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Beyond culture history: Coast Salish settlement patterning and demography in the Fraser Valley, BC

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ABSTRACT

The florescence of large, regional radiocarbon data sets allows archaeologists to examine fine-scale, local changes in demography and settlement that are not tied to regional culture historical frameworks. We compile 599 radiocarbon dates from 95 archaeological sites in the Fraser Valley of British Columbia and use two complimentary approaches to explore how populations are distributed over time and across the region. First, we apply a summed probability distribution model to the dataset; this model indicates that populations generally increased over the Holocene with a significant rise ~800–600 years ago. We then divide our data into 250-year periods and classify each site based on the number of houses, as a large settlement, small settlement, or camp for every period. We observe that the relative numbers of these site types fluctuate through time, and hypothesize that the larger fluctuations indicate changing patterns of social aggregation and dispersal, and settlement abandonment and reoccupation. Through time we see an increase in the number of sites overall, but with considerable variation in the relative number of site types. We see an underlying stability in settlement organization indicative of long-term cultural continuity and place-based identities linked to both specific sites and general locations within the region.

1. Introduction

Radiocarbon dating revolutionized the practice of archaeology by enabling archaeologists to reexamine and compare human history and culture change within a universal chronological framework. In many regions, however, relatively sparse radiocarbon data sets continue to result in reified cultural historical frameworks that can magnify differences and obscure temporal and spatial continuity. It is only with the collation of relatively large radiocarbon datasets, advances in calibration, and refined modeling that archaeologists are able to examine culture change and demography as a continuous process relatively free of more essentialist spatial and temporal units (Edinborough, 2008; Edinborough et al., 2015; Shennan et al., 2013; Williams, 2012).

Examining archaeological data outside of the bounds of culture historical frameworks has direct relevance for how we define and thus track socio-cultural change in space and time. Independent dating of social, cultural, demographic and technological correlates allows us to see how they wax and wane and develop out of sync with each other (e.g., Ames, 1991; Lesure and Blake, 2002; Sassaman, 2004). This is especially so when the correlates are tracked over long periods of time and at culturally and historically meaningful scales (cf. Cowgill, 1975; Wobst, 1974).

On the Northwest Coast of North America, as in many regions of North America and beyond, the development of artifact-based culture histories was concurrent and intertwined with the building of radiocarbon-based chronologies. Over time, the presence or absence of artifact types have come to be iteratively used both as temporal markers and as indicators of cultural behavior and culture complexity (Matson and Coupland, 1995; Burley, 1980; Mitchell, 1971). There has also been a tendency to apply relatively well worked out culture historical sequences, such as that developed for the Gulf of Georgia region in southwestern British Columbia, to other regional and cultural contexts (e.g., Matson and Coupland, 1995) within the broader Salish Sea (Fig. 1). Given the specificity and dynamism of local histories, it is unsurprising that

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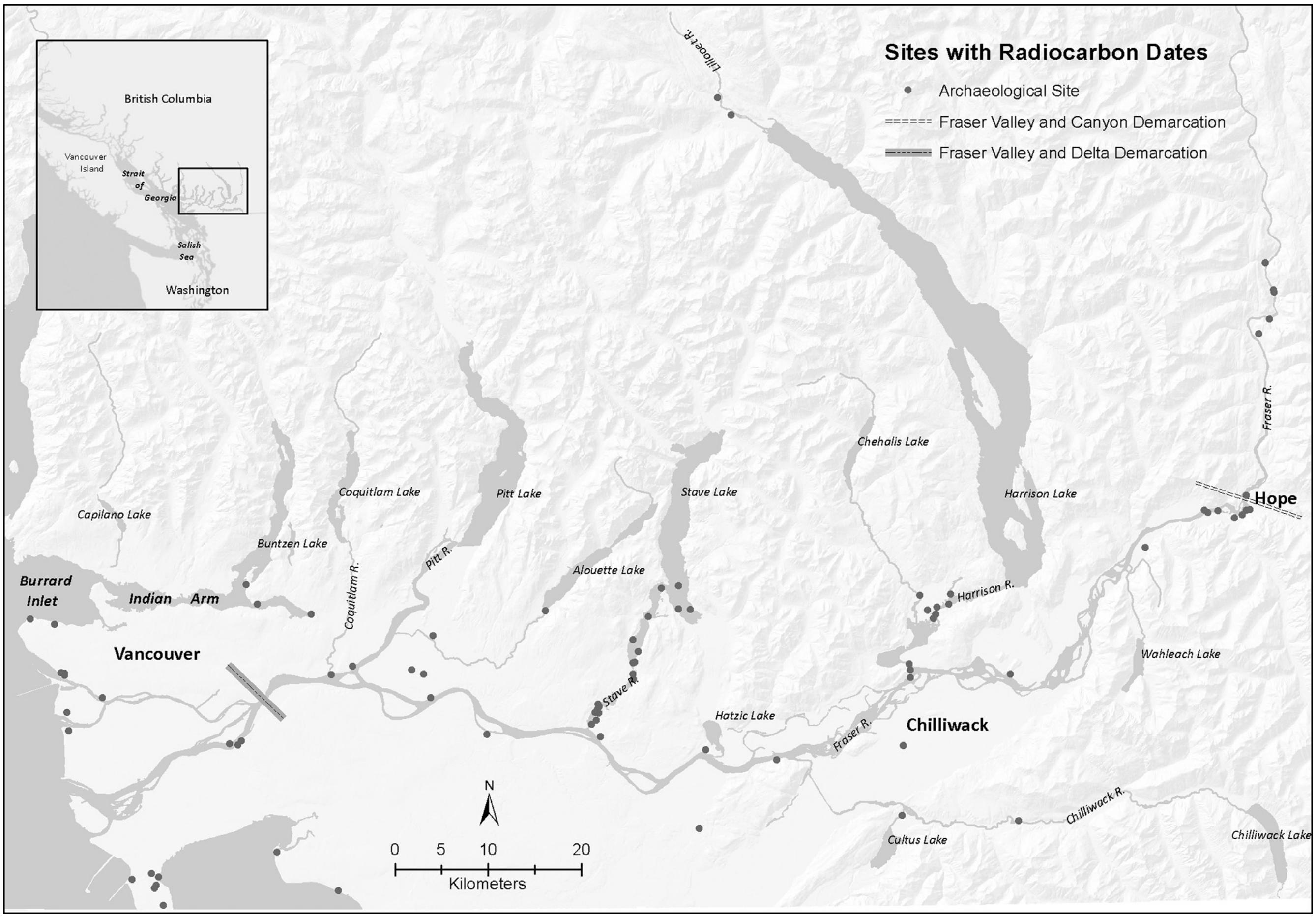

Fig. 1. The Fraser Valley showing the location of the dated sites used in this study and places mentioned in the text.

recent re-analyses of established culture historical frameworks in the Salish Sea region suggest these frameworks obscure culturally-meaningful temporal and spatial variation (Clark, 2000; Schaepe, 2009; Taylor et al., 2011; Thom, 1992).

Historically, the Coast Salish, perhaps more than that of any other Northwest Coast peoples, are characterized by social movement and broad regional connections, while still being anchored to specific places (Carlson, 1996, 2001a,b; Kennedy, 2007; Miller, 1989; Suttles, 1987a). Thus, in some respects, it could be argued that bounding relations in space and time, as culture historical frameworks tend to do, is antithetical to the Coast Salish way of interaction with their social and physical landscapes (Kennedy, 1995, 2000; Thom, 2009; Suttles, 1987a). Among the Fraser Valley Coast Salish, especially, there is thought to be a fluidity in residence and kin connections that mirrors and is connected to the flow of the Fraser River and its tributaries (Duff, 1964:16; Lepofsky et al., 2009). Thus, a regional view of settlement that is not constrained by culture historical boxes, will allow these landscape level relationships to emerge as they unfolded through time.

In this study, we move beyond spatially and temporally restrictive culture historical units to highlight diachronic social processes in the Fraser Valley (Fig. 1). We do this by analyzing both long-term demographic trends (e.g., Edinborough, 2008; Shennan et al., 2013) and settlement patterns that reflect different degrees of population aggregation and commitment to the landscape. Understanding the long-term relationship between demography and settlement patterning strategies are central to interpretations of social organization, social networks, identity, and status (Ames, 1991; Arnold et al., 2015; Kelly, 2013; Sassaman, 2004). We suggest our approach to understanding ancient demography and settlement is robust because it uses complimentary top down and bottom up approaches. It is top down in that we construct a model based on demographic theory that we then test using regional data (Collard et al., 2010; Shennan et al., 2013). Our "bottom up" analysis involves aggregating temporal data from individual sites, and then exploring intersite patterns at the scale of the region. Taken together, our analyses provide dynamic insights into constantly changing Coast Salish settlement, social-political organization, demography, and connections to space and place.

We have chosen the Fraser Valley as a unit of study for several reasons. First, it is a meaningful physio-geographic unit, being bounded by mountains to the north and south, the ocean to the west, and a narrow canyon to the east. It is also a socially meaningful unit as the historic home of Halkomelem speaking Central Coast Salish (Carlson, 2010; Lepofsky et al., 2009; Suttles, 1990) and the archaeological and oral-historical data indicate there has not been a significant movement in or out of this region in the past. In addition, after over 50 years of excavation projects in the Fraser Valley—both development-driven and research based—a large number of radiocarbon dates from a range of sites types and ages have been amassed. Recent analyses of some of these dates demonstrate considerable changes in the size, timing, composition, and location of settlements which do not necessarily square with established cultural units (Ritchie, 2010; Schaepe, 2009). A regional synthesis and re-evaluation of radiocarbon dates and settlement data is long overdue.

2. Methods

2.1. The database

We compiled the radiocarbon dates in our Fraser Valley database from determinations filed in the Canadian Archaeological Radiocarbon Database (CARD), determinations referenced in archaeological reports, and those collected by ourselves and colleagues working in the Fraser Valley. Our dataset is comprehensive up to 2013. After that time, we added a few sites (N = 11) that have been the focus of major investigations and from which significant data have emerged (N = 148). We only included in the database determinations that we could securely link to cultural deposits and were made on charcoal, wood, plant fibers, and seeds. Given the uncertainties in marine and freshwater reservoir effects and the complexities in potential carbonate leaching, we also eliminated all shell, and human and domesticated dog bone from our sample—of all which come from the Fraser delta where the shell-rich deposits more readily allow for bone preservation. We also excluded radiocarbon dates that report authors considered to be erroneous. We calibrated each radiocarbon date using InCal09 and IntCal13 calibration curves (Reimer et al., 2013; Stuiver et al., 2014).

2.2. Classifying site types: Large settlements, small settlements, camps

We assigned every site into one of three settlement types for each 250 year period that it was occupied: large settlement, small settlement, or camp. Our classification provides a way to assess archaeologically visible proxies of settlement organization through time and across space. Large settlements are identified by the presence of 10 or more house features—either plank houses or pithouses. Small settlements are sites with between one and nine house features. Camps are sites that have no visible residential features and can range is size from small clusters of lithics or a single hearth, to fairly large middens.

Our three-part classification system is meant to represent fundamentally different social and economic organizations. In general, residential structures in the Fraser Valley reflect a tangible, enduring connection to place (Grier, 2006; Lepofsky et al., 2009; Springer, 2009) requiring significant labour investments over multiple generations and a re-ordering of society (Ames, 1991). Large settlements in particular, would have been central population hubs comprised of multiple local groups that collectively managed and controlled important resource areas as well as trade and transportation corridors (Carlson, 1996; Ritchie, 2010; Schaepe, 2009). Small settlements reflect a smaller aggregation of people and households, and perhaps a more tightly knit kin group, that also facilitated production of resources (Coupland, 1991:74).

Camps, in our classification, is a relatively broad category of non-residential sites. Camps can represent small-scale exploitation of a limited number of resources by a limited number of people, or the intensive harvesting of resources by a large organized group, possibly over multiple years and generations. We recognize, of course, that in some cases the absence of recorded residential structures could be an artifact of a range of factors including limited survey or excavation intensity (Lyman, 2009:60) or various taphonomic factors. However, our data set is sufficiently robust to allow for some misclassification of site types. We do note that since camps tend to be less studied by archaeologists than sites with residential structures, we expect that the number of camps is particularly underrepresented in our sample.

We explored grouping the data in ways other than our three-part classification, but found this to be problematic. For instance, we attempted to classify sites with individual house features as a unique settlement type with the idea that these sites represented fundamentally different forms of social groupings. We dismissed this after seeing that separating out these data did not alter the overall trends. We also attempted to isolate burials as a distinct site type, but since burials are almost always associated with some type of contemporaneous settlement activity, isolating burials did not significantly add to our understanding of changes in settlement over time.

2.3. Temporal patterns

We assessed temporal patterns in demography and settlements in two discrete ways. First, we applied a summed probability distribution (SPD) method to reconstruct relative population dynamics, choosing a uniform distribution as the appropriate null model to fit to the summed radiocarbon data. This model assumes that taphonomic loss has been constant through time. For several reasons, we believe that this assumption is a reasonable first approximation of the processes of site loss (cf. Shennan et al., 2013; Timpson et al., 2014). First, based on our extensive understanding of the geomorphological and industrial taphonomic factors affecting archaeological sites in the Fraser Valley, we do not believe that taphonomic loss will have a significantly greater impact on older sites. This is especially so for the last 5000–6000 years, which would exhibit much more uniform levels of taphonomic loss since sea levels stabilized and the progradation of the Fraser River delta was nearly at modern levels. These factors, coupled with the short time span and limited spatial extent of our study area, as well as, the local preference on the part of archaeologists for dating early components, further mitigates against any biases in our data set towards younger sites.

The 599 calibrated Fraser Valley radiocarbon dates were binned by sites and at 200 years within sites (Shennan et al., 2013) to account for general research-wealth bias and sampling strategies which can reinforce assumed cultural boundaries (Timpson et al., 2014; Weninger et al., 2015). This resulted in a total of 226 bins. After calibration with the INTCAL 13 curve, the data were summed within bins and the resulting sums were summed between bins.

In the next step, 1000 simulated radiocarbon datasets were generated by randomly sampling calendar dates from the specified time interval according to the probabilities given by the taphonomic null model. We prepared two temporal ranges for this study, one spanning from 10,000 cal BP to 100 cal BP, and a second from 6000 cal BP to 100 cal BP. The number of dates for each simulated dataset is equal to the number of bins in the empirical dataset. Each set of sampled calendar dates is used to generate one possible null model SPD curve by first "uncalibrating", followed by recalibrating, and finally summing the simulated dates.

To assess whether the empirical SPD curve significantly deviates from the uniform null model, the empirical curve is compared to the 95% percentile intervals based on the SPD curves simulated from the null model. When the empirical SPD curve goes above or below 95% CIs, this can be interpreted as statistically significant deviation from a stationary population size. This complex calibration and simulation process thus accounts for potential calibration errors (Weninger et al., 2015) and Holocene wiggles in the calibration curve to a conservative accuracy and precision of ca. 200 years (Timpson et al., 2014; Weninger et al., 2015). The entire model was tested for false positives using a global test of significance of the Z scores (Code was written in R using the INTCAL 13 terrestrial calibration curve; Reimer et al., 2013). The data are smoothed with a rolling 200-year mean to remove peaks due to edge effects and calibration curve effects.

To track site level shifts in settlement patterning over time, we used the median age of each calibrated radiocarbon determination in our dataset. We use calibrated median ages because the median is the single date within the calibrated range that is most likely to be closest to the "true age" (i.e., because it is in the middle of the range; Telford et al., 2004). We recognize that the median is an imperfect estimate of age. However, given that we are analyzing trends in 250-year intervals, and our sample is large, significant temporal patterns in the data should be evident even if some sites are placed in the "wrong" time interval. Utilizing 250-year periods with enough data (Williams, 2012) offers a balance between ensuring the periods are longer than potentially confounding (ca. 200 year) Holocene scaled wiggles in the calibration curve (De Vries, 1958) and having small enough temporal periods so the data can still meaningfully show changes in settlement over time.

To avoid over-representation of well-dated sites, we chose only one median date per site for each 250-year interval, selecting the date with the narrowest calibrated range. The resultant graph is therefore an accurate representation of the number of dated sites in any given 250-year unit of time, but is an under-representation of the total number of dates in the database per unit of time. No taphonomic correction was applied to this data subset.

In our analysis of median dates by site type, we examine the data for deviations from the overall trend and expected ranges of variation. We consider increases or decreases of five or more sites of a single site type within a 250-year period to indicate a cultural shift in settlement strategies. We chose this number *a priori* because it is a conservative proxy for meaningful social changes. In fact, we could argue that for large settlements, which took significant time and effort to establish and are relatively easier to find archaeologically, smaller shifts in number are also meaningful. However, for the sake of consistency and simplicity, we apply the ±5 site criteria to each of the three site types. Thus, we hypothesize that shifts in number of sites that are equal or greater than this threshold is a meaningful proxy for population aggregation and dispersion in the Fraser Valley. By examining total number of sites, as well as number of camps and small and large village sites and their relationship to each other, we are able to present hypotheses about how social organization changed through time and across space in response to socio-cultural and environmental stimuli.

2.4. Spatial patterns

We also plotted the UTM coordinates of each securely dated archaeological site in our Fraser Valley data set. To do this, we divided the 12,000 year continuum of human occupation in the Fraser Valley into eight time spans represented on eight map sheets: 12–9.25 kya, 9.25–7.5 kya, 7.5–6.25 kya, 6.25–5.0 kya, 5.0–3.75 kya, 3.75–2.5 kya, 2.5–1.25 kya, and 1.25 kya to 50 cal BP. Each of these 1250-year spans was further broken into 250-year increments. Every archaeological site in our database with one or more median calibrated age determinations falling within a 250-year period is represented on each map; a site is represented only once within any 250-year interval, regardless of the number of median calibrated age determinations falling within that interval. Some sites are represented only once throughout the entire historical sequence, and others with greater continuity of occupation or more robust samples, are represented in many of the 250-year intervals and on many of the map sheets.

3. Results

Our database is comprised of 599 radiocarbon determinations originating from 95 sites. The dates range in age from the early Holocene to the historic period (Fig. 2) and are distributed throughout the Fraser Valley (Figs. 3–10). Based on our 250-year brackets, there are 348 unique occupation events associated with these 95 sites (large settlements N = 47; small settlements N = 116; camps N = 185). Our sample is robust and reflects the known spatial and temporal distribution of sites in the Fraser Valley.

When we incorporate our entire Holocene radiocarbon data set into the SPD model, the model is not globally significant due to the paucity of radiocarbon dates in the early Holocene. However, when we truncate the data after 6000 cal BP, when our sample size is considerably larger, the results are globally significant ($p = 0.007$; Fig. 2). The trend in the modeled data suggests population increased in the Fraser Valley over the last 6000 years. Within this general trend of what appears to be gradual increasing population, there is one significant event between ~800 and 600 cal BP when population in the Fraser Valley rose dramatically. We discuss the cultural importance of this event in greater detail, below.

There is a strong correspondence between the output of the demographic model and the distribution of the subset of median ages we use in our analysis (i.e., one date per site per 250-year interval; Fig. 2). This good match demonstrates that we did not lose any significant information or compromise the data by selecting a subset for settlement analyses; it also suggests the modeled demographic trends are representative of real trends. Below, we examine the settlement data in three temporal clusters, based on the presence of only camps and the subsequent appearance of small and then large settlements. We explore how these patterns shift in relationship to these broader regional demographic patterns.

3.1. ~12,000–7000 cal BP: Camps

The first 5000 years of recorded human occupation in our study area is characterized by a relatively low number of sites (N = 30), likely reflecting relatively low population densities (Fig. 2). All of these sites lack evidence for residential features and are thus considered camps in our scheme. The number of sites fluctuates between 0 and 5 sites per 250-year interval, reflecting in part the dynamic social and ecological context of the early Holocene of the Fraser Valley. The sites in this first 5000 years of occupation are distributed across our study area, from the Fraser Canyon to the east, the edge of the expanding Fraser Delta to the west, the lower Lillooet River to the north, and the Chilliwack River to the south (Figs. 3–5).

The earliest and most densely and continually occupied places during this period were the Stave watershed and the Fraser Canyon. During this time, the Stave area was situated at an interface between glacial ice and the ocean, and people had to respond to the retreat of the ocean, fluctuating fresh water availability, shifts in vegetation, and terrestrial and aquatic resources (Clague et al., 1983; McLaren et al., 1997). The Fraser Canyon was also a highly dynamic geomorphological environment and the Fraser River was roughly 20 m higher than it is today (Borden, 1960). People were drawn to these places repeatedly during this time as they have continued to be ever since. This early use of the Fraser Canyon presages its role in hosting large year-round populations and seasonal aggregations unrivaled in the Salish Sea.

The concentration of early sites at the confluence of the Stave and Fraser Rivers is notable because it reflects both the potential to find early sites and the density of such sites on some portions of the landscape. In part, the Stave record is so dense because of the extensive dating program associated with the Stave dam drawdowns (McLaren et al., 1997; McLaren, 2008; McLaren and Grey, 2010). However, the density also has to do with the suitability of the area for settlement (McLaren et al., 1997). In addition to a marine still-stand (70–80 masl) just prior to 11,000 BP that corresponds to the reservoir inundation zone, this region was one of the first relatively low areas of stable land exposed

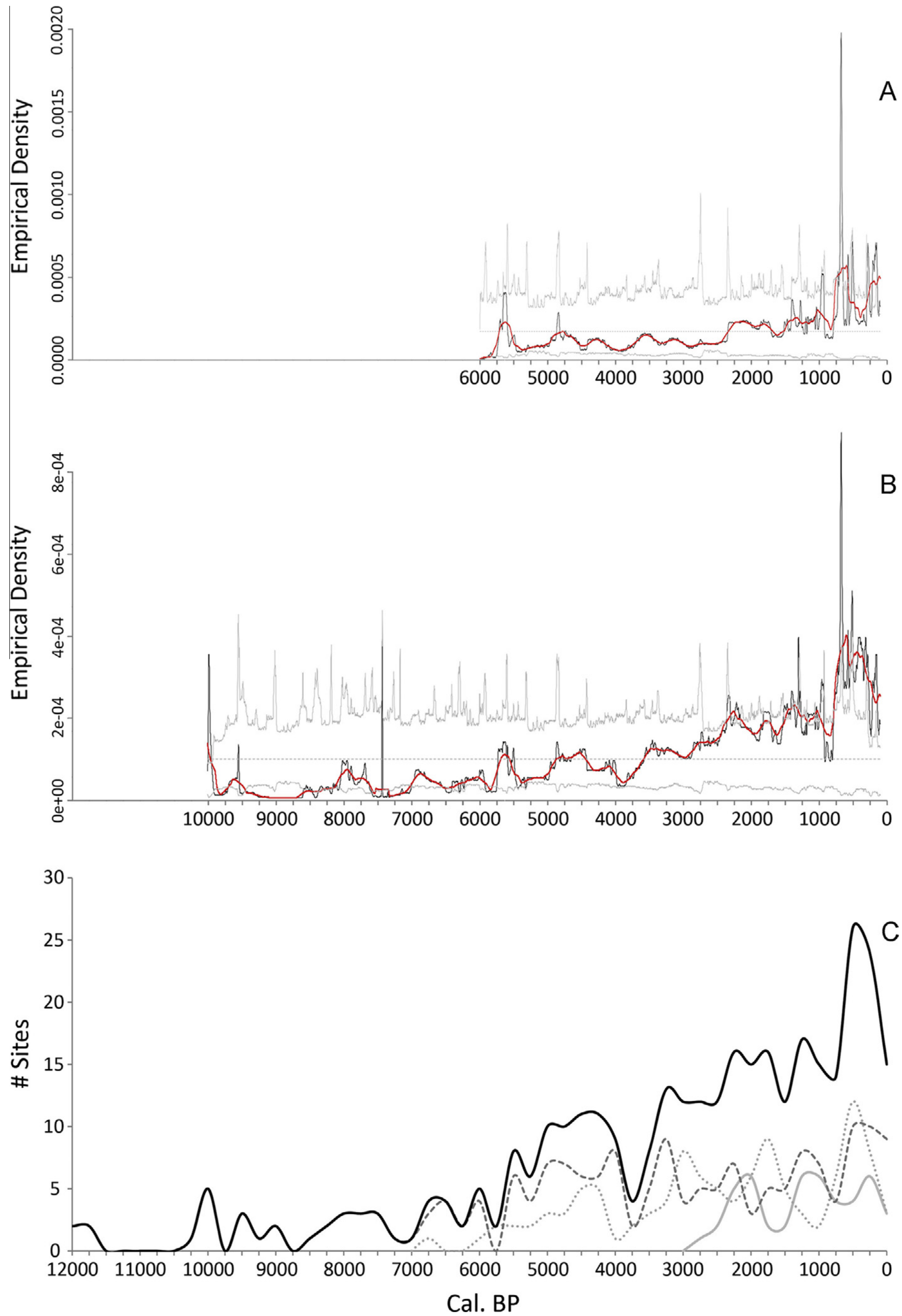

Fig. 2. (a) Statistically significant 6000 year demographic model using of all radiocarbon ages (N = 599) in the Fraser Valley. Dotted line = uniform curve, Black line = actual C14 data, Smoothed line = 200 year rolling mean (conservative population estimate), Grey lines = Simulated data 95% confidence interval (2 S.D.). (b) 10,000 year demographic model using of all radiocarbon ages (N = 599) in the Fraser Valley. Dotted line = uniform curve, Black line = actual C14 data, Smoothed line = 200 year rolling mean (conservative population estimate), Grey lines = Simulated data 95% confidence interval (2 S.D.). (c) Line graph of number of dated sites per 250-yr period (N = 95 sites; unique occupations = 348). Black = all sites, solid grey = lg settlements, dot = small settlements, dash = camps. Note that before 7000 BP, all sites are camps, and thus there is only a single line.

after the retreat of glaciers and the marine transgression (James et al., 2002). With sea level still 20–30 m higher ca. 11,000 BP than today, the active Fraser proto-delta was east of Pitt River, and many low lying areas in the lower Fraser Valley were inundated (James et al., 2002; McLaren et al., 1997). Thus, the oldest camps along the Stave River are situated on relic marine terraces 72–81 masl (McLaren, 2006). Other early Holocene sites in the study area are situated on raised river terraces (~15–20 masl), reflecting the importance of tributaries and river terraces as a place of settlement.

3.2. 7000–3000 cal BP: Camps and small settlements

The occupation history of the Fraser Valley becomes increasingly varied after ~7000 years ago with the co-utilization of both camps and small settlements. The appearance of these small settlements with residential structures reflects increasing investment into the region's ecological and cultural landscape. Against the background of gradually increasing population numbers, we note two periods when the total number of sites vary beyond our threshold of ±5 sites: 6000–5500 cal BP, and 4000–3500 cal BP.

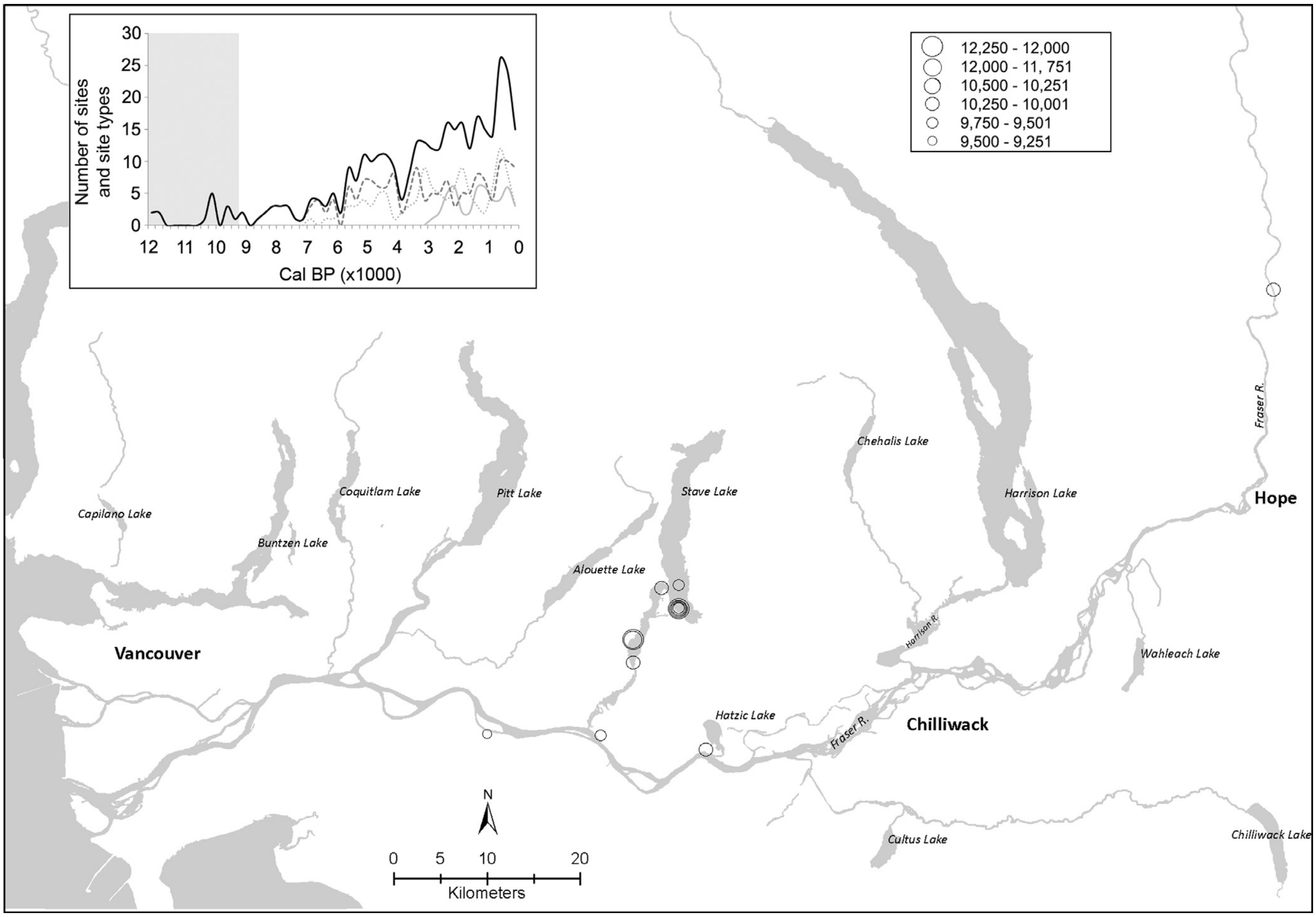

Fig. 3. Radiocarbon dates from sites in the Fraser Valley, 12,000–9251 cal BP, with one date represented per site per 250-year interval and the size of the symbol representing different age classes (largest are oldest).

These variations may reflect significant periods of settlement change. The later downward trend in number of sites is particularly out-of-step with the overall trend of increasing settlements through time.

Throughout this period, and continuing throughout the time series, there is a roughly inverse relationship in the number of camps and small settlements. In this time period specifically, there tends to be more camps than small settlements until the end of this period when small settlements clearly increase in number. The inverse relationship in the number of these site types may indicate that the two site types served similar social and/or economic roles but that there were times when more sedentary larger social grouping became increasing desirable and/or viable. The site of *X̱á:ytem* illustrates this shift from temporary camp, to single family seasonal residential structure, to multi-family year-round residence (Lepofsky et al., 2009; Mason, 1994; Ormerod, 2002). The extensively excavated and well-dated site (DhRp-52) in Pitt Meadows (n = 108 C14 dates) reveals a similar pattern. These and other similar examples reveal dynamic population aggregations and disaggregations.

The increase in sites overall is reflected spatially by the in-filling of gaps in occupation areas in the Fraser Valley (Figs. 5–8). As was the case in the early Holocene, sites continue to be represented on the Fraser River, its prograding delta, and the major tributaries. While the earliest known small settlements were situated on terraces above significant rivers, settlements quickly expanded to include additional environs, such as dry ground adjacent to sloughs, stable floodplains, and the oceanfront. Three regions emerge as focal areas for settlement (the Stave-Fraser confluence, the Pitt-Fraser Confluence, and the Hope region), with sites along the Fraser-Harrison confluence and the Fraser Delta also increasing in density. Several individual sites display evidence of "continuous" occupation (cf. Stein et al., 2003). This continuity suggests an increased attachment to place not evident in the earlier record and a solidification of place-based identity.

The relatively dramatic increase in number of camps between 6000 and 5500 cal BP may reflect a jump in population numbers around this time. The increase in small settlements towards the end of this period indicates a re-organization of how people interacted with one another, and with their cultural and natural landscapes. For instance, shifts in kin structures and social networks (Lepofsky et al., 2005; Suttles, 1987a,b,c), and the formalization of resource management systems (e.g., Fowler and Lepofsky, 2011; Turner et al., 2013) would allow increasingly larger populations to live within the "natural" carrying capacity of the valley. By this time, the Fraser Valley lowlands were generally stabilized and organic sedimentation had commenced (Clague et al., 1983), making resources increasingly available and predicable.

The dip in number of both camps and small settlements ~4000 years ago is out of line with the overall trend for increasing numbers of sites. This drop corresponds to a time of demographic decline noted 4000–3500 cal BP in neighbouring regions (Chatters and Prentiss, 2005; Prentiss et al., 2007). Chatters and Prentiss (2005) posit that this demographic drop is associated with the colder climate of the Neoglacial period when sedentism was less viable and populations tended to practice greater seasonal

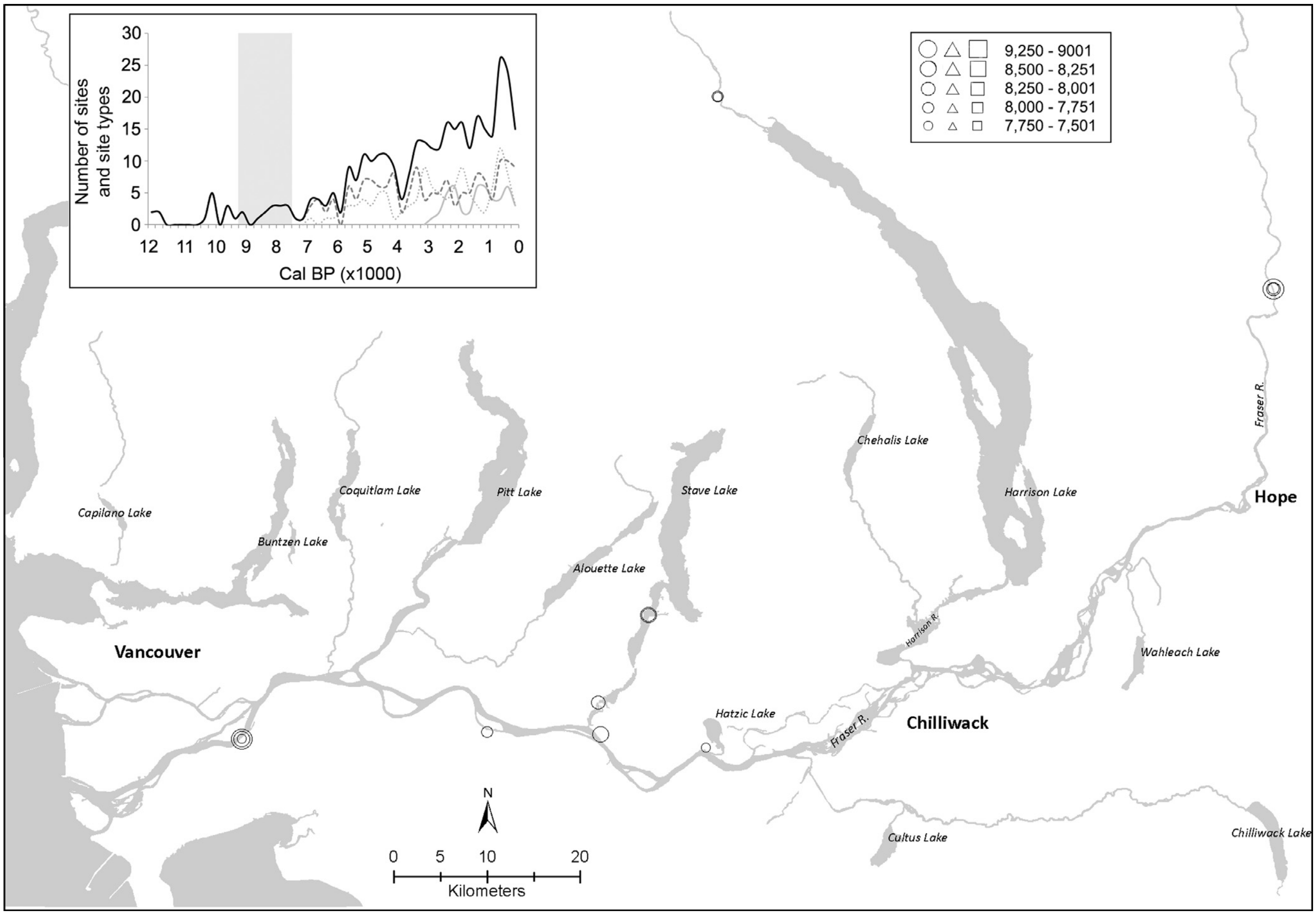

Fig. 4. Radiocarbon dates from sites in the Fraser Valley, 9250–7501 cal BP, with one date represented per site per 250-year interval.

mobility. This hypothesized pattern of increased mobility should result in an increase in number of camps relative to other site types. Our data, however, indicate that both camps and small settlements decline in number at this time. Thus, unless a shift to greater mobility resulted in sites that are even less visible (and thus unrecorded) than the camps of our settlement scheme, our data provide stronger support for an overall decline in population during this time.

3.3. ~3000–250 BP: Camps, small settlements, and large settlements

The period between ~3000 and 250 BP was a socially dynamic time. It is at this time that large settlements appear on the landscape and the three sites types display a complex pattern of rise and falls (Fig. 2). Within the overall trend of increasing number of sites through time, the number of camps fluctuates significantly between ~1200 and 500 BP. The overall trend in number of small settlements likewise increases through time, but numbers of this site type fluctuate dramatically from about 2000 years ago onwards. In sharp contrast to the two other site types, the number of large settlements reaches its maximum at ~2000 years ago and never exceeds this number. Within this overall pattern, we do note a major period of fluctuation between 2250 and 1250 years ago. Furthermore, we note that the rises and falls in number of large settlements are roughly inversely correlated with the numbers of small settlements, suggesting a dynamic interplay between larger and smaller communities.

The radiocarbon SPD shows population growth throughout this period, with a significant pulse in population growth between ~800 and 600 cal BP. The settlement data suggest that the pulse in population is the result of more small settlements and camps, but not more large settlements. Other data suggests, however, that while large settlements aren't increasing number at this time, the size of these settlements is larger, especially around 500 cal BP (Schaepe, 2009). The appearance of small settlements in new localities, such as on small mid-river islands (on the Harrison and Fraser Rivers; Fig. 10) further bolsters the impression of population growth and expansion at this time.

The first large settlements appear as bookends to the Fraser Valley (Fig. 8) and are largely situated on the Fraser River proper. This pattern continues until ~1500 BP when large settlements were also constructed in the mid lower Fraser, and more particularly on the major tributaries. Small settlements in contrast, tend to be evenly distributed across the Fraser Valley during the majority of this period. The distribution of these sites illustrates considerable continuity of occupation on the landscape, but also that population centers may have shifted through time.

As part of the appearance and spread of large settlements, new locations seem to have been occupied for the first time, and other locations with thousands of years of occupational history become densely populated focal places. Specifically, ~2500 BP is the first time the Fraser canyon, at the upper end of the Fraser Valley, supported residential settlements (Fig. 9). This relatively greater aggregation of people in the upper valley likely reflects some combination of concentrated resources as well as a desire or need to cooperate for social, economic, or defensive reasons (Schaepe, 2009).

The dynamic spatial-temporal relationship among site types we noted in earlier periods continues. For instance, while there are

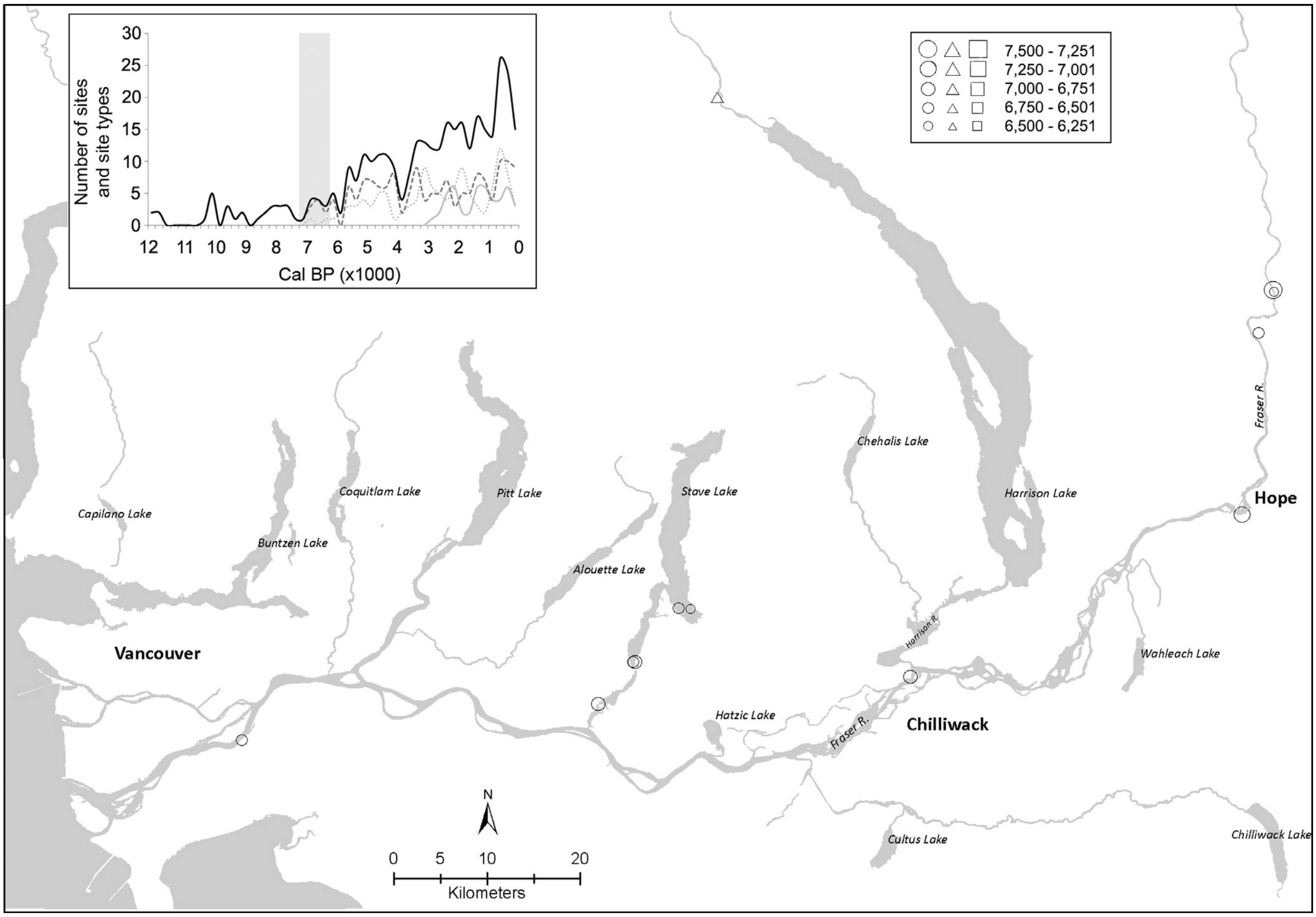

Fig. 5. Radiocarbon dates from sites in the Fraser Valley, 7500–6251 cal BP, with one date represented per site per 250-year interval.

numerous small and large settlements in the upper valley between ~2250 and ~750 cal BP, seasonal camps are virtually absent (Figs. 9 and 10). Similarly, between ~3000 BP and ~1500 cal BP, in the middle and lower portions of the valley, the number of large settlements is roughly inversely correlated to the number of camps (Figs. 7–9). The increase in number of small and large settlements without a similar rise in camps may reflect a desire by people to aggregate into larger groups. In the upper valley, this aggregation may have in part been motivated by logistical reasons, since level ground adjacent to the Fraser River is at a premium there.

We are not confident that the distribution of radiocarbon dates at the very end of the sequence is a meaningful representation of the number of sites on the landscape. In our sample, the number of sites dating to the last 250 years drops precipitously from the previous interval (from 24 to 15). While the dramatic population declines of the post-contact era, possibly beginning as early as CE 1500 (Boyd, 1999; Harris, 1994; Campbell, 1989) could easily account for this decline the relatively low numbers of dated sites is also almost certainly compounded by the fact that archaeologists tend not to get radiocarbon dates from the most recent levels that have associated historic artifacts, or radiocarbon dates are rejected for being too recent. Similarly, the final pulse in the SPD at ~250 cal BP may be an artifact of the higher levels of carbon in the atmosphere at this time rather than an indication of higher populations. The dynamism of the social landscape, as reflected in the occupation of settlements, is well documented in the historic period (Graesch, 2006; Carlson, 2007, 2010).

4. Discussion

Taken together, our data reveal both predictable changes in population and settlement through time as well as some unexpected patterning. In particular, the SPD radiocarbon model indicates an increase in population through time beginning at least 6000 years ago, presumably reflecting the process of settling in and expanding on to the landscape. These modeled results allow us, in turn, to set up expectations for settlement aggregation and dispersal. That is, all things being equal, we expect that as population increases there will be a corresponding increase in each of our three site types through time. Furthermore, the relative number of the different site types should remain the same if there is no shift in settlement patterns. In the following discussion we explore deviations in this patterning that may provide insights into settlement and social organization.

Our summary of radiocarbon dated sites over time and across space provides many insights into the choices people made about living in the Fraser Valley, and how those choices in turn influenced the ebb and flow of social relations. At the grossest scale, our data show the expected pattern of changing settlement and population. That is, through time, there is an increasing number of sites and people, an in-filling of the settlement landscape, and an increase in large sites and sites of different size. Against this backdrop we see a more complex settlement history characterized by considerable variation in the relative abundance of different settlement forms. Collectively, these data reflect both long-term and emergent connections among the Coast Salish to specific locations

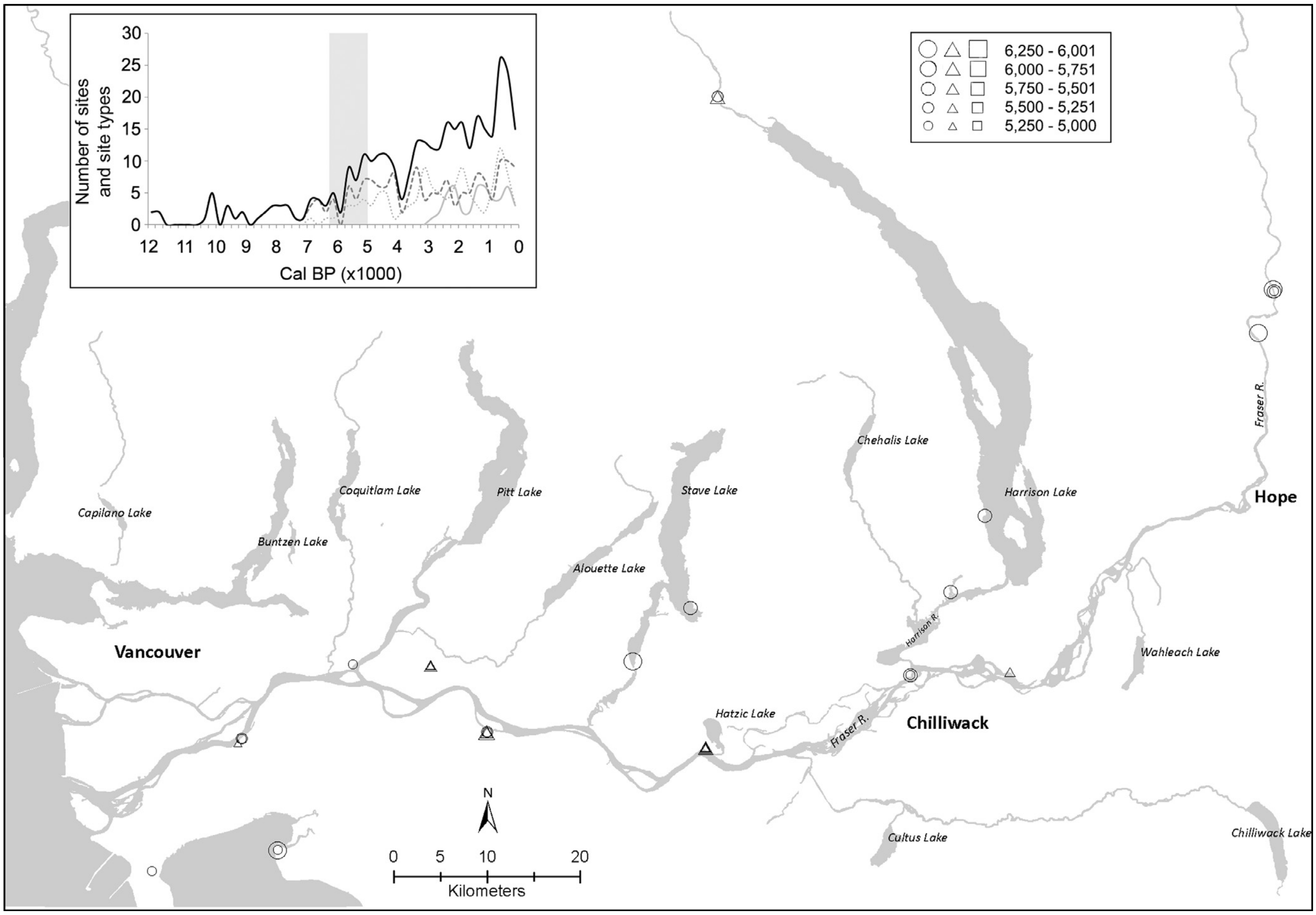

Fig. 6. Radiocarbon dates from sites in the Fraser Valley, 6250–5000 cal BP, with one date represented per site per 250-year interval.

within the Fraser Valley. In some instances, these long-term connections are established with an important geographical locale rather than an "archaeological site", per se.

We know relatively little about settlements in the early to mid Holocene, which has in turn contributed to only the most generalized understanding of people's connection to the landscape. The rise and fall in number of sites, and the slow increase in number of sites overall indicates that social and/or ecological pressures were limiting population and/or group size. These early inhabitants focused their camps and later, their small settlements, on the main Fraser River channel and its major tributaries (including montane lakes), with some areas being relatively densely populated (e.g., the Stave watershed). Some of these sites were occupied over several generations spanning hundreds, and even thousands of years (e.g., McCallum, Glenrose Cannery, Xá:ytem, Milliken, and Lelaxin). Focusing on these major waterways ensured easy access and communication among the widespread populations – at a time when population numbers overall were relatively low. The connection to the Fraser River and its major tributaries, which is so central to the identity of later Fraser Valley Coast Salish (e.g., Carlson, 2001a,b, 2010; Lepofsky et al., 2009), clearly has deep temporal roots.

Through time, the record indicates a trajectory of people increasingly "settling in" and connecting to their landscape. In some cases, this is because particular places are continuously inhabited throughout the later Holocene. By "continuous" we do not mean that there are no gaps in occupation (cf. Stein et al., 2003), or that sites never shift "function" (i.e., from settlement to camp and back again). Rather, we suggest, as others have done (e.g., Cosmopoulos, 2014), continuity means that as time goes on there is increasing social memory that connects a group of people to specific places, and that this collective memory may span century-level gaps in specific settlements. Furthermore, we argue that camps as well as settlements can be imbued with such social memory (e.g., Tveskov, 2007).

In other cases, people's connection is more generally to areas rather than site-specific locations. This is reflected in increasingly dense settlement clusters through time. These focal places are located at key resource areas that have likely been consistently reliable for the greater part of the Holocene. These key resource areas are distributed across the Fraser Valley, often at confluences with the Fraser, major tributaries such as the Coquitlam, Pitt, Stave, Chilliwack, and Harrison Rivers, the mouth of the Fraser River, and Burrard Inlet. Each of these resource areas in the Fraser Valley are central places within modern Coast Salish tribal areas and feature prominently into their tribal identities. These non-tangible connections to landscapes have implications for how we understand archaeological sites, sacred places, and continuity/discontinuity in the archaeological record (Nelson and Hegmon, 2001; Nelson and Schachner, 2002). By refocusing our lens from the site to landscape, including the wider region, interconnections between people and place can be viewed in their broader ecological and social context.

Within this general trend towards increasing connections to the Fraser Valley landscape, there was a dynamic tension between the establishment and maintenance of different social groupings. This is reflected in the rise and fall of the number of camps and small and large settlements through time. We note for much of the time

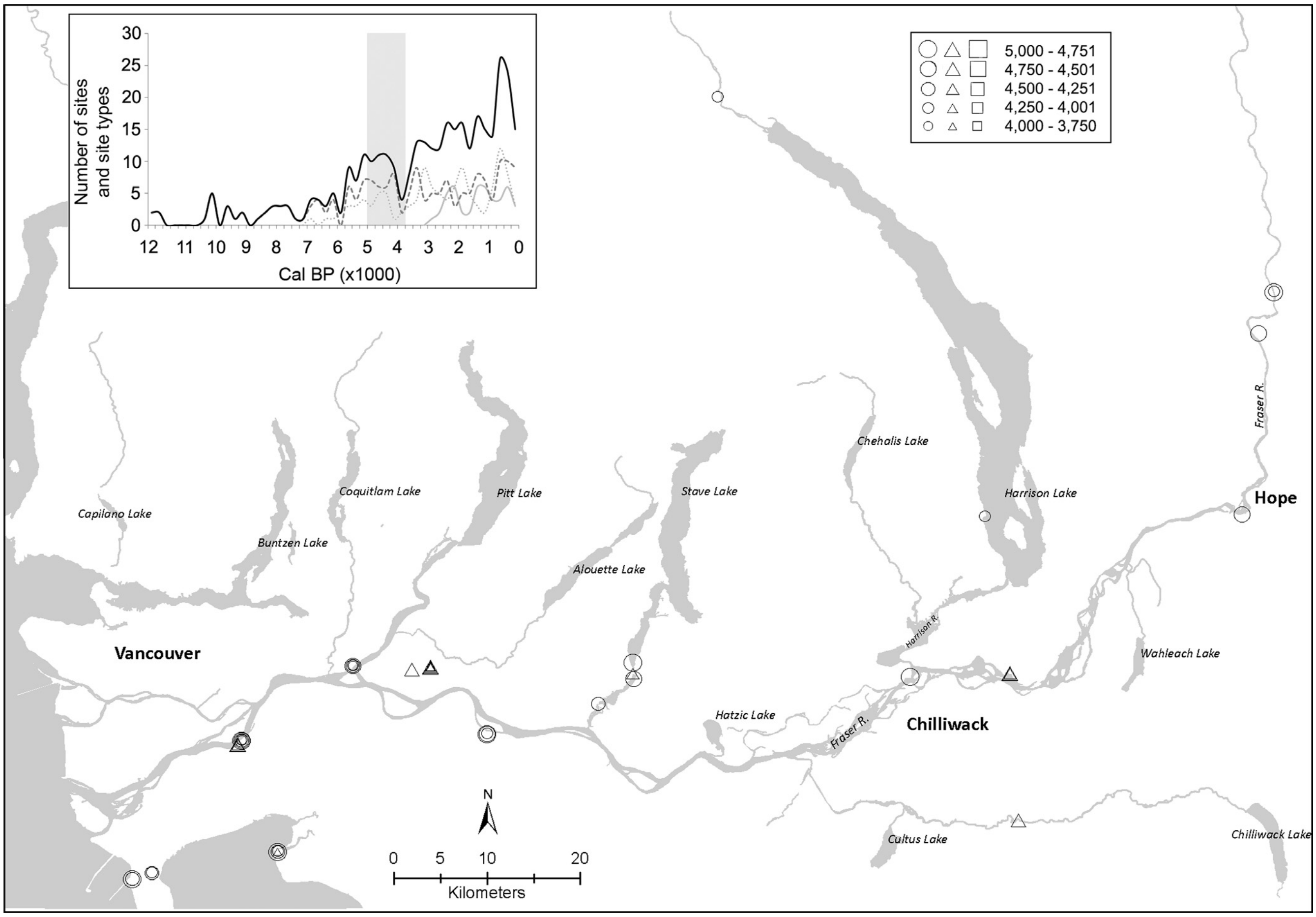

Fig. 7. Radiocarbon dates from sites in the Fraser Valley, 5000–3751 cal BP, with one date represented per site per 250-year interval.

sequence, the number of camps and small settlements are often inversely related, suggesting on ongoing tension between autonomy and centralization. Similarly, the patterning of large settlements in our sequence suggests that there may have been socio-political or social-ecological mechanisms among the Coast Salish that limited the number of large settlements (cf. Angelbeck and Grier, 2012). Comparing the rise and fall in number of large settlements to the size and location of these settlements (e.g., Schaepe, 2009) would add to our understanding of these thresholds and to community organization. An important area of inquiry is understanding the social and ecological contexts that encourage people to stay put, to split into smaller groups, or to aggregate into larger groups (cf. Angelbeck, 2009; Angelbeck and Cameron, 2014; Angelbeck and Grier, 2012; Hakar, 2014; Hickok, 2013).

As noted by other researchers, there is some correspondence between the periods in which people chose to aggregate into large settlements and other culture historical trends in the region. The initial period of aggregation between ~2250 and 2000 cal BP is associated with indicators of increased socio-economic complexity, such as the proliferation of carved and decorated artifacts and extensive inter-regional interactions (Clark, 2013; Matson and Coupland, 1995; Morin, 2012). At ~1500–1250 cal BP, the increase in number of large settlements and the drop in small settlements corresponds to the often-cited boundary between the Marpole and Late phases (Matson and Coupland, 1995; Lepofsky et al., 2005). Evidence for social hierarchy is exhibited by the size and arrangement of houses at some of the large settlements from this time, but not all (Ritchie, 2010; Schaepe, 2009). The final possible increase in aggregation into large settlements at ~500 cal BP does not align with established cultural phases. A defining characteristic of this period is that both settlements and house sizes range dramatically in size leading researchers to speculate on increasing social hierarchies and centralized authority (Angelbeck, 2009; Schaepe, 2009).

The correlation between settlement data and demographic data from the Fraser Valley and neighbouring regions reinforces the impression that social change occasionally occurred at large geographic scales and that a degree of interaction between regions was common. For instance, our data indicate that the latter two periods of aggregation into large settlements in our Fraser Valley data correspond with notable periods of population increase and population aggregation just up river in the Interior Plateau of British Columbia (Harris, 2012; Hayden and Ryder, 1991; Morin et al., 2008; Prentiss et al., 2007). In the Fraser Valley, the aggregation of people into larger settlements resulted in a wide range of house sizes within settlements, whereas in the Interior Plateau households converged into larger houses so the range of house sizes decreases. Thus, external indicators of social status are much less clear on the Interior Plateau during these periods than in the Fraser Valley (Harris, 2012; Ritchie, 2010; Schaepe, 2009). The similarities and differences manifested in regional settlement strategies may reveal culturally specific responses to periods of inter-regional change

The rise in population at ~800–600 cal BP evident in our demographic modeling of the Fraser Valley populations may mark a time of significant social change across the coast. In particular, this corresponds to a time when burial patterns across the region shift from below ground midden and mound and cairn internments to

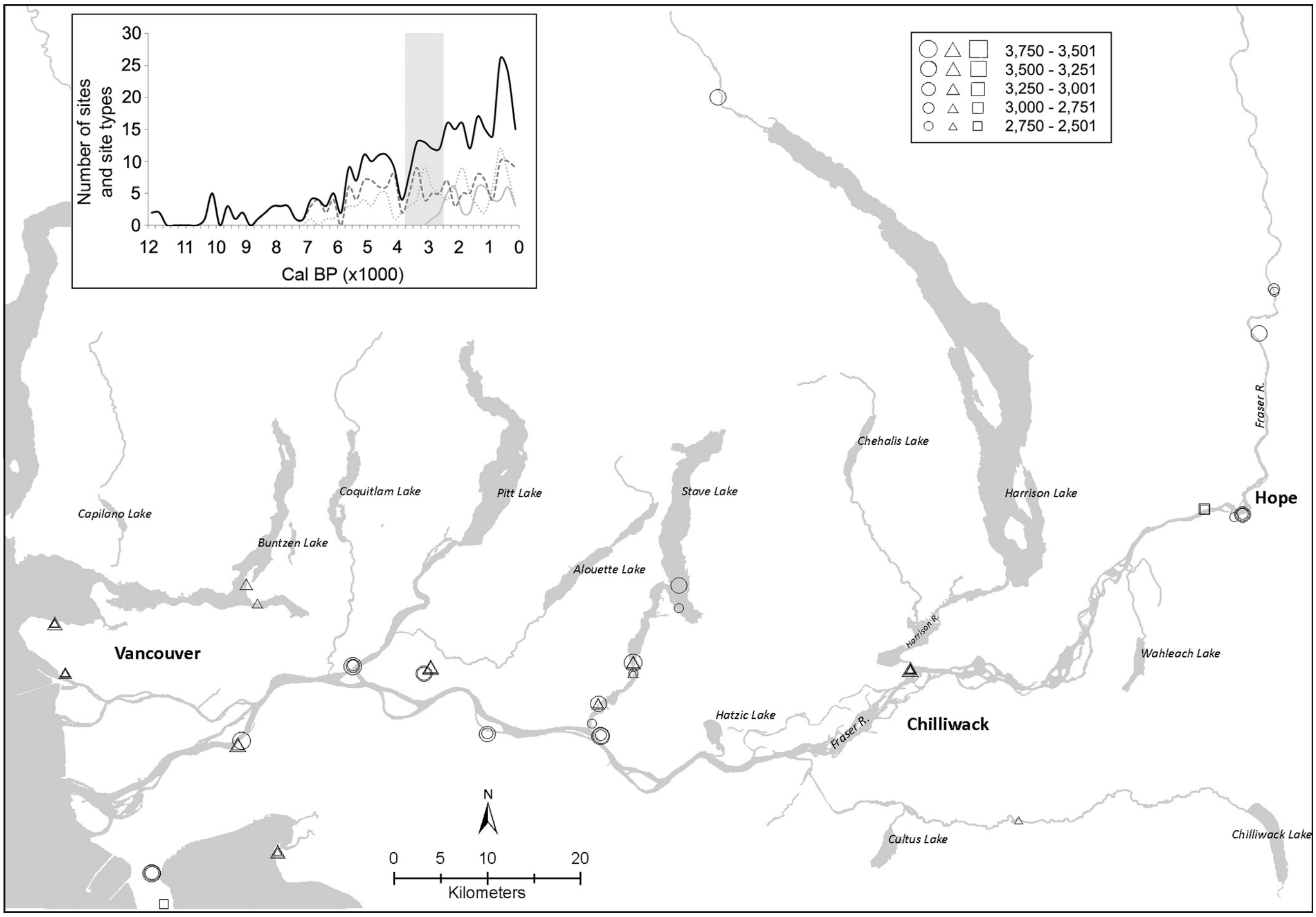

Fig. 8. Radiocarbon dates from sites in the Fraser Valley, 3750–2501 cal BP, with one date represented per site per 250-year interval.

archaeologically invisible above-ground internments (e.g., Thom, 1995; Cybluski, 1992). In our study area, the demographic shift corresponds with the appearance of more small settlements, but no change in the number of larger settlements. There are potentially a myriad of reasons for settlement patterning to take this form, such as a local preference for the greater social autonomy that is a defining characteristic of ethnographic Coast Salish society. Notably, this significant time of social change in the Fraser Valley does not correspond to extant local culture historical boundaries.

Our data indicate that shifts between settlement aggregation and dispersion are not necessarily related to population numbers, suggesting instead that people chose to live together or apart for a myriad of social reasons. These choices likely reflect the larger social, economic, and ecological contexts in which the Coast Salish lived (cf. Angelbeck and Cameron, 2014; Angelbeck and Grier, 2012; Lepofsky et al., 2005; Prentiss, 2009) and may reflect differing degrees of socio-political centralization that shift as social relationships and status are re-negotiated (cf. Angelbeck, 2009; Ames, 1991; Matson and Coupland, 1995). For instance, the increase in small settlements relative to large ones may represent a re-organization where people left primary settlements to establish smaller, connected settlements nearby. In doing so, they would have created an increasingly complex and socially stratified inter-settlement organizational structure that provided greater opportunity for leadership and competition to emerge (Ritchie, 2010; Schaepe, 2009; Snyder, 1964). This settlement strategy could also lead to greater group identity and cooperation when required. This kind of fluid process of fissioning and aggregation is characteristic of the Coast Salish in the historic period (Barnett, 1955; Elmendorf, 1974), and of social groups more generally around the world (Kelly, 2013).

There are several broader implications relating to current discussions of social change and sociopolitical organization we can draw from this study. The way in which people in the Fraser Valley chose to aggregate and disperse over time reinforces the impression that the development of sociopolitical complexity was not linear (Ames, 1991; Arnold et al., 2015) and highly negotiated (Angelbeck and Grier, 2012). Our study demonstrates that greater aggregations of people, whether in large settlements or a number of interconnected smaller settlements, correspond to periods of increased regional sociopolitical organization and interaction. This correlation bolsters the position that access to labour, and the organization of that labour should be central to global definitions of social complexity (Arnold et al., 2015). Finally, we note that informed discussions of social complexity must consider both horizontal and vertical planes of relationships among peoples in settlements across the region (Schaepe, 2009).

5. Conclusions

This study offers an increasingly refined perspective on demography and settlement strategies which in turn highlights some of the fundamental issues with bounding expressions of culture in time and space. In particular, it is evident that changes in settlement strategies in the Fraser Valley were highly dynamic, and did not always occur contemporaneously throughout the region. When we zoom into particular local areas, we see evidence for

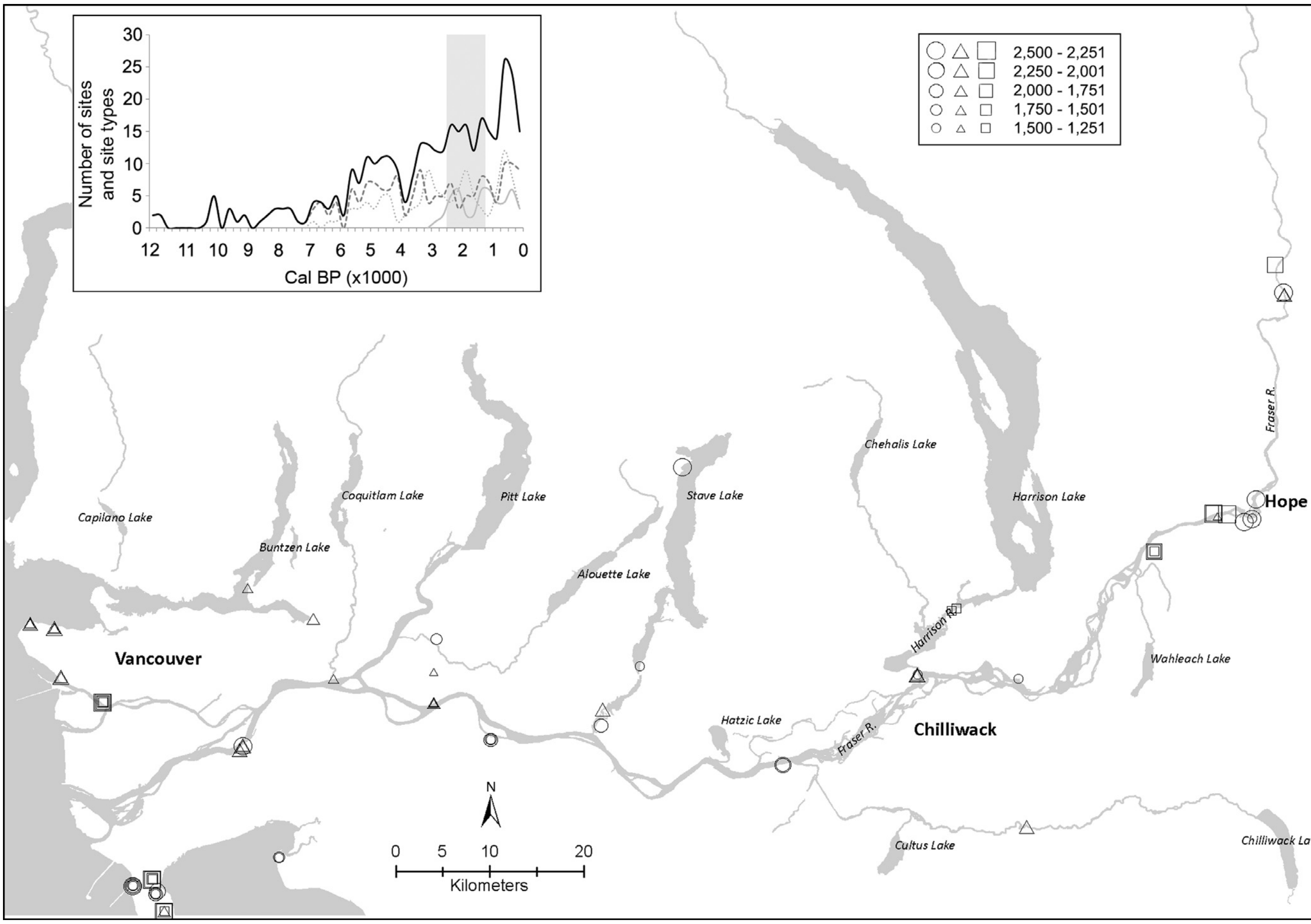

Fig. 9. Radiocarbon dates from sites in the Fraser Valley, 2500–1251 cal BP, with one date represented per site per 250-year interval.

social groups with long term connections to specific places that intermittently converged and retracted, reshaping one another and the social landscape in the process. The complimentary perspectives we get from top down modeling and bottom up data collection and analysis enable us to observe patterns that may otherwise be obscured.

The demographic and settlement data presented in this paper both inform and challenge entrenched ideas of socio-cultural change in the Coast Salish region. Notwithstanding the fundamental and now decades-old archaeological tenet that culture historical phases are simply heuristic devices to help make sense of continuous temporal and spatial variation in human behavior, regional phases on the Northwest Coast, as in many regions worldwide (e.g., Pestle et al., 2013), have taken on a life of their own (e.g., Marpole phase = Marpole culture = Marpole society; e.g., Grier, 2007). Furthermore, we observe that radiocarbon dates from the Northwest Coast can end up being used to affirm the temporal boundedness of a certain set of assumed human behaviors, rather than as a source of independent data with which to evaluate temporal variation in predicted behaviors (Edinborough et al., 2015). We avoid this methodological circularity by exploring the temporal distribution of settlements within a well-defined culturally meaningful spatial unit, which allows variations in behavior to fall in and out of step with phase boundaries and other cultural developments.

Clearly, there is huge value in utilizing large, regional radiocarbon databases as the foundation for examining demography and residential patterning; this patterning in turn informs our understanding of social organization, status, regional interaction, and the development of place-based identity. Our analyses will be more powerful when more residential data are available and can be overlain with other material expressions of social relations, such as trade, resource management and use, and the details of burial practices. To better explore social histories in the manner we suggest requires careful scrutiny of all data, including the data gaps within and between sites. Moving beyond a site-based analysis to one that considers locales forces us to explicitly re-evaluate what those gaps can then tell us about continuity and discontinuity in occupation, social processes, and conversely, sampling biases (e.g., Hakar, 2014; Nelson and Hegmon, 2001; Taylor et al., 2011).

In many regions of the world, archaeologists are re-thinking the consequences of and value in framing archaeological inquiry within the bounds of culture historical phases (e.g., Lyman et al., 1997; Pestle et al., 2013; Stahl, 2012). In large part, this re-thinking has been made possible because archaeologists have amassed a huge sample of region-specific material remains often associated with massive radiocarbon databases that facilitate much broader analyses and comparisons. These datasets allow us to track long-term trends and processes occurring at many different social-spatial scales and at different tempos. Without culture-historical boundaries, we are better able to explore how people interacted with each other and their natural and cultural environments. This approach has the potential to be both respectful and representative of past peoples and their descendant communities. Our challenge as archaeologists is to remember not only that culture change is experienced and expressed by individuals and groups in multi-dimensional ways, but that our stacked temporal

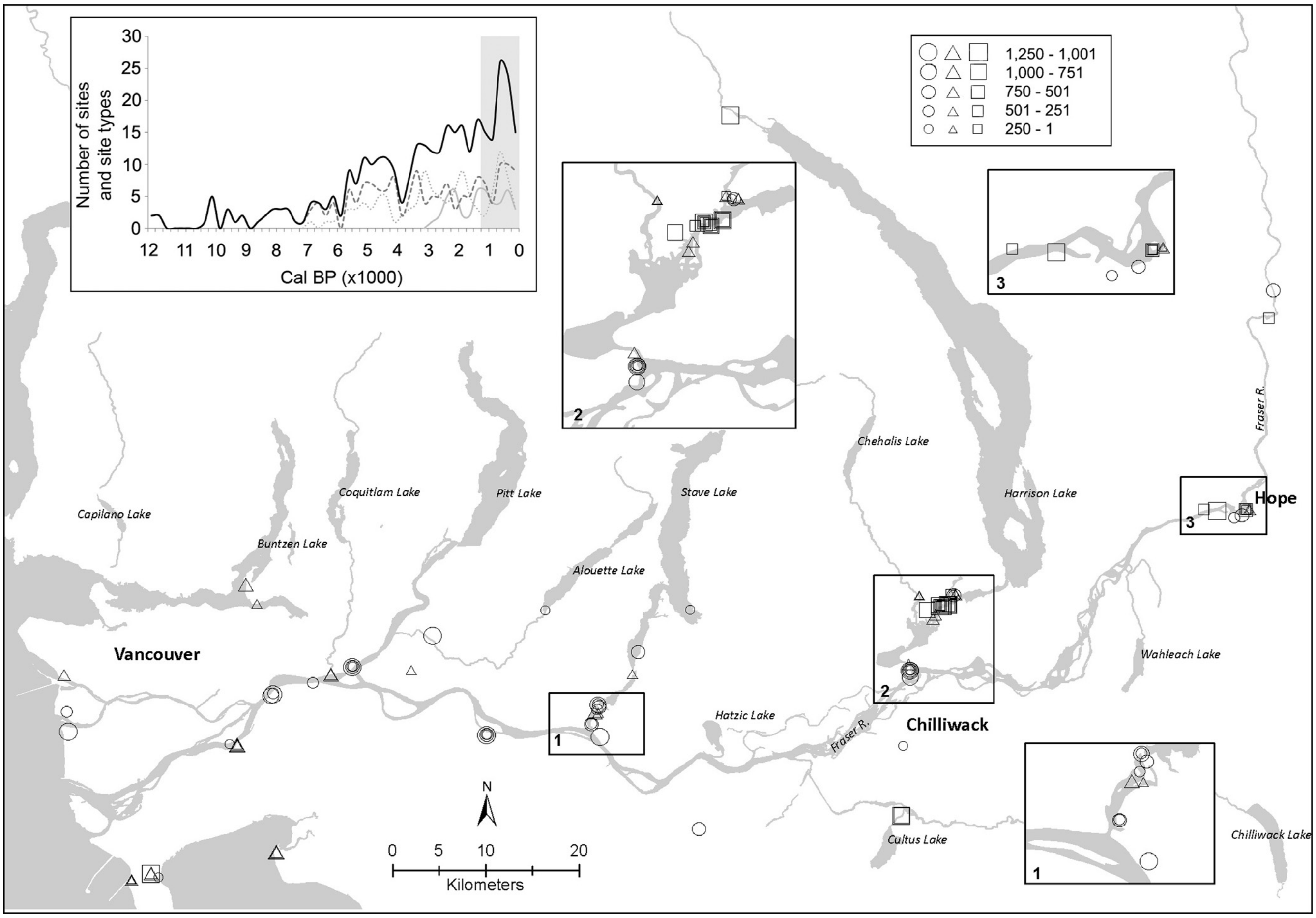

Fig. 10. Radiocarbon dates from sites in the Fraser Valley, 1250–1 cal BP, with one date represented per site per 250-year interval.

units, although analytically convenient, will tend to obscure this multi-dimensionality.

Acknowledgments

We are indebted to all those archaeologists that have conducted research in the Fraser Valley of British Columbia and collected radiometric samples in this pursuit. We are also grateful to the First Nations of the Fraser Valley for their collaboration and willingness to share their rich heritage.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jaa.2016.06.002.

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