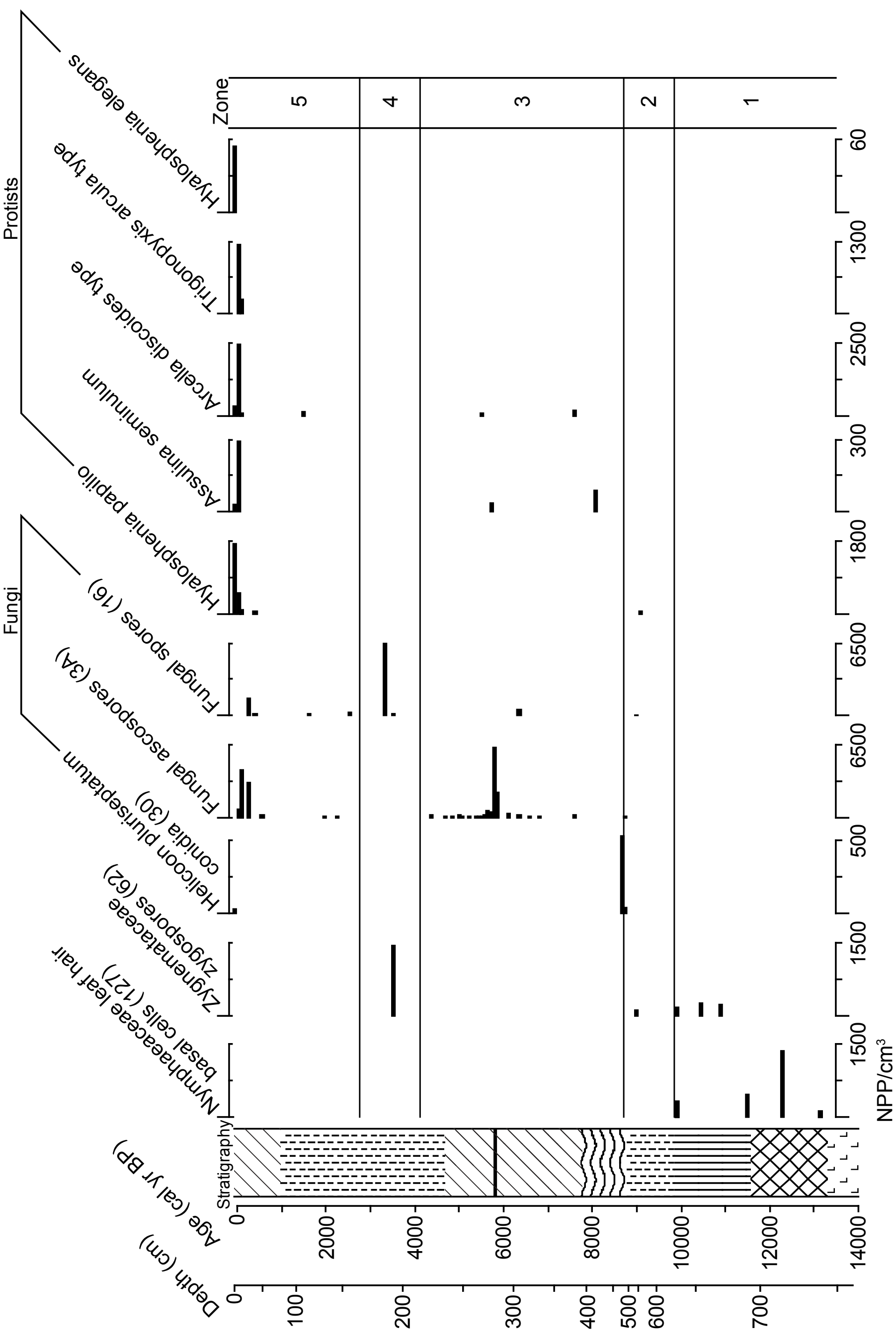
Supplementary Material for Lacourse et al. 2019. ***Postglacial wetland succession, carbon accumulation and forest dynamics on the east coast of Vancouver Island, British Columbia, Canada*****. Quaternary Research.**



Supplementary Figure 1: Concentrations of infrequent non-pollen palynomorphs in the core from Grant's Bog on Vancouver Island, British Columbia. Note changes in scale on x-axes. Numbers in parentheses are NPP types in van Geel (1978) and Pals et al. (1980). See Fig. 3 of the paper for stratigraphy legend.

Electron microprobe analysis of tephra from Grant's Bog, Vancouver Island

Glass shards from peat at Grant's Bog were mounted in epoxy on a glass slide and polished to 0.25-μm diamond grit. We attempted to determine major element concentrations by electron microprobe analysis at the University of British Columbia. Operating conditions were 15 kV and 25 nA, with a 5 μm beam, with peak counting times as follows: Si, Al, K (15 s); Ti, Mn, Fe (25 s); Mg, Ca (20 sec); and Na (4 s). To limit volatilization by the electron beam, Na and K were counted first, and background counts were only made on first and last samples in the analytical run. Fragments of a Mt. Meager dacite glass were also analyzed to check for accuracy and showed results within 5% of values reported in Rust et al. (1999) for all elements except Na (20%) and Ti (25%), which occur at trace levels. The majority of the glass shards from Grant's Bog were too small for analysis with a 5 μm beam, and only 2 of 18 glass shards returned quantitative results. Nonetheless, we compared the mean composition of these two shards to nine other tephras known to occur in southern British Columbia as well as two mid-Holocene tephras from Alaska. Only the tephra from Mount Mazama has ever been documented on Vancouver Island.

Glass shards at Grant's Bog are relatively high in SiO_2 and K_2O, and low in Al_2O_3 and Na_2O, making them similar to tephras from Glacier Peak but dissimilar to those from other nearby possible sources (Supplementary Table 1 and Supplementary Figure 2). The highest similarity coefficient (0.93) is with the Glacier Peak-Dusty Creek tephra that has been dated to 5120 ± 90 ^{14}C yr BP (5750−5940 cal yr BP) by Beget (1981) via charcoal embedded in pyroclastic flow near the base of Glacier Peak. Foit et al. (2004) report an interpolated age range of 5710−5880 cal yr BP for this tephra in lake sediments from southeastern British Columbia. The age for the tephra based on the Grant's Bog age-depth model (5800 cal yr BP) is within the uncertainty of both of these age estimates and provides further support that the tephra at Grant's Bog is derived from the Glacier Peak-Dusty Creek assemblage.

Supplementary Table 1: Major element composition of glass shards (normalized to 100 wt. %) from Grant's Bog, Vancouver Island and various standards reported in the literature. The age-depth model for Grant's Bog predicts an age of 5800 cal yr BP (5410–5970 cal yr BP) for the depth of the tephra.

Shard	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	Cl	MnO	Total	Analytical Total
GB280-1	78.40	0.19	12.17	0.95	0.14	1.08	2.83	3.89	0.35	0.003	100	85.6
GB280-2	79.95	0.30	10.90	1.03	0.15	0.89	2.28	4.29	0.14	0.059	100	93.3
Mean	79.18	0.24	11.53	0.99	0.15	0.99	2.56	4.09	0.24	0.03	100	
Std. Dev.	1.10	0.08	0.90	0.05	0.01	0.13	0.39	0.29	0.15	0.04		

Tephra	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	SC [a]	Age (cal yr BP)
GP DC [b]	78.24	0.19	12.15	1.03	0.16	0.93	3.51	3.65	0.93	5750–5940
GP A [c]	77.35	0.38	12.32	1.41	0.18	0.86	3.28	4.10	0.88	~1700–2000
GP D [d]	78.16	0.38	11.68	1.35	0.13	0.71	3.42	4.10	0.87	~6000–6300
GP G [e]	77.41	0.18	12.73	1.03	0.23	1.21	3.62	3.39	0.87	13,410–13,710
GP B [e]	77.23	0.21	12.78	1.15	0.27	1.41	3.72	3.00	0.82	13,410–13,710
Oshetna [f]	72.55	0.43	14.63	2.29	0.66	2.31	4.20	2.72	0.80	~6500–7000
Aniakchak [g]	70.86	0.48	15.00	2.70	0.54	1.73	5.77	3.03	0.79	~3600
Meager [h]	75.21	0.34	13.52	1.59	0.35	1.28	4.51	3.25	0.77	2300–2400
MSH-P [i]	76.90	0.21	13.11	1.61	0.32	1.18	3.91	2.65	0.77	~2700–3000
MSH-Y [i]	76.40	0.14	13.71	1.37	0.31	1.56	4.21	2.22	0.72	~3400–3700
Mazama [j]	73.26	0.42	14.34	2.26	0.43	1.59	4.80	2.74	0.66	7580–7680

[a] Similarity coefficient (SC) is the weighted average of the ratios between the mean composition of the Grant's Bog tephra and standards, after Borchardt et al. (1972), using all oxide concentrations except Cl and MnO. As per Foit et al. (2014), TiO_2 and MgO are weighted to 0.25 because of low concentrations and high relative error. Na_2O is also weighted to 0.25 because of volatilization of sodium that typically occurs during analysis of glass. A SC of 1 represents a perfect match.

[b] Glacier Peak-Dusty Creek, north-western Washington: Hallett et al. (2001), Beget (1981, 1984)

[c] Glacier Peak A, north-western Washington: Foit et al. (2004), Mastin and Waitt (2000)

[d] Glacier Peak D, north-western Washington: Foit et al. (2004), Beget (1984)

[e] Glacier Peak G and B, north-western Washington: Kuehn et al. (2009)

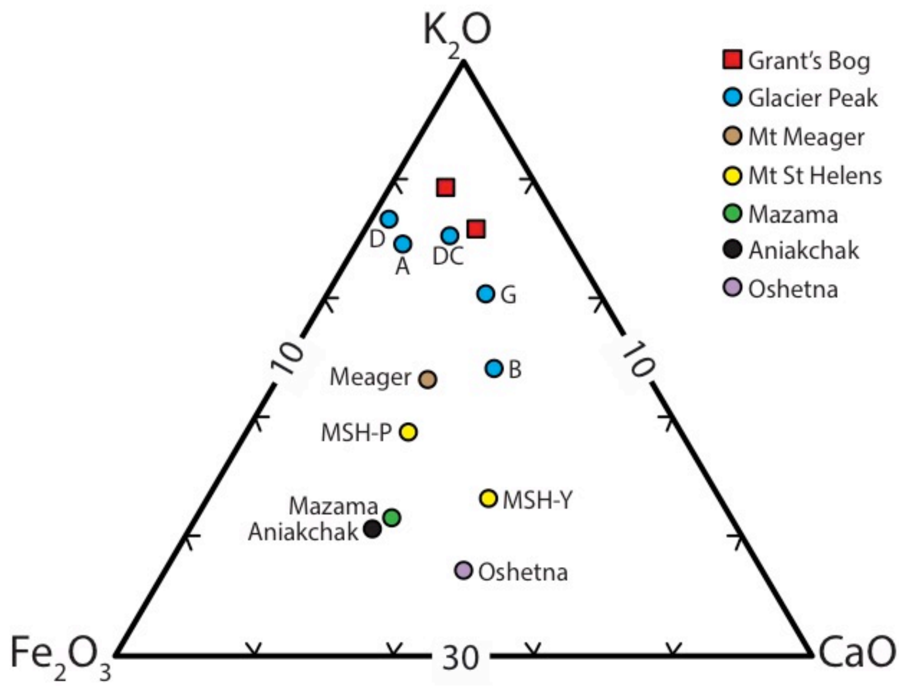
[f] Oshetna, south-central Alaska: Child et al. (1998), Dixon and Smith (1990)

[g] Aniakchak, south-western Alaska: Denton and Pearce (2008), Beget et al. (1992)

[h] Mount Meager Bridge River UA1 (Pebble Creek), south-western British Columbia: Westgate (1977), Leonard (1995)

[i] Mount St. Helens P and Y, south-western Washington: Foit et al. (2004), Mullineaux (1996)

[j] Mount Mazama, south-western Oregon: Foit et al. (1993), Egan et al. (2015)



Supplementary Figure 2: Relative abundance of K_2O-Fe_2O_3-CaO in tephras given in Supplementary Table 1. Red squares are shards from Grant's Bog. Circles are tephra standards. Tephras from Glacier Peak (blue circles) are labelled with letters as per Supplementary Table 1.

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