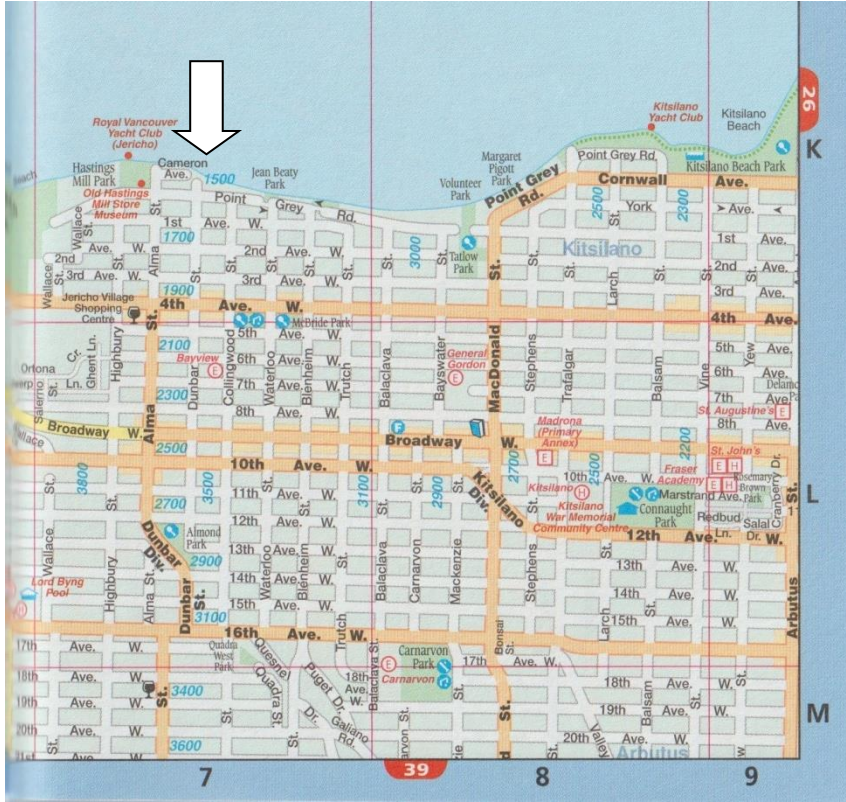


13 th BCPA Symposium 2021
Vancouver, Kitsilano Foreshore Field Trip
July 10 (Saturday)



Meeting Place: At 1:30 pm, at the end of Dunbar Street next to Point Grey Road. There are concrete steps that lead to the Kitsilano foreshore. **Perry Poon** is your field trip leader. Contact information: Cell phone number – 604-317-5869.

Tide Table for July 10, 2021

LowTide/HighTide	PDT (Pacific Daylight Saving Time)	Metres (m)	Feet (ft)
Low Tide	1:01 am	3.57 m	11.71 ft
High Tide	5:05 am	4.12 m	13.52 ft
Low Tide	1:00 pm	0.6 m	1.97 ft
High Tide	8:32 pm	4.53 m	14.86 ft



Stairs leading to Kitsilano Foreshore.



End of Dunbar Street at Point Grey Road (left).



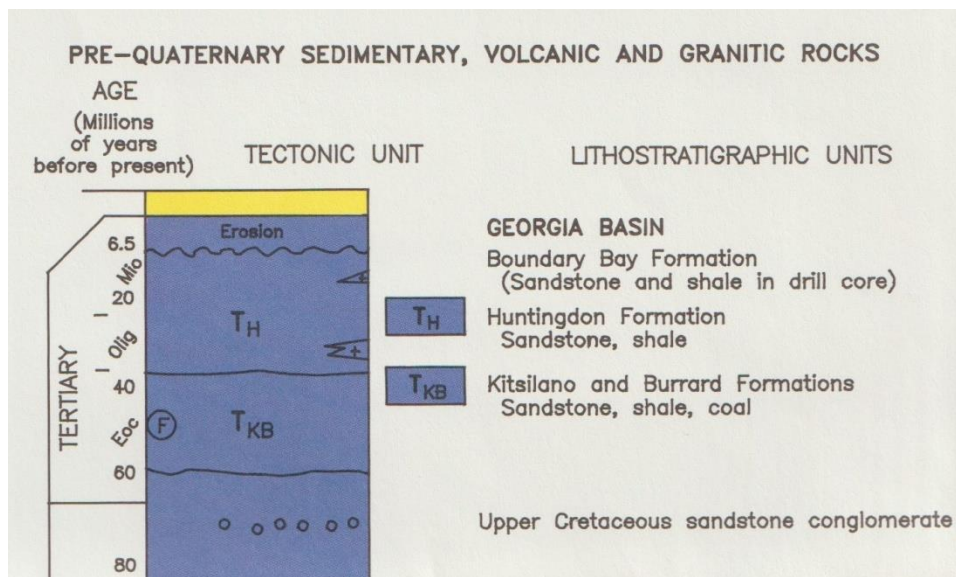
Fossil leaves of the Kitsilano Formation (right)(picture taken by Brennan Martens)



Fossil leaves of the Kitsilano Formation (picture taken by Brennan Martens)

Paleontology of the Kitsilano Foreshore

Geology of the Kitsilano foreshore consisted of low cliffs composed of layers of ancient rocks deposited on river channels. The Eocene rocks (45 to 50 million years ago) form the Kitsilano Formation. The sedimentary rocks are composed of inter-bedded brown feldspar-rich sandstone, siltstone, sandy shale, and conglomerates, deposited in the Georgia Basin to form thick sedimentary rock layers sometimes 1600 m in some area. The sandstone show numerous cross bedding, and cut and fell channeling of rivers. Cross-bedding indicated the direction of currents in a river or stream, when the sand was deposited about 35 to 50 million years ago. This showed that the river flowed from the land to the west and south, and into the Pacific Ocean. The sedimentary rock layers are tilted about 10 degrees to the northwest (inclining to the south) into the Whatcom Basin, that extends from the Coastal Mountains north of Vancouver to Bellingham in the south. This low basin measures about 75 km wide.



Bedrock Geology. Kitsilano Formation and the Burrard Formation (From Armstrong, 1990, map insert).

In the sandstone layers are seams and lenses of coal, inter-layered with fine grain sediments, and plant debris deposited in ancient swamps and bogs. During low tides, there are flat beds of mud and clay sedimentary rocks that preserve fossil plant remains, consisting of leaves, fruits, flowers, and pollen, amongst thin seam of coal. These sedimentary rocks were deposited in the late Eocene or possibly the early Oligocene about 40 million years ago. The Kitsilano Formation is probably about 760 m thick but fossil collectors see only 1% of the rocks visible on the foreshore. No formal paper has been written on the fossil flora of this area since the 1960s. The fossil plant flora listed species of ferns, conifers, cypress, pine, willow, alder, hornbeam, hazel, chestnut, beech, ash, hickory, wing-nuts, elm, lime trees, and bayberry are present in the rock layers. Plant leaves, fruits, flowers, pollen, parts, and detritus are preserved due to rapid burial by fine sediments, and the low oxygen content produce good fossil preservation.

Palynology is the study of fossil spores and pollen, in alluvial sediments. Spores and pollen are recognizable even after burial and lithification, that they can be identified to plant species! Information from spores and pollen indicate geographic location, and environmental climate. The palynology studies in Vancouver show that the Eocene was a subtropical environment, and that chestnut, beech, willow, holly, oak, magnolia, cypress, and redwoods were present.

The sedimentary rock layers reveal a 45 to 55 million year old massive floodplain at a river mouth, where the river drained from the east into the Pacific Ocean. The floodplain extended from Vancouver to Oregon, and remained active for millions of years which formed the wedge of thick sediments. This floodplain had several river channels cutting through a sandy alluvial plain. The floodplain had lagoons, ponds and marshes where mud would be deposited along with plant material.

One interesting fact about the Kitsilano Formation foreshore fossil site, is the absence of animal fossils. No animal fossil have been found at the fossil site, even though the paleo-environment indicated a productive floodplain which would have supported a high diversity of animal fauna of fish, insects, and mammals. Other Eocene fossil sites in B.C., like Princeton, Driftwood Canyon, and McAbee have produced fossil plants as well as fossil fish, birds, and insects. Explanation of the lack of animal fossils in the Kitsilano Formation maybe due to the low sample size, small exposure of the fossil bearing rock layer, and well-preserved fossils were found in blocks of sedimentary rocks which occasionally occurs in the area. Some of the sedimentary layers are thin, and inter-bedded with sandstone which does not preserve animal remains due to coarse grain size. Other explanations include a high energy environment would not preserve animal remains, and acidity of the water may have dissolved animal remains. If animal remains are mixed with the fossil leaves, then it would be difficult to find and recognize the fossil remains. Some fossil plant leaves show burrowing patterns made by mites or some herbivorous insect.

Equipment and Gear

Fossil material is wet due to tides. Fossil can be wrap in newspaper with piece of masking tape indicating date an identification of the fossil. This is to protect the fossils during transport. Later, unwrap the fossil and allow them to dry. Please remember to never turn your back to the sea. Also, people can check the local Vancouver intertidal marine life.

- Eye protection like work glasses, and goggles.
- Gloves to protect hands
- Hat, sunscreen, sunglasses
- Plastic or cloth collection bags
- Newspaper, toilet paper or paper towels, and masking tape
- Small sledge and crowbar
- Geology hammer
- Shovel
- Rubber boots and raingear
- Large and small chisels
- Krazy glue or white glue
- Camera
- Water bottle and snacks

Acknowledgements

Many thanks to Brennan Martens's contribution to the Kitsilano field trip guide with pictures of some flora from the Kitsilano Formation.

References

Tide Tables

<https://www.tides-forecast.com/locations/Vancouver-British-Columbia/tides/latest>

https://tides.gc.ca/eng/data/table/2021/wley_ref7735

Geology

https://bbcga.com/kitsbeachgeotour_main/

<https://www.geologyforinvestors.com/fossil-treasure-trove-downtown-vancouver>

Armstrong, John E. (1990). Vancouver Geology. Geological Association of Canada. Cordilleran Section. pp 37 and 72.