

The Origin of Puget Sound: Tectonics and Glaciers



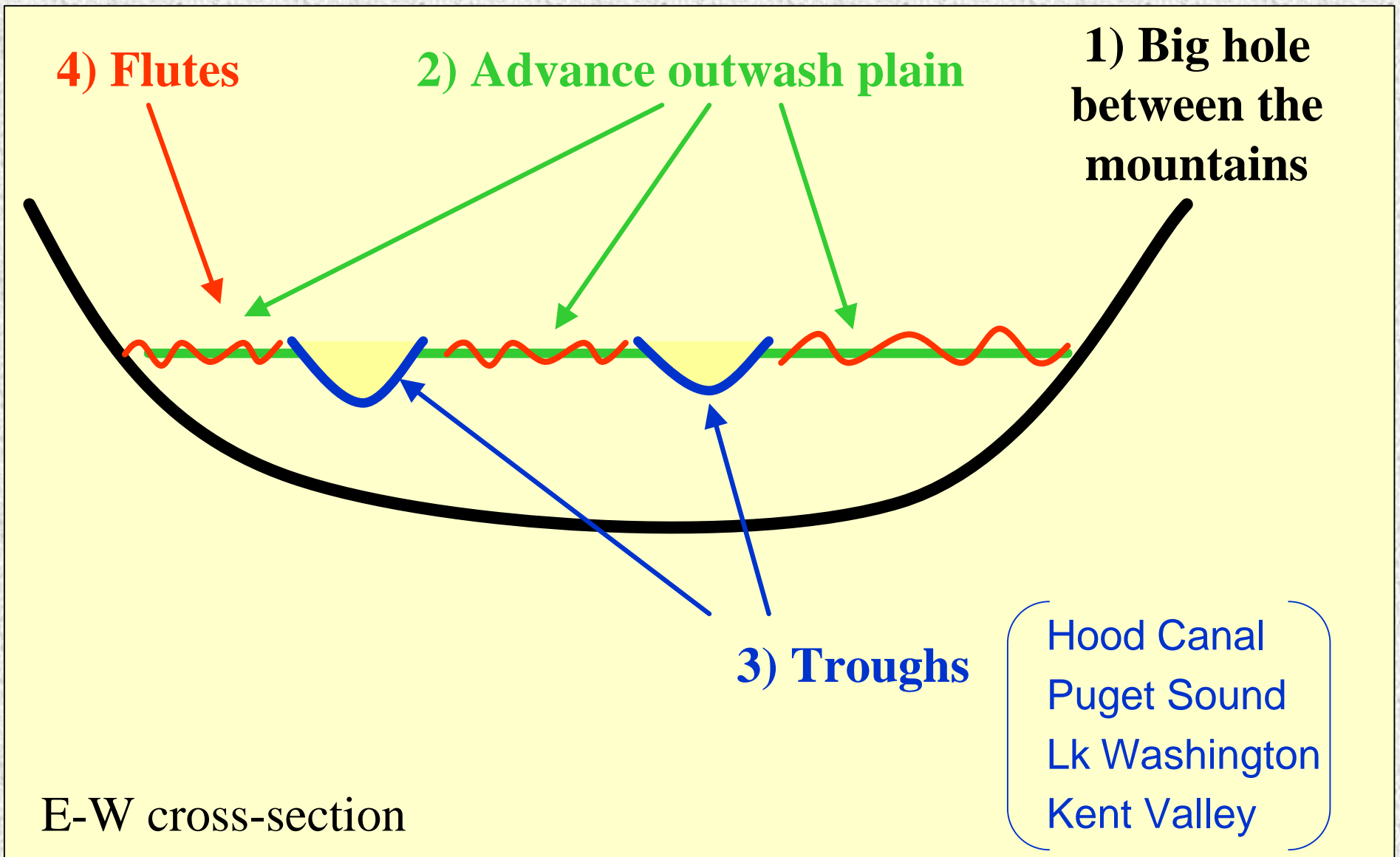
By: Kathy Goetz Troost, UW-Seattle-Area Geologic Mapping Project

Puget Lowland Landscape Elements

- 1) Big hole between the mountains
- 2) Advance outwash plain
- 3) Troughs
- 4) Flutes
- 5) Cross-warps

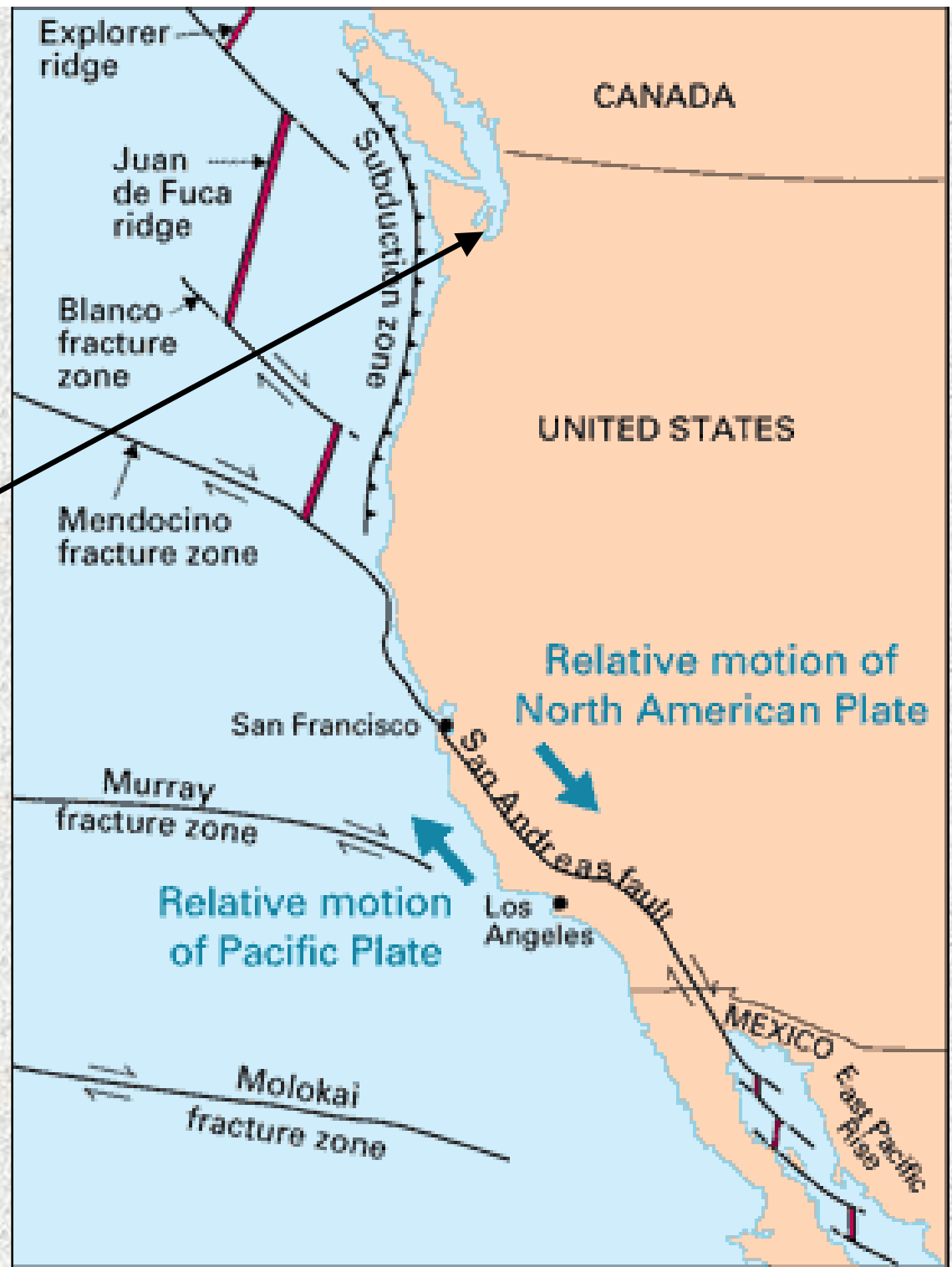


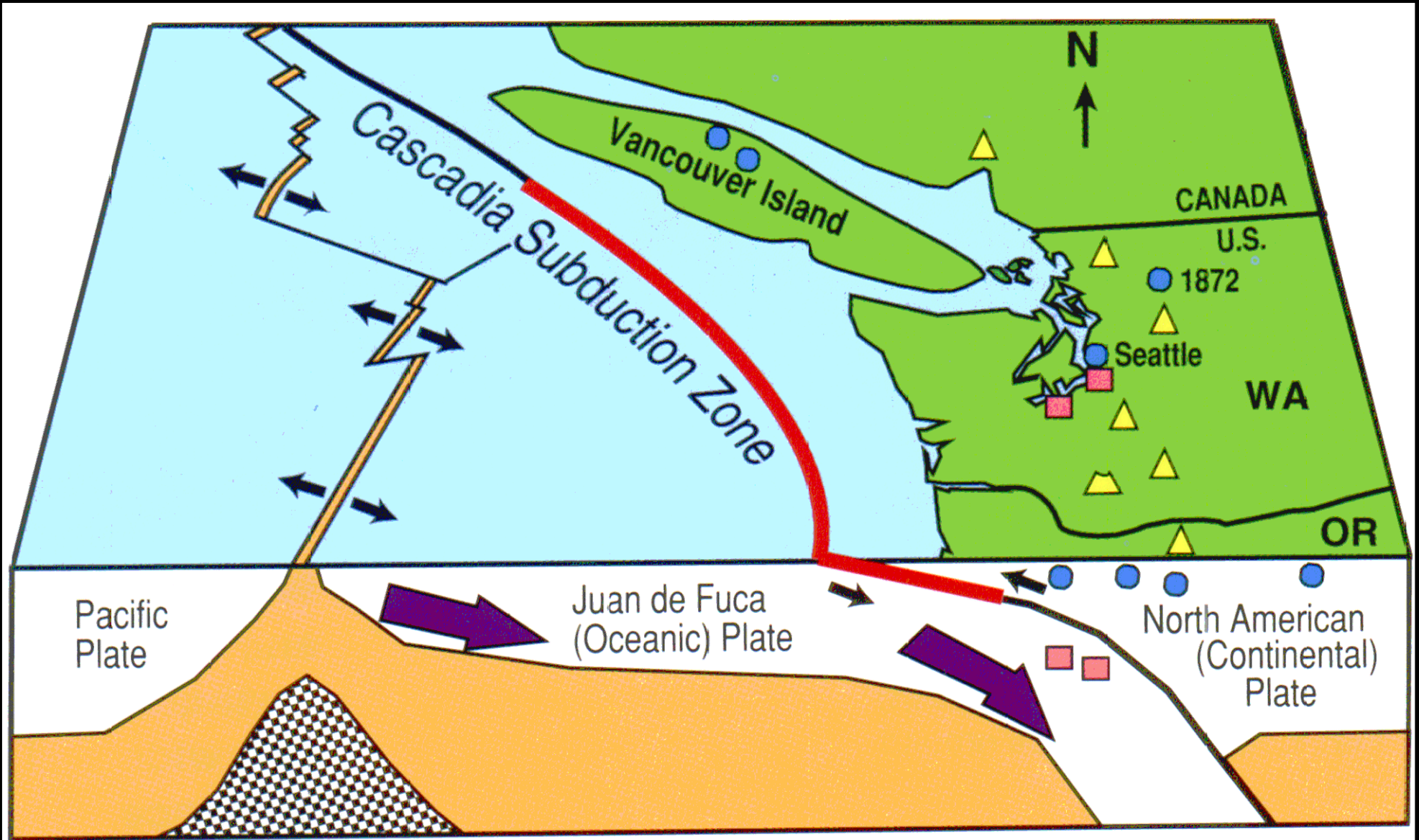
Puget Lowland Landscape Elements



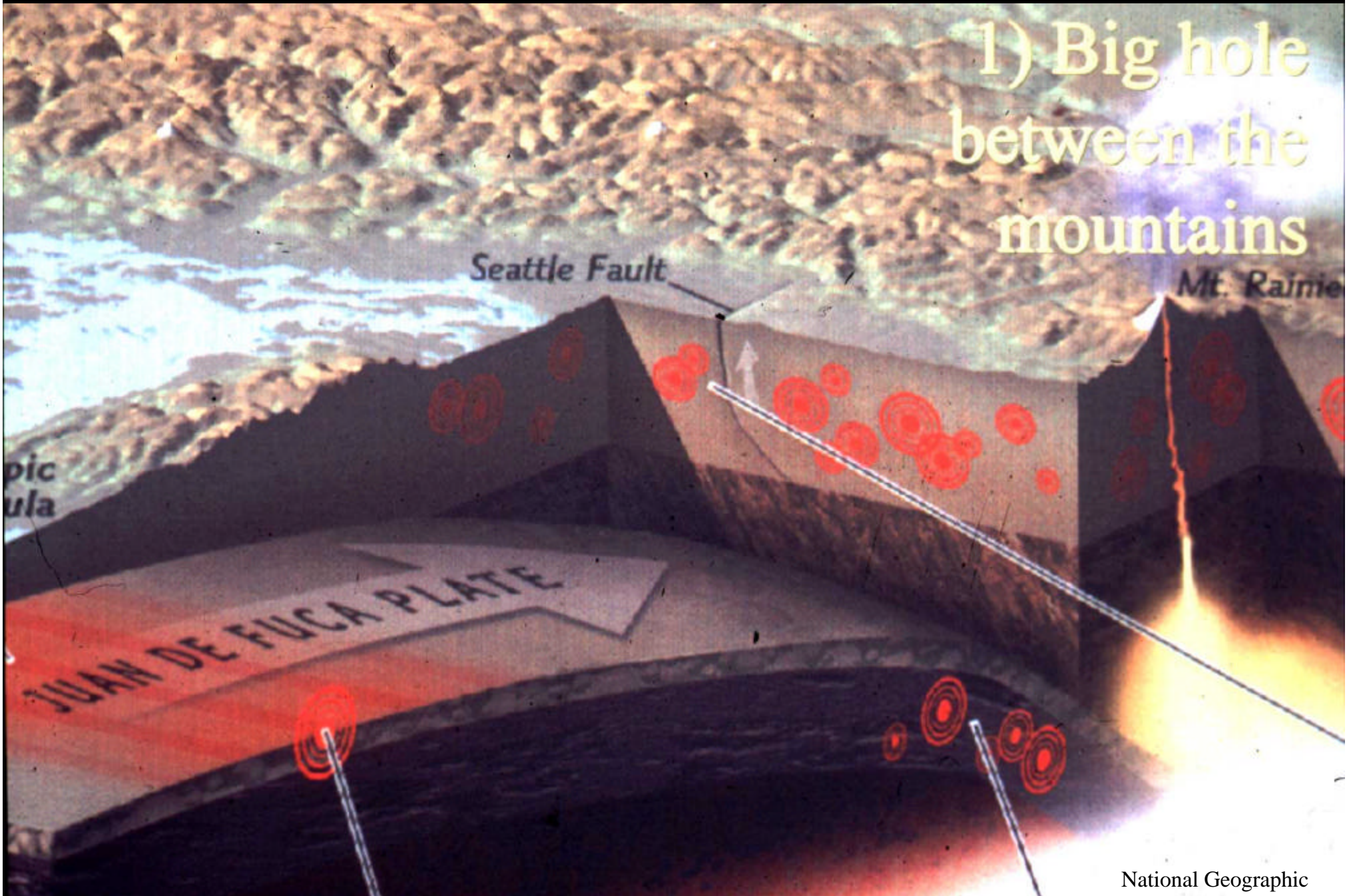
Tectonic Setting

The Puget Lowland occupies a structural trough, formed by a complicated sequence of tectonic activity.

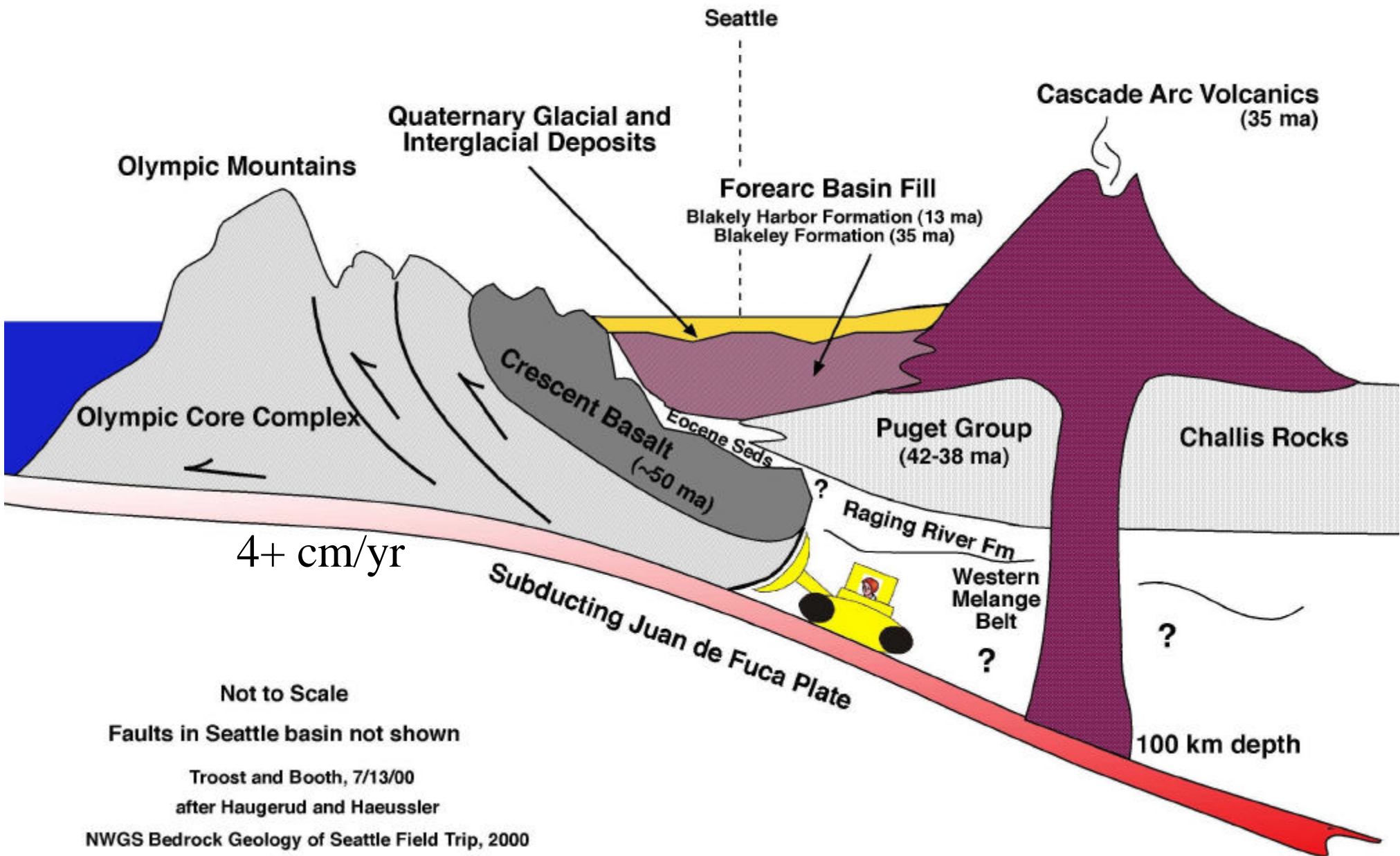




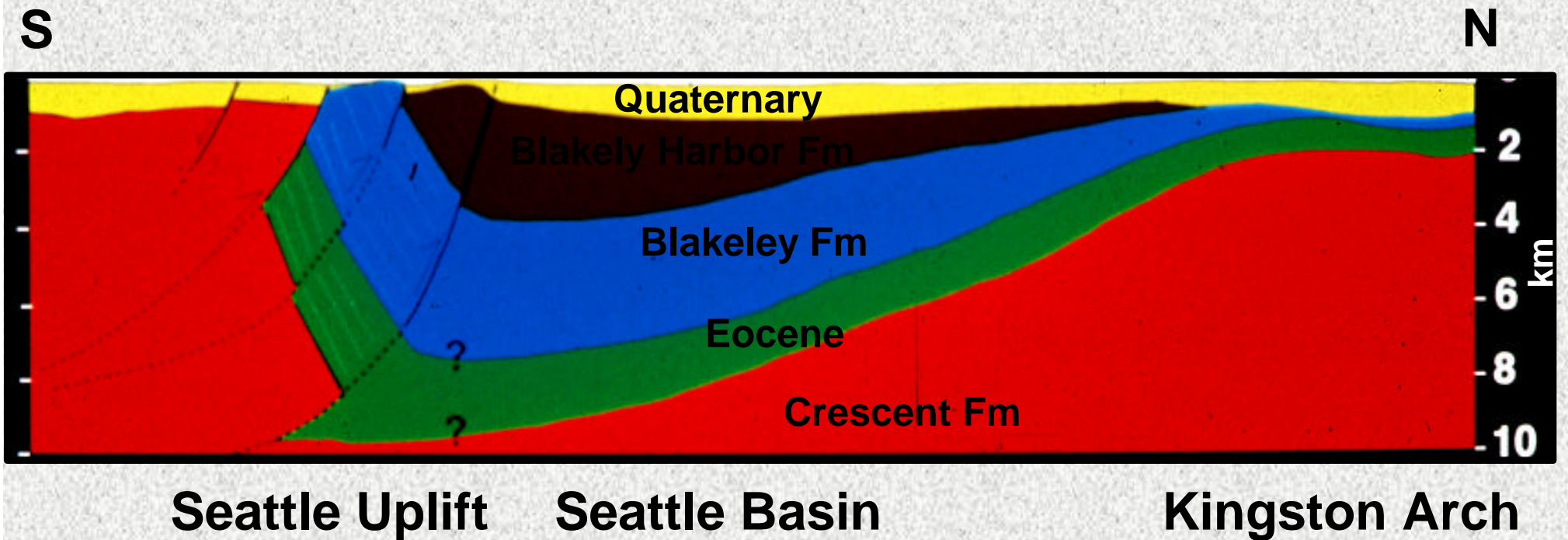
1) Big hole between the mountains



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Bedrock Structure



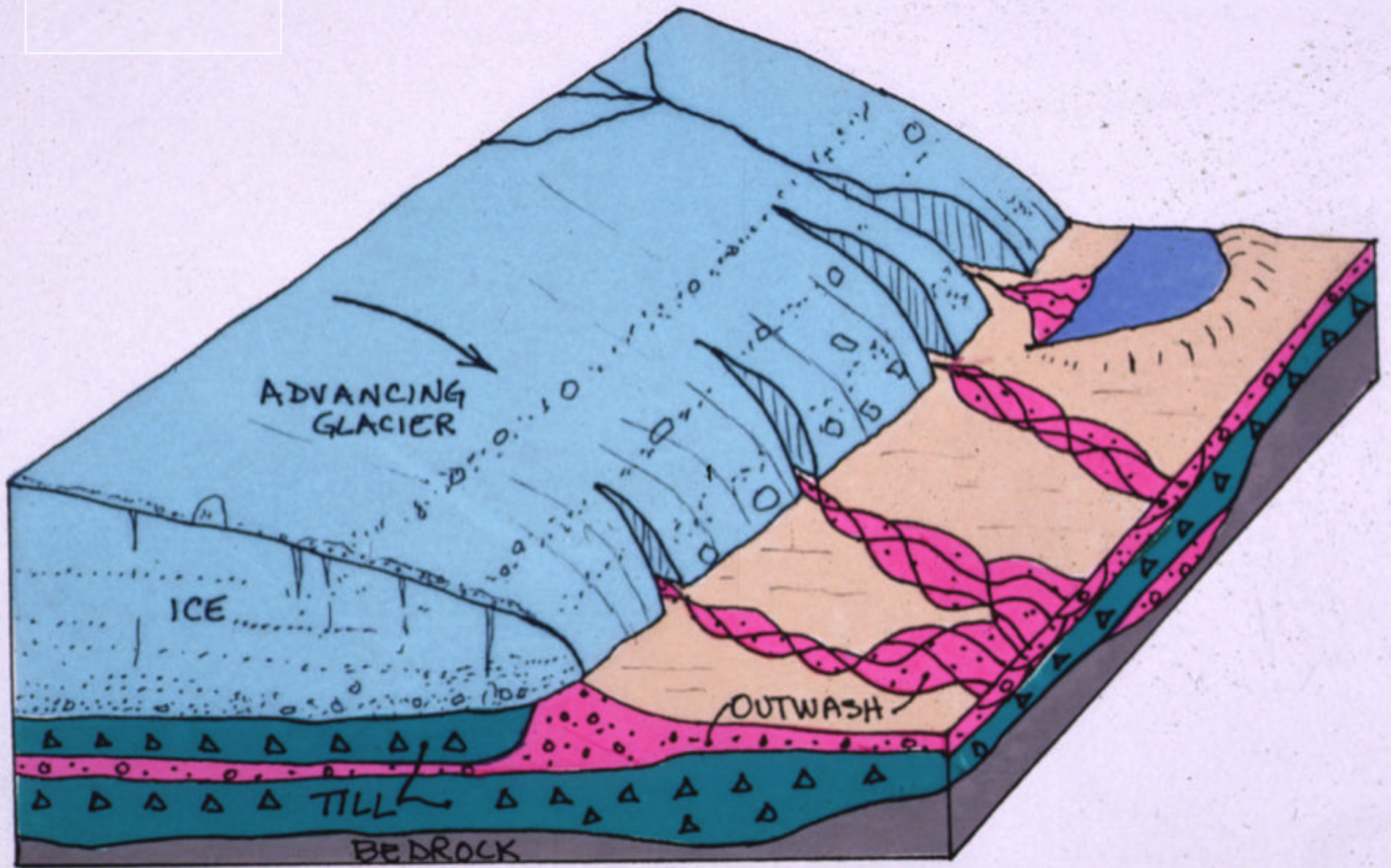
The glacial story

Columbia glacier, Alaska

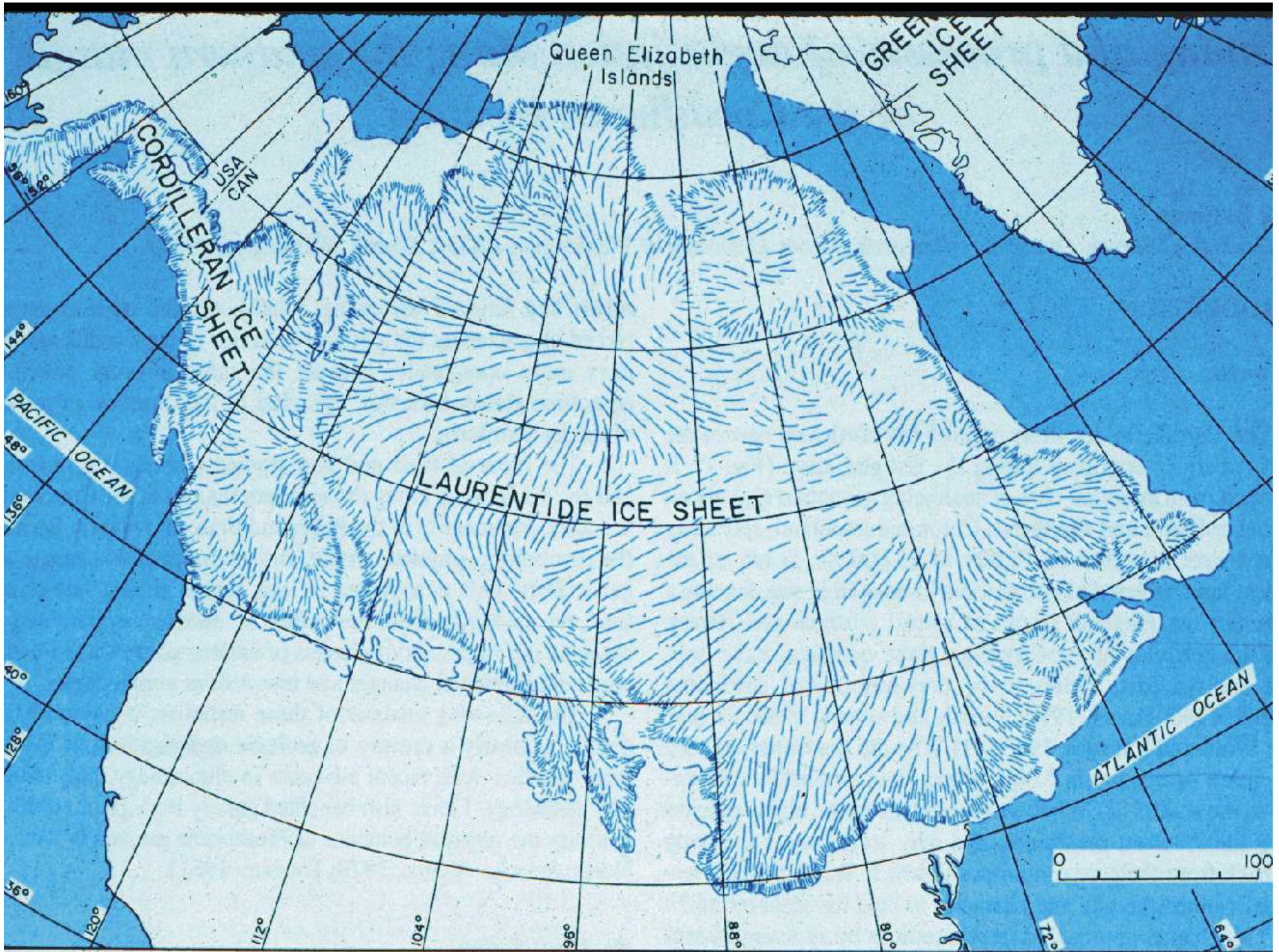
Photo by K. Troost

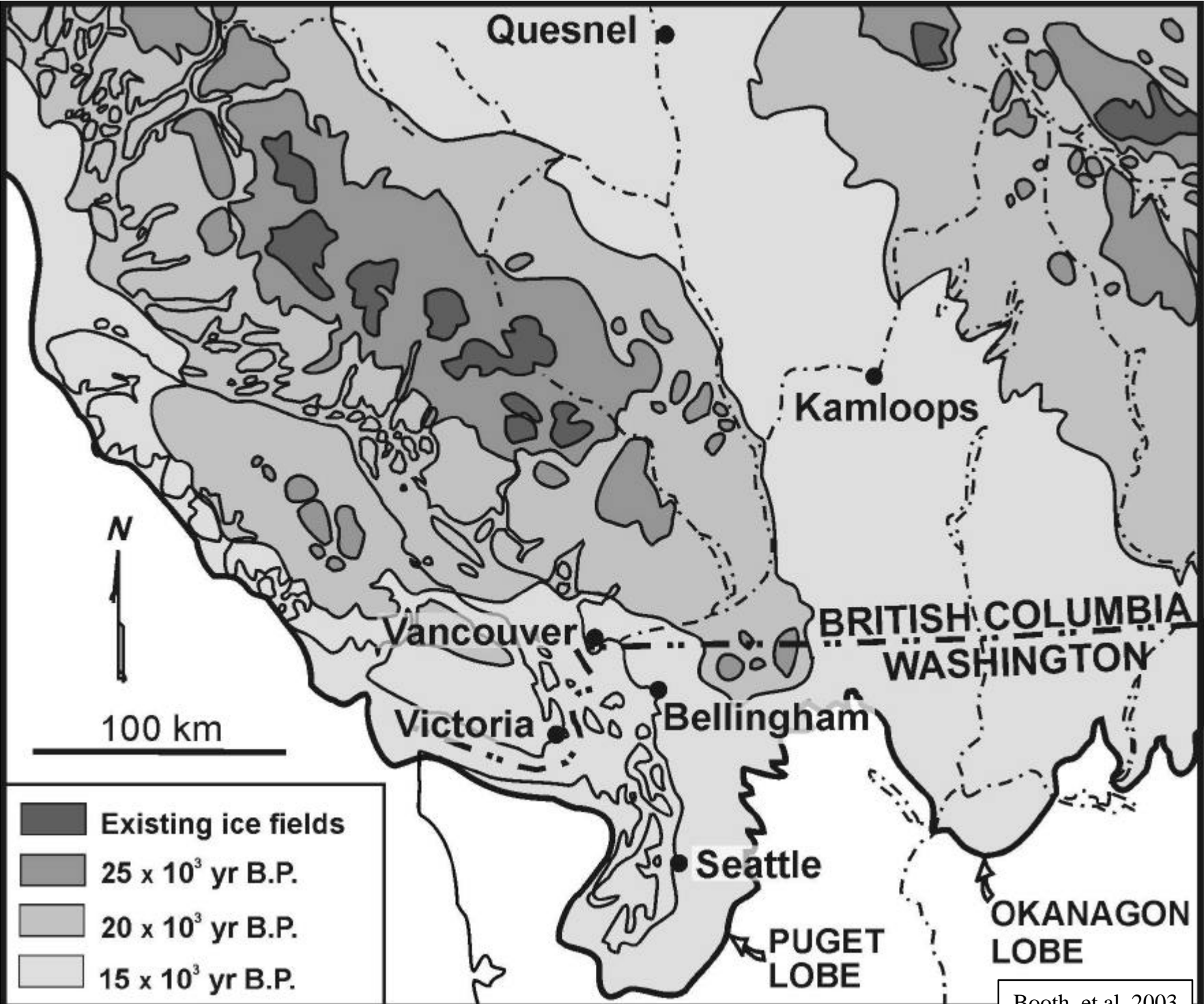


GLACIAL DEPOSITS



K. Troost



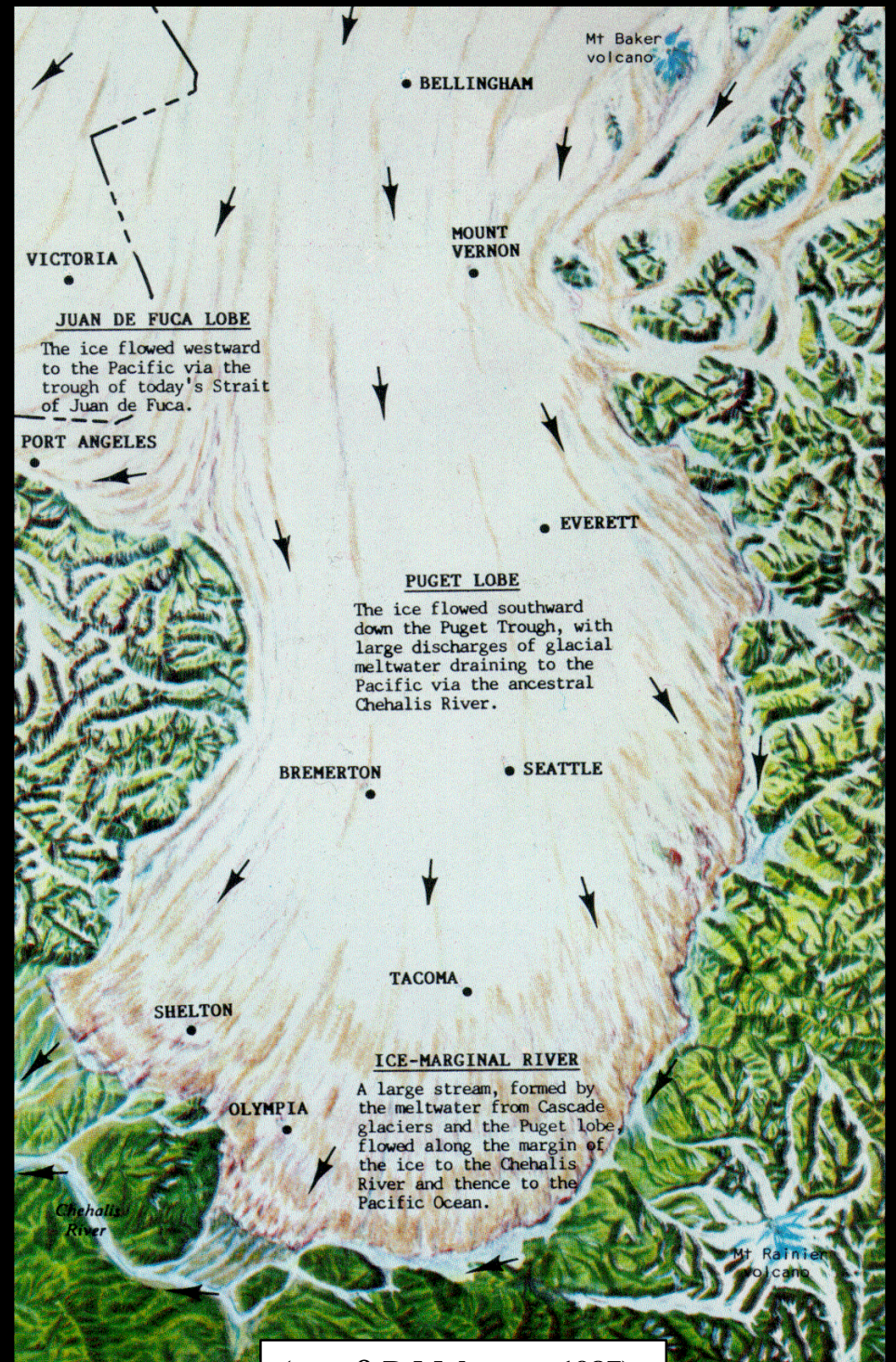


**The Vashon glacier was over 3000
feet thick in Seattle,**

5 x the height of the Space Needle.

Photo by K. Troost





(map ? D Molenaar, 1987)



View of the South Beach Bluffs, Fort Lawton, Seattle



Photo by K. Troost

Proglacial lake deposits, at Point Defiance, Tacoma

Advance outwash sand at a gravel pit near Tacoma



Photos by K. Troost



Landsliding on top of proglacial lake deposits, Perkins Lane, Seattle

Photo by K. Troost



Photo by K. Troost

Vashon till at Perkins Lane

Puget Lowland Landscape Elements

- 1) Big hole between the mountains
- 2) Advance outwash plain
- 3) Troughs
- 4) Flutes
- 5) Cross-warps (e.g. Ship Canal)

2-5 are glacial in origin

DEM by D. Booth

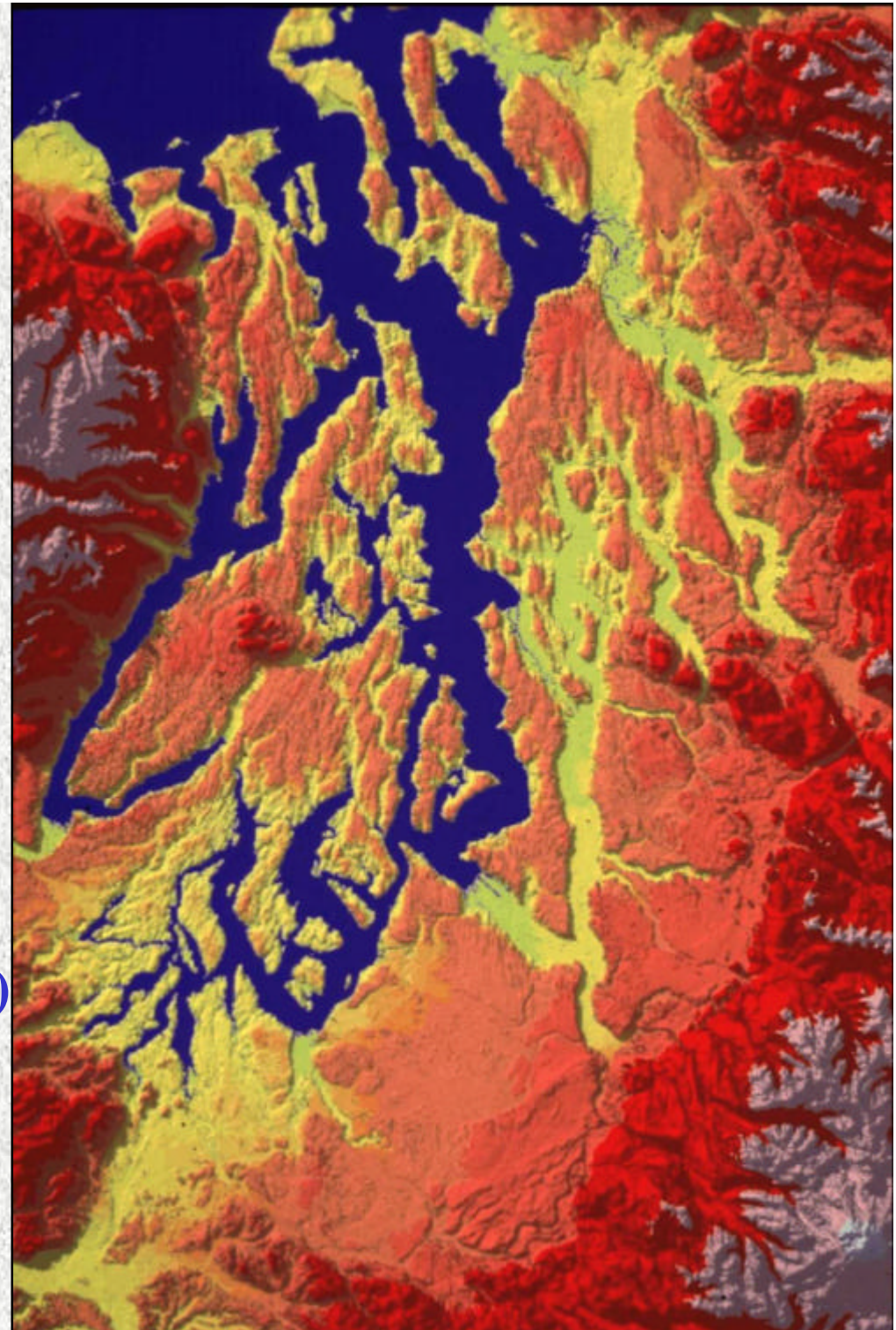


Photo by D. Booth

Outwash in front of an advancing glacier



Photo by D. Booth

Outwash capped by till



Photo by D. Booth

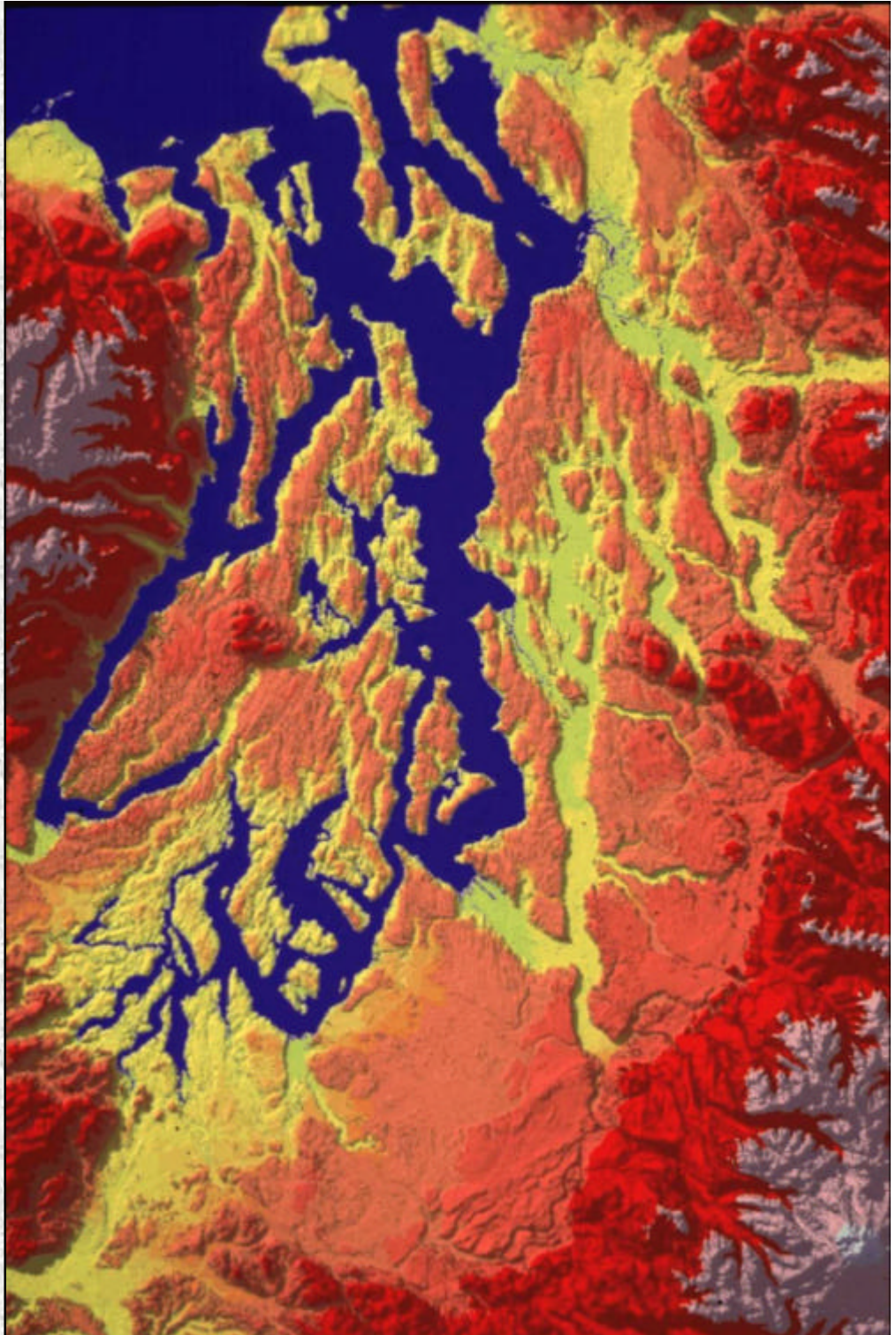
2) Advance outwash fill plain



3) Troughs (subglacial drainageways)

During the Vashon glaciation, the Cascade and Olympic Mountains were ice free, but rainfall continued, so streams carried large volumes of water to the basin.

DEM by D. Booth



Water flowing into moulin

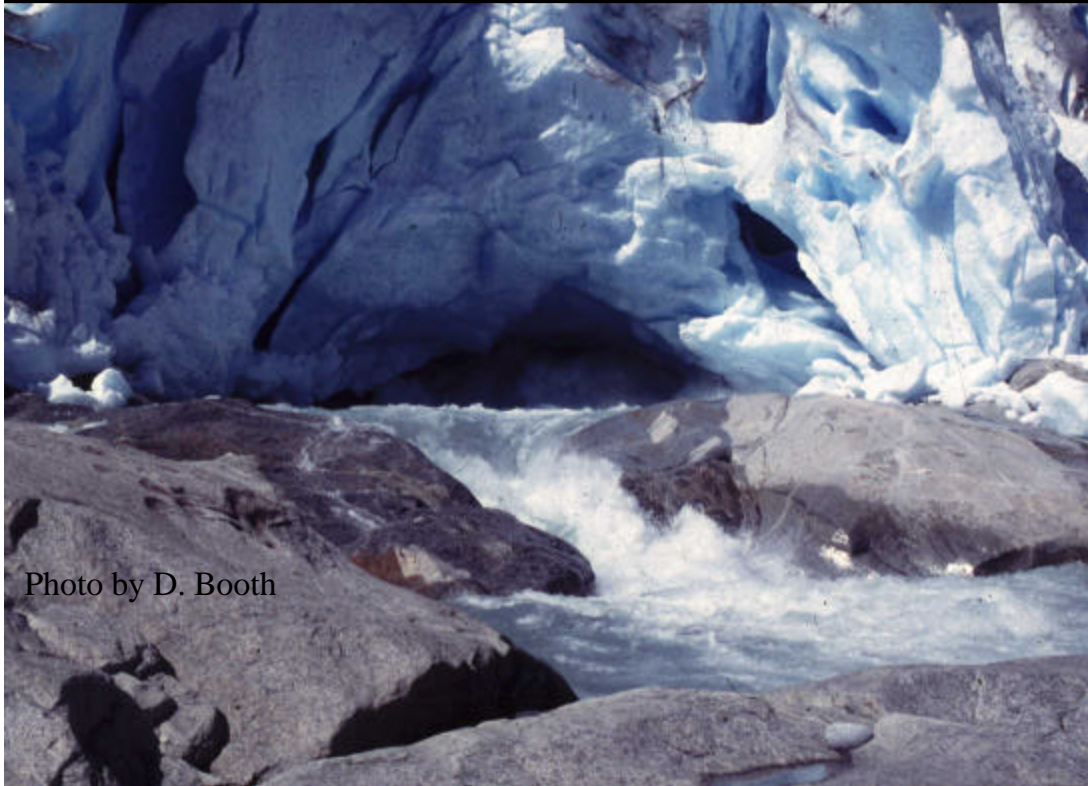
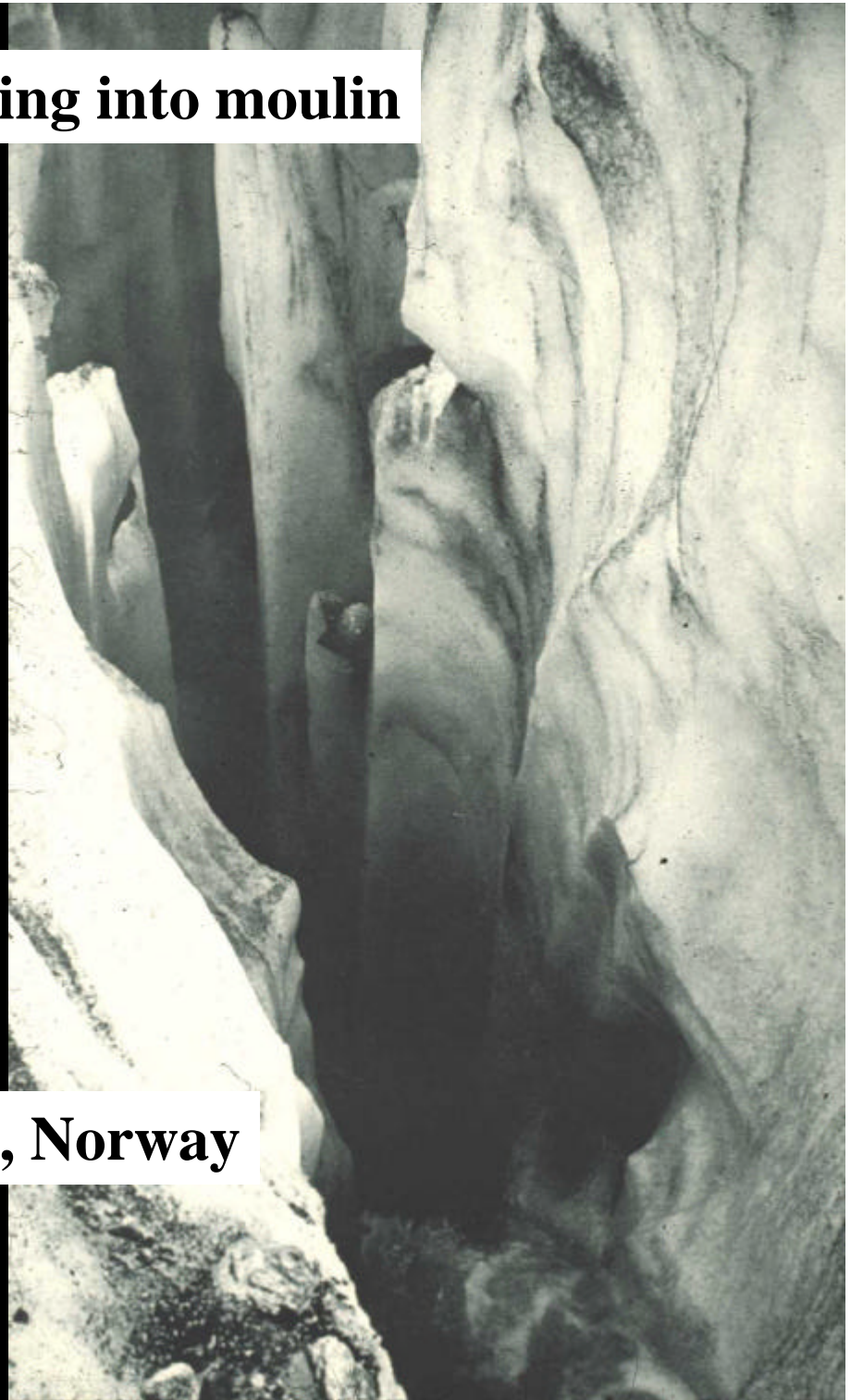


Photo by D. Booth

Flow at snout of Nigardsbreen glacier, Norway



Ice-Surface Altitude (m)

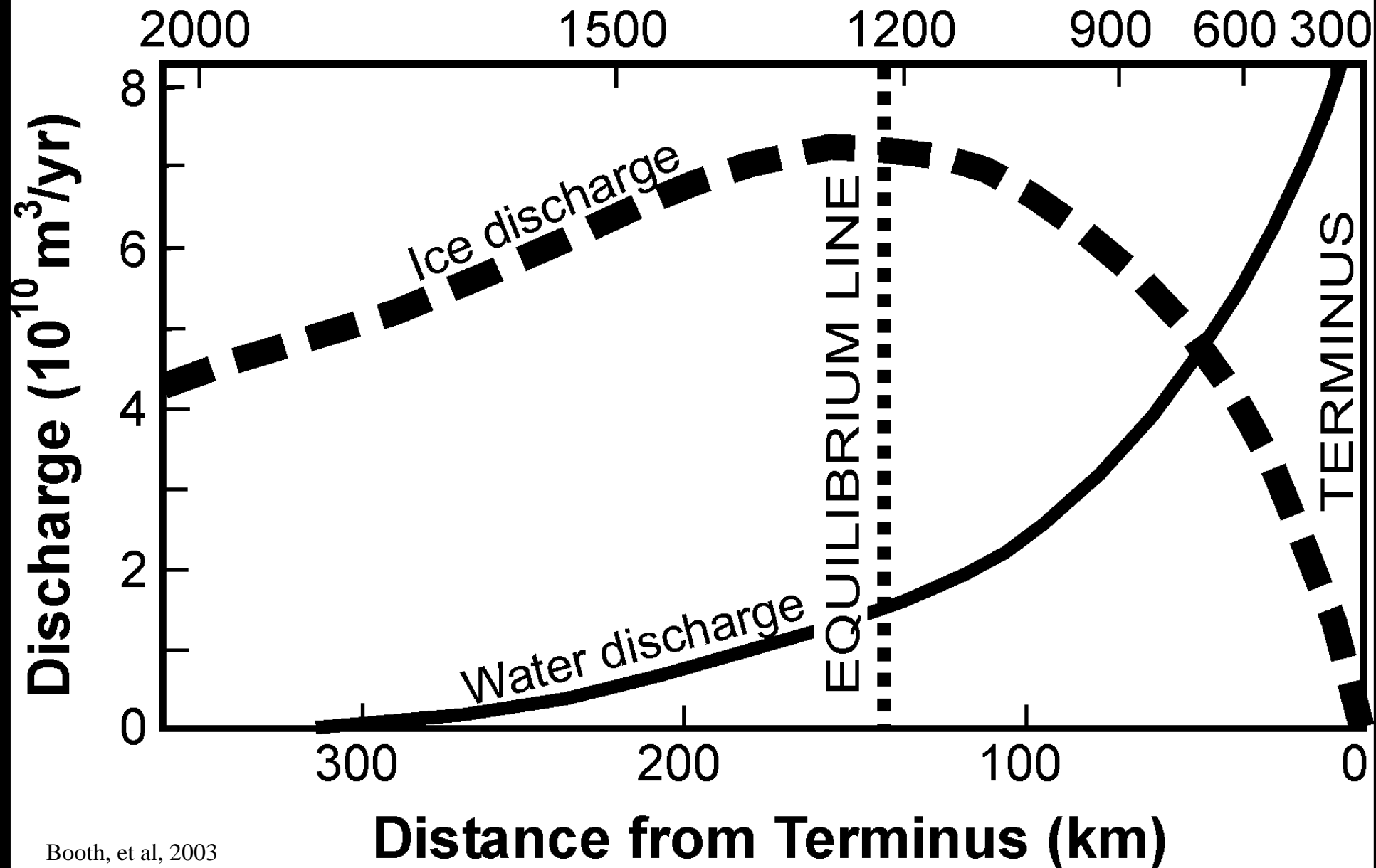
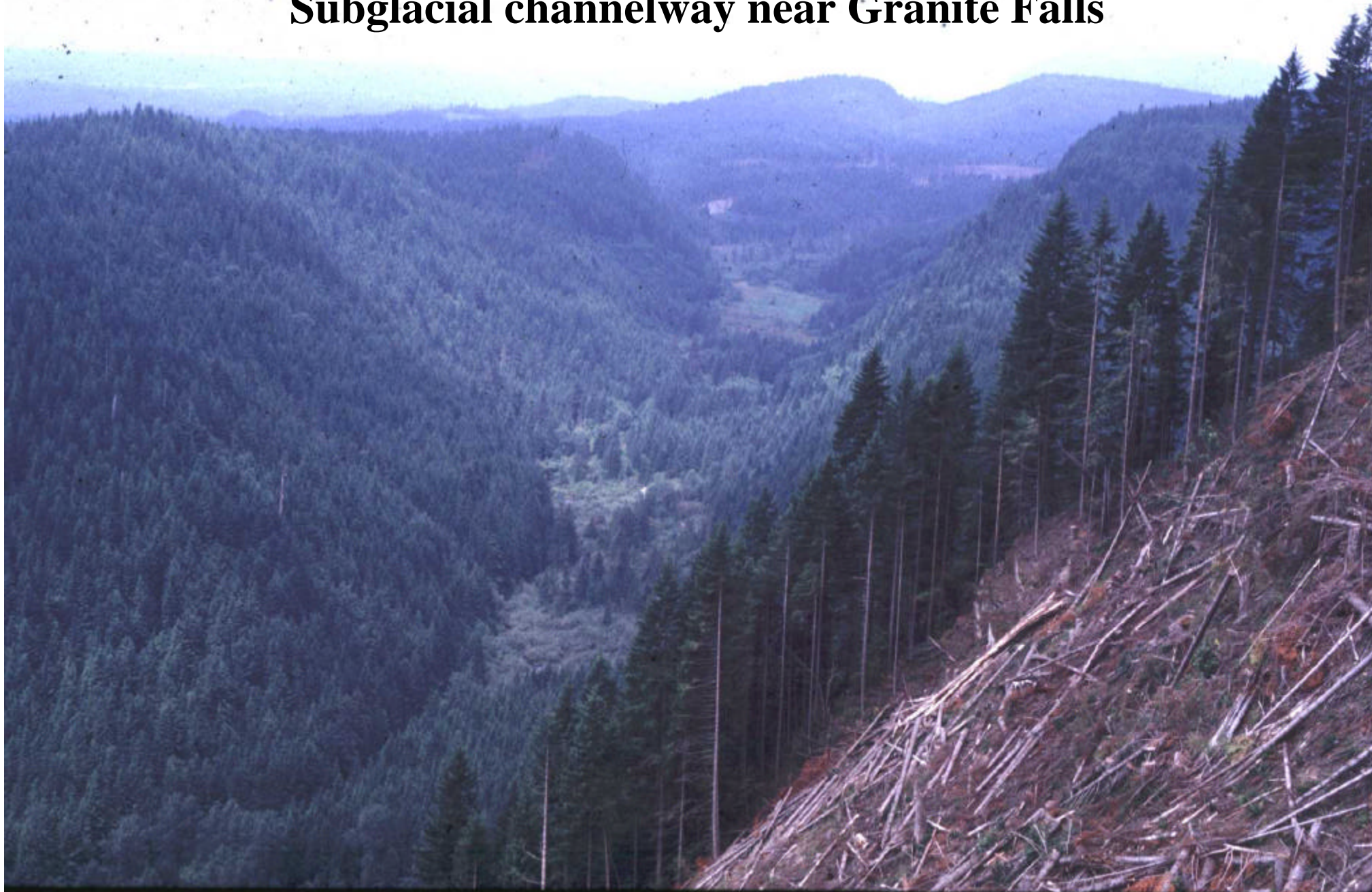


Photo by D. Booth

Subglacial channelway near Granite Falls



A topographic map of a coastal region, likely in Norway, showing a large fjord system. The land is colored in shades of green and yellow, indicating elevation. The water is light blue. The map shows several long, narrow, parallel ridges extending from the coast into the fjord, which are identified as glacial flutes. A scale bar at the bottom indicates a distance of 24 km. A text box in the upper right corner explains that these flutes are the result of glacial scour.

**4) Flutes =
glacial scour**

24 km

DEM from Haugerud, 2001

Oblique aerial view of flutes around Echo Lake

Photo by D. Booth



5) Cross warps, folds, and trends

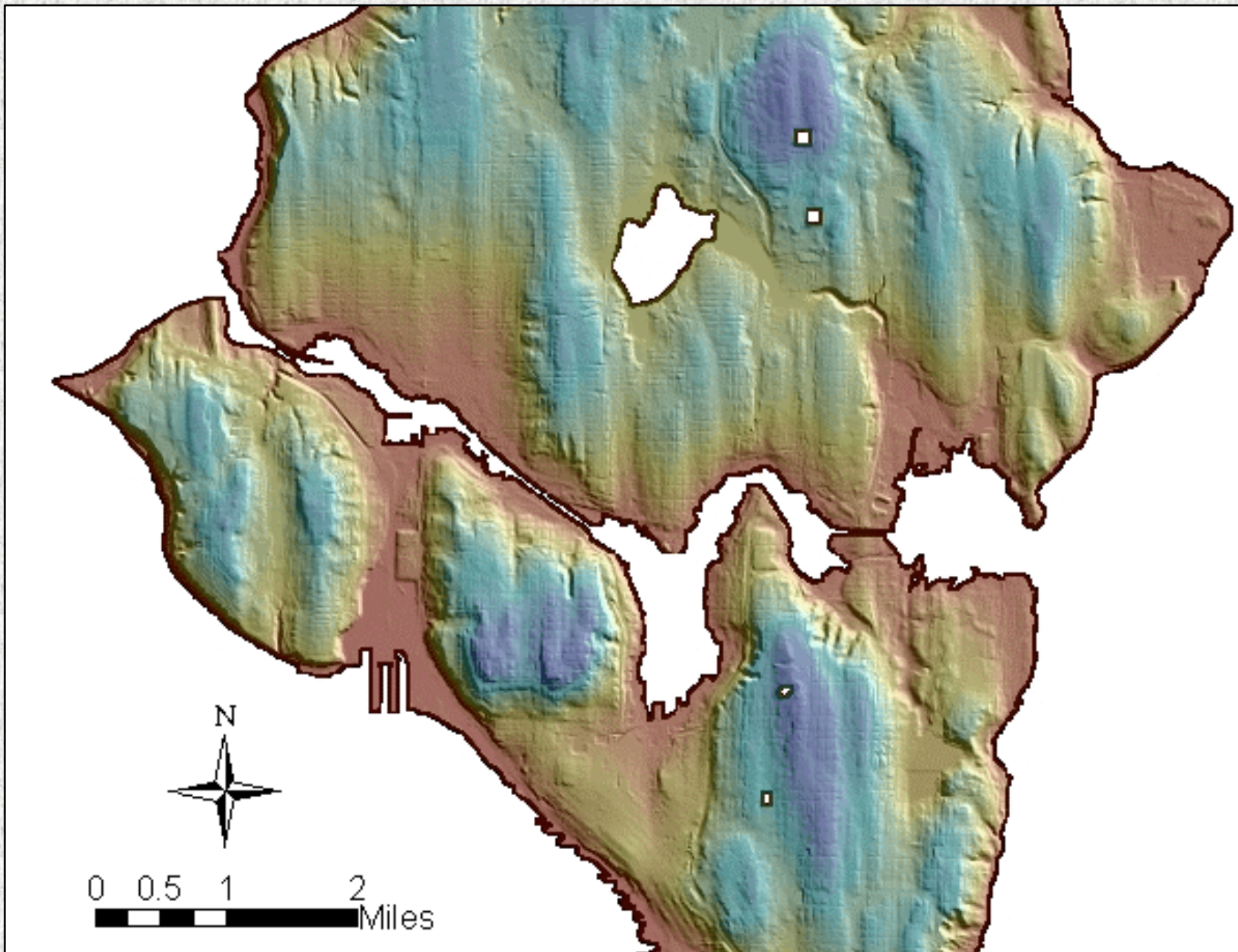
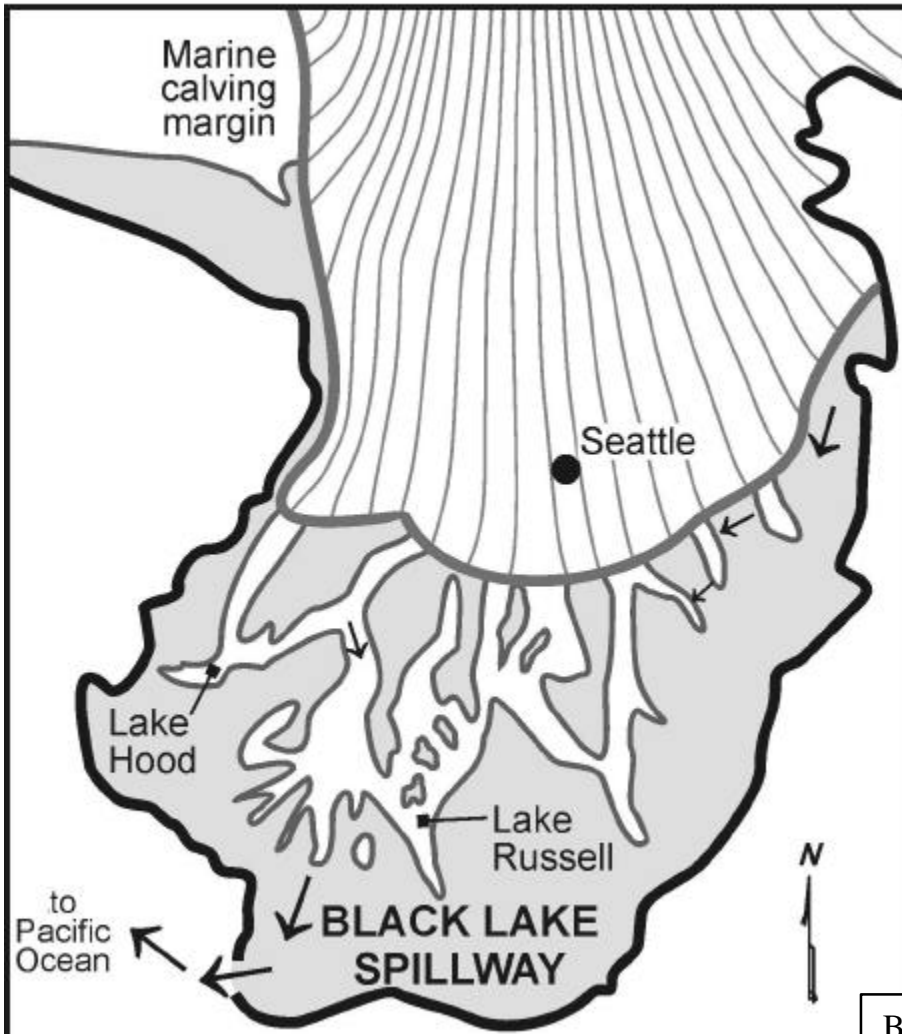
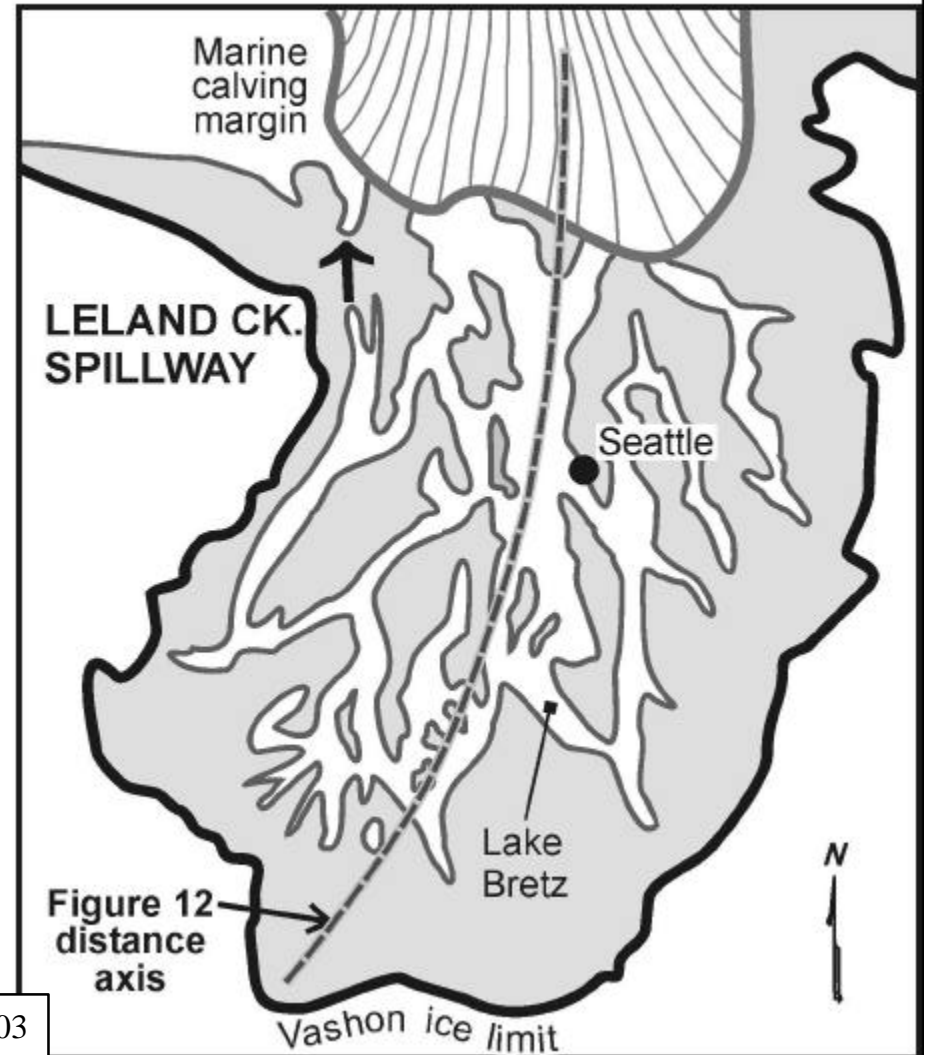


Image from Seattle_Area Geologic Mapping Project

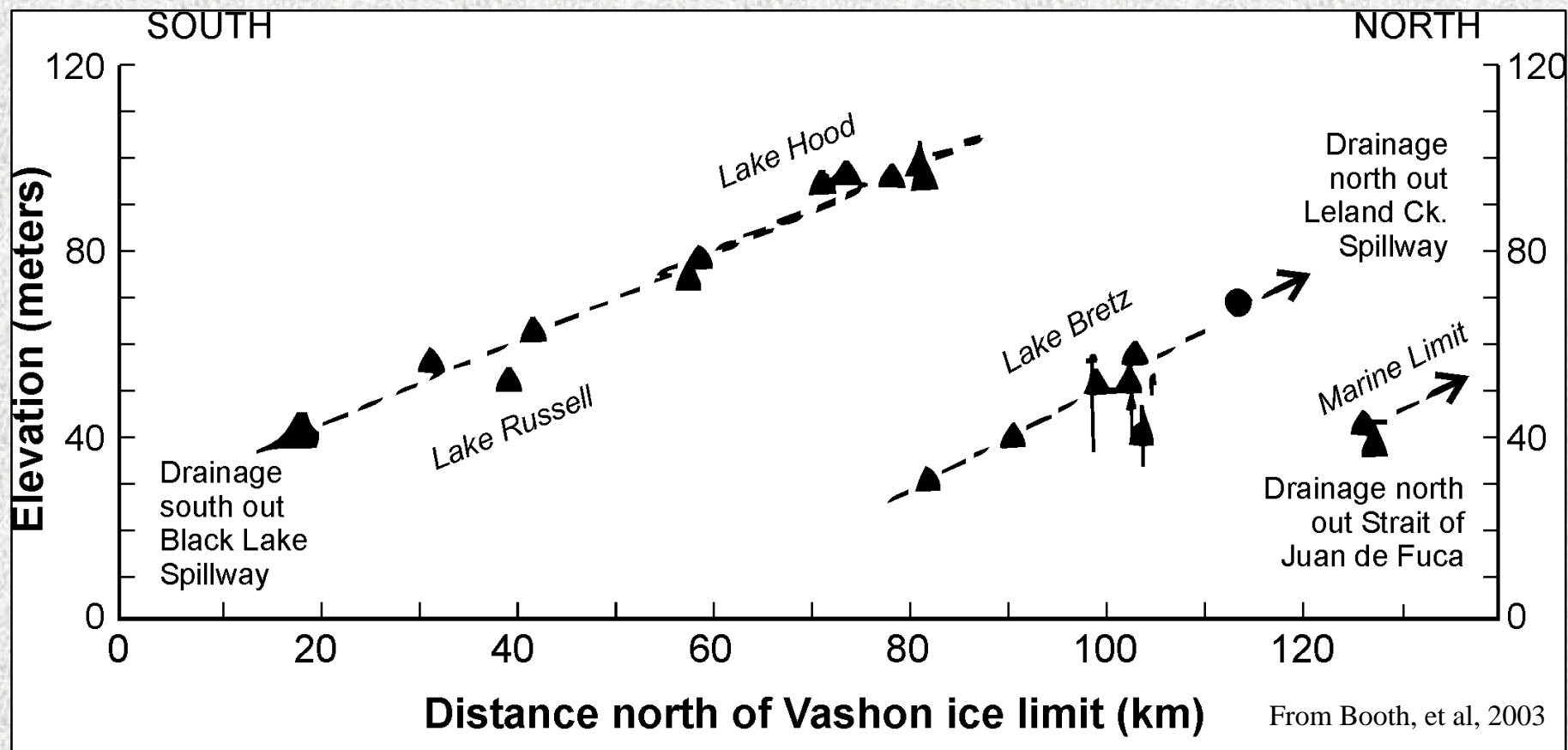
GLACIAL LAKE RUSSELL

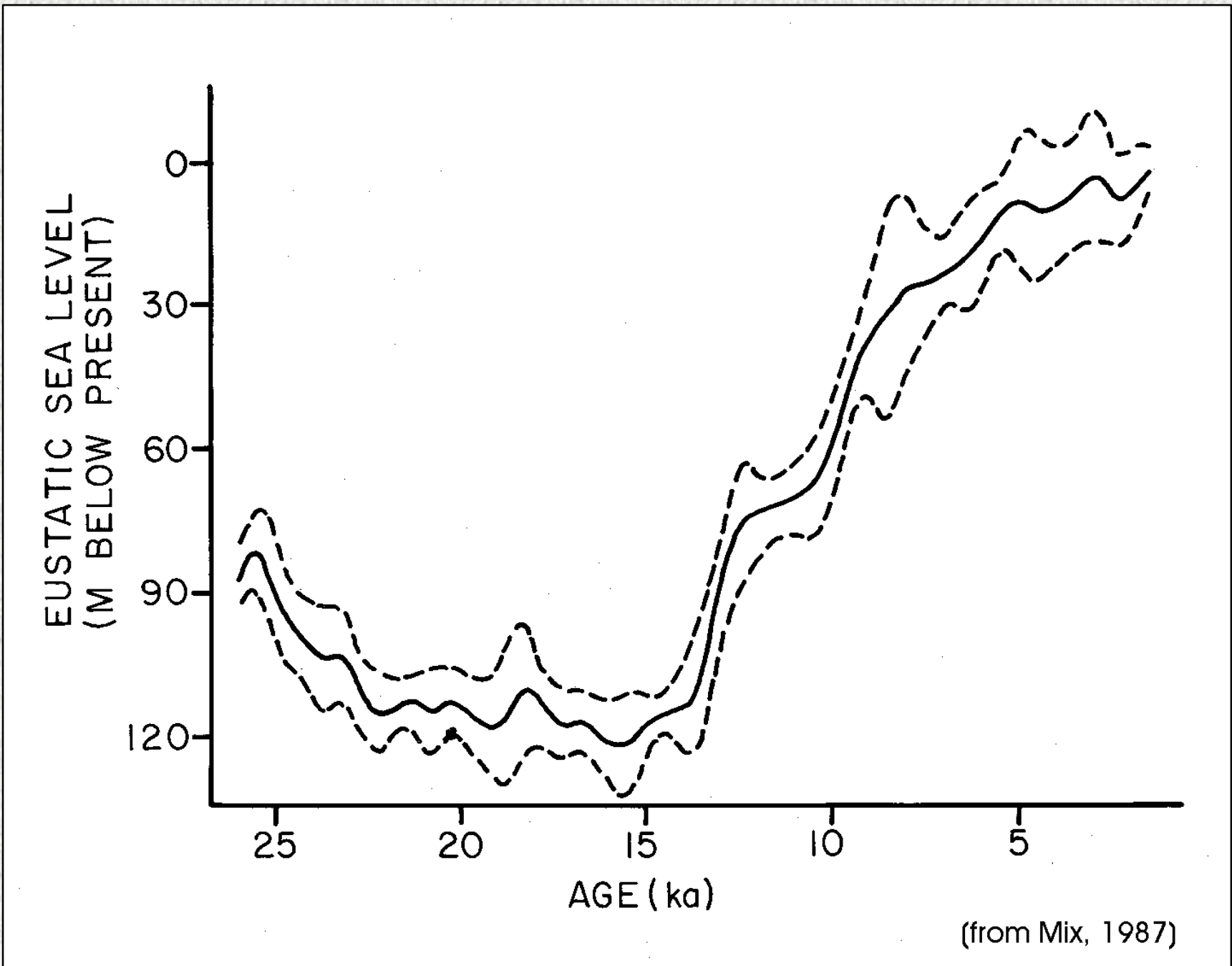


GLACIAL LAKE BRETZ



Booth, et al, 2003



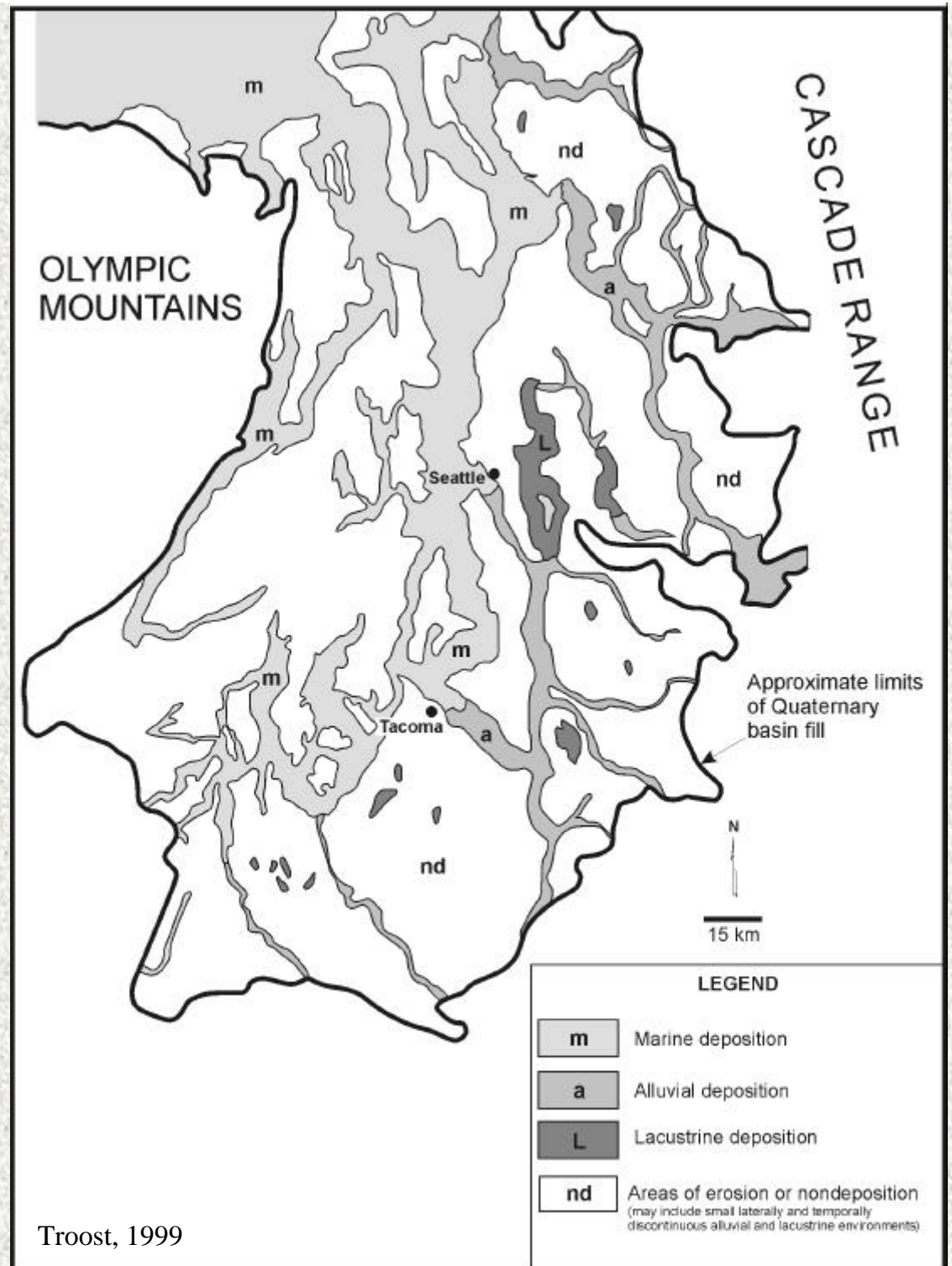


Sea Level rise over the last 25,000 years.



West Point sewage treatment plant spit

Modern topography may be an analog for previous landscapes.



**Interglacial
deposits occur
between glacial
drift packages.**

Photo by K. Troost



Photo by D. Booth



Mount Rainier from Interstate 5

Mount St. Helens from TWA

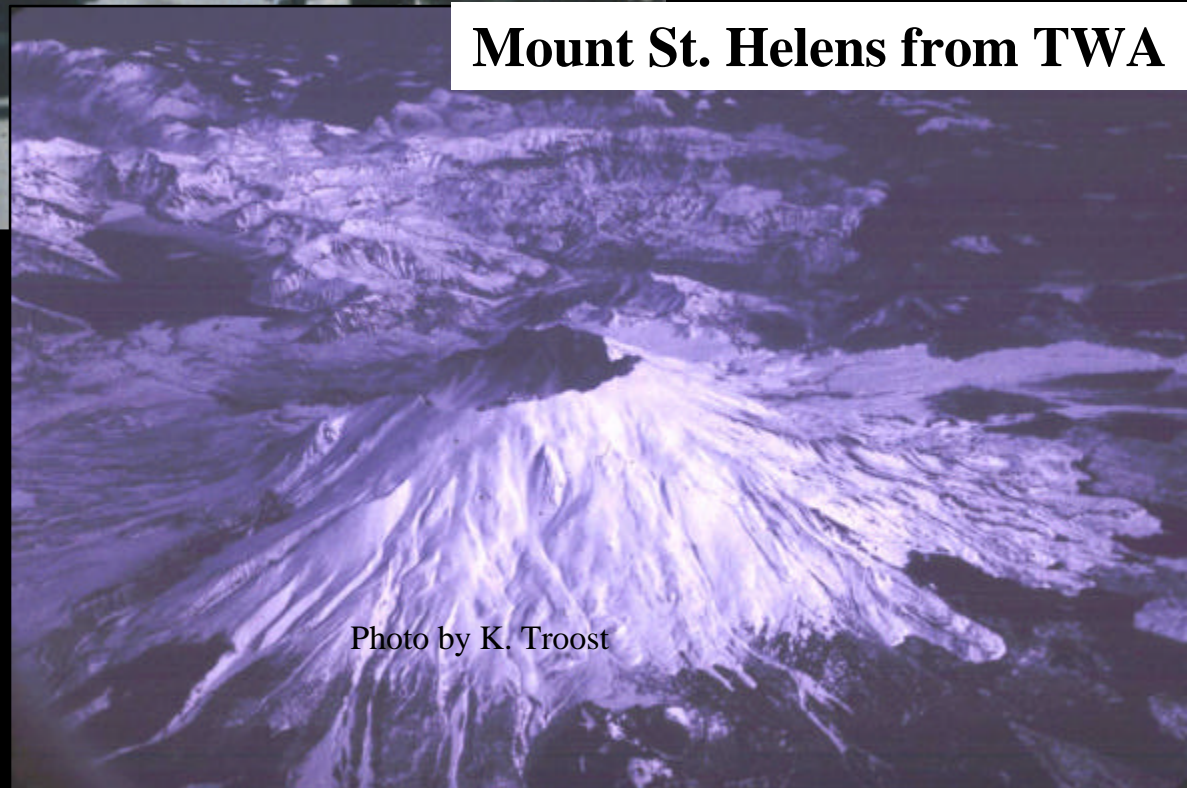
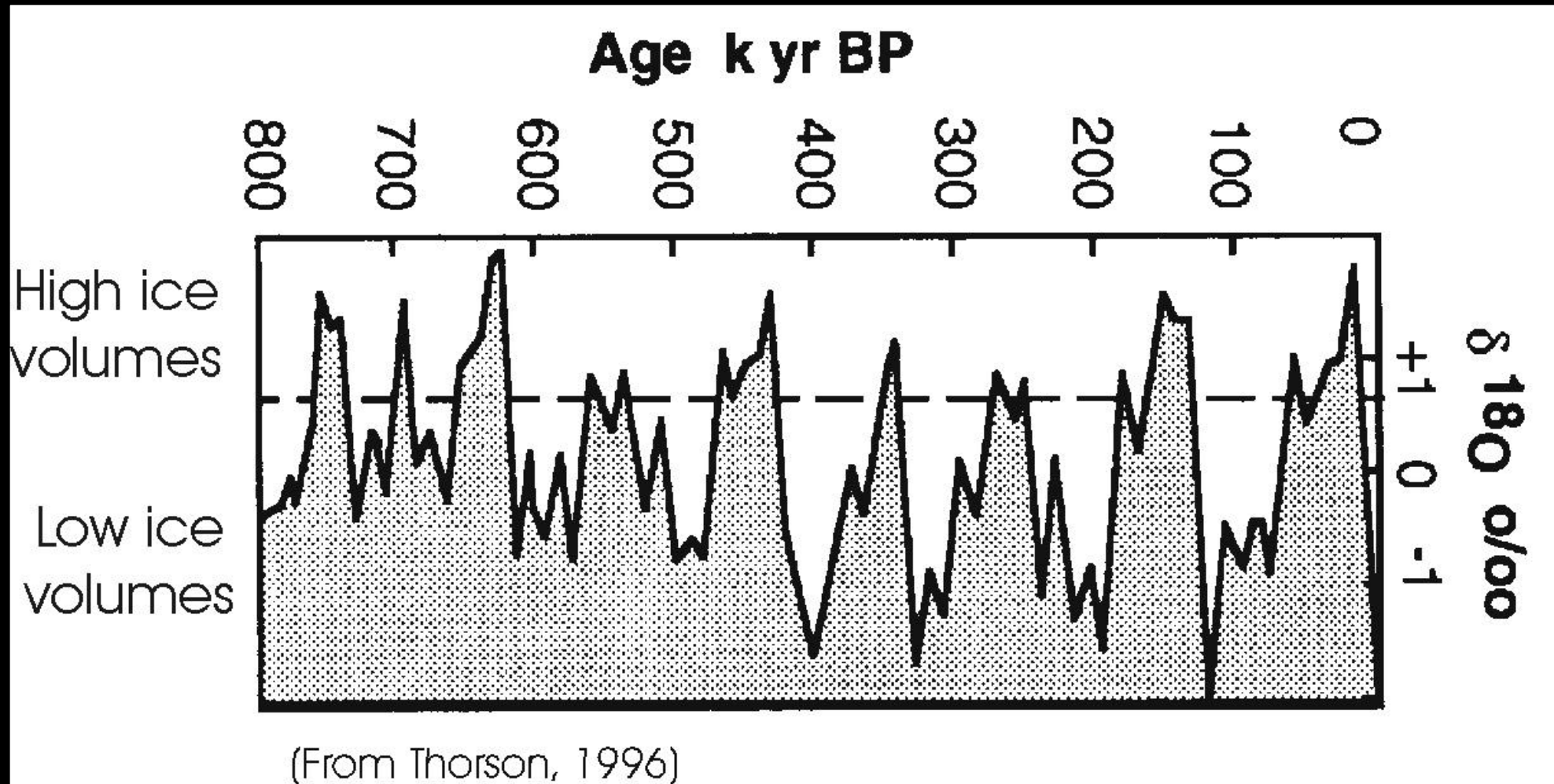


Photo by K. Troost

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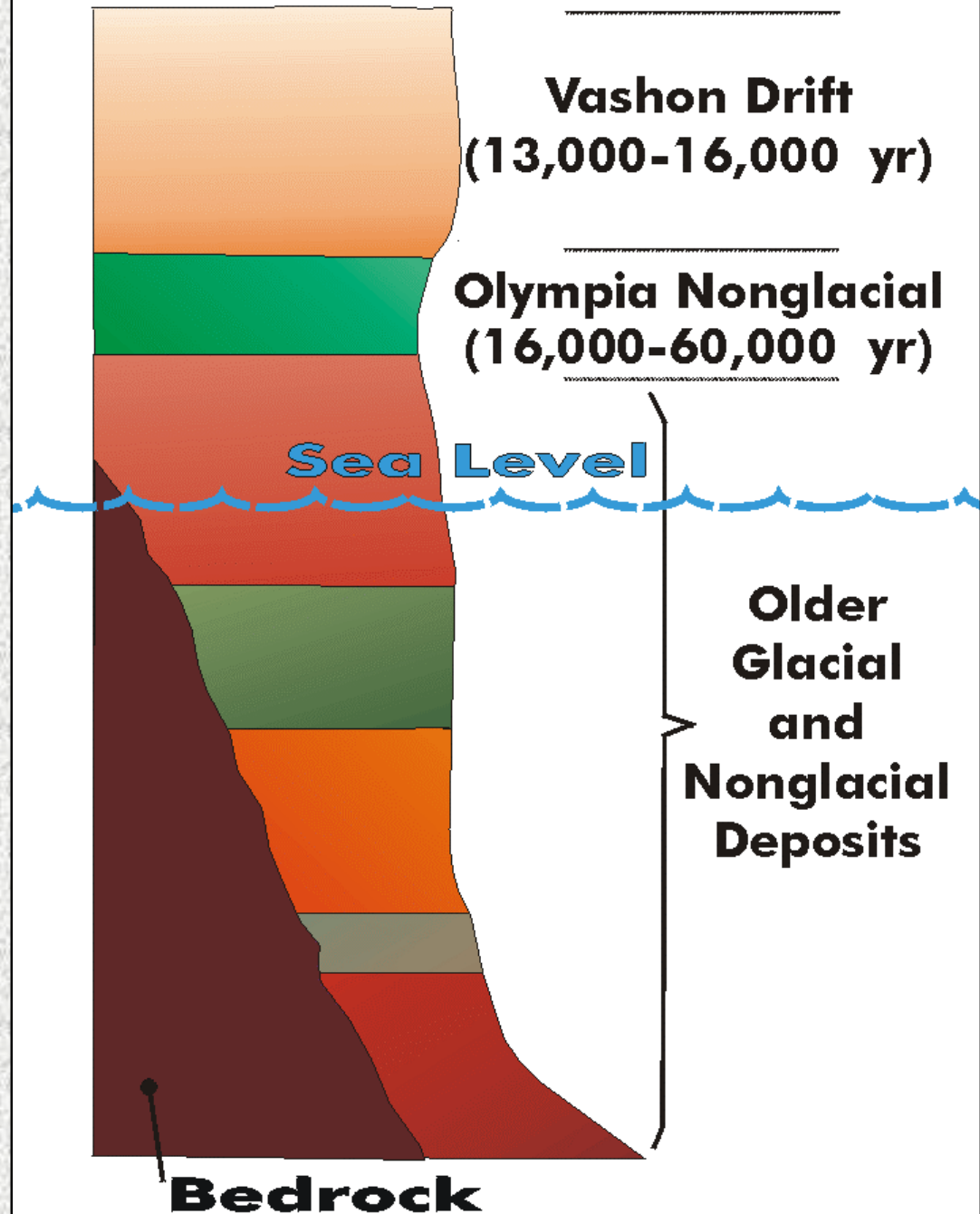
Bogs occupy some flutes.



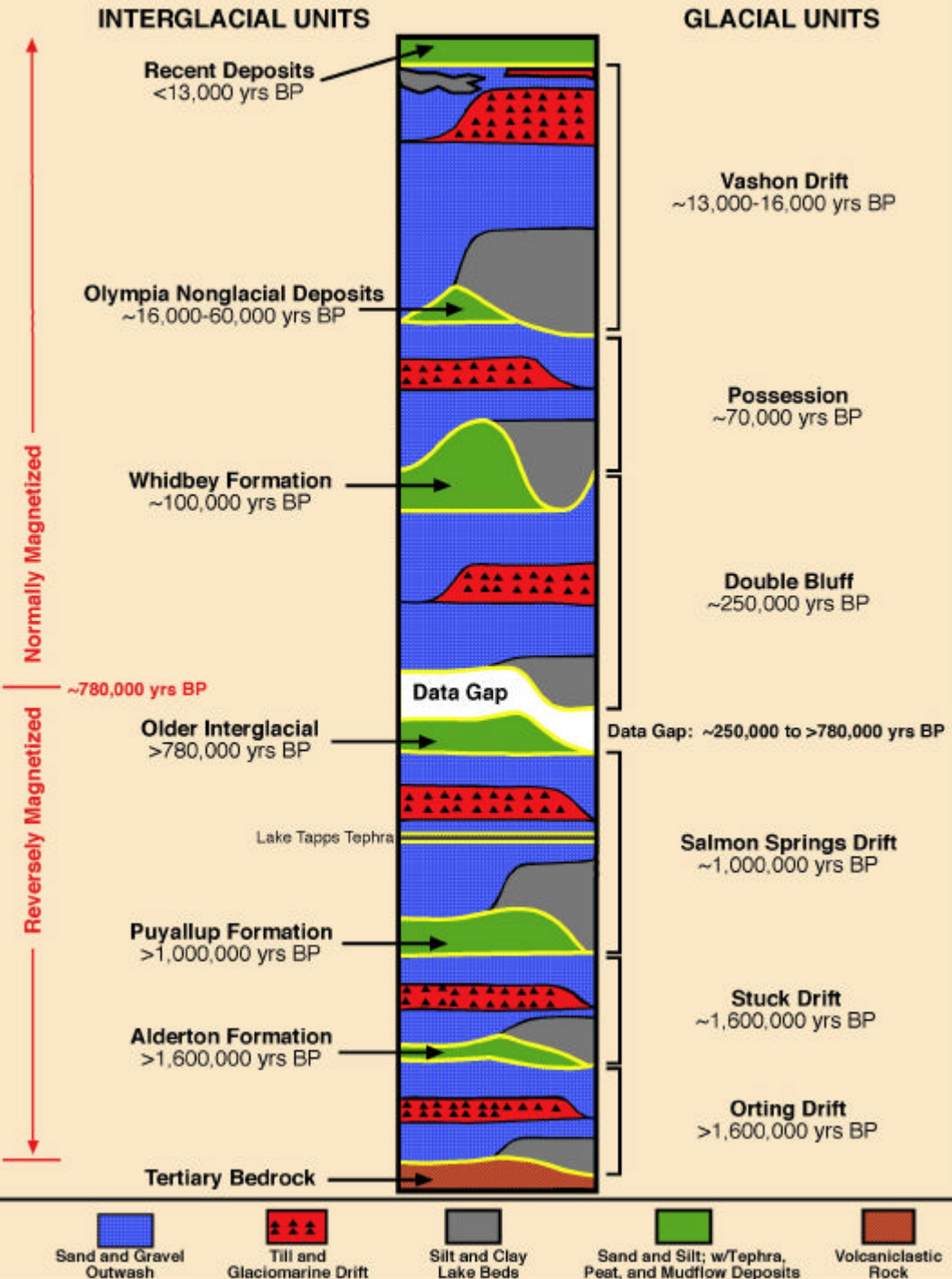


Climate has cooled enough times to have produced at least 6 glaciations in the Puget Lowland.

Seattle Area



CONCEPTUAL STRATIGRAPHIC COLUMN, Central Puget Lowland Area



Troset, 2001 (Dates from Blunt, Easterbrook, and Rutter, 1987, DGER Bulletin 77)



Photo by K. Troost