



INTRODUCTION TO GEOSPATIAL DATA

Christine Homuth

Spatial Information (GIS) Specialist

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scds.ca/events/code-of-conduct/

Certification Program

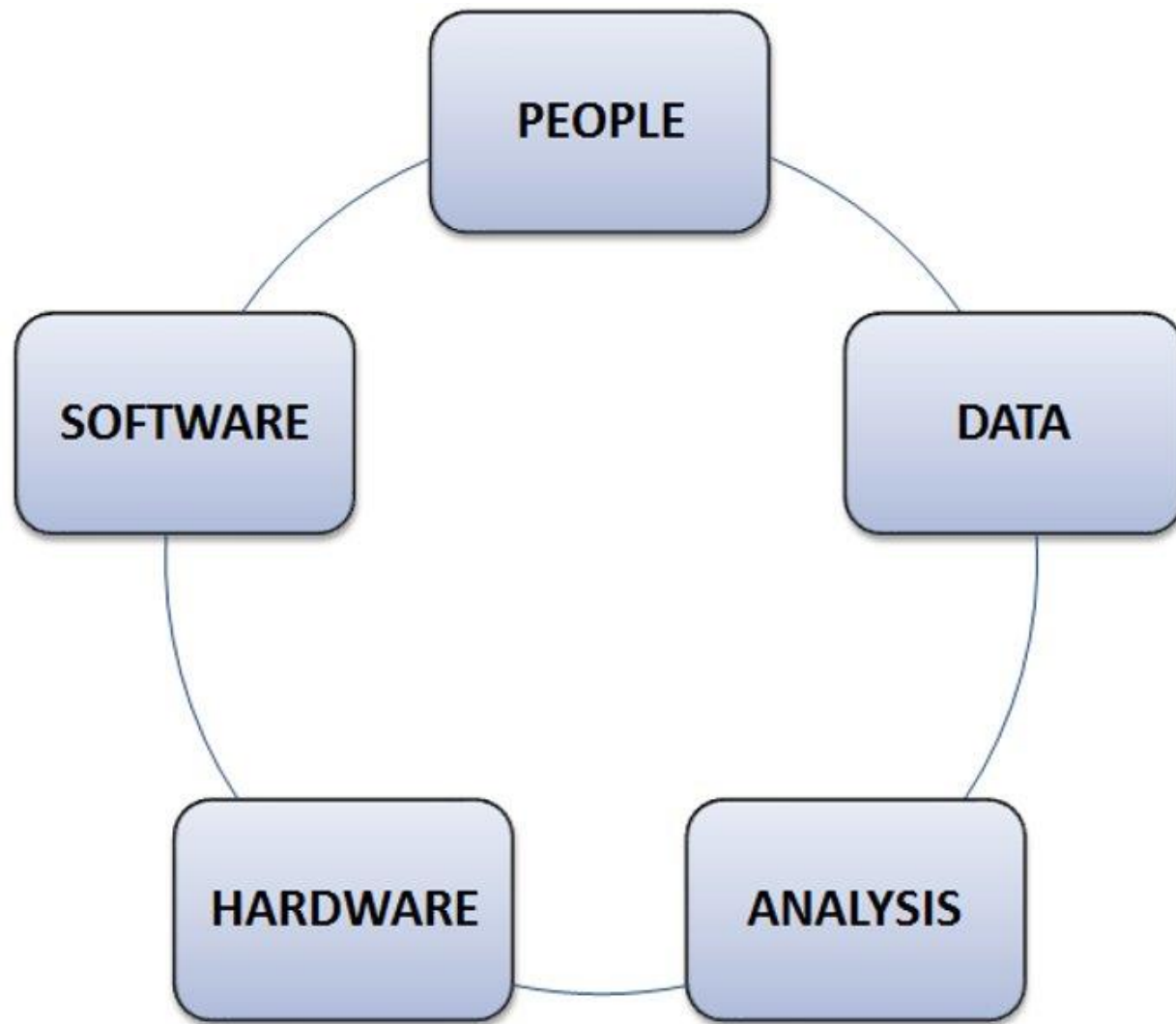
The Sherman Centre offers a Certificate of Completion that rewards synchronous participation at 7 workshops. We also offer concentrations in Data Analysis and Visualization, Digital Scholarship, and Research Data Management.

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Program: <https://scds.ca/certificate-program>

If you would like to be considered for the certificate, verify
your participation in
this form: <https://u.mcmaster.ca/verification>

At an unspecified point during the workshop, a code will be
read aloud. This is the answer to the third question of the
form.

GIS Components



Overview



Geospatial data



Geospatial data types



Sources for data



Considerations



Activity



Resources



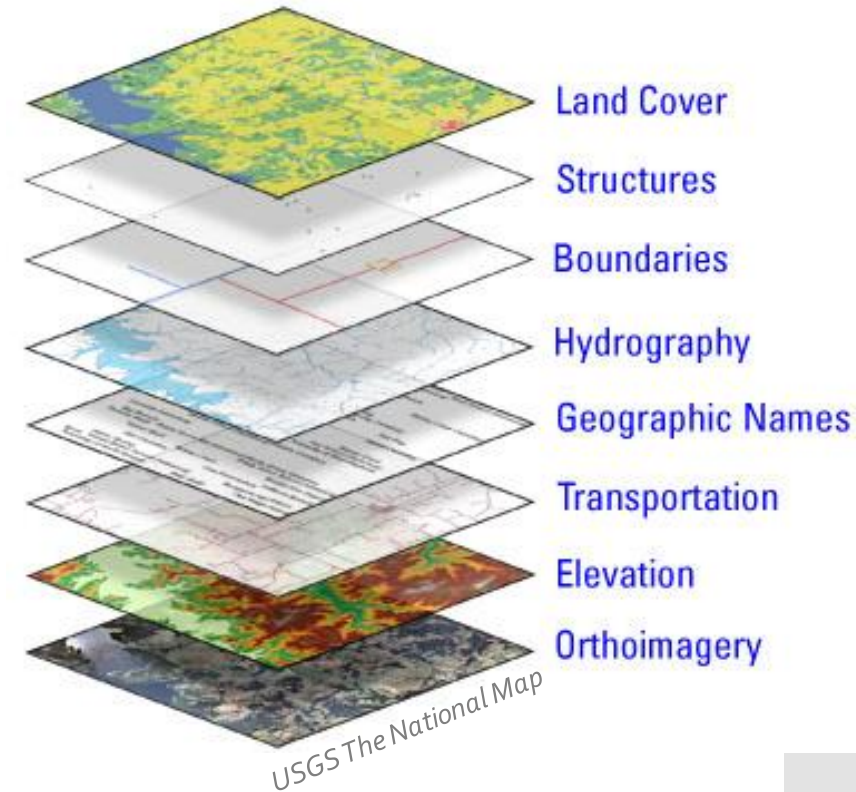
Q&A



GEOSPATIAL DATA

Geospatial Data

- "Data that represents features or objects on the Earth's surface" (Safe).
- Coordinate Reference Systems
- Not restricted to the outdoors
 - Indoor mapping, Building Information Management (BIM), Architecture, Engineering, and Construction (AEC)

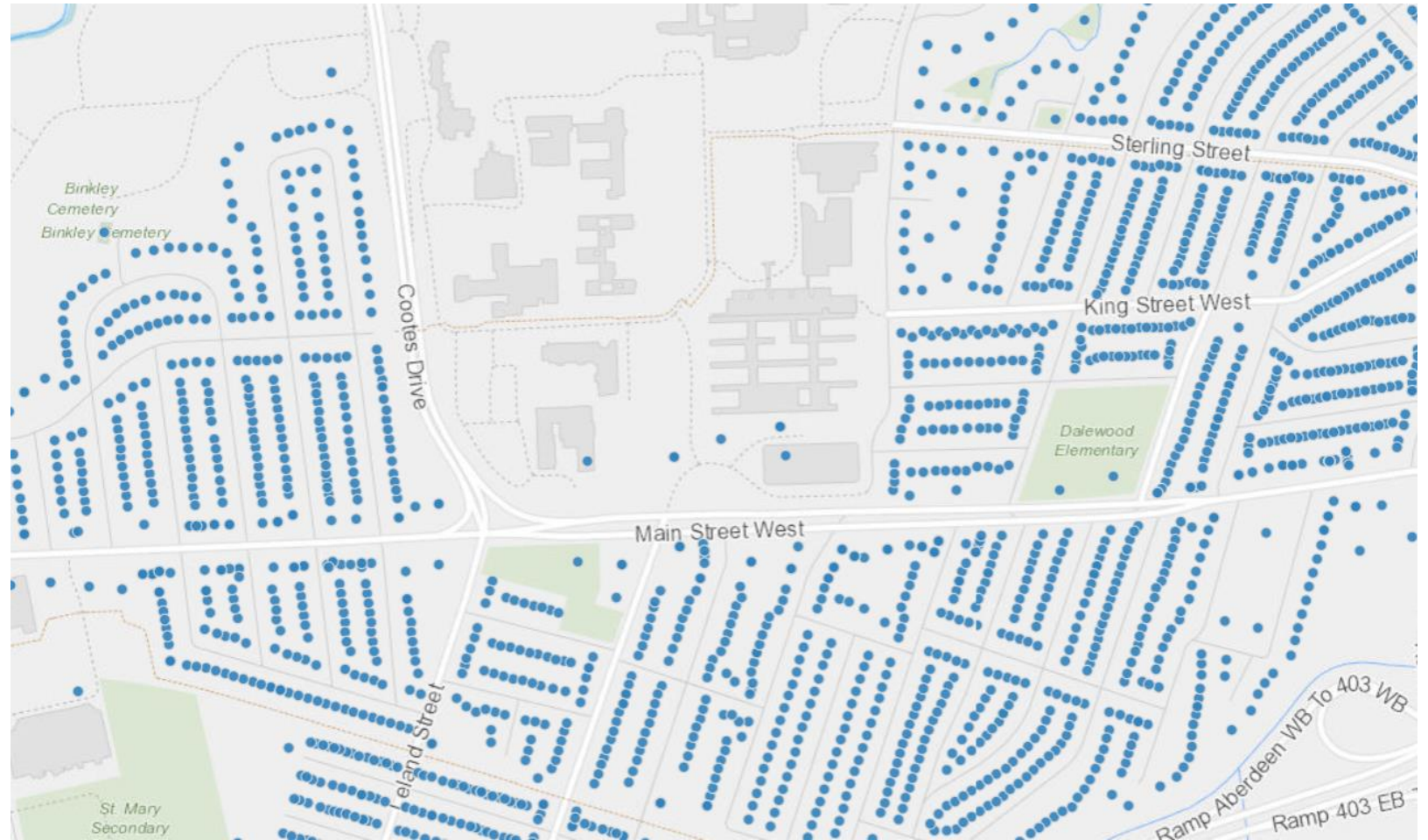


The background of the slide features three red, 3D-style location pins of different sizes. One is small and positioned on the left, a medium-sized one is in the center, and a large one is on the right. They are set against a clear, light blue sky with a few wispy clouds. A dark grey horizontal bar is positioned at the bottom of the image, containing the title text.

GEOSPATIAL DATA TYPES






Vector data

- Points
 - X/Y locations
- Line
 - Connected X/Y locations
- Polygon (area)
 - Connected X/Y locations forming a closed figure
- Good for representing clearly defined objects

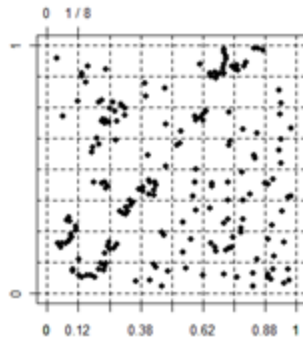
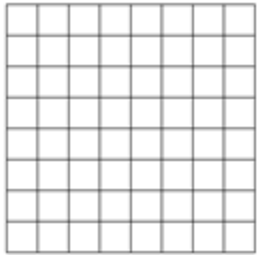


Vector data

- **Format** - shapefile (.shp)

| | | | |
|---|-------------------|--------------------|-----------|
|  PED_LANDUSE.shx | 5/4/2018 12:14 PM | SHX File | 1,218 KB |
|  PED_LANDUSE.shp | 5/4/2018 12:14 PM | SHP File | 27,278 KB |
|  PED_LANDUSE | 5/4/2018 12:14 PM | PRJ File | 1 KB |
|  PED_LANDUSE.dbf | 5/4/2018 12:14 PM | DBF File | 75,651 KB |
|  Land_Use_Codes_2009 | 5/4/2018 12:14 PM | Adobe Acrobat D... | 33 KB |

Raster Data

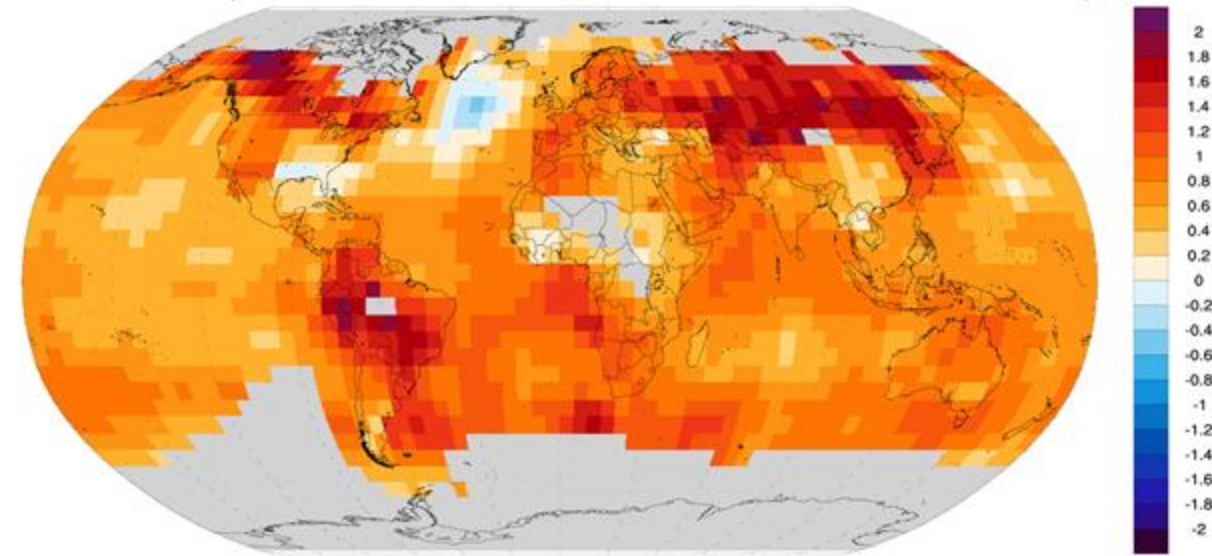


| | | | | | | | |
|---|----|---|---|---|----|---|---|
| 1 | 3 | 0 | 0 | 1 | 12 | 8 | 0 |
| 1 | 4 | 3 | 3 | 0 | 2 | 0 | 2 |
| 1 | 7 | 4 | 1 | 5 | 4 | 2 | 2 |
| 0 | 3 | 1 | 2 | 2 | 2 | 2 | 3 |
| 0 | 5 | 1 | 9 | 3 | 3 | 3 | 4 |
| 5 | 0 | 8 | 0 | 2 | 4 | 3 | 2 |
| 8 | 4 | 3 | 2 | 2 | 7 | 2 | 3 |
| 2 | 10 | 1 | 5 | 2 | 1 | 3 | 7 |



1901-2011 Temperature Trend

°C/century



Wikimedia

- Grid of cells
- Numbers assigned to each cell representing data
 - Categorical - Land use, e.g.
 - Continuous - Temperature, elevation, e.g.
- Good for representing continuously changing attributes

Attributes

| SNO | NAME | ALTERNATE_NAME | COMMUNITY | TYPE | RANKING | CLUSTER_AREA | HEIGHT_IN_M | WIDTH_IN_M | OWNERSHIP |
|-----|-----------------------------|---------------------|--------------|-----------|---------|---------------------|-------------|------------|-----------|
| 80 | West Iroquoia Falls | | Hamilton | Waterfall | B | Chedoke-Scenic | 19.8 | 1 | public |
| 93 | West of Fifty Upper Cascade | | Stoney Creek | Cascade | C | Stoney Creek-Winona | 8 | 1.5 | public |
| 41 | Westcliffe Falls | | Hamilton | Cascade | A | West Chedoke | 15 | 2 | public |
| 48 | Albion Falls | Mount Albion Falls | Hamilton | Cascade | A | Red Hill | 19 | 18 | public |
| 79 | Ancaster Heights Falls | | Ancaster | Cascade | B | Tiffany-Coldwater | 13.4 | 1.8 | public |
| 113 | Auchmar Falls | Upper Beckett Falls | Hamilton | Waterfall | C | Chedoke | 12 | 1.5 | public |
| 130 | Baby Albion Falls | | Hamilton | Waterfall | C | Red Hill | 8.5 | 1 | public |
| 14 | Baby Webster's Falls | | Flamborough | Waterfall | B | Spencer-Logie's | 9 | 3 | public |
| 99 | Beckett Falls | Lower Beckett Falls | Hamilton | Waterfall | C | Chedoke | 3 | 1.2 | public |
| 53 | Billy Green Falls | Battlefield Falls | Stoney Creek | Waterfall | B | Glover-Battlefield | 17 | 6 | public |
| 126 | Billy Monkley Cascade | | Hamilton | Cascade | C | Red Hill | 3 | 6.4 | public |
| 6 | Borer's Falls | Rock Chapel Falls | Flamborough | Waterfall | A | Borer's | 15 | 5 | public |
| 122 | Broman Falls | Coop's Falls | Hamilton | Waterfall | C | Red Hill | 7 | 1.1 | public |
| 47 | Buttermilk Falls | Inglis Falls | Hamilton | Waterfall | A | Red Hill | 23 | 8 | public |
| 23 | Canterbury Falls | Milne Falls | Ancaster | Cascade | B | Ancaster-Sulphur | 9 | 4 | public |
| 83 | Centennial Falls | | Stoney Creek | Cascade | B | Glover-Battlefield | 10 | 4 | public |
| 45 | Chedoke Falls | | Hamilton | Waterfall | A | Chedoke | 18 | 9 | public |

Metadata

City Waterfalls
ISO-19139 Metadata

Last update: 2018-10-19

Name of the metadata standard used: NAP - Metadata
Version of the metadata standard: 1.2

Metadata identifier: 51c6d946f91249828bc1c594celb27d1

Title: City Waterfalls

Descriptive keywords - :
Keywords: City Waterfalls, culture & tourism, Recreation

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Abstract:
Publicly accessible waterfalls in Hamilton, on both public and private property. Only waterfalls on private property which have been granted limited access by the landowner are

Limitations of use: Open Data Licence Terms and Conditions

Credits:
City of Hamilton

Distribution Information:

Transfer options:

Online resource:

Online location:https://spatialsolutions.hamilton.ca/webgis/rest/services/OpenData/Spatial_Collection_1/MapServer/16

Connection protocol:

Online resource:

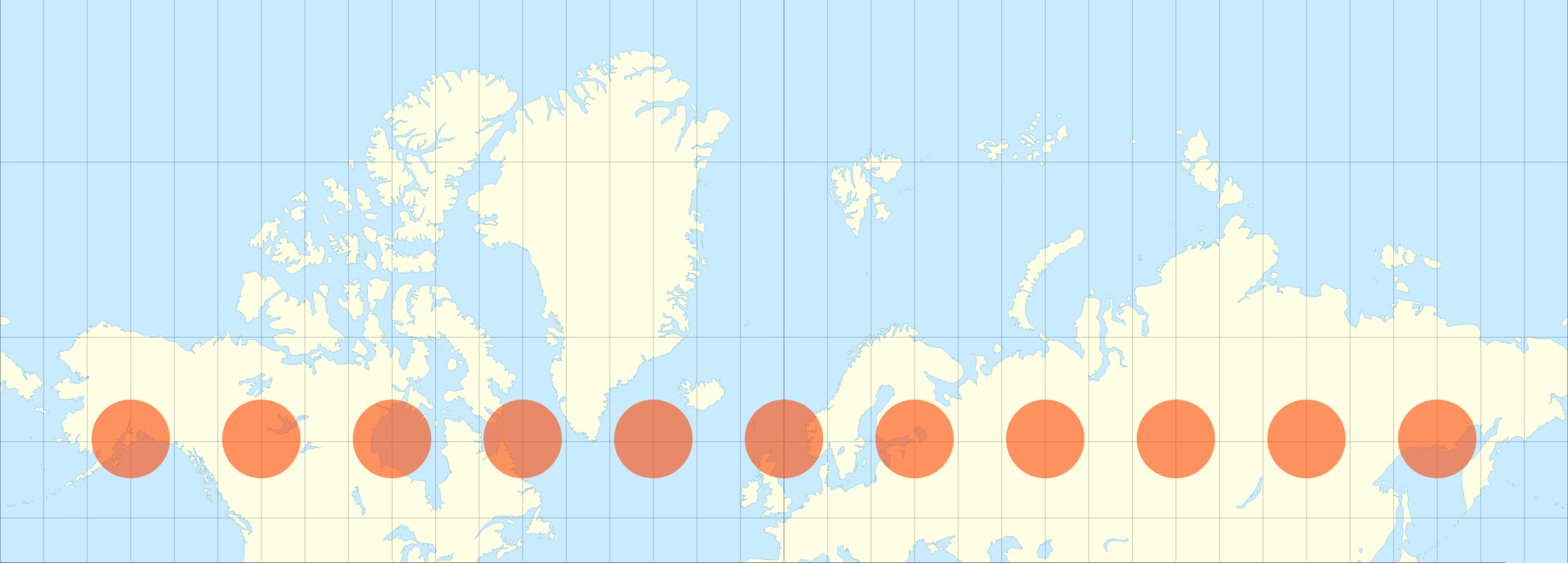
Name of resource: Metadata

Online location:<http://spatialsolutions.maps.arcgis.com/sharing/rest/content/items/465d9a4759a14f90ad2507aeea0599f6/data>

Connection protocol:

Function performed: download

Description: metadata



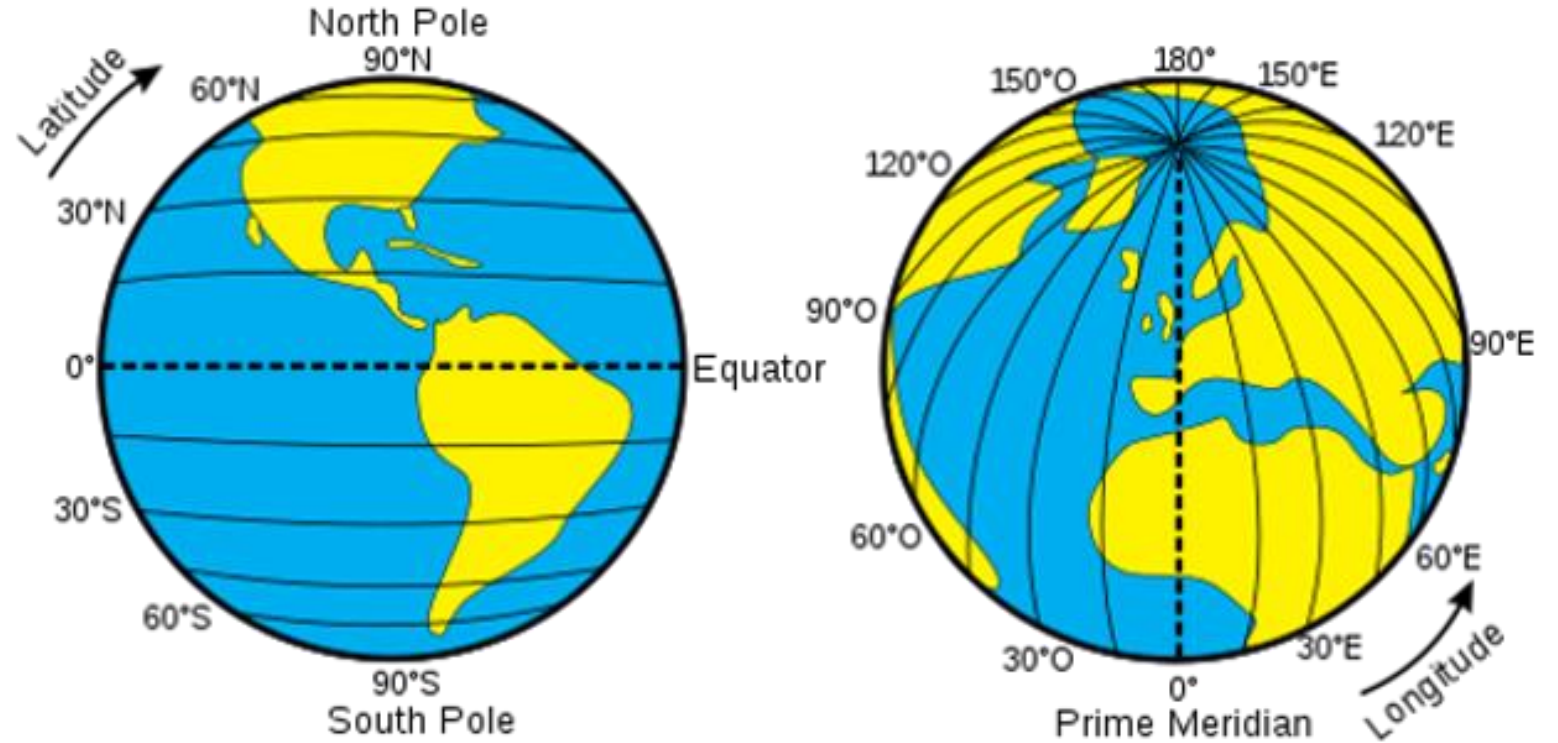
COORDINATE REFERENCE SYSTEMS

Coordinate Reference Systems

- Referencing the location of features on the earth's surface
- Two methods - **Geographic** Coordinate Systems or **Projected** Coordinate Systems

Geographic Coordinate Systems

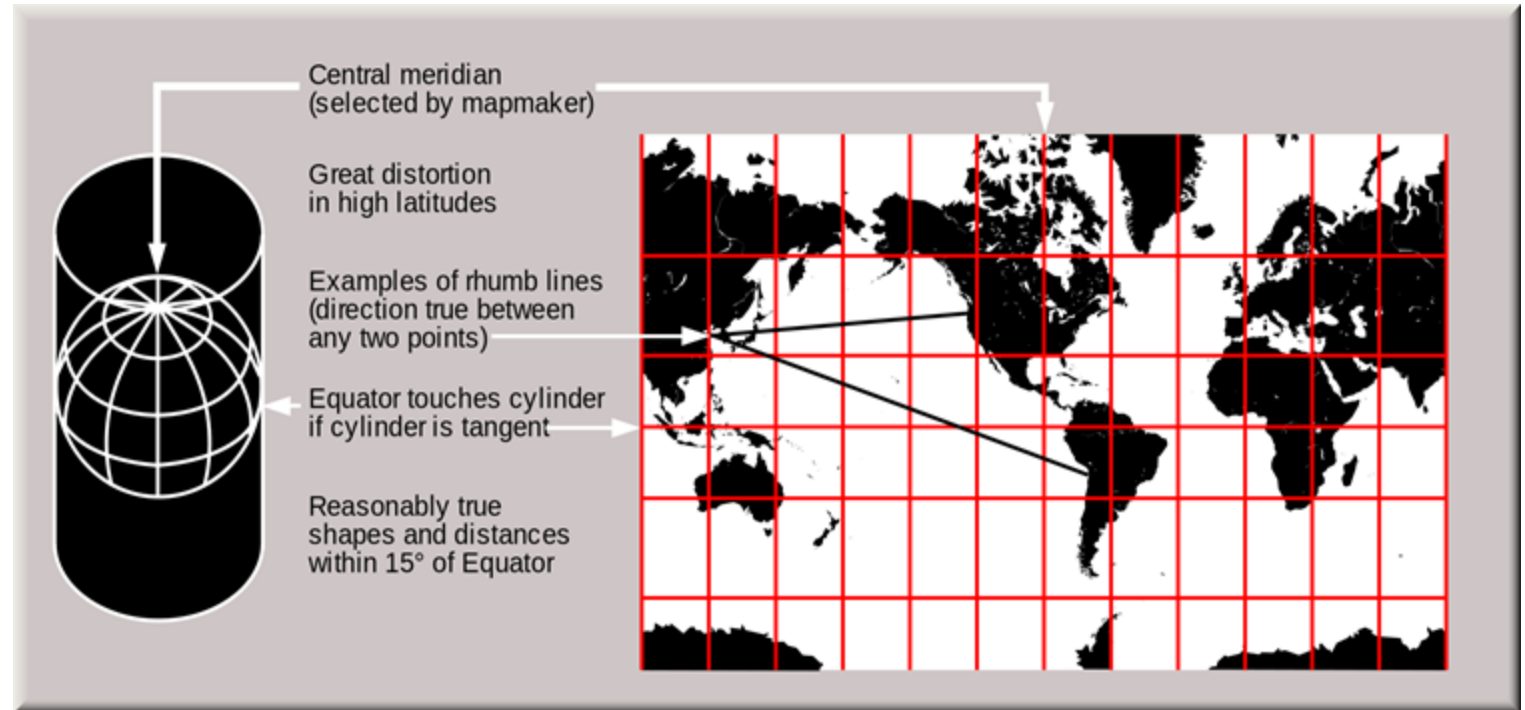
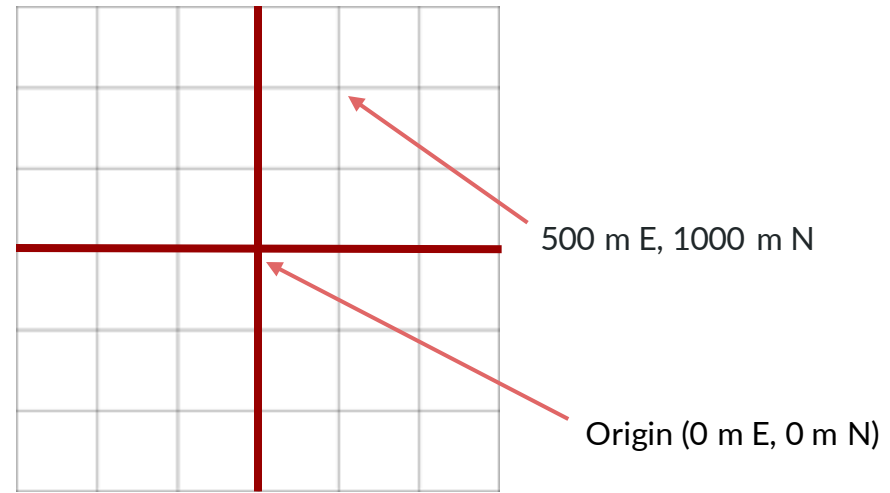
- Locations expressed as angles from a point
- Network or intersecting lines - meridians (longitude), parallels (latitude)
- Reference system for a curved earth based on a geodetic datum
- Many datums exist - World Geodetic System (WGS) 84, North American Datum (NAD) 83



Wikimedia

Projected Coordinate Systems

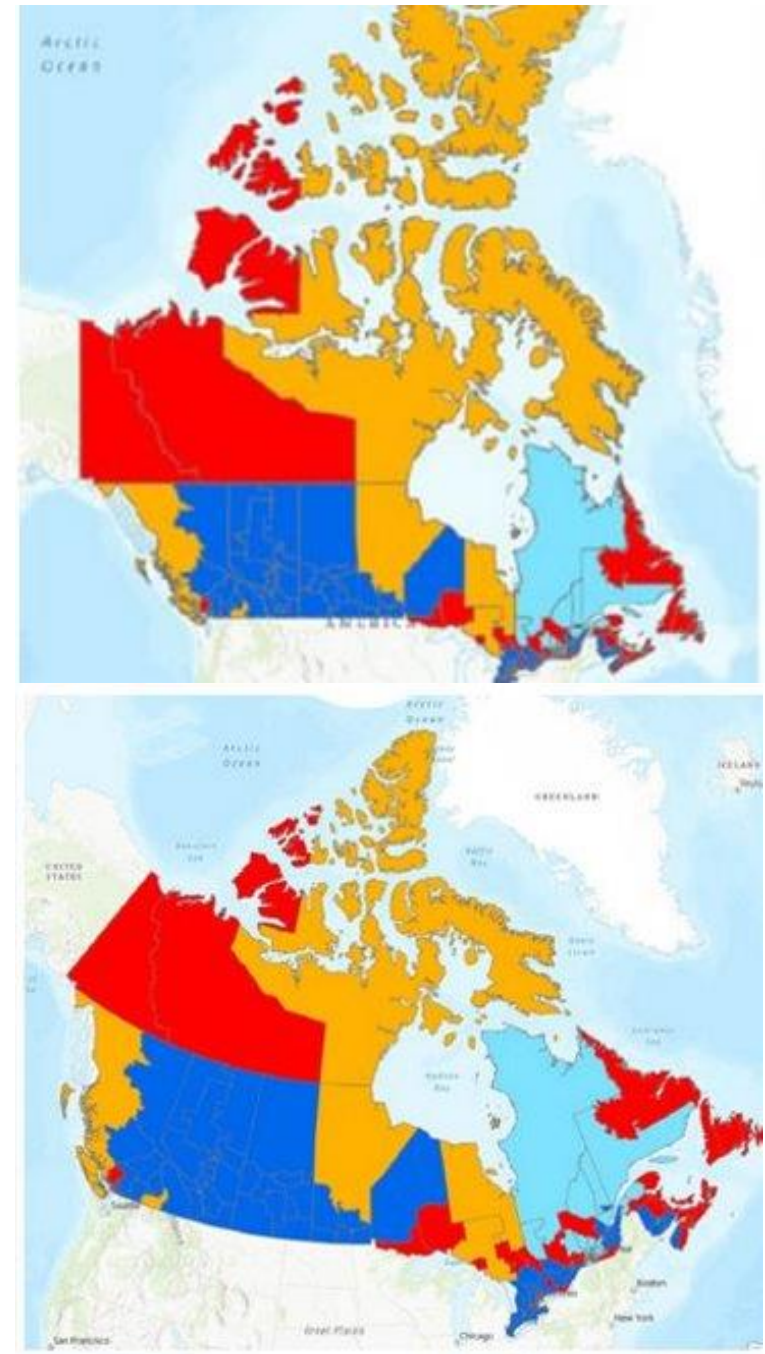
- Projecting the round earth onto a flat surface
- Representing the earth in two dimensions causes distortion
- Different projections preserve shape (*conformal*), area (*equal area*), distance (*equidistant*), OR direction (*true direction*)
- Locations are referenced as distance from reference point



Coordinate Reference Systems



Penn State





FINDING GEOSPATIAL DATA

Geospatial Data Sources

- Surveys, statistics, data tables
- Fieldwork
- Remote sensing/imagery
- Shapefiles
- Scanned and georeferenced maps
- Digitizing

McMaster
University

- [Scholars GeoPortal](#)
- [McMaster University Library](#)
- Contact us!

Online Data Portals

- Open data portals
 - [Open Hamilton](#)
 - [Ontario GeoHub](#)
 - [Open Canada](#)
- ArcGIS Online and Living Atlas
- Online data providers
 - Thematic
 - Imagery
- ...



CONSIDERATIONS

Data Quality

- What format is the data in, is it usable?
- Does it have a known coordinate reference system?
- What is the source of the data, is it reliable?
- Does it contain the variables you need for your analysis?
- What is the currency and scope?
- What is the copyright and terms of use?



ACTIVITY

Activity 1

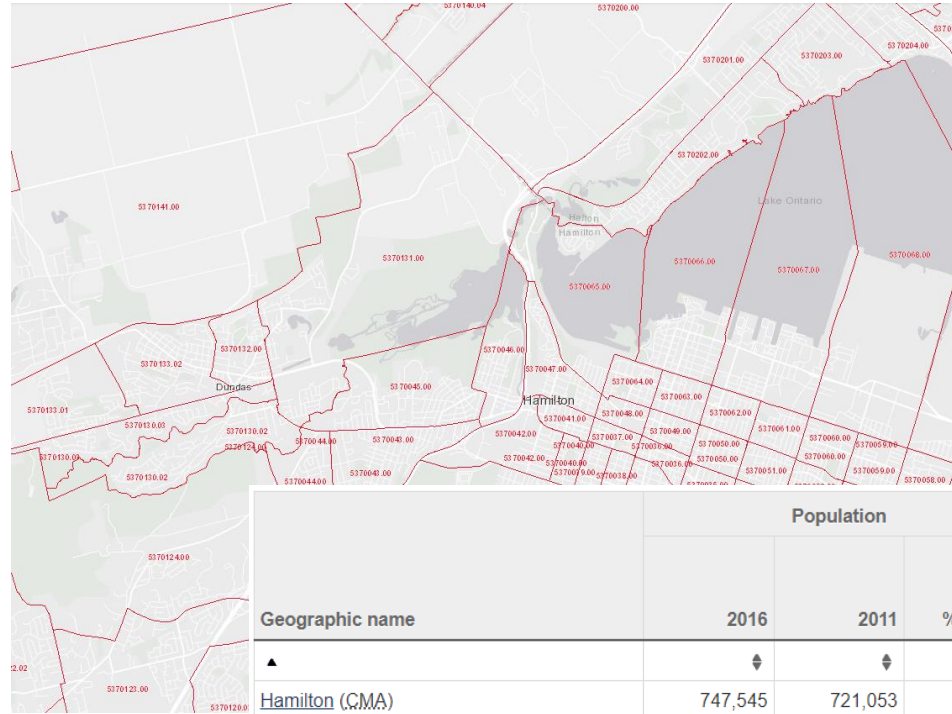
Scholars GeoPortal

- Go to <https://geo.scholarsportal.info>
- Search for the Cartographic Boundary Files (CBF) for the 2016 Census
- Download the Census Tract file

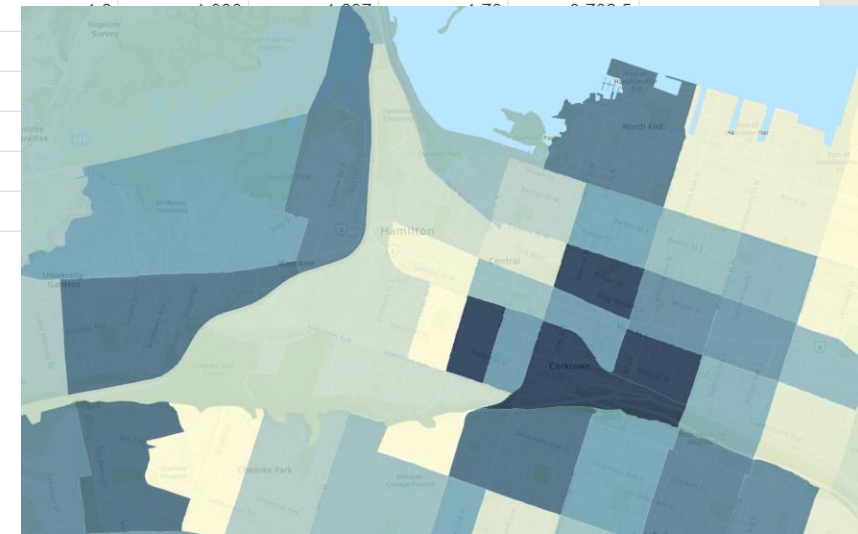
Statistics Canada

- Go to <https://www.statcan.gc.ca/>
- Go to Geography > Spatial Information Products > Boundary Files
- Navigate to the 2021 census year
- Download Census Tracts Cartographic Boundary File

Activity



| Geographic name | Population | | | Private dwellings, 2016 | | Land area in square kilometres, 2016 | Population density per square kilometre, 2016 |
|----------------------------|------------|---------|----------|-------------------------|-----------------------------|--------------------------------------|---|
| | 2016 | 2011 | % change | Total | Occupied by usual residents | | |
| ▲ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ | ◆ |
| Hamilton (CMA) | 747,545 | 721,053 | 3.7 | 306,034 | 293,345 | 1,371.89 | 544.9 |
| 5370001.01 | 2,193 | 2,118 | 3.5 | 772 | 766 | 5.52 | 397.6 |
| 5370001.02 | 5,302 | 5,475 | -3.2 | 1,784 | 1,760 | 1.29 | 4,102.4 |
| 5370001.04 | 6,305 | 6,223 | 1.3 | 1,833 | 1,827 | 1.73 | 3,700.5 |
| 5370001.05 | 5,344 | 4,695 | 13.5 | 1,833 | 1,827 | 1.73 | 3,700.5 |
| 5370001.06 | 5,191 | 5,411 | -4.1 | 1,833 | 1,827 | 1.73 | 3,700.5 |
| 5370001.07 | 3,725 | 3,713 | 0.3 | 1,833 | 1,827 | 1.73 | 3,700.5 |
| 5370001.08 | 6,556 | 6,125 | 7.0 | 1,833 | 1,827 | 1.73 | 3,700.5 |
| 5370001.09 | 4,566 | 4,445 | 2.7 | 1,833 | 1,827 | 1.73 | 3,700.5 |





QUESTIONS?

libgis@mcmaster.ca



Sources

- Open Hamilton
 - [Addresses](#)
 - [COVID-19 Case Counts by Census Tract](#)
- Scholars GeoPortal
 - [Cartographic Boundary Files \(CBF\), 2016 Census](#)
- Spatial Reserves
 - [A graphical aid in deciding whether geospatial data meets your needs](#)
- Statistics Canada Census
 - [Population and dwelling counts, for census metropolitan areas, tracted census agglomerations and census tracts, 2016 and 2011 censuses – 100% data](#)
- USGS
 - [Image showing layers of The National Map](#)
- Wikimedia
 - [Latitude and Longitude of the Earth](#)
 - [The use of a raster data structure to summarize a point pattern](#) (Ldecola, CC-BY-SA 3.0)
 - [NCDC temperature trend](#) (Georgiogp2, CC-BY-SA 3.0)