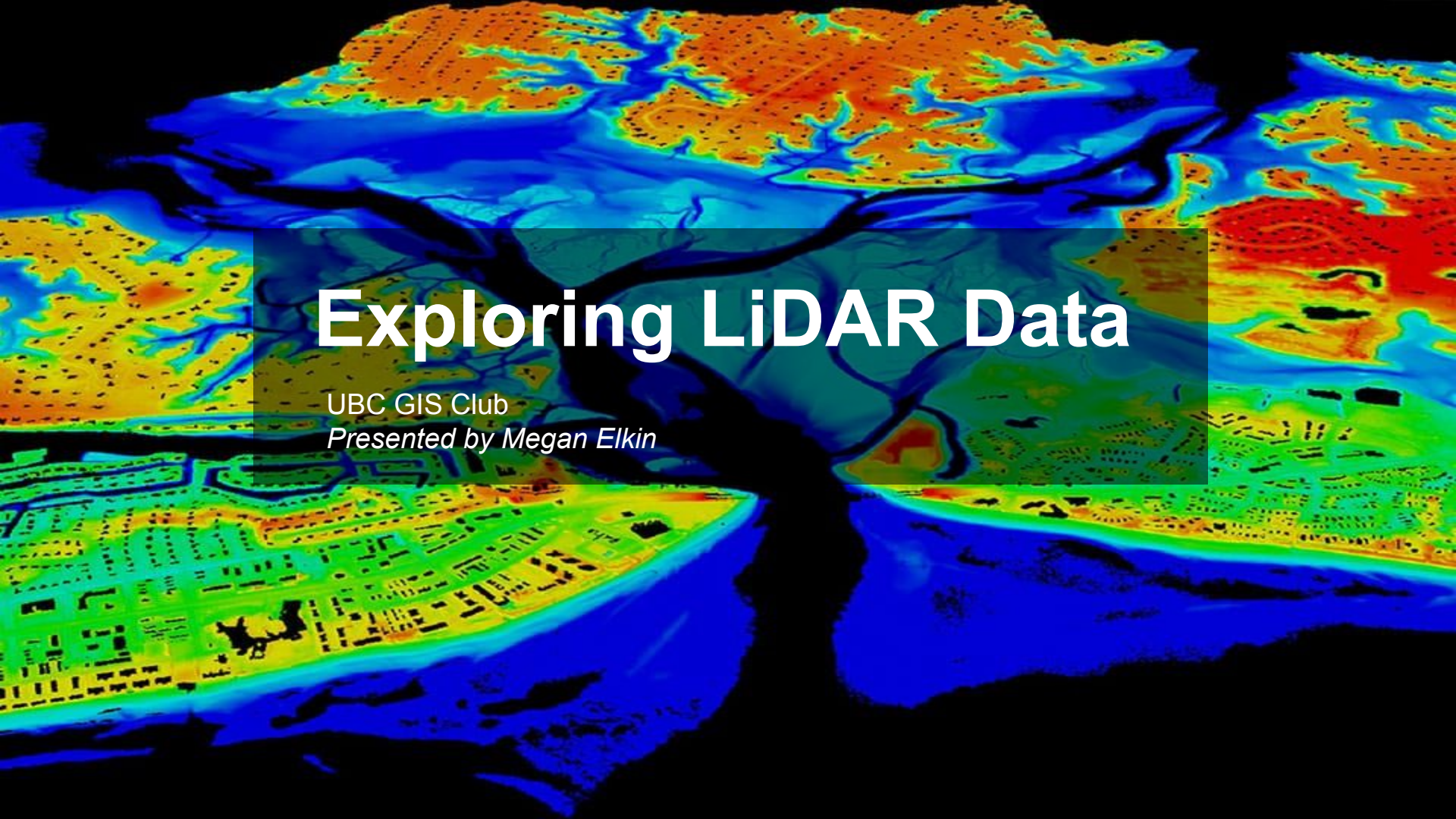
Welcome!

1. Log in with your CWL
2. Open ArcGIS and save a project folder



Exploring LiDAR Data

UBC GIS Club

Presented by Megan Elkin

AGENDA

1….What is LiDAR?

2….LidarBC

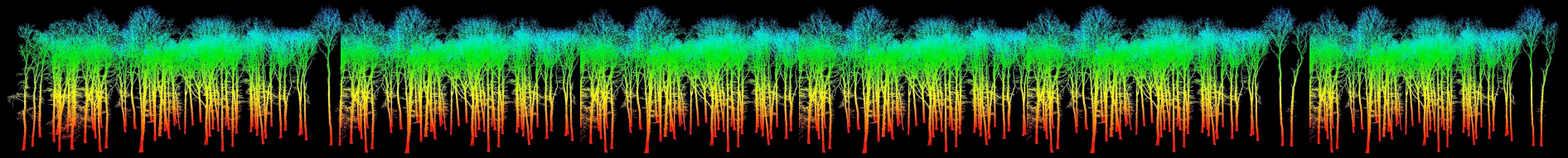
3….Creating a DEM in ArcPro

4….Helpful Resources

What is LiDAR?

Light **D**etection **a**nd **R**anging

- A remote sensing method used to examine the surface of the earth
- Uses light in the form of a pulsed laser to measure ranges (visible distances) to the Earth



LiDAR sensors send light pulses to the ground.

The pulses return to the sensor.

The return time measures the distance.

- LAS file format: 3D point cloud data

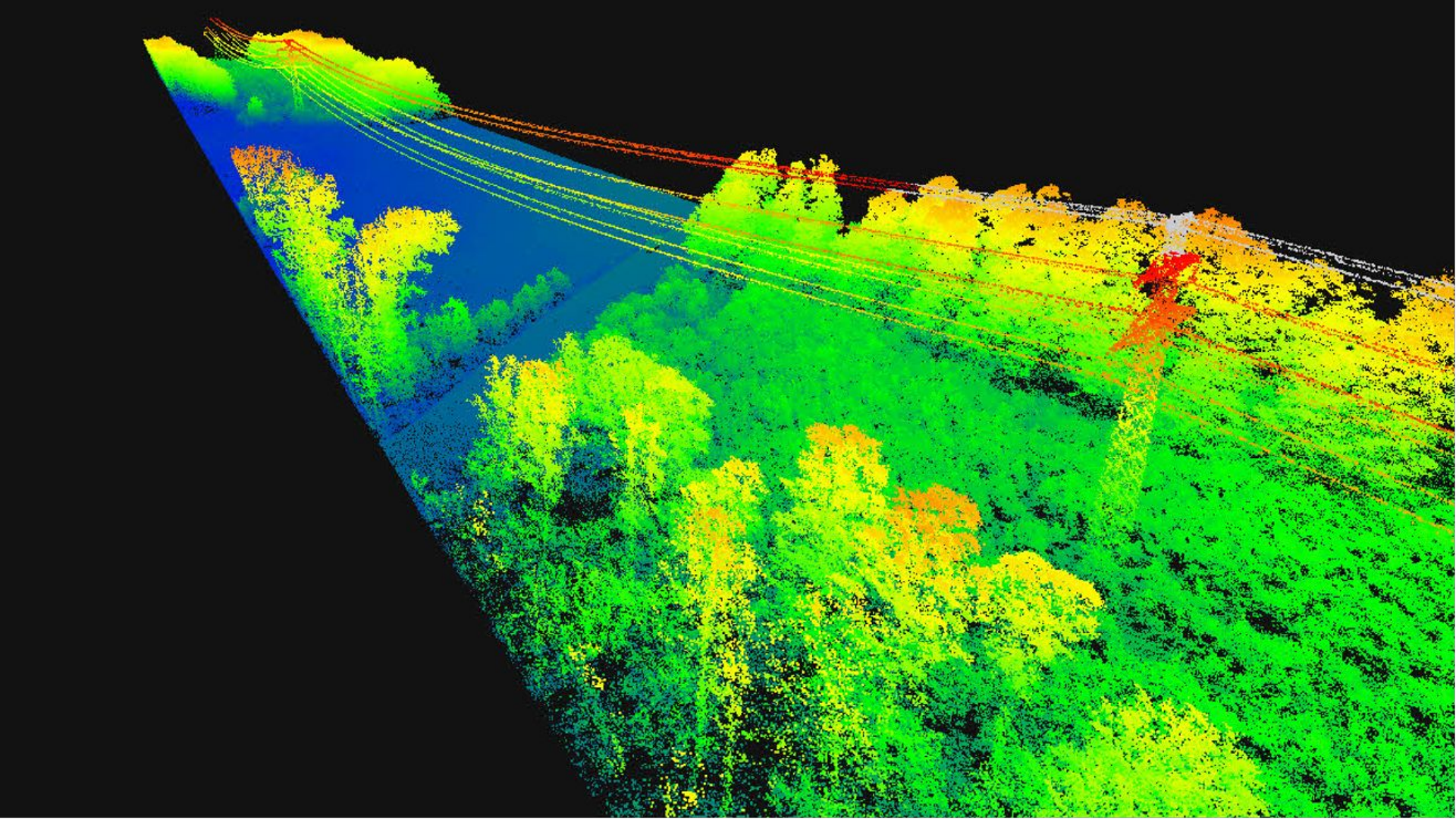
- LiDAR points can be assigned a classification that define the type of object that has reflected the laser pulse

- Predefined classification schemes defined by the *American Society for Photogrammetry and Remote Sensing (ASPRS)*

ASPRS LiDAR Classification Codes

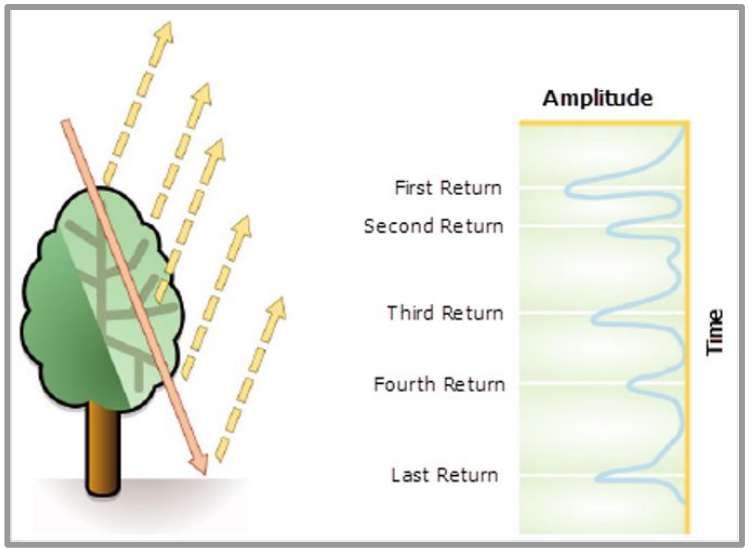
Note: only LAS 1.1-1.4 supports these classifications

Classification Value	Meaning
0	Never classified
1	Unassigned
2	Ground
3	Low Vegetation
4	Medium Vegetation
5	High Vegetation
6	Building
7	Low Point
8	Reserved
9	Water
10	Rail
11	Road Surface
12	Reserved
13	Wire - Guard (Shield)
14	Wire - Conductor (Phase)
15	Transmission Tower
16	Wire-Structure Connector (Insulator)
17	Bridge Deck
18	High Noise
19-63	Reserved
64-255	User Definable



- Laser pulses emitted from a lidar system reflect from objects both on and above the ground surface. One emitted laser pulse can return to the lidar sensor as one or many returns.

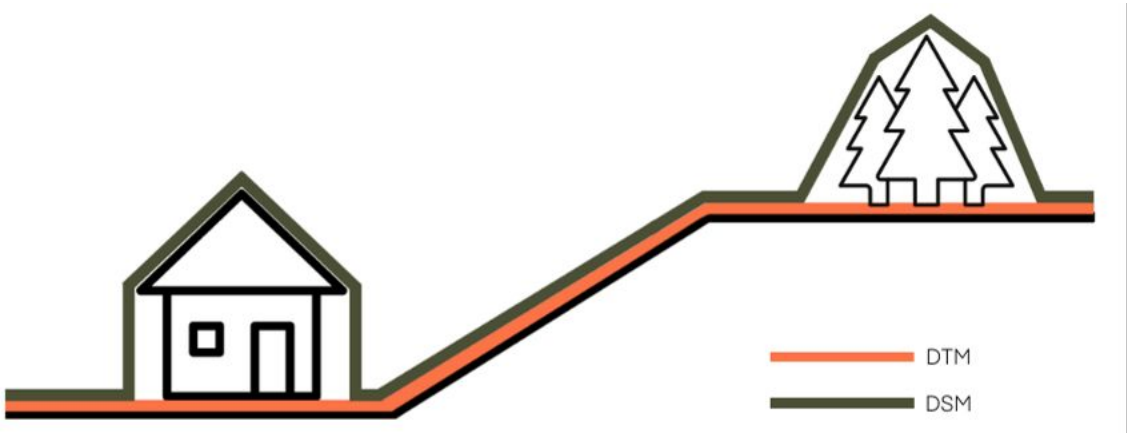
- Any emitted laser pulse that encounters multiple reflection surfaces as it travels toward the ground is split into as many returns as there are reflective surfaces.



- *The first returned laser pulse is the most significant return and will be associated with the highest feature in the landscape like a treetop or the top of a building (or ground).*

DSM (Digital Surface Model) captures both the natural and built/artificial features of the environment.

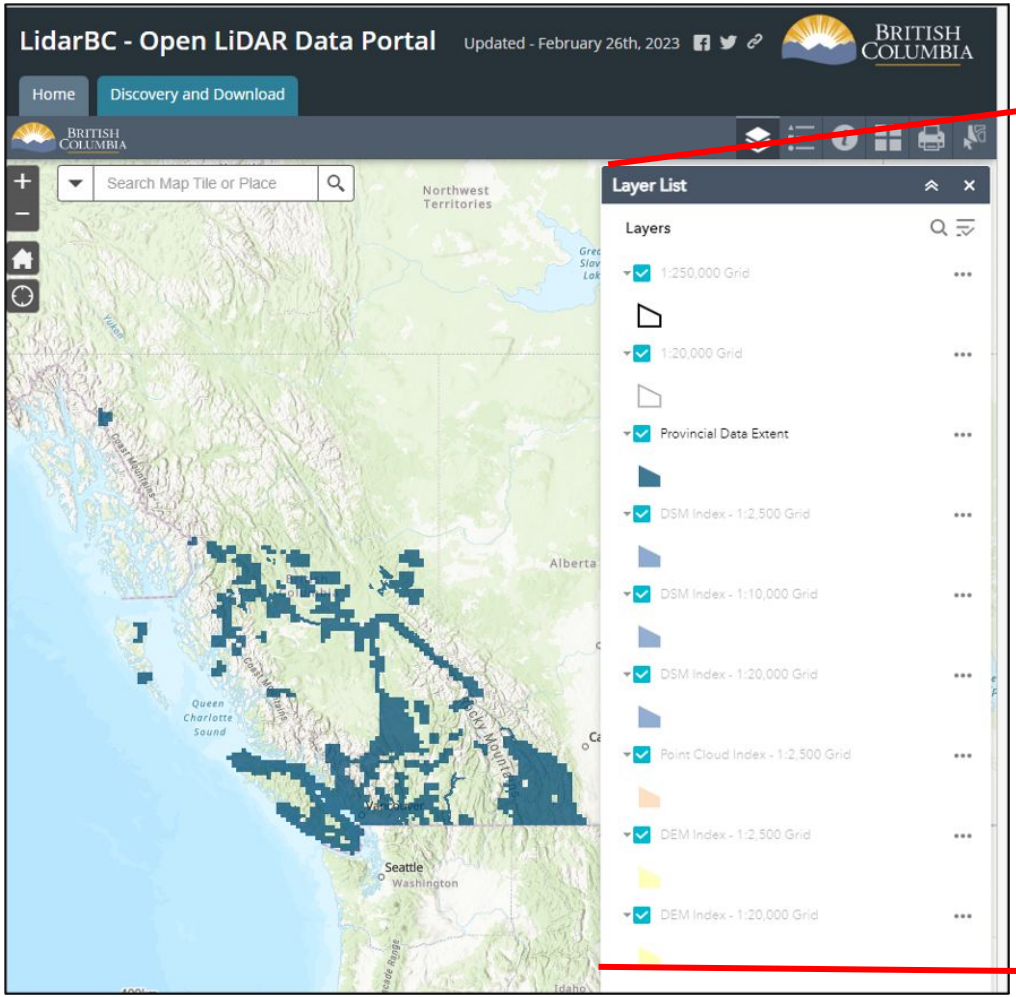
DEM (Digital Elevation Model) Represents the bare-Earth surface, removing all natural and built features.

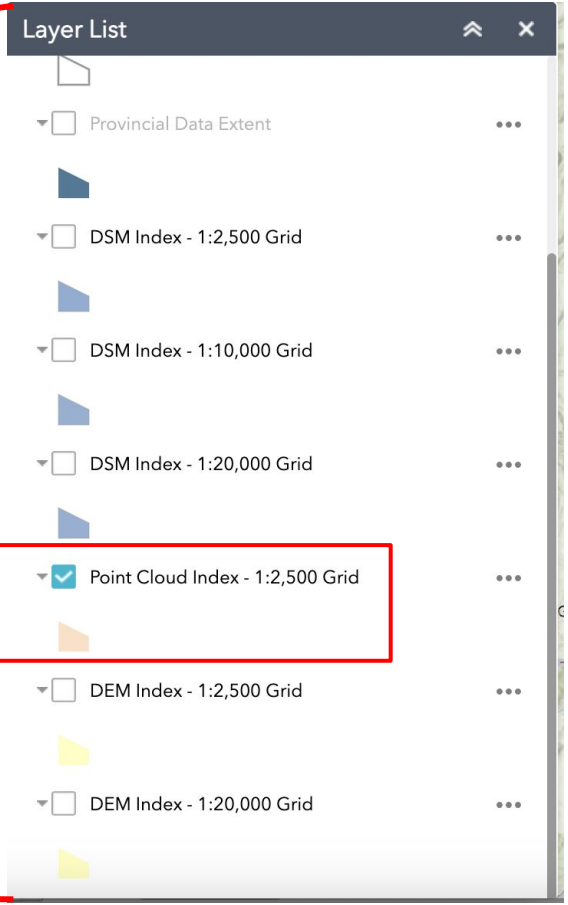


LidarBC

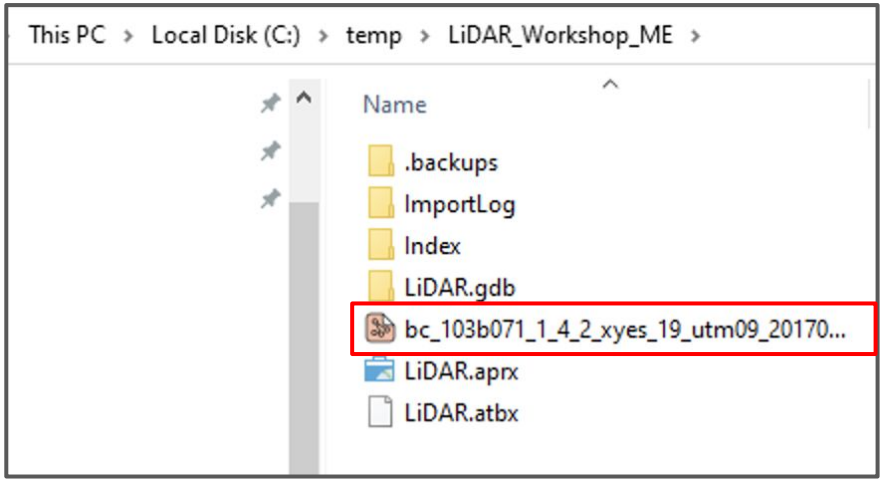
- *Source*: LidarBC - Open LiDAR Data Portal (arcgis.com)
- *Point Spacing:* 0.305m
- *Collection Date:* 2016
  - *Important Note:* For most of the data, LidarBC only uses two classifications: unassigned (1) and ground (2). LidarBC has data coverage for most of the province (in DEM, DSM and Point Cloud datasets).
  - LidarBC is working on updating their BC coverage in the next coming years.

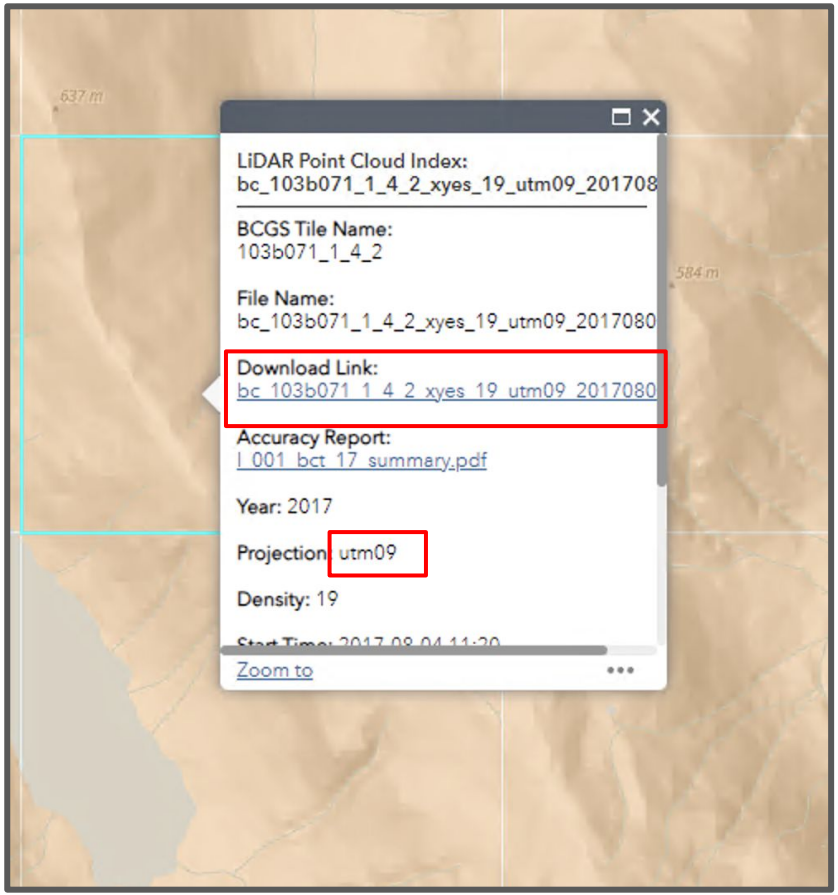
- Toggle to Point Cloud Index



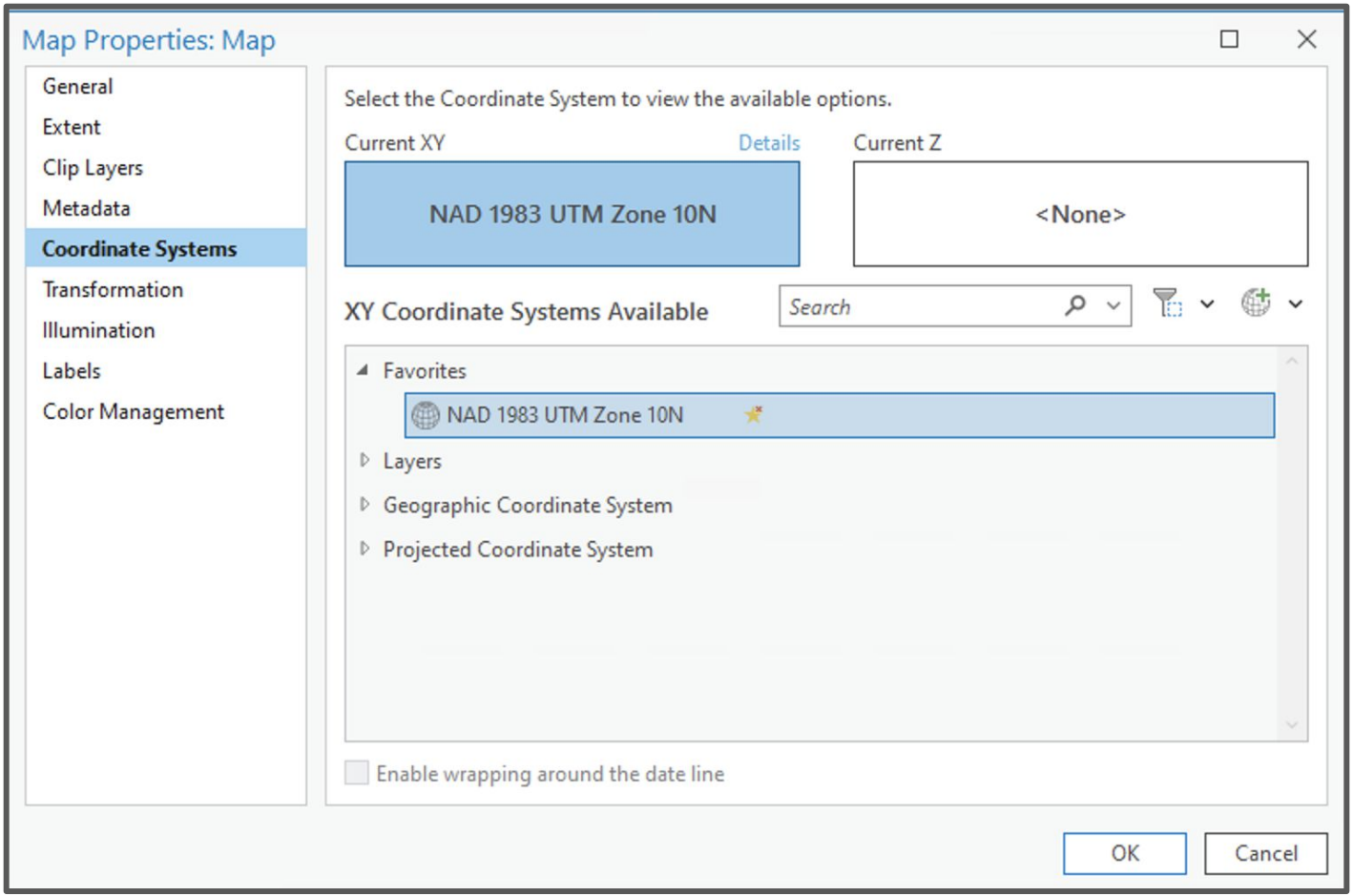


- Pick a Tile
  - Make note of projection!
- Download Tile
- Save Tile to ArcGIS project folder
  - File will be saved in LAZ format

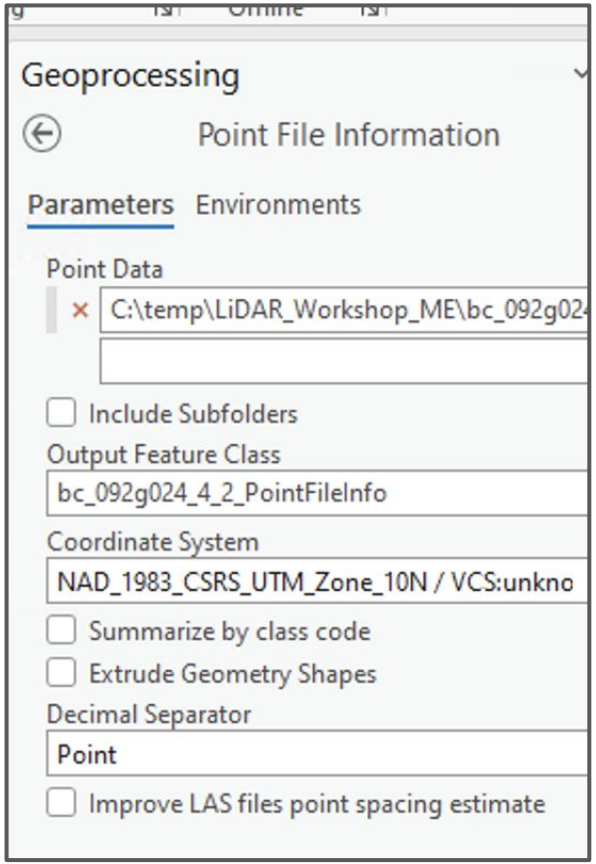




Before we start the computation, change your projection to **match your** LAZ Tile.



We are also going to determine the *Point Spacing*



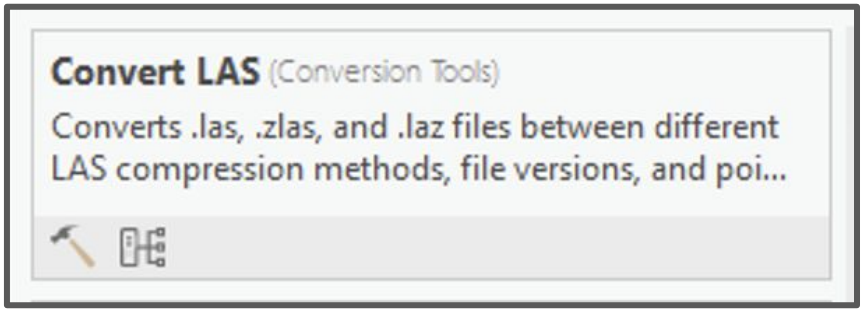
- This is the distance between your point clouds
- Use the Point File Information Tool
- Point Spacing will be located in the output layer **Attribute Table**

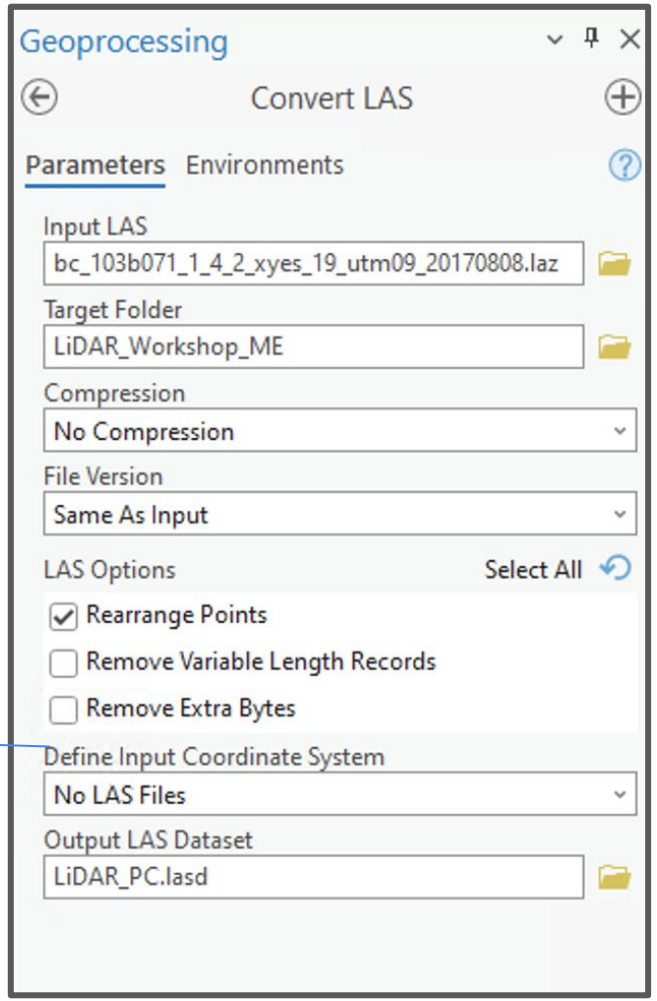
	OID *	Shape *	FileName	Pt_Count	Pt_Spacing
1	1	Polygon	bc_092g024_4_2_2_xye...	39784898	0.252833

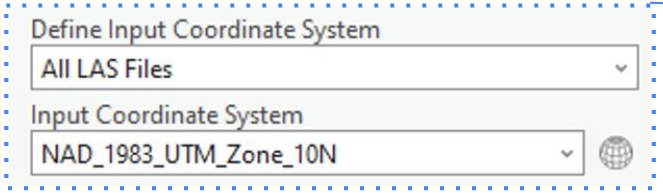
Creating a DEM and DSM in ArcPro

1) Convert LAZ file to LAS format

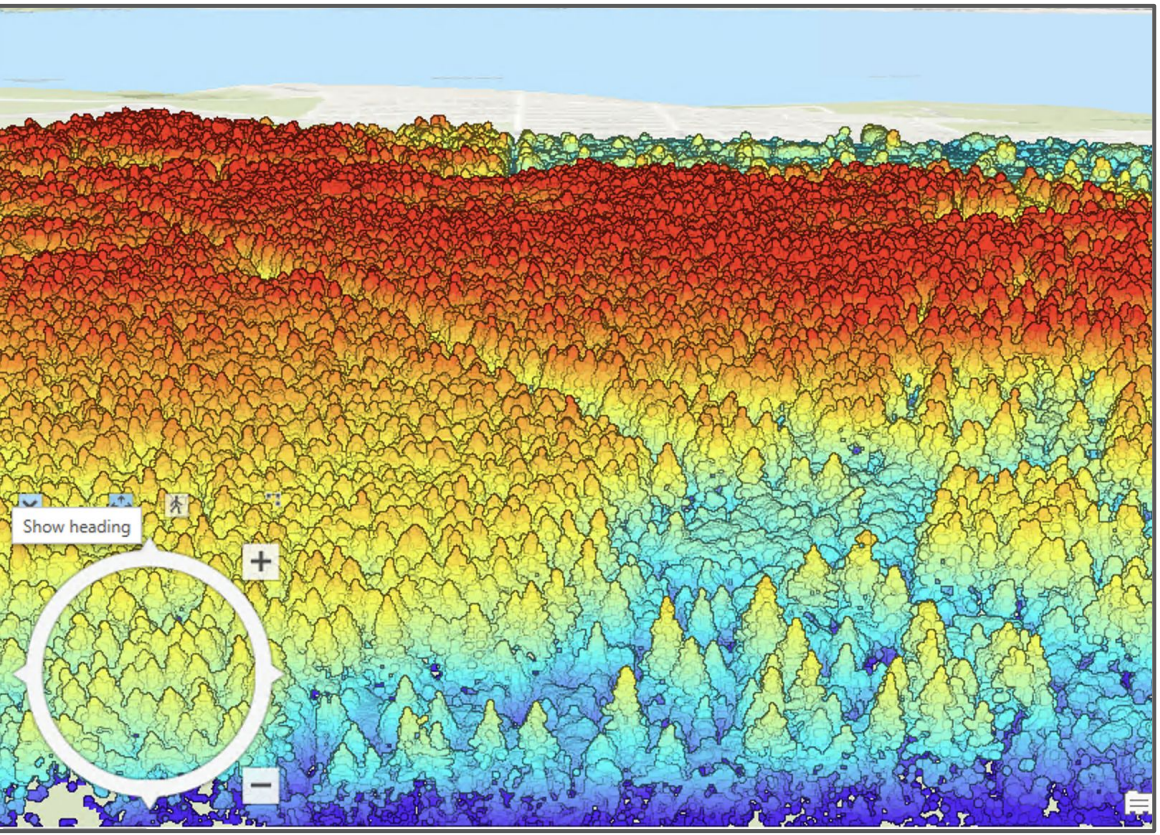
a) Open the Toolbox and search for “Convert LAS”.







Incase your coordinate system has not been defined for your dataset, you will need to manually change it.

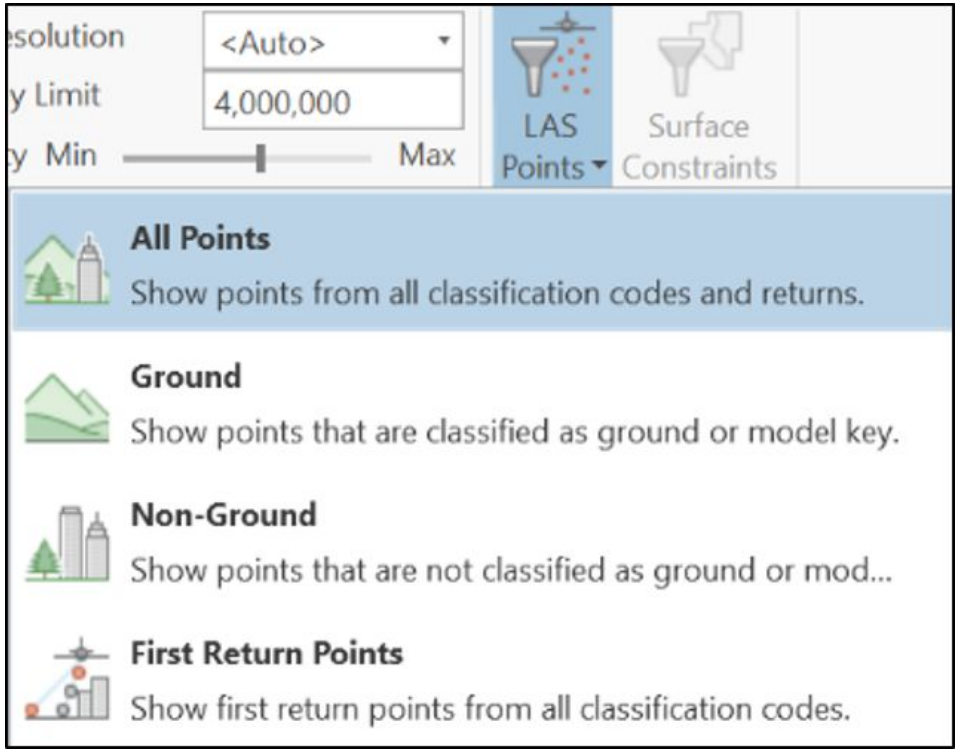


Don’t forget to play around with the super cool LiDAR point clouds you just uploaded!

(Picture is using 3D local scene in ArcGIS to view point cloud data).

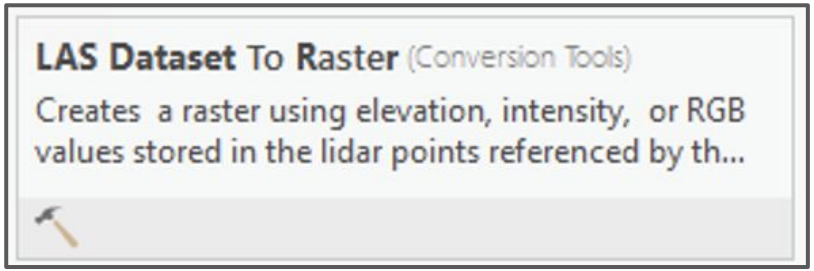
N*ote:* You will need to zoom in under 1:4000 to make point clouds visible; they are large datasets!

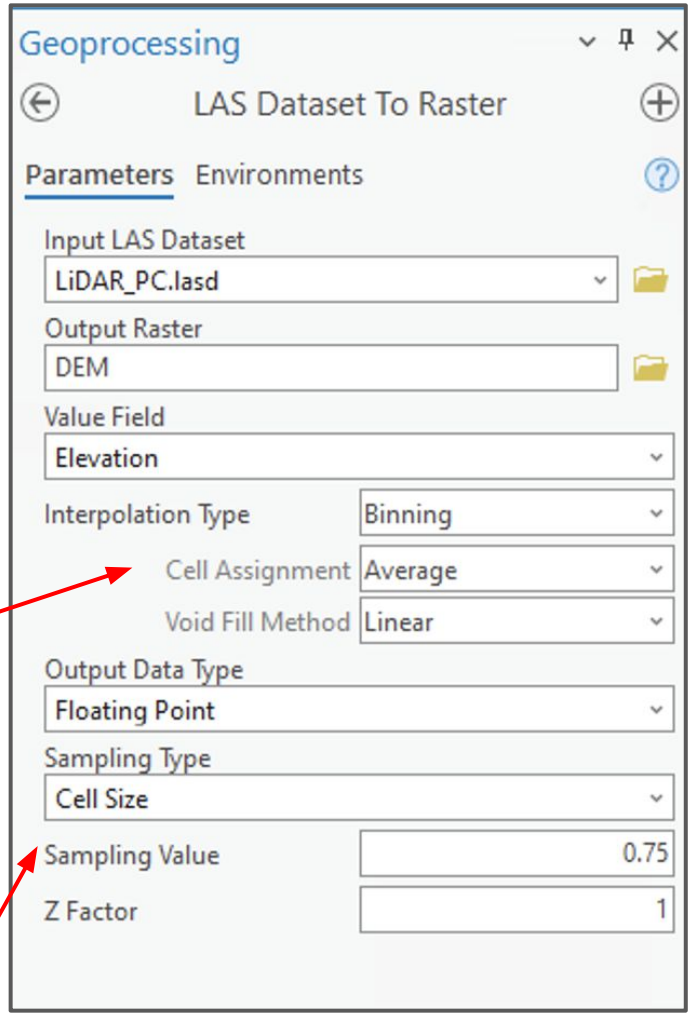
2) Filter Point Clouds to *Ground*



3) Create DEM

- Use LAS Dataset to Raster Tool



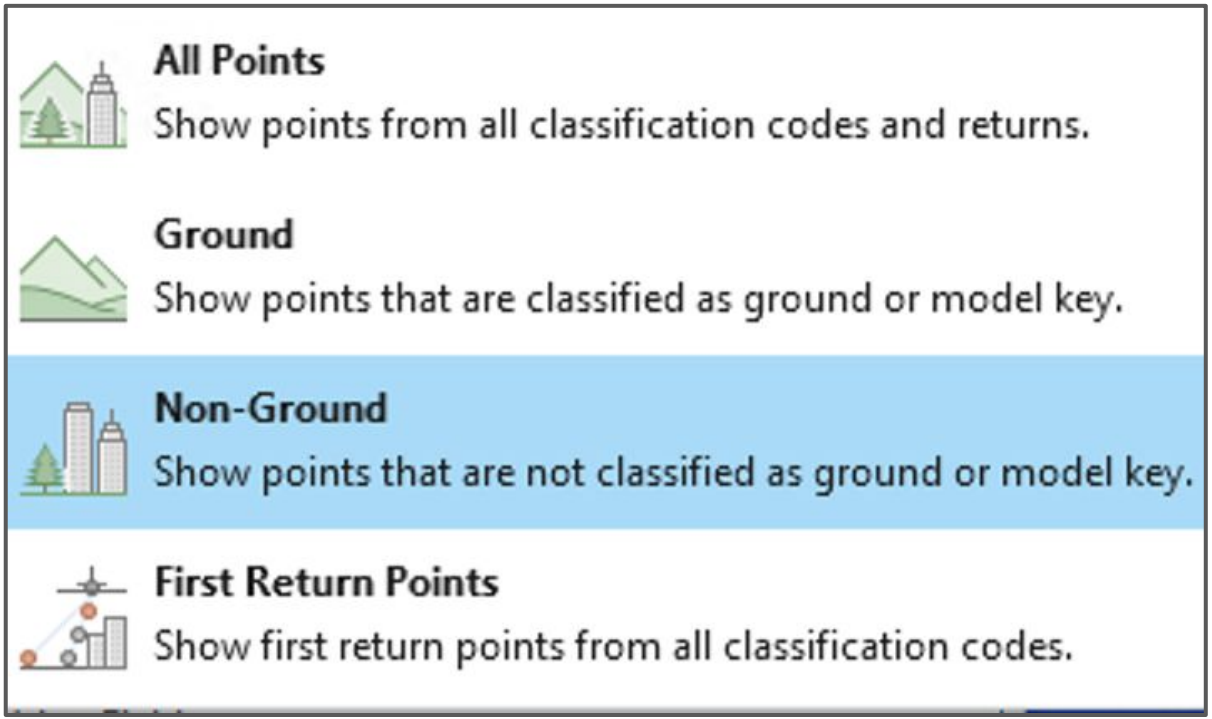


Average- Assigns the average value of all points in the cell. This is the default. Used to create DEM.

Sampling Value- This is used to define resolution. Sampling value is recommended to be at least 2-3 times the point spacing.

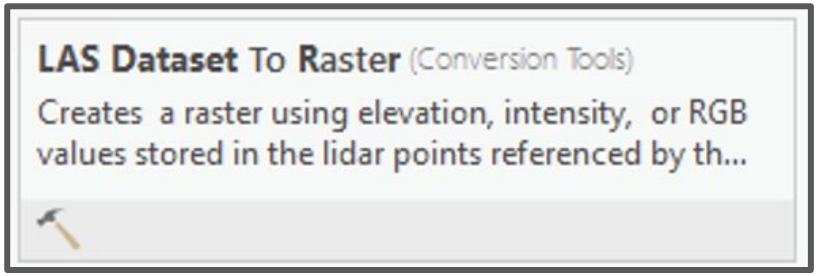
4) Filter Point Clouds to Non-*Ground*

(first, toggle back to LASD. layer)



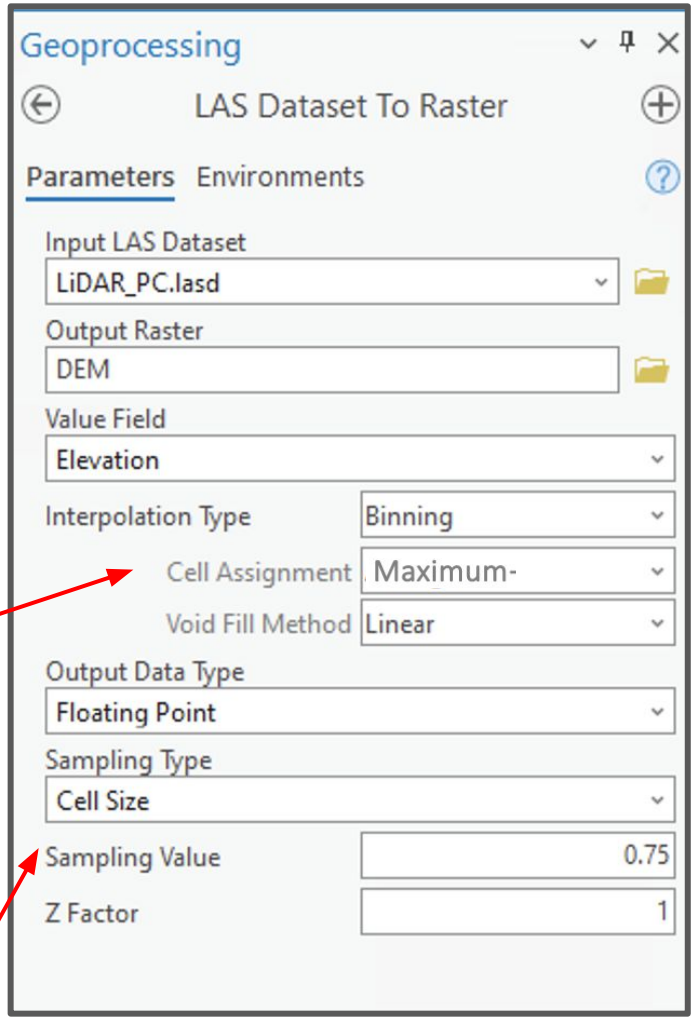
5) Create DSM

- Use LAS Dataset to Raster Tool



Maximum—Assigns the maximum value found in the points within the cell. Used to create DSM.

Sampling Value- This is used to define resolution. Sampling value is recommended to be at least 2-3 times the point spacing.



DEM


W 7th Ave
W 8th Ave
University Golf Club
W 10th Ave
W 11th Ave
W 12th Ave
W 14th Ave
16th Ave
Pacific Spirit Regional Park

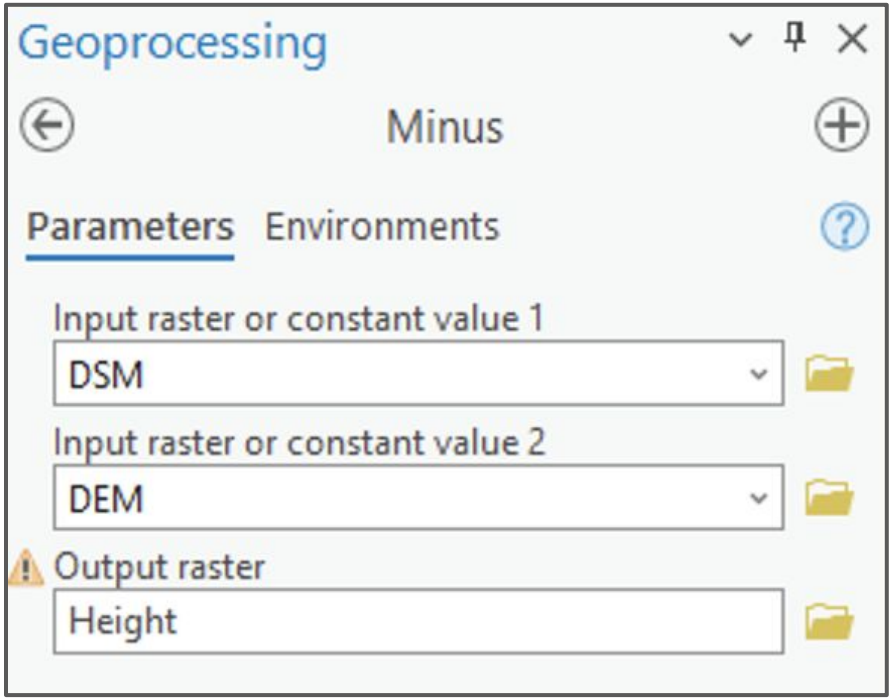
DSM


W 8th Ave
University Golf Club
W 10th Ave
W 11th Ave
W 12th Ave
W 14th Ave
Pacific Spirit Regional Park

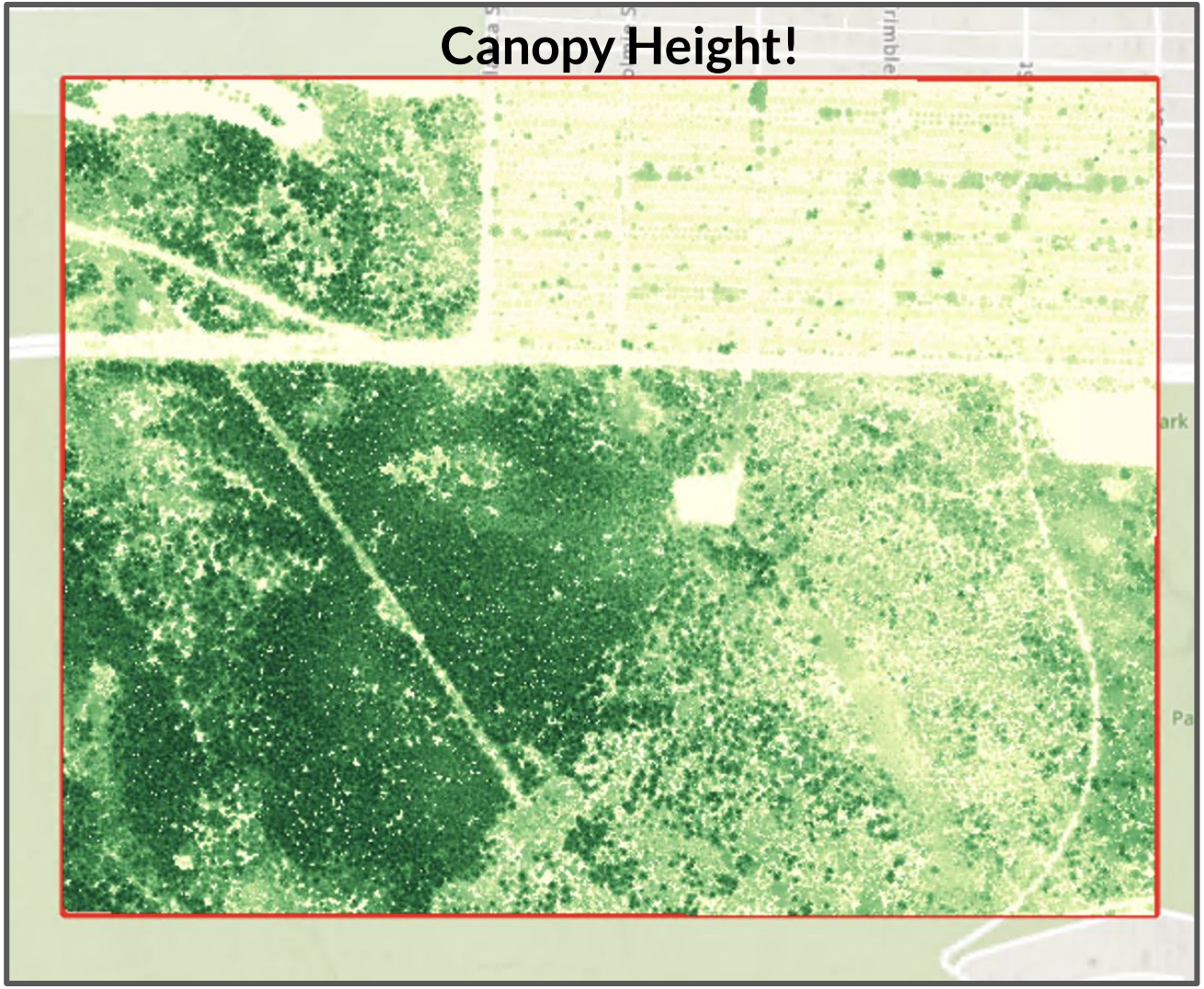
Bonus!

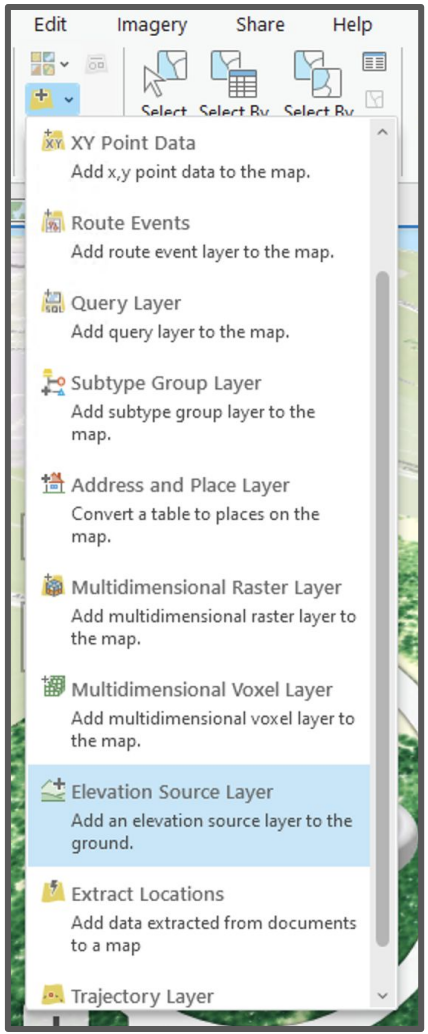
Calculate Canopy Height:

1. Use Minus Tool
2. Subtract DEM from DSM
3. Celebrate your accomplishment!

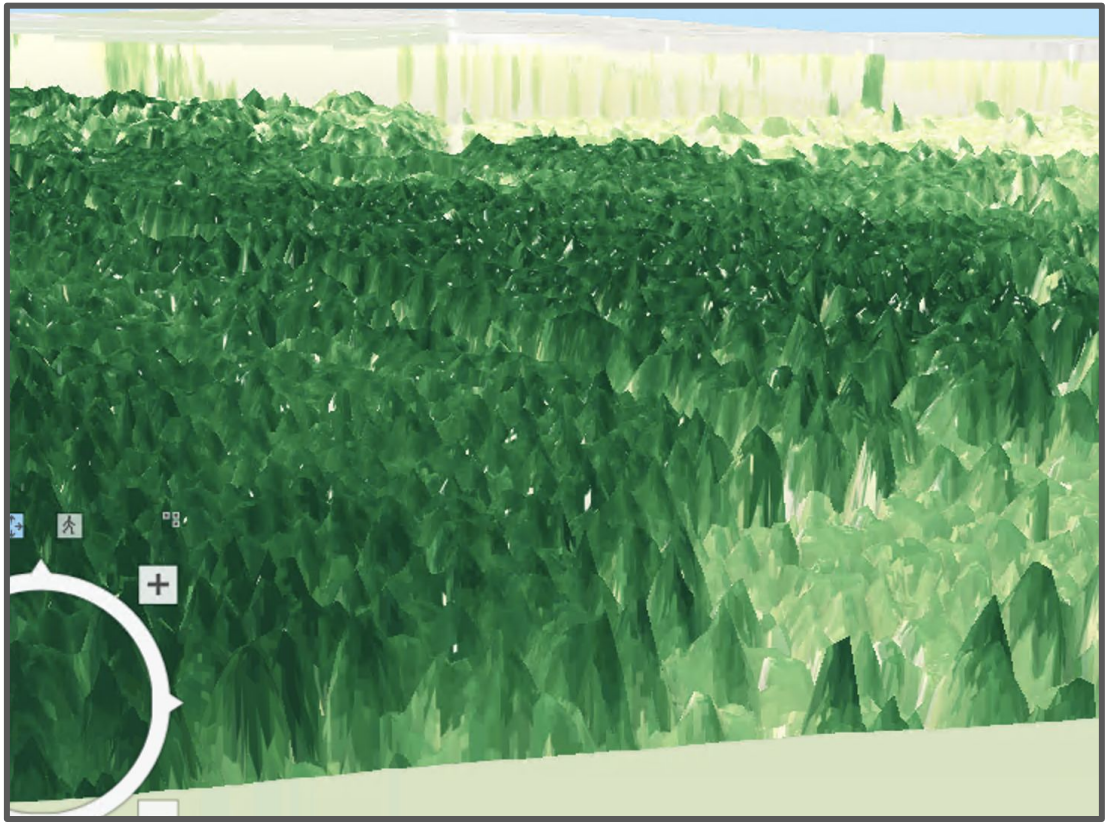


Canopy Height!





By Setting your Height layer to your elevation source, you can also view your layer in 3D!



Helpful Resources

What is Lidar data?—ArcGIS Pro | Documentation

Elevation Modeling - the differences between DTM, DSM & DEM – Plex-Earth Support Desk (plexearth.com)

Creating raster DEMs and DSMs from large lidar point collections—ArcMap | Documentation (arcgis.com)