Surficial Geologic Map and Cross-Sections of Richmond, Vermont

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Introduction

This poster details research conducted on surficial materials and landforms surrounding Richmond and the conclusions made on how glacial movement has shaped the environment. Richmond is located within Chittenden County, Vermont. To the west is Williston, north is Jericho, east is Bolton and to the south is bordered by the Winooski River.

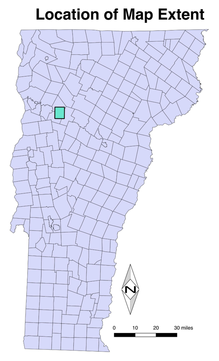


Figure 1: *Our area of study stretched from the valley of the Winooski River in the south up to Mill Brook in the north, covering roughly 60 square kilometers of terrain.*

Methods

Roughly 1,700 geospatial observations were collected over four weeks in June of 2018. Our travel routes were constructed using LiDAR and elevation imagery to estimate the most likely points of contact between glacial till and lacustrine sediment. Soil probes and augurs were used to sample surficial layers and identify glacial till, lacustrine sediment and alluvium. A geologic compass was used to collect striation and groove data off of bedrock outcrops. Water wells found would have their location and tag number logged to later find the subsurface stratigraphic depths at those locations, used to construct our cross-sections. Survey data and the presence of less frequent landforms, which include landslides, terraces, alluvial fans, abandoned stream channels, eskers, and erratics, were recorded using the mobile app Fulcrum. The survey data and observations made were used in conjunction with LiDAR and elevation base maps to interpolate geologic contacts and construct a surficial map in the software QGIS.

Observations

Photo (Left): This photo displays the diversity of rounded grain sizes found along the esker in the mapping area. The grains ranged from medium sand to large cobbles. A soil probe is included for scale.

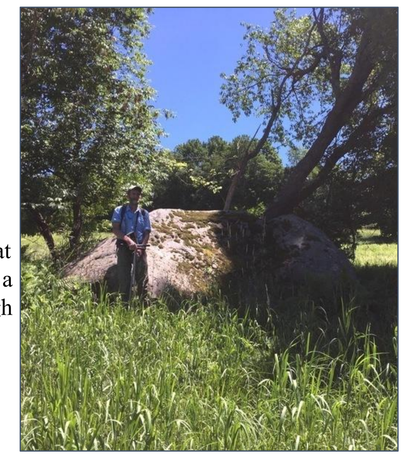
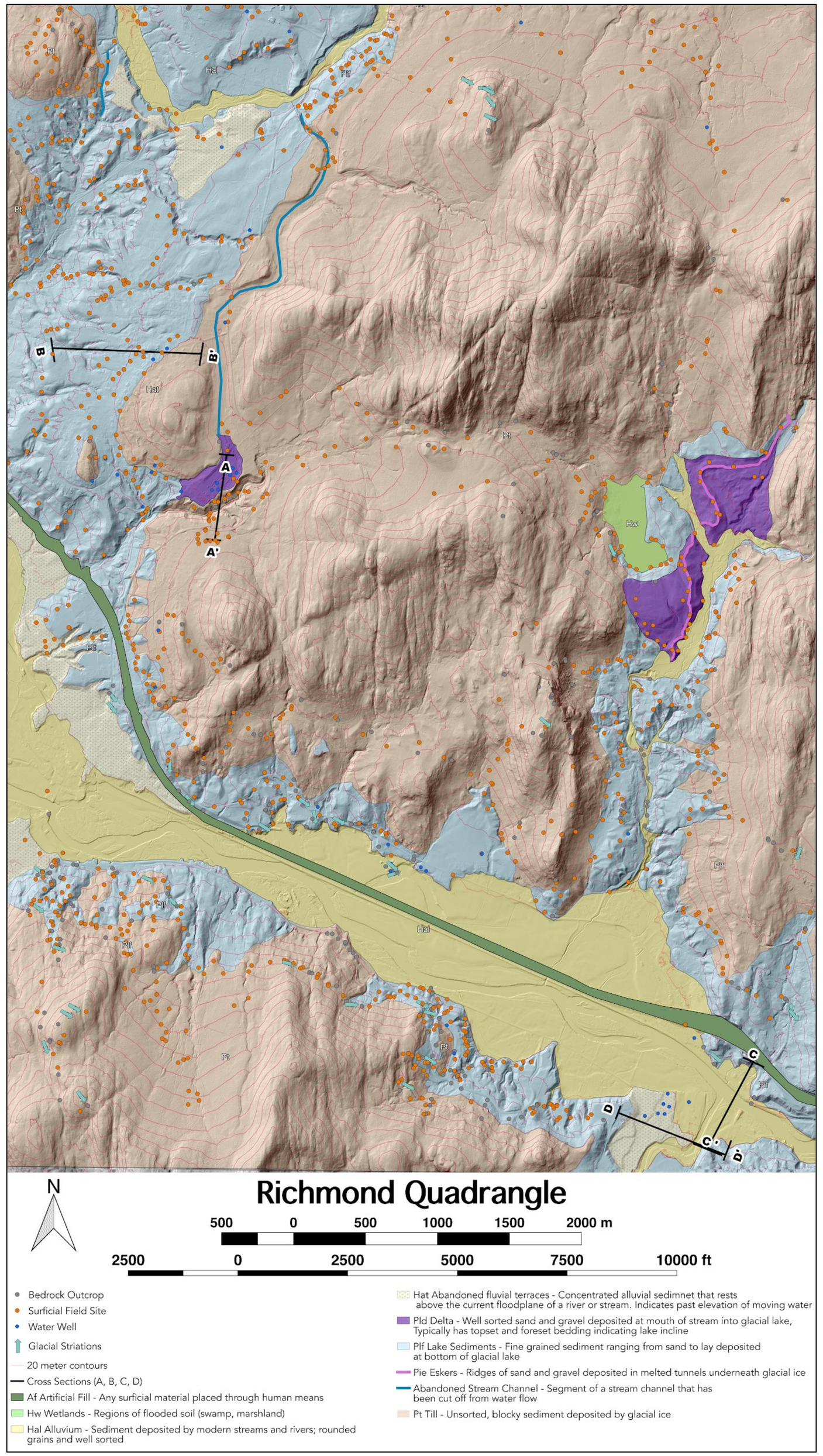


Photo (Right): An erratic that was dropped in a field as a glacier was retreating through the area.

Photo (Right): There are many streams scattered throughout the area of study that are moving sediment towards the Winooski River.



Cross-Sections

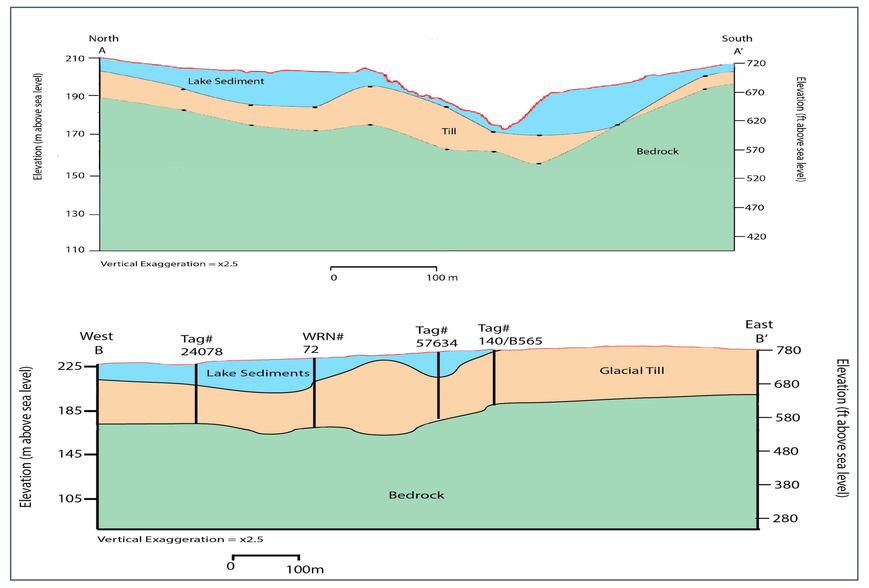


Figure 2: *These cross-sections show the stratigraphy of sediment below where glacial lake Mansfield was. Of note in this area is the transition from lake sediments to glacial till suggesting that this was on the shoreline of glacial lake Mansfield.*

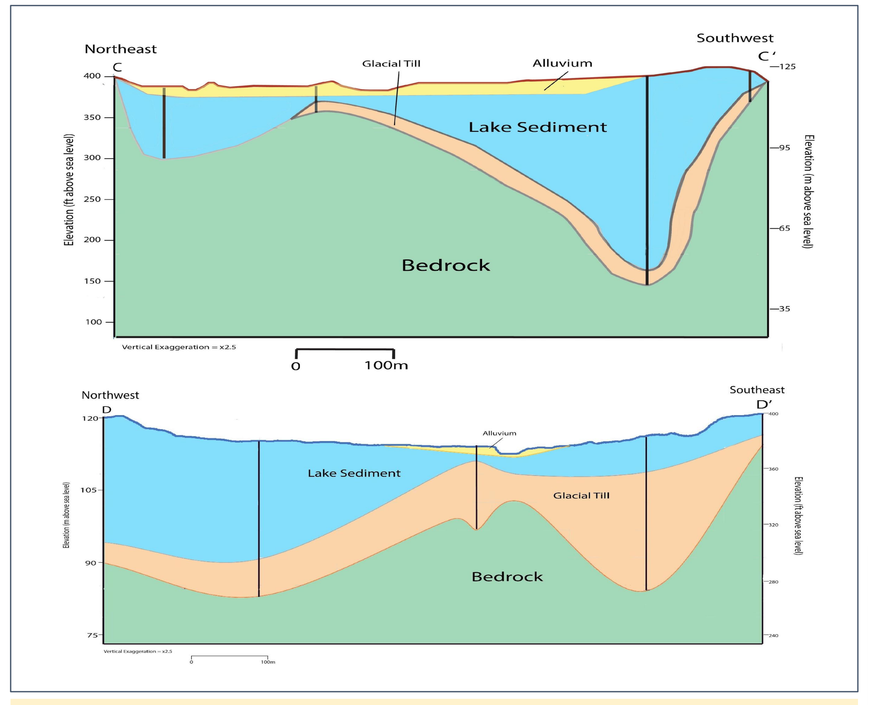


Figure 3: *These cross-sections show the modern deposition of sediment in the Winooski River valley and Huntington River valley, respectively. The lake sediment layer above the glacial till layer suggests that the lake formed after the glaciers had already retreated.*

Photo (Above): A sample taken with a soil probe that consists of organic material on top of lake sediments

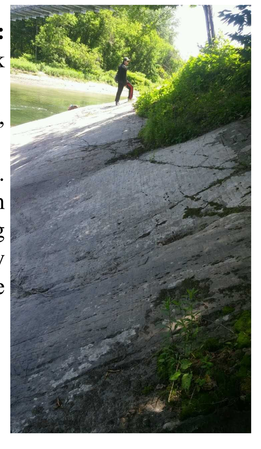


Photo (Right): exposed bedrock alongside Winooski River, underneath public bridge. Grooves from glacier carving through valley floor can be measured here.

Photo (Below): Course sediment depositing along Huntington River, adding to alluvium

Interpretations

- The abandoned stream channel in the northwest part of the map indicates that a glacier was present directly to the west. The abandoned channel would have provided the only way for water to go in that area.
- Glacial striations in the area of study mostly point northwest to southeast or west to east as shown in (Figure 4).
- Elevations above 216 m did not show signs of lake sediments throughout the entire study area, indicating that lake levels never rose above that elevation
- Deltas in western section have eroded away to reveal eskers, showing that the eskers were deposited under glacial ice before stream tributaries formed the deltas

Photo (Above): Bedrock outcrop in southeast section. Several were measured to determine direction of glacial movement

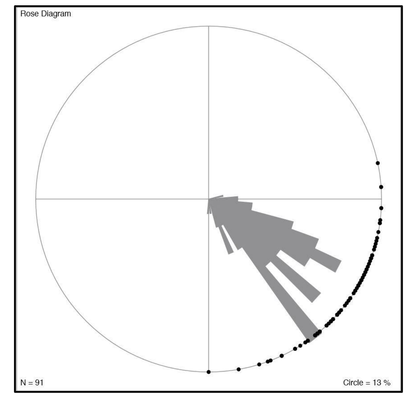
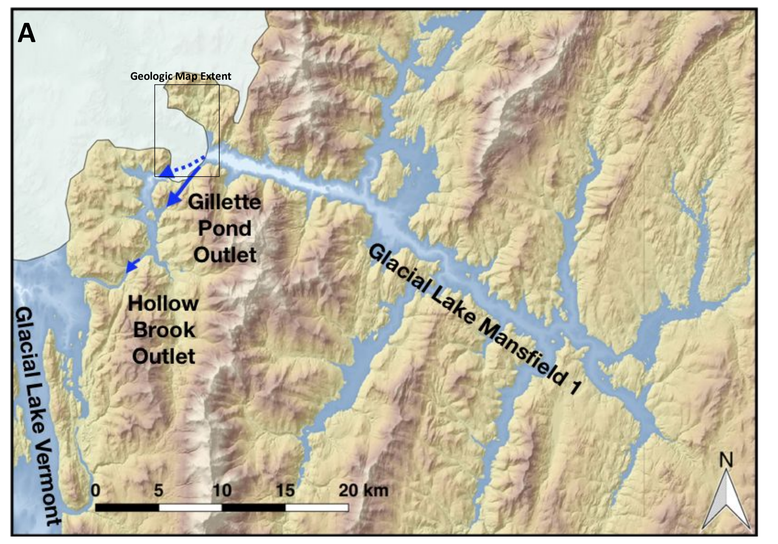
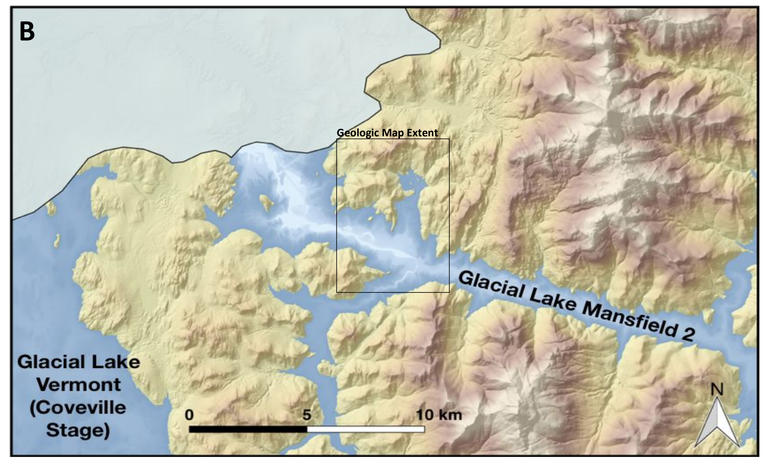


Figure 4: *A rose diagram depicting the orientation of glacial striations observed in the mapping area. The diagram has been projected to represent the direction of glacial ice movement from the Northwest to the Southeast. A second major trend is oriented closer to West-East and represents a time when glacial ice had thinned and was constrained by the topography of the Winooski River Valley.*

Glacial Modeling





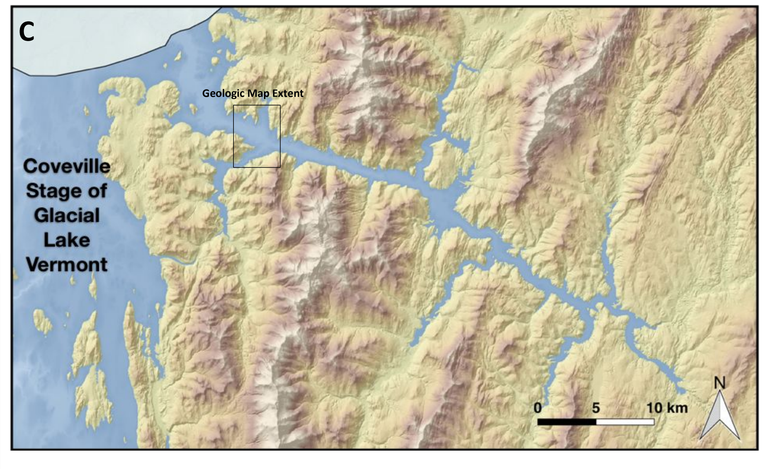


Figure 5: (**A**) *Extent of Glacial Lake Mansfield 2 in the Winooski River valley. The Gilette pond outlet allowed drainage of this lake, but is now at a higher elevation due to isostatic rebound.* (**B**) *Extent of Glacial Lake Mansfield 2 within the Winooski River Valley.* (**C**) *With further retreat of the ice sheet the Winooski River valley became an arm of Glacial Lake Vermont, eventually draining to become the modern Winooski River.*

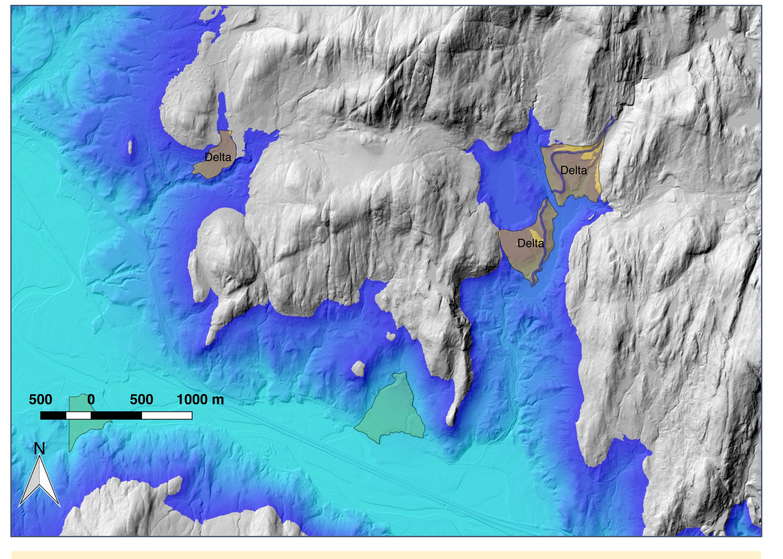


Figure 6: *Extent of Glacial Lake Mansfield 2 within the mapping area. Identified deltas are labelled. The current elevation of these delta features was used to estimate the previous shoreline elevation of the lake (216 m or 709 feet). The water was blocked by the ice sheet to the Northwest, forming Glacial Lake Mansfield 2 at the observed elevation.*