Late Holocene history of Squamish River north of Brackendale, British Columbia

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Squamish River has prograded a delta into Howe Sound in southwestern British Columbia since the end of the last glaciation. The watershed of the River contains two large Quaternary-age stratovolcano complexes: Mt. Garibaldi, Near Squamish, British Columbia, and Mt. Cayley, 45 km upstream of Squamish. When the glacier in Squamish Valley retreated at the end of the Pleistocene, Howe Sound reached more than 30 km upvalley of its present head at Squamish.

A lake formed in Squamish Valley upstream of what are now the northern suburbs of Squamish during the early Holocene. The lake was impounded behind Cheekye Fan, which had spread across and blocked the valley. Over the remainder of the Holocene, the lake gradually filled-in as Squamish River advanced its delta and floodplain southward toward the fan.

Exposures of organic and inorganic silt in the banks of Squamish River north of Brackendale provide evidence for persistence of a shallow lake that reached up to 9 km upstream of Cheekye Fan from before 3400 years ago to 2300 years ago. Geomorphic observations and the distribution of fine-grained facies indicate that both Cheakamus and Squamish rivers contributed sediment to the lake, and, consequently, different depositional environments existed closer to Cheekye Fan than farther upstream. Cheakamus River deposited fine-grained sediment derived from debris flows that travelled down Cheekye River in the deepest part of the lake, just north of the fan. Farther upstream, organic-rich silts were deposited in fens and marshes surrounding the lake.

Steep banks of cobble-boulder gravel confine Squamish River 1.5–2 km north of the present Cheakamus-Squamish confluence, suggesting that coarse sediment transported by Cheakamus River was important in controlling the lake outlet. As sediment delivery from Cheakamus and Cheekye rivers declined, the lake outlet was progressively lowered and the lake drained.

Squamish River floodplain is also controlled by sediment delivery from landslides on Mt. Cayley, upstream. A large landslide on Mt. Cayley 1100 years ago supplied a large amount of sediment to the Squamish River basin, forcing the floodplain to aggrade, and burying the remaining fens that occupied much of the low-gradient floodplain. As the floodplain of Squamish River has aggraded, it has likewise altered the biotic environment. Widespread fens on the low-gradient floodplain have been replaced with a mature floodplain forest subject to patch disturbance.

The model used to interpret Squamish River floodplain can be used to link it to other low-gradient floodplains impounded by alluvial fans. Because most alluvial fans in British Columbia were emplaced shortly following deglaciation, declining sediment delivery through the Holocene has allowed rivers to begin to incise the toes of these fans, gradually lowering base level. Base-level in these fan-dammed basins is subject to sediment availability in the basin supplying the alluvial fan.

Large fans, with abundant entrainable paraglacial sediment sources may continue aggrading long after deglaciation, whereas the Cheekye Fan, which was supplied by a much smaller basin, aggraded rapidly following deglaciation, and has since become stagnant. Paraglacial sediment availability may thus explain changing base level, and sedimentary environments in other inland lake systems.