CHAPTER 18

The Occupational History of the Stave Watershed

Duncan McLaren
Cordillera Archaeology

Introduction and Background

Archaeological investigations have been undertaken in the Stave Watershed since 1996. This has been funded by BC Hydro, who currently operates Stave and Hayward Reservoirs in the watershed. The majority of this work has been conducted in the reservoir shoreline fluctuation zones. All aspects of this research have been undertaken in collaboration with the Kwantlen First Nation. Representatives from the Katzie, Semiahmoo, Sts'ailes, and Matsqui First Nations have also participated. Research results summarized here have been presented over the years in technical reports, publications, and other documents (Eldridge and McLaren 1998; Fedje et al. 2011; Gray et al. 2010; Mackie et al. 2011; McLaren 2000, 2002, 2003, 2004, 2005, 2006; McLaren et al. 1997, 1998, 2003, 2008, 2011, 2014; McLaren and Maxwell 1998; McLaren and Owens 2000; McLaren and Steffen 2008, Ryder 1998a; Ryder 1998b).

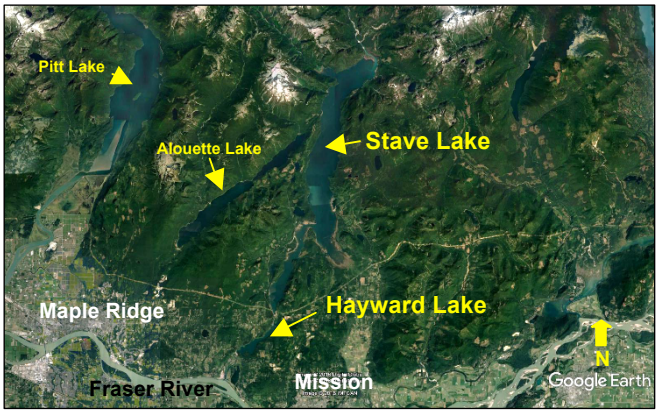

Figure 1. Location of Stave and Hayward Lakes and adjacent landmarks. Google Earth Image, 2016.

The first objective of field research was to conduct detailed archaeological site inventory in the shoreline fluctuation zones of both reservoirs (Figure 1). During visual inspections, numerous lithics were found as lag deposits (McLaren et al. 1997; McLaren and Maxwell 1998). Shovel testing has also been employed to find sites. To date 88 archaeological sites have been found and recorded in and around the reservoirs and over 20,000 artifacts have been collected and analyzed. Based on the stylistic attributes of the artifacts found during the first field season, it was noted that objects attributable to all known cultural historical eras defined for the region were represented in the sample. Also, a number of spear points with attributes not commonly found in components for the defined local cultural historical sequence were found. These spear points seemed to have common affinities with Pleistocene/Holocene transition artifacts from areas to the east and south of the Fraser Valley, in particular, the Western Stemmed Tradition (Bryan 1980; Carlson 1996; Jenkins 2012). Based on these observations, it was concluded that the Stave drainage has been repeatedly and intensively inhabited and used over at least the last 10,000 years (McLaren et al. 1997), thus providing a unique long-term historical perspective of land-use and occupancy.

Two separate stylistic analyses of bifaces from surface collections were undertaken to further assess the likelihood that these items represent evidence of long-term habitation. Primary analysis methods employed were seriation (McLaren 2003) and cross-dating (McLaren and Steffen 2008). Results of both analyses added support to our suspicions that materials from surface lithic scatters date to different time periods. In some cases, it was possible to provide relative dates to different surface scatters based on the diagnostic types of projectile points and other artifacts found.

In 2002 a subsurface testing program was initiated to determine the nature and integrity of subsurface cultural deposits at different sites. Radiocarbon dating was employed for contexts where archaeological materials were found *in situ*. While these proved to be valuable for assessing relative significance values of each site for management purposes, they also provided an additional line of evidence to support the hypothesis of the long-term occupation and land use of the drainage area. In addition to the program of evaluative testing, detailed systematic excavations were undertaken in 2009 at the Ruskin Dam Site (DhRo 59), near the mouth of the Stave River, where stratified cultural deposits indicate occupation spanning over the last 7000 years (Gray et al. 2010) (Chapters 13 and 14).

Aside from the general cultural resource management goals of the investigations, one overarching research question has been pursued since the first field season: what evidence is there for repeated occupation of the Stave Drainage for the last 10,000 years? This chapter presents and discusses the evidence for this from excavations, radiocarbon dating, artifacts found in surface scatters, stylistic and technological analyses, and the place of these collections in the regional cultural historical sequence.

Archaeology of the Lower Fraser River Region
Edited by Mike K. Rousseau, pp. 149-158
Archaeology Press, Simon Fraser University, 2017

Subsurface Testing and Radiocarbon Dating

A total of 101 radiocarbon dates from *in situ* cultural deposits at 28 archaeological sites have been used to assess the chronometric age of organic materials found in association with lithic assemblages (Table 1). In many cases attempts were made to gather samples adjacent to *in situ* artifacts or features. Plant macro-fossils were preferentially chosen for dating where possible, however, in most cases, charcoal was the only dateable material found. In some instances, sclerotia were selected for dating.

Table 1. Radiocarbon Ages from Cultural Bearing Deposits in the Stave Watershed. Calibrations have been calculated using a two sigma standard deviation and the Intercal 13 curve.

Sample #	Site	Conventional ^{14}C BP Age & SD	Cal BP Old-Young	Material	Associated Cultural Material
Beta 355422	DhRn 11	**2970+/-30**	3229-3007	Charcoal	Debitage
Beta 355423	DhRn 11	**3070+/-30**	3363-3184	Charcoal	Hearth
Beta 191868	DhRn 11	**4790+/-50**	5608-5328	Charcoal	Biface preform
Beta 178579	DhRn 11	**5560+/-40**	6410-6288	Charcoal	Micro-debitage
Wk 19454	DhRn 16	**8990+/-46**	10240-9928	Seeds and charcoal	Micro-debitage
Beta 355418	DhRn 18	**5560+/-40**	6410-6288	Seeds	Beneath flake
Beta 355417	DhRn 18	**9780+/-40**	11251-11162	Charcoal	Beneath flake
Beta 355419	DhRn 18	**9920+/-50**	11602-11225	Charcoal	Beneath flake
Beta 355416	DhRn 18	**10020+/-50**	11752-11292	Charcoal	Beneath flake
Wk 19456	DhRn 21	**3098+/-56**	3445-3168	Sclerotia	Debitage
Wk 19455	DhRn 21	**8702+/-43**	9884-9544	Sclerotia	Debitage
Beta 226978	DhRn 29	**2550+/-40**	2755-2491	Charcoal	Debitage
Beta 245385	DhRn 29	**2650+/-40**	2846-2737	Charcoal	Debitage
Beta 226977	DhRn 29	**5800+/-50**	6730-6487	Charcoal	Debitage
Beta 204766	DhRn 29	**8590+/-40**	9656-9493	Charcoal	Micro-debitage
Beta 194838	DhRn 29	**8950+/-50**	10224-9914	Charcoal	Micro-debitage
Beta 245384	DhRn 29	**9190+/-50**	10495-10242	Charcoal	Debitage
Beta 191869	DhRn 29	**9220+/-40**	10500-10258	Charcoal	Hearth
Beta 194839	DhRn 29	**9250+/-60**	10569-10257	Charcoal	Hearth
Beta 226980	DhRn 29	**10150+/-40**	12021-11621	Charcoal	Biface preform
Beta 241999	DhRn 29	**10370+/-40**	12404-12051	Charcoal	Biface preform
BGS 2511	DhRn 40	**760+/-140**	951-516	Charcoal	Corner-notched projectile point
DAM S9880	DhRo 1	**821+/-23**	781-688	Split cedar root	Water logged deposits
Beta 365591	DhRo 1	**840+/-30**	891-686	wood	Cradle basket
DAM S9879	DhRo 1	**935+/-23**	918-794	Charred plant	Preserved wood
Wk 19445	DhRo 10	**2949+/-34**	3210-2997	Charcoal	Labret and hearth
Wk 19444	DhRo 10	**3004+/-39**	3338-3068	Charcoal	Pit house rim - top
Wk 19446	DhRo 10	**3230+/-35**	3558-3379	Charcoal	Pit house rim - bottom
Wk 19447	DhRo 10	**3234+/-43**	3562-3379	Charcoal	Hearth feature
Beta 178581	DhRo 11	**3290+/-40**	3613-3407	Charcoal	Debitage
Beta 204764	DhRo 11	**3470+/-40**	3841-3637	Sclerotia	Projectile point base
Wk 19448	DhRo 11	**4331+/-41**	5033-4836	Sclerotia	Debitage
Beta 178580	DhRo 11	**5370+/-40**	6280-6005	Charcoal	Debitage
CAM S57054	DhRo 11	**5920+/-50**	6882-6650	Charcoal	Microblade core
Wk 19449	DhRo 11	**9075+/-45**	10371-10176	Charcoal	Debitage
Wk 19453	DhRo 14	**1345+/-34**	1312-1184	Sclerotia	Debitage
Wk 19452	DhRo 14	**1565+/-32**	1533-1387	Sclerotia	Debitage
Wk 19450	DhRo 14	**6056+/-37**	7000-6795	Sclerotia	Debitage
Beta 315162	DhRo 16	**3670+/-40**	4143-3889	Plant material	Micro-debitage
Beta 298936	DhRo 16	**6360+/-50**	7418-7176	Charred plant material	Micro-debitage
Beta 245383	DhRo 16	**10210+/-40**	12086-11760	Charcoal	Large flake tool
Beta 249280	DhRo 16	**10290+/-50**	12381-11829	Charcoal	Large flake tool
Beta 328082	DhRo 25	**300+/-30**	460-296	Charcoal	Above cultural deposits
Beta 328083	DhRo 25	**1090+/-30**	1057-937	Charcoal	Pit house floor
Beta 328084	DhRo 25	**4460+/-30**	5285-4970	Charcoal	Pit house floor
Wk 19442	DhRo 26	**358+/-45**	499-313	Sclerotia	Quartz Crystal
Beta 110058	DhRo 26	**2530+/-40**	2748-2489	Charcoal	Hearth
Beta 214393	DhRo 26	**2710+/-40**	2878-2751	Sclerotia	Quartz Crystal
Beta 214394	DhRo 26	**4000+/-40**	4779-4318	Sclerotia	Core
BGS 2546	DhRo 28	**287+/-40**	466-154	Charcoal	Ground stone
BGS2547	DhRo 28	**316+/-40**	480-300	Charcoal	Hearth feature
DAMS 9882	DhRo 29	**276+/-25**	430-157	Charred plant material	Hearth
Beta 178582	DhRo 29	**290+/-40**	466-155	Charcoal	Ground stone
DAMS 9884	DhRo 29	**330+/-27**	469-308	Charred plant material	Hearth
DAMS 9885	DhRo 29	**558+/-23**	635-526	Charred plant material	House floor
Wk 19459	DhRo 35	**719+/-32**	724-567	Charcoal	Hearth
Wk 19458	DhRo 35	**840+/-32**	892-686	Charcoal	Hearth
BG S2548	DhRo 4	**310+/-40**	477-297	Charcoal	Hearth
Beta 204763	DhRo 4	**620+/-40**	662-545	Charcoal	Hearth
DAM S9883	DhRo 4	**686+/-27**	681-563	Charred plant material	Cultural stratum
Beta 204762	DhRo 4	**820+/-40**	892-673	Charcoal	Hearth
DAMS 9878	DhRo 4	**939+/-29**	923-792	Charred plant material	Hearth
BGS 2549	DhRo 4	**2506+/-40**	2743-2440	Charcoal	Hearth
DAMS 9881	DhRo 40	**802+/-24**	758-678	Charred plant material	Hearth
Beta 165886	DhRo 40	**890+/-40**	916-730	Charcoal	Hearth
Beta 165887	DhRo 41	**1830+/-40**	1870-1629	Charcoal	Hearth
Beta 284091	DhRo 43	**60+/-40**	265-0	Charcoal	Cairn cyst
Beta 365502	DhRo 43	**1160+/-30**	1176-983	Charcoal	Hearth

Continued…

Table 1 Continued.

Sample #	Site	Conventional ^{14}C BP Age & SD	Cal BP Old-Young	Material	Associated Cultural Material
Beta 365499	DhRo 43	**1550+/-30**	1527-1377	Charcoal	Hearth
Beta 293549	DhRo 43	**1580+/-40**	1552-1387	Charcoal	Corner notched projectile point
Beta 293548	DhRo 43	**4470+/-40**	5293-4972	Charcoal	Beneath cobble chopper
Beta 365501	DhRo 43	**6270+/-30**	7263-7161	Charcoal	Under lithic
Beta 365500	DhRo 43	**7550+/-40**	8421-8219	Charcoal	Under lithic
Wk 19461	DhRo 53	**7222+/-41**	8159-7964	Charcoal	Quartz Crystal
Wk 19460	DhRo 53	**7748+/-43**	8595-8429	Charcoal	Microblade
Beta 249281	DhRo 57	**570+/-40**	651-522	Charcoal	Hearth
Beta 249282	DhRo 58	**130+/-40**	280-6	Charcoal	Hearth feature
Beta 264275	DhRo 59	**140+/-40**	282-2	Charcoal	Cultural stratum
Beta 273153	DhRo 59	**370+/-40**	504-315	Charcoal	Cultural stratum
Beta 271240	DhRo 59	**880+/-40**	913-770	Textile	Copper ornament
Beta 273156	DhRo 59	**2260+/-40**	2348-2154	Charcoal	Stone slab box
Beta 264278	DhRo 59	**2740+/-40**	2925-2760	Charcoal	Hearth
Beta 284093	DhRo 59	**2740+/-40**	2925-2760	Charcoal	Hearth
Beta 273155	DhRo 59	**2860+/-40**	3138-2863	Charcoal	House floor
Beta 284095	DhRo 59	**2890+/-40**	3158-2890	Charcoal	Hearth
Beta 284094	DhRo 59	**2940+/-40**	3209-2968	Charcoal	Hearth
Beta 284092	DhRo 59	**3050+/-40**	3366-3085	Charcoal	Hearth
Beta 273154	DhRo 59	**4030+/-40**	4783-4417	Charcoal	Hearth
Beta 264277	DhRo 59	**6090+/-50**	7157-6800	Charcoal	Basal cultural stratum
Beta 273152	DhRo 59	**7190+/-50**	8158-7935	Charcoal	Under projectile point
Beta 328085	DhRo 9	**3030+/-30**	3344-3084	Charcoal	Pit house
Beta 328086	DhRo 9	**3300+/-30**	3592-3453	Charcoal	Hearth
Beta 191870	DhRo 9	**4120+/-40**	4820-4526	Charcoal	Hearth
Beta 275570	DhRo 66	**780+/-40**	780-666	Charcoal	Hearth
Beta 204765	DiRn 1	**2380+/-40**	2687-2334	Charcoal	Hearth feature
Beta 355420	DiRn 1	**2420+/-30**	2696-2351	Charcoal	Lithics
D-AMS 016806	DiRn 1	**5368+/-60**	6282-6000	Charcoal	Hearth
D-AMS 016804	DiRn 1	**7009+/-56**	7948-7710	Charcoal	Beside flake
Beta 355421	DiRn 1	**7220+/-40**	8159-7962	Charcoal	Hearth
D-AMS 016805	DiRn 1	**8645+/-68**	9885-9500	Charcoal	Under flake
Beta 355415	DiRn 4	**800+/-30**	766-675	Charcoal	Ground stone knife

The results attest to a broad temporal span of land use and occupation (Figure 3). There are sites dating to each of the culture historical units in the Fraser Delta and Salish Sea archaeological sequences. The earliest radiocarbon age for cultural bearing deposits is 10,370 BP (Beta 241999, 12,460-12,020 Cal BP) on charcoal associated with a biface preform from site DhRn 29. Repeated use and occupation has been documented for each subsequent millennia to the present era. Considered alongside the temporal and spatial distribution of archaeological sites in the study area, the data provide a unique opportunity to study cultural historical perspectives as well as land-use and settlement patterns through time.

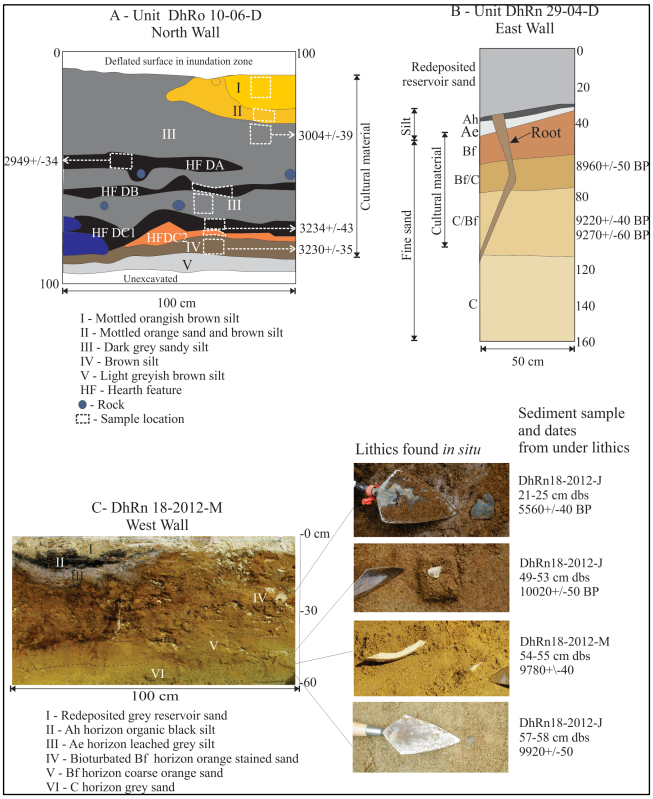

Figure 2. Examples of stratigraphic profiles from the SW Arm of Stave Reservoir (A): DhRn 10) and SE Arm of Stave Reservoir (B): DhRn 29 and (C): DhRn 18).

The stratigraphic context of cultural deposits can be summarized into two general categories (Figure 2). In the southeast arm of Stave Reservoir, most cultural deposits were found in mineral soils which are characteristic of an iron-stained, sandy, Bf soil horizon. Where they are present, overlying organic soils generally lack cultural materials. These results demonstrate that land-use activities were being carried out on beaches and sand bars of Stave Lake. With fluctuating seasonal lake levels, some of these deposits became encapsulated in sand deposits and then eventually overgrown by forests.

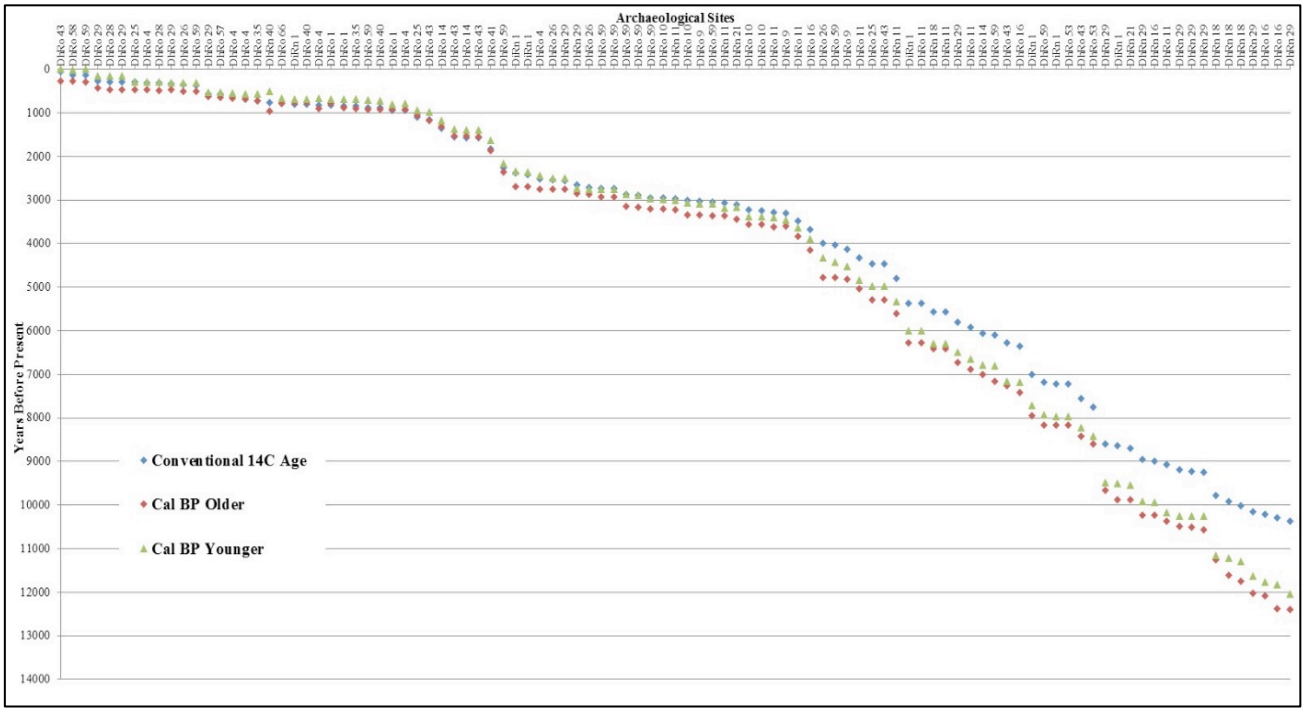

Figure 3. Chart showing conventional radiocarbon dates and 2 Sigma calibration ranges calculated using the Intercal13 curve (Reimer et al. 2013).

There is some evidence for sand dunes in this locality dating 7982+/-42 BP (Wk19443; 9000-8654 CalBP), and aeolian transport may also have played a part in the inclusion of cultural deposits in sand. Despite being situated in an almost pure sand context, almost all cultural bearing deposits have associated charcoal flecks.

Along the southwestern arm of Stave Reservoir and in areas downstream, the general stratigraphy and context of cultural material is different. Sediments are less sandy and siltier. Cultural material is found in the organic components of these soils which are brown or black depending on relative amounts of charcoal present. This depositional pattern suggests that land use and occupation was occurring along the banks of the Stave River and that most of the areas being used were vegetated. The deposition of cultural deposits occurred as a result of organic and/or cultural accumulation with additional fluvial sediments being added by occasion flood events. In some cases cultural deposits in this part of the study area are well and clearly stratified. Underlying organic/cultural deposits, soils are either an orange, iron-stained silt (Bf horizon) or gray clay (C horizon) in which cultural materials are sometimes found, but to a lesser degree and generally near the top of the horizon.

Stave Lake is situated at 72 m above sea level. At the end of the last ice age, sea level was 180 m higher than today 14,500 years ago (James et al. 2002). Around, 13,500 years ago sea level had dropped to the area around 72 m. After this time, sea level continued to drop revealing the river valley below the lake. None of the dated archaeological components are old enough to suggest that they are associated with times of this higher sea level stand.

Long-Term Occupational History of the Stave Drainage based on Material Culture

The Stave drainage cultural historical sequence has clear affinities with the Salish Sea and Fraser Delta sequence (e.g., Borden 1970, Matson 1976; Mitchell 1990) and also has some commonalities with the Fraser Canyon (see Archer 1980; Mitchell and Pokotylo 1996) and Plateau sequences (Rousseau 2008). The Salish Sea and Fraser Delta sequences include many objects of bone and antler that have been preserved in shell midden contexts. This excellent preservation is lacking in the Stave drainage sites, with the rare exception, and for this reason the description and definition of the Stave cultural historical sequence is limited almost exclusively to data related to stylistic, technological, contextual, and behavioural aspects of stone tools. There are some exceptions to this, calcined faunal remains have been found and identified at six sites in the watershed (Gray et al. 2010, Gray and McLaren 2012; McLaren 2000).

With exception of the Ruskin Dam Site (DhRo 59), all radiocarbon dates are from small scale excavations or evaluative tests. In many cases the cultural material identified only consists of lithic debitage or a hearth feature and other temporally diagnostic materials are lacking. The dated samples have limiting factors, and in some instances charcoal dates may be younger than the cultural material as a result of root penetration and/or subsequent burning. In other cases, charcoal dates may be affected by burning of old wood by the site occupants. In a few situations the

radiocarbon dates do not seem to match the types of cultural material. This is particularly the case at DhRo 14 where a date of 6056+/-37 BP (Wk19450, 7000 – 6795 CalBP) is associated with cultural material. Other dates from this site, 1345+/-34 BP (Wk19453, 1312-1184 Cal BP) and 1565+/-32 BP (Wk19452, 1533-1387 Cal BP) suggests otherwise. Cultural material found on the surface suggests that the earlier date (6056 BP) is probably closer to the actual age. As the Ruskin Dam Site (DhRo 59) has numerous identifiable components spanning 7190 to 140 BP (8158-140 CalBP) and it has been useful in serving as a comparative foundation for interpreting and defining the cultural historical sequence.

Despite the limitations of the radiocarbon ages produced, when all of the temporal indicators are collectively considered, a unique opportunity is presented to compare the materials from the Stave drainage to the broader cultural historical framework defined for the Salish Sea and lower Fraser River regions. The regional sequence includes six distinct periods: Protowestern Tradition, Old Cordilleran culture, Charles phase, Locarno Beach phase, Marpole phase, and Strait of Georgia phase.

Protowestern Tradition: 11,340 to 8500 BP (13,200 – 9500 CalBP)

Prior to archaeological inquiries into the Stave drainage area, the Protowestern Tradition was not well known from the lower Fraser Valley region (Matson and Coupland 1995; McLaren 2003). On a more region scale, the Protowestern Tradition is known from Western North America (Bryan 1980; Carlson 1996). Assemblages include well-manufactured bifaces known as western stemmed points, the earliest known of these dates to 11,340 BP (13,285 – 13,087 CalBP) at Paisley Cave in Oregon (Jenkins et al. 2012). Several surface collected bifacial points from the Stave drainage share formal attributes and traits of western stemmed points (Figure 4).

A total of 14 radiocarbon ages from six sites in the Stave region (DhRn 16, DhRn 18, DhRn 21, DhRn 29, DhRo 11, and DhRo 16), fall in the temporal range of the Protowestern Tradition. Amongst the chipped stone material found at DhRn 16, two exquisitely crafted, co-laterally flaked formed bifaces were surface collected. Subsurface testing in the vicinity of one of these finds uncovered microdebitage with an associated date of 8990+/-46 BP (Wk19454; 10240-9928 CalBP). At DhRn 29, a biface preform was found *in situ*, surrounded by debitage (Figure 4). An age of 10,150+/-40BP (Beta226980; 12,021 – 11,621 CalBP) was obtained from a piece of charcoal collected from directly beneath this item. A similar radiocarbon age of 10,370+/-40 BP (Beta241999; 12,404-12,051 CalBP) was obtained from a charcoal fleck found adjacent (5 cm) to the preform. Five additional dates ranging from 9250+/-60 BP (Beta194839; 10569-10257 CalBP) 8590+/-40 BP (Beta 204766; 9656-9493 CalBP) from other excavation units at DhRn 29 place the earliest component at this site in the Protowestern Tradition (Figure 3). At DhRo 16, charcoal found directly above a large basalt flake tool provided an age of 10,290+/-50 BP (Beta249280; 12,381-11,829 CalBP). This date was replicated with an additional sample: 10,210+/-40 BP (Beta245383; 12,086-11,760 CalBP). Protowestern aged radiocarbon ages from DhRn 18 (Figure 3), DhRn 21 and DhRo 11 are associated scatters of debitage found *in situ*.

Figure 4. Selection of bifacial objects with stylistic and temporal affinities associated with the Western Stemmed Point Tradition. Item (A): a biface preform found *in situ* and associated an age of 10,370+/-40 BP. The remaining objects all bear evidence of collaterally removed finishing flake scars and were found in secondary depositional contexts. Items (B) to (F): square bases; (G) to (L): concave basal margins; (M): a Clovis-style fluted projectile point base; (N) to (P): lanceolate forms; (Q): lanceolate form and contracting stem. Some items are ground along basal lateral margins.

Formed bifaces from 23 archaeological sites in the study area have similar stylistic and technical attributes to western stemmed projectile points (Figure 4). These objects feature collateral finishing flake scars which differ stylistically from all bifaces found during excavations at DhRo 59 where occupation began 7190+/-50 BP (Beta273152; 8158-7935 CalBP), lending a further line of evidence that they pre-date this time period. Of the collaterally flaked bifaces found to

date, there are three general forms: square-base stemmed bifaces, concave-base bifaces, and lanceolate-shaped. Basal-lateral grinding is present on some of these objects. Some collateral types likely persist into Old Cordilleran culture time periods (McLaren and Steffen 2008). Similarly, On the Canadian Plateau, collaterally flaked Early Nesikep phase bifaces have an initial mid-Holocene temporal affiliation (Rousseau 2008:229).

Although not considered part of the Protowestern Tradition, Clovis style projectile points are at least partly contemporaneous, dating between 11,050 and 10,800 BP (13,250-12,800 CalBP) across North America (Waters and Stafford 2007). One Clovis-style point base has been found in the Stave drainage area on the deflated surface of archaeological site DhRn 20 (McLaren et al. 2014). Subsurface testing to date has not found integral subsurface deposits in the general area and as a results the site remains undated.

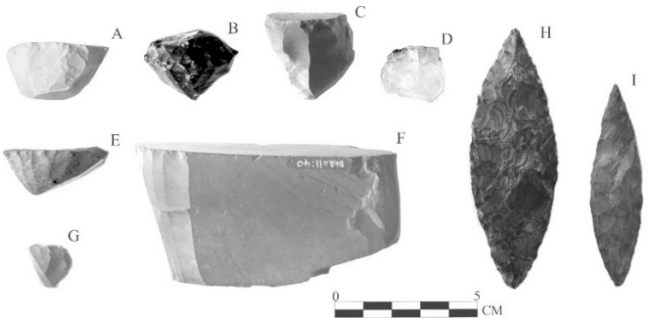

Figure 5. Microblade cores and bi-point foliate bifaces that appear in Old Cordilleran phase and later period assemblages. Microblade cores (A): sub-pyramidal (DhRn 29); (B): radial (DhRn 14); (C): sub-pyramidal (DhRo 10); (D): quartz crystal; (E): sub-pyramidal (DhRo 11); (F): tabular (DhRo 11); (G): amorphous microblade core (DhRo 11) from subsurface deposits dating to 5,920+/-50 BP (CAMS57054, 6870-6630 CalBP). Bi-point foliate bifaces (H) and (I): surface finds from Old Cordilleran phase deposits at DiRn 1 and DhRo 14.

Old Cordilleran Culture, 8500 to 5500 BP (9200 – 6300 Cal BP)

The Old Cordilleran culture is best known from one excavated context at the Glenrose Cannery Site (DgRr 6) in the lower Fraser Valley, where the component dates between 8000 and 5500 BP (8750 - 6300 CalBP) (Matson 1976, 1996). Other Old Cordilleran components in British Columbia are located in the Fraser Canyon, on the north end of Vancouver Island and in Washington State (Matson and Coupland 1995). The oldest component in the Fraser Canyon is dated to 9000 BP (Mitchell and Pokotylo 1996). An early component at the Fort Langley National Historical site (DhRp 7) is also associated with the Old Cordilleran culture type (Porter and Copp 1993). The Old Cordilleran material culture assemblage is characterized through flaked stone tools, with some ground stone, and bone and antler tools. It has affiliations with the 'Cascade' phase in eastern Washington State, as the 'Olcott' phase in the Seattle area. Common artifacts associated with Old Cordilleran components include a cobble reduction industry, foliate-shaped bifaces, and flake tools. Recently, microblades have been found in deposits dating to Old Cordilleran times (Magne et al. 2006; McLaren et al. 2008).

Fifteen radiocarbon dates on cultural deposits suggest affiliation with the Old Cordilleran tradition. These dates are from DhRn 11, DhRn 29, DhRo 11, DhRo 14, DhRo 16, DhRo 53, DiRn 1 and the earliest component at DhRo 59. Several similarities in attributes between the Western Stemmed biface and well manufactured foliate shaped bifaces suggest continuity between the two time periods. Microblade-bearing deposits dating to the Old Cordilleran Tradition have been found at DhRo 11 and DhRo 53. At DhRo 53 microblades were found bracketed between dates of 7748+/-43 BP (Wk19460, 8595-8429 CalBP) and 7222+/-41 BP (Wk73461, 8159-7964 CalBP). At DhRo 11, an expired microblade core (Figure 5) was found with disperse charcoal and was dated to 5920+/-50 BP (CAMS57054, 6882-6650 CalBP).

Artifacts associated with the earliest dates at the Ruskin Dam site include higher frequencies of cobble choppers, spalls, and large flake tools than are found in later periods (Gray et al. 2010). Foliate biface projectile points and knives, ground stone beads, and quartz crystal objects are also present in the earliest archaeological deposits at DhRo 59. With the exception of the ground stone beads, there is an absence of other ground stone objects. Stone boiling appears to be represented at DhRo 59 but is lacking at other sites of this time period.

The Charles Phase: 5500 to 3500 BP (6300 – 3700 CalBP)

The Charles phase is defined as an amalgamation of the St. Mungo (lower Fraser Valley), Mayne (Gulf Islands), and Eayem Phases (Fraser Canyon) dating between 5500 and 3500 BP (6300-3700 CalBP) (Borden 1975; Matson and Coupland 1995; Pratt 1992). The Charles culture developed from the Old Cordilleran becoming a more distinctive regional material culture pattern (Matson and Coupland 1995). Retention of a cobble reduction and tool industry and foliate bifaces provides a link of continuity between older and later periods (Haley 1996). Contracting-stemmed bifaces are added to the Charles phase (Figure 6). There is an increase in the use of ground stone manufacturing, which included points, beads, and incised stones (Ames 2009; Pratt 1992). However, with exception of ground stone beads (see Ames 2009), pecked and ground stone tools are considered rare.

The shift from the Charles phase to the later Locarno Beach culture type is subtle, although Pratt (1992) maintains that there is enough distinction between the two to keep them as distinct temporal units. Evidence from burial complexes indicates that social stratification existed by this time (Brolly et al. 1999).

Table 2. Diagnostic artifact types from specific culture historical periods in the Stave Watershed. Symbol "☒" identifies situations where diagnostic artifacts were found at DhRo 59 in context that agrees with the period as defined by the cultural historical sequence. "X"s indicate the temporal span of diagnostic artifacts from surface or excavated contexts in other Stave drainage assemblages. "O"s indicate presence of diagnostic artifacts which do not coincide with their expected temporal affiliation. Table modified from, Gray et al. (2010), and includes information on the long-term history of artifacts from other sources (Borden 1970; Matson 1976; Matson and Coupland 1995; McLaren and Steffen 2008; Mitchell 1971; Mitchell 1990).

Cultural Historical Unit	Proto-western	Old Cordilleran	Charles	Locarno	Marpole	Strait of Georgia
Temporal Span – Years BP	11,300-8500 BP	8500-5500 BP	5500-3500 BP	3500-2500 BP	2500-1500 BP	1500-200 BP
Pebble tools	X	☒	☒	☒	☒	
Colaterally-flaked projectile points	X	X				
Microblades		☒	☒	☒	☒	O
Quartz crystal objects		☒	☒	☒	☒	☒
Bifacially contracting-stem projectile points and knives		O	☒	☒	☒	
Ground stone beads		O	☒	☒	☒	☒
Boiling stone technology		O	☒	☒	☒	☒
Ground stone projectiles			X	X	X	X
Ground slate knives			☒	☒	☒	☒
Labrets			X	☒	☒	
Notched projectile points			☒	☒	☒	X
Celts				☒	☒	☒
Ear spool				X		
Faceted ground slate points				X	☒	
Whatzits				X	X	
Shaped abrader				☒	☒	O
Triangular projectile points				X	X	☒
Hand mauls				☒	X	X
Stone pipes					X	X
Copper objects				X	X	☒
Stone bowls					X	
Spindle whorls						X

A total of nine radiocarbon ages place archaeological components from sites DhRn 11, DhRo 9, DhRo 11, DhRo 16, DhRo 25, DhRo 26, DhRo 43, DhRo 59 and DiRn 1 in the Charles phase. A circular pithouse floor dating this time period was excavated at DhRo 25. Evidence from these sites indicates changes in the Charles period that include: 1) the widespread occurrence of a stone boiling/steaming industry, 2) the first appearance of ground stone implements other than beads, and 3) formed bifaces become increasingly subradially finished and are foliate, stemmed, or notched in form (McLaren and Steffen 2008). Overall there appears to be a continuing reliance on cobble chopper, spall, and large flake tools compared to later time periods. Other artifacts include quartz crystal implements and microblades.

Figure 6. Contracting-stem bifaces with variable flake scar patterning (Type 6) from DhRo 59. This suite of biface forms first appears in the Charles phase and continues into later periods. Numbers below each artifact indicates the artifact number and stratum at DhRo 59.

Locarno Beach Phase: 3500 to 2500 BP (3700 – 2500 CalBP) and Marpole Phase: 2500 to 1500 BP (2500 – 1400 CalBP)

At archaeological sites in the study area it has been difficult to separate Locarno Beach and Marpole components on the basis of lithic material. This may partly due to a higher proportion of Locarno Beach versus Marpole components. As the lithics from these two phases are very similar in many ways, they are conflated in this discussion.

The Locarno Beach phase between 3500 and 2500 BP (3700 – 2500 CalBP) (Borden 1970; Matson and Coupland 1995). The lithic industry is characterized by: contracting-stem and foliate bifaces, a microlith industry, flaked slate and sandstone, pebble reduction industry and tools, thick ground slate knives, ground celts, labrets, and net sinkers (Mitchell 1990). The transition from Locarno Beach to Marpole phases has been discussed by many and attributed to various different causes from population replacement (Borden 1951) to environmental change (Mitchell 1971) despite the clear evidence of continuity between the two phases.

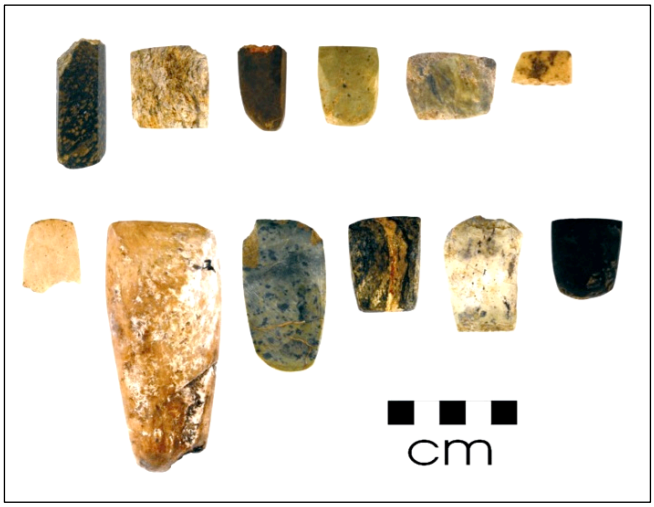

Figure 7. Celts from archaeological site DhRo 59 recovered from multiple strata dating between 4000 and 300 BP (Charles through Strait of Georgia components). Bits are oriented upward.

Matson and Coupland (1995) list 40 sites in the lower Fraser River and Salish Sea region with Marpole components dating between 2500 and 1500 BP (2500 – 1400 CalBP). Marpole phase traits include: stemmed, foliate, triangular, and notched chipped stone projectile points, microblade technology, leaf-shaped and stemmed ground stone projectile points, thin ground slate knives, ground stone celts, shale and shell beads, labrets, hand mauls, abraders, pecked and ground bowls (often decorative), seated human figure bowls, pipe bowls, and incised siltstone tablets. Native copper objects appear in this time period (Mitchell 1990), although there is some indication that they occur in Locarno Beach components as well (Grant Keddie personal communication).

A total of 21 radiocarbon dates in the Stave drainage place eight archaeological components in the Locarno Beach phase compared to seven dates from Marpole components. Sites with Locarno Beach components include: DhRo 4, DhRo 9, DhRn 21, DhRn 29, DhRo 10, DhRo 11, DhRo 26, DhRo 59. Marpole components are present at DhRo 14, DhRo 41, DhRo 43, DhRo 59, and DiRn 1. Sites with the most cultural material in securely dated contexts are: DhRo 10, DhRo 26 and DhRo 59.

Structural remains dating to the Locarno Beach phase have been found and tested at DhRo 9, DhRo 10 and DhRo 59. Structures at DhRo 9 and DhRo 10 are circular pithouses, and those at DhRo 59 are rectangular house platforms. Regardless of the formal differences in shapes of these structures, the cultural materials found at these sites are similar.

Archaeological sites in the study area containing to the Locarno Beach and Marpole components are recognized by a high prevalence of quartz crystal objects, boiling stones, bifacial projectile points and knives that are foliate, contracting-stem, triangular or notched in form, ground stone knives, celts (Figure 7) labrets, microblade technology, and abraders.

Early ground slate knives from DhRo 59 were marginally thicker (0.49 cm) on average compared to knives from later components, possibly indicating a refinement of this technology in the Marpole phase. This is congruent with other evidence that ground slate knives decreases in thickness in later (Marpole-aged) deposits (Mitchell 1990). Celts found at DhRo 59 (Figure 7) are somewhat similar to the expected cultural-historical pattern of smaller celts being more common early on (Gray et al. 2010).

Strait of Georgia Phase: 1500 to 200 BP

The final archaeological culture type is known as the Strait of Georgia phase which lasted from the termination of the Marpole phase until 200 BP (AD 1750), when European explorers began arriving and the Fur Trade era began. The shift from the Marpole to the Strait of Georgia phase was initially attributed to population replacement (Borden 1951). However, differences between the two culture types are subtle, suggesting that continuity is prevalent between the two culture types (Mitchell 1971; Burley 1980; Charlton 1980). It is more likely that changes in material culture and ideological diffusion streams may account for some of the differences rather than any sort of population replacement (Charlton 1980). According to Mitchell (1971), many aspects of the Strait of Georgia phase are characterized as being essentially the same as those described ethnographically (Barnett 1955; Boas 1894; Duff 1952; Suttles 1987). This period seems to be less well known archaeologically than older periods (Matson and Coupland 1995). Distinctive aspects of lithic technology of the Strait of Georgia phase include small triangular and often side-notched chipped stone projectile points, thin triangular ground stone points, ground slate knives, large ground celts, hand mauls, and abrader stones (Mitchell 1990). Mitchell

(1971:46) suggests that the North Straits, Central Straits, lower Fraser River, and Southern Straits subcultures have cultural distinctions and local occupational histories with significant time depth, at least for the duration of the Strait of Georgia phase period, and likely much longer.

Thirty-two radiocarbon ages from sixteen archaeological sites fall into the temporal span of the Strait of Georgia phase in the Stave drainage area. Most information is from sites DhRo 4, DhRo 28, DhRo 29, DhRo 35 and DhRo 59.

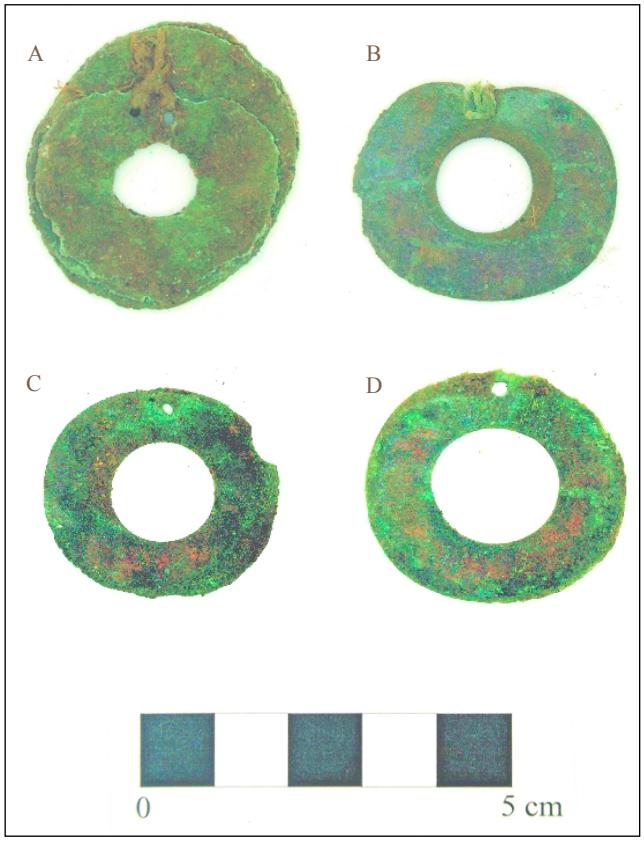

Figure 8. Copper ornaments from DhRo 59 with preserved fibres. A piece of the fibre from copper Object B was carefully sampled and sent to Beta Analytic for AMS dating. The resulting date of 880+/-40 BP (Beta 271240) reveals that this object was deposited during the later occupation of the site.

As mentioned above, there is much in common between lithic assemblages found in the Locarno/Marpole and early Strait of Georgia components. However, no labrets have been found in any Strait of Georgia components and there is a decrease in the amount of quartz crystal at DhRo 59. Ground slate knives tend to be thinner and celts larger in the Strait of Georgia phase. Small side-notched, foliate, contracting-stem, and triangular projectile points are indicative of the adoption of bow and arrow technology. The diversity of arrow head forms at DhRo 59 suggests that all existing atlatl point types were adapted to bow and arrow technology (Gray et al. 2010). Other items found in occupations dating to this time period include a bolus stone (DhRo 29) and copper ornaments (DhRo 59 and DhRo 28) (Figure 8).

At DhRo 28, structural remains with associated pit hearths and extensive scatters and heaps of fire-cracked rock date to this period. Excavations were small scale and the general shape of the structures floor could not be discerned, although the landform on which the site sits suggests that it is large and rectangular in plan.

Continuity and Change in the Stave Watershed Archaeological Record

After using the cultural historical divisions of the region as a temporal framework to help order lithic artifacts from the Stave Watershed, one of the most outstanding features is the long-term continuity and overlapping history of tool types. While archaeologists working in the lower Fraser River region have spent much time and energy theorizing reasons for culture changes, say from the Locarno Beach to Marpole phase, it is clear that there is far more similarity between these two cultural types than differences. The transition boundaries between these cultural historical divisions are the constructs of archaeologists and seem to have little to do with the overall ubiquity and continuum of lithic tool types. Long-term stability in tool types from the area has been noted and illustrated in Carlson (1983), Fladmark (1982) and McLaren (2003).

Multiple lines of evidence provide an understanding of the long-term archaeological record of the Stave drainage. With this we can begin to consider and test hypothesizes concerning change and stability in the archaeological record of the region.

The large suite of radiocarbon dates, excavated materials, and surface scattered lithics, reveals long-term continuity in occupation of the Stave drainage (Table 2). What is most clear from artifact type persistence through time is an absence of abrupt change. Once they appear, most artifact types were used over millennia. There are a few exceptions including the disappearance of co-laterally flaked project points sometime during the early Holocene and the lack of labrets in Strait of Georgia phase sites.

Summary and Recommendations for Future Research

It is clear that the archaeological data from the Stave watershed attests to a very long history of land and resource use. The sequence of cultural material assemblages is in general agreement with the cultural historical sequence outlined for the Salish Sea and Fraser Delta. However, some differences do exist. For example, microblade technology appears in the Old Cordilleran tradition in the Stave cultural historical sequence and there is a greater representation of Protowestern and Old Cordilleran material from the Stave study area than is currently known from the remainder of the Fraser Valley region. While aspects and frequencies of tool types change through time, these changes do not necessarily coincide with the major cultural historical transitions that have been developed for the region. Overall, there is a pattern in which tool types are periodically added to the existing set. Once adopted, tool types tend to persist and be

replicated for millennia. Long-term continuity in lithic production and use is clear in the cultural historical record. Few have attempted to theorize the mechanisms and reasons for this observed continuity, but cultural persistence is likely a key to this.

Now that a cultural historical sequence from the Stave watershed has been outlined, we can begin to explore and provide explanations for the long-term patterns found. Using the information collected to date, it will be possible to target future archaeological investigations to sites with specific and known temporal spans. Larger scale excavations at early period sites will be beneficial for collecting information on early post-glacial land use and occupation, which to date, is poorly understood in the lower Fraser Valley.

Acknowledgements

I am grateful to many of the people that have helped with the work we have conducted in the region over the years. In particular: Joey Antone, Tumia Knott, Tony Dandurand, Les Antone, Wes Antone, Quint Stubbington, Charlie Savino, Shane Stubbington, Brendan Gray, Jenny Storey, John Savino, Daniel MacDonald, Susan Formosa, Morley Eldridge, D'Ann Owens, Jim Stafford, John Maxwell, Les Antone Jr., Kathryn Antone, Josh Antone, Daryl Fedje, Marianne Berkey, Leah Jackson, Justin Himmelright, David Hunter, Sandra Wilson, David Wilson, Quentin Mackie, Peter Locher, Craig Antone, Jacinthe Messier, Hazel Gludo, Rita Bailey, John Antone Jr., Glen Ross, and anyone else who I have failed to mention.