Refining the pattern and relative timing of Cordilleran Ice Sheet retreat:

paleogeography and evolution of late-glacial ice-marginal lakes on the southern Fraser Plateau, British Columbia

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Rationale

- Regional reconstructions of glacioisostatic rebound near the southern Fraser Plateau imply a sloping ice surface and suggest systematic ice-margin retreat (Fig. 1) [1,2], in contrast to the prevailing view of regional stagnation [3,4].
- A lack of large recessional moraines in south-central BC has confounded reconstructions of ice-margin retreat.
- The paleogeography and evolution of expansive late-glacial lake systems on BC's plateaus provide an untapped tool for reconstructing ice-margin evolution.

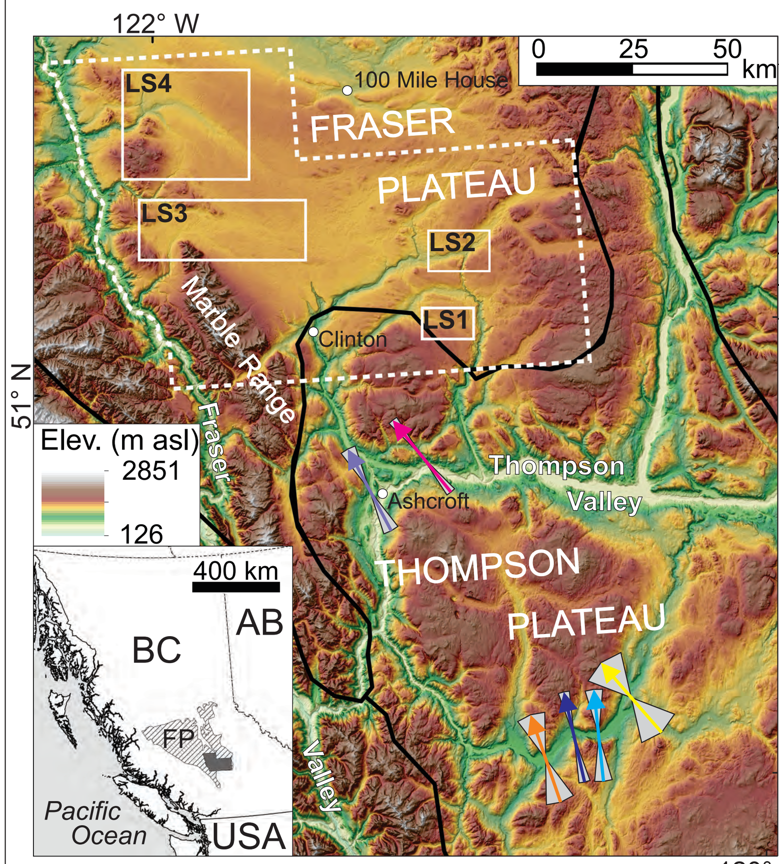


Table 1: Glacial lake shoreline tilts

Map symbol	Glacial lake*	Slope (m/km)
yellow arrow	Quilchena [3]	3.8 ± 10
light blue arrow	Hamilton (upper stage) [3]	1.8 ± 0.6
dark blue arrow	Hamilton (lower stage) [3]	1.6 ± 0.7
orange arrow	Merritt [3]	1.8 ± 0.6
grey arrow	Thompson (high stage) [4]	1.8 ± 0.7
pink arrow	Deadman (lowest stage) [4]	1.7 ± 0.4

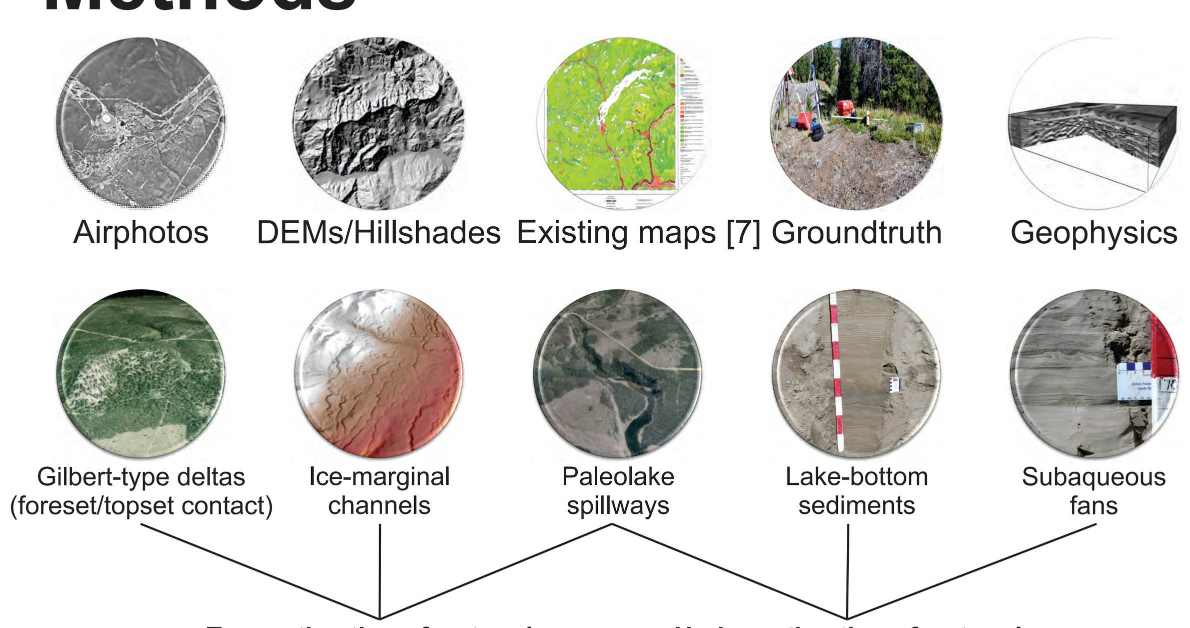
*listed in inferred chronological order, oldest to youngest [5]

Figure 1: Visualization of regionally reconstructed late-glacial lake shoreline tilt directions (gray range indicates error in reconstructed direction, Table 1) and location of reconstructed lake systems (LS1-LS4). Thick black lines indicate extent of interior plateau systems [6]. DEM and Hillshade data are from Geobase®. Inset map shows study area location (gray polygon) and location of the Fraser Plateau (FP).

Objectives

1. Reconstruct the paleogeography and evolution of late-glacial ice-marginal lake systems on the southern Fraser Plateau.
2. Use successive stages of lake evolution (supported by other landforms where applicable) and the inferred position of ice dams to reconstruct the pattern and relative timing of ice-margin retreat.

Methods



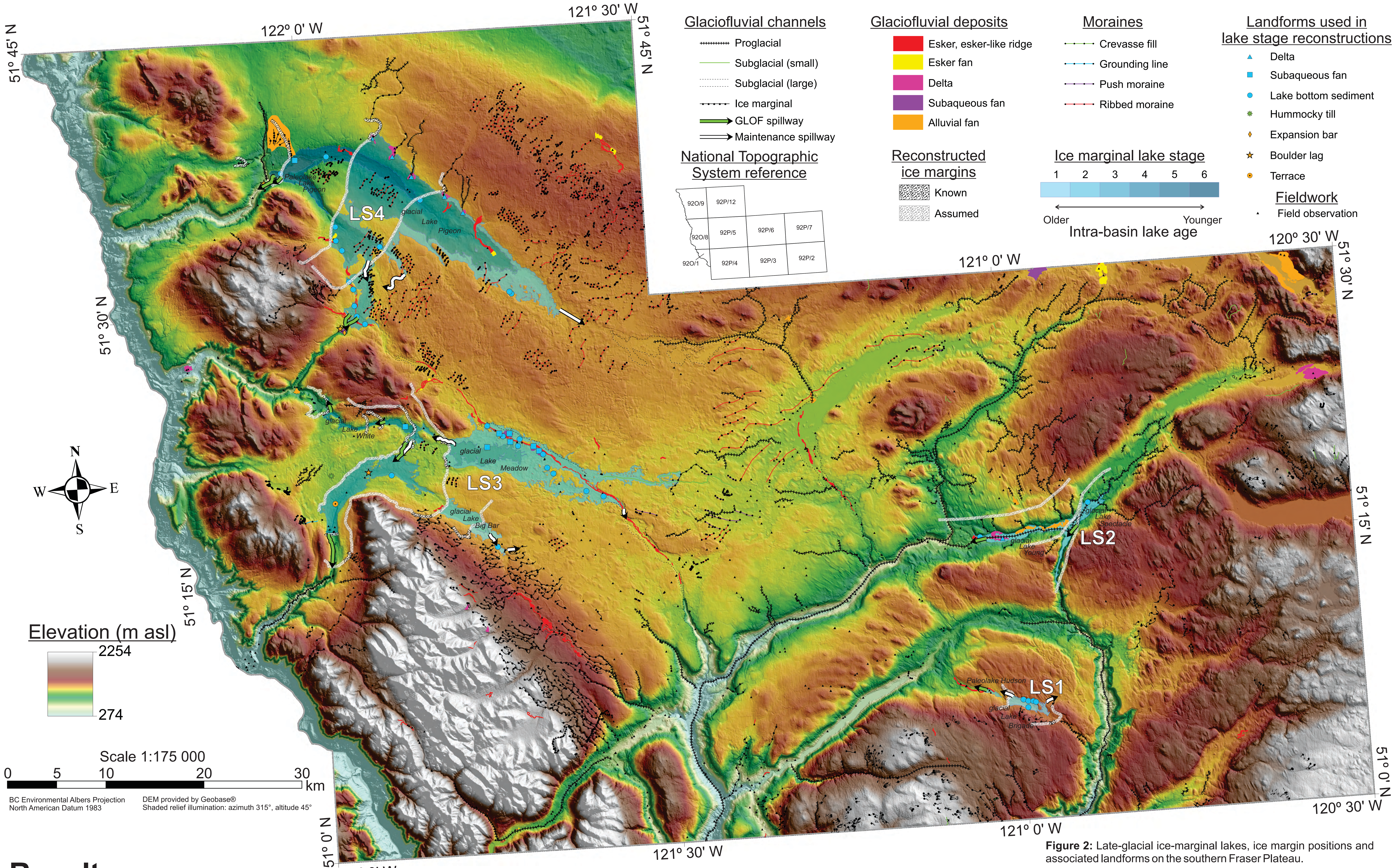


Figure 2: Late-glacial ice-marginal lakes, ice margin positions and associated landforms on the southern Fraser Plateau.

Results

1. Late-glacial ice-marginal lakes on the southern Fraser Plateau were expansive (avg. 42 km^2, Fig. 2) and shallow (avg. 18 m deep).
2. Within basins and between basins, successive lake stages developed from southeast to northwest, and define systematic ice-margin retreat to the northwest (Fig. 2).
3. The evolution of ice-marginal lake stages provides a useful indicator of the ice margin in the absence of traditional ice-marginal indicators (e.g. large recessional moraines).

References

[1] Fulton, R.J. and Walcott, R.I. 1975. Lithospheric flexure as shown by deformation of glacial lake shorelines in southern British Columbia. in Quantitative studies in the geological sciences. Edited by E.H.T. Whitten. Geological Society of America, Boulder CO., Memoir 142, pp. 163-173. [2] Johnsen, T.F., and Brennand, T.A. 2004. Late-glacial lakes in the Thompson Basin, British Columbia: paleogeography and evolution. Canadian Journal of Earth Sciences, **41**: 1367-1383. [3] Fulton, R.J. 1991. A conceptual model for growth and decay of the Cordilleran Ice Sheet. Géographie Physique et Quaternaire, 45(3): 281-286. [4] Clague, J.J. and James, T.S. 2002. History and isostatic effects of the last ice sheet in southern British Columbia. Quaternary Science Reviews, 21: 71-87. [5] Fulton, R.J. 1969. Glacial lake history, southern Interior Plateau, British Columbia. Geological Survey of Canada Paper 69-37, 14 pp. [6] Holland, S. 1976. Landforms of British Columbia - A physiographic outline. B.C. Dept. of Mines and Petroleum Resources, Bulletin No. 48. pp. 138. [7] Tipper, H.W., 1971. Surficial geology, Bonaparte Lake, British Columbia. Geological Survey of Canada, Map 1293A, Scale 1:250 000; Huntley, D.H. 1995. Surficial geology of Churn Creek (92O/07), Empire Valley (92O/08), Dog Creek (92O/09) and Mount Alex (92O/10) map areas. Geological Survey of Canada, Open File 3155, Scale 1:50 000; Bednarski, J.M. 2009. Surficial geology, Bridge Lake, British Columbia. Geological Survey of Canada, Open File 5839, scale 1:50 000; Huscroft, C.A. 2009. Surficial geology, Criss Creek, British Columbia. Geological Survey of Canada, Open File 5932, scale 1:50 000; Plouffe, A. 2009. Surficial geology, Green Lake, British Columbia. Geological Survey of Canada, Open File 5939, scale 1:50 000; Plouffe, A. 2009. Surficial geology, Loon Lake, British Columbia. Geological Survey of Canada, Open File 5933, scale 1:50 000.