Mapping Census data with QGIS

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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*.

Learning outcomes for today's session

- Learn about Statistics Canada's Census of Population
  - Statistics
  - Boundary files
- Basics of QGIS – open source GIS
- Geoprocessing tools

Census of Population

STATISTICS CANADA

Census of Population

- Provides a detailed statistical portrait of Canada by their demographic, social and economic characteristics
- Conducted every 5 years
  - Most recent was in 2021
  - Oldest was in 1871
- Important for communities and is vital for planning services such as child care, schooling, family services, and skills training for employment.

Census of Population

- Short form and long form
  - Everyone (100%) receives or is included in short-form census
  - 25% of people receive or are included in long-form census
    - Exception in 2011: it was voluntary and called National Household Survey so comparisons with other census years are difficult
- Ideally have 100% response rate but not usually the reality
  - 2021 had Canada-wide response rate of 96.9% (short-form) and 95.7% (weighted, occupied private dwellings)

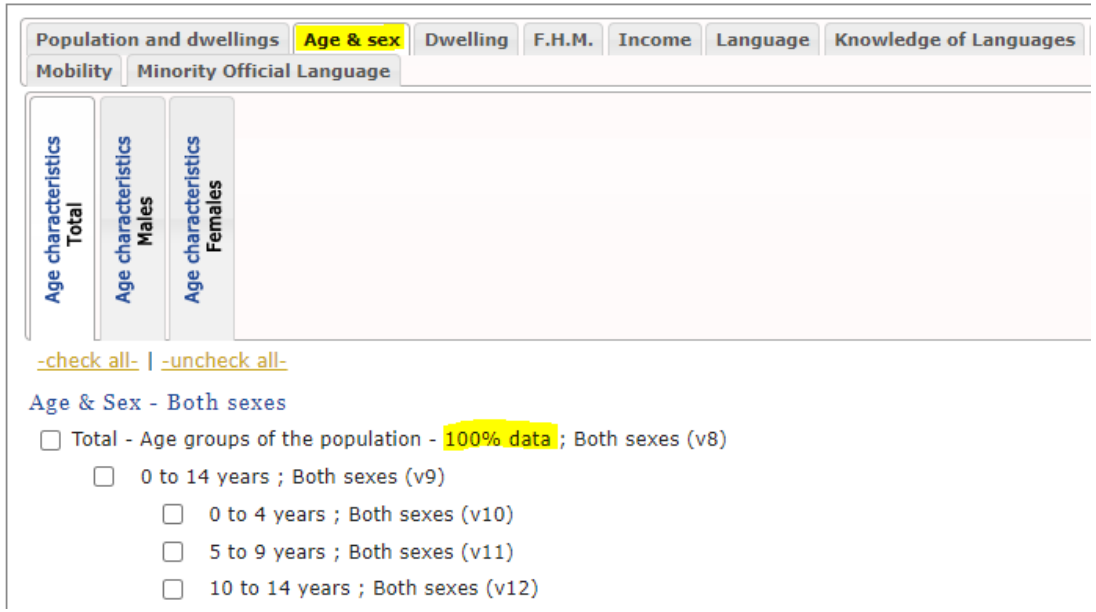
Census of Population

- 2021 Census topics, short-form in bold

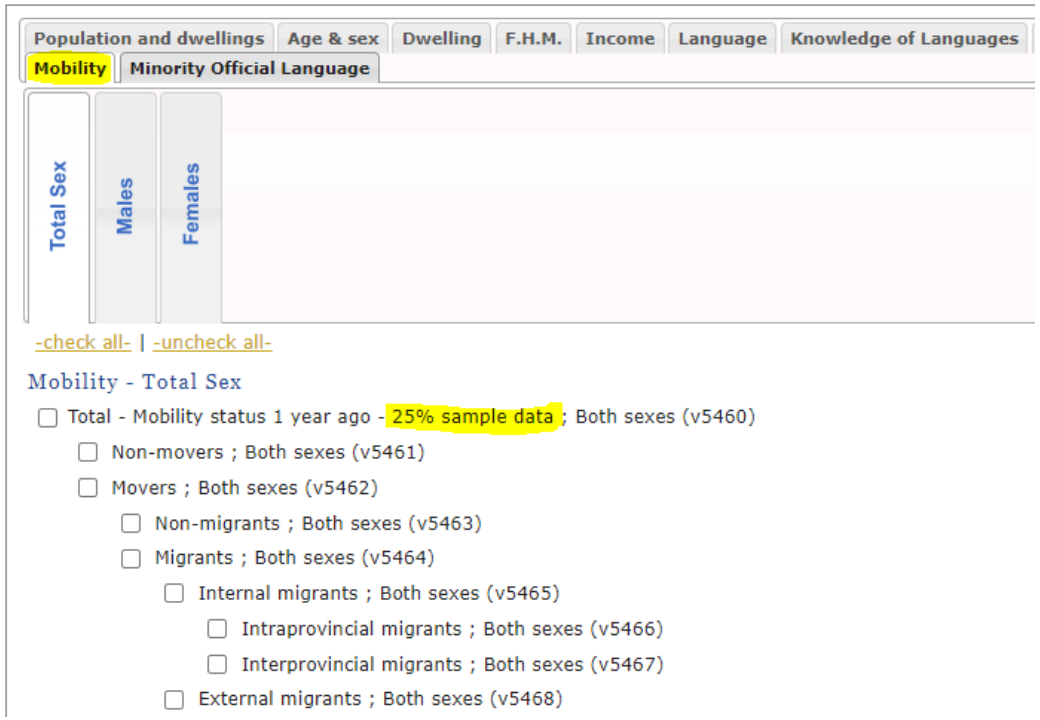
  - **Population and dwelling counts**
  - **Age, sex at birth, and gender**
  - **Type of dwelling**
  - Canadian military experience
  - Commuting
  - Education
  - Ethnocultural and religious diversity
  - **Families, households, and marital status**
  - Housing
  - Immigration, place of birth, and citizenship
  - **Income**
  - Indigenous peoples
  - Labour
  - Language
  - Language of work
  - Mobility and migration

Short form & long form in Canadian Census Analyzer

Short form: 100% data



Long form: 25% sample data



Census Geographies

ADMINISTRATIVE AND STATISTICAL

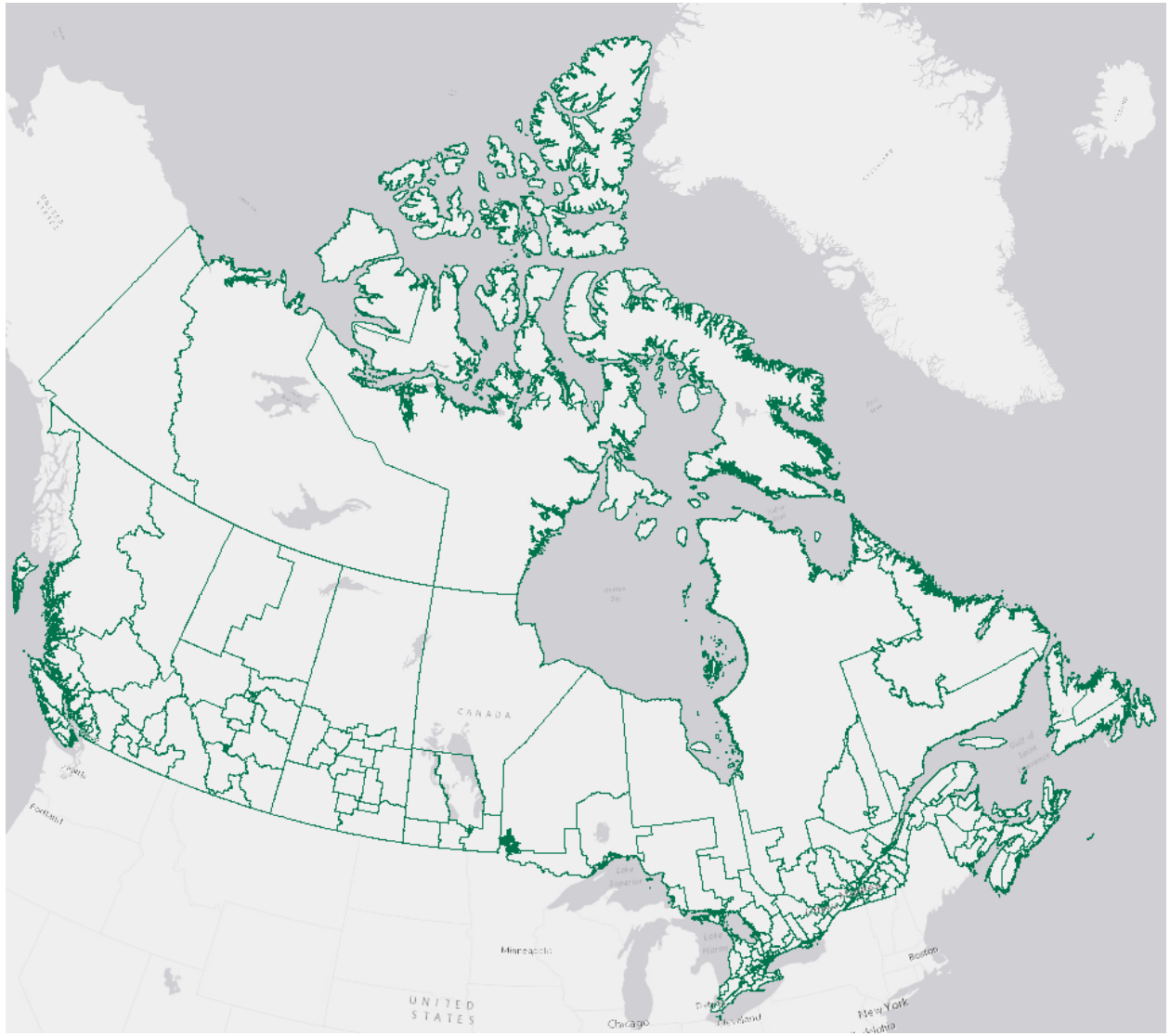
Mapping the Census of Canada guides

Census Geographies – Provinces & Territories

- All 13 provinces and territories
  - 10 provinces, 3 territories

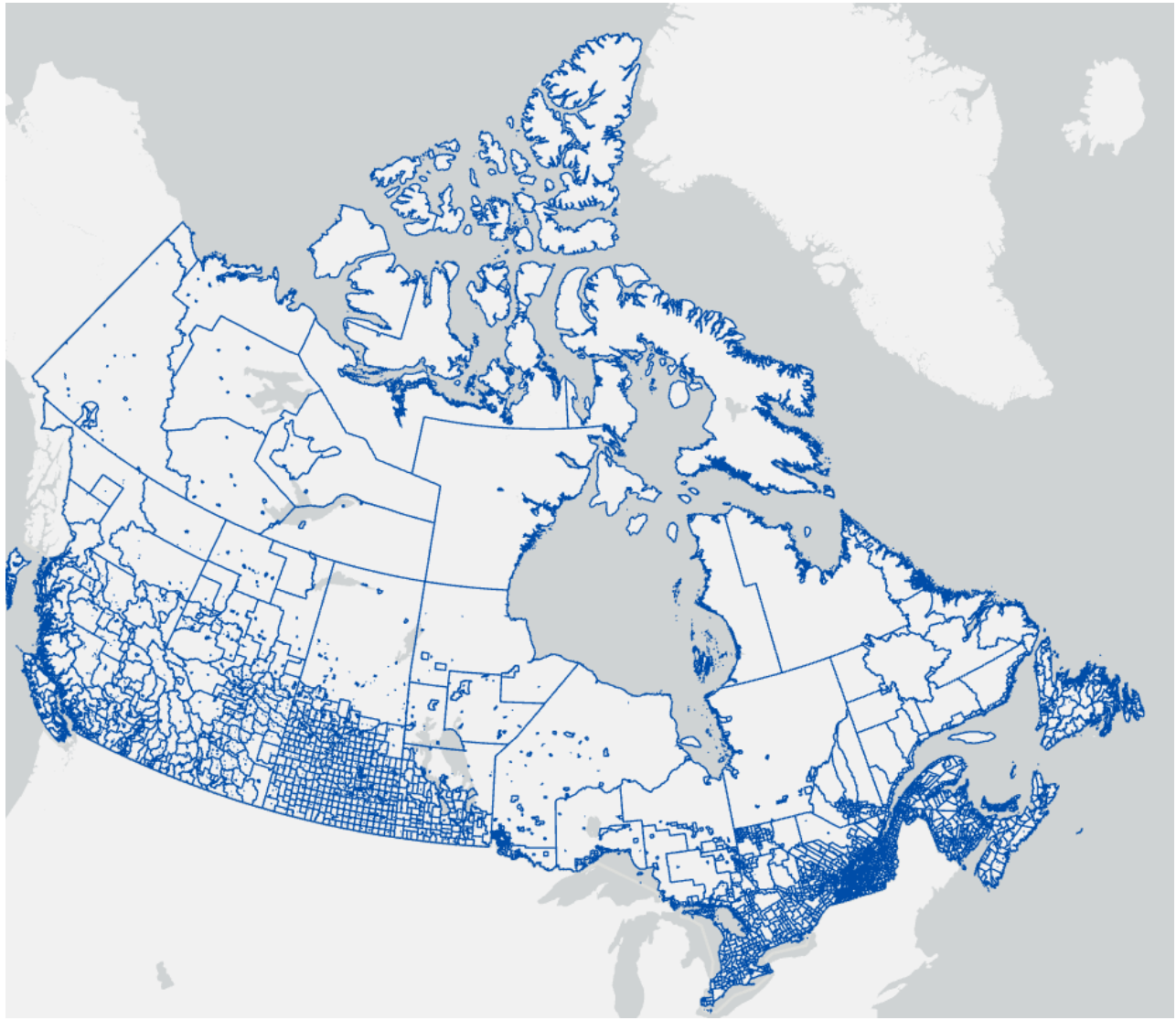
Census Geographies – Federal Electoral Districts

- 338 Federal Electoral Districts (FEDs)
- Cover all of Canada
- Each area represented by one Member of Parliament



Census Geographies – Census Subdivisions

- 5161 Census subdivisions (CSDs)
- Cover all of Canada

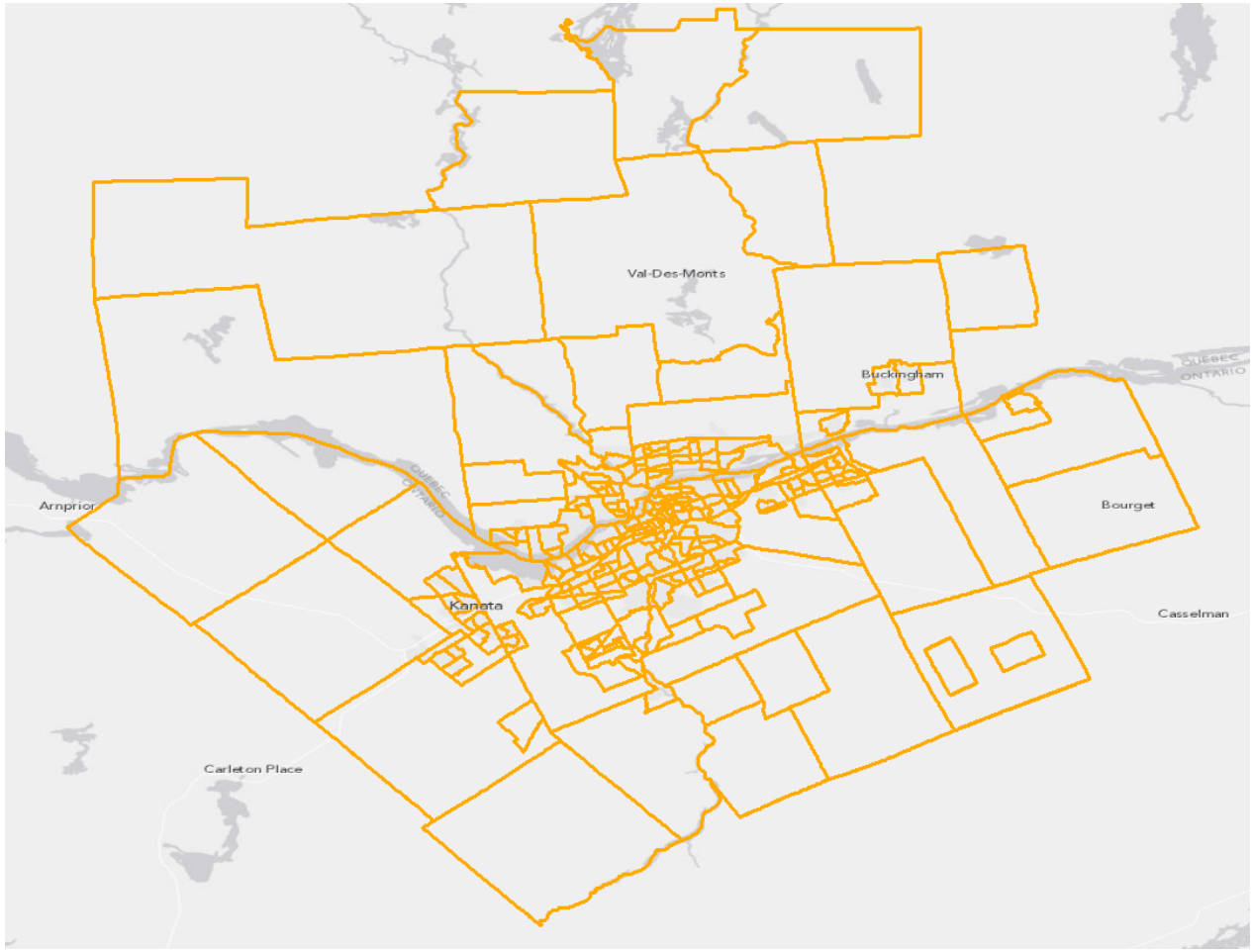


Census Geographies – Cities and Towns

- Census metropolitan areas (CMAs)
  - 41 cities with population at least 100,000
- Census agglomerations (CAs)
  - 111 towns with population at least 10,000

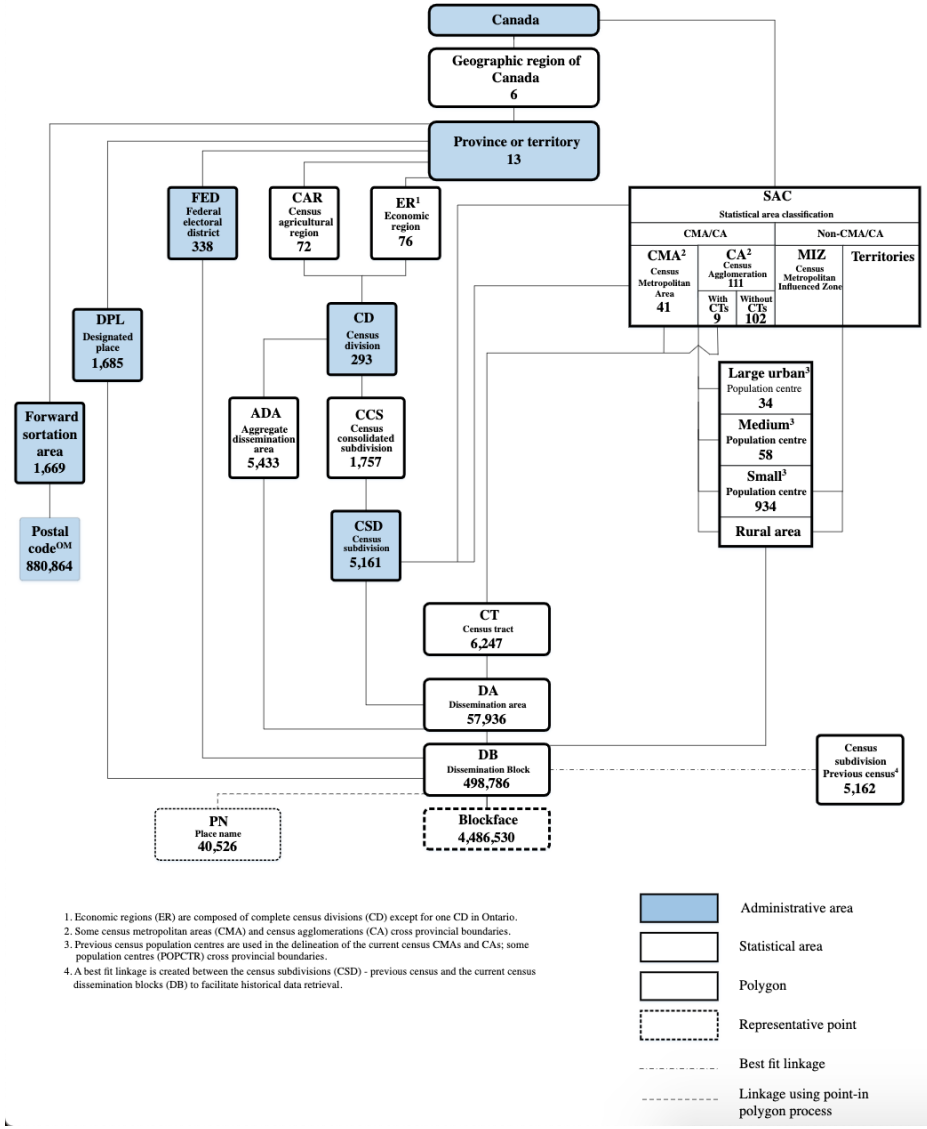
Census Geographies – Census Tracts

- Census tracts (CTs)
  - Only found in Census Metropolitan Areas and Census Agglomerations that have core populations of >50,000
- CTs usually have a population between 2,500 and 8,000



Census Geographies - Hierarchy

- Relationships between geographies can vary
  - E.g. Census Tracts are smaller parts of CMAs & CAs, but do not fit within Census Divisions
- Full coverage of Canada also varies
- More details: https://library.carleton.ca/guides/help/census-canada-choosing-census-geography

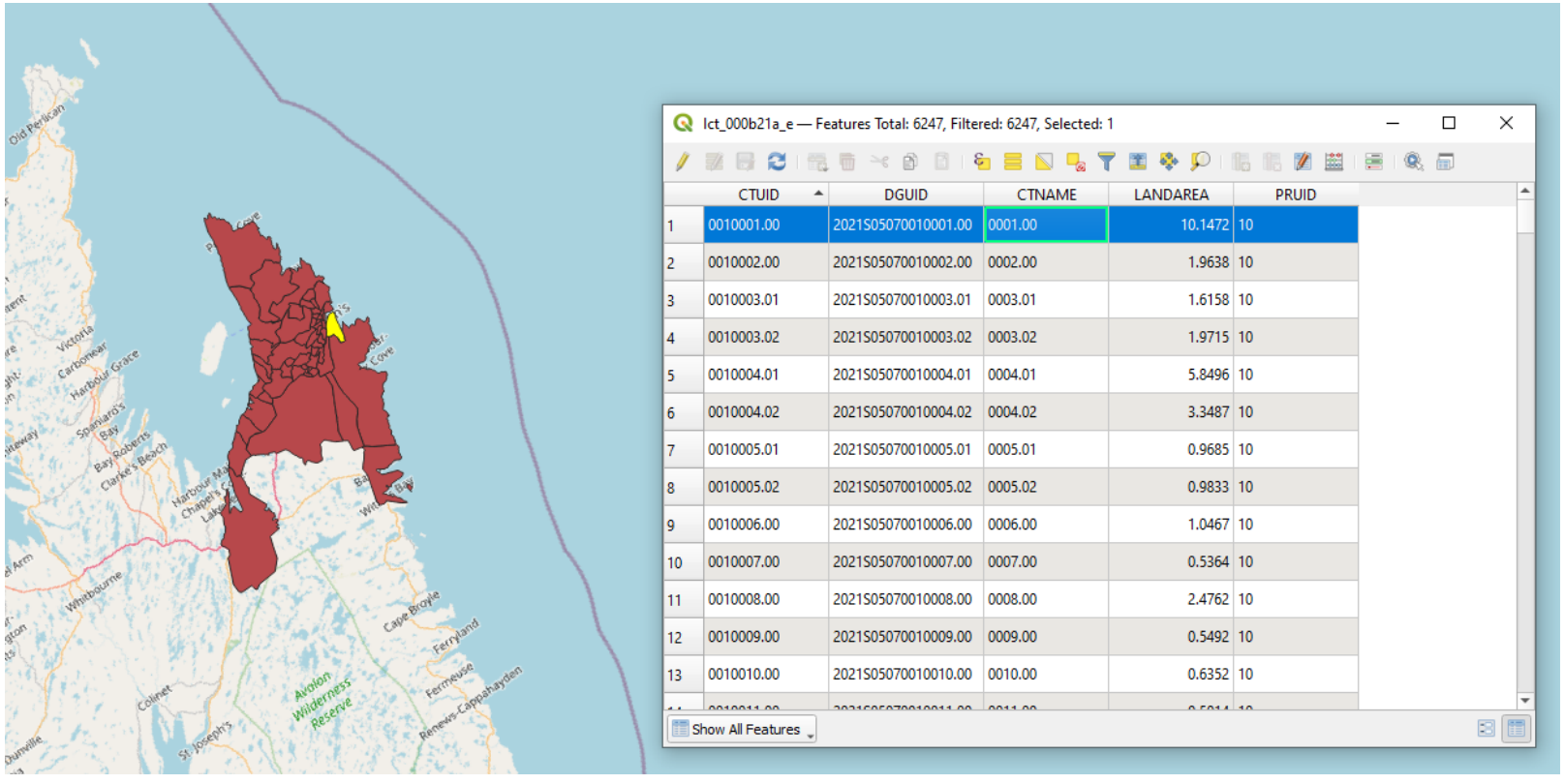


Census Geographies – Unique IDs

- Each census geography has a unique identification code
- This enables census data (e.g. spreadsheet) to be joined successfully to a geographic file (e.g. shapefile)
- There can be multiple attributes that look and sound the same, but they are often different
- **Tip:** Use the ___ID field, not the ___NAME field
  - List of all the attribute fields in Statistics Canada's geographic datasets

Census Geographies – CTNAME vs CTUID

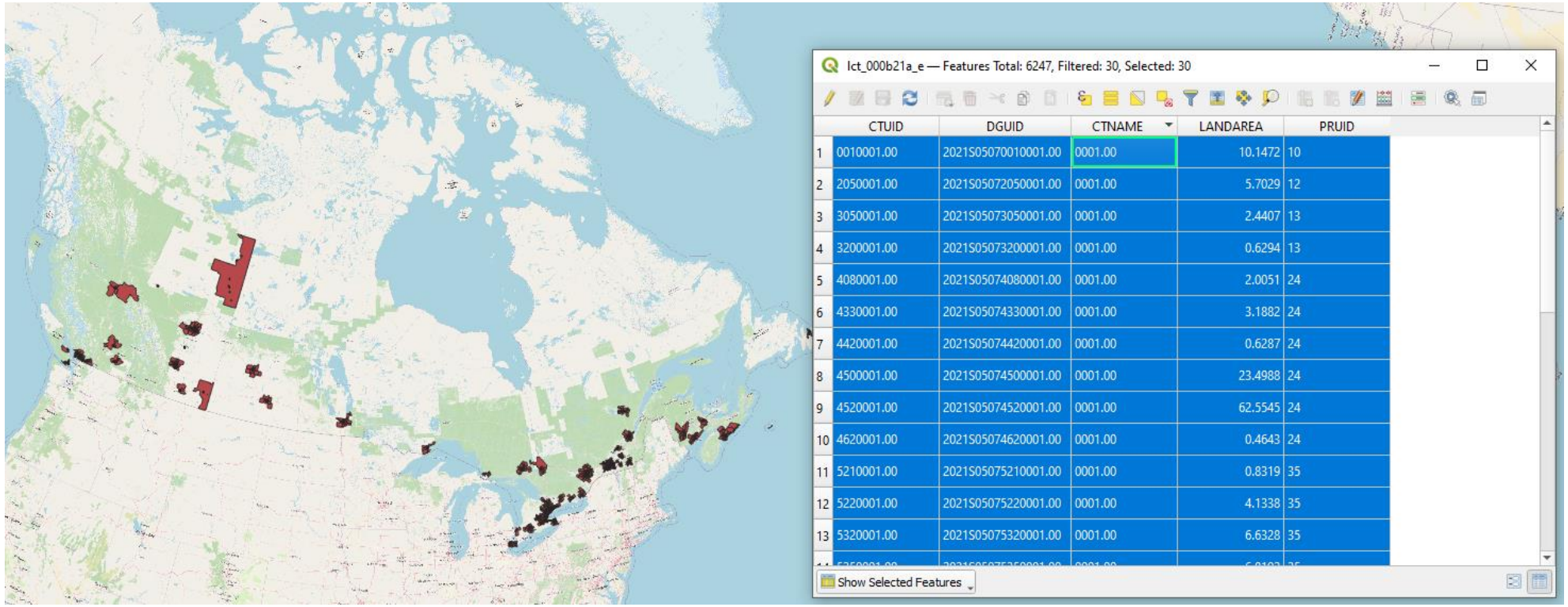
- CTNAME is a 6-digit code for a census tract in a census metropolitan area, let's say St John's, NL



	CTUID	DGUID	CTNAME	LANDAREA	PRUID
1	0010001.00	2021S05070010001.00	0001.00	10.1472	10
2	0010002.00	2021S05070010002.00	0002.00	1.9638	10
3	0010003.01	2021S05070010003.01	0003.01	1.6158	10
4	0010003.02	2021S05070010003.02	0003.02	1.9715	10
5	0010004.01	2021S05070010004.01	0004.01	5.8496	10
6	0010004.02	2021S05070010004.02	0004.02	3.3487	10
7	0010005.01	2021S05070010005.01	0005.01	0.9685	10
8	0010005.02	2021S05070010005.02	0005.02	0.9833	10
9	0010006.00	2021S05070010006.00	0006.00	1.0467	10
10	0010007.00	2021S05070010007.00	0007.00	0.5364	10
11	0010008.00	2021S05070010008.00	0008.00	2.4762	10
12	0010009.00	2021S05070010009.00	0009.00	0.5492	10
13	0010010.00	2021S05070010010.00	0010.00	0.6352	10

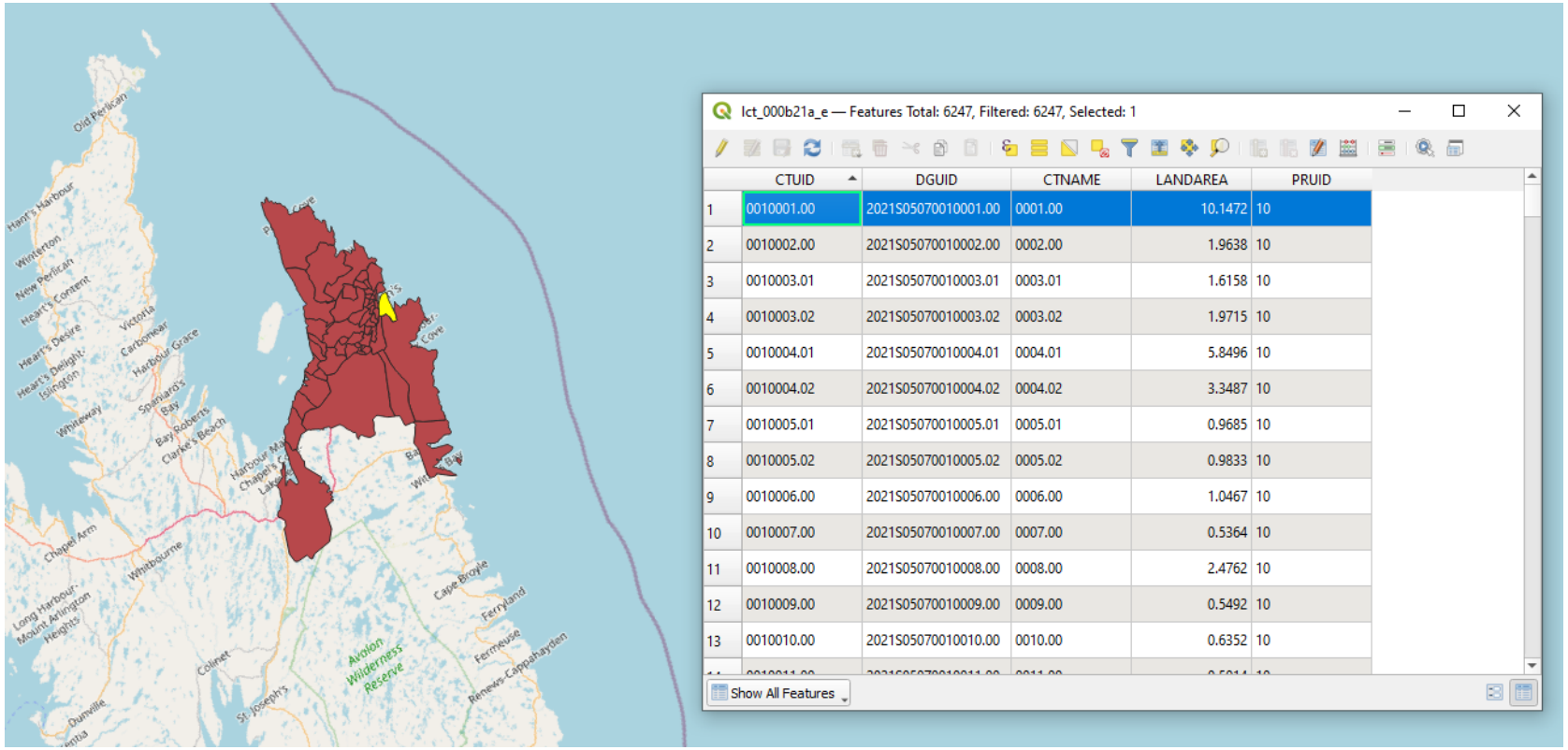
Census Geographies – CTNAME vs CTUID

- However, there are thirty 0001.00 CTNAME codes across Canada



Census Geographies – CTNAME vs CTUID

- CTUID is a unique identification number for a specific census tract that is the CMA/CA code + CTNAME



Census Geographies – Data tables

- Depending on where you get the tabular Census data, the relevant codes may be called GEO, GEOUID, the same as in the Statistics Canada shapefile, or something else
  - Have a look at the tables to find the matching field

Statistics Canada CSV

	A	B	C	D	E	F	G	H	I	J	K
1	REF_DATE	GEO	DGUID	Populatio	UOM	UOM_ID	SCALAR_F	SCALAR_I	VECTOR	COORDIN	VALUE
2	2021	5050001.04	2021S0507	Population, 2021		0	units	0		2977.1	2865
3	2021	5050001.04	2021S0507	Population, 2016		0	units	0		2977.2	2718
4	2021	5050001.04	2021S0507	Population percenta		0	units	0		2977.3	5.4
5	2021	5050001.04	2021S0507	Total private dwellir		0	units	0		2977.4	1238
6	2021	5050001.04	2021S0507	Private dwellings oc		0	units	0		2977.5	1176
7	2021	5050001.04	2021S0507	Land area in square k		0	units	0		2977.6	1.35
8	2021	5050001.04	2021S0507	Population density p		0	units	0		2977.7	2116.3
9	2021	5050001.05	2021S0507	Population, 2021		0	units	0		2978.1	5882

Canadian Census Analyzer

	A	B	C	D	E	F	G	H	I	J
1	GEOUID	CMACode	CTName	Pop2021	Pop2016	PrivDwel	COL6	COL7	COL8	COL9
2	5050001.04	505	0001.04	2865	2718	5.4	1238	1176	2116.3	1.35
3	5050001.05	505	0001.05	5882	5984	-1.7	2027	1989	2204.6	2.67
4	5050001.06	505	0001.06	6083	6111	-0.5	2398	2347	4849.7	1.25
5	5050001.07	505	0001.07	4075	4193	-2.8	1472	1438	4182.9	0.97
6	5050001.08	505	0001.08	4481	4632	-3.3	1536	1511	973.1	4.6
7	5050001.09	505	0001.09	5314	5033	5.6	2279	2200	4633.8	1.15
8	5050001.1	505	0001.10	3111	2949	5.5	1244	1180	3436.8	0.91
9	5050002.01	505	0002.01	3030	2885	5	1177	1153	1169.5	2.59
10	5050002.02	505	0002.02	3445	3470	-0.7	1341	1309	2267.3	1.52

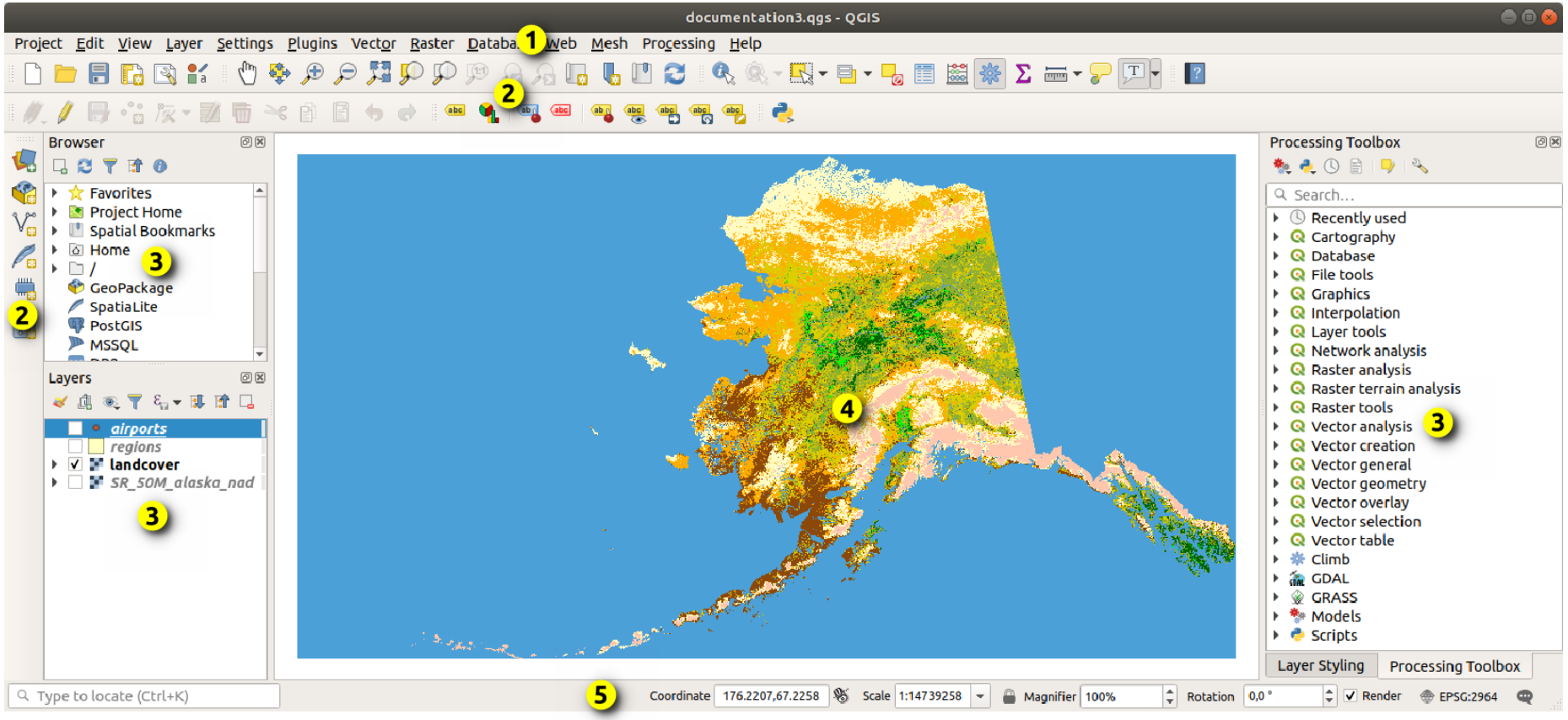
QGIS

OPEN SOURCE DESKTOP GIS SOFTWARE

What is QGIS?

- QGIS = Quantum Geographic Information Systems
- Free and open-source desktop GIS that supports viewing, editing, and analysis of geospatial data
- Windows, Mac & Linux compatible
- We recommend installing the most recent long-term release (LTR)
  - More details https://library.carleton.ca/guides/help/gis-software

QGIS interface



1. Menu bar
2. Toolbars
3. Panels
4. Map View
5. Status Bar

Image from https://docs.qgis.org/3.28/en/_images/startup.png

QGIS documentation & tutorials

- Documentation (version 3.28) - https://docs.qgis.org/3.28/en/docs/index.html
- Training Manual - https://docs.qgis.org/3.28/en/docs/training_manual/index.html
  - Step by step modules and instructions
- QGIS tutorials - https://www.qgistutorials.com/en/

Some QGIS geoprocessing tools

- Selection
  - Selecting features manually in the map frame
  - Selecting features by values in attribute table
- Attribute tables
  - Using the Field Calculator
- Joins

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