



# 3D-Printed Geography for Education, Outreach, and More?

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**Geography & Environmental Studies**  
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# Outline

- Show-and-tell
- Howto
- Why
- What next

# Show-and-tell: watershed puzzle (Toronto and Region)





# Show-and-tell: watershed puzzle (Central Lake Ontario)



**Claus Rinner** @ClausRinner · Aug 3

Central Lake Ontario has quite a "puzzling" geography! 3D printed for  
[@CLOCA1](#) / [@CLOCA\\_Flood](#) GIS team



# Show-and-tell: larger, multi-part prints (Oak Ridges Moraine)



Claus Rinner  
@ClausRinner

2-piece #3Dprint of Oak Ridges Moraine  
(shown on @RyersonGeo hallway carpet;)  
200km to 50cm wide; 25x z-exaggeration



RETWEETS 2  
LIKES 3



8:29 PM - 20 Apr 2016



# Show-and-tell: cityscapes (Ryerson campus)



# Show-and-tell: thematic “maps”

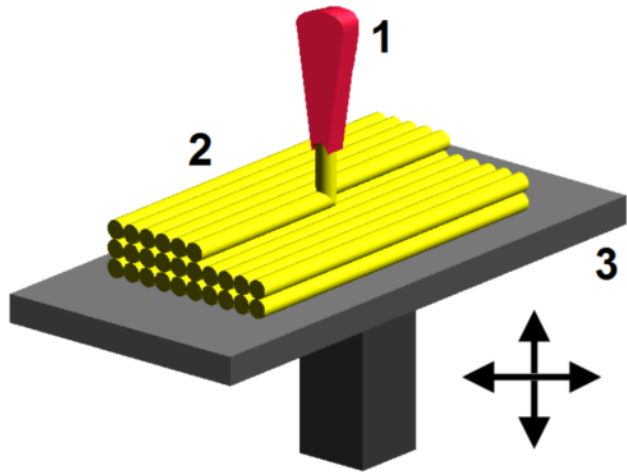




# Howto – desktop 3D printing

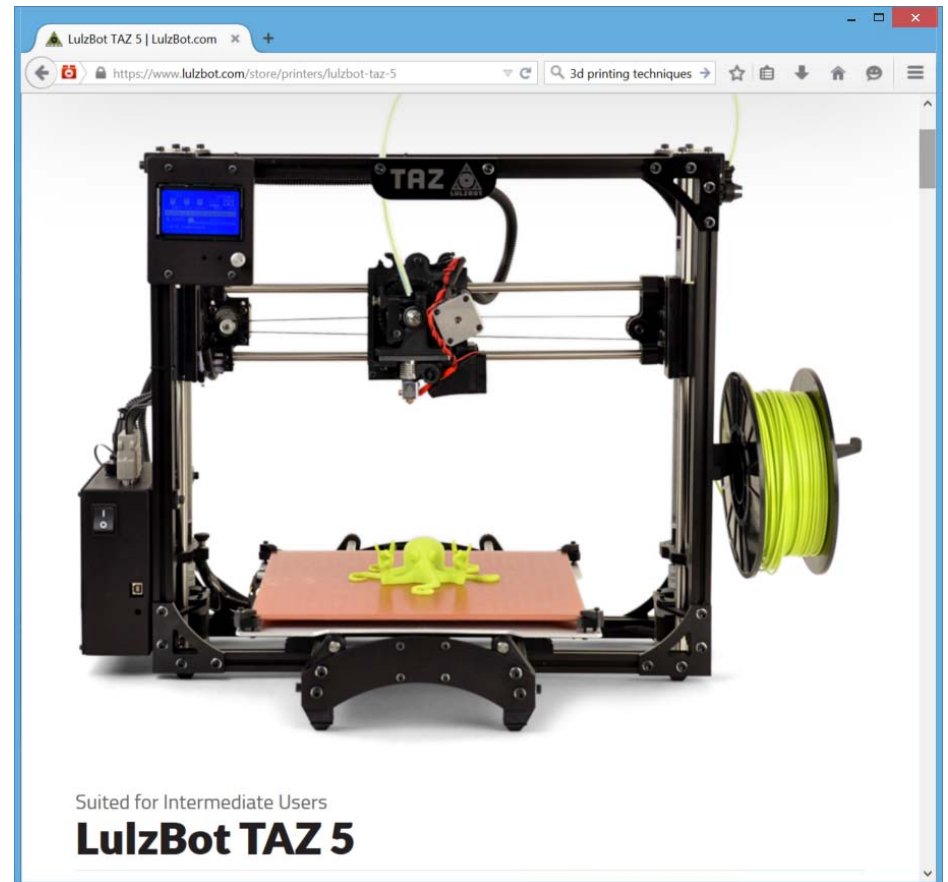
## Material Extrusion

The most commonly used technology in this process is **Fused deposition modeling (FDM)**



Fused deposition modelling (FDM), a method of rapid prototyping: 1 – nozzle ejecting molten material (plastic), 2 – deposited material (modelled part), 3 – controlled movable table. Image source: Wikipedia, made by user Zureks under CC Attribution-Share Alike 4.0 International license.

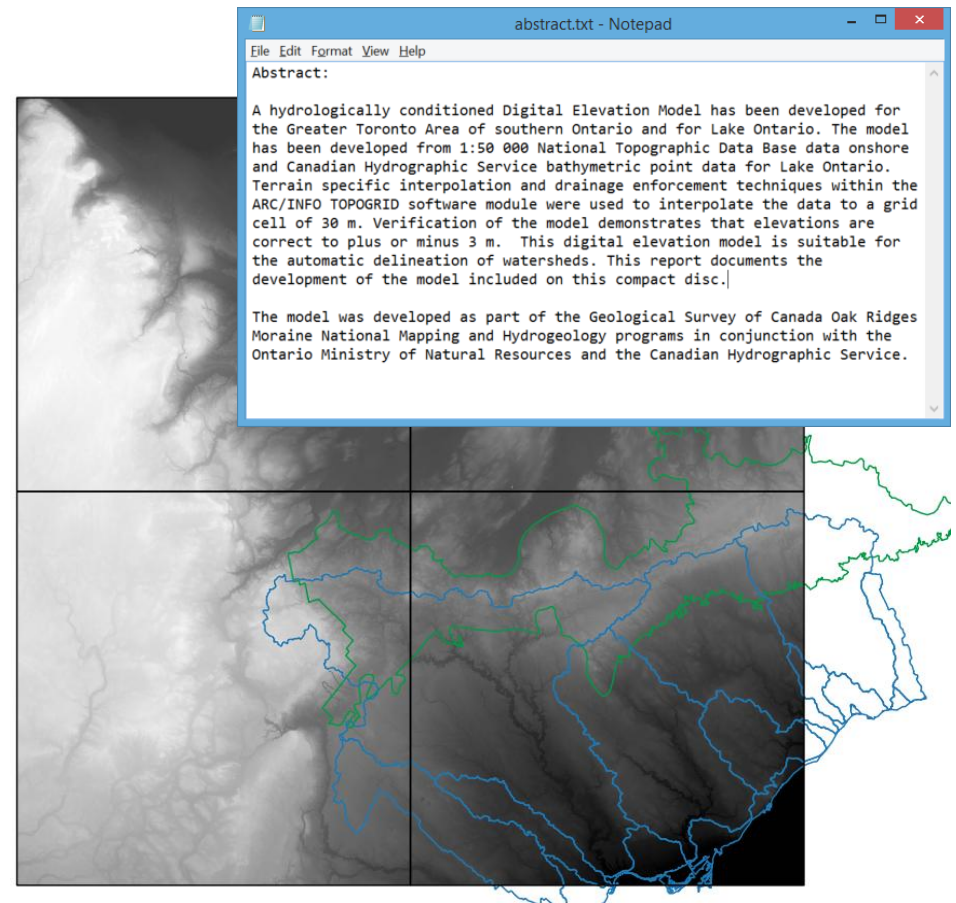
<http://3dprinting.com/what-is-3d-printing/>





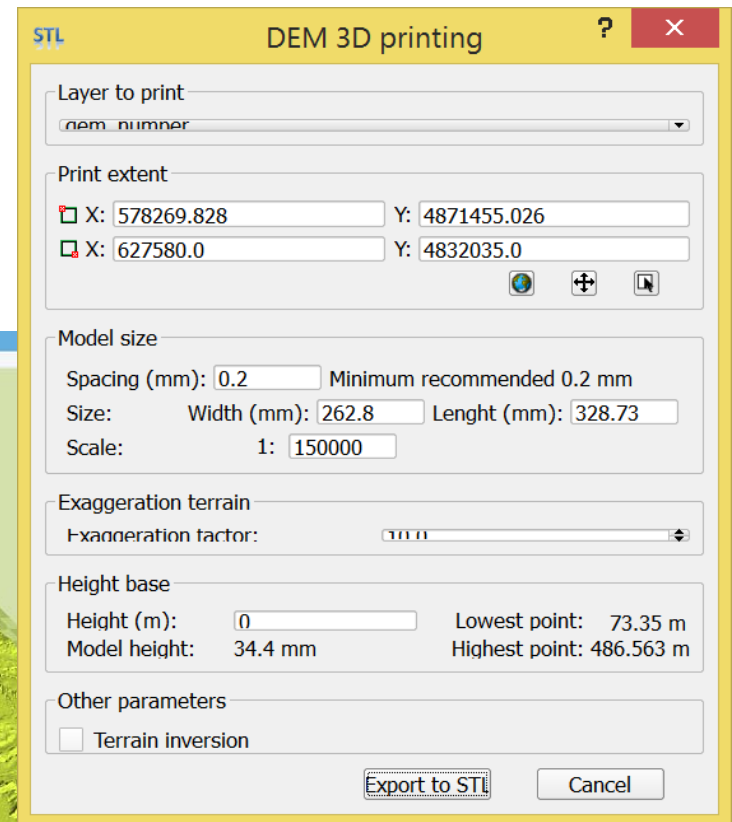
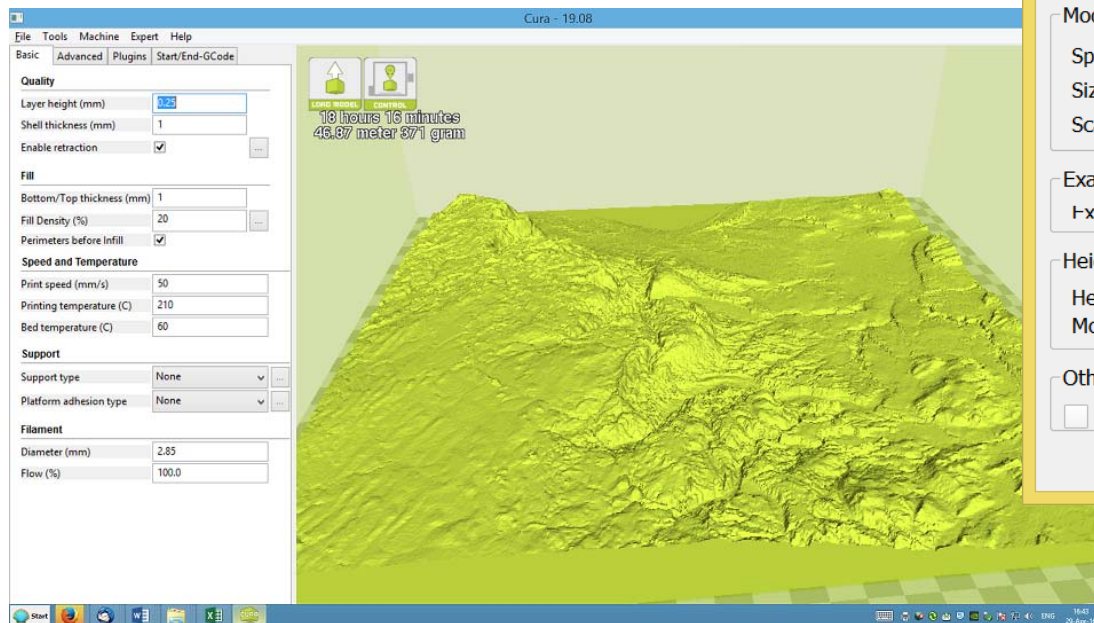
# Howto – processing geospatial data (DEM) for 3D printing

- GTA DEM by Geological Survey of Canada
- Various boundary files
- ArcGIS/QGIS raster processing and visualization
- Export as greyscale image and use of translator script or direct import

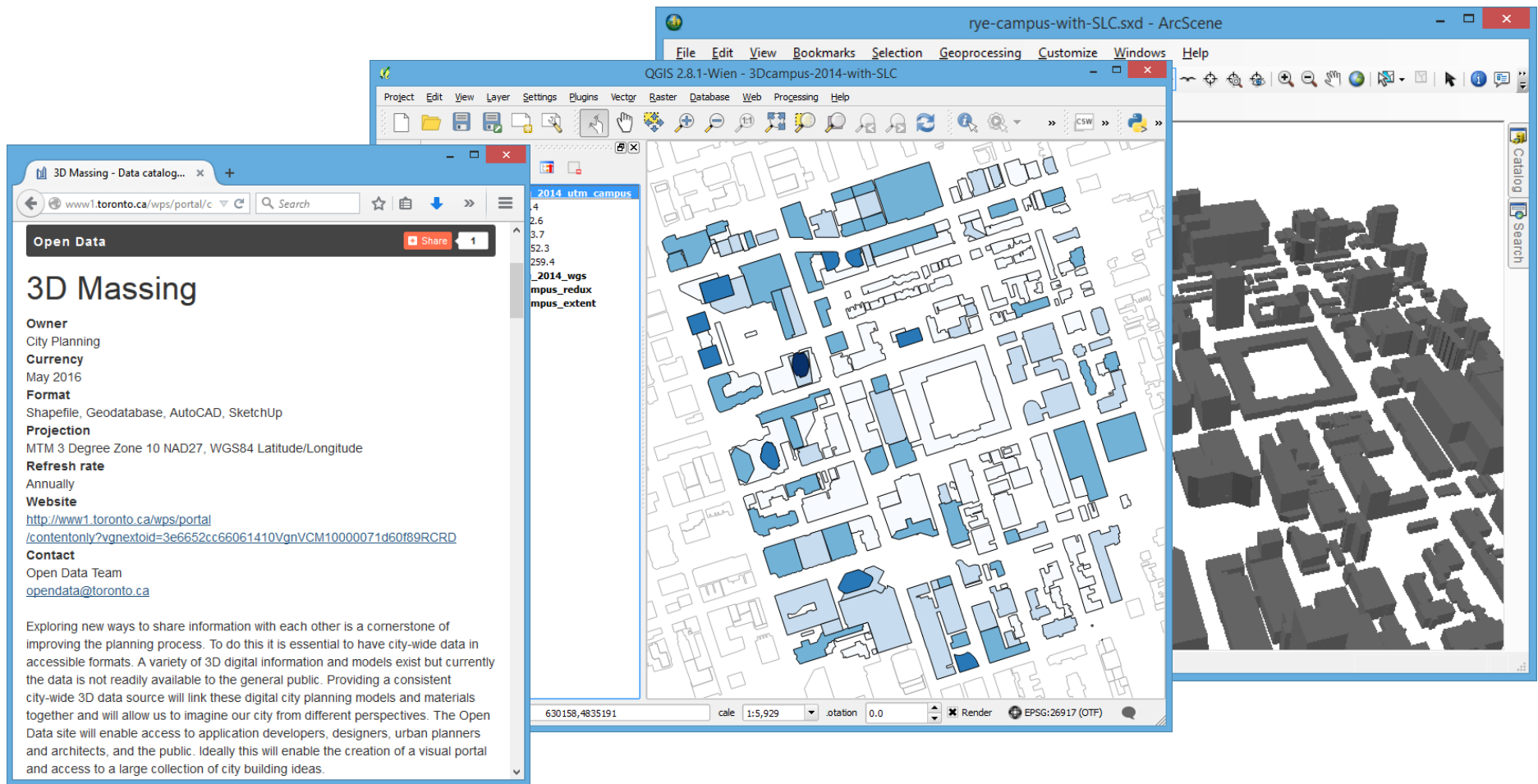


# Howto – processing geospatial data (DEM) for 3D printing

- QGIS plugin DEMto3D
- STL file format
- Printer's 3D viewer

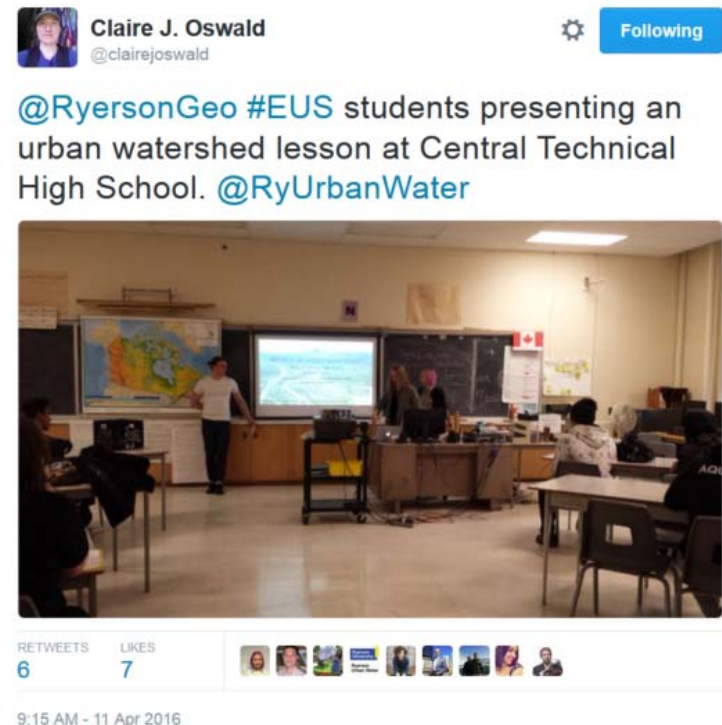


# Howto – processing geospatial data (3D massing)



# Why – education, outreach, and more?

- RECODE social innovation project:  
“A 3D elevation model of Toronto watersheds to promote citizen science in urban hydrology and water resources”
  - Watershed-focused high school teaching module





# Why – education, outreach, and more?

- Science Rendezvous
  - “What watershed do you live in?”
  - Proximity to waterways
  - Land use
  - Water quality

=> Research questions?



# What next – research vs tech exploration vs entrepreneurship

- Expand outreach on urban water (DEMs) to more schools, more conservation authorities, more events
  - Print more watersheds: Great Lakes, Canada, ...
- Develop outreach on urban form (cityscapes) to planners, emergency managers, ...
  - Print buildings, blocks, neighbourhoods, cities

# Acknowledgements

- J.W. McConnell Family Foundation – RECODE at Ryerson, social innovation grant
  - Think2Thing Inc – “concept to object”, co-applicant
- Ryerson Urban Water
- The critics:
  - Central Lake Ontario Conservation Authority
  - Toronto and Region Conservation Authority
  - Conservation Ontario
  - ...