

A hiker with a large backpack stands on a rocky ridge overlooking a vibrant blue lake, surrounded by snow-capped mountains.

Garibaldi Park

Alpine jewel
of Howe Sound

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Bowen Island Conservancy

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Retired, Geological Survey of Canada

*“We can create beauty
through the dailyness of our lives,
standing our ground in the places we love”*

Terry Tempest Williams





Mt Garibaldi from Pam Rocks

Bowen Island



Trail just below Black Tusk



Bowen
Island



**Bioregionalism:
Taking root in my
home watershed**

Garibaldi

Nch'kay - Sacred Mountain to the Squamish People





Giuseppe Garibaldi

Royal Navy survey ship H.M.S. Plumper,
surveying the BC coast in 1860





First ascent of
Mt Garibaldi, 1907

First ascent of
Mt Garibaldi, 1907

Early Mountaineering

Garibaldi Lake area was a popular hiking area by 1910

Black Tusk Meadows



PGE in Cheakamus Canyon



... and BC's 2nd Provincial Park by 1920



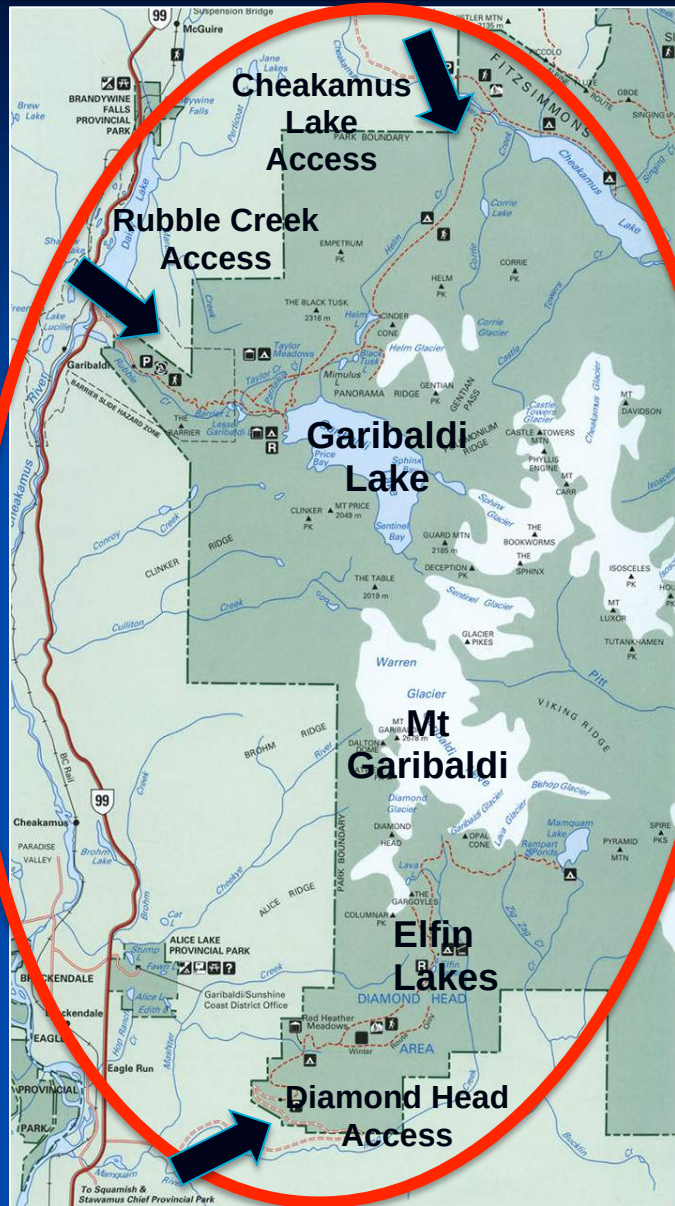
Ottar Brandvold

**Diamond Head Chalet,
Elfin Lakes, 1950s**



Garibaldi today

The famous western edge of Park





Black Tusk, May 1986

A geologist's view: Garibaldi's FIRE and ICE story



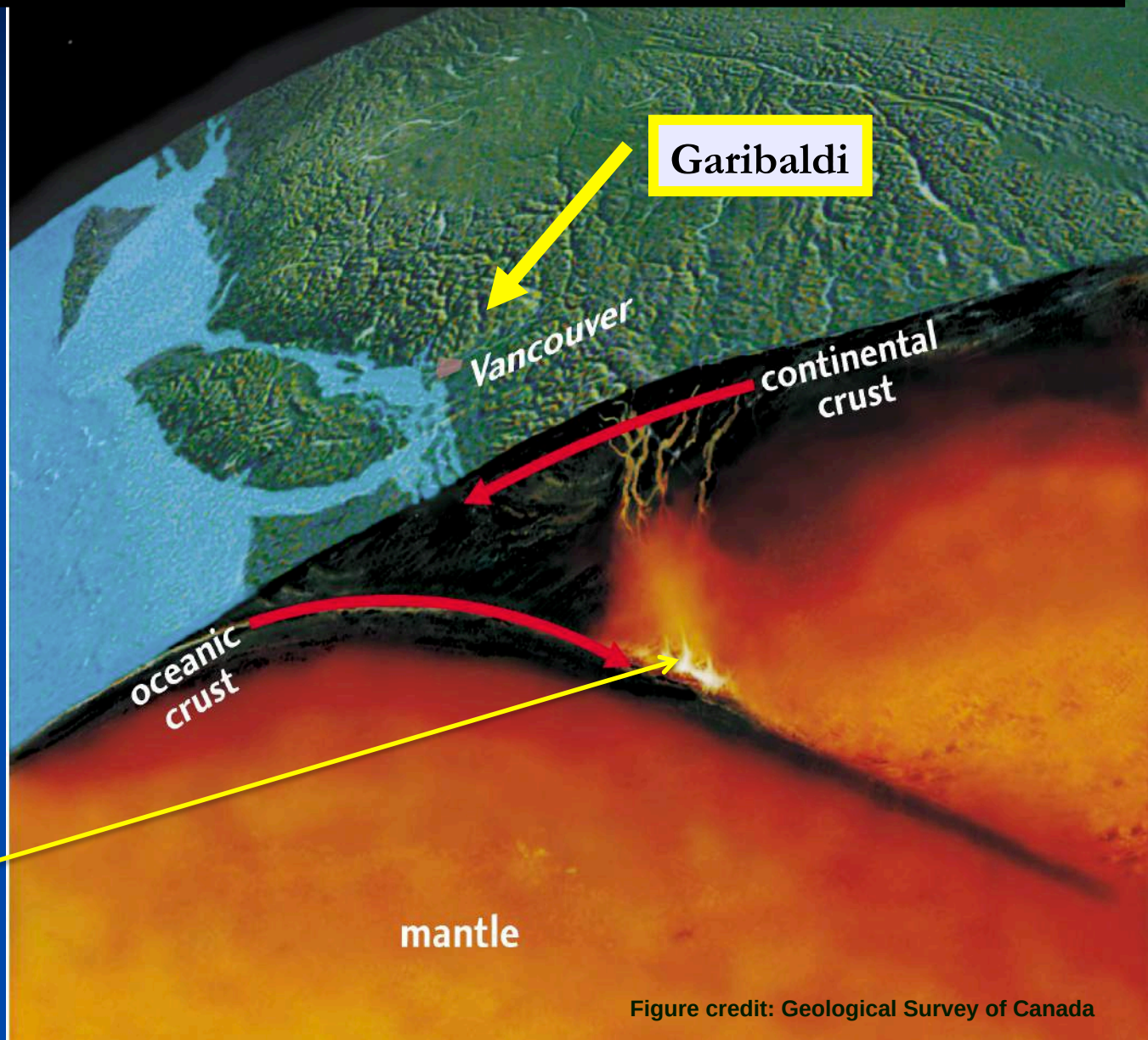
Deception Peak from Polemonium Ridge

“FIRE”: We live in volcano country!

Volcanoes

the inevitable
consequence
of collision
(subduction)
zones

The
volcano
factory





Mount Garibaldi

Garibaldi

– just the top end of a 60-100 km deep plumbing system

Cascade Eruptions During The Last 4,000 years

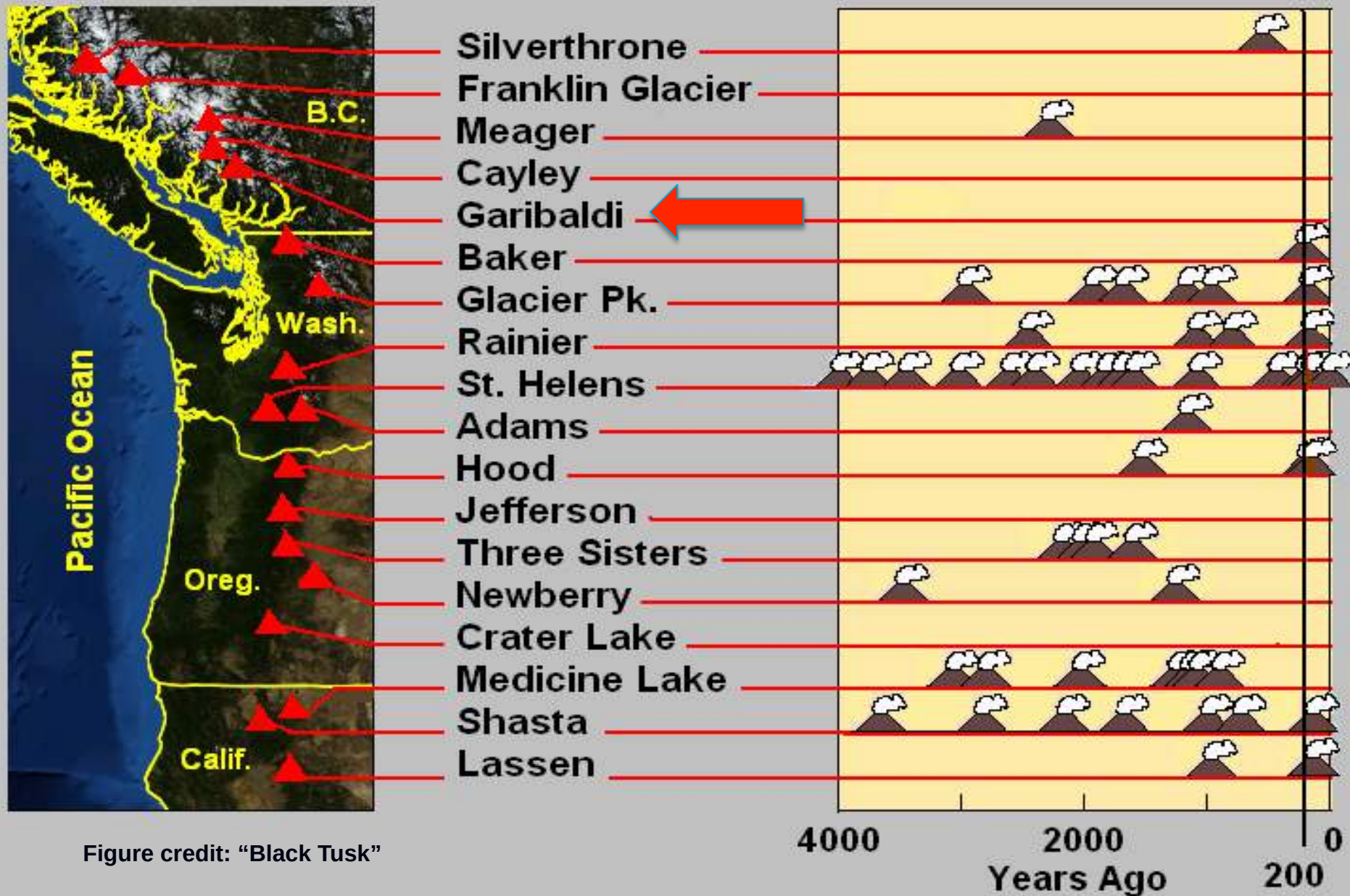
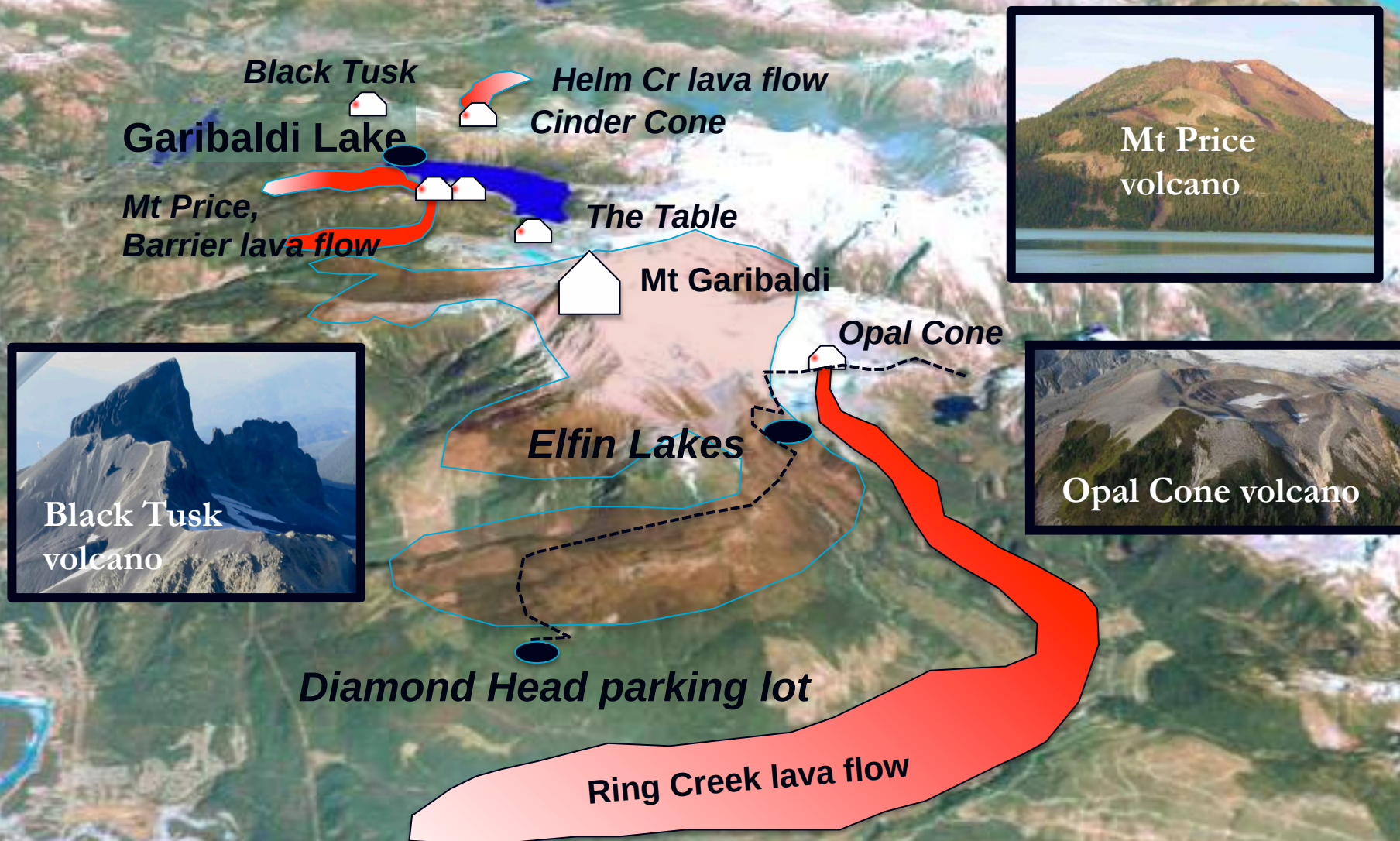


Figure credit: "Black Tusk"



**Not just 1 volcano, but 13!
... and 4 lava flows**

Could Garibaldi erupt?

Vital signs

Last eruption 9000 years ago

No hot springs or fumeroles

Some seismicity; unclear significance

..... but “potentially active”



and “ICE”: The Ice Age

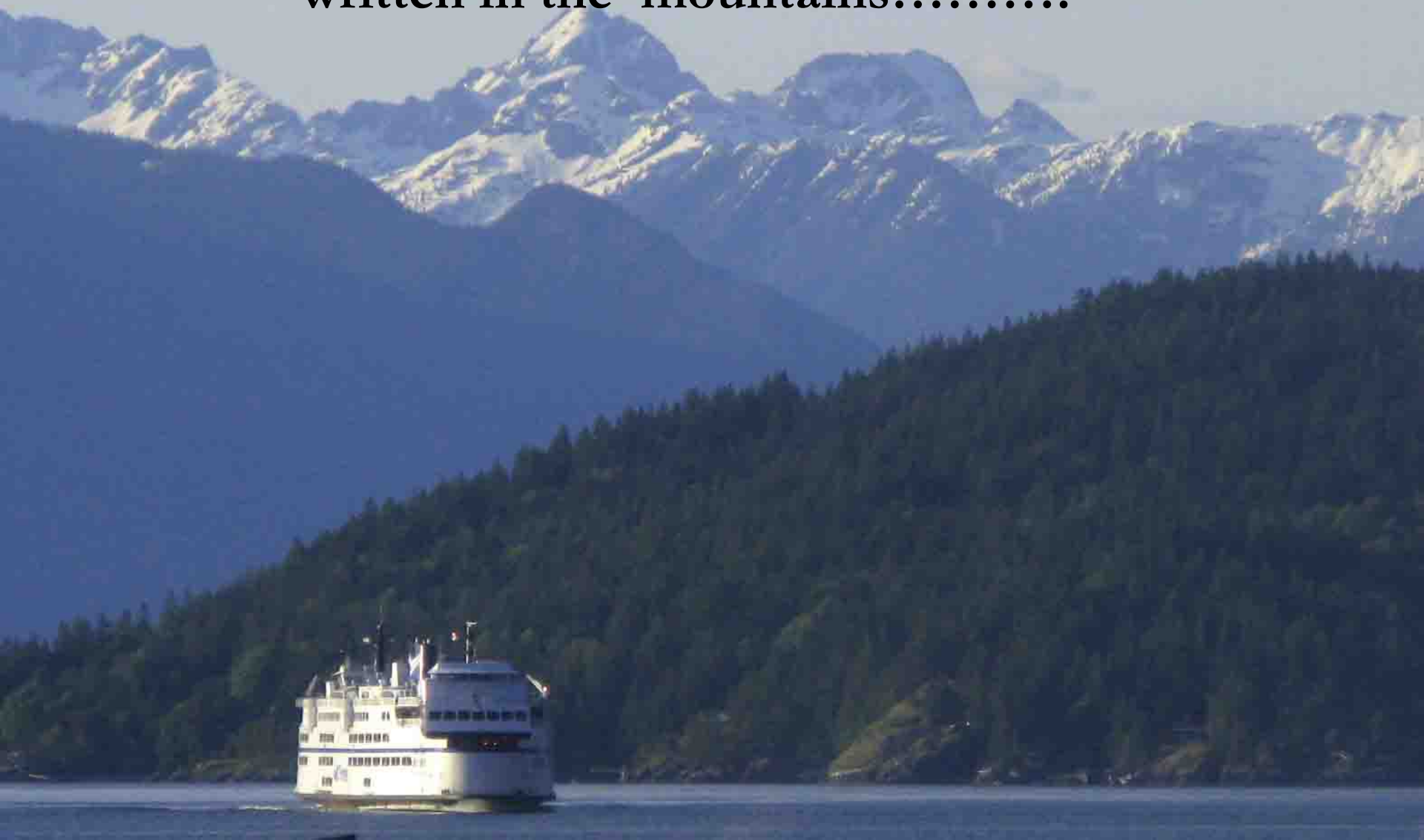
Photo credit: Simon Morris

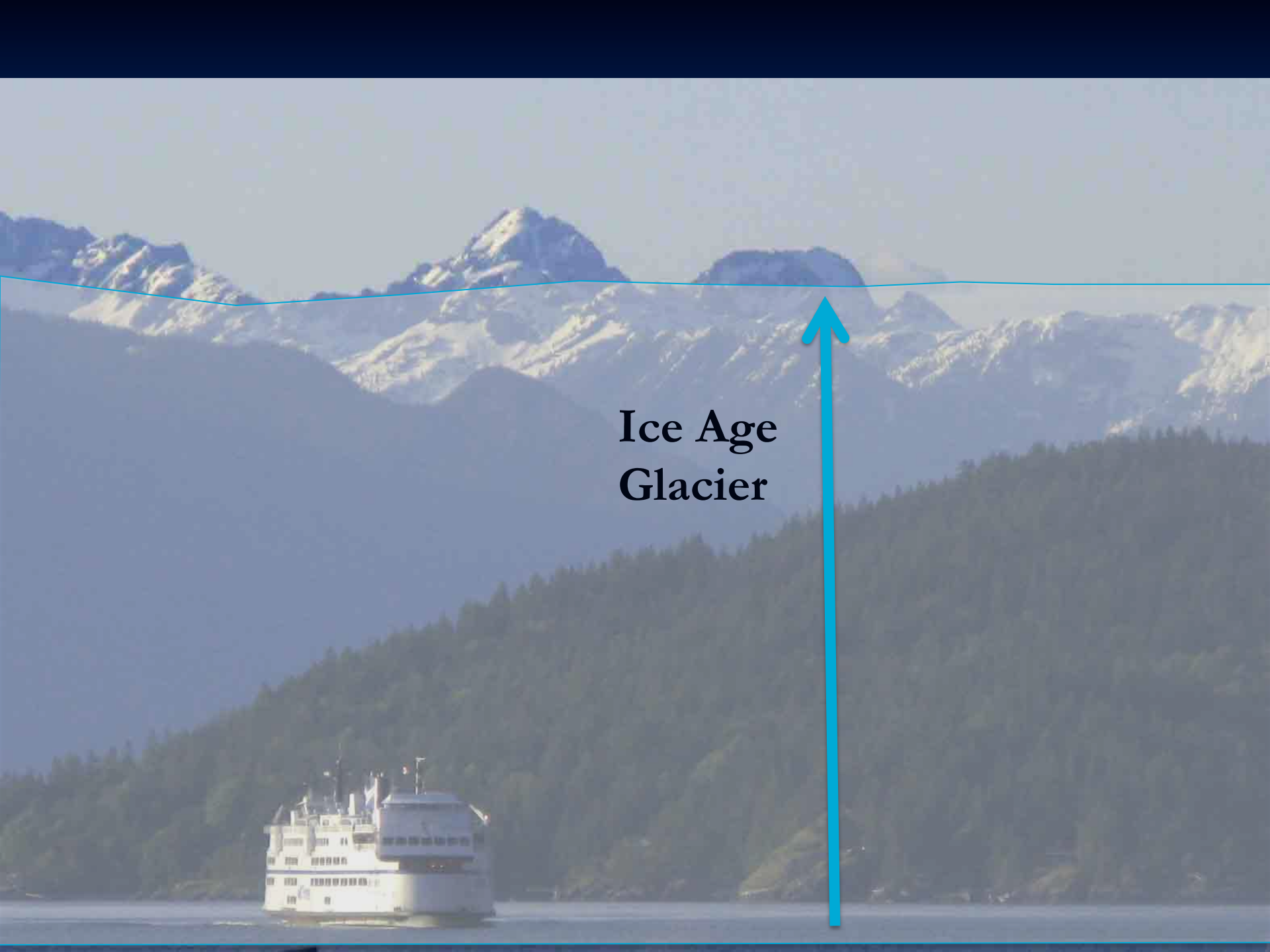


2 million to 10,000 years ago



You can see the glacier limits
written in the mountains.....





Ice Age
Glacier

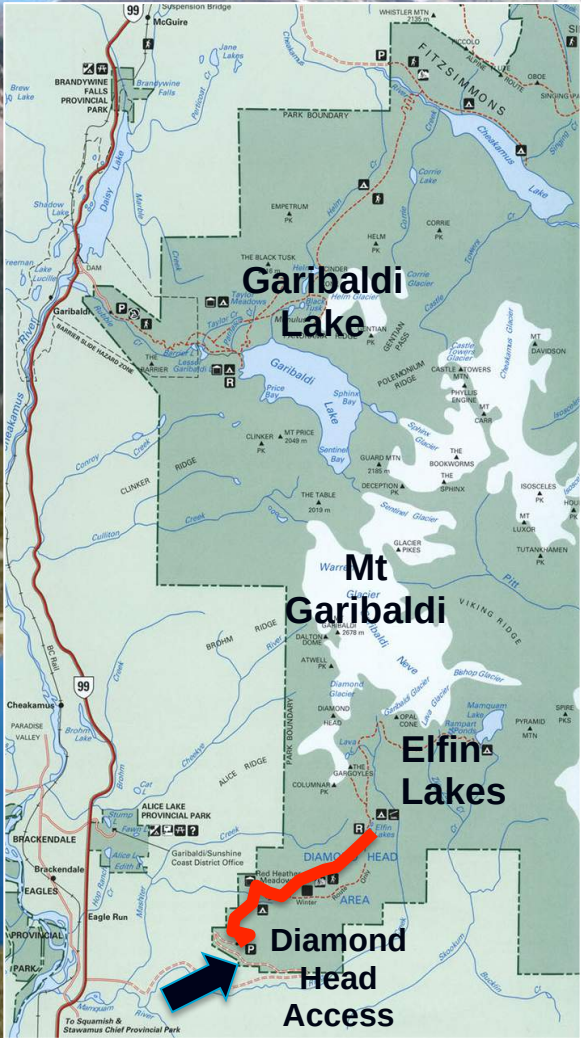
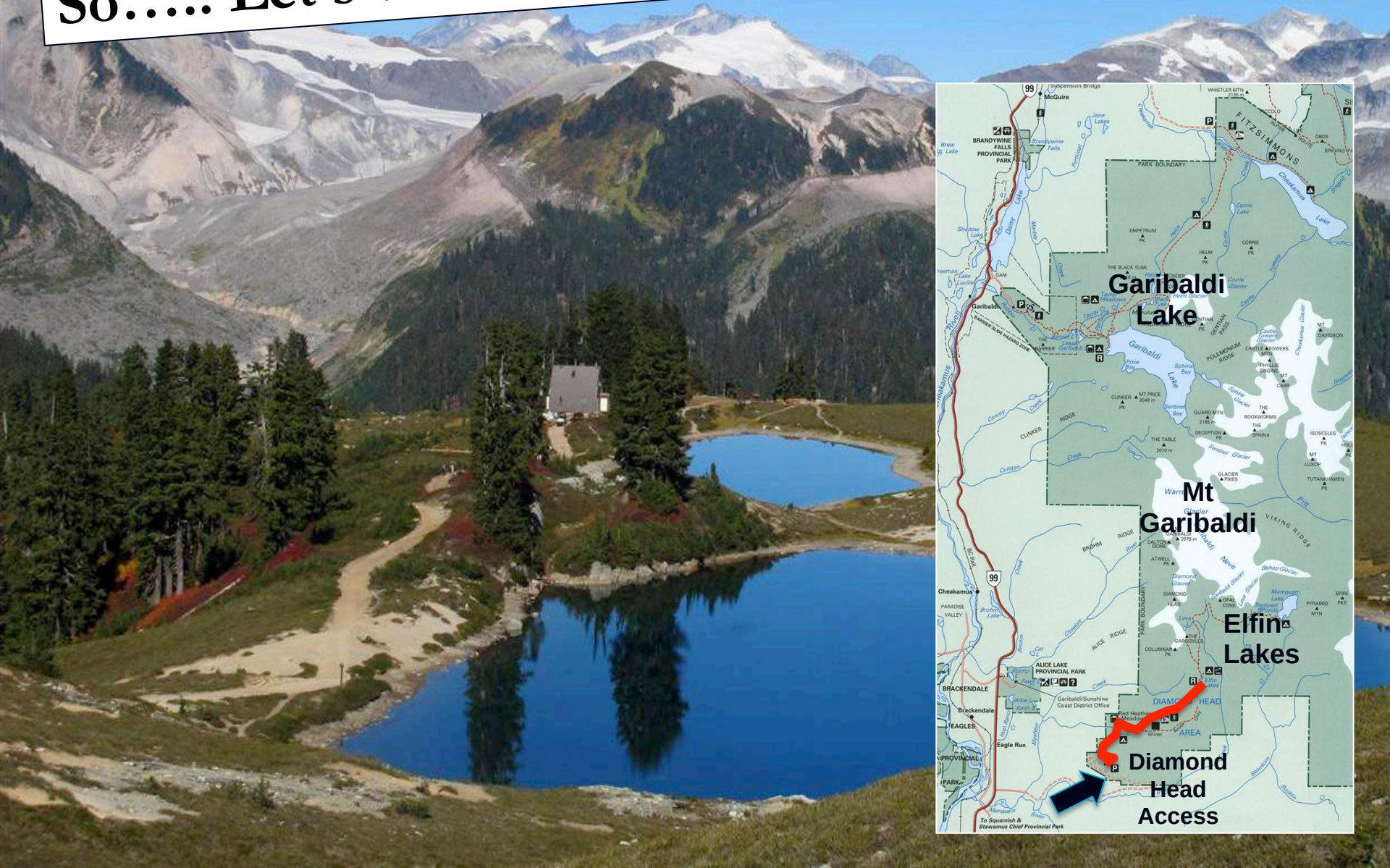
Volcanic eruption through glacier, Iceland

Almost all of Garibaldi's volcanoes
erupted during the Ice Age



Matthew J. Roberts <matthew@vedur.is>

So..... Let's walk Elfin Lakes hike

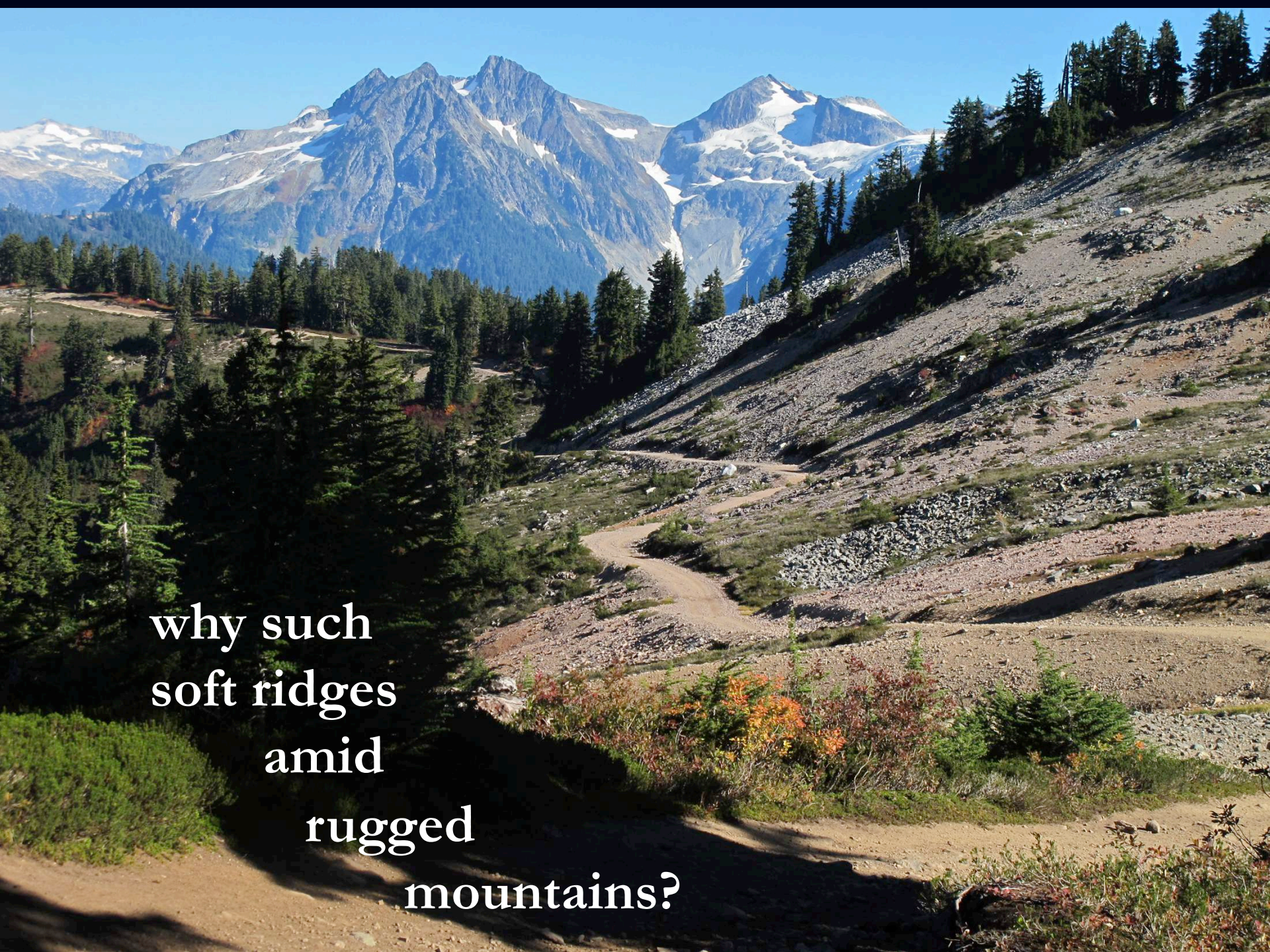




Elfin Lakes hut

Elfin Lakes campground

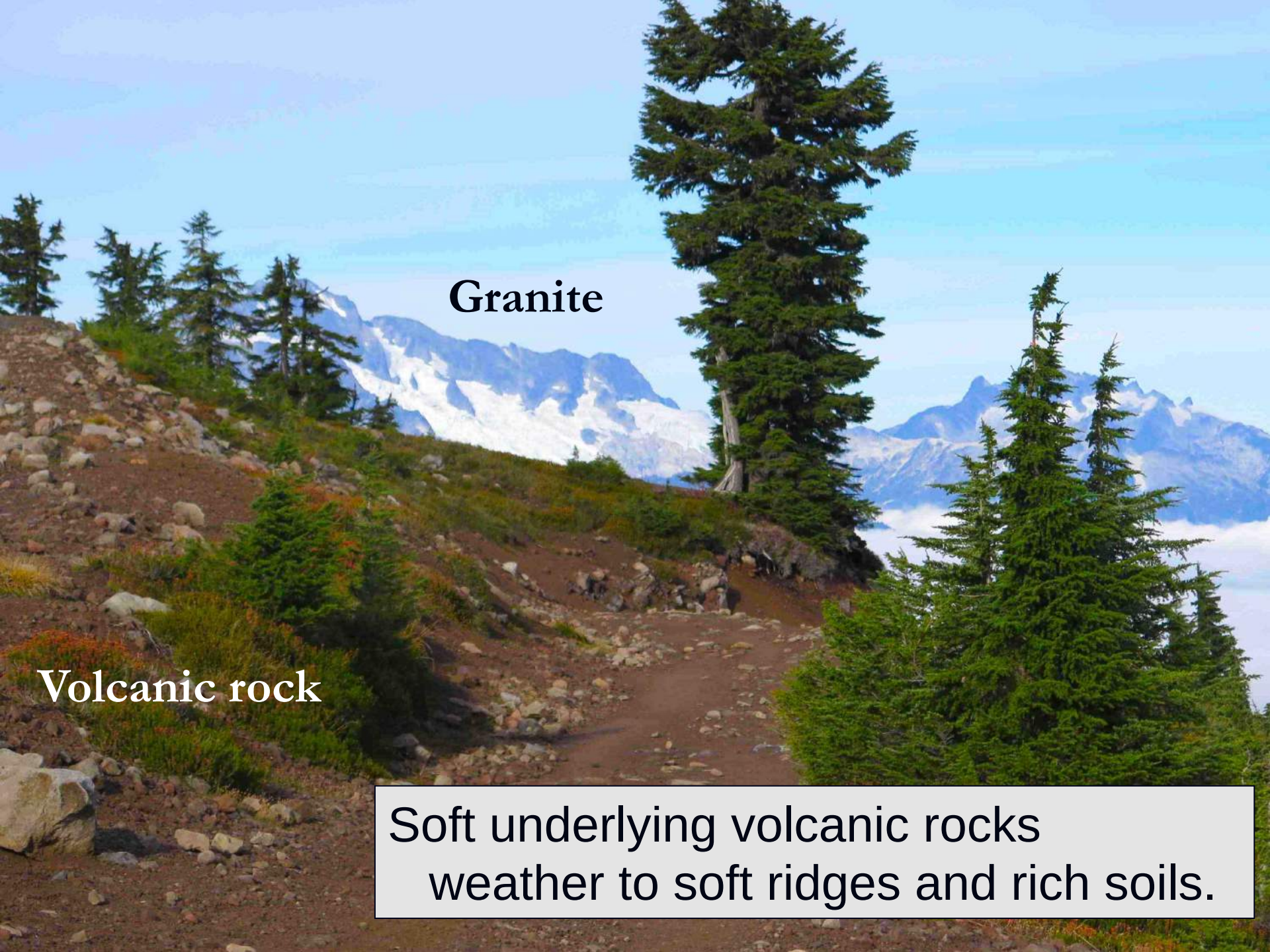




why such
soft ridges
amid
rugged
mountains?



and why such rich
meadows?

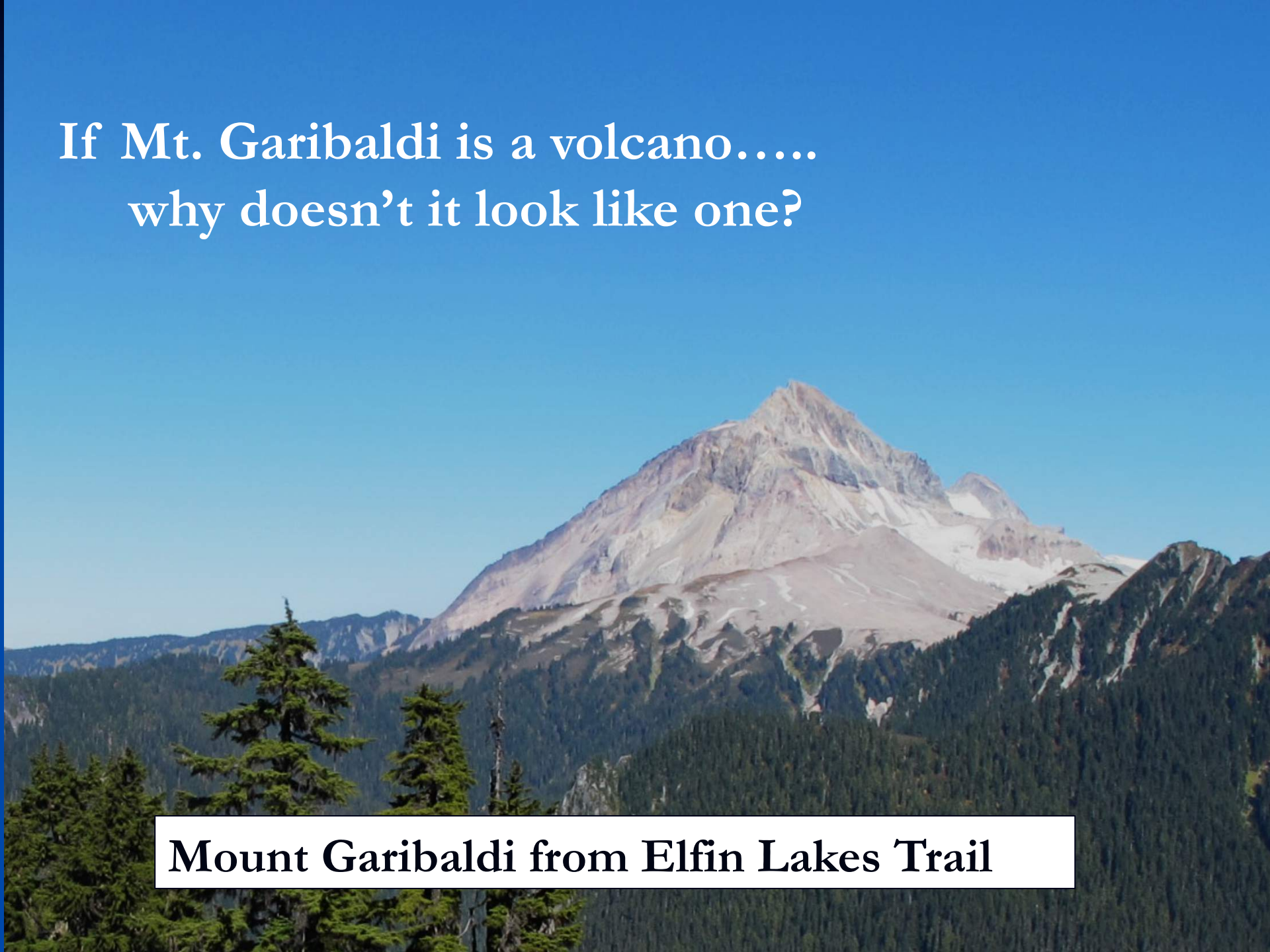
A scenic mountain landscape featuring a dirt path that winds through a forest of evergreen trees. In the background, majestic mountains with patches of snow are visible under a clear blue sky. The foreground shows a mix of brown soil and small rocks, indicating a volcanic environment.

Granite

Volcanic rock

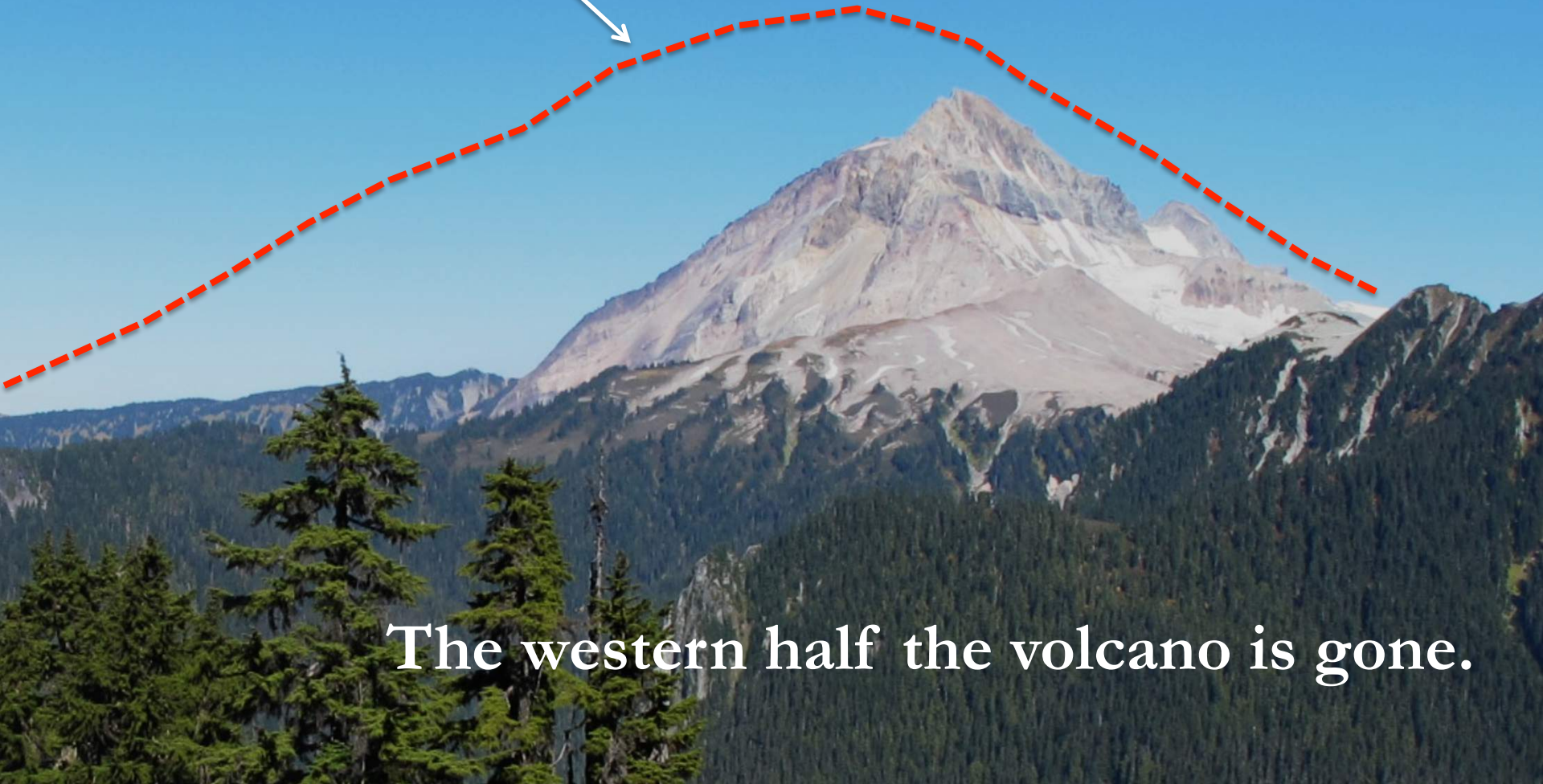
Soft underlying volcanic rocks
weather to soft ridges and rich soils.

If Mt. Garibaldi is a volcano.....
why doesn't it look like one?



Mount Garibaldi from Elfin Lakes Trail

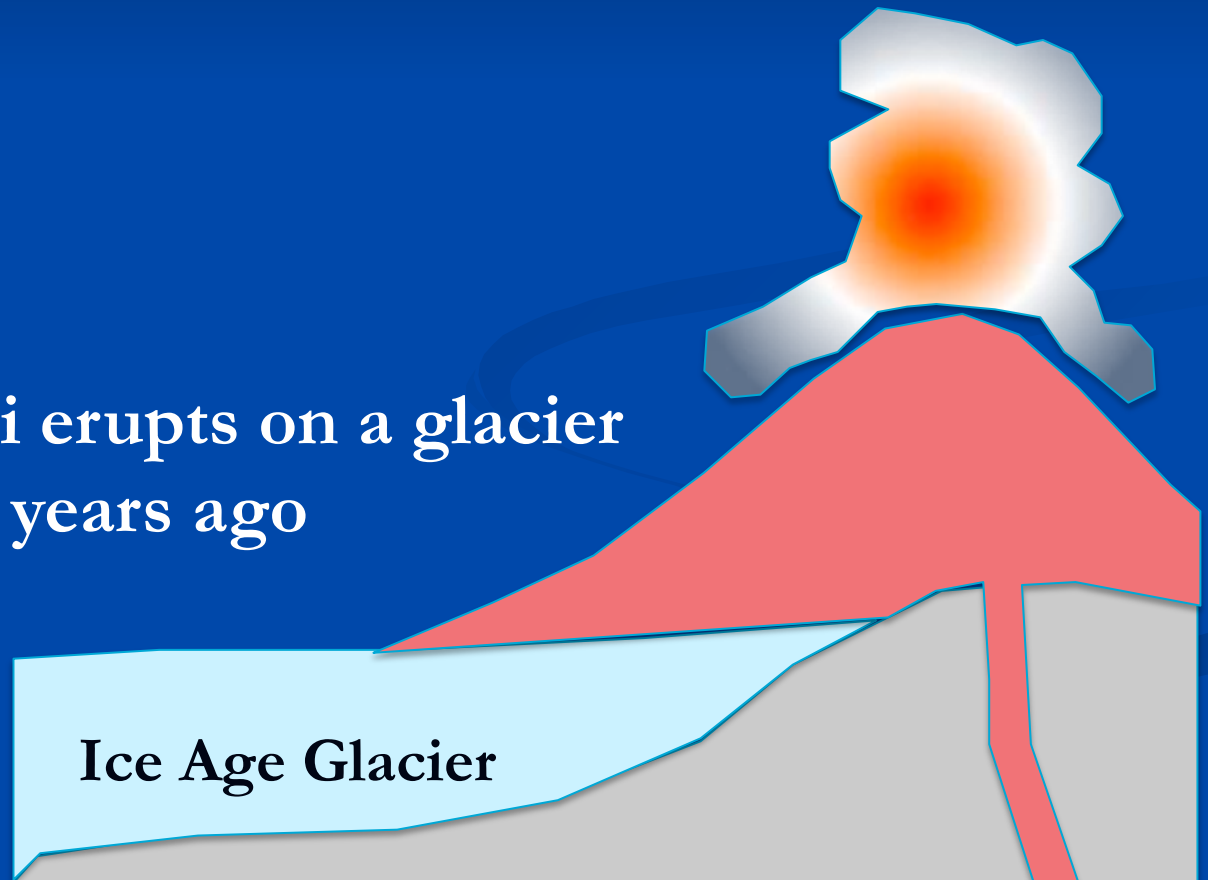
Original shape of
volcano



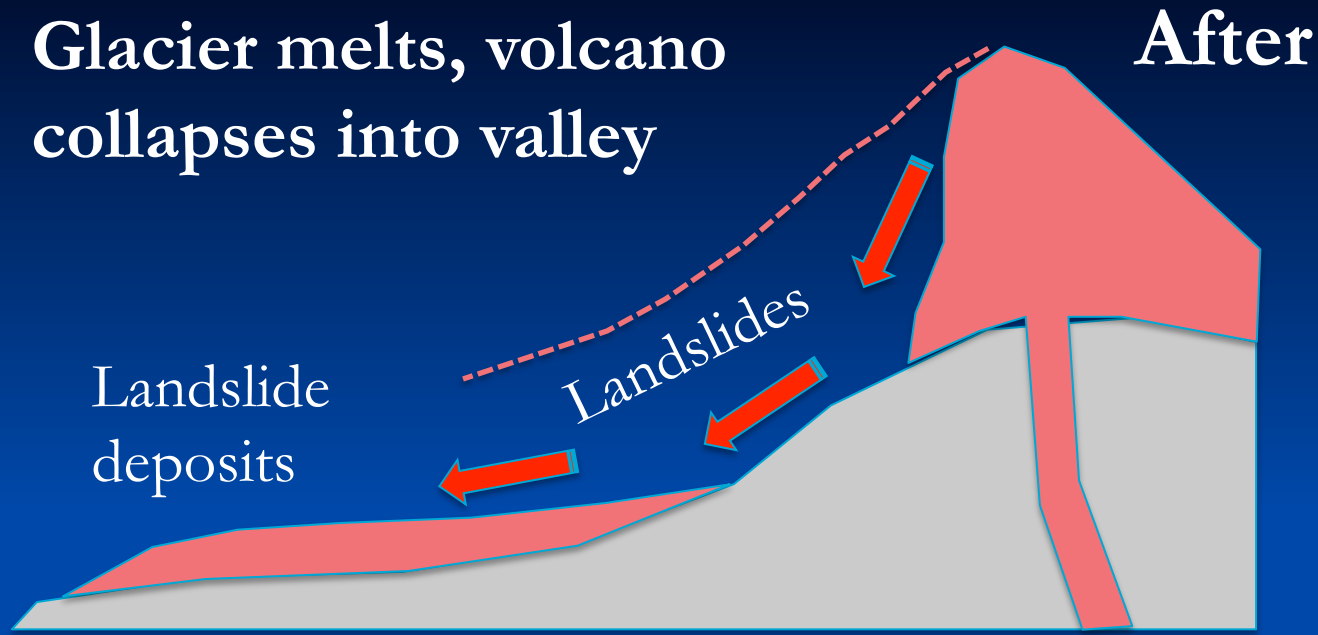
The western half the volcano is gone.

Before

Mount Garibaldi erupts on a glacier
11,000 years ago

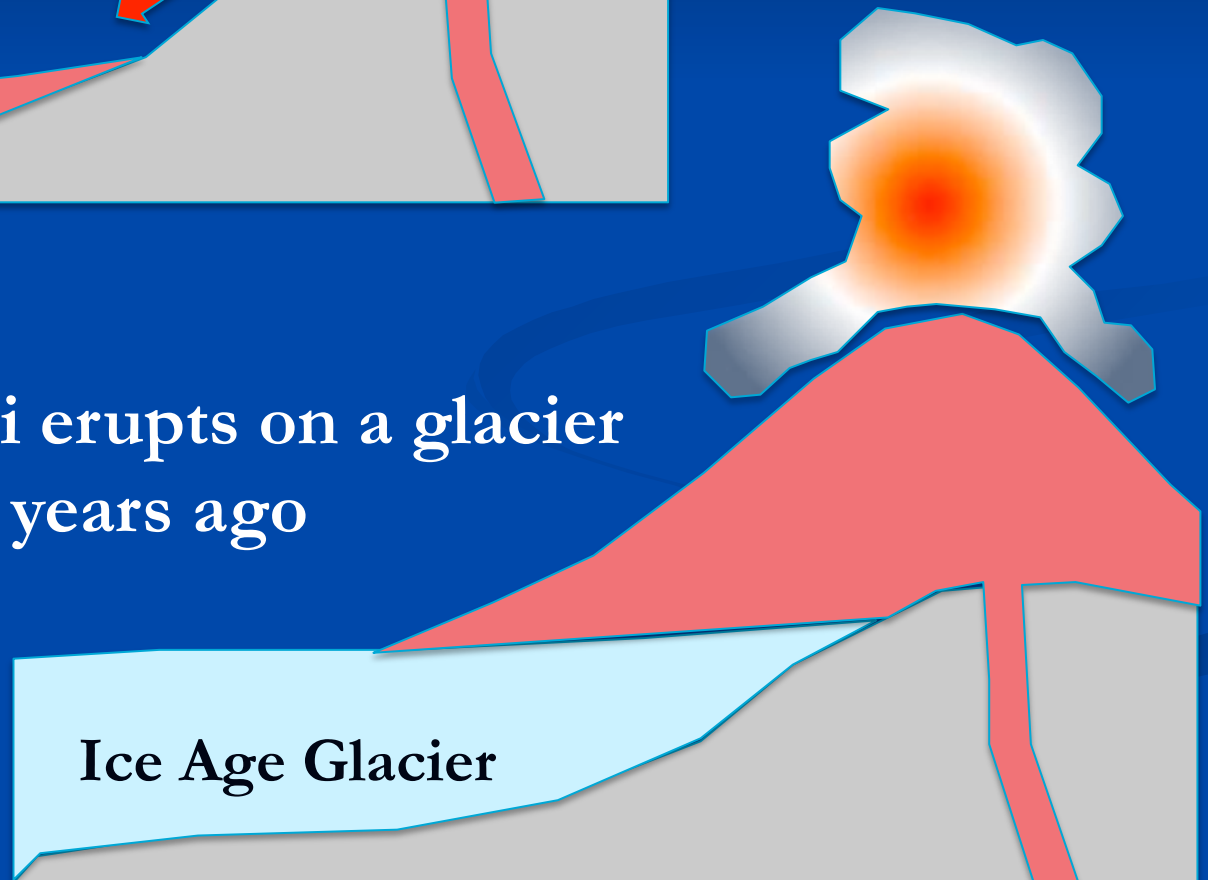


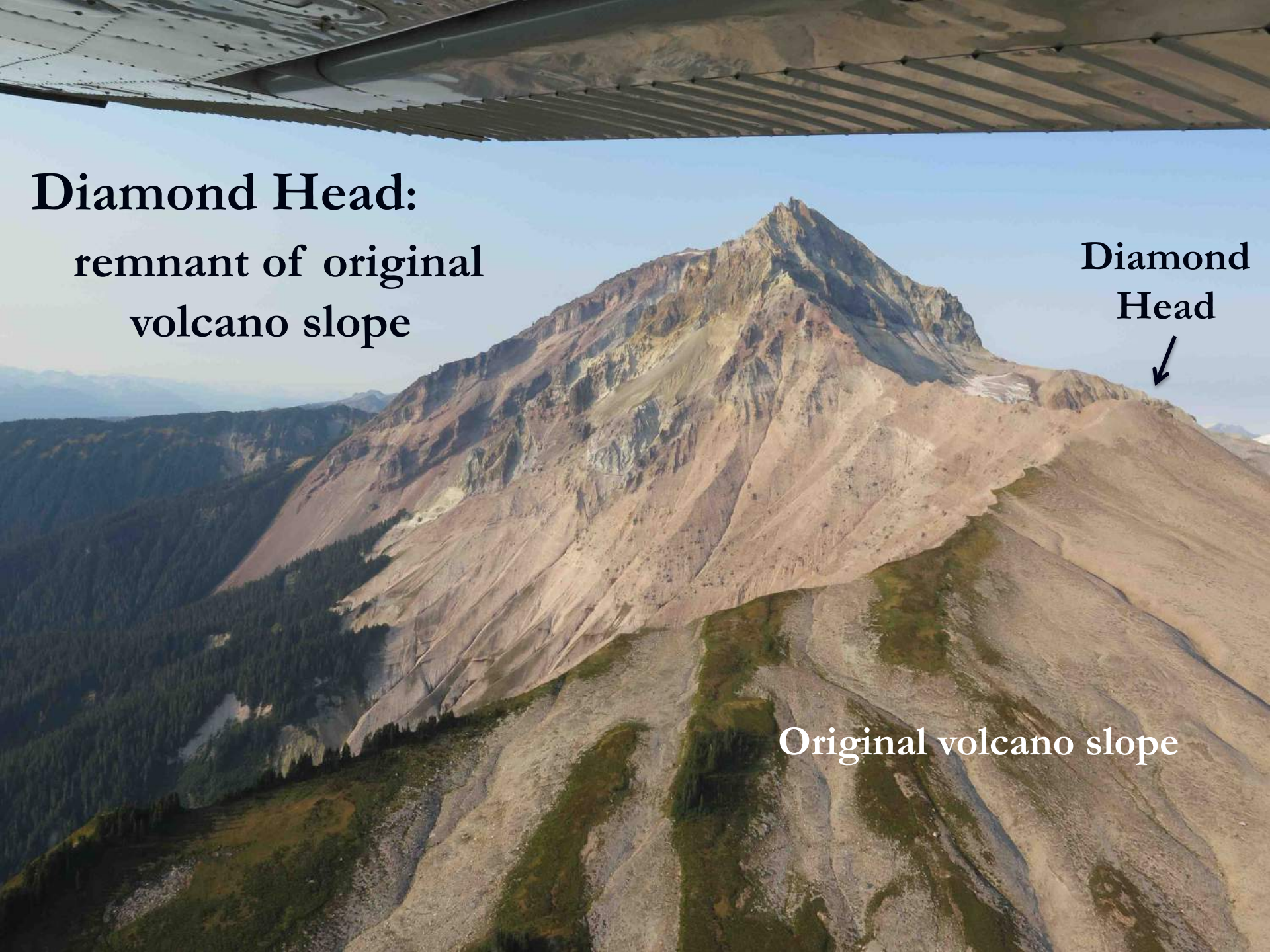
Glacier melts, volcano
collapses into valley



Before

Mount Garibaldi erupts on a glacier
11,000 years ago





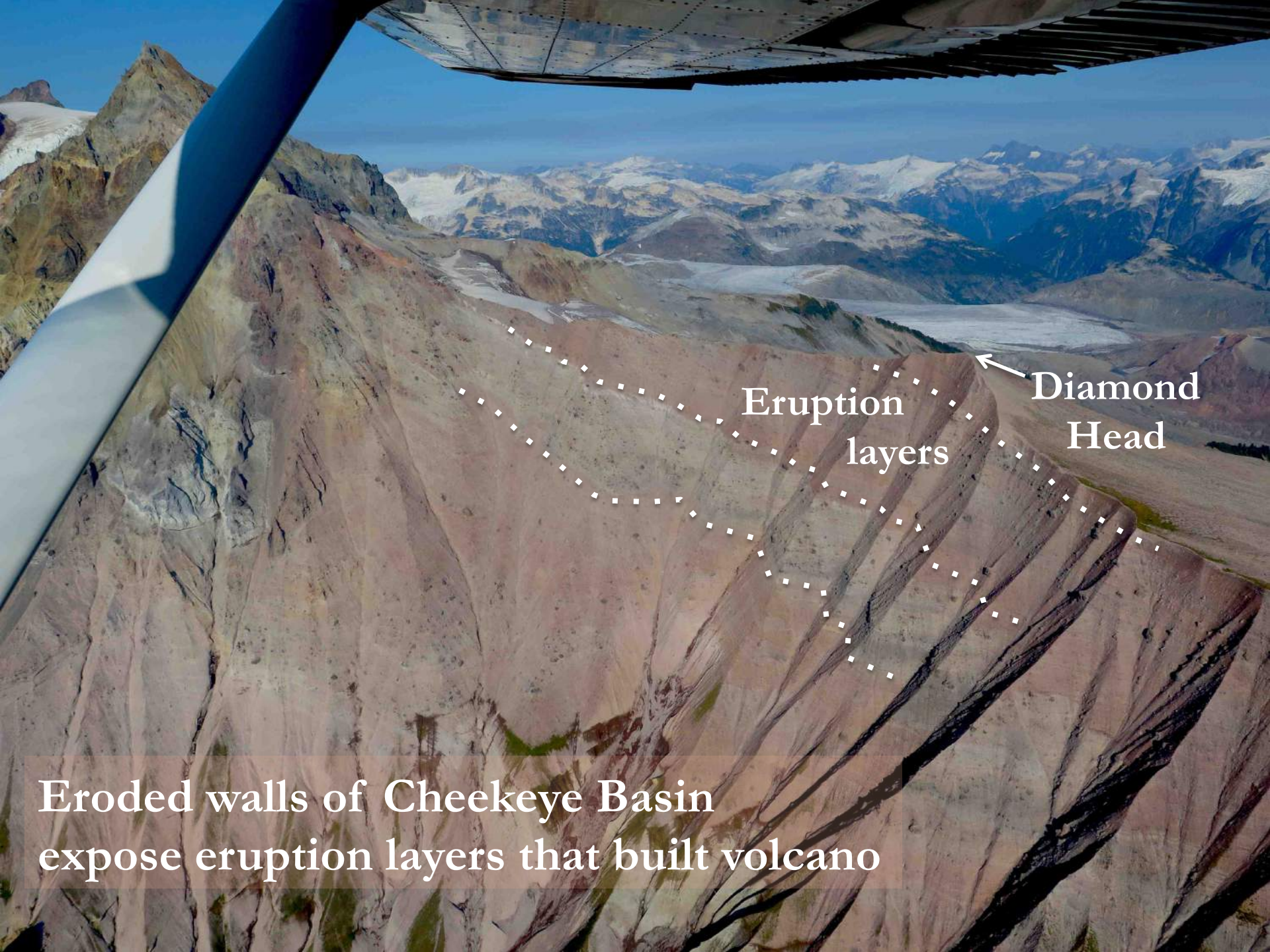
Diamond Head:
remnant of original
volcano slope

This is an aerial photograph taken from a helicopter, looking down at the Diamond Head volcano. The top of the frame shows the metal structure of the helicopter's rotor hub. The volcano's peak is a sharp, rocky point. The slopes are covered in light-colored, eroded volcanic material. A dark, forested valley is visible to the left. The sky is clear and blue.

**Diamond
Head**



Original volcano slope



Eruption
layers

Diamond
Head

Eroded walls of Cheekeye Basin
expose eruption layers that built volcano

Mayon volcano
“burning cloud”
Philippines
1984

Photograph by C.G. Newhall

... approaching Elfin Lakes

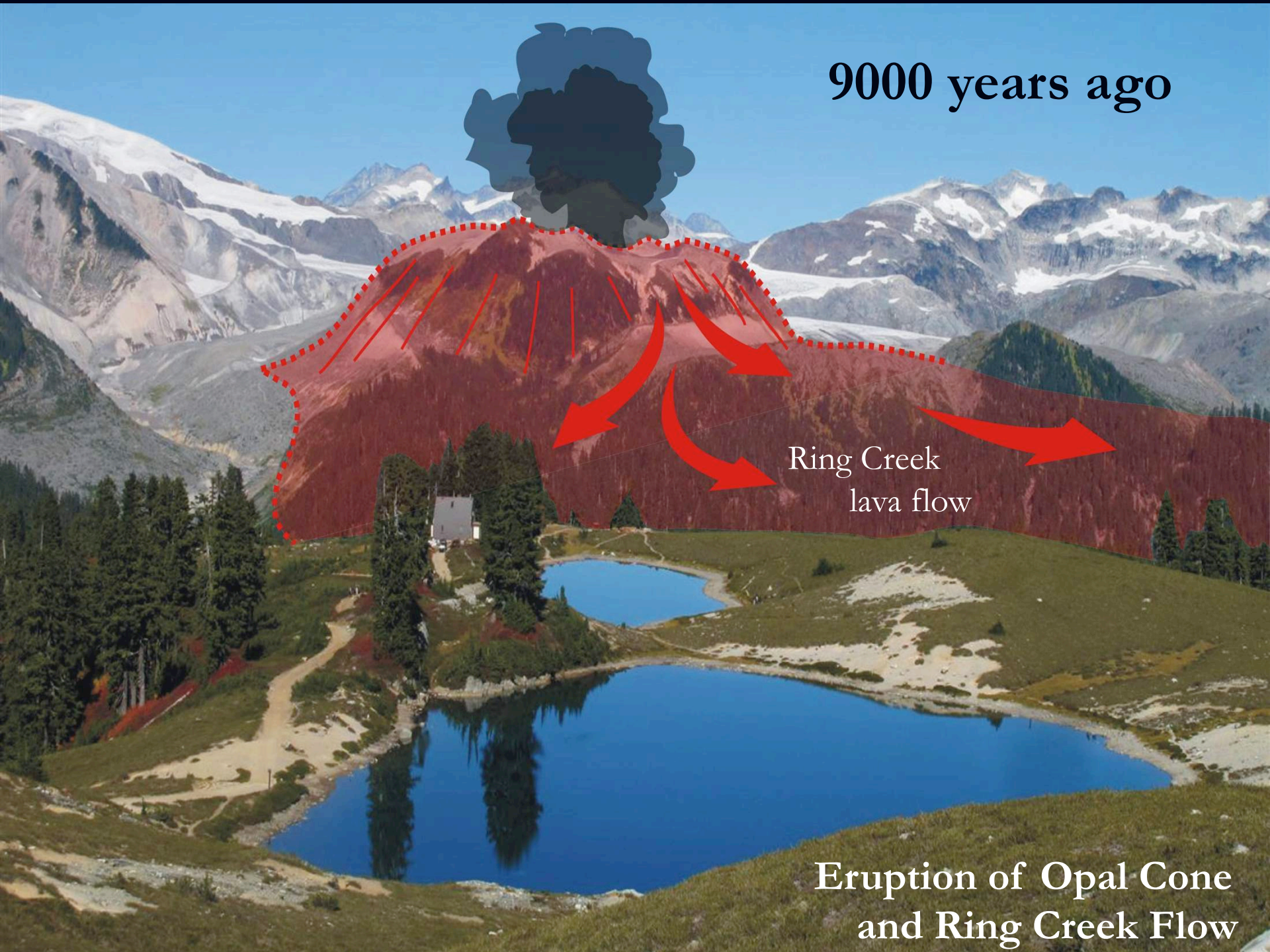


Opal Cone

Ring Creek
valley

Trail

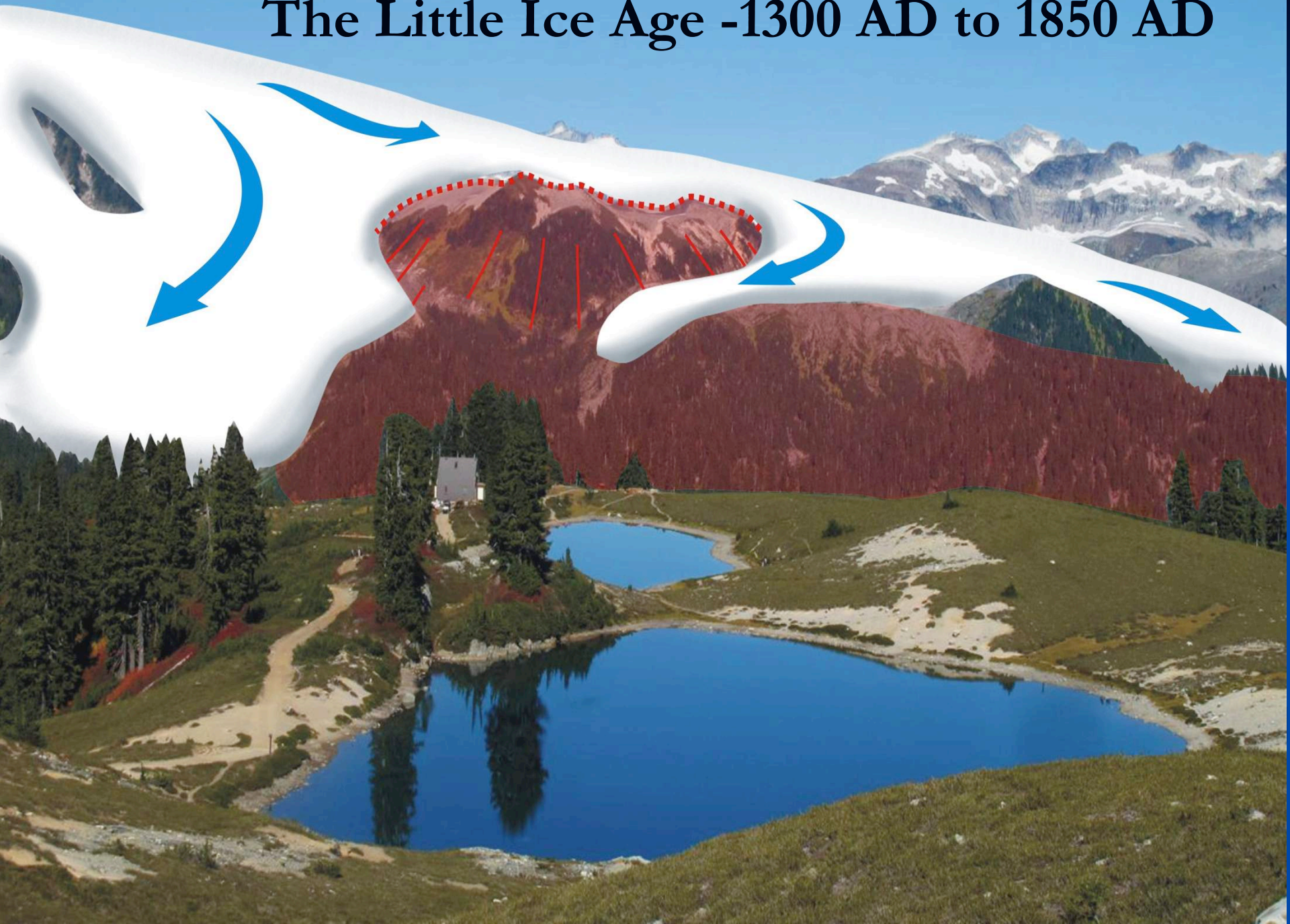
9000 years ago

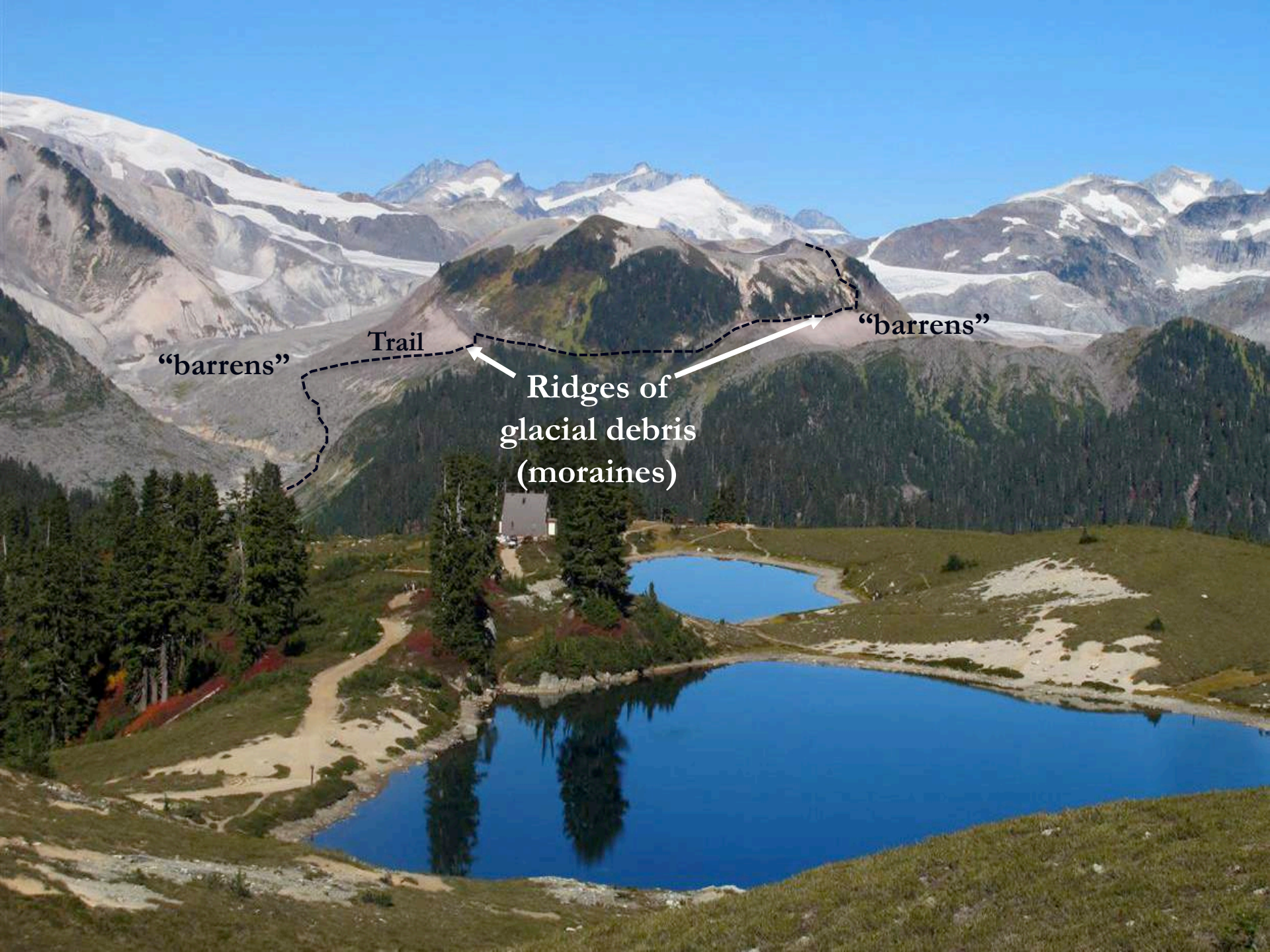


Ring Creek
lava flow

Eruption of Opal Cone
and Ring Creek Flow

The Little Ice Age -1300 AD to 1850 AD





“barrens”

Trail

Ridges of
glacial debris
(moraines)

“barrens”

Garibaldi Lake Trail

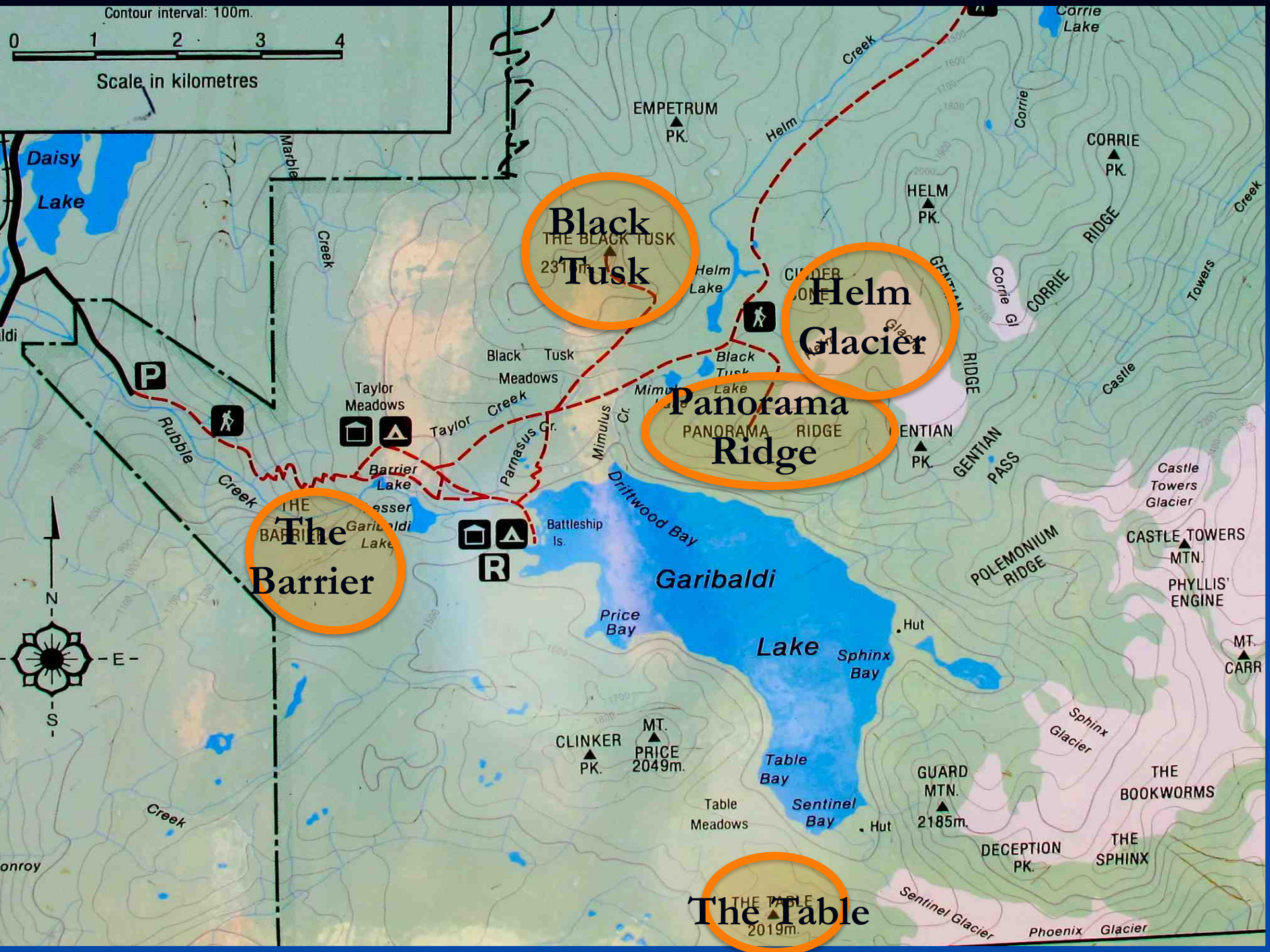


Rubble Creek trailhead

Contour interval: 100m.

0 1 2 3 4

Scale in kilometres



Warning

Slide Hazard Area

The Barrier is comprised
of unstable volcanic rock.



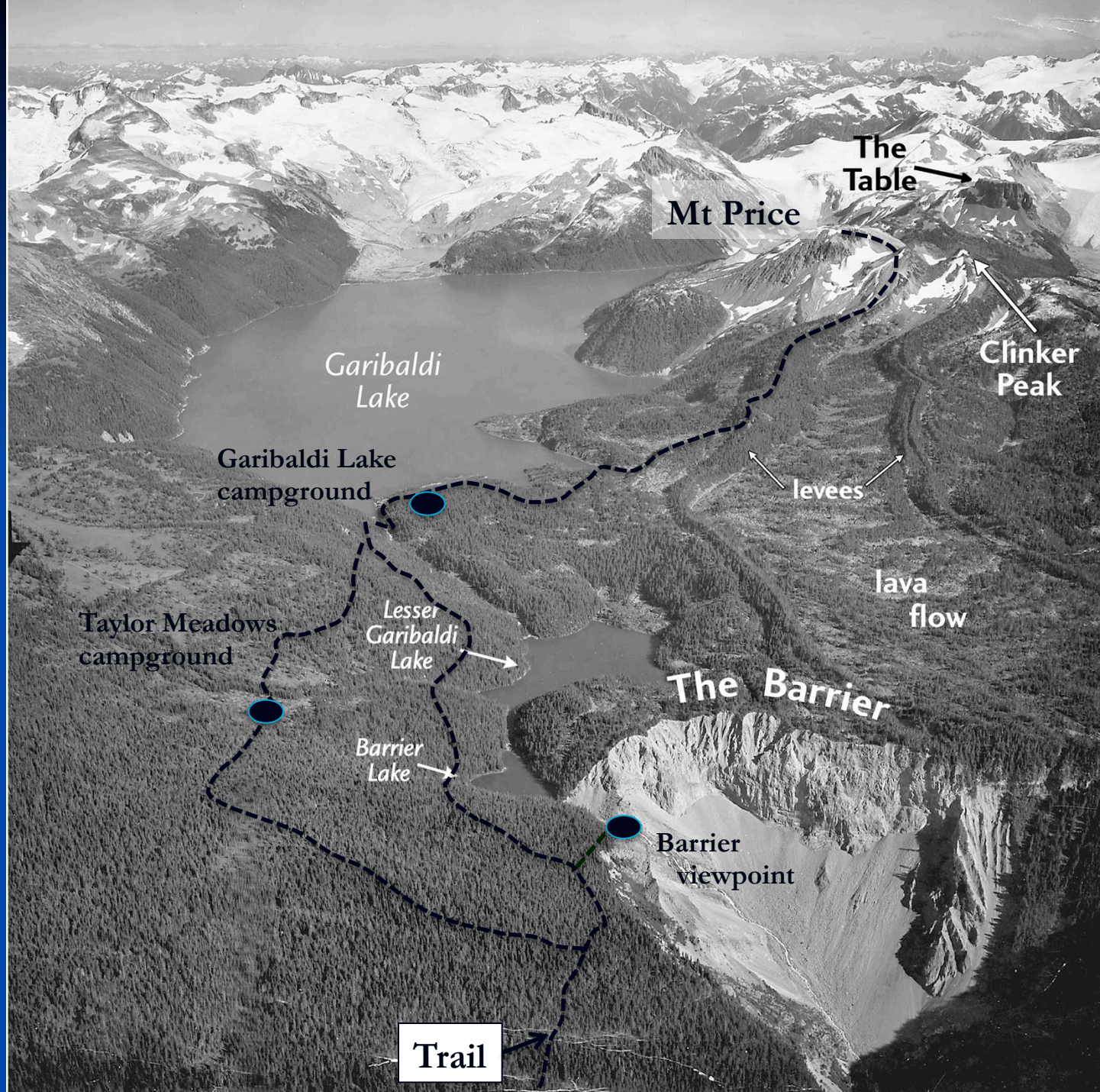
Overnight camping is
prohibited in this area.

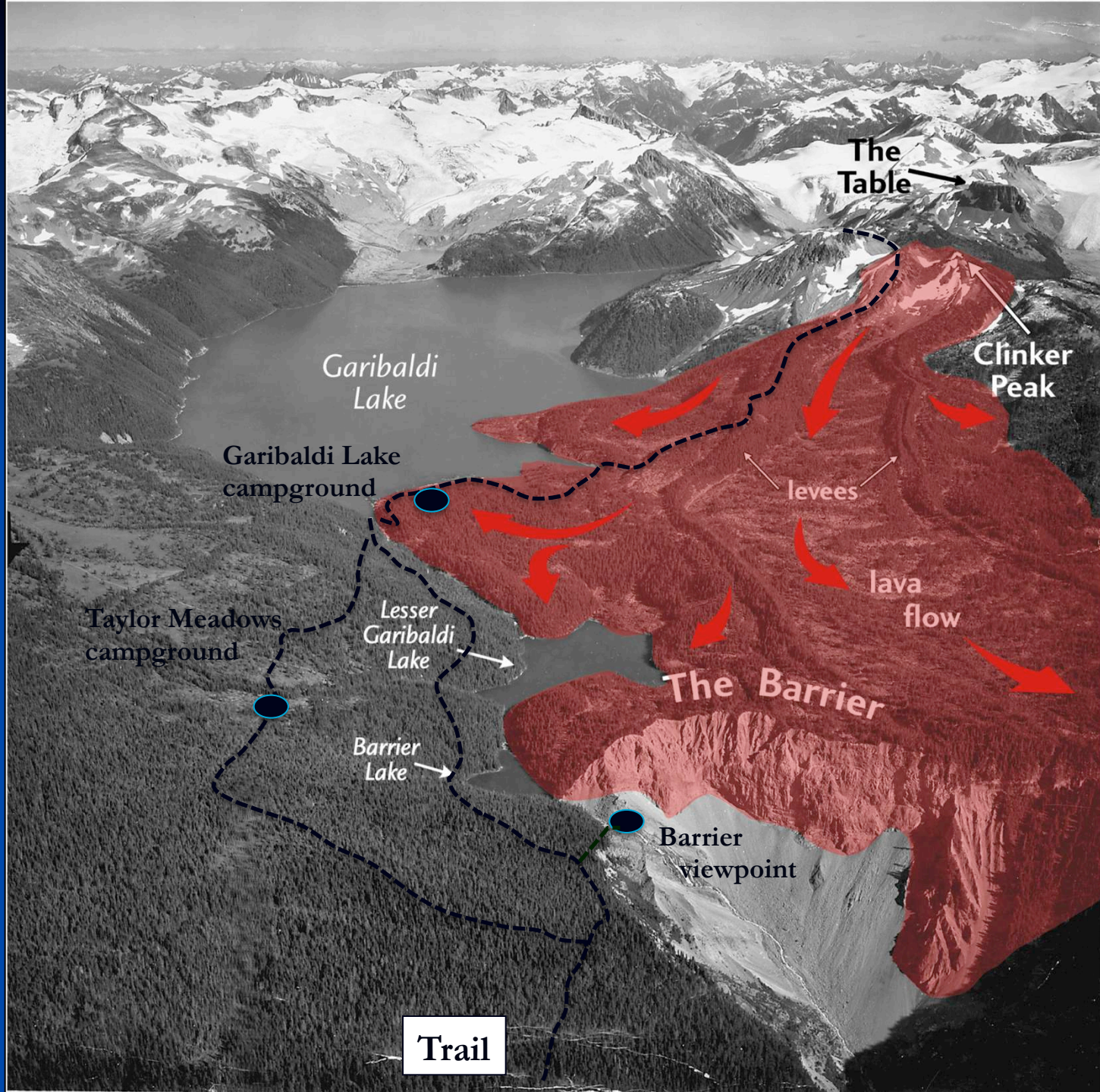


BC Parks



The Barrier





The
Table

Clinker
Peak

Garibaldi
Lake

Garibaldi Lake
campground

levees

lava
flow

Taylor Meadows
campground

Lesser
Garibaldi
Lake

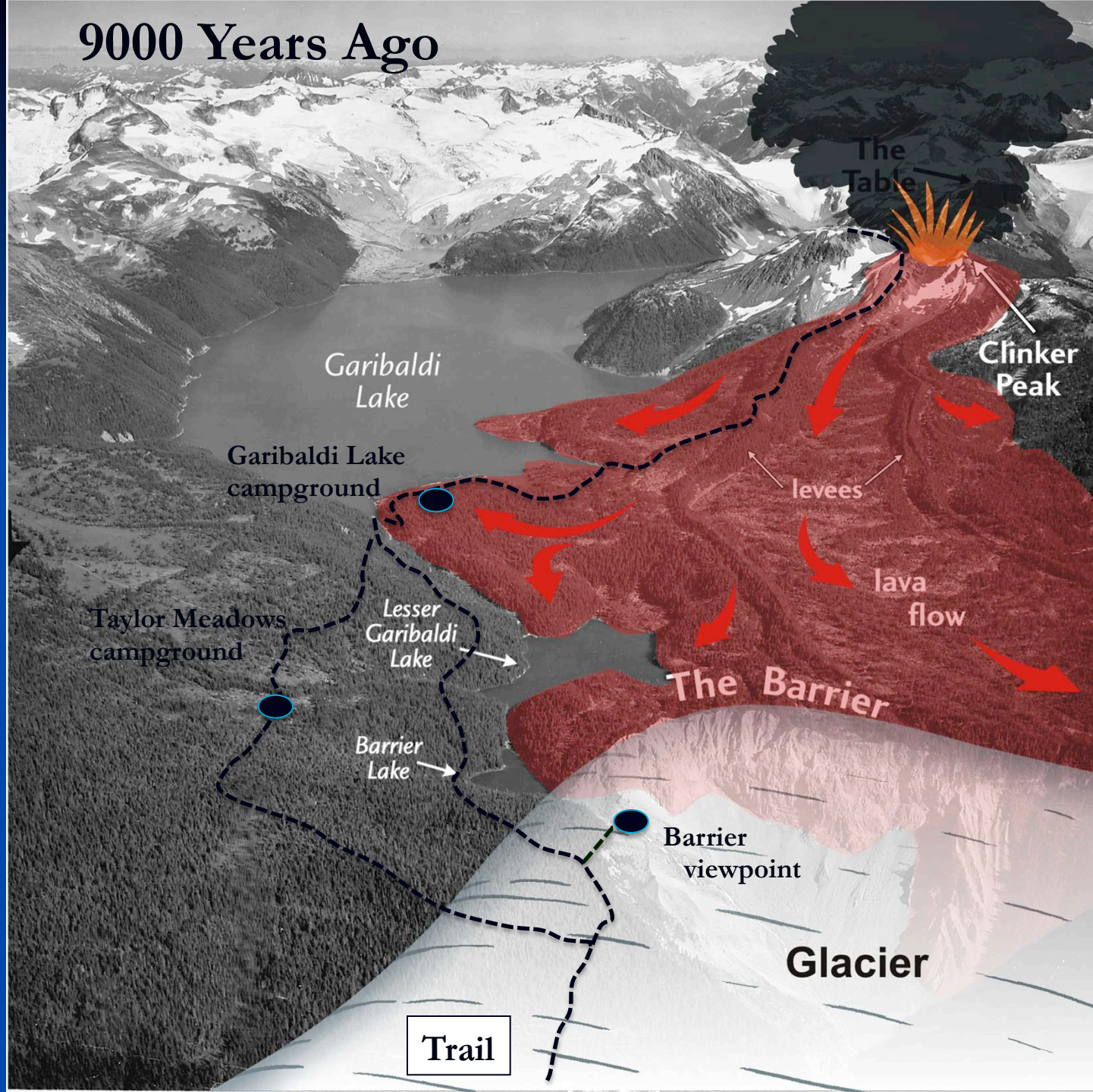
Barrier
Lake

The Barrier

Barrier
viewpoint

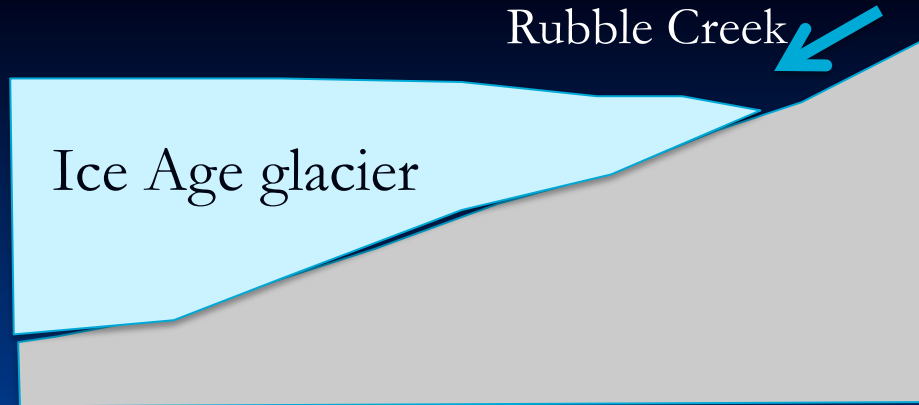
Trail

9000 Years Ago



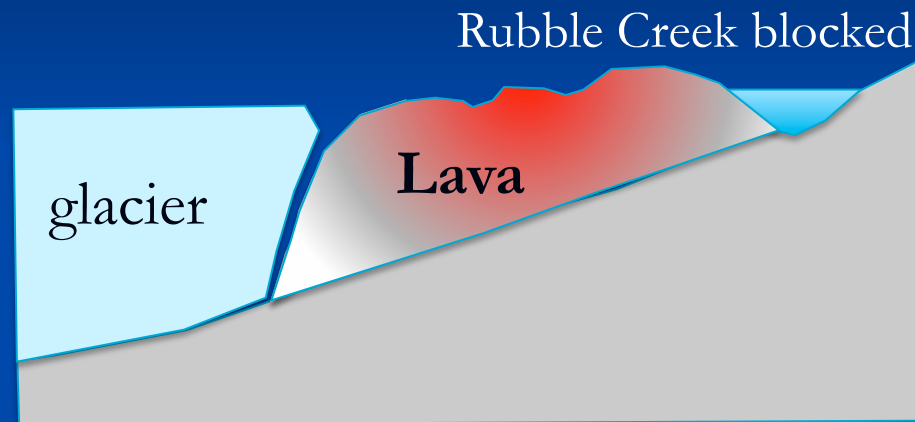
10,000 years ago

Ice Age glacier fills valley



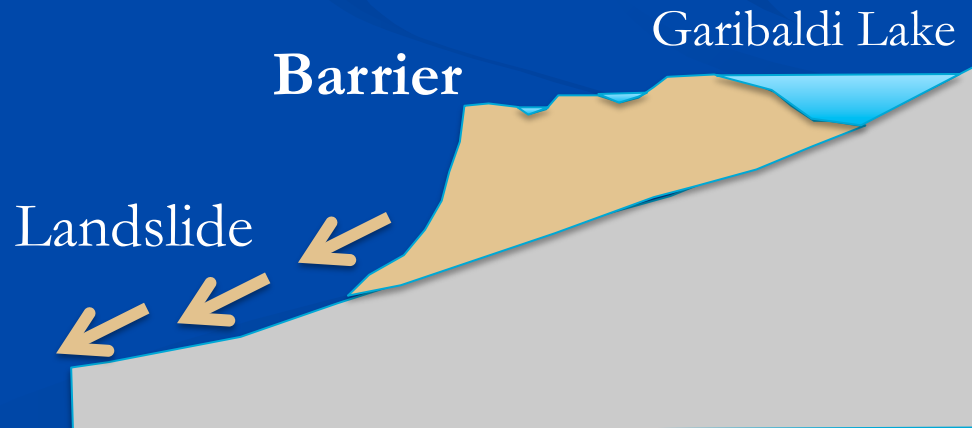
9000 years ago

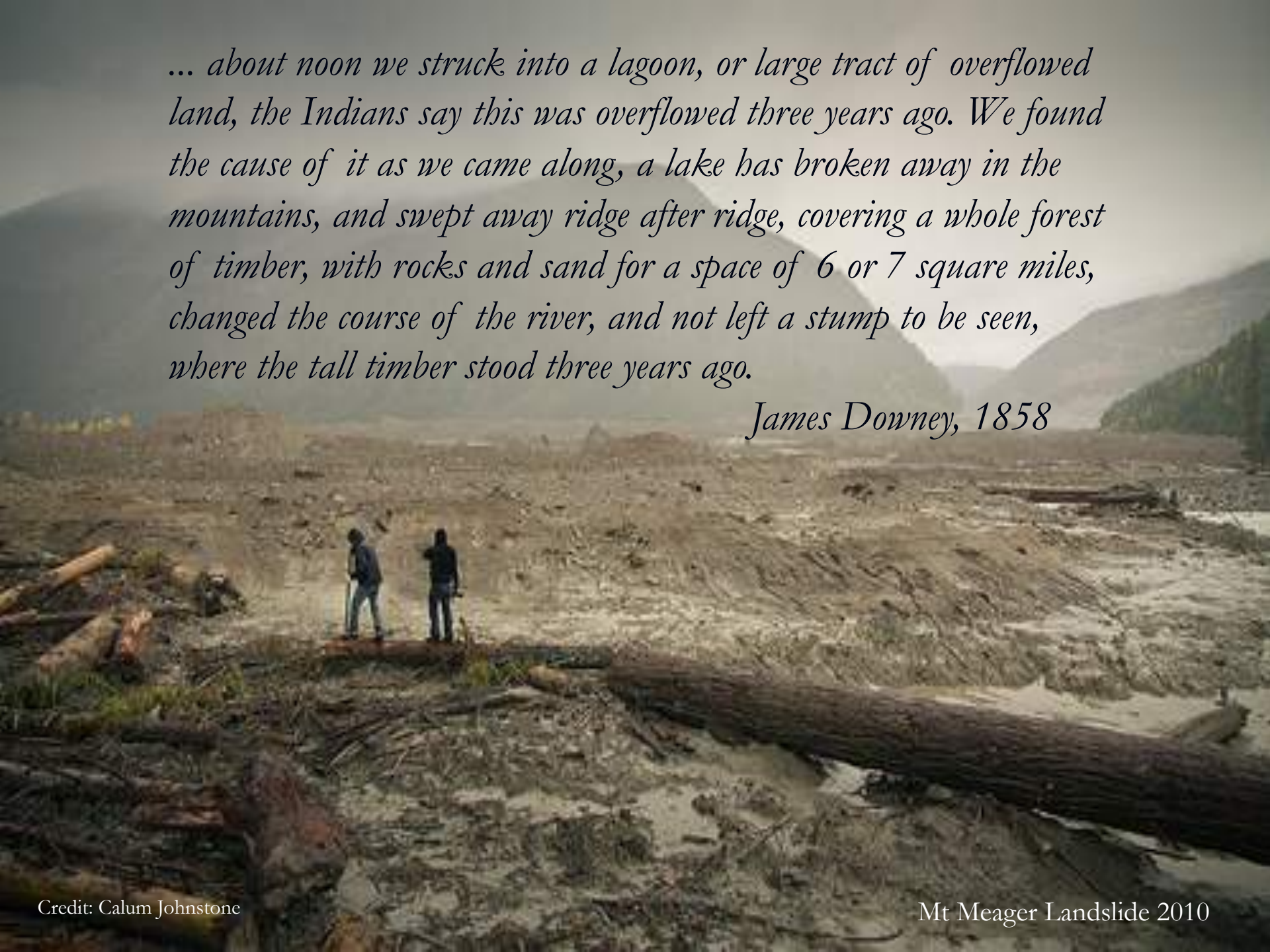
Lava flow blocks valley,
melts glacier



Today

Steep unstable
lava wall



A photograph of a massive landslide area. In the foreground, two people are standing on a large, dark log that lies horizontally across the frame. The ground is a vast, flat expanse of light-colored sand and silt, littered with debris and smaller logs. In the background, there are hazy, forested mountains under a grey, overcast sky. The overall scene depicts the aftermath of a significant geological event.

... about noon we struck into a lagoon, or large tract of overflowed land, the Indians say this was overflowed three years ago. We found the cause of it as we came along, a lake has broken away in the mountains, and swept away ridge after ridge, covering a whole forest of timber, with rocks and sand for a space of 6 or 7 square miles, changed the course of the river, and not left a stump to be seen, where the tall timber stood three years ago.

James Downey, 1858

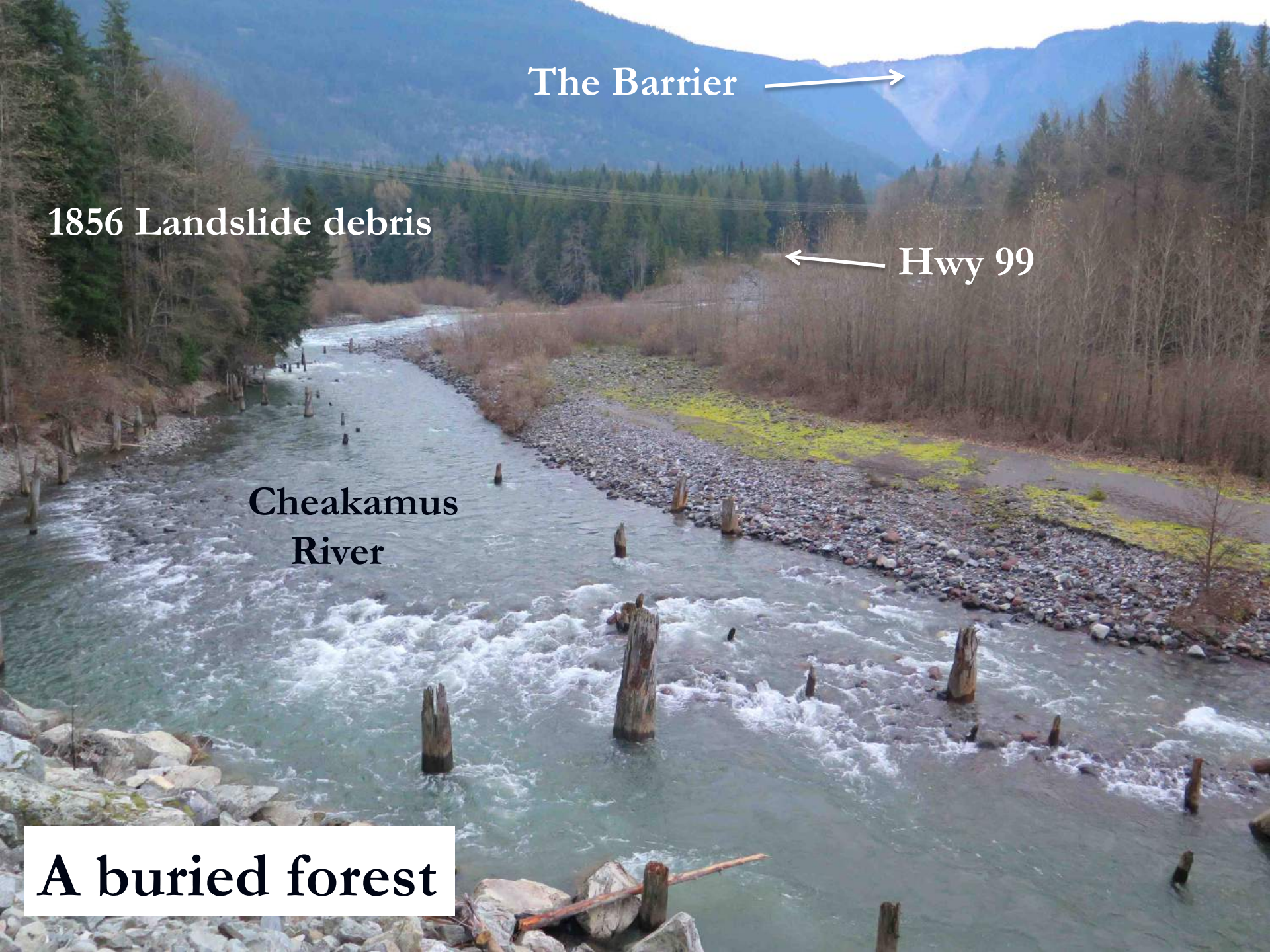
The Barrier →

1856 Landslide debris

← Hwy 99

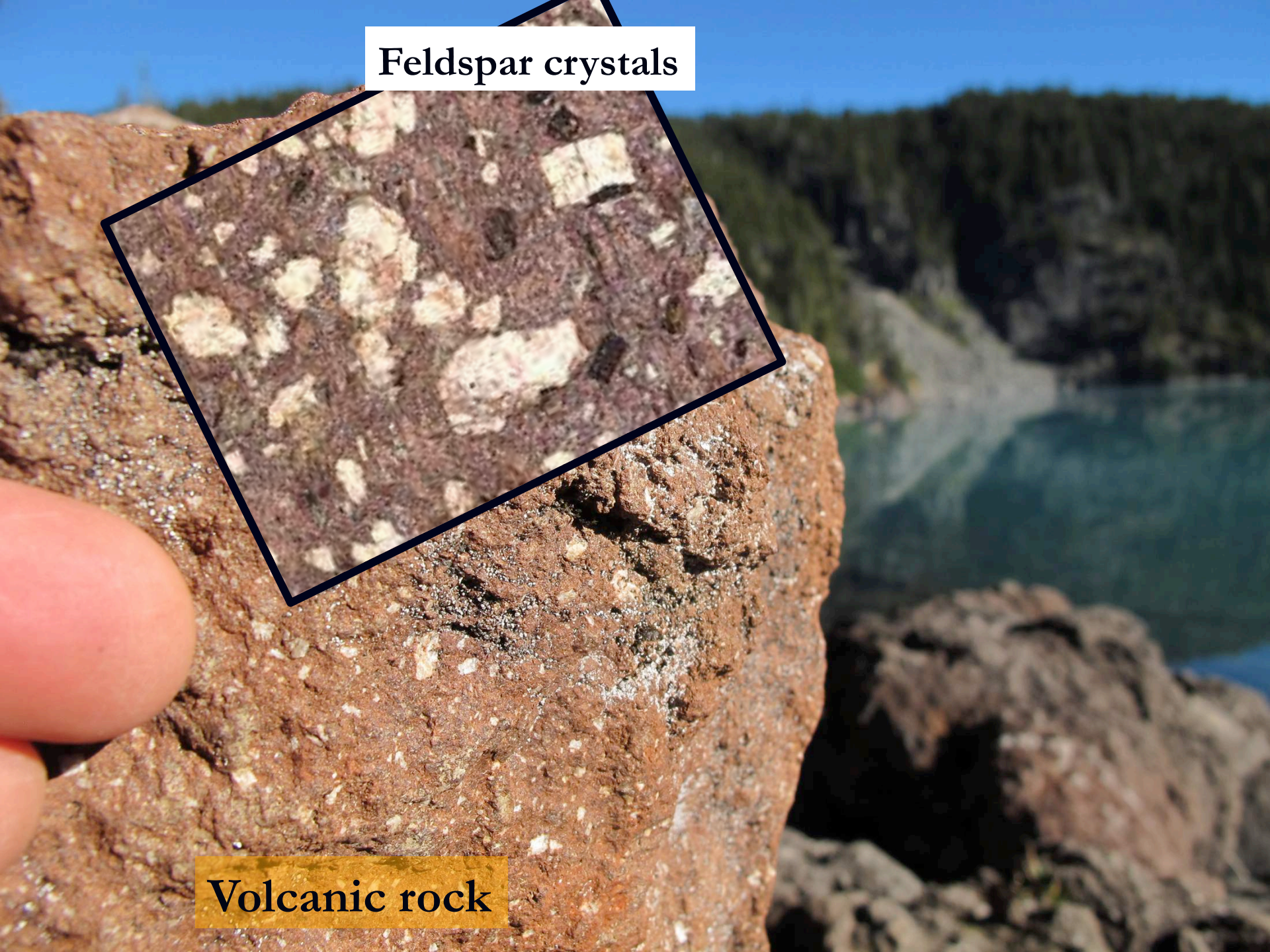
Cheakamus
River

A buried forest



Garibaldi Lake Campground – on a lava flow!



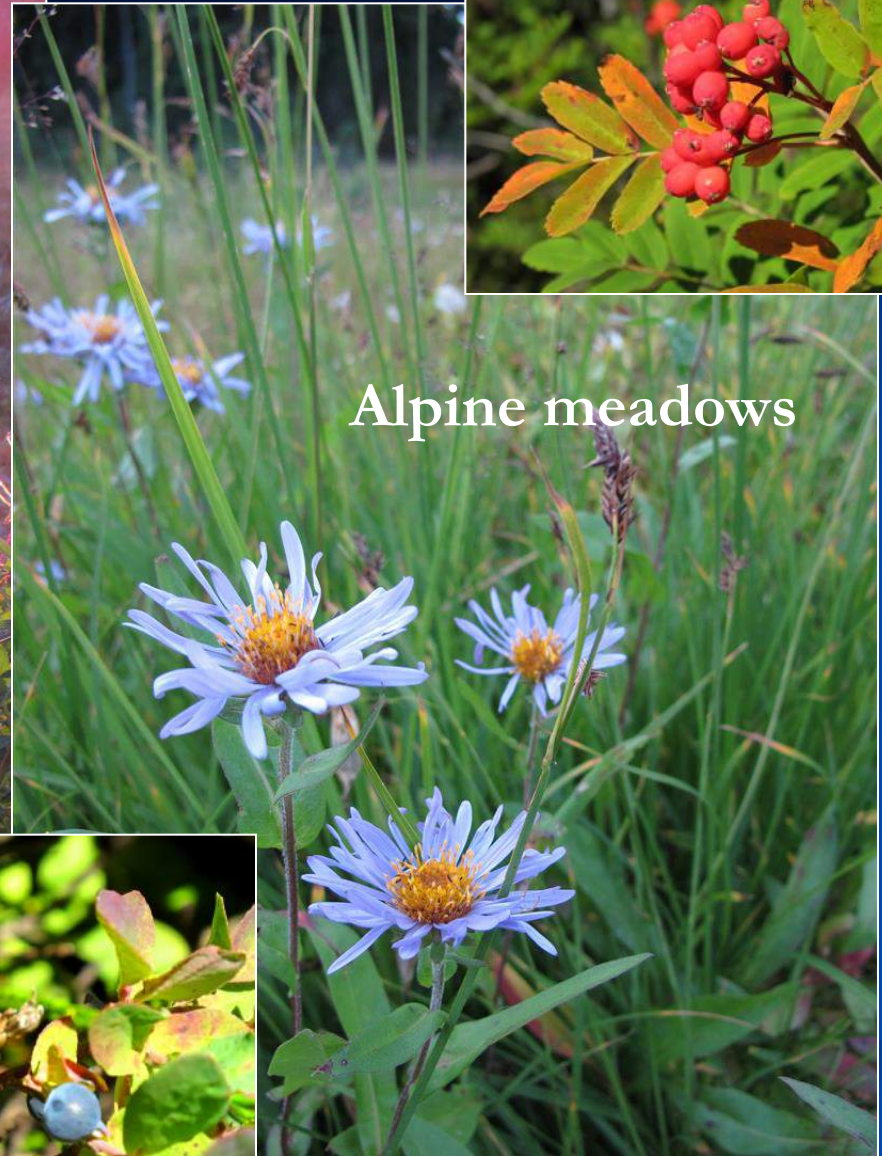


Feldspar crystals

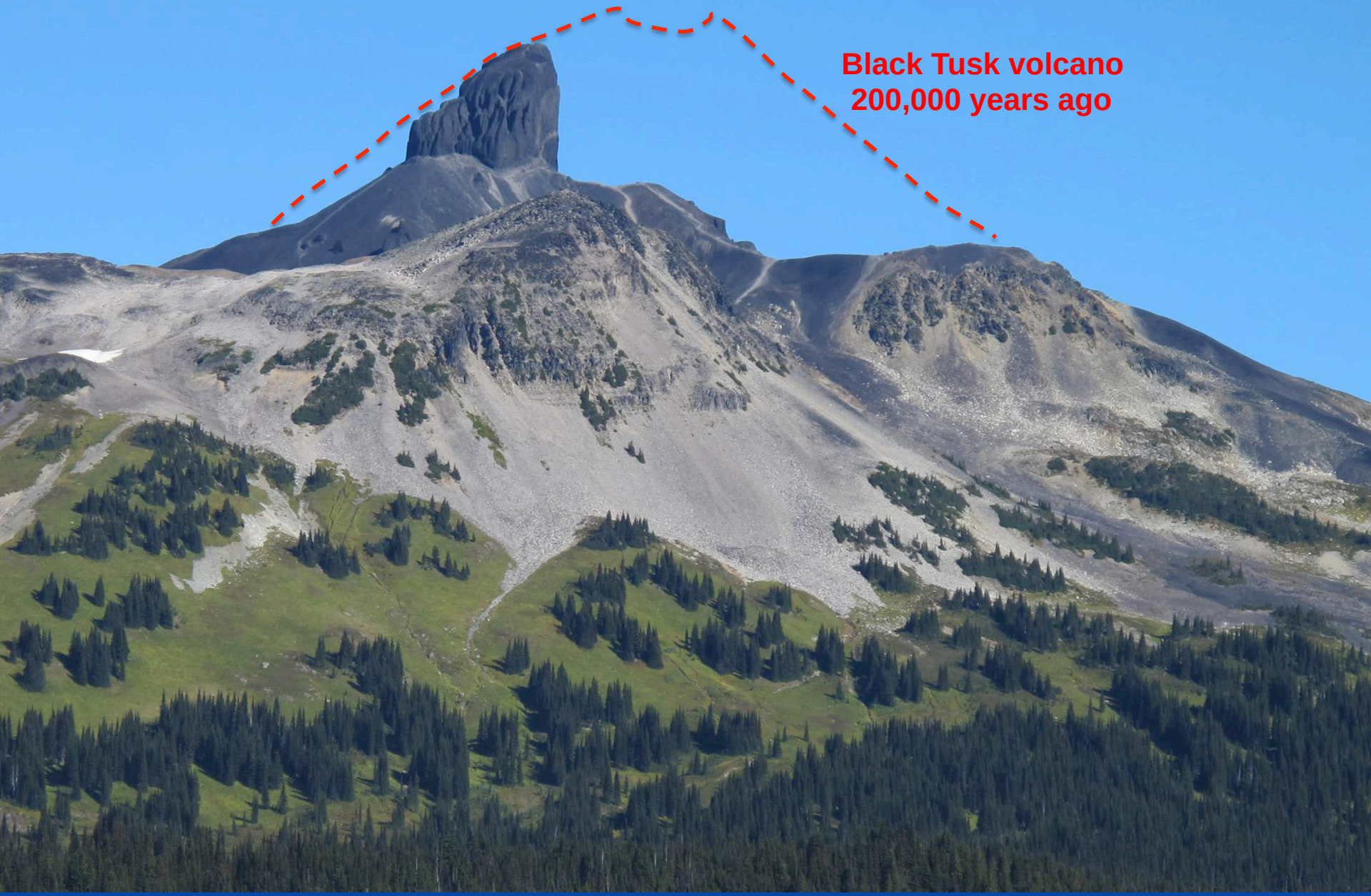
Volcanic rock

... Up Black Tusk!





Black Tusk: the eroded remnant of a volcano



**Black Tusk volcano
200,000 years ago**



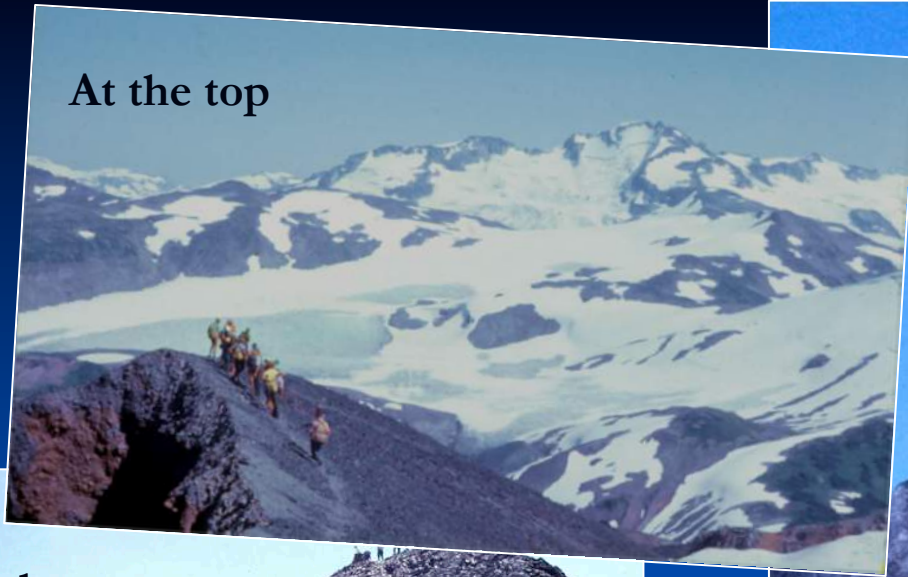
Remnant surface of volcano

Magma feeder
of volcano



trail

At the top



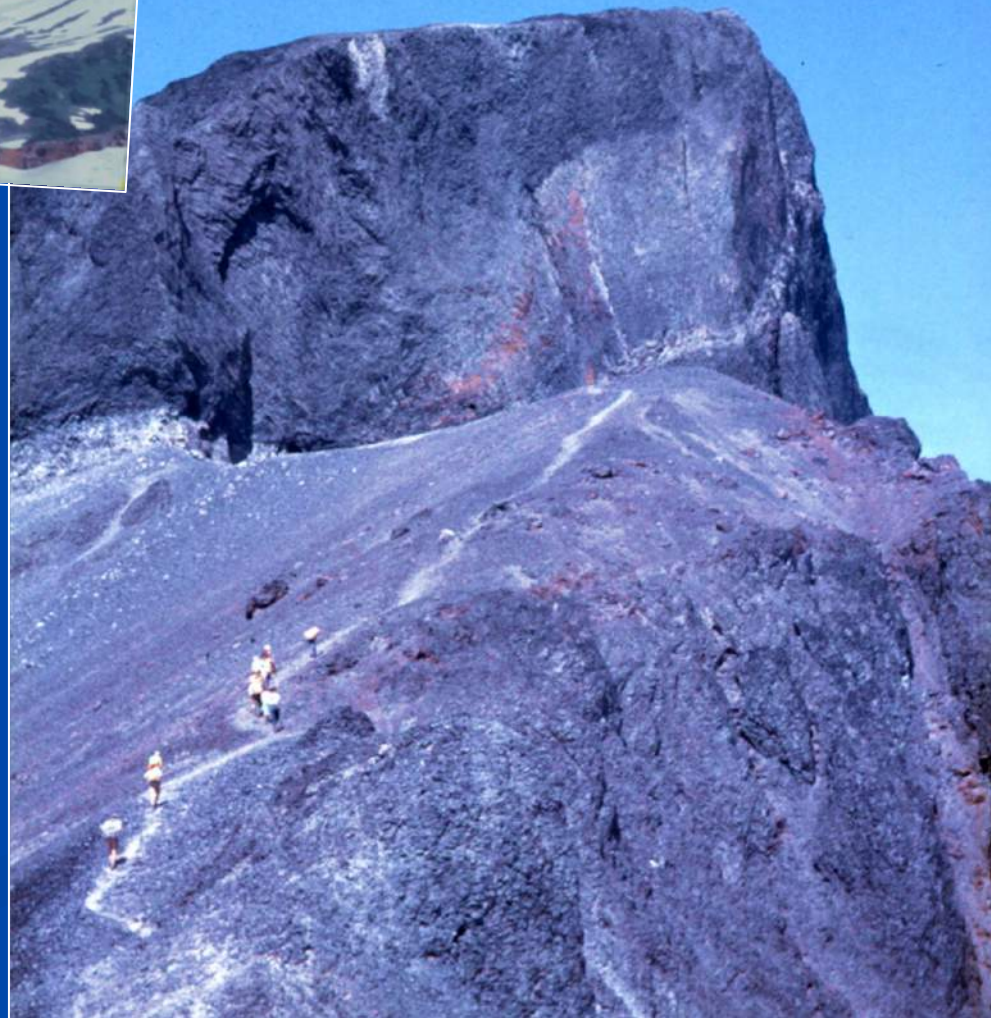
On the
upper slope



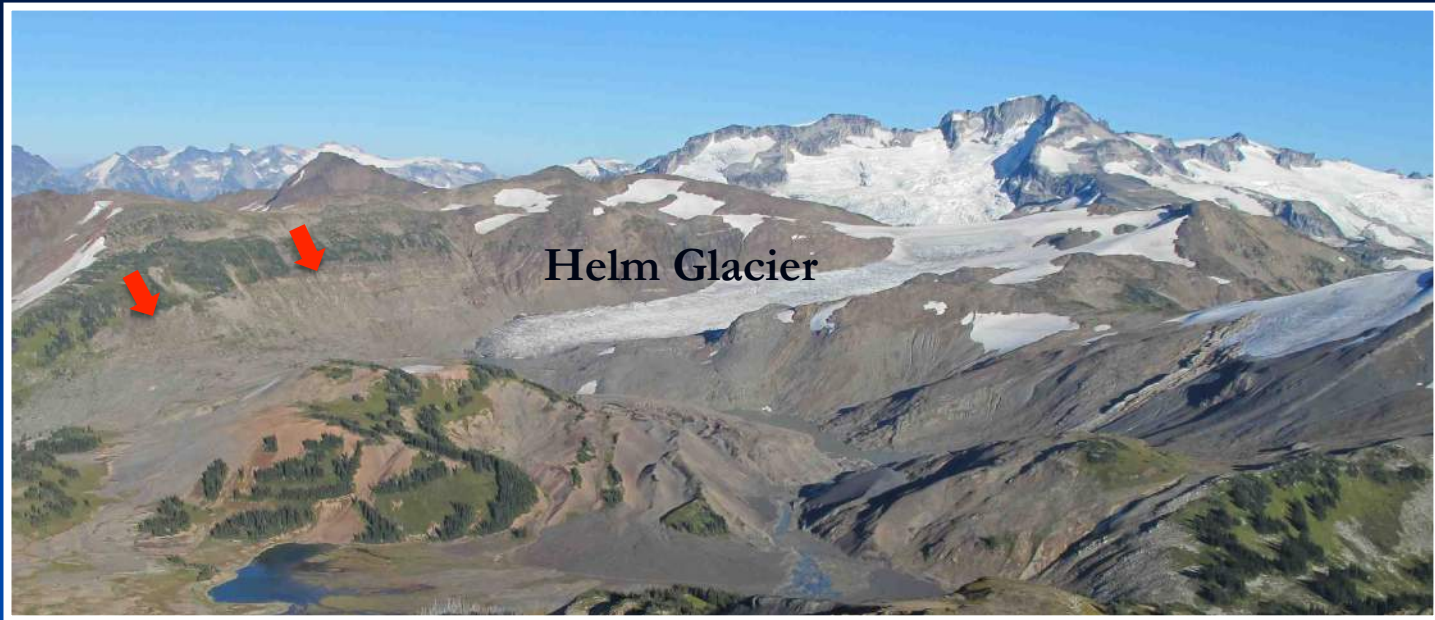
In the chimney



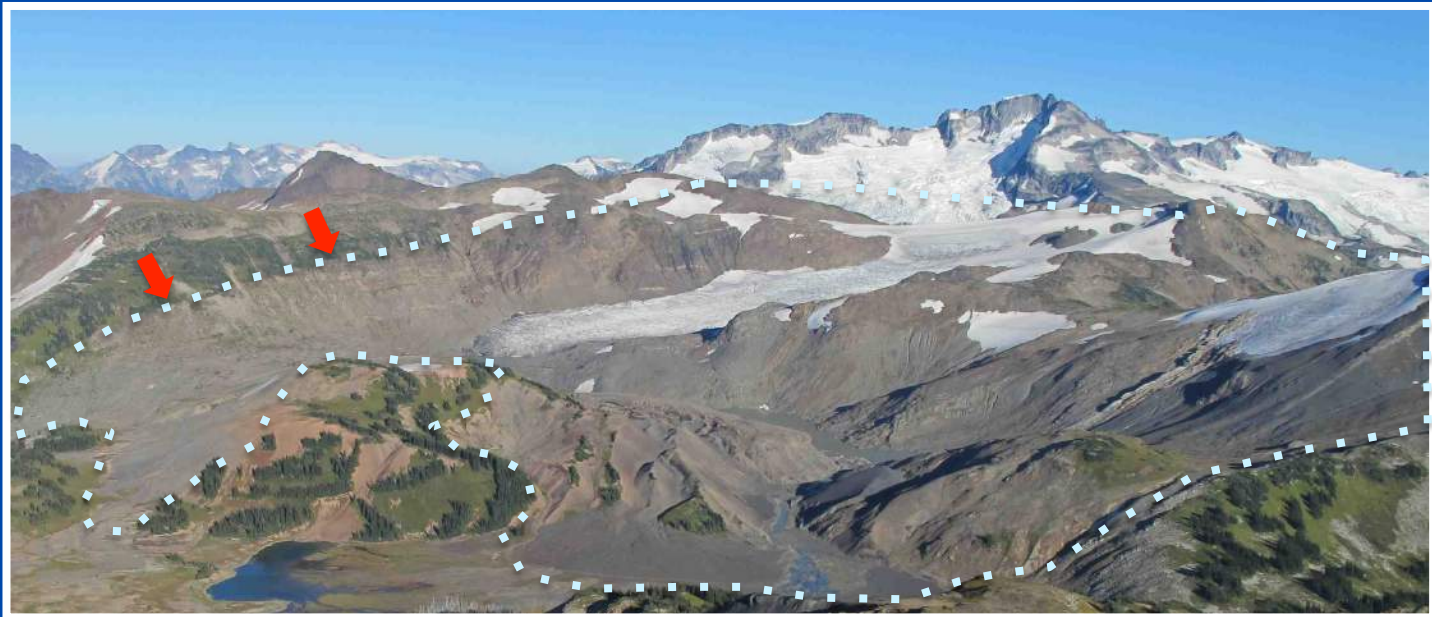
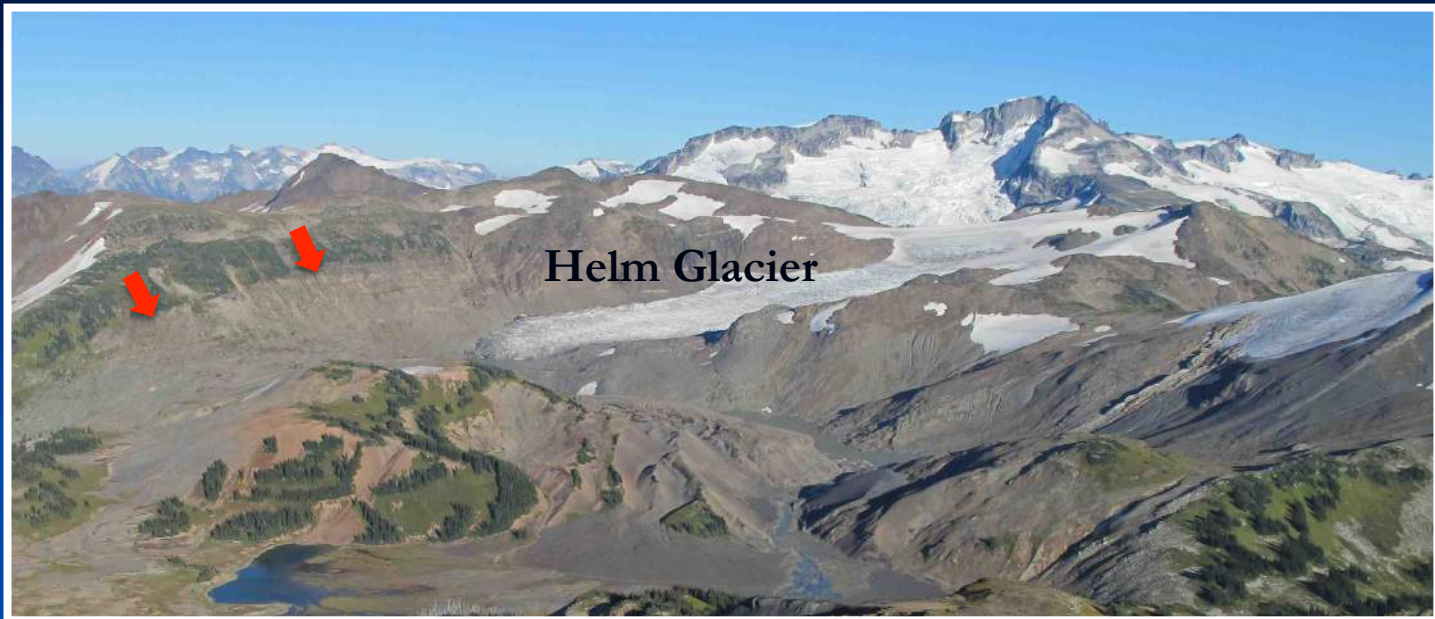
1952 Black Tusk hike



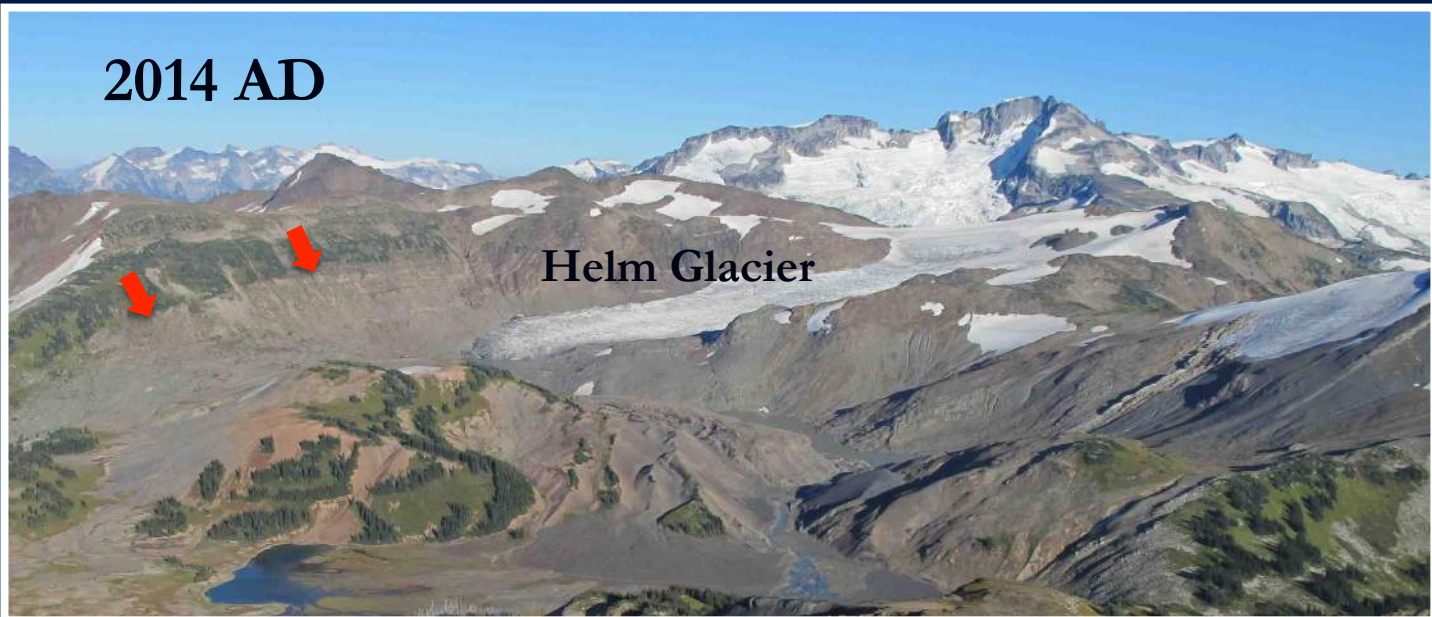
View east from Black Tusk – a shrinking glacier!



View east from Black Tusk – a shrinking glacier!



2014 AD

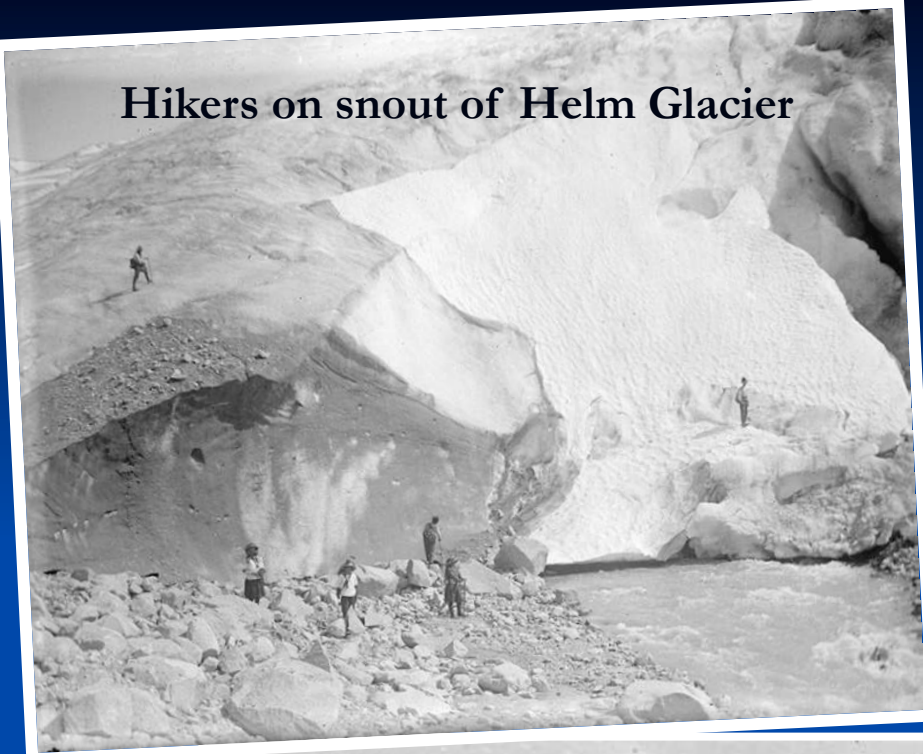


1800 AD

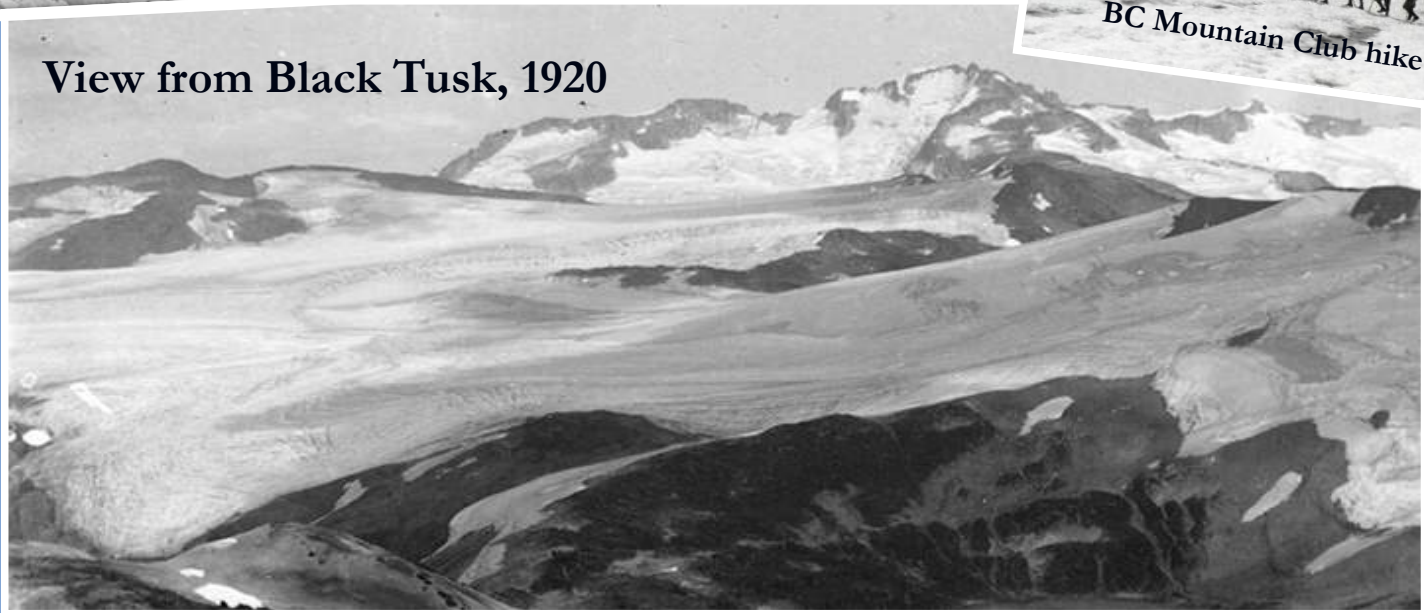


Helm Glacier 1910s and 1920s

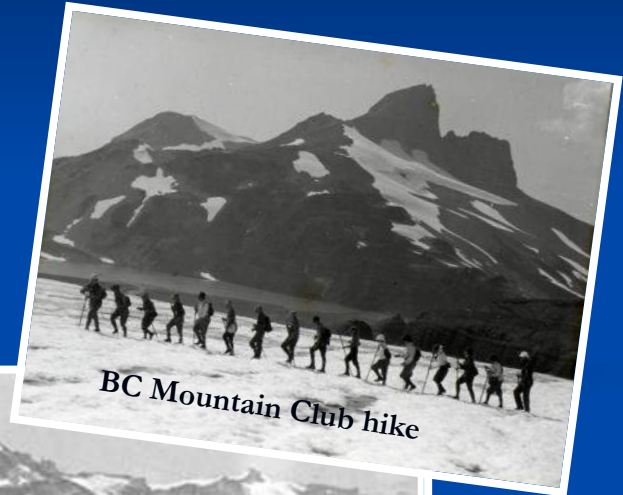
Hikers on snout of Helm Glacier



View from Black Tusk, 1920



BC Mountain Club hike



View from Black Tusk: Panorama Ridge and Trail





Panorama Ridge view

more than a beautiful lake a curious one

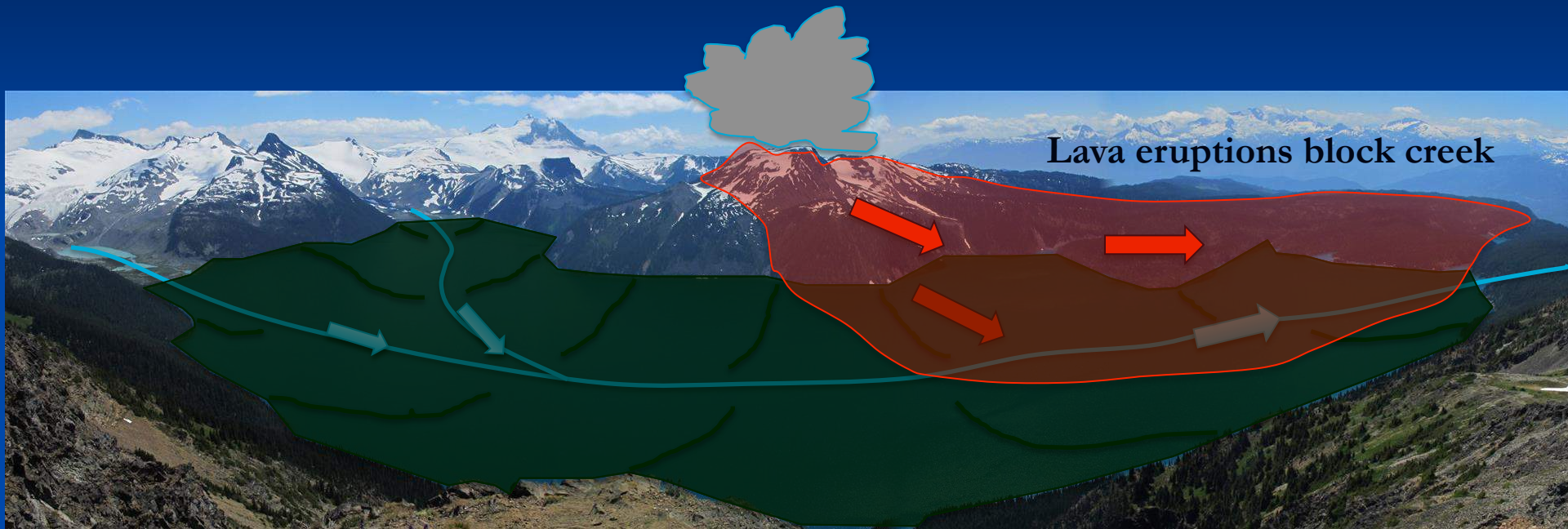


There is no larger lake at higher elevation in BC
It is also as deep as Howe Sound

Once it was a mountain valley drained by Rubble Creek



Then Mt Price and later Clinker Peak erupted



Today, Garibaldi Lake: a lava-dammed lake

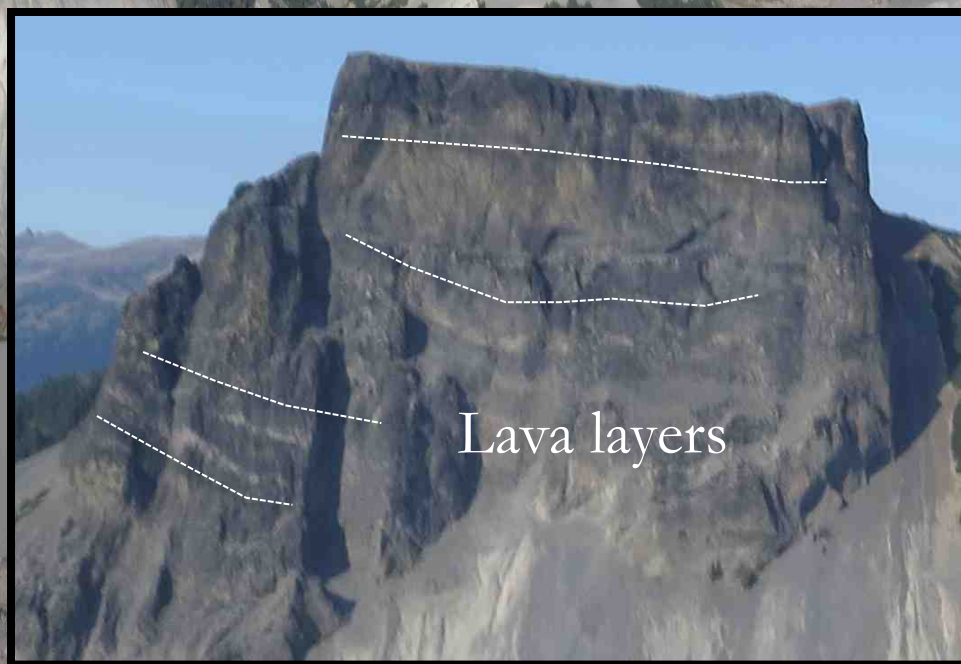
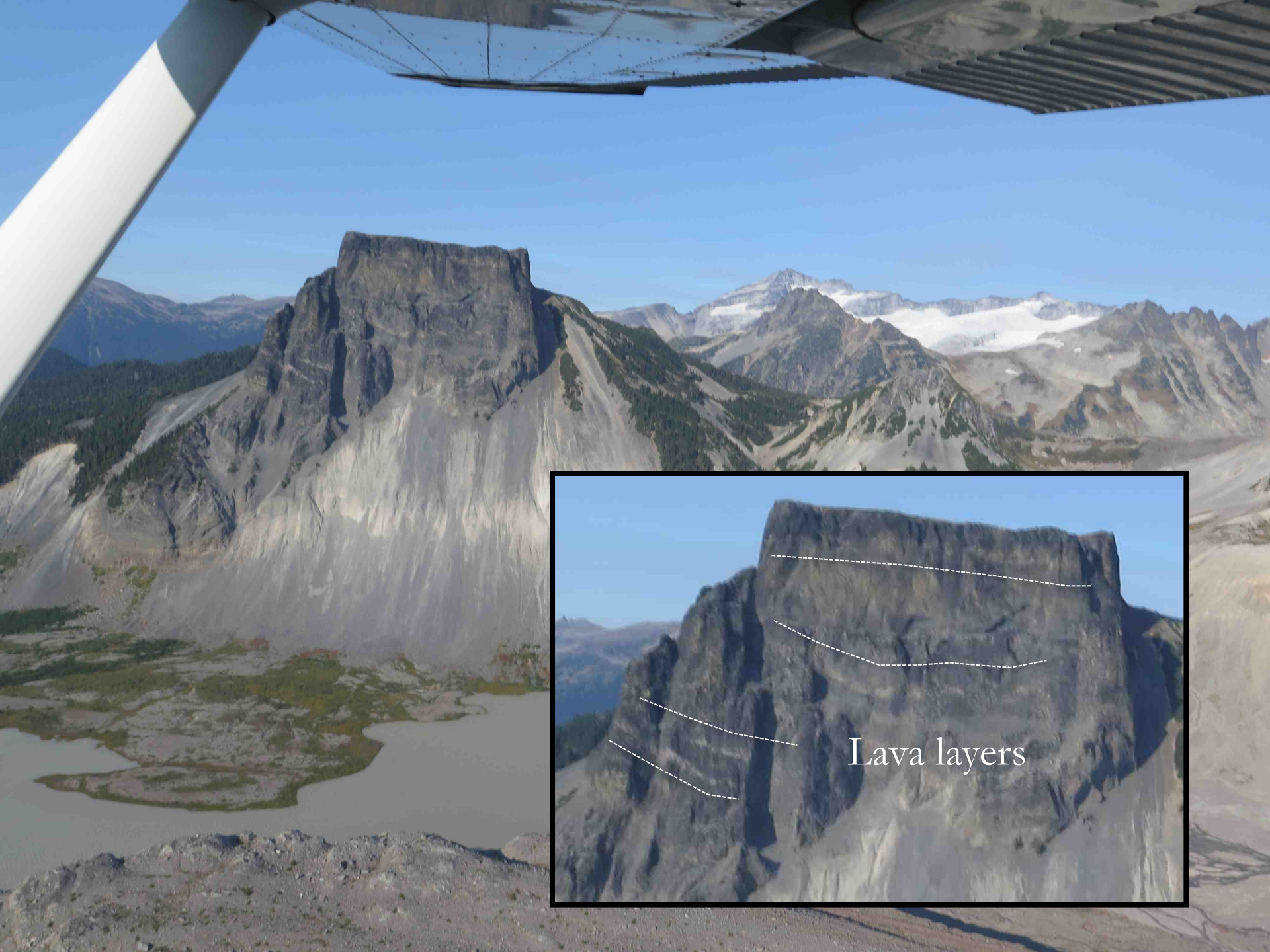


The Table: A very odd mountain

Mt Garibaldi

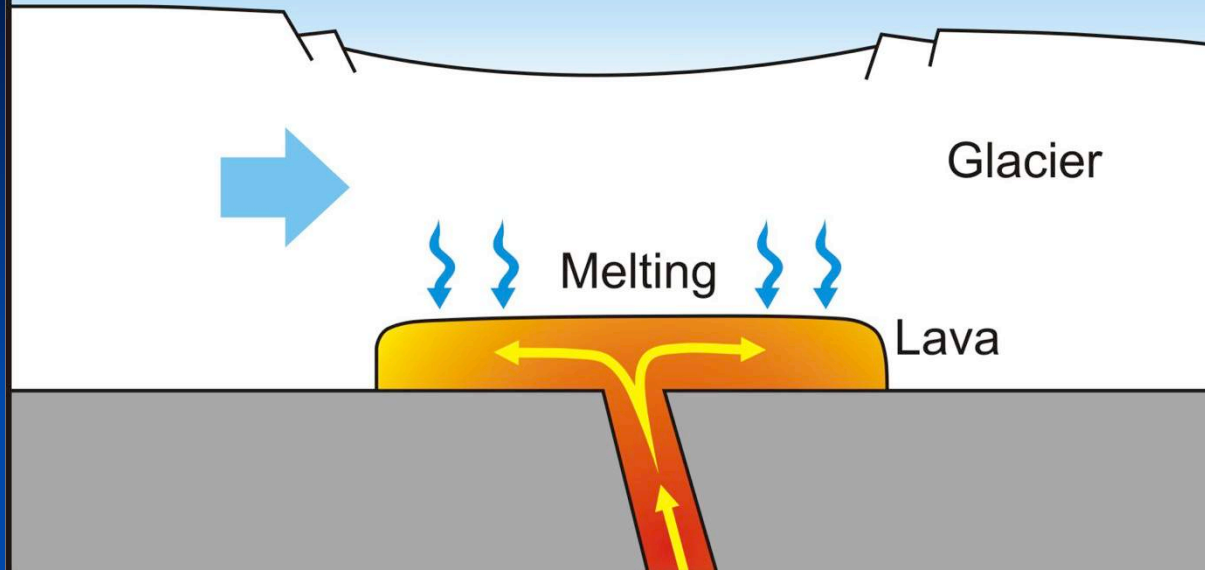
The Table



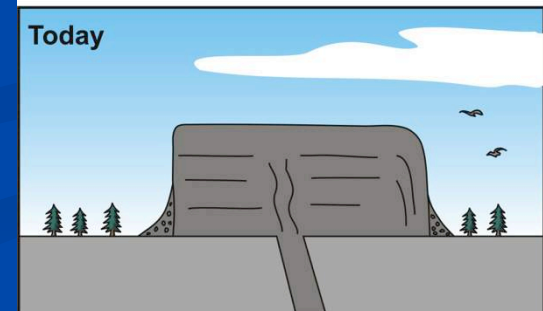
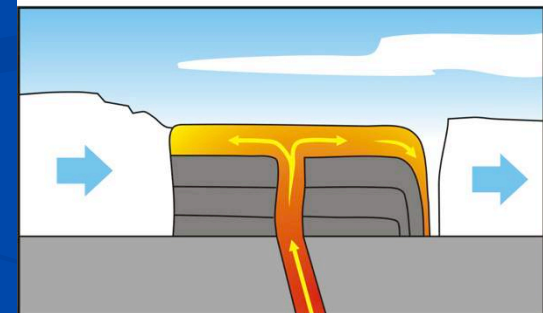
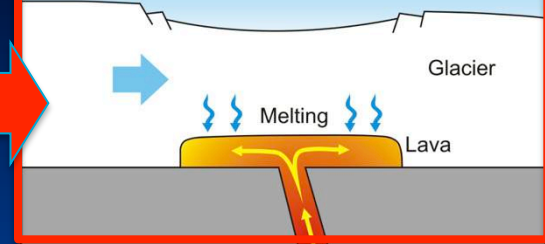


Lava layers

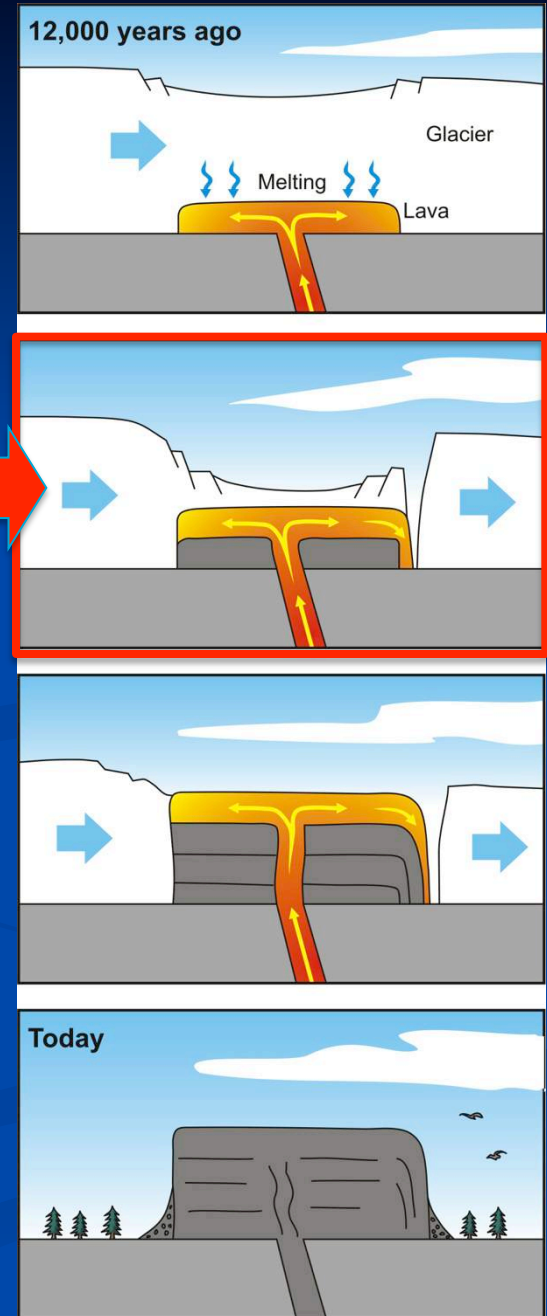
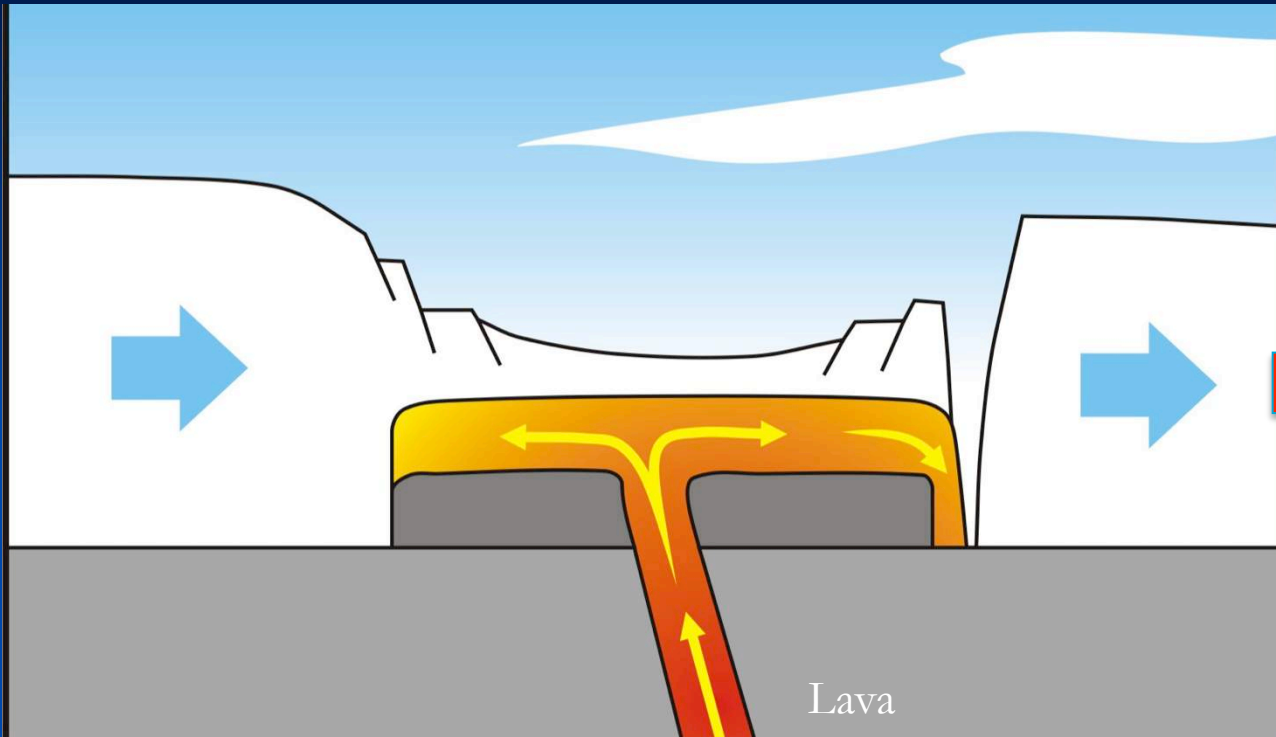
12,000 years ago

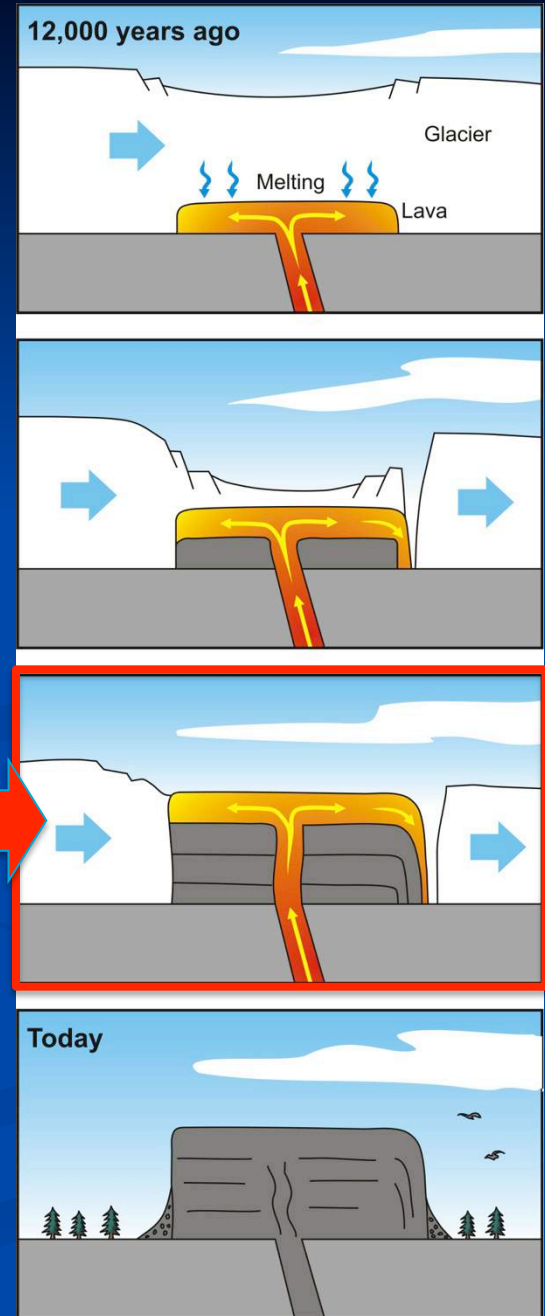
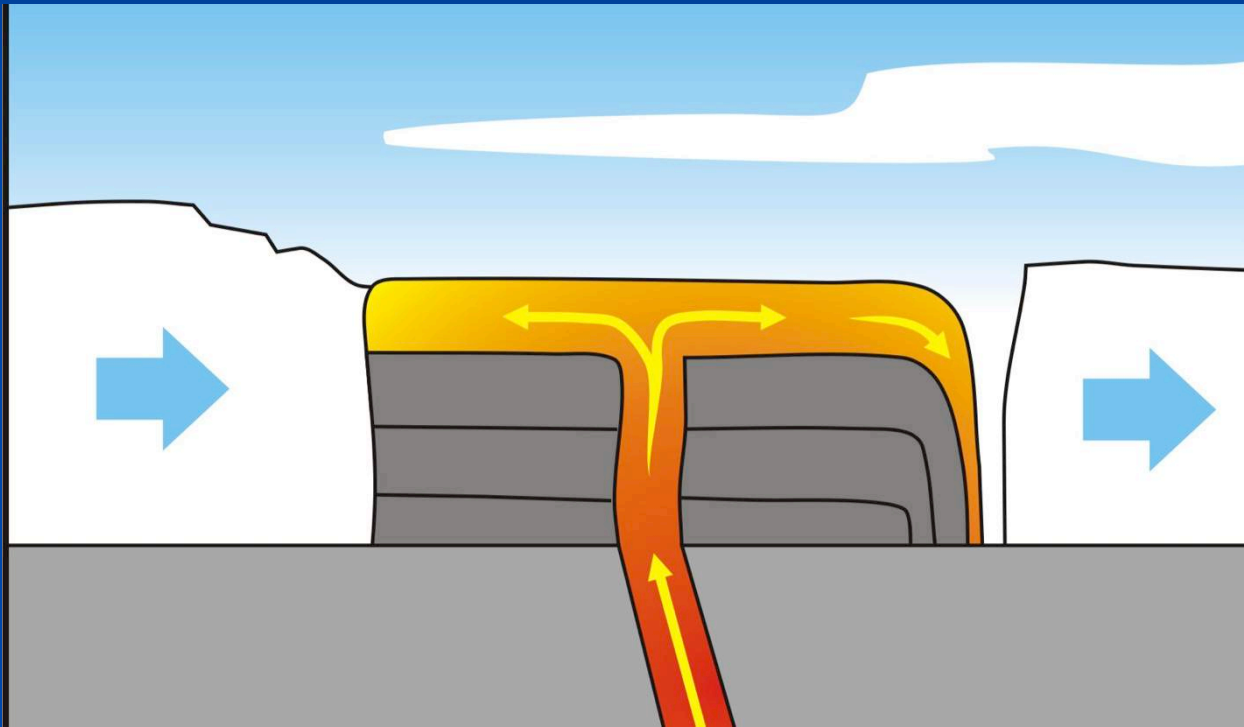


12,000 years ago

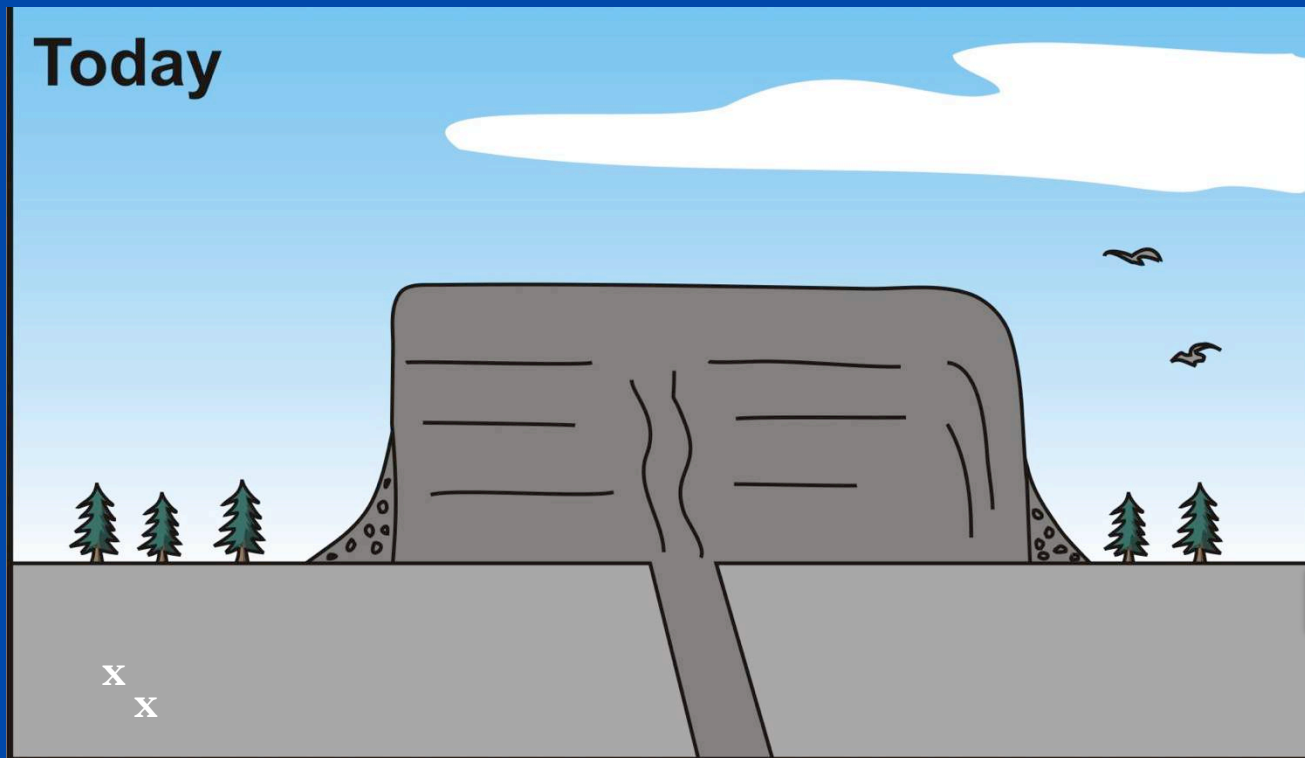


How “The Table” formed

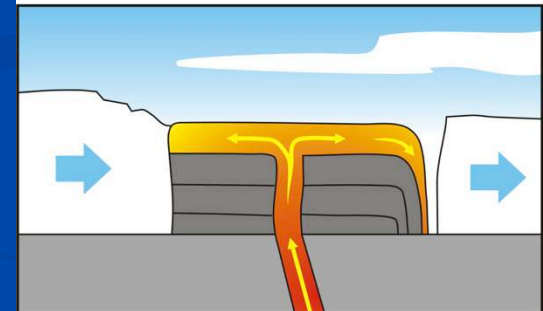
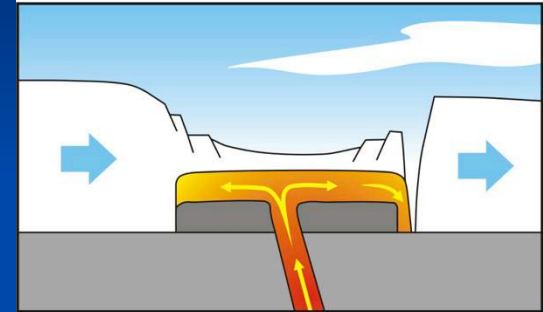
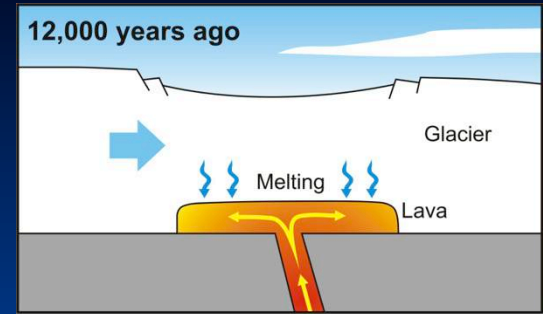




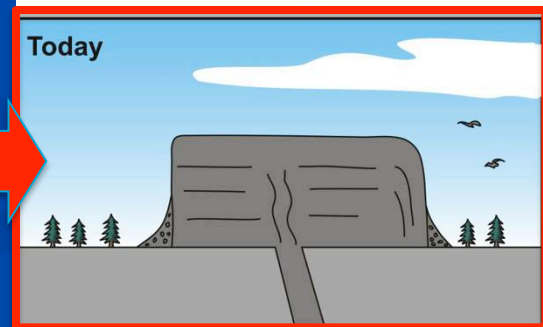
Today



12,000 years ago



Today





Humans are disappearing from the outdoors at a rate that would make them top any conservationist's list of endangered species.

Tim Gill

So

