Peterborough Drumlin Field

Visualizing subglacial landforms with a derivative elevation surface

Moulded by subglacial meltwater beneath the Laurentide Ice Sheet, the landscape east of Peterborough, Ontario persists as a prime example of one of the many drumlin fields produced during the Wisconsin Glaciation(Christopherson et al., 2013; Maclachlan & Eyles, 2013). Drumlins are hill landforms composed of deposited till and are shaped like a half-ellipsoid with a blunt, steeper slope at one end and a gently tapering slope at the other (Trenhaile, 2013; Christopherson et al., 2013). Because they form in meltwater flows, their longer axis tends to run parallel to the direction of ice sheet movement (Trenhaile, 2013). Thus, a typical drumlin field usually contains several egg-shaped hills pointed in the same direction. Their tendency to exist in swarms and their characteristic shape and orientation make them easily recognizable in digital elevation models (DEMs) and derivative slope or curvature surfaces (Maclachlan & Eyles, 2013).

To visualize the Peterborough Drumlin Field through elevation and slope, a DEM was produced using the Topo to Raster interpolation tool with NTS elevation points and contour lines as inputs. The grid resolution was set as 20 metres, contour lines were considered the primary type of input, and the minimum and maximum elevation values permitted in the interpolation were 185 m and 303 m, respectively. From this DEM, a slope surface was derived using the Slope tool. The output measurement was degrees (as most audiences are familiar with this unit of angular measurement), the calculation method was planar because this analysis is on a local scale, and the z-factor was 1 because the elevation units are the same as the x, y direction units (metres).

This slope surface that was derived allows the drumlins to be delineated visually because it demonstrates both their elongated shape and the steeper slopes at the upstream end of the landforms (Maclachlan & Eyles, 2013). The slope surface also displays their northwest/southeast orientation, which is consistent with the known direction of continental ice flow in this region of Canada (Trenhaile, 2013).

References:
Christopherson, R., Byrne, M.-L., Giles, P. (2013). Geosystems: An Introduction to Physical Geography (3rd Canadian ed.). Pearson Canada Inc.
Maclachlan, J.C. & Eyles, C.H. (2013). Quantitative geomorphological analysis of drumlins in the Peterborough Drumlin Field, Ontario, Canada. Geografiska Annaler: Series A, Physical Geography, 95(2), 125-144. DOI:10.1111/geoa.12005
Trenhaile, A.S. (2013). Geomorphology: A Canadian Perspective (5th ed.). Oxford University Press.

1:10,000

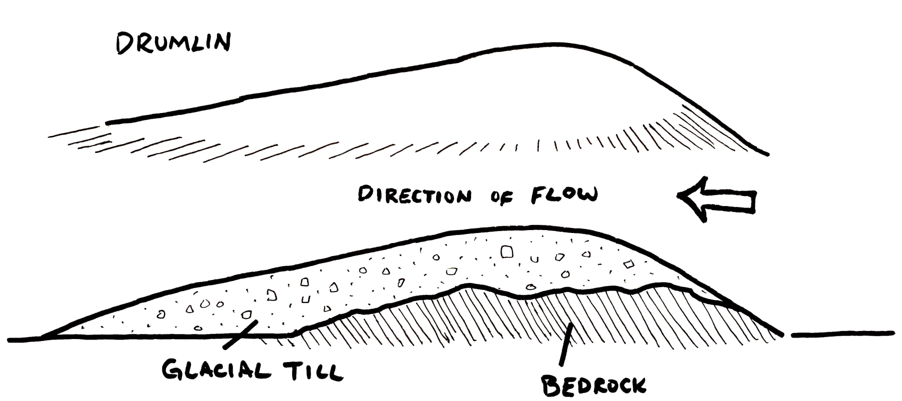
0 1 2 3 4 5 km

Source: Natural Resources Canada National Topographic System (NTS): 031D08/2005 Peterborough, clipped (Original scale 1:50,000).
Projected Coordinate System: NAD 1983 UTM 17N; Top: 4,922,054 m / Bottom: 4,903,074 m / Left: 710,418 m / Right: 739,518 m

Slope (degrees)

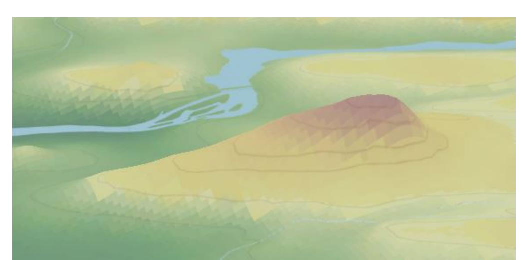
- ≤1.72
- ≤3.43
- ≤5.71
- ≤8.53
- ≤11.3
- ≤14.04
- ≤16.7
- ≤21.8
- ≤30.96
- ≤45
- ≤90

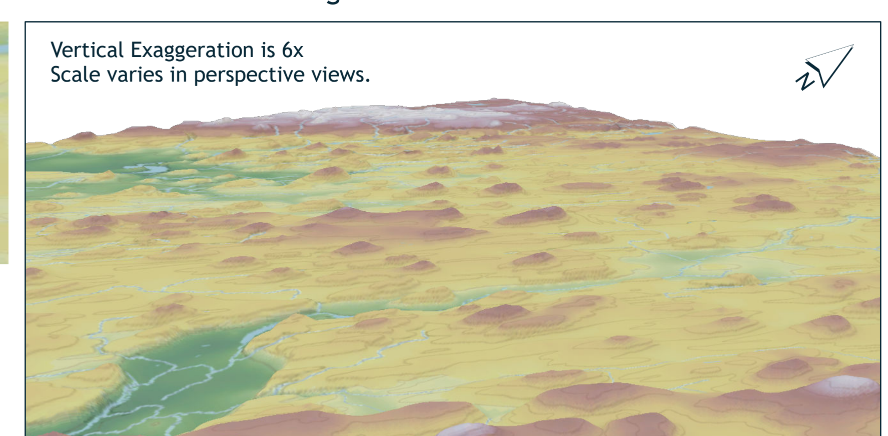
- Primary Road
- Secondary Road
- Builtup Area
- Waterbody



http://www.geo.mtu.edu/KeweenawGeoheritage/Glaciers/Glaciers/Drumlin.html

Digital Elevation Model





Elevation (m)

303

185

Designed and produced by Lindsay Aldous, February 2022 using ArcGIS Pro 2.8.0.

Study Area