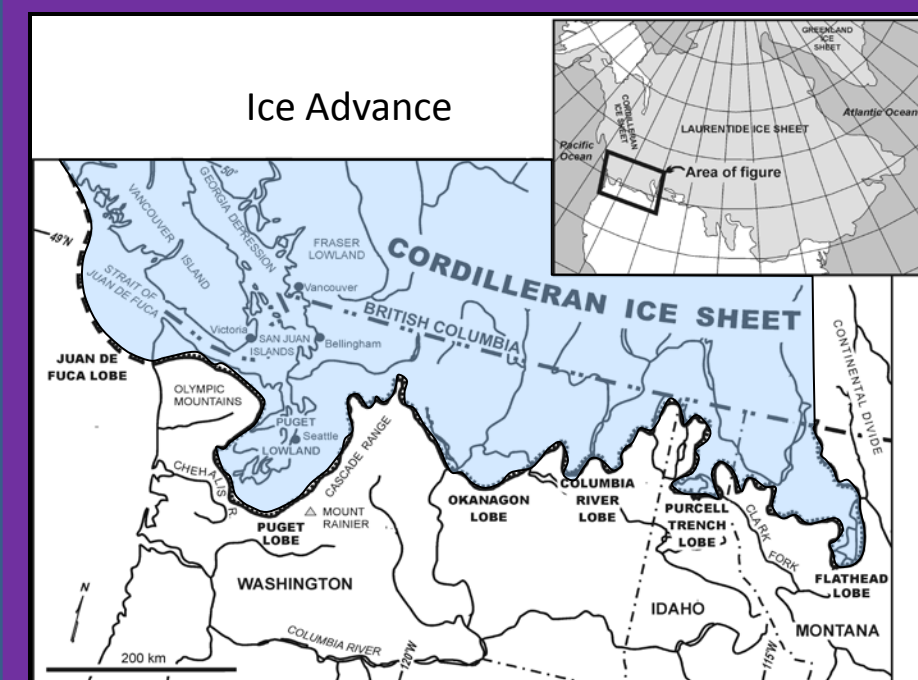


## 1. Goals: Identification and age of glacial and interglacial deposits in the central Puget Lowland?

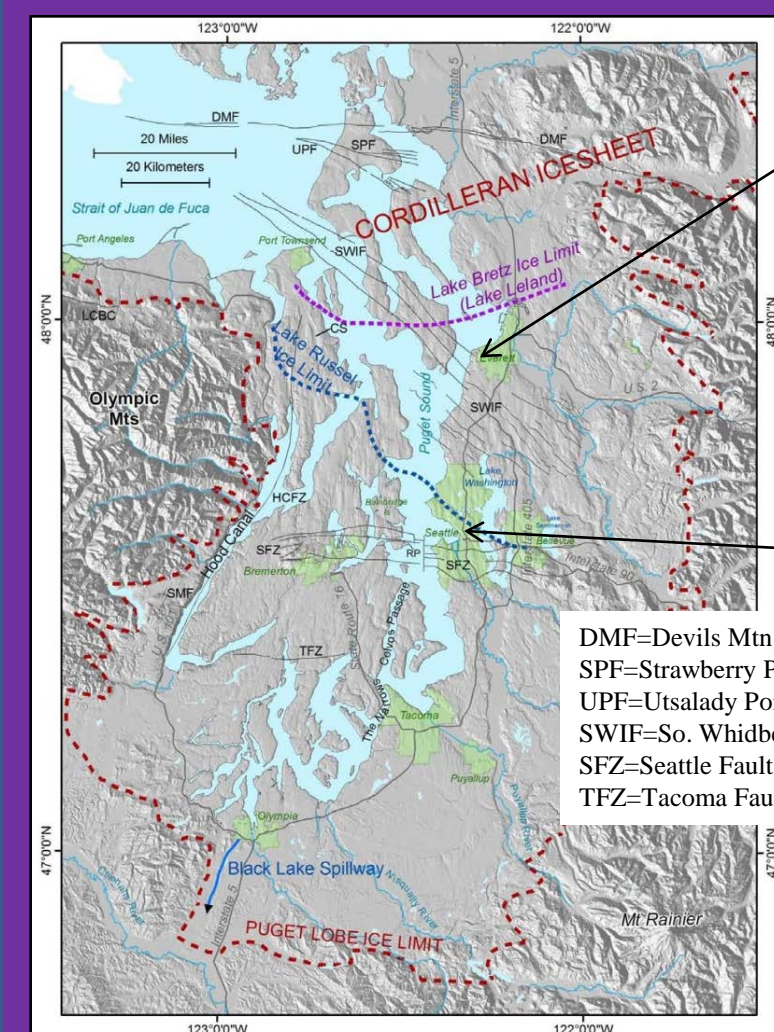


Multiple glaciers have advanced into the Puget Lowland from British Columbia, the three most recent corresponding with OIS 2, 4, and 6. Unlike the most recent advance, the Fraser Glaciation, any previous glaciations are poorly understood and their deposits are known mostly at type sections.



Till over outwash, typical of all of the glacial advances in the lowland.

## 2. Why?: ecosystems, climate, groundwater sources and storage, planning, and geologic hazards.



Angular unconformity in >400ka glacial deposits in South Whidbey Island Fault Zone (SWIF).

Map showing extent of last lowland glaciation (MIS 2), ice fronts during recession, and some of the active faults.



Deformed, Possession-age (MIS 4, IRSL 65-75 ka), glaciolacustrine beds under I-5 in the Seattle Fault Zone (SFZ).

## 3. Methods: 14C, OSL/IRSL, paleomagnetism, micro and macrofossils, provenance, mapping, aeromagnetism, geomorphology...

*Picea Engelmannii*



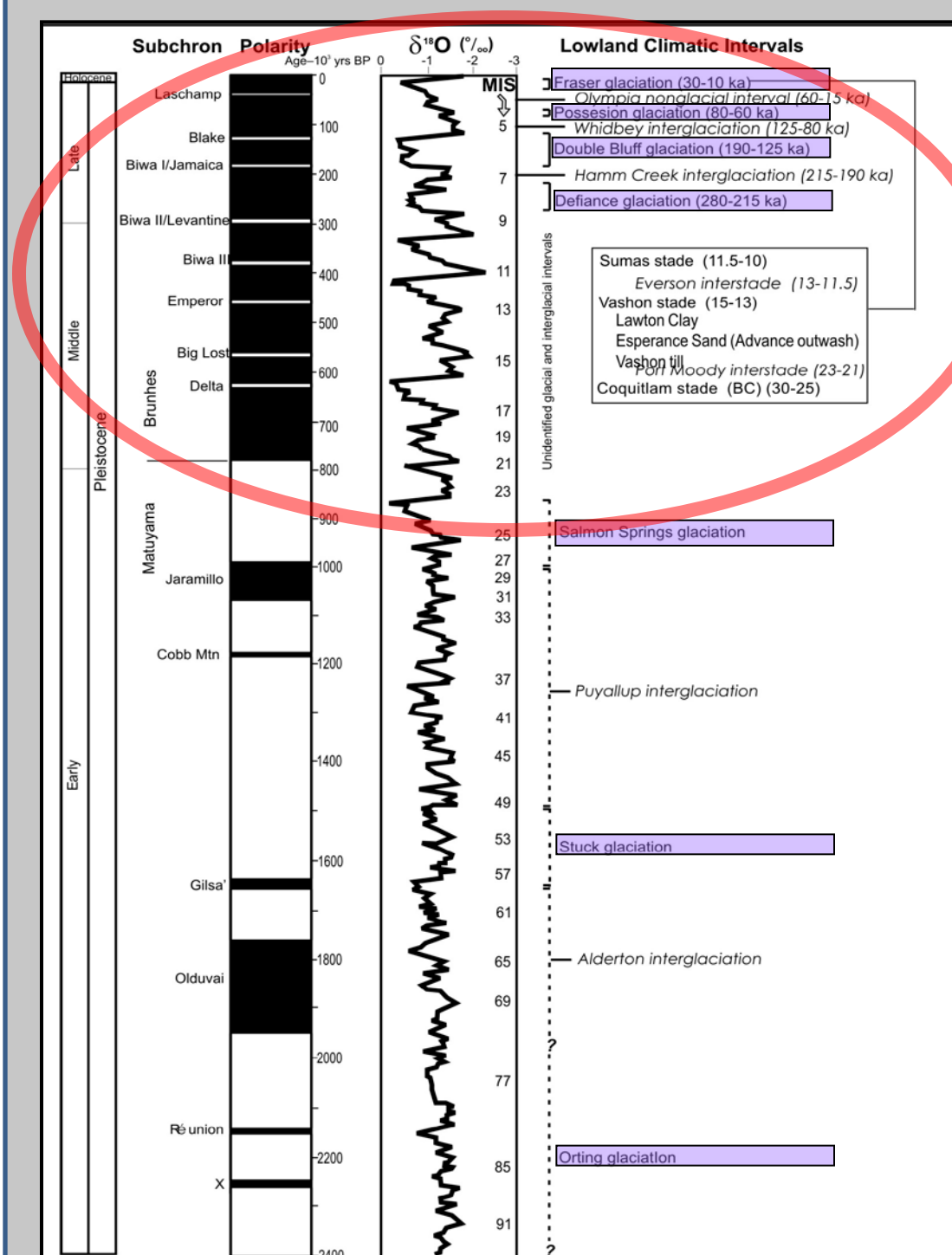
Western White Pine



IRSL sampling, south end of Whidbey Island.

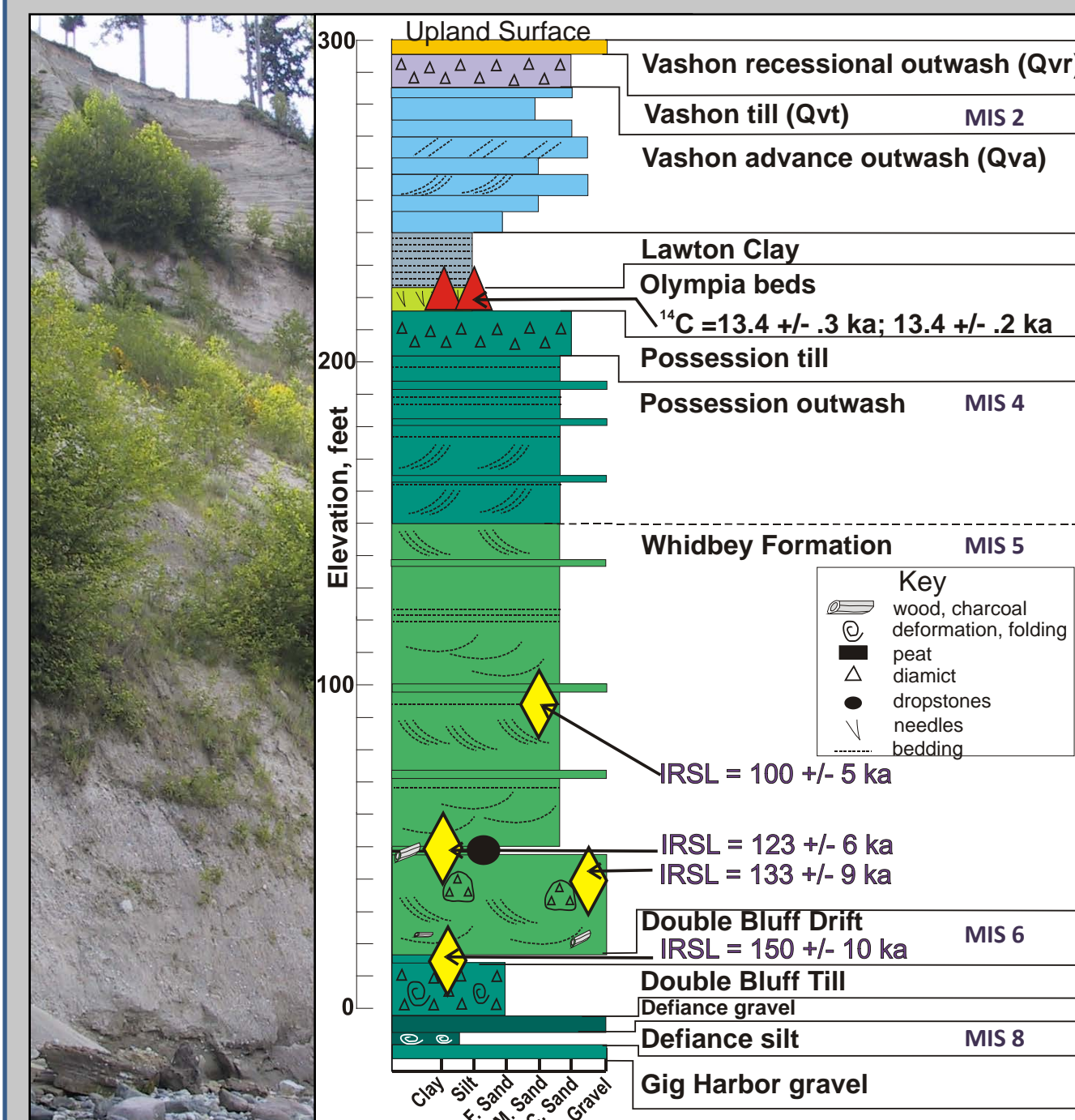


Obligate marine mussels in MIS 4/5 deposits.



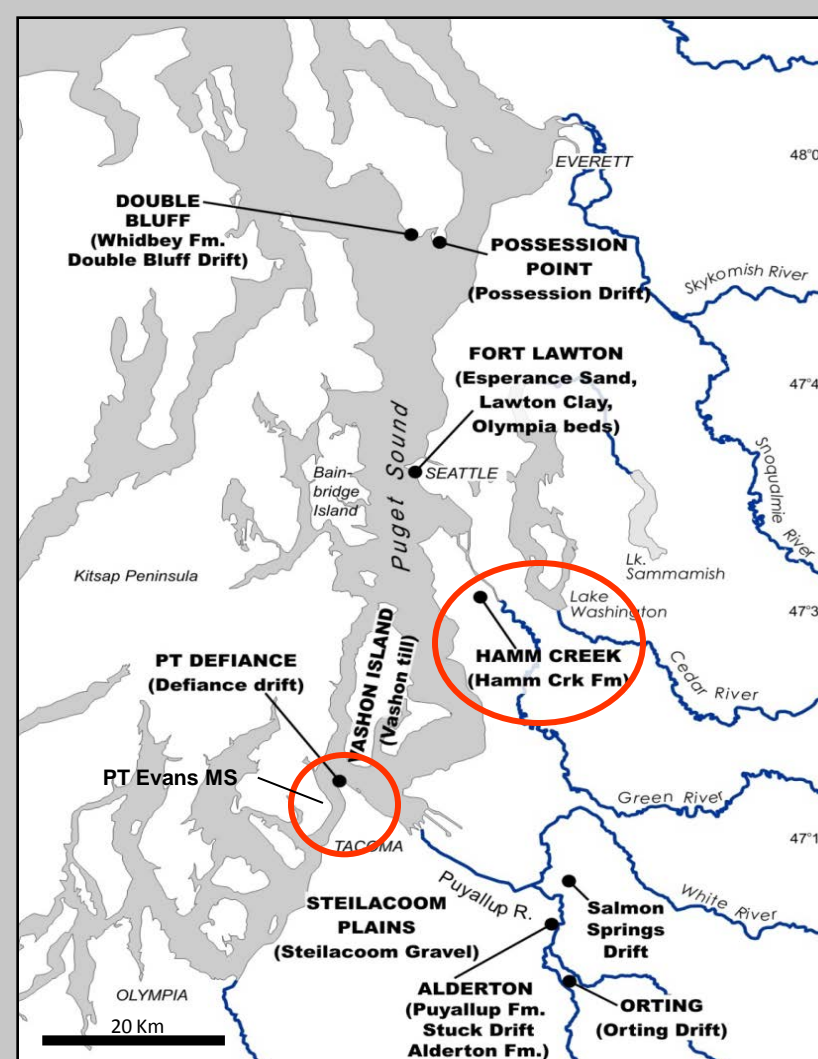
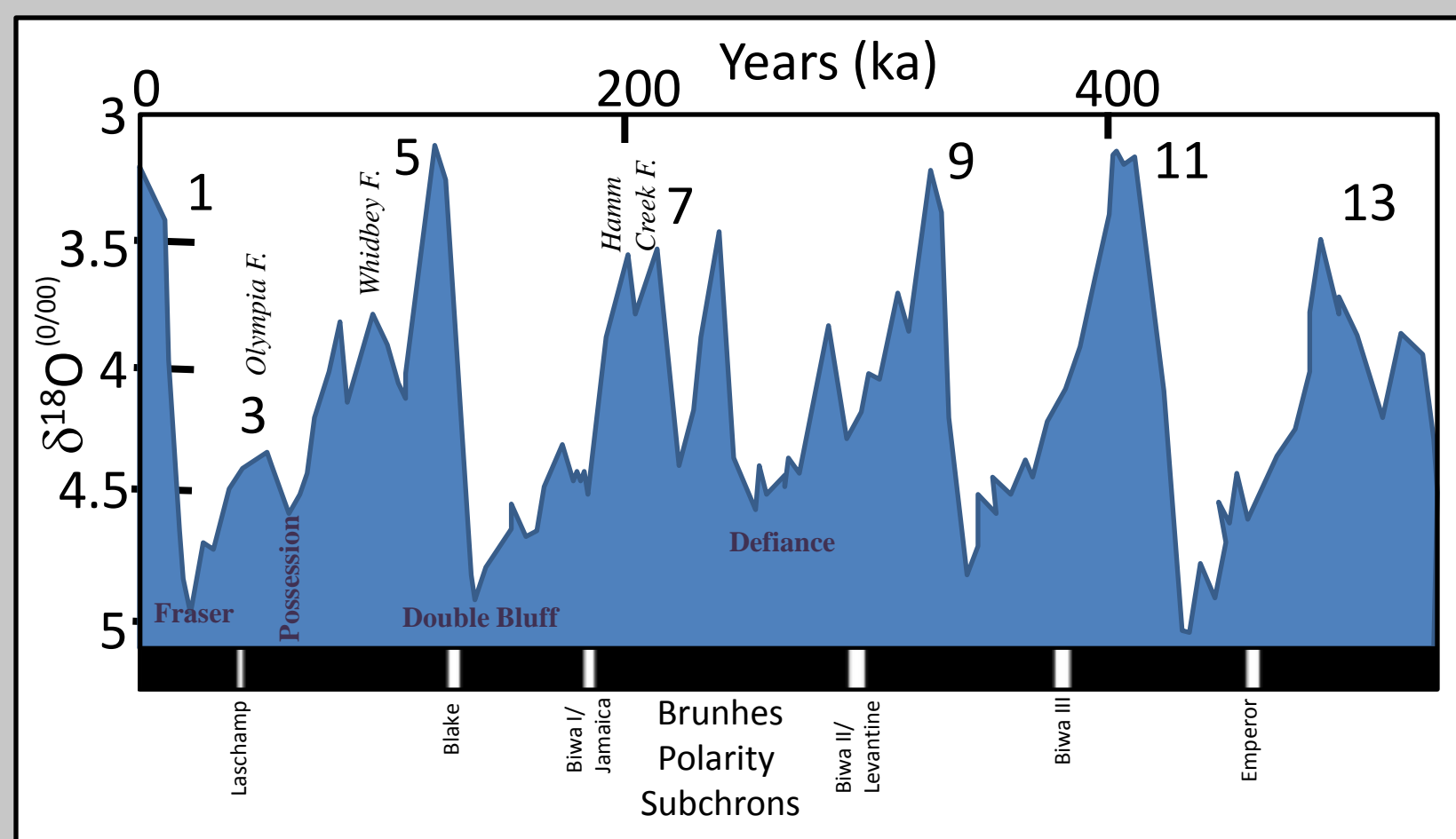
A. Composite stratigraphic column for the south-central Puget Lowland from Troost and Booth, 2008. Reversely magnetized, unique polarity deposits help identify MIS 5.

B. Point Evans, Tacoma area, measured section showing multiple lines of evidence for MIS 4, 5, 6, and 8 deposits.



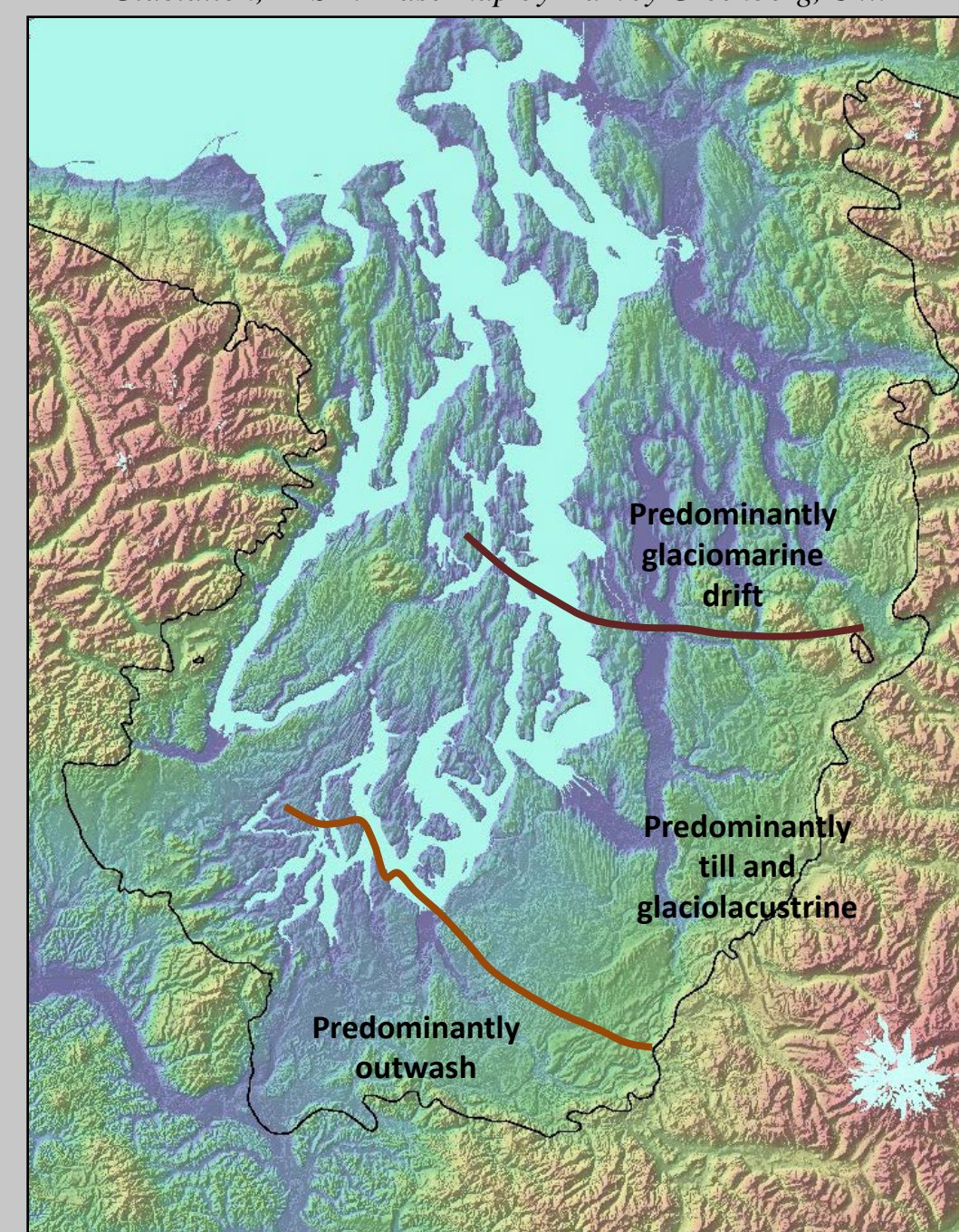
## 4. Findings:

- Further extent of MIS 4 glaciation
- MIS 5 and 6 deposits in new areas
- Newly identified MIS 7 interglacial deposits
- Newly identified MIS 8 glacial deposits
- Newly identified glacial deposits >400ka

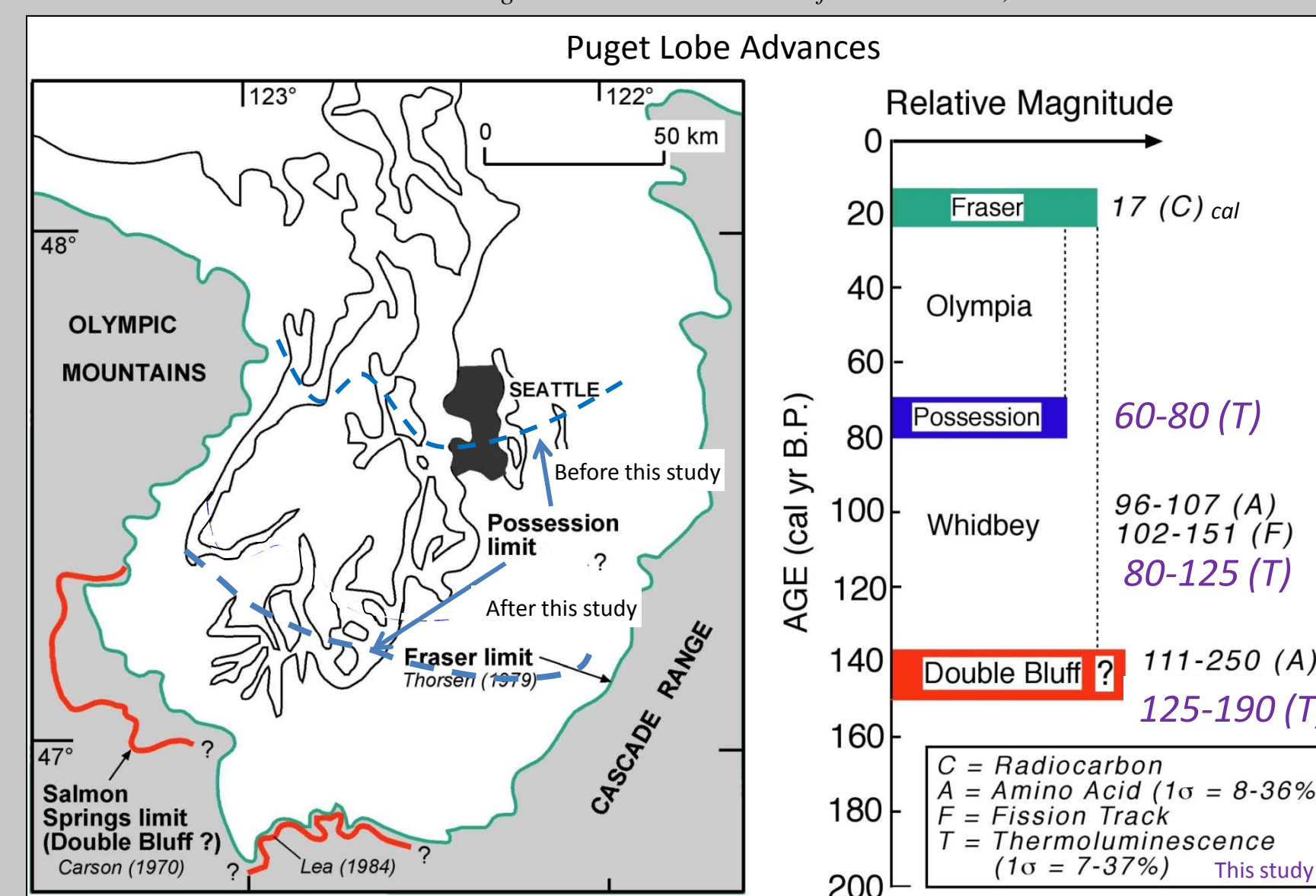


C. Map showing location of new type sections for MIS 7 (Hamm Creek) and MIS 8 (Defiance Drift) deposits.

E. Map showing facies from the MIS 4, Possession, glacial advance into the Puget Lowland. The black line shows the limit of the Fraser Glaciation, MIS 2. Base map by Harvey Greenberg, UW.



D. Map and graph showing relative extents of the last three glaciers to extend into the Puget Lowland from the North. The MIS 8 glacier extended at least as far as the MIS 4, Possession.



## 5. Conclusions:

- Extensive mapping and chronological work led to the discovery of newly identified glacial and interglacial deposits.
- Stratigraphic units identified by Dr. Donald Easterbrook in the 1960's, 70's, and 80's, in the northern lowland, can be correlated with glacial and interglacial deposits in the Seattle and Tacoma areas.
- MIS 3 deposits indicate nonglacial conditions, and are discontinuous but well distributed in the Puget Lowland.
- MIS 4-Possession-age deposits are discontinuous but well distributed throughout the Central Puget Lowland.
- The MIS 4-Possession glacier was smaller and did not extend as far as the MIS 2-Vashon glacier.
- The relief on the MIS-4 paleotopographic surface is similar to that of MIS-2, so perhaps ice sheet dynamics were somewhat similar.
- Multiple lines of evidence point to a wet climate. Climate proxies show that the MIS4 climate was slightly warmer than MIS2.
- Extensive glaciomarine and glaciolacustrine deposits suggest more water-laid deposits during MIS 4 than during MIS 2 Vashon glaciation.
- The facies model for MIS 4 suggests a wet-based glacier with deep scouring in troughs and drumlin formation on the uplands.



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