# Introduction to ArcGIS Pro

REBECCA BARTLETT, GIS LIBRARIAN

MEAGHAN KENNY, GEOSPATIAL DATA SERVICES SPECIALIST

GIS@CARLETON.CA

# Learning outcomes

- Learn the basics of GIS & mapping
- Learn about geoprocessing tools
- Learn some basics of ArcGIS Pro

# Before we start

GIS has a lot of terminology and technical quirks, so can be frustrating. That's normal!

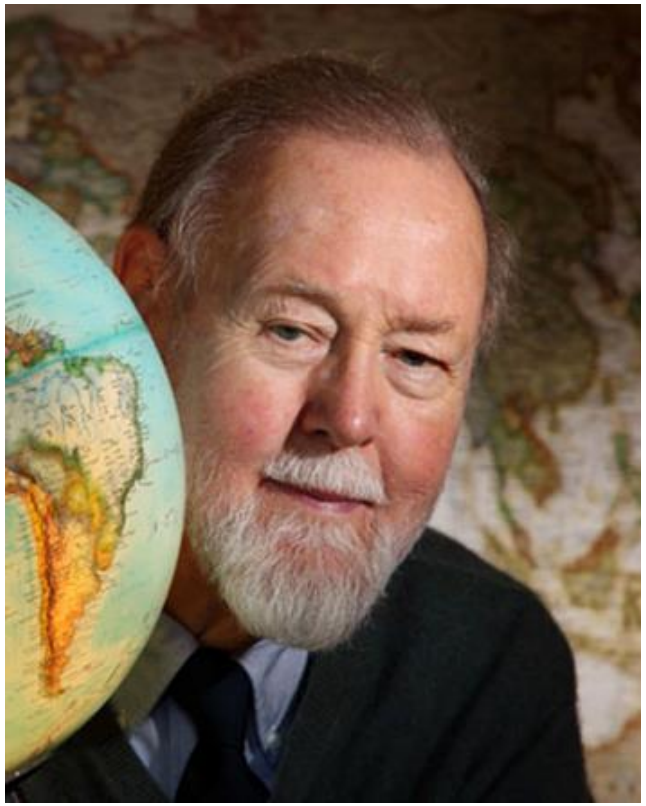
We often say that it's not a learning *curve*, but a *brick wall*.

# GIS & GIS data

# What is GIS?

- GIS = Geographic Information System

- Invented in the 1960s by Roger Tomlinson at Natural Resources Canada



Source: https://commons.wikimedia.org/wiki/File:RogerGlobe.jpg

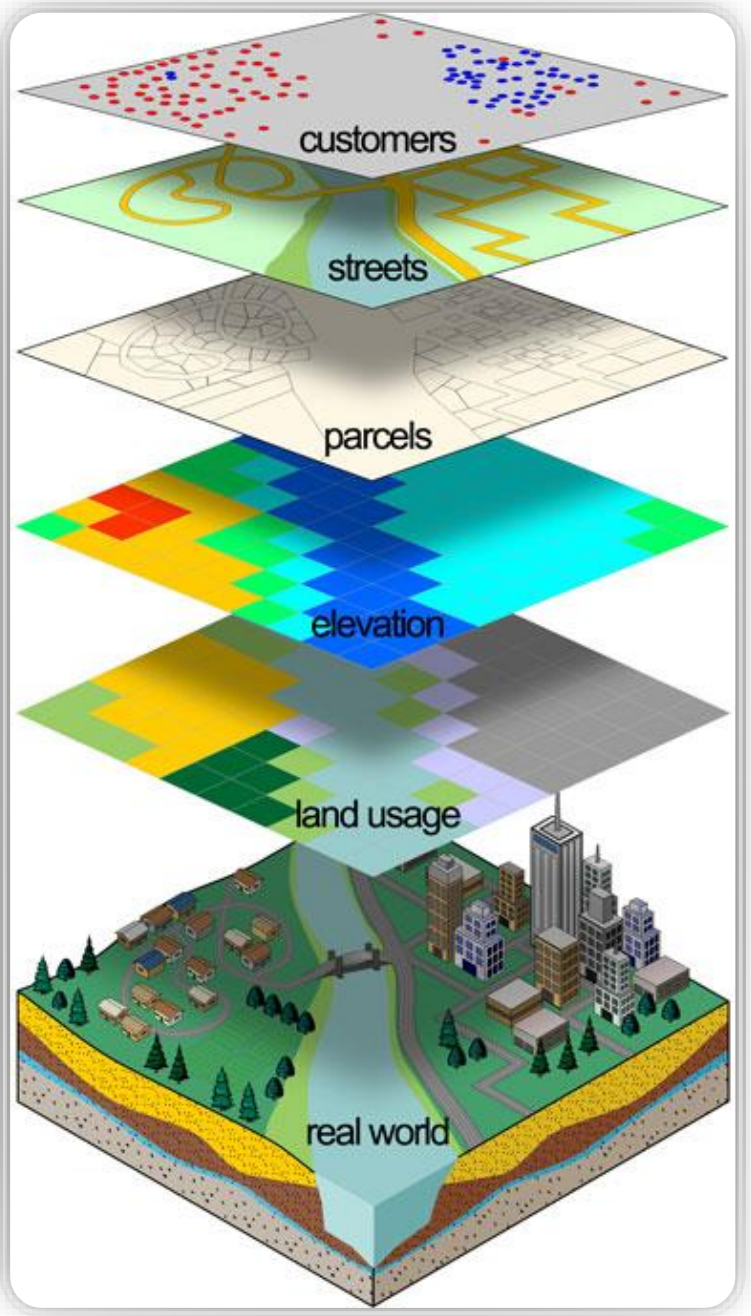
# What is GIS?

- There are 3 main components to a GIS:
  - Visual representation as layers (map)
  - Table (data)
  - Analysis tools (software)

- **These 3 components are directly linked**
  - What happens in the table (underlying data) is represented visually in the map layer.
  - If you do analysis (e.g. querying, filtering a selection) in the table, the changes are represented and visualized in the layer.

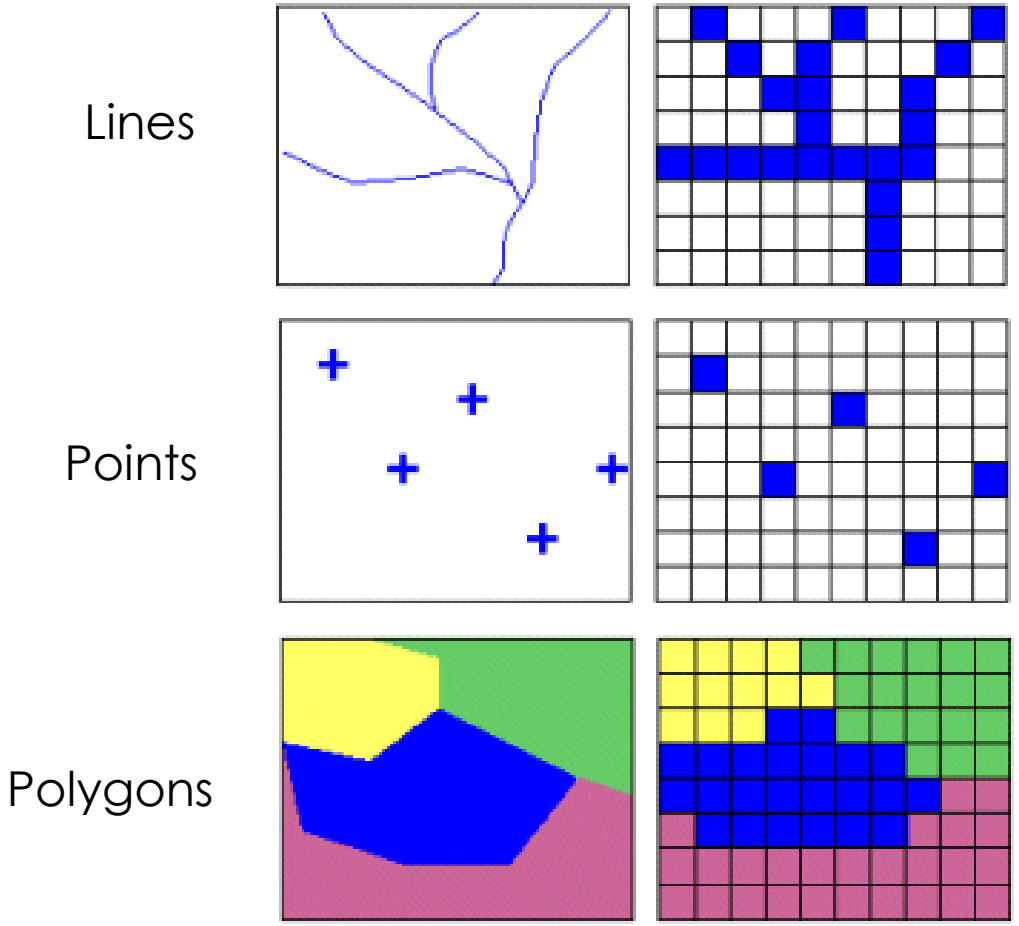
# GIS layers

- **Each GIS dataset is a *layer* when used in GIS software**
- Layers can be stacked on top of one another to create a map or to perform analysis
- It is important to note that there is a hierarchy to the layer drawing order
  - If you place a polygon layer with a colour fill on top of a point layer, your points may not show up



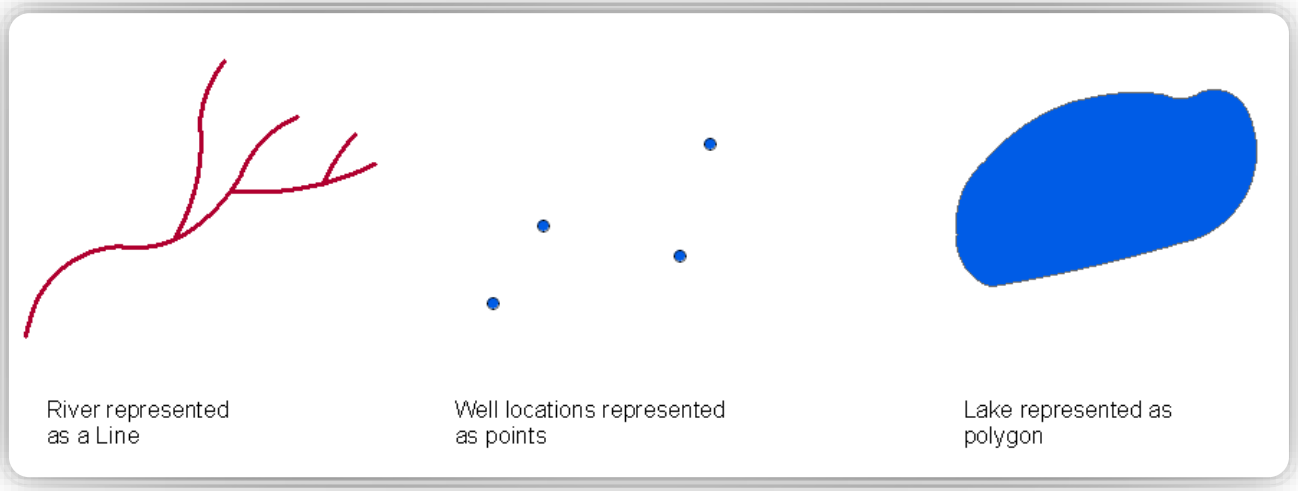
# Two types of GIS layers

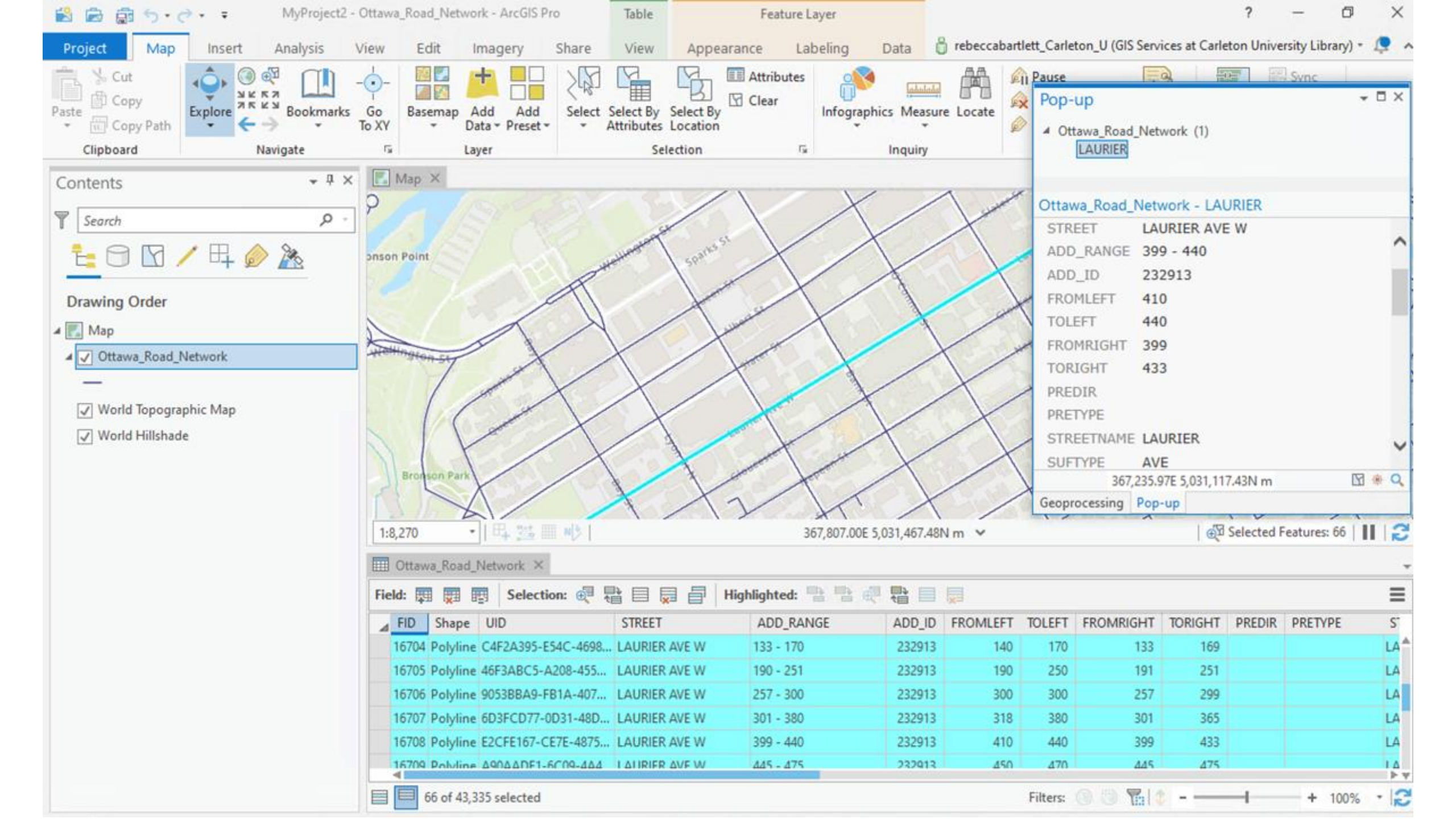
- Vector: points, lines, and polygon geometries
  - File types include DWG, shapefiles, Google Earth KML
- Raster: continuous grids made up of pixels
  - File types include TIFF & JPEG
  - Air photos are raster files



# Vector layers

- **Vector** - Geographical features often expressed as types of geometry.
  - Points, Polylines & Polygons
  - Common file formats
    - Esri Shapefile (shp)
    - AutoCAD Drawing (dwg)
    - Google Earth (kml)
    - OpenStreetMap (osm)




MyProject2 - Ottawa_Road_Network - ArcGIS Pro
Table
Feature Layer
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
View
Appearance
Labeling
Data
rebeccabartlett_Carleton_U (GIS Services at Carleton University Library)
Cut
Copy
Paste
Copy Path
Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Preset
Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Selection
Infographics
Measure
Locate
Inquiry
Pause
Sync
Pop-up
Ottawa_Road_Network (1)
LAURIER
Ottawa_Road_Network - LAURIER
STREET LAURIER AVE W
ADD_RANGE 399 - 440
ADD_ID 232913
FROMLEFT 410
TOLEFT 440
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STREETNAME LAURIER
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Geoprocessing
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Drawing Order
Map
Ottawa_Road_Network
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World Hillshade
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Wellington St
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Queen St
Albert St
Slater St
Laurier Ave W
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367,807.00E 5,031,467.48N m
Selected Features: 66
Ottawa_Road_Network
Field:
Selection:
Highlighted:
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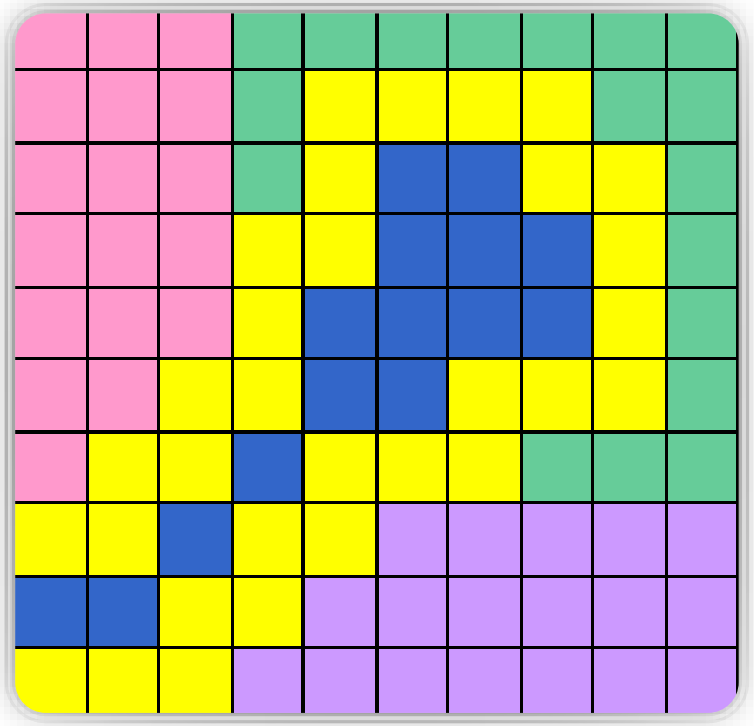
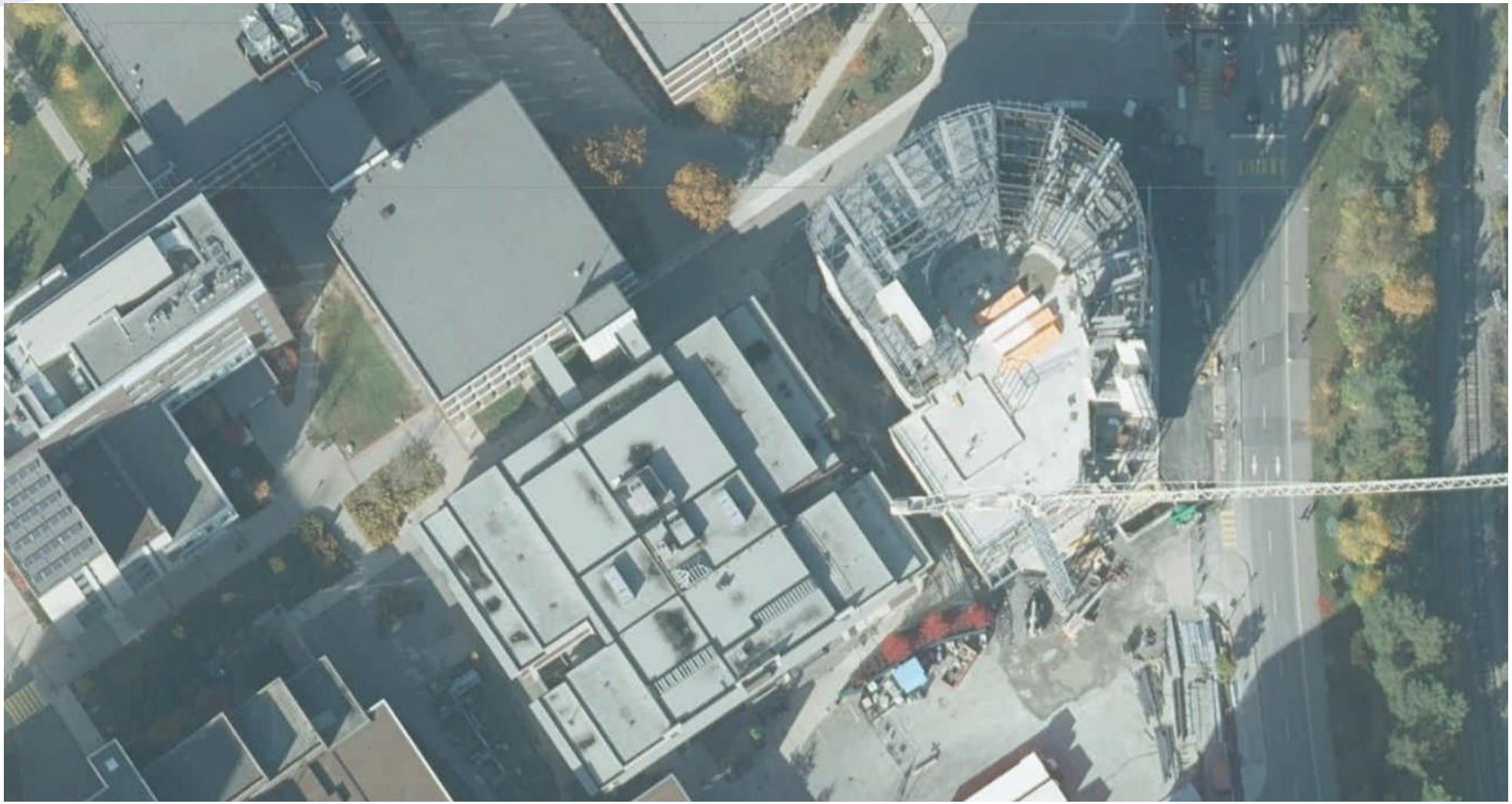
16704 Polyline C4F2A395-E54C-4698... LAURIER AVE W 133 - 170 232913 140 170 133 169
16705 Polyline 46F3ABC5-A208-455... LAURIER AVE W 190 - 251 232913 190 250 191 251
16706 Polyline 9053BBA9-FB1A-407... LAURIER AVE W 257 - 300 232913 300 300 257 299
16707 Polyline 6D3FCD77-0D31-48D... LAURIER AVE W 301 - 380 232913 318 380 301 365
16708 Polyline E2CFE167-CE7E-4875... LAURIER AVE W 399 - 440 232913 410 440 399 433
66 of 43,335 selected
Filters:
100%

# Raster layers

- **Raster** - Type of digital image represented by reducible and enlargeable grids or pixels.
  - Air photos, satellite images, Digital Elevation Models (DEMs)
  - Various file formats:
    - GeoTiff
    - JPEG
    - JPEG2000
    - MrSID

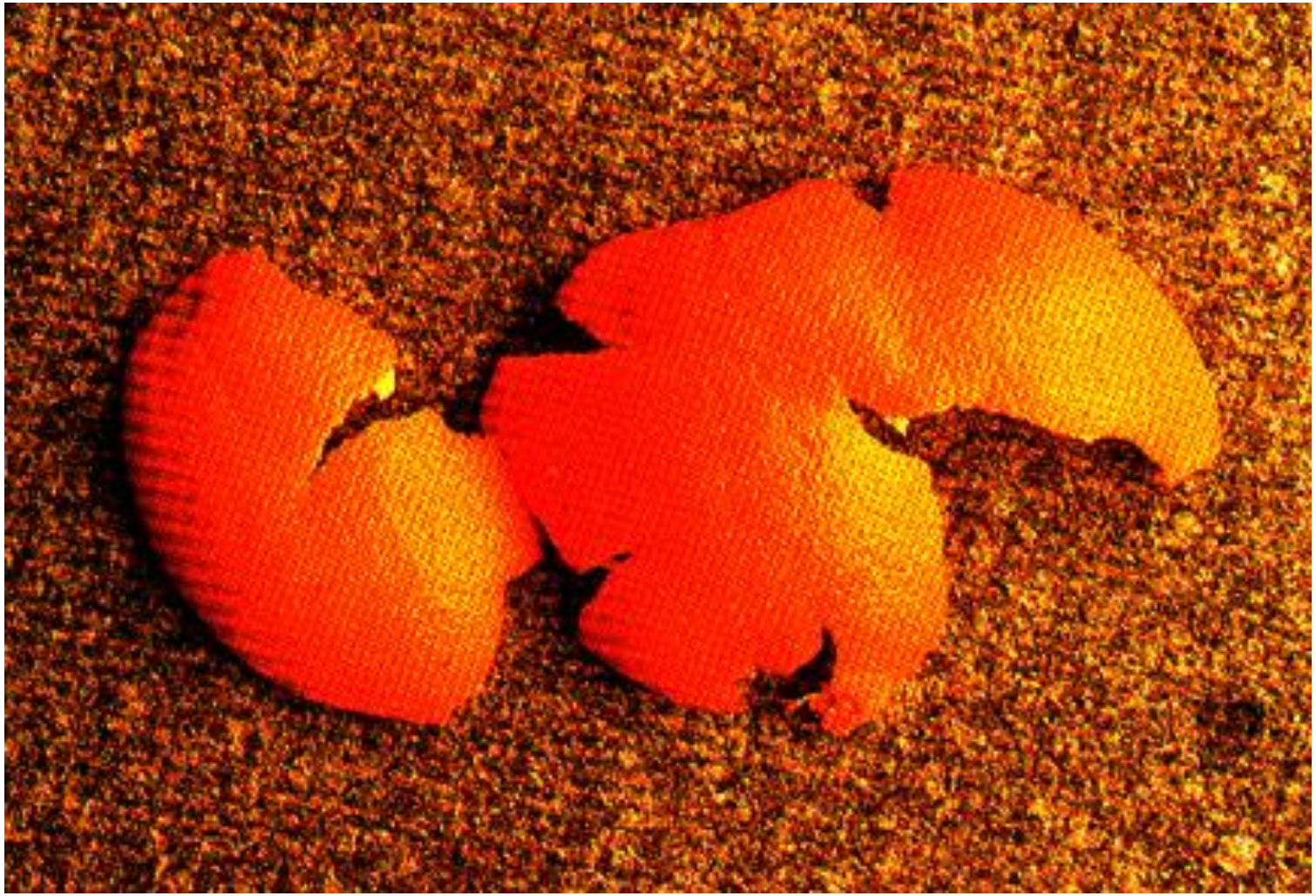


# Raster layer: Air photo



Source: 2019 DRAPE imagery, Land Information Ontario; https://geo.scholarsportal.info/#r/details/_uri@=2799205642

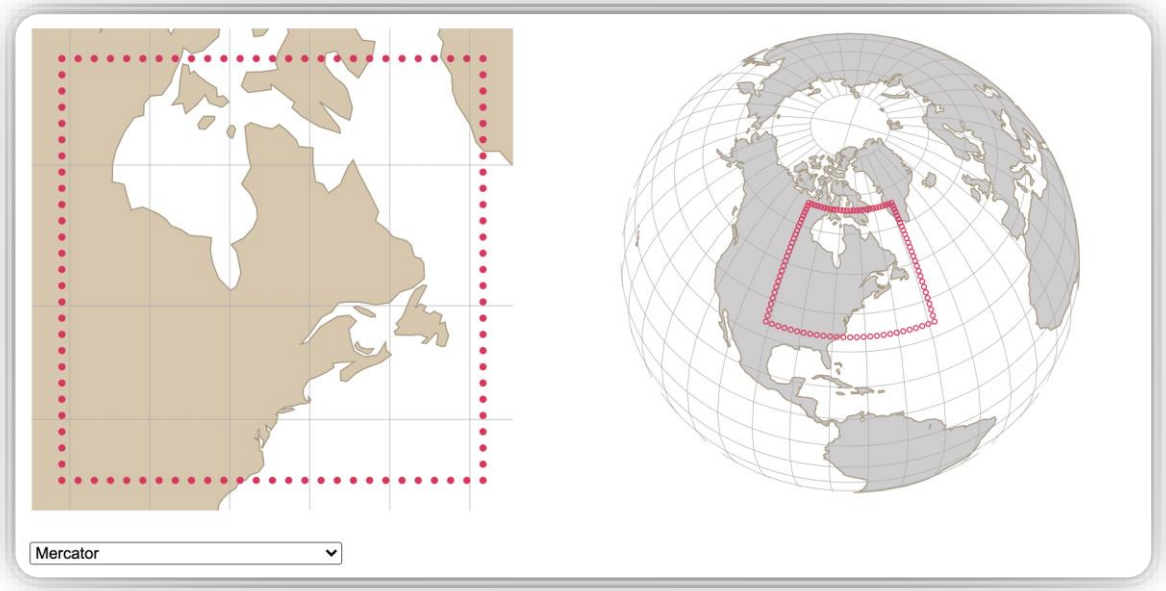
# GIS Data: Coordinate systems and projections



Source: https://krygier.owu.edu/krygier_html/geog_222/geog_222_lo/geog_222_lo13_gr/orangepeel.jpg

# GIS Data: Coordinate systems and projections

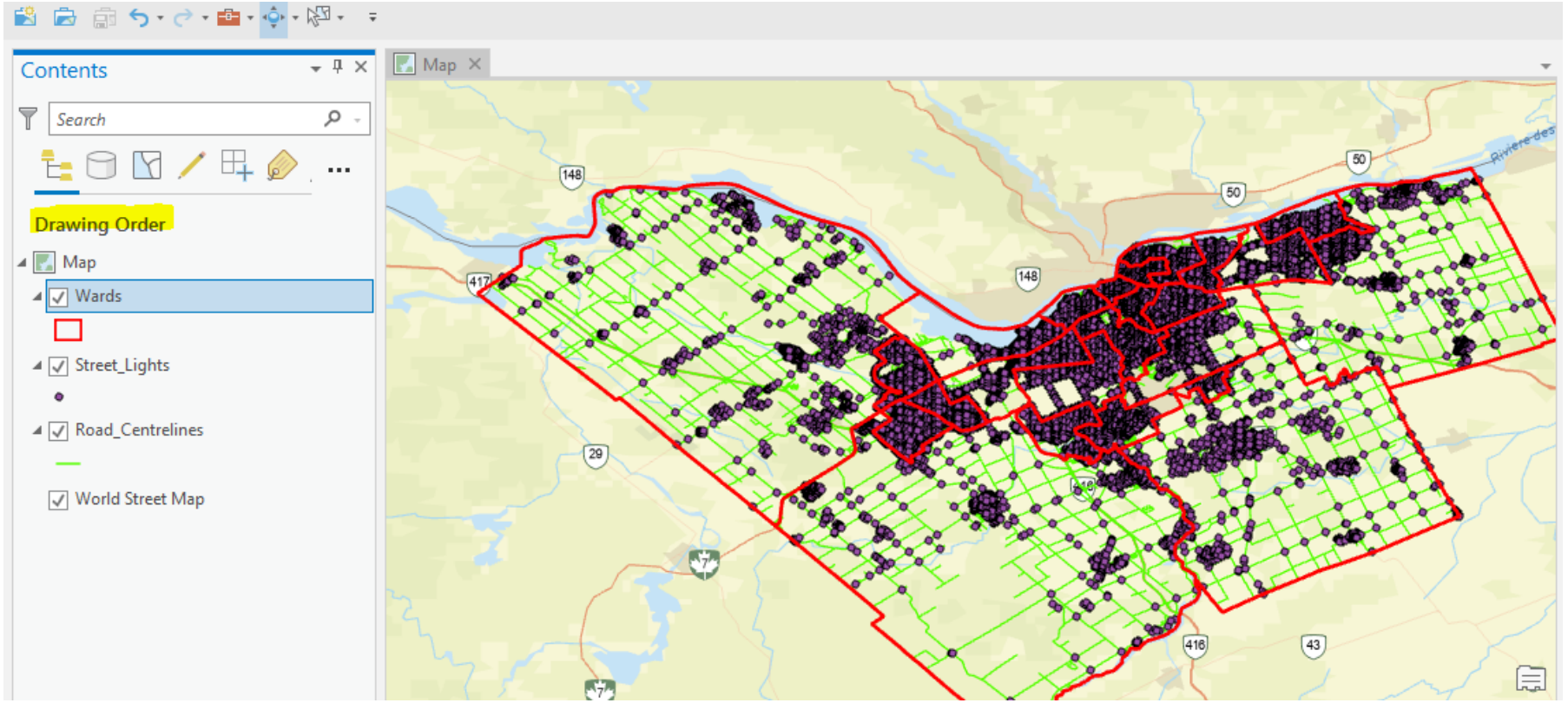
- There will always – *always* – be distortion in at least one of the following ways:
  - Area
  - Shape
  - Distance
  - Direction
- See the distortion: https://blocks.roadtolarissa.com/enjalot/bd552e711b8325c64729




Source: https://blocks.roadtolarissa.com/enjalot/bd552e711b8325c64729

# What is GIS: GIS layers

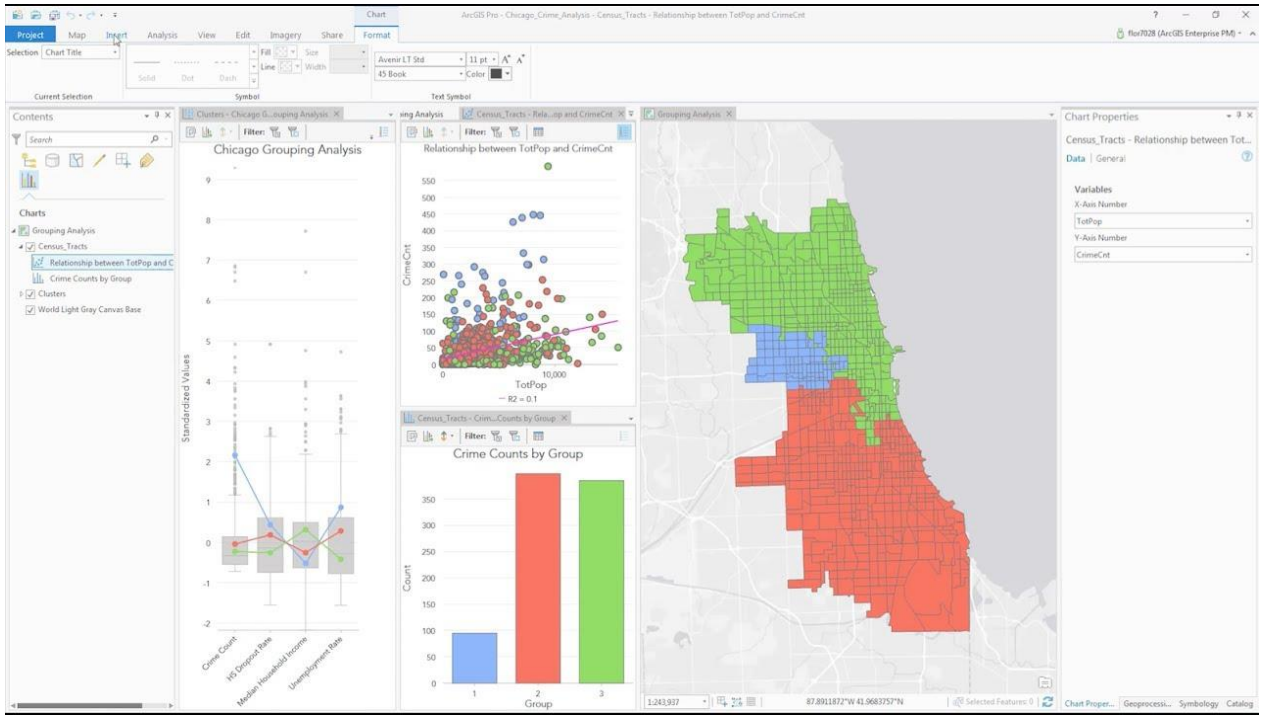
- Layer order or drawing order is important to take note of



# ArcGIS Pro & analysis tools

# What is ArcGIS Pro?

- ArcGIS Pro is Esri's flagship desktop GIS application. It provides users with professional 2D and 3D mapping capabilities that supports viewing, editing, and analysis of geospatial data



# Some vector analysis tools

- Select
  - by Attribute
  - by Location
- Join
  - by Attribute
  - Spatially
- Clip
- Merge
- Buffer
- Summary Statistics

# ArcGIS Pro access and training

- ArcGIS Pro is free for current Carleton students, staff & faculty
  - https://library.carleton.ca/services/arcgis-pro
- Accessible on library computers and from off-campus via VMWare
  - https://library.carleton.ca/services/gis-software-and-workstations
- Esri Online Training
  - Free online courses are available to Carleton faculty and students
- Consult the course catalog and/or try the list of suggested courses below:
  - ArcGIS Pro Fundamentals learning plan
  - Getting Started with Geoprocessing
  - Getting Started with Spatial Analysis
  - Processing Raster Data Using ArcGIS Pro

# Hands-on time with vector datasets in ArcGIS Pro

- Selecting features
  - Manually
  - by attribute
  - by location
- Exporting selected features
- Joins
  - by attribute
  - by location (spatial join)
- Symbology & labels

# We'll be using City of Ottawa open data to find…

- Parks and green spaces within 1000m of elementary schools
- Totally 2023 property value assessments in each city ward
- The city wards that have the most trees

# Download the data & instructions

http://tinyurl.com/TrajectoriesGIS

# Project management tips

https://library.carleton.ca/guides/help/gis-project-tips

- **Keep all data files together** in one project folder
  - When saving your map project, make sure it is saved in the same folder as the data (makes it easy to zip everything up and share it if needed)
  - If you move your data from one folder location to another, the GIS software may not be able to find the path to the data and consequently will not display the data layers
- **Keep raw data saved and untouched** in a separate folder and save copies of it or any newly created files in a "working data" folder
- When saving data files or layers, **don't use spaces or characters in the file names.** Try using underscore for spaces or CamelCase

# Questions?

DON'T HESITATE TO EMAIL US AT
GIS@CARLETON.CA