

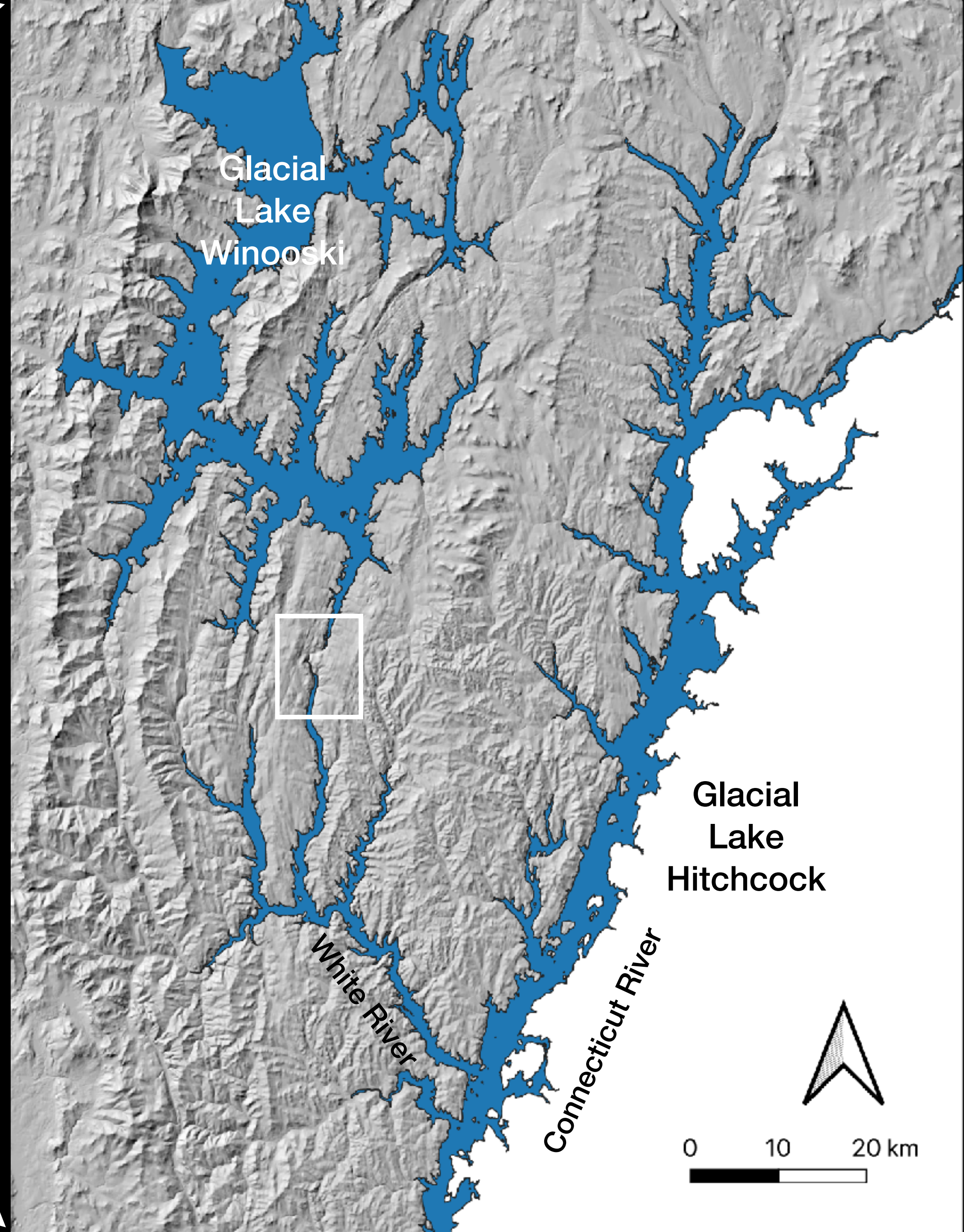
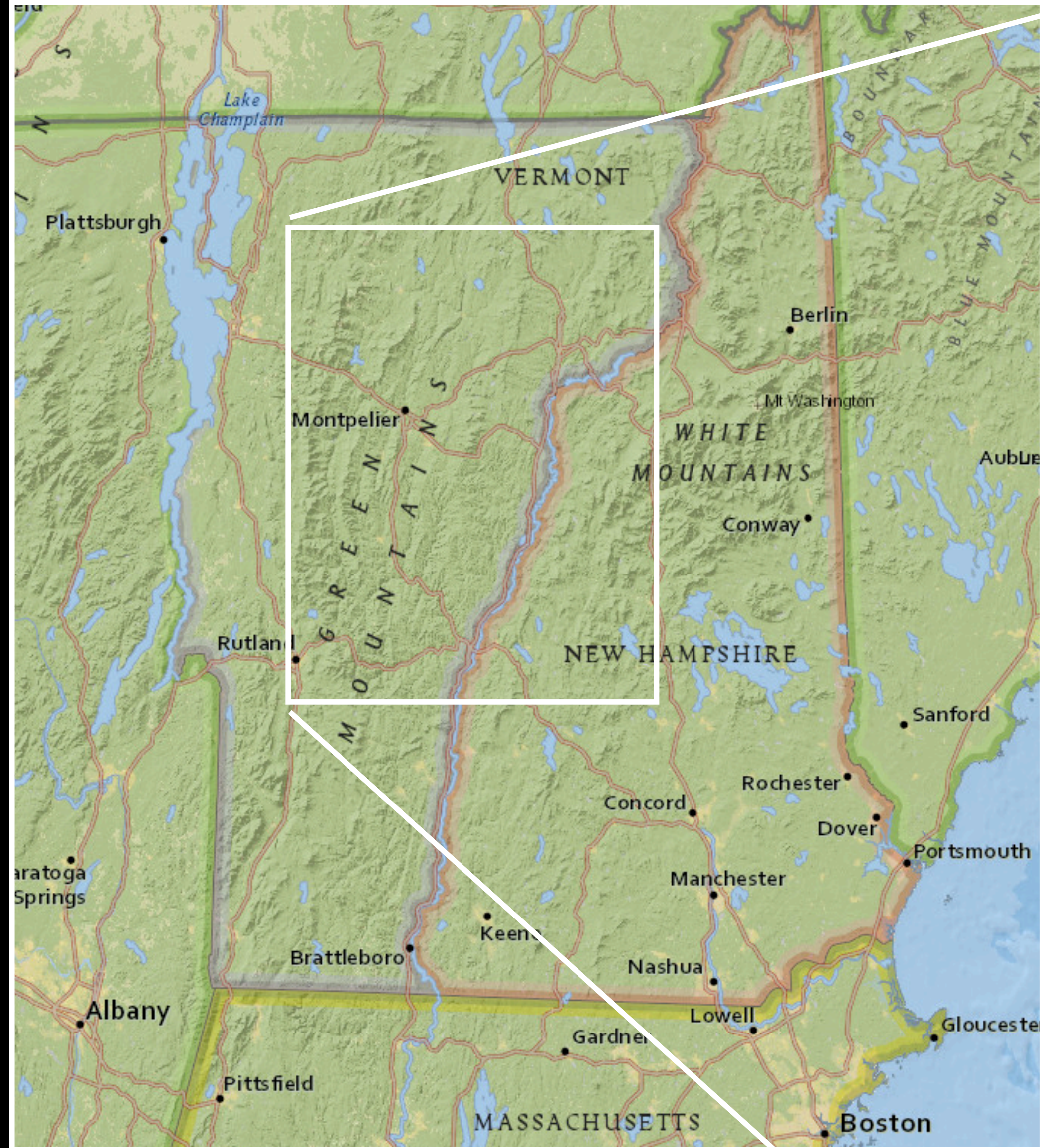


# Intertwined Histories of Glacial Lakes Hitchcock and Winooski in the Brookfield Quadrangle, North-central Vermont

Stephen Wright  
Department of Geology  
University of Vermont

View south along the Second Branch of the White River valley (Route 14), East Brookfield





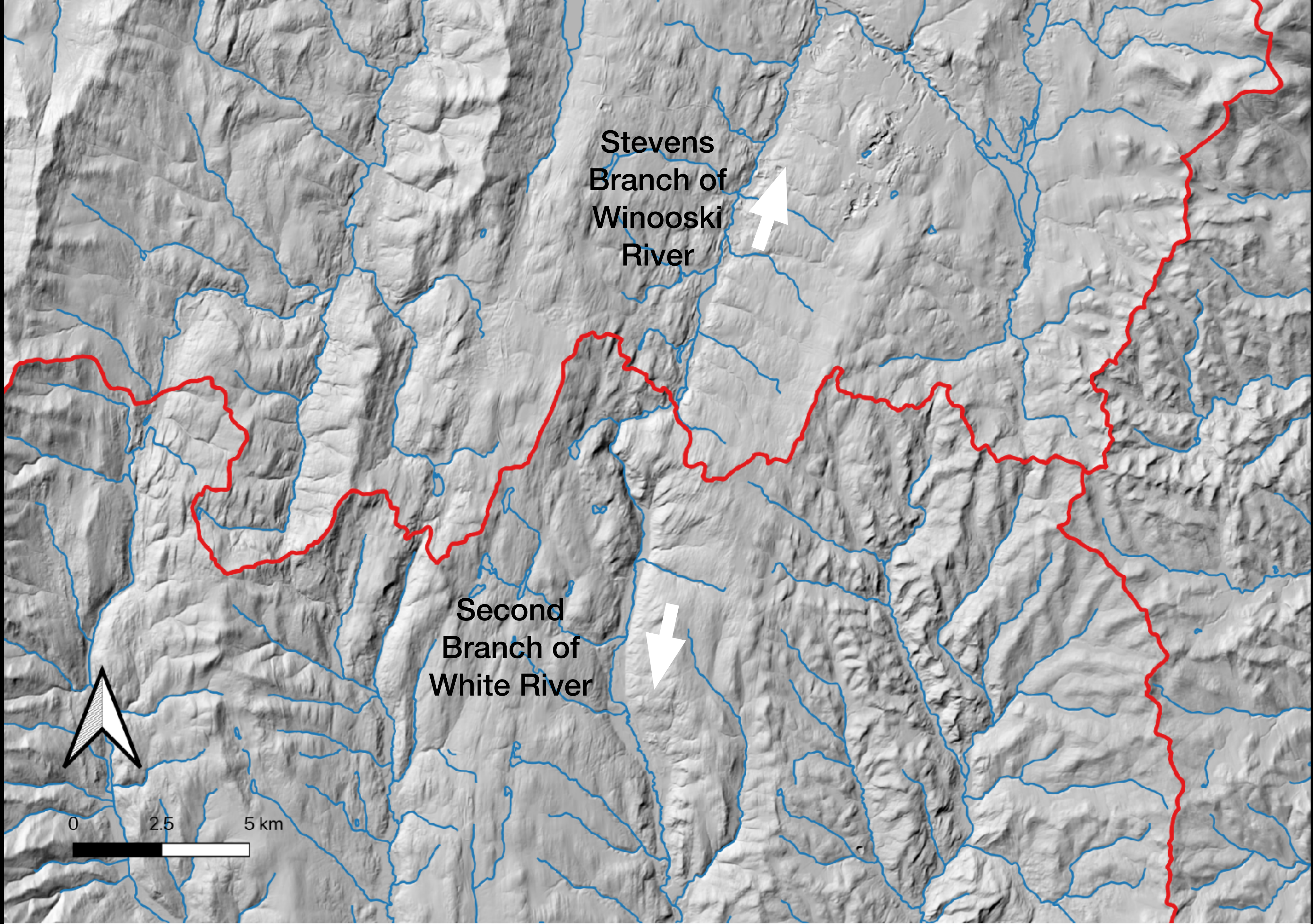


# UVM Student Interns 2021

Cate Hogen, Remy Farrell, Abby Baker, Caitlin Farkas, Jason Drebber, Will Vanderlan, Ryan Mistur, Evan Choquette





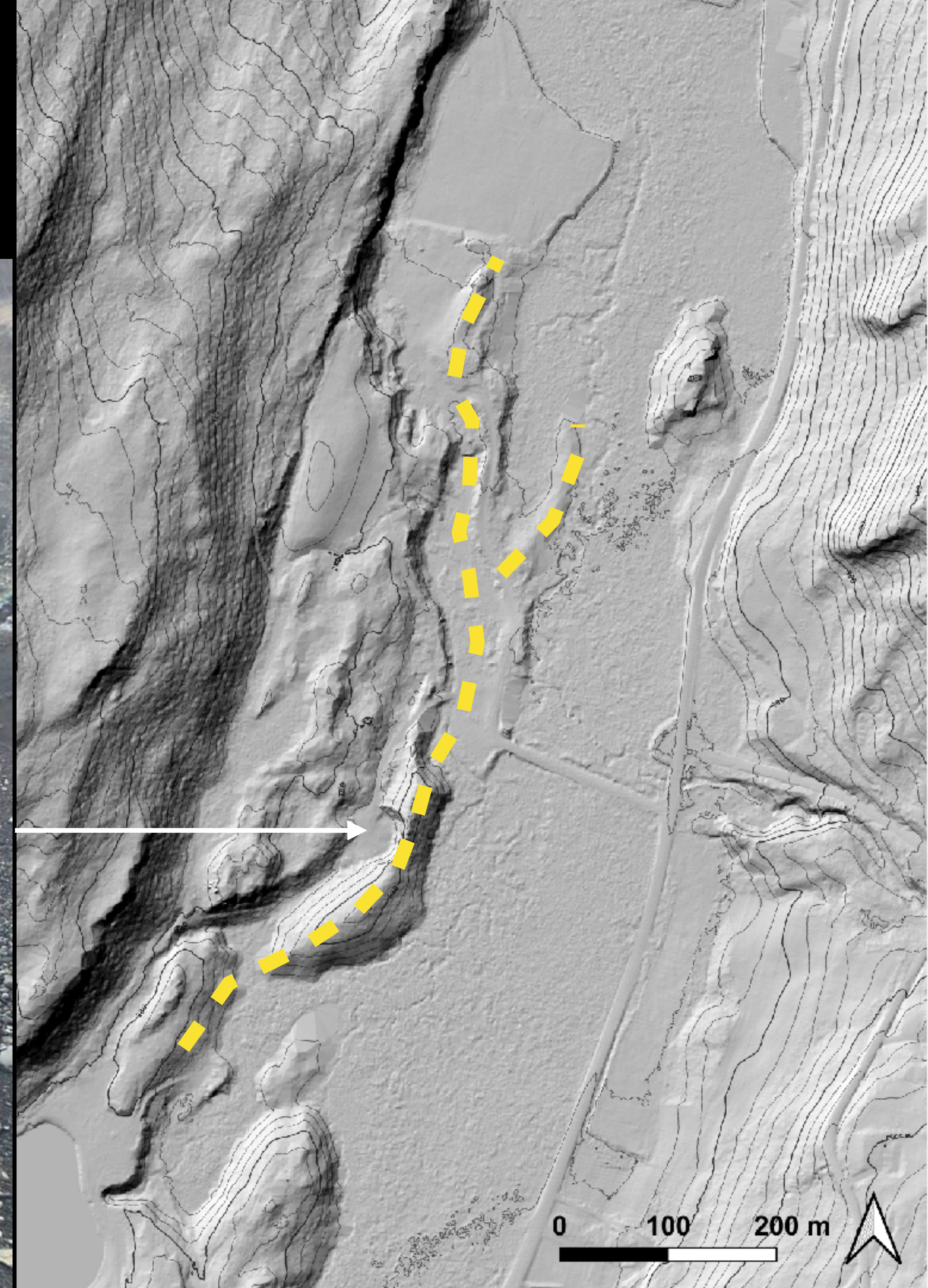




# North-South Subglacial Drainage System funneled meltwater and sediments.

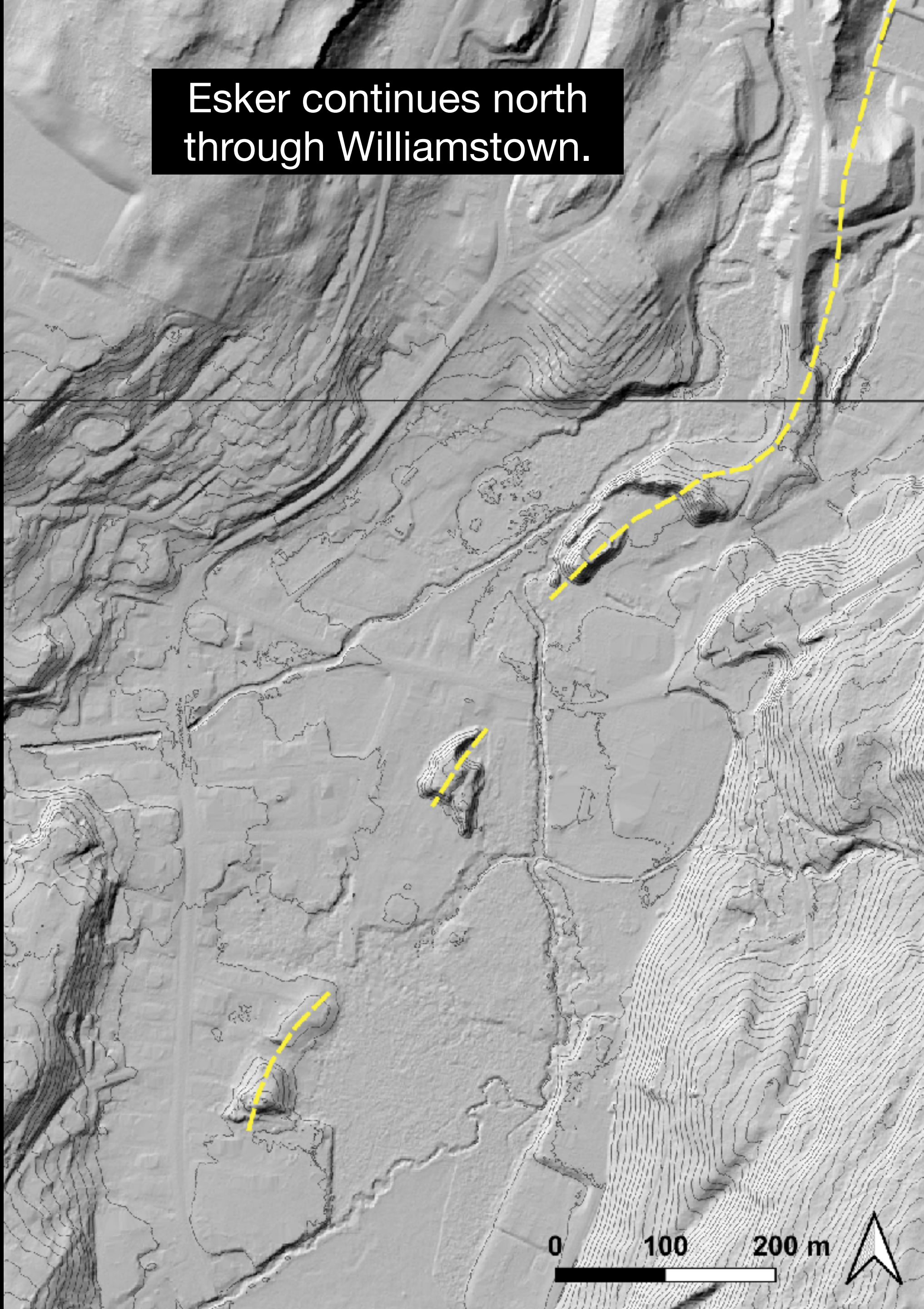
North

South

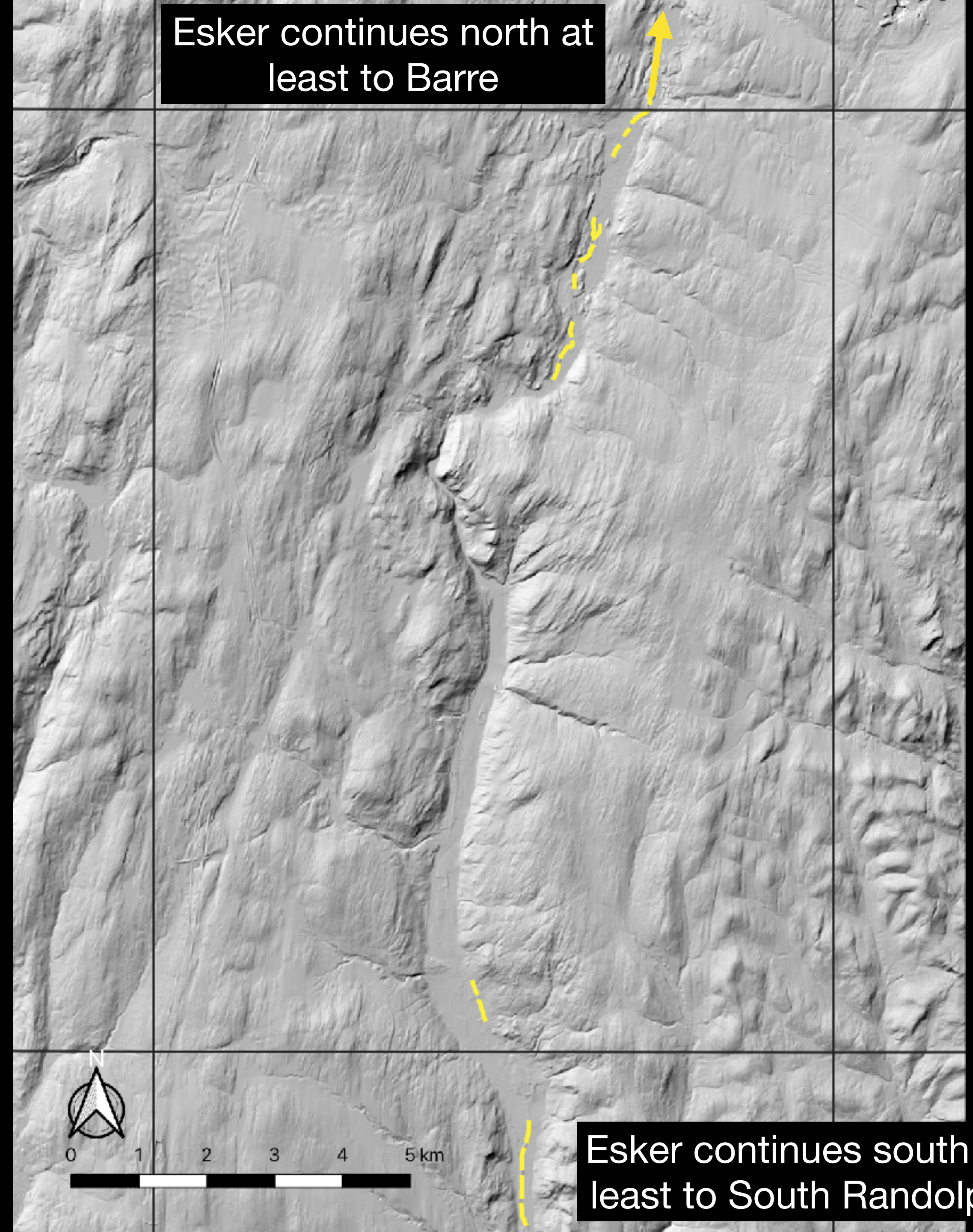




Esker continues north  
through Williamstown.



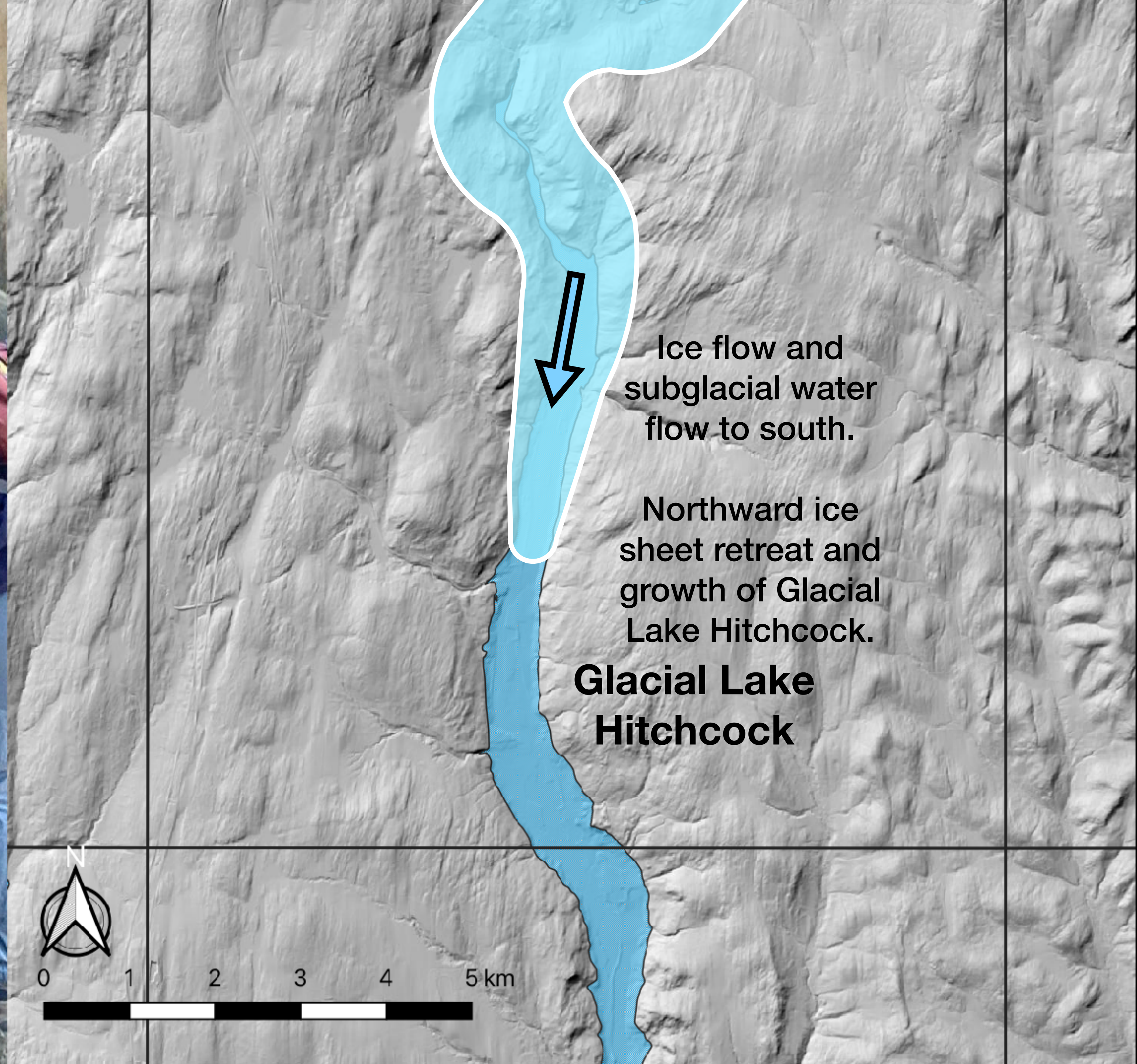
Esker continues north at  
least to Barre



Esker continues south at  
least to South Randolph



Glacial Lake Sediments

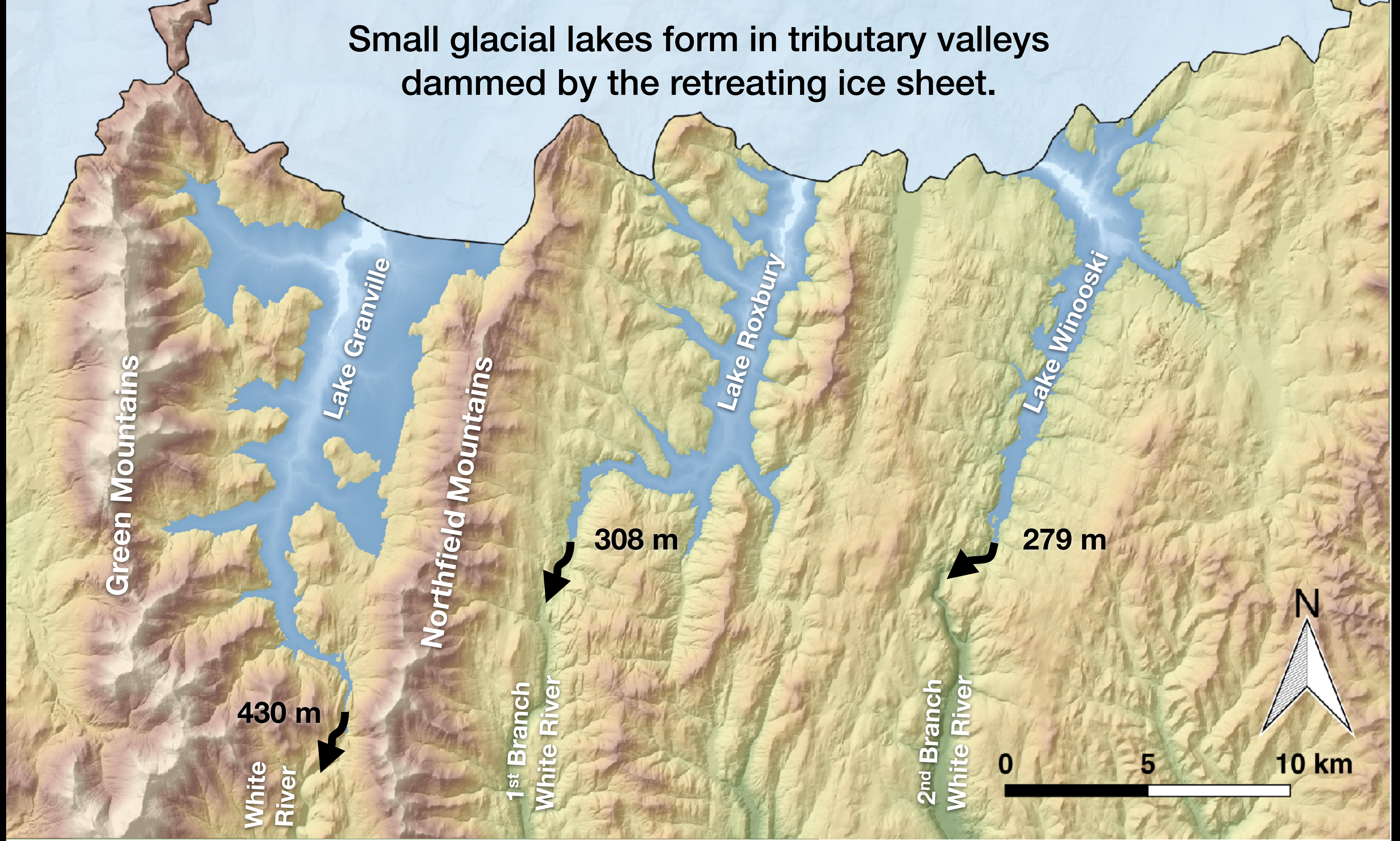




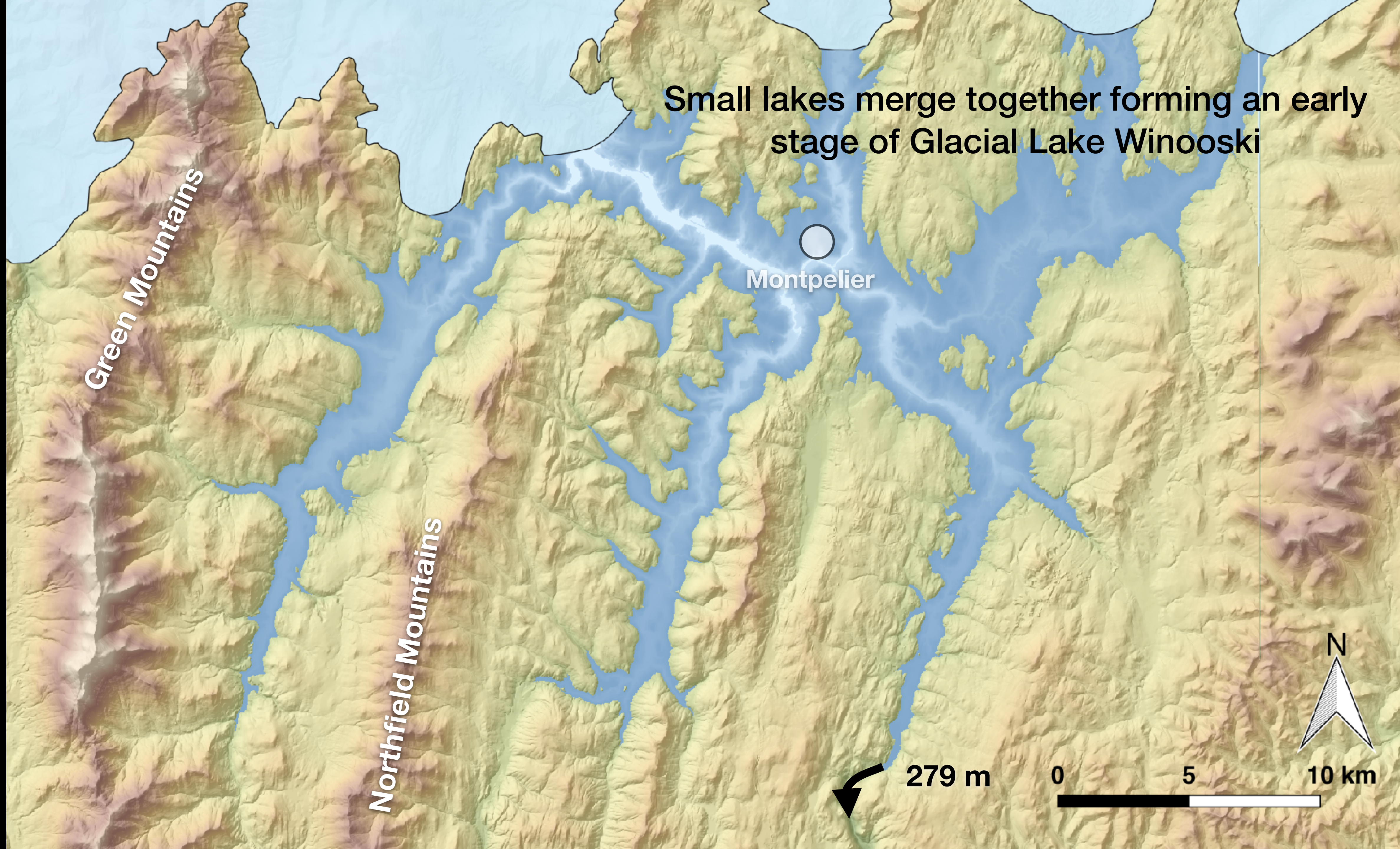




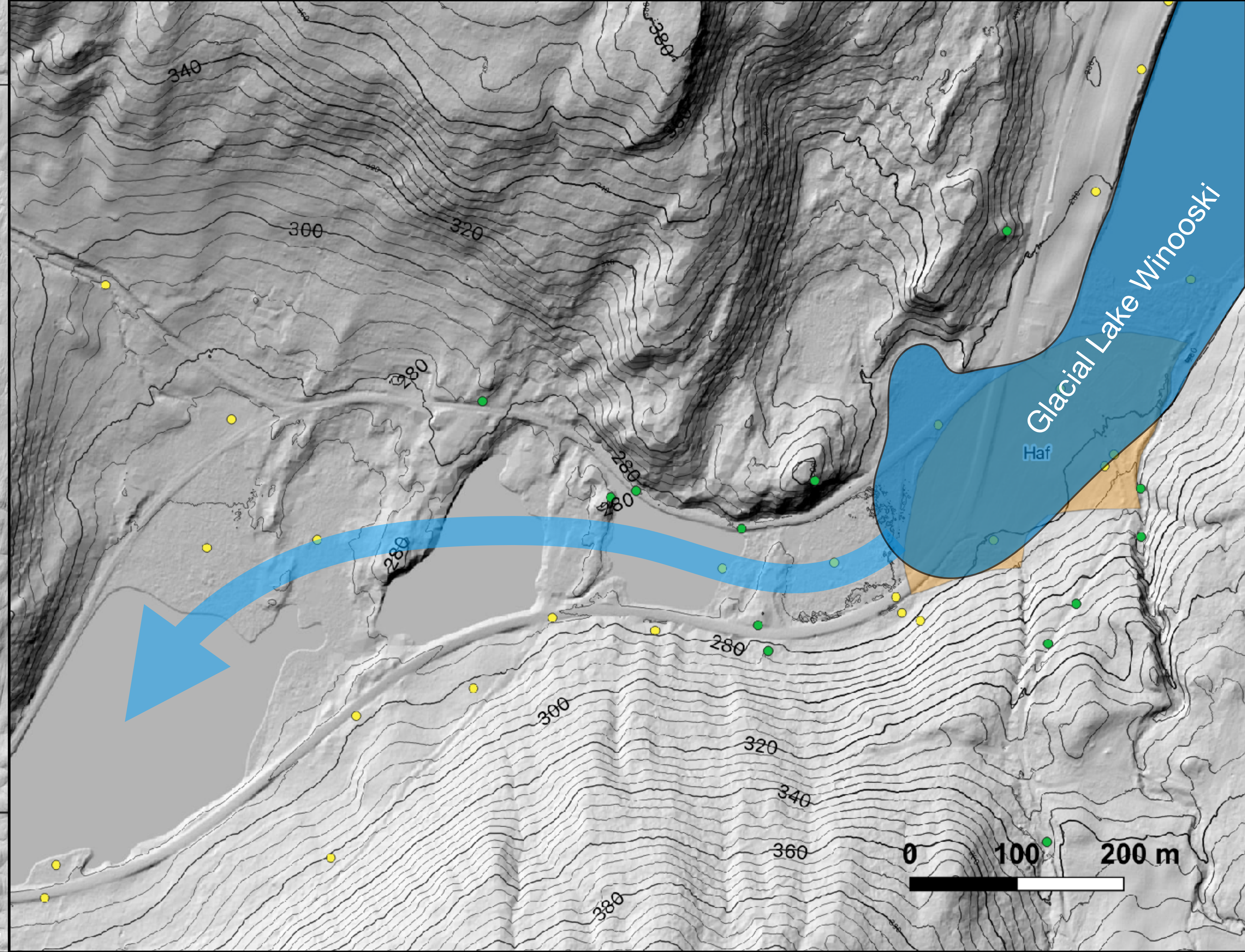
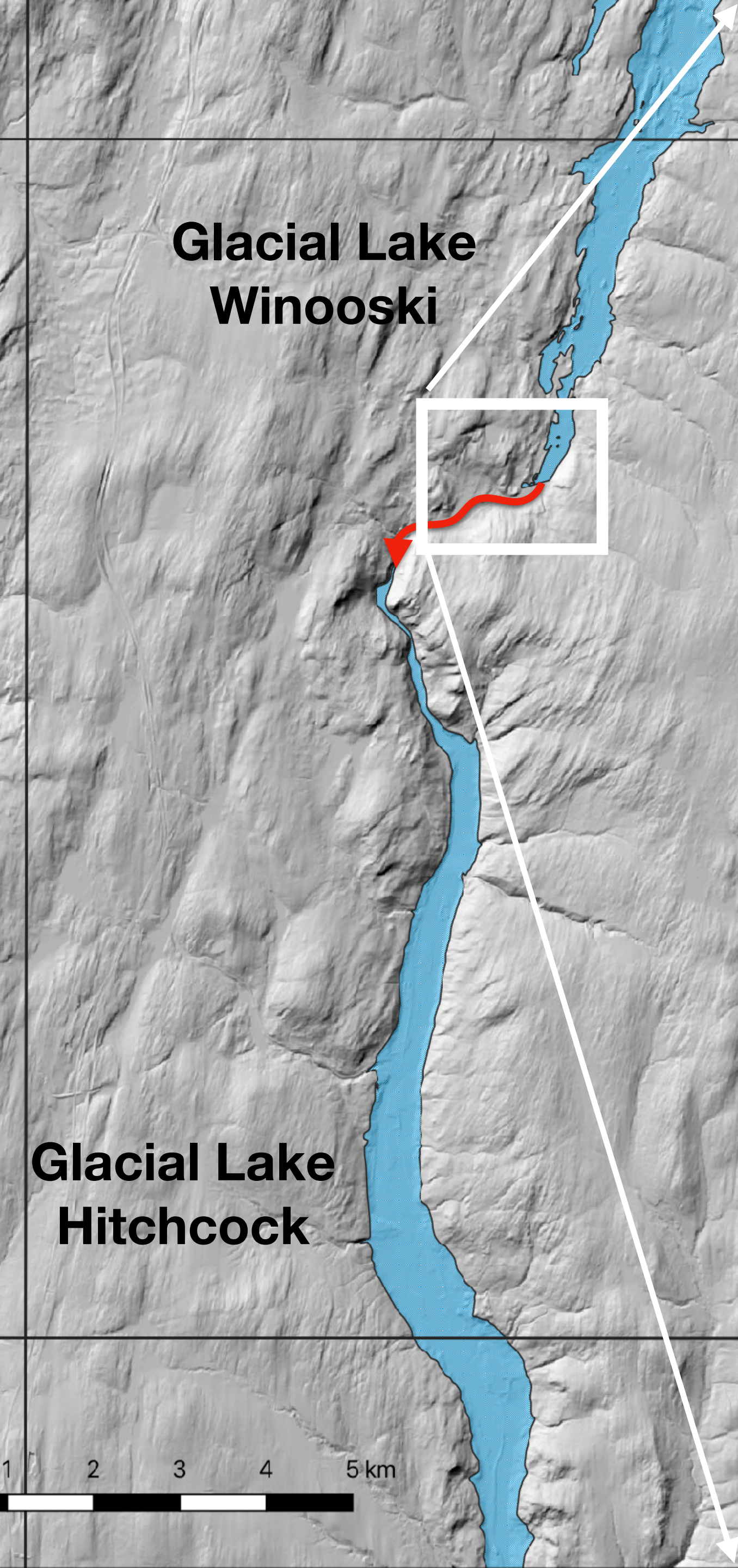
Small glacial lakes form in tributary valleys dammed by the retreating ice sheet.



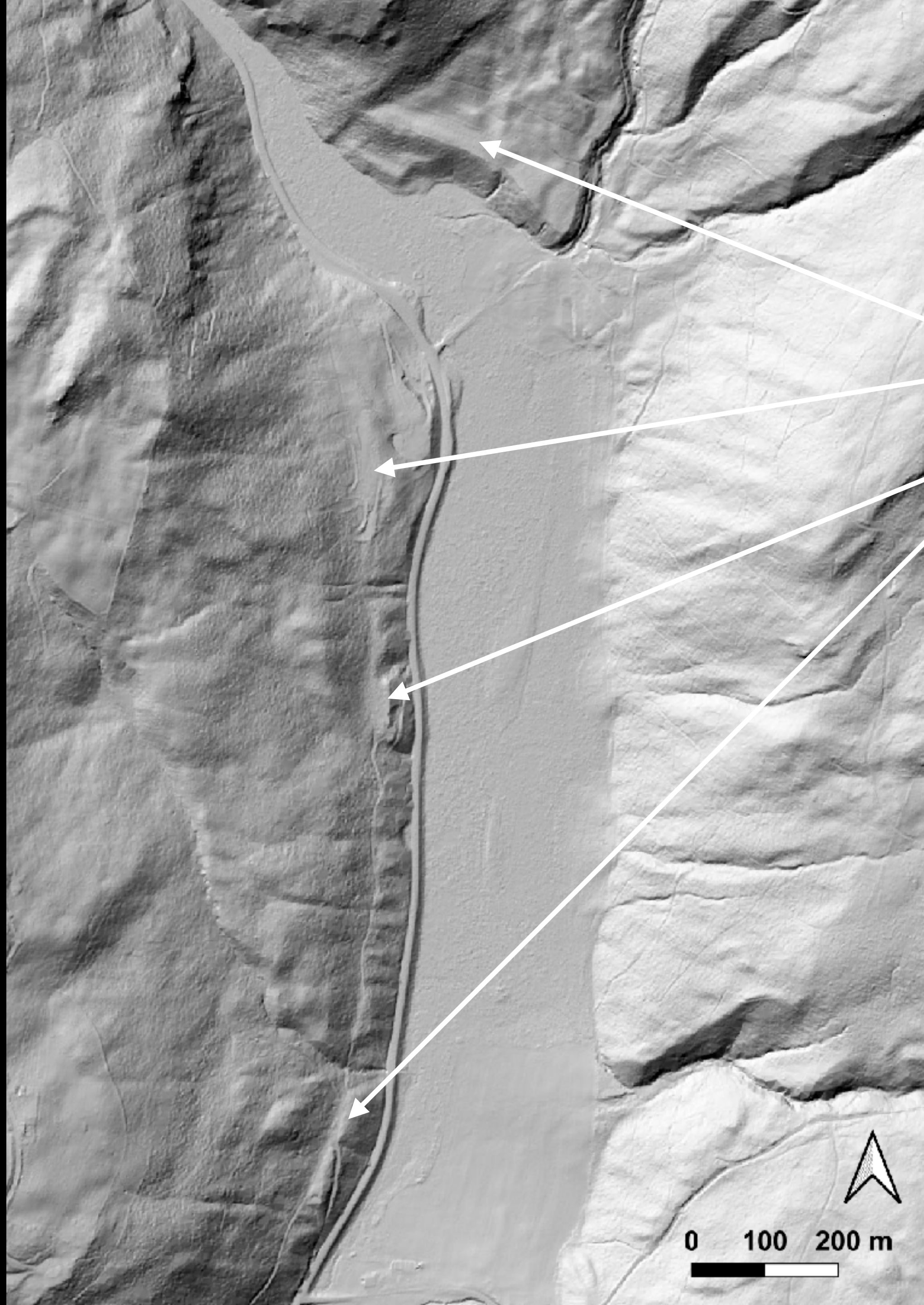




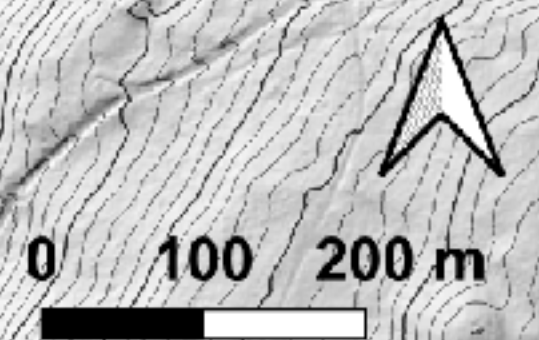
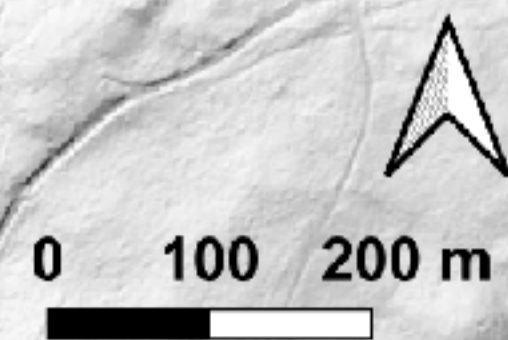




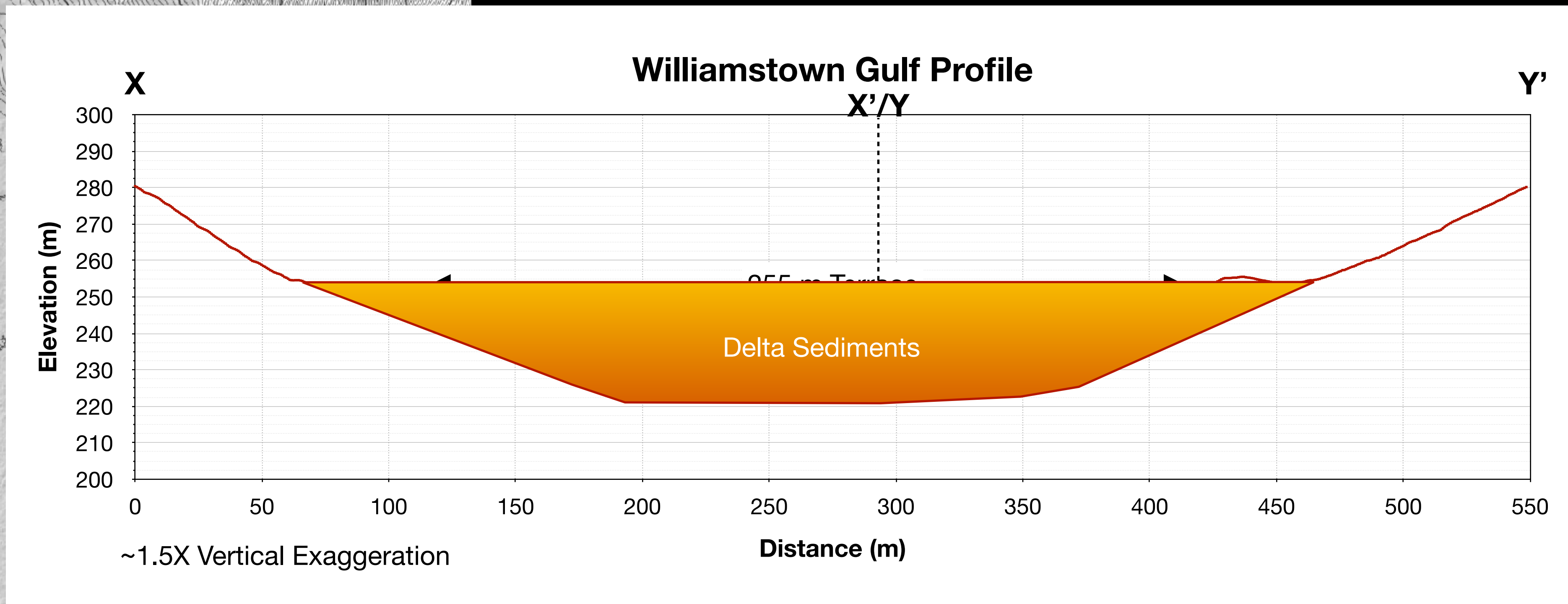
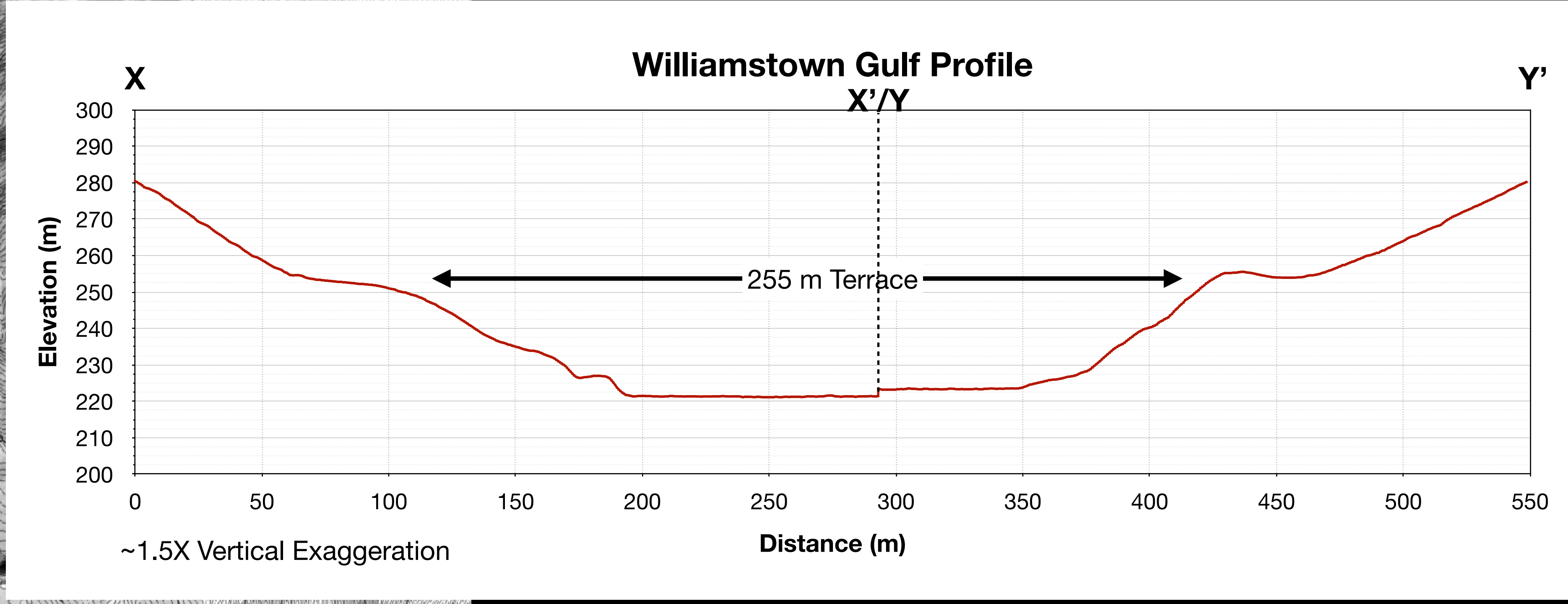
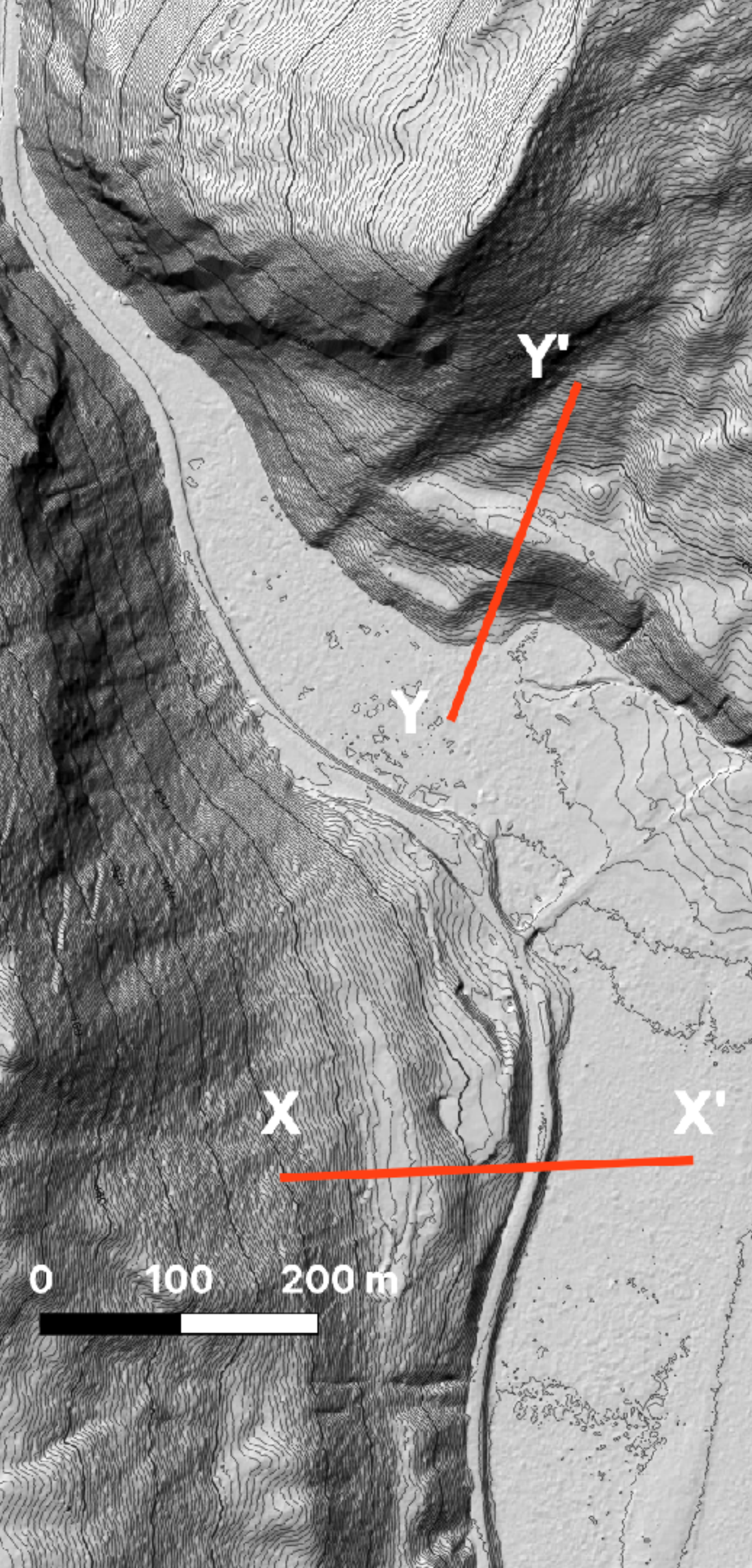




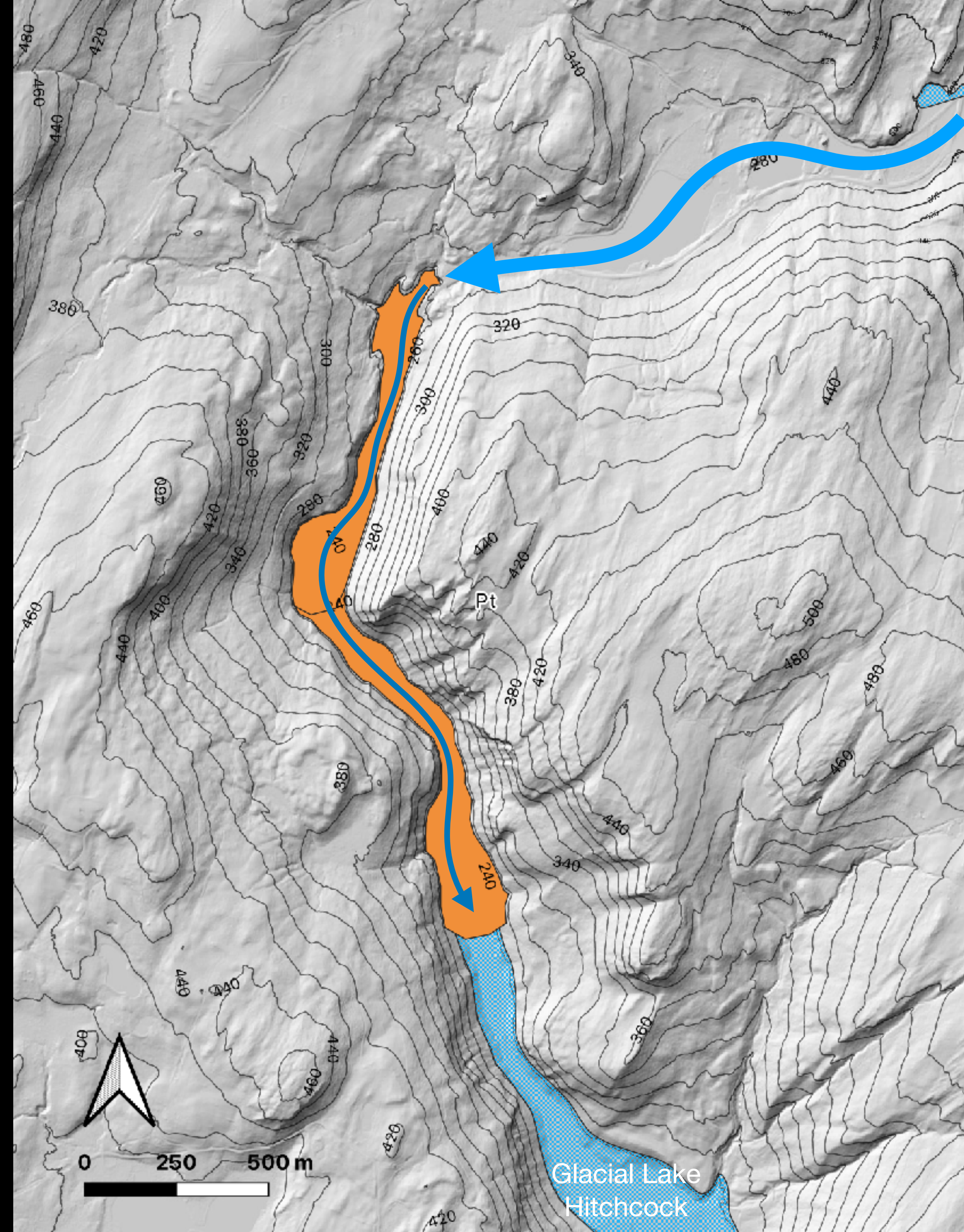
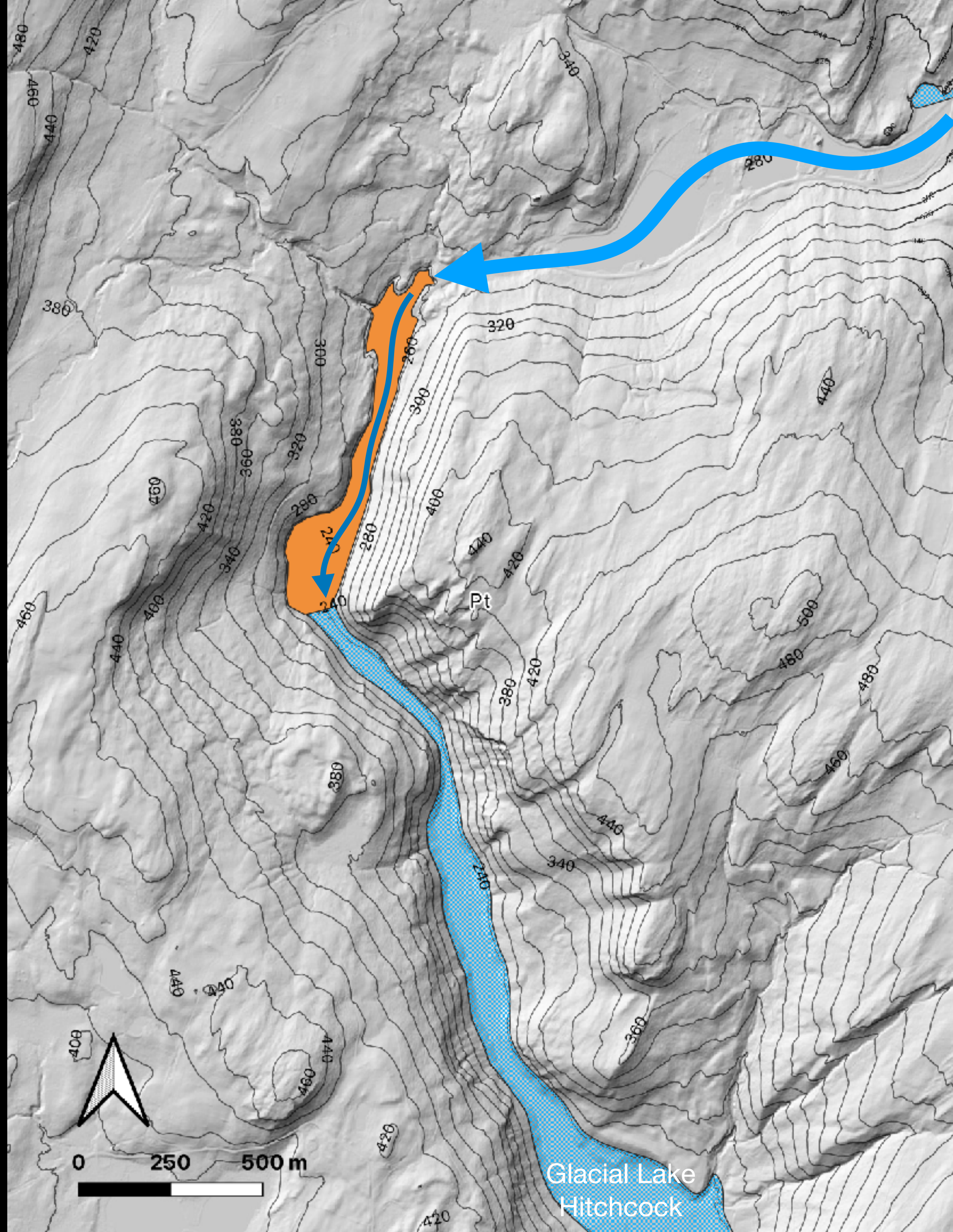
Terraces  
composed of  
sand and gravel



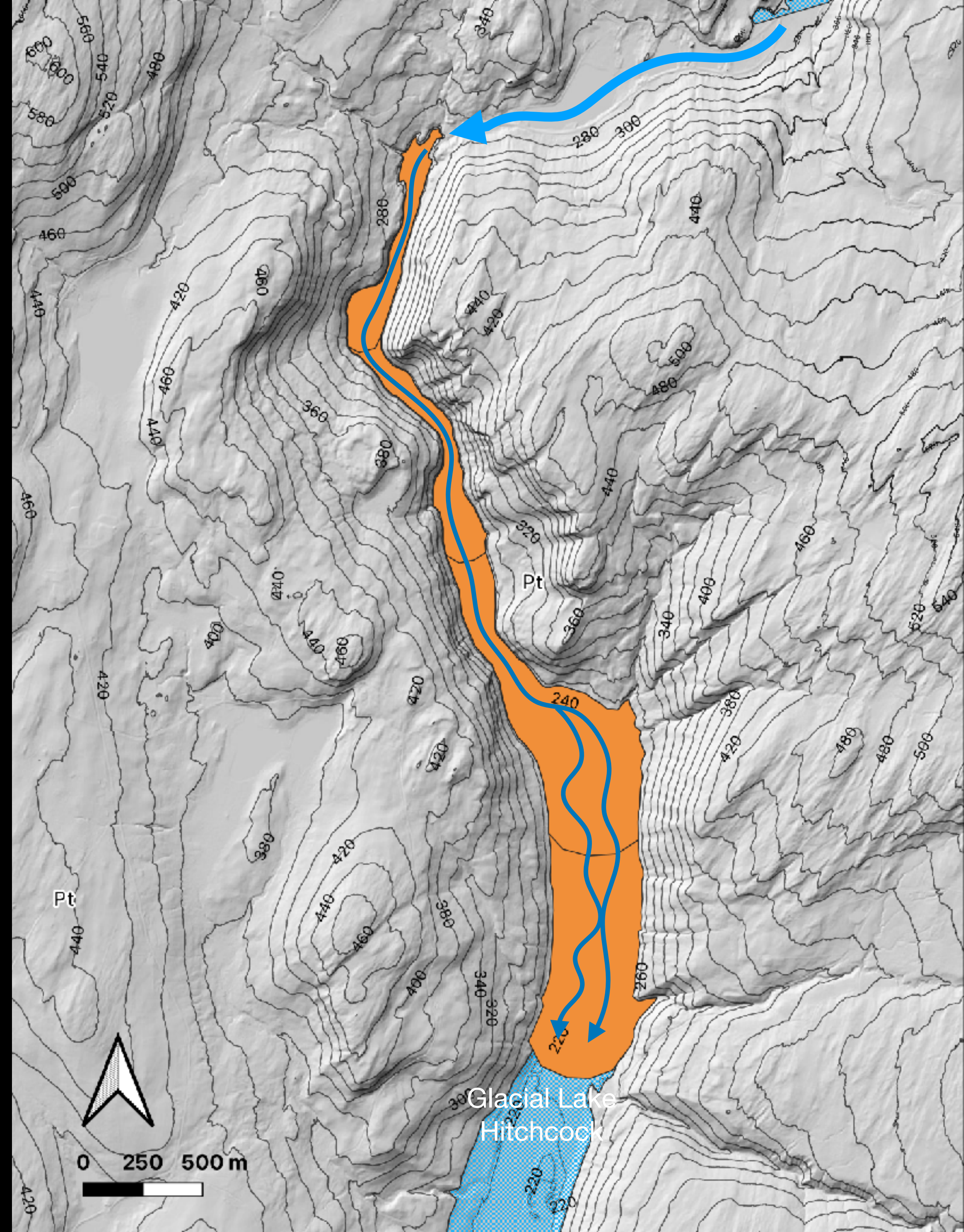
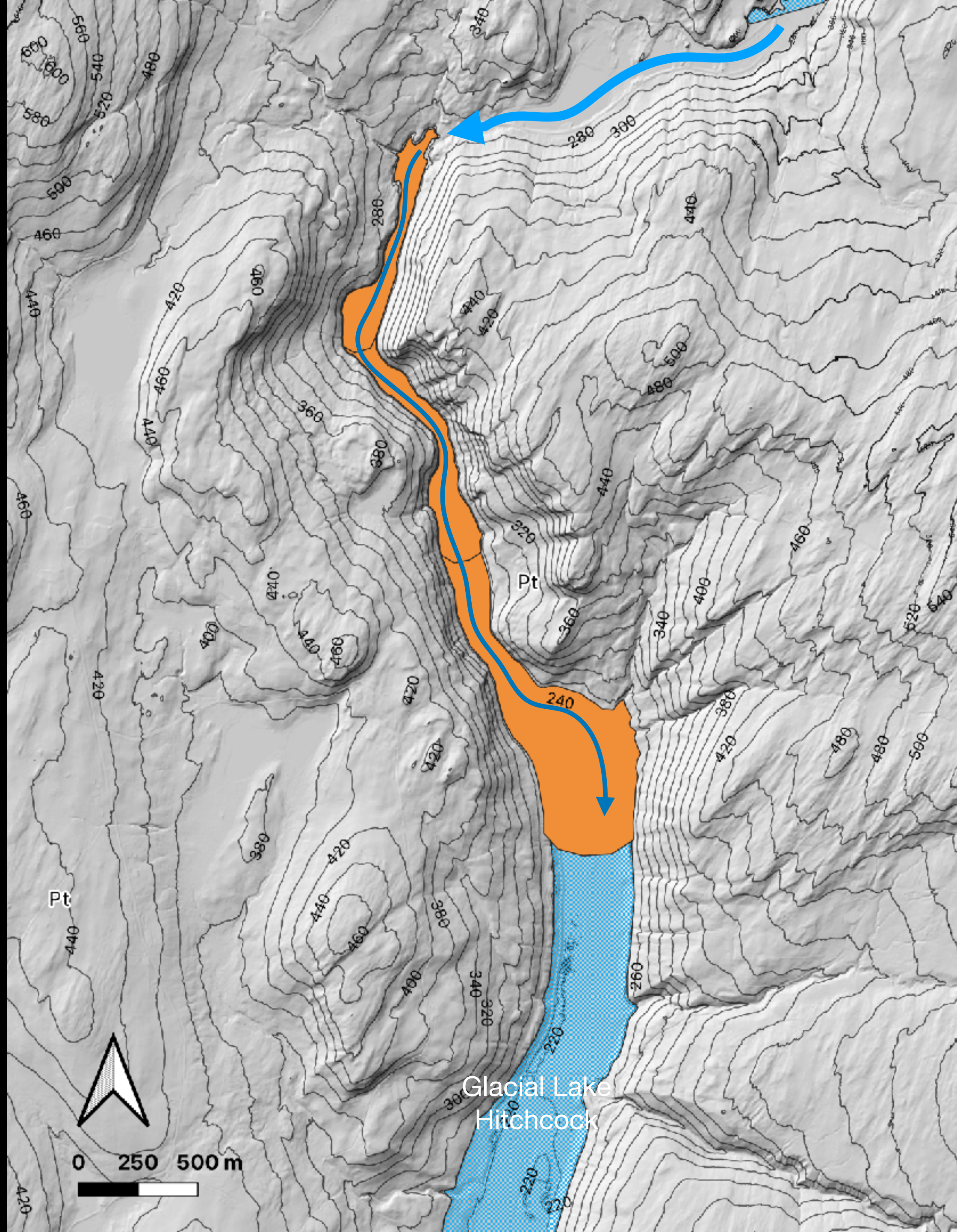




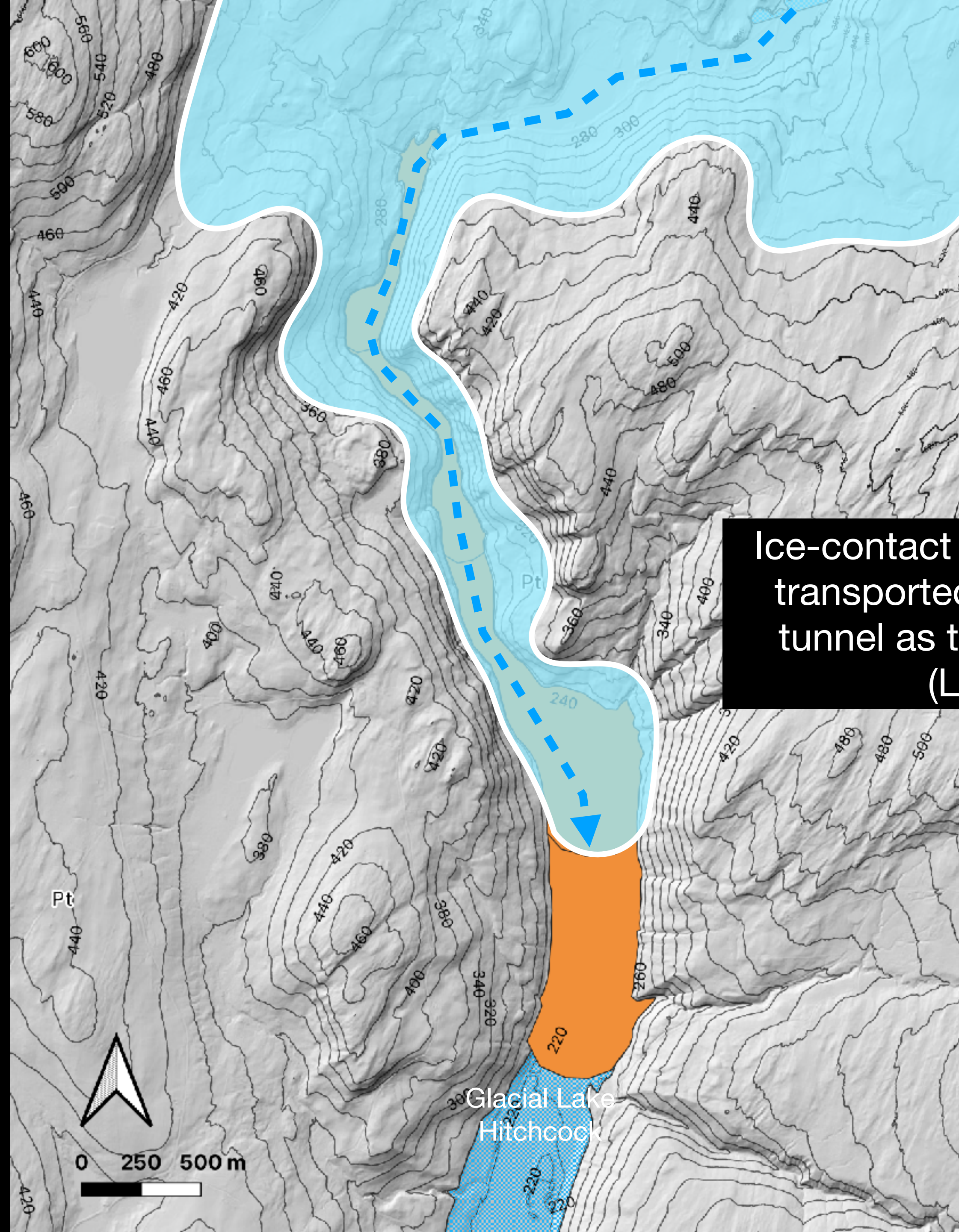




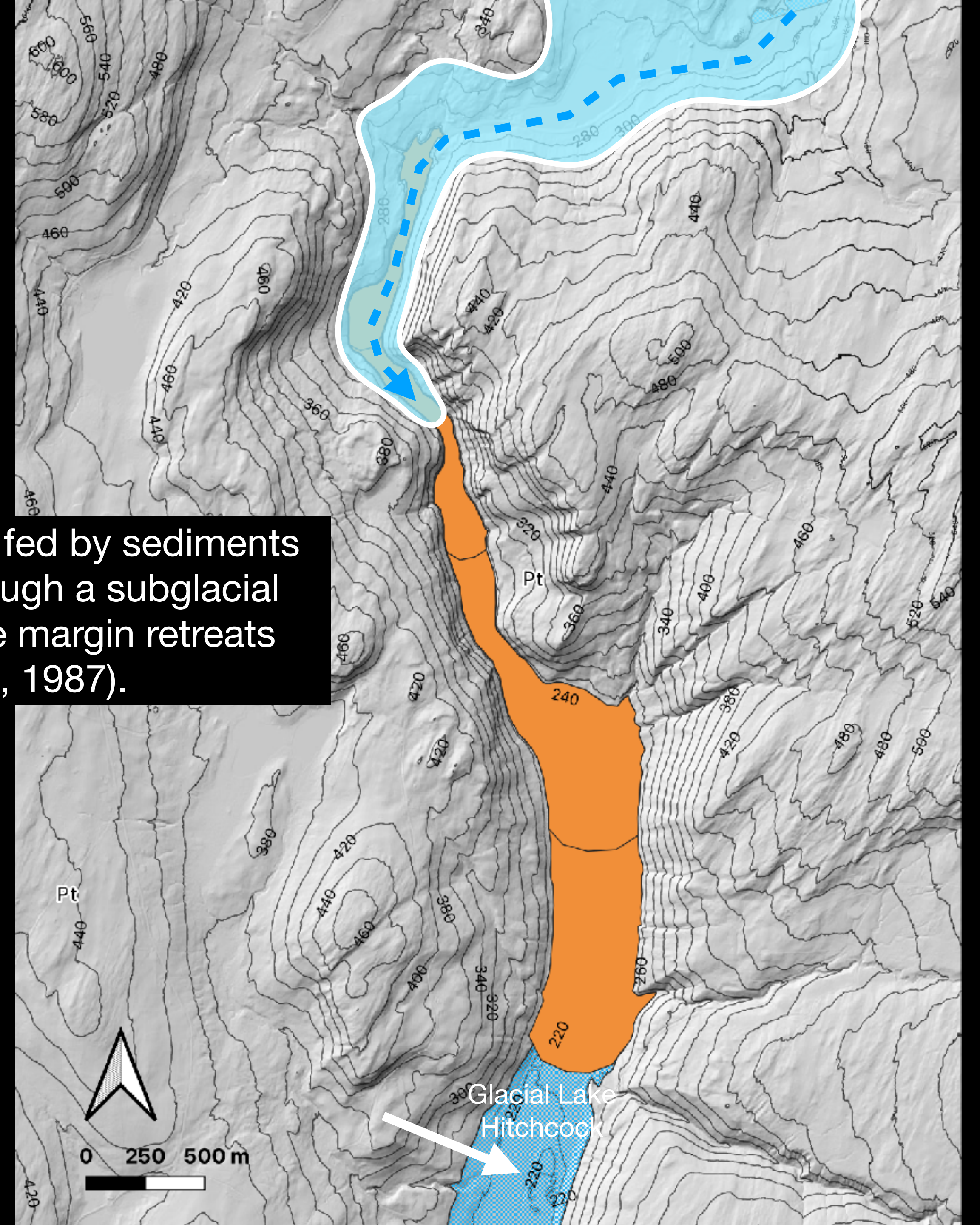








Ice-contact delta fed by sediments transported through a subglacial tunnel as the ice margin retreats (Larsen, 1987).









North



South





The gravel must have been deposited after Glacial Lake Hitchcock drained from the Second Branch valley.

Gravel

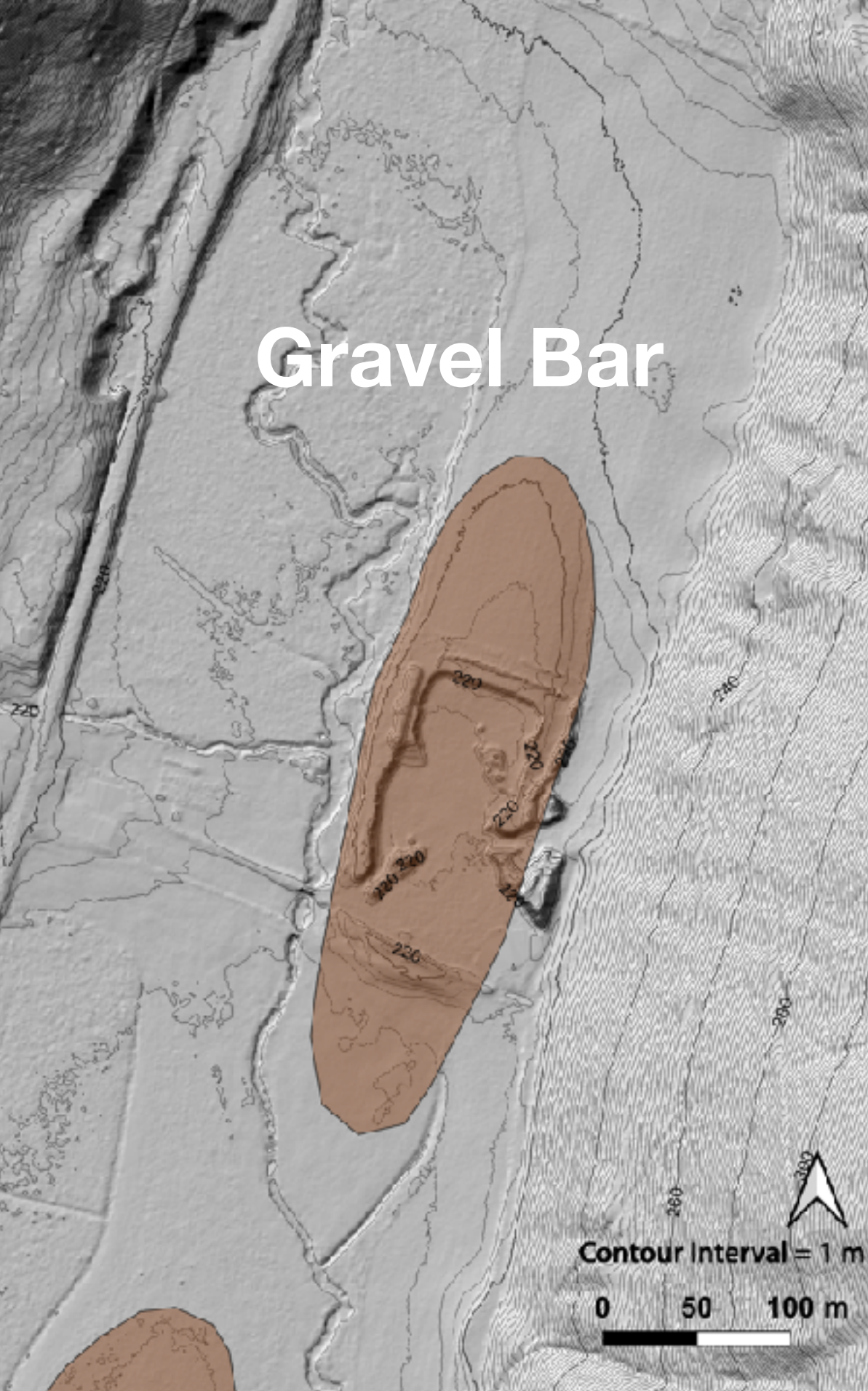
Silt/Clay

Glacial Lake Hitchcock



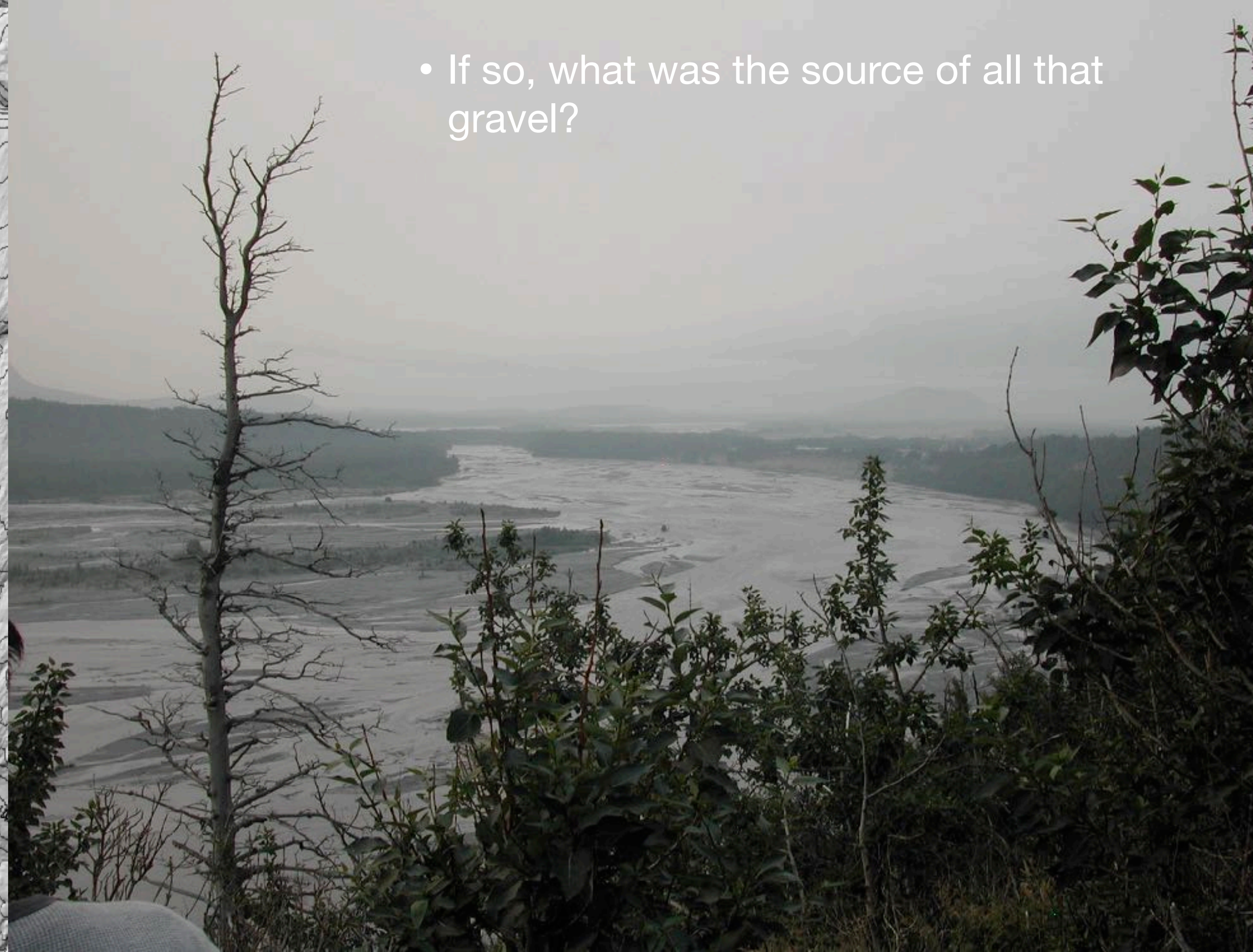


## Gravel Bar

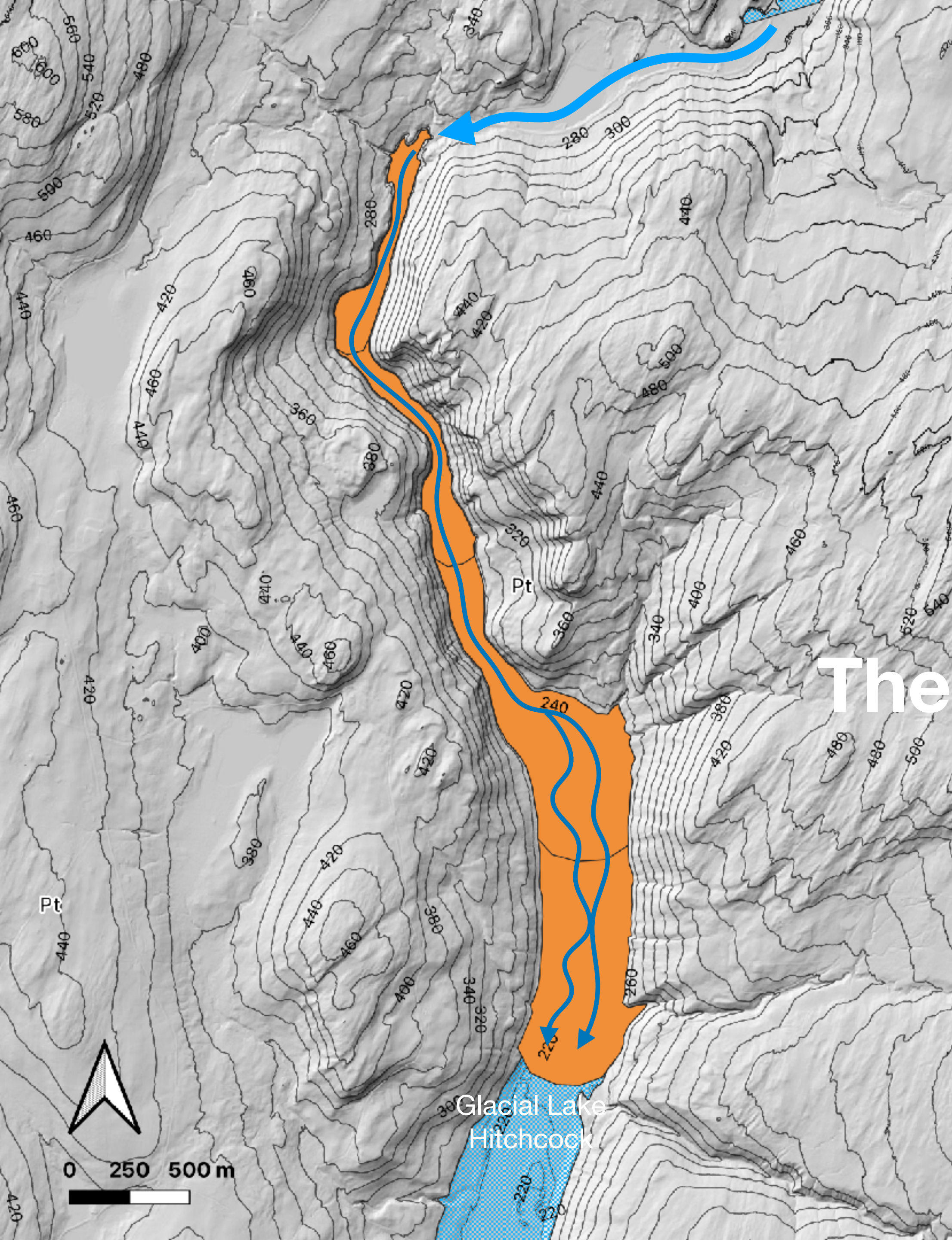


## Gravel Bars

- Deposited after Glacial Lake Hitchcock drained or lowered at least 32 m, enough so that the Second Branch valley was no longer filled with lake water.
- Were these deposited by a braided river system?
- If so, what was the source of all that gravel?





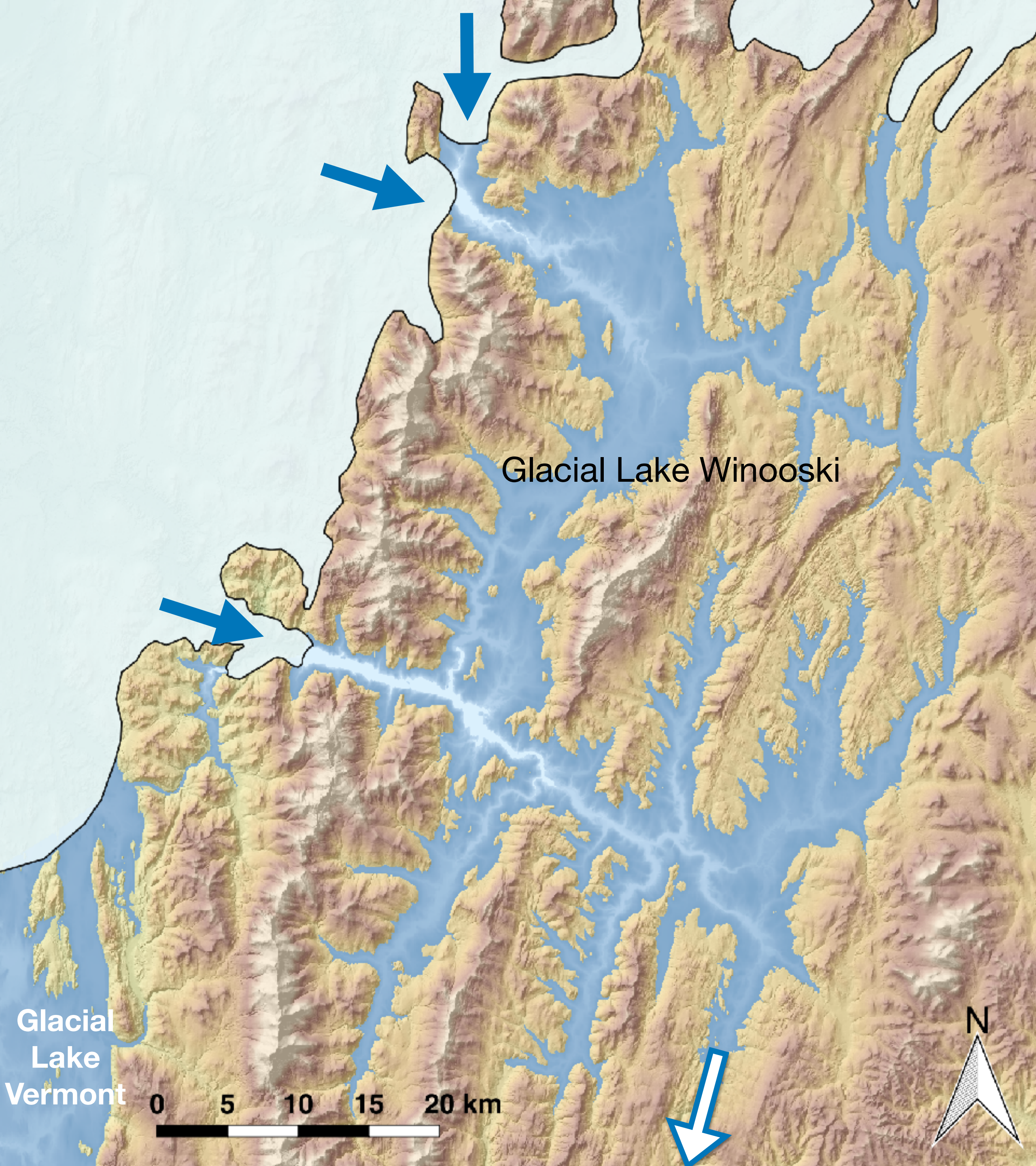


# The Delta



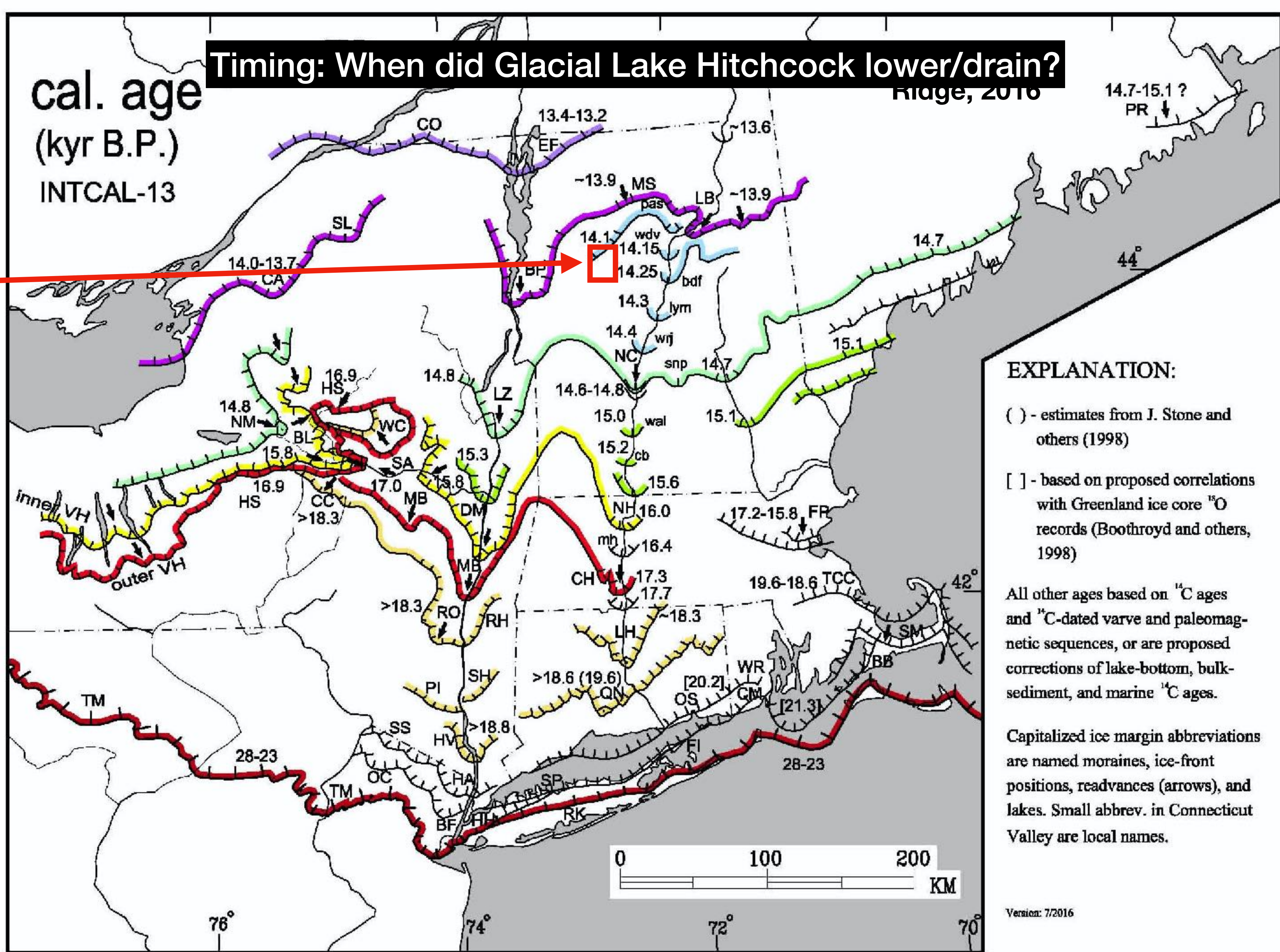
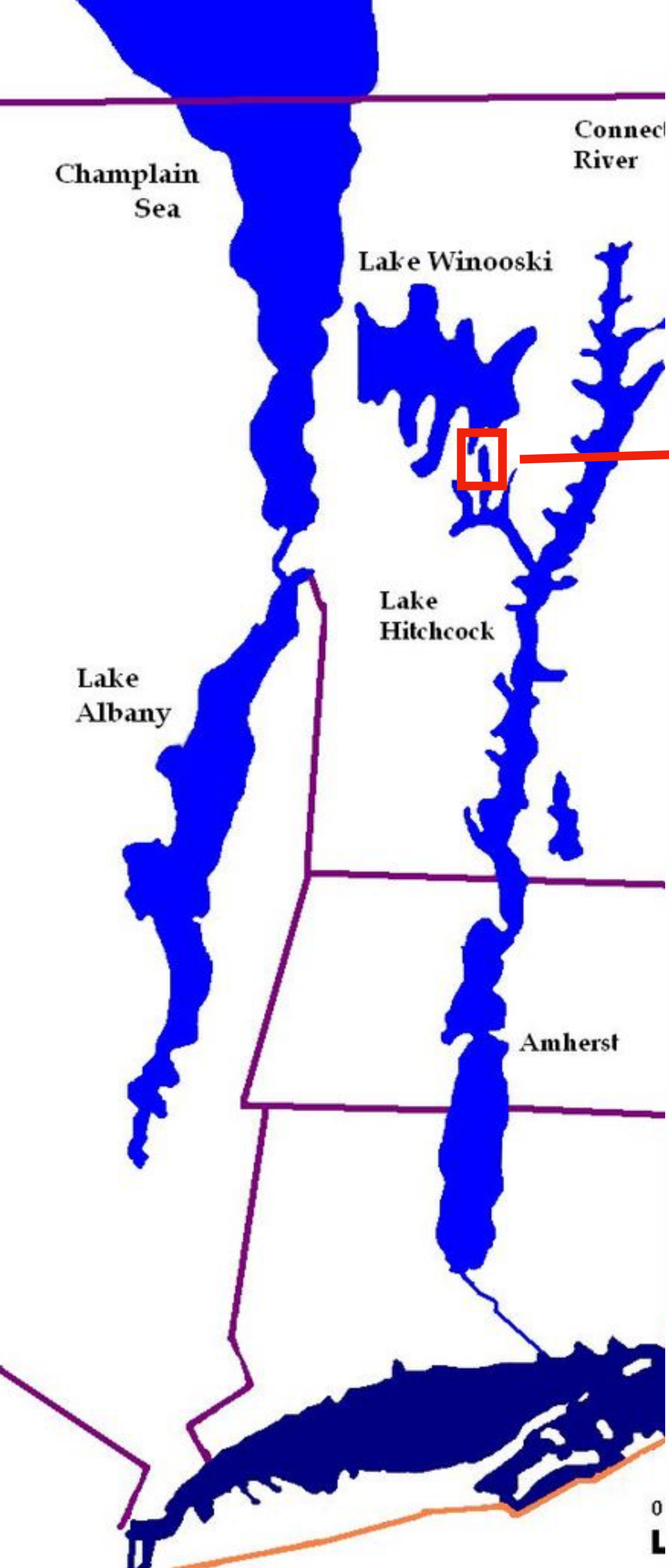


# Source of water to both build and erode the delta



- All of the meltwater from the receding ice sheet east of the mountains as well as some meltwater from west of the mountains flowed into and out of Glacial Lake Winooski.
- All of the meteoric water falling east of the mountains also flowed into and out of Glacial Lake Winooski.









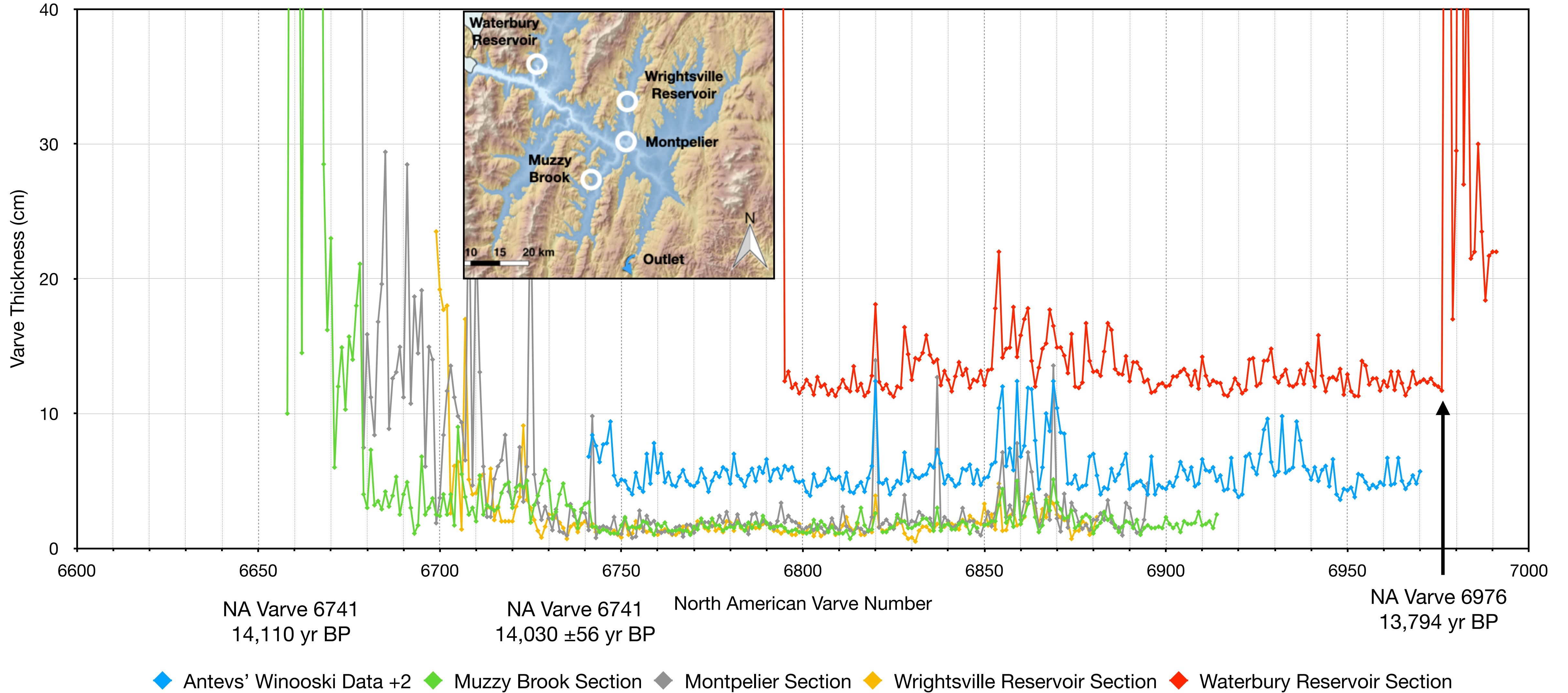
## Largest Extent of Glacial Lake Winooski

- Four Measure Sections of Varved Glacial Lake Sediments
  - Waterbury Reservoir (S.F. Wright)
  - Wrightsville Reservoir (S.F. Wright and Students)
  - Montpelier (George Springston and Colleagues)
  - Muzzy Brook (Fred Larsen)
- These have been correlated to Antevs' (1928) Winooski Valley varve compilation which have in turn been correlated to the North American Varve Chronology.

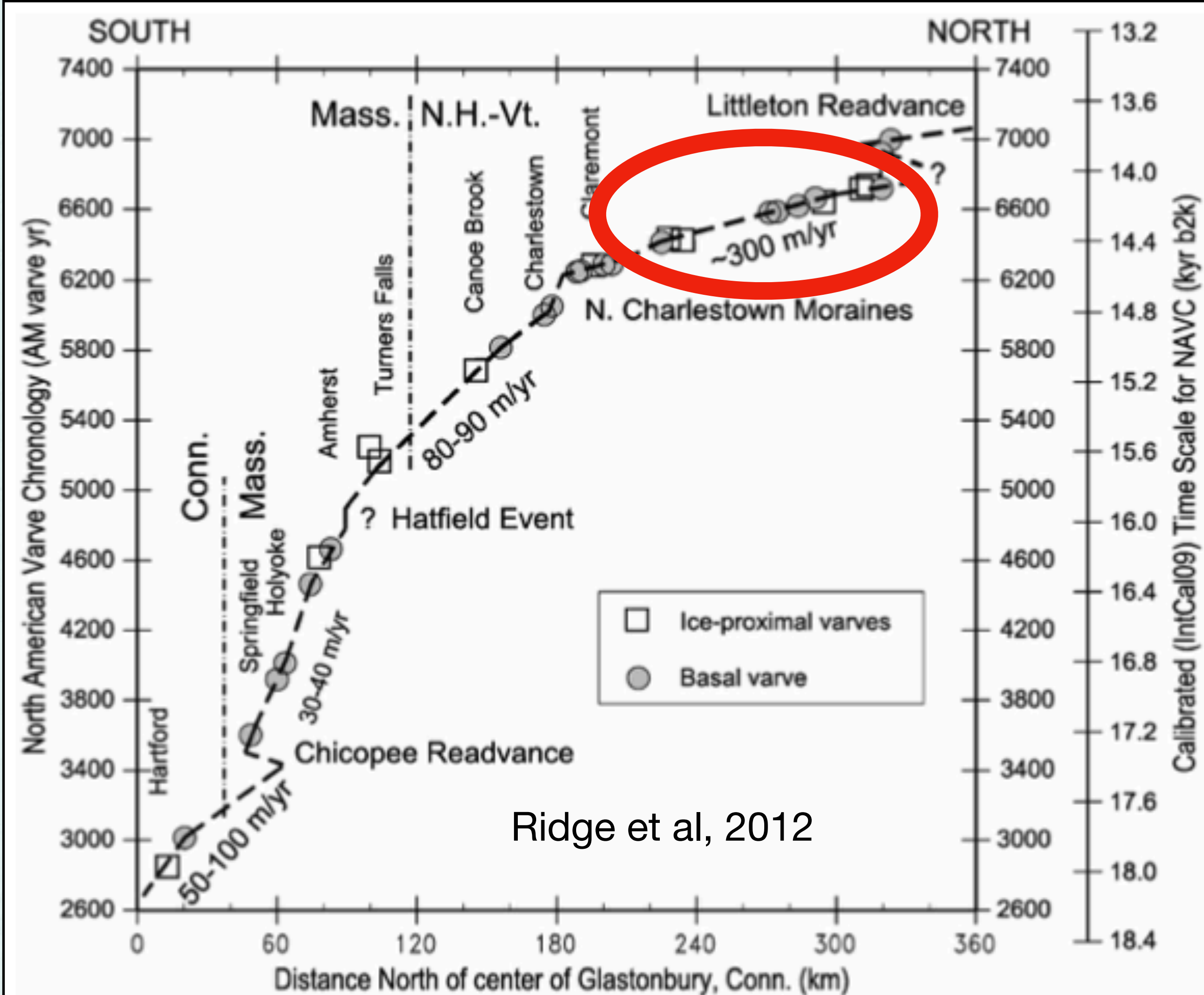


# Correlation of Glacial Lake Winooski Varves

Breakout flood into Champlain Valley  
Glacial Lake Winooski Ends

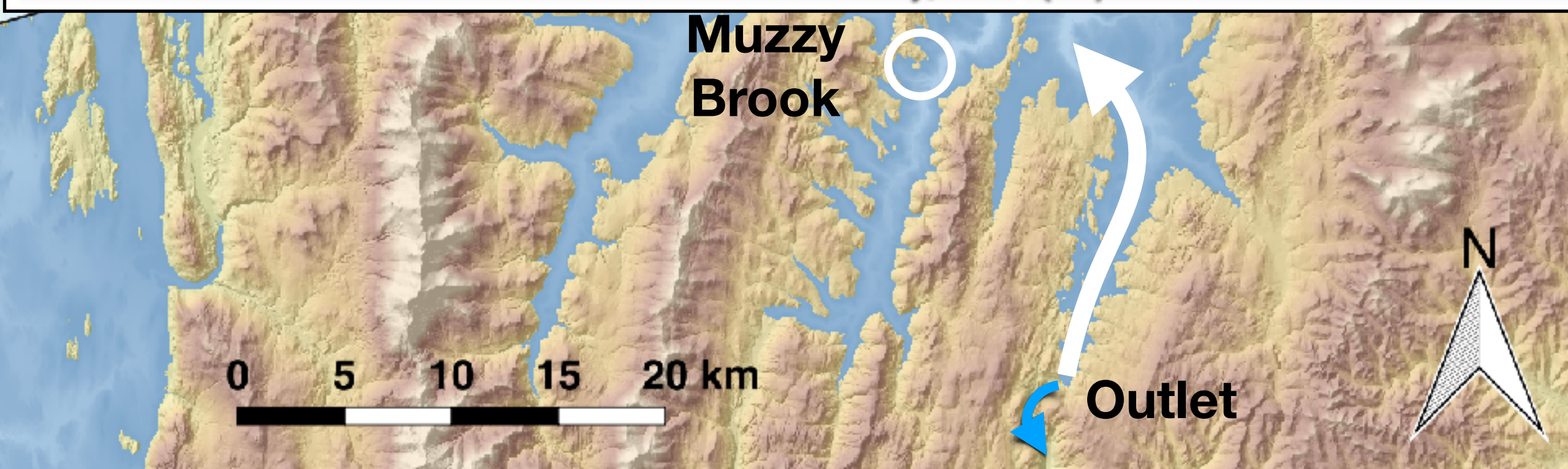




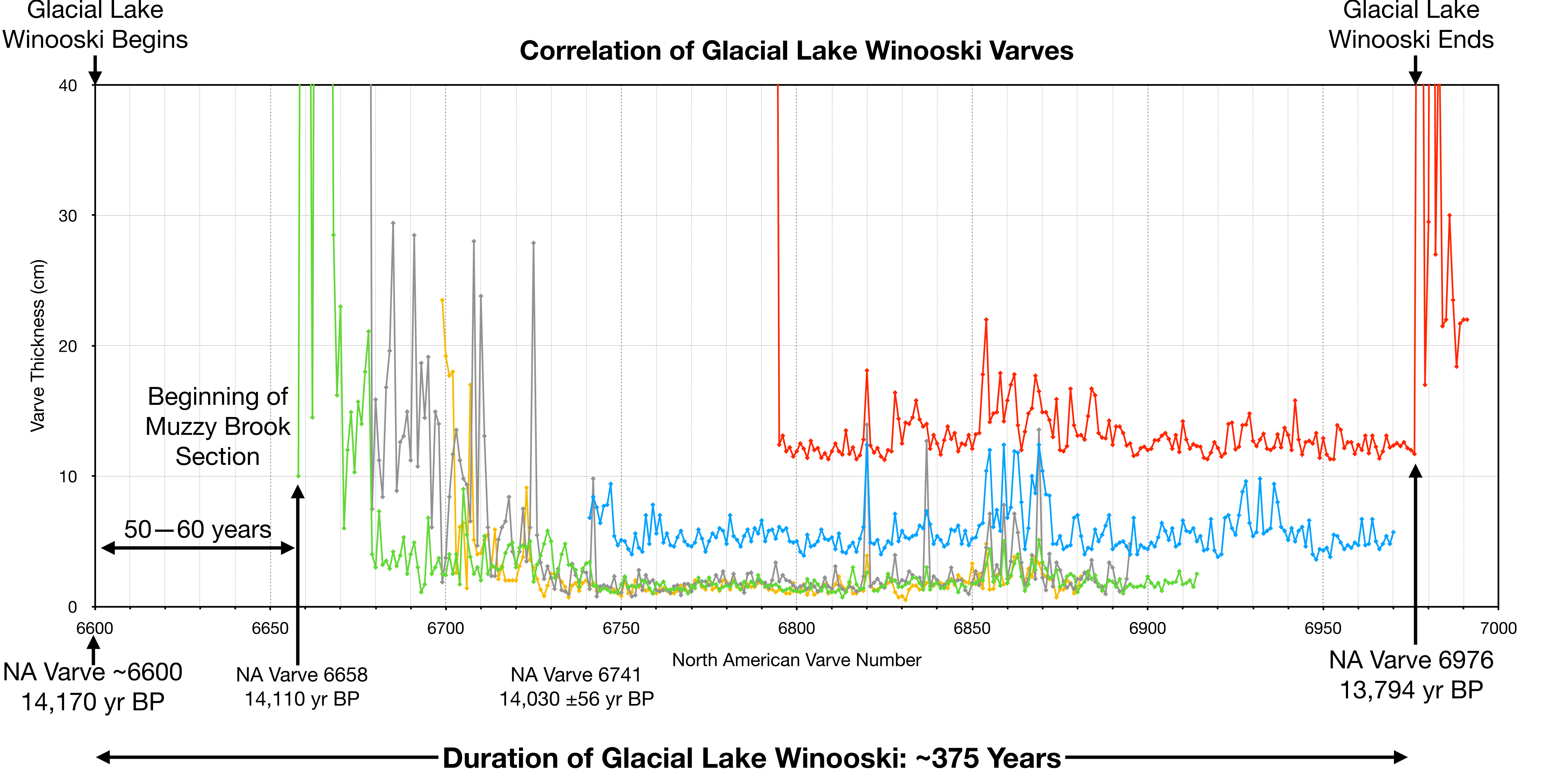


## Timing of Glacial Lake Winooski

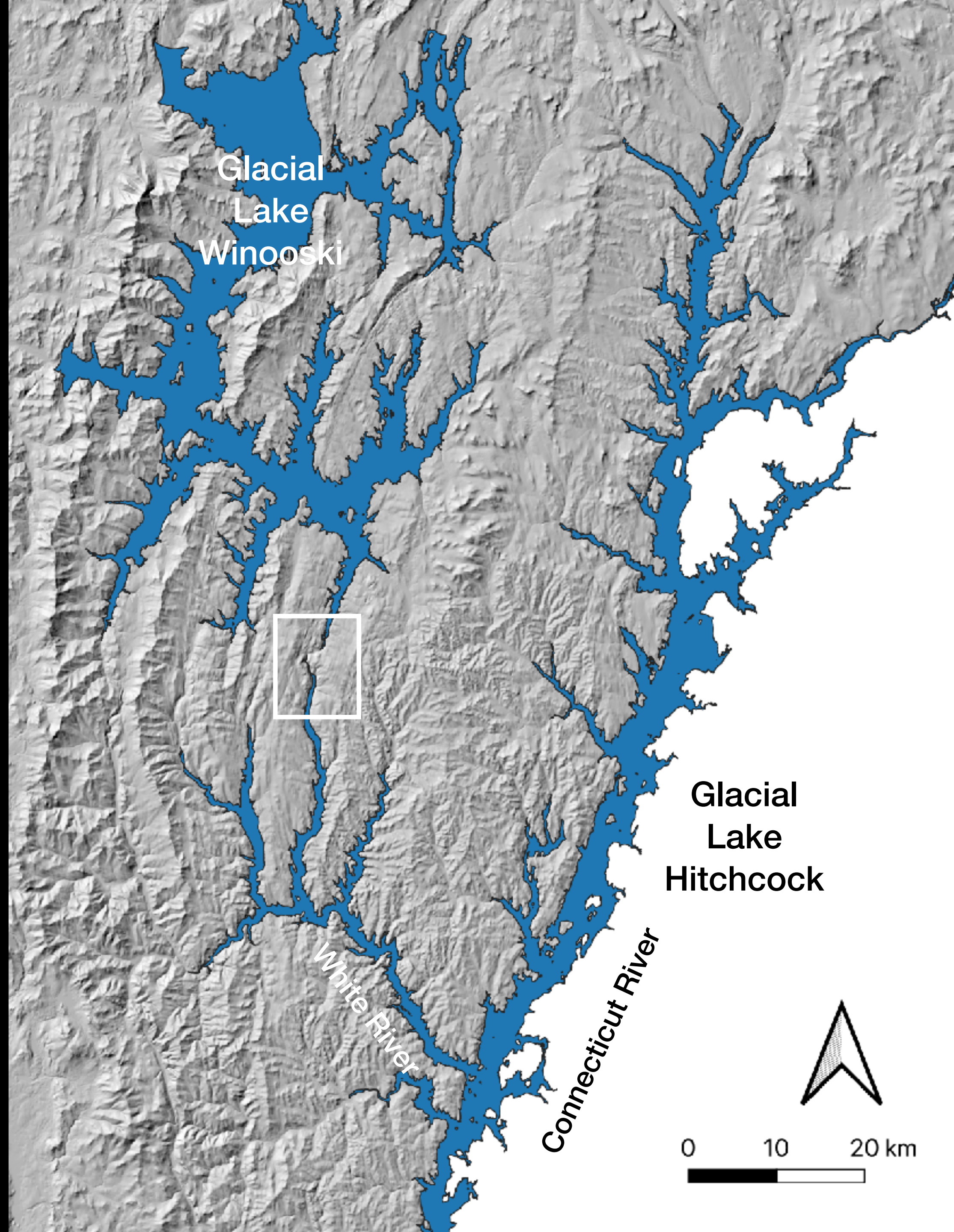
- Ice Margin Retreat Rates
  - Muzzy Brook to Montpelier
    - $5.9 \text{ km}/20 \text{ yr} = 295 \text{ m/yr}$
  - Montpelier to Wrightsville Reservoir
    - $6.4 \text{ km}/21 \text{ yr} = 305 \text{ m/yr}$
  - Upper Connecticut River Valley (Ridge et al., 2012)
    - $\sim 300 \text{ m/yr}$
- How long did it take for the ice to retreat from the outlet of Glacial Lake Winooski to Muzzy Brook?
  - $15 \text{ km}/300 \text{ m/yr} = 50 \text{ years}$
  - $15 \text{ km}/250 \text{ m/yr} = 60 \text{ years}$











## Timing of Glacial Lake Winooski

- Glacial Lake Winooski existed ~14,170 to 13,795 years ago (~375 years)
- During this time:
  - A substantial delta grew in Glacial Lake Hitchcock
  - Glacial Lake Hitchcock drained from the Second Branch valley
  - Outflow from Glacial Lake Winooski eroded the delta and deposited those sediments in large gravel bars



