Context:
Gabriola ice-age geology

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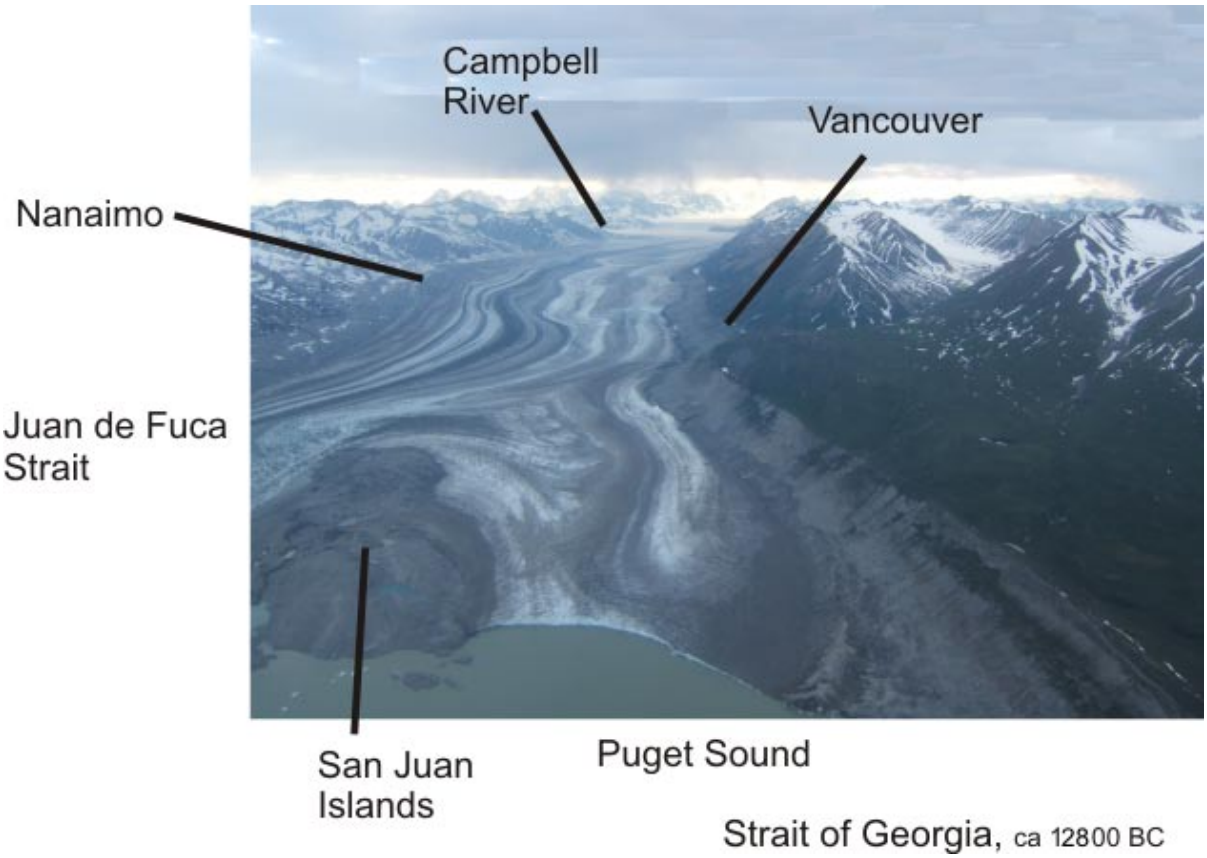
Gabriola's glacial drift

by Nick Doe



When I began researching Gabriola's ice-age history, I intended to write a complete account of the late-Pleistocene (ice-age) and early-Holocene (post ice-age) geology of Gabriola. Describing Gabriola's ice-age legacy was, I thought, going to be easy—and brief.

Well, wrong! Now, instead of a single article entitled, *Gabriola's glacial history*, I'm writing a series of articles that describe observations of some of the things you see on Gabriola that are attributable to the work of ice, pose some questions, and tentatively advance some theories.

Some of these articles are technical; some are less so. In keeping with the diminished pretentiousness, the title of the series of articles now refers only to "glacial drift". This is a vague and old-fashioned term for "stuff left behind by glaciers". It was often used back in the days when nobody knew very much about ice ages, so the term suits my present purposes perfectly.

The deep freeze

If the solar system, including the earth, had been formed one week ago—it was actually 4.6 billion years ago—then the last of the global ice ages—there were many, but the last is the only one we need consider here—the last would have ended only slightly more than one second before you began reading this sentence.[1] It should come as no surprise therefore, considering how recent the events of the late-Pleistocene and early-Holocene have been,[2] that no matter where you are on the island, you can see in the landscape, the aftermath of the transition from "iced-up" to "ice-free", the moment you step out the door.

Perhaps there is no better illustration of the changes that the ice wrought is to note that without them, we wouldn't need a ferry. At the start of the Pleistocene, about 2.6-million years ago, the Georgia Basin and Gabriola Island had probably not been near the sea for nigh on sixty-million years.[3] The waters that we now call the Salish Sea are drowned valleys that have been scraped out by glaciers in the geologically-recent past.

Another familiar indication that we live in a northern land is the skyline of the mountains on Vancouver Island. Except for a few jagged, often-snow-capped peaks, the skyline, seen from the front of the ferry on its way to Nanaimo, is a collage of U-shaped valleys and sinuous silhouettes of foothills that have been sculpted by the passage of gigantic quantities of ice.

Then, if you need more, there's the golf course on Gabriola. Those gently undulating slopes and scoured rocky outcrops that keep the club members from being bored would not be out of place anywhere in the glaciated subarctic regions of Canada.

Ice—lots of it

The environment that Gabriola found itself in, let's say fifteen-thousand years ago, was extraordinary.[4] The ice on Gabriola has been estimated to have been about 1,800 metres thick.[5] Don't skim over that number. Let it sink in. The ice was more than a mile thick. Its surface was way higher than the summit of Mount Benson, which is a mere one-thousand metres above sea-level.

My favourite way of observing the reality of the enormous weight of all that ice is to go down to the beach below the Community Cemetery on Gabriola and pick up a lump of shale that has fallen from the bluff. You can break these lumps open with your bare hands, and if you do, you'll invariably see that the freshly-exposed surfaces have a thin, steely-blue coating. This coating was

[1] The bedrock of Gabriola is, of course, much older. The oldest shale here is about 74-million years old. On our week-long timescale that means it was mud at about 9:30 p.m. on the seventh and final day. Interestingly, the latest research on the evolution of DNA puts 75-million years ago as about the last time that mankind and mice shared a common ancestor. But, I digress… it's just that we occasionally have trouble with mice.

[2] The *Pleistocene* Epoch began 2.6 million years ago and ended 10 thousand (radiocarbon) years ago. Over 11 major global glaciations (ice ages) have been identified as occurring in this timeframe. The *Holocene* Epoch is the name given to the period since the ending of the last ice age. The two together are sometimes called the *Quaternary* Period. Some geologists speculate that the Holocene is just an interglacial period, and that another ice age is due in about 30-thousand years from now.

[3] Mustard & Rouse, GSC Bulletin 481, 1994.

[4] The last ice age, known formally as the "Late Wisconsinan Glaciation" and locally as the "Fraser Glaciation", commenced about 29,000 years ago and culminated in the Vashon Stade *ca* 14,500 years ago.

[5] Evan J. Gowan, *Glacio-isostatic adjustment modelling of improved relative sea-level observations in Southwestern British Columbia, Canada*, p.109, M.Sc. Thesis, University of Manitoba, 2005.

Blue-grey coatings on shale on Gabriola are rich in iron and manganese. These thin coatings were probably deposited on fracture surfaces in the shale at the end of the last ice age when, beneath the ice, acidic and anaerobic meltwater laden with rock flour and rich in dissolved minerals suddenly came into contact with the oxygenated alkaline water of the sea.

deposited by water; yet, the hairline crack that allowed you to break the lump apart so readily is invisible to the naked eye. The water, saturated with rock-flour minerals, was forced into the shale by the tremendous hydraulic pressure at the bottom of the ice, and the coating contains iron and manganese deposited when the water eventually came into contact with the atmosphere.[6]

The aspects of Gabriola's ice-age legacy that I have been investigating are: the distribution and make up of the glacial drift; events during de-glaciation and the period known as the Younger Dryas; ice-age fossils, and striae (striations) and grooves in the rock carved by the movement of the ice.

Some of the conclusions of this work conflicts with information in peer-reviewed geological journals, and you should exercise due caution in accepting everything I say.

The last article in the series is a glossary. ◊

Articles:

[6] N.A. Doe, *Non-marine weathering of sandstone and mudrock*, *SHALE* 25, pp.31–48, March 2011.