateau of Northwestern North America*, ed. William Prentiss and Ian Kuijt, 3-22. Salt Lake City: University of Utah Press.

Sakaguchi, Takashi. 2006. "A GIS Analysis of Defensibility of Large Prehistoric Sites in the Mid-Fraser Canyon on the Canadian Plateau." Paper presented at the *59th Annual Northwest Anthropological Conference*, Seattle.

Schaepe, David. 2006. "Rock Fortifications: Archaeological Insights into Precontact Warfare and Sociopolitical Organization among the Sto:Lo of the Lower Fraser River Canyon, BC." *American Antiquity* 71(4): 671-706.

Shennan, Stephen, and Kevan Edinborough. 2007. "Prehistoric Population History: From the Late Glacial to the Late Neolithic in Central and Northern Europe." *Journal of Archaeological Science* 34: 1339-45.

Speller, Camilla, Dongya Yang, and Brian Hayden. 2005. "Ancient DNA Investigation of Prehistoric Resource Utilization at Keatley Creek, British Columbia, Canada." *Journal of Archaeological Science* 32: 1378-89.

Stryd, Arnoud, and Len Hills. 1972. "An Archaeological Site Survey of the Lillooet Big-Bar Area, British Columbia." *Syesis* 5: 191-209

Stryd, Arnoud. 1973. "The Later Prehistory of the Lillooet Area, British Columbia." PhD dissertation, University of Calgary, Calgary.

———. 1980. "A Review of the Recent Activities Undertaken by the Lillooet Archaeological Project." *The Midden* 12(2): 5-19.

Teit, James. 1900. "The Thompson Indians of British Columbia." In *The Jesup North Pacific Expedition*, ed. F. Boas, 167-392. New York: AMS Press.

———. 1906. "The Lillooet Indians." In *The Jesup North Pacific Expedition* , ed. F. Boas, 193-300. New York: AMS Press

———. 1909. "The Shuswap." In the *Jesup North Pacific Expedition*, ed. F. Boas, 443-758. New York: AMS Press.