Population Ecumene Boundary Files, Reference Guide, 2021 Census

Release date: February 9, 2022

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Population Ecumene Boundary Files, Reference Guide, 2021 Census

This reference guide is intended for users of the *2021 Population Ecumene Boundary Files*. This guide provides an overview of the files, the general methodology used to create them, and important technical information.

What's new?

- As of 2020, all the boundaries maintained by Statistics Canada have been adjusted to the more current, accurate and consistent CanVec hydrographic features (Topographic Data of Canada – Natural Resources Canada), which comply with international geomatics standards seamlessly across Canada

- The generalized hydrographic layer is not included in the *2021 Population Ecumene Boundary Files* product. Users are invited to directly access CanVec data and services.

- The *2021 Population Ecumene Boundary Files are* now available in File Geodatabase (.gdb), Esri ®REST and Web Mapping Service (WMS) formats.

- The *2021 Population Ecumene Boundary Files* are no longer available in MapInfo (.tab) format.

1. About this guide

This reference guide does not provide details on specific software packages that are available for use with the *2021 Population Ecumene Boundary Files*. Users are advised to contact the appropriate software vendor for information.

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2. Overview

The *2021 Population Ecumene Boundary Files* represent Canada's population ecumene. Ecumene is a term used by geographers to indicate inhabited land. Statistics Canada applies the definition of the population ecumene as land where people have made their permanent home.

The product also includes generalized cartographic boundary files of the census divisions (CD) and the provinces and territories (PR).

The *2021 Population Ecumene Boundary Files* are available for download or viewing, and are portrayed in Lambert conformal conic projection (North American Datum of 1983 [NAD83]).

3. About this product

Purpose of the product

The population ecumene is designed to assist users in thematically mapping data. By effectively masking ecumene areas of Canada, it enables users to display data in areas where population is concentrated.

An ecumene mask is useful for dot and choropleth thematic mapping. In dot map applications, if an ecumene is not applied, the dots may be spread over the spatial extent of a geographic area. This approach defeats the main attributes of dot mapping (i.e., showing correct location, extent and density of various characteristics).

In choropleth map applications, one of the inherent limitations is that the statistical distribution is assumed to be homogeneous or uniformly spread over each geographic area, and is consequently represented by a single tone or colour covering the entire area. Using an ecumene limits the display to only those areas where population is found and results in a more accurate representation of the spatial distribution of data.

Figure 3.1
Example of the ecumene mask extent with the Province and Territory Generalized Cartographic Boundary File
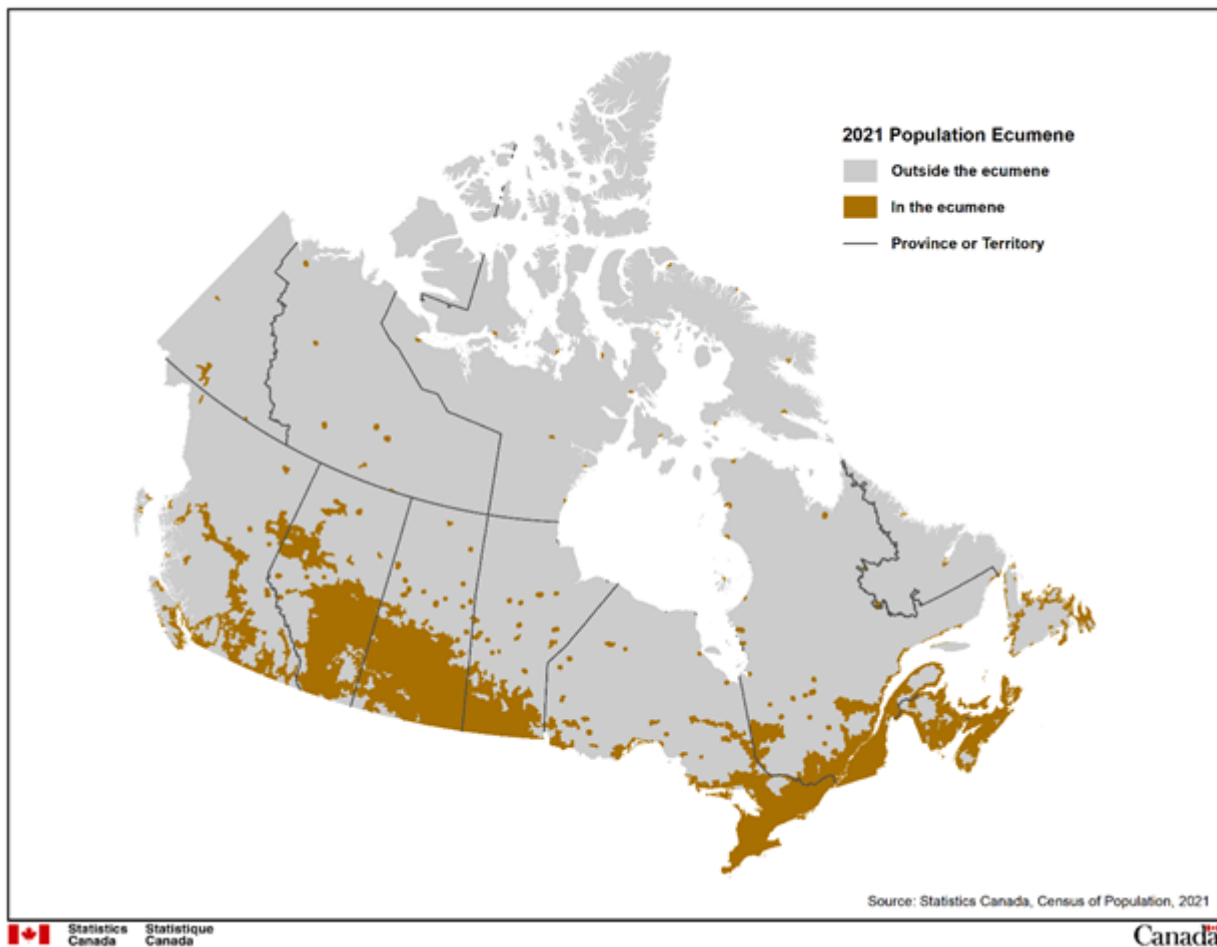
Definitions and concepts

Geographic terms and concepts are briefly defined in the *Dictionary, Census of Population, 2021*.

Content

The *2021 Population Ecumene Boundary Files* product consists of three spatial files:

Population Ecumene Mask File

The "Population Ecumene Mask File" consists of polygons flagged with a value: 1, being in the ecumene; 0, outside the ecumene. There is at least one ecumene polygon in every CD in Canada.

Census Division Generalized Cartographic Boundary File

The "Census Division Generalized Cartographic Boundary File" contains CD boundaries. Related attribute information is available for each CD polygon, including the unique identifier (UID), dissemination geography unique identifier (DGUID), name, type and land area. It also contains the provincial unique identifier (PRUID).

Province and Territory Generalized Cartographic Boundary File

The "Province and Territory Generalized Cartographic Boundary File" contains the boundaries of the PR. Related attribute information is available for each PR polygon, including the UID, DGUID, official name, English name, French name, English abbreviation, French abbreviation and land area.

General methodology

The National Geographic Database (NGD) is a joint Statistics Canada-Elections Canada initiative to develop and maintain a spatial database which serves the needs of both organizations. The focus of the NGD is the continual improvement of quality and currency of spatial coverage using updates from provinces, territories and local sources. The source files used for the creation of the 2021 Census population ecumene spatial files reside on Statistics Canada's Spatial Data Infrastructure (SDI) which was derived directly from data stored on the NGD.

Creation of the *2021 Population Ecumene Boundary Files*

Population Ecumene Mask File

The "Population Ecumene Mask File" was created by using the land area and the 2021 Census population count to calculate the population density of each dissemination block (DB). Every DB was then classified as either being an ecumene block (meeting the population density criteria of 0.4 or more persons per square kilometre) or being a non-ecumene block (those with a population density below 0.4 persons per square kilometre). These ecumene blocks were aggregated and buffered into ecumene pockets, and retained if they had a minimum population of 1,000 persons or were associated to a population centre (POPCTR). Each CD contains an ecumene pocket to allow for national mapping of data. If a CD did not have an ecumene pocket after the above criteria was imposed, the ecumene pocket with the largest population was added back into the ecumene for that CD. The resulting ecumene outline was smoothed and buffered to facilitate small scale mapping.

Generalized cartographic boundary files

To create the generalized cartographic boundary files, a subset of the full hydrography was created using the coastal layer as a starting point. The coastal hydrographic features were then used to erase the portions of CDs that are covered by coastal waters. Subsequently, the "Province and Territory Generalized Cartographic Boundary File" was derived from the "Census Division Generalized Cartographic Boundary File".

Post-processing

The files were verified for the spatial and attribute content, translated into French and English, and appropriately named according to the file naming convention. Final data processing consisted of the conversion from the File Geodatabase format, using FME® (Safe Software), into the following Geographic Information System (GIS) file formats: Shapefile (.shp), Geography Markup Language (.gml) and File Geodatabase (.gdb).

The Shapefile, Geography Markup Language and File Geodatabase files were compressed into WinZip® files (file extension .zip) and made available for download from the Internet.

Limitations

The input data used to create the file were originally obtained from several sources having a wide range of scales. The file will not be precise if plotted at a larger scale than the scale of the source material used in its creation. Maps created from the files included in the *2021 Population Ecumene Boundary Files* should not be used to determine the precise location of boundaries.

The positional accuracy of these files does not support cadastral, legal, surveying, digitizing or engineering applications.

Comparison to other products or versions

The *2021 Population Ecumene Boundary Files* are generalized to render them suitable for cartographic display at a small scale (i.e., 1:20,000,000 to 1:25,000,000). Due to this generalization, the position of the shoreline is not necessarily consistent with the suite of census cartographic boundary files or the *2021 Road Network File.*

The files included in the *2021 Population Ecumene Boundary Files* are similar but not necessarily consistent with ecumene boundary files released prior to the 2021 Census.

The generalized cartographic boundary files included in the *2021 Population Ecumene Boundary Files* (CD and PR) can be linked to other 2021 Census statistical data products using the DGUIDs for each geographic area.

Use with other products

When considering using the *2021 Population Ecumene Boundary Files*, users should be aware of the compatibility of these files with those that are available from other sources. They may not be consistent with Statistics Canada files.

Reference date

Population counts

The population count data used to create the "Population Ecumene Mask File" refer to the 2021 Census of Population which was conducted on May 11, 2021.

Standard geographic areas

The geographic reference date is a date determined by Statistics Canada to finalize the geographic framework for which census data are collected, tabulated and reported. The reference date for 2021 Census standard geographic areas is January 1, 2021.

4. Technical specifications

Record layout and data descriptions

Population Ecumene Mask File

The "Population Ecumene Mask File" contains polygons for each ecumene and non-ecumene pocket, which combined, cover all of Canada.

Table 4.1
Record layout - Population ecumene mask file

Attribute name	Data type	Description
ECUID	Character (10)	Uniquely identifies an ecumene polygon.
ECUMENE	Character (1)	A 1-digit code indicating whether the polygon is part of the ecumene: 1 = in the ecumene; 0 = outside the ecumene.

For more information on ecumenes, refer to the "Ecumene" definition from the *Dictionary, Census of Population, 2021*.

Census Division Generalized Cartographic Boundary File

The "Census Division Generalized Cartographic Boundary File" portrays the CD boundaries for which 2021 Census statistical data are disseminated. The file contains the boundaries of all CDs, which combined, cover all of Canada.

Table 4.2
Record layout - Census division generalized cartographic boundary file

Attribute name	Data type	Description
CDUID	Character (4)	Uniquely identifies a census division (composed of the 2-digit province or territory unique identifier followed by the 2-digit census division code).
DGUID	Character (21)	Dissemination Geography Unique Identifier.[1]
CDNAME	Character (100)	Census division name.
CDTYPE	Character (3)	Census division type.
PRUID	Character (2)	Uniquely identifies a province or territory.
LANDAREA	Number (12.4)	Land area of geographic area, in square kilometres (km^2).

1. For further information please refer to the "Dissemination Geography Unique Identifier (DGUID)" definition from the *Dictionary, Census of Population, 2021.*

For more information on census divisions, refer to the "Census division (CD)" definition and "Census division types by province and territory, 2021 Census" table from the *Dictionary, Census of Population, 2021.*

Province and Territory Generalized Cartographic Boundary File

The "Province and Territory Generalized Cartographic Boundary File" portrays the boundaries of the 10 provinces and 3 territories for which 2021 Census statistical data are disseminated. The file contains the boundaries of all PRs, which combined, cover all of Canada.

Table 4.3
Record layout - Province and territory generalized cartographic boundary file

Attribute name	Data type	Description
PRUID	Character (2)	Uniquely identifies a province or territory.
PRNAME	Character (100)	Province or territory name.
PRENAME	Character (100)	Province or territory name in English.
PRFNAME	Character (100)	Province or territory name in French.
PREABBR	Character (10)	English abbreviation of the province or territory name.
PRFABBR	Character (10)	French abbreviation of the province or territory name.
DGUID	Character (21)	Dissemination Geography Unique Identifier.[1]
LANDAREA	Number (12.4)	Land area of geographic area, in square kilometres (km^2).

1. For further information please refer to the "Dissemination Geography Unique Identifier (DGUID)" definition from the *Dictionary, Census of Population, 2021*.

For more information on provinces or territories, refer to the "Province or territory" definition from the *Dictionary, Census of Population, 2021*.

Attribute domain values

Census division type (CDTYPE)

For information on census division types, refer to the "Census division type (CDTYPE), 2021 Census" table.

File specifications

Not applicable

Software formats

The *2021 Population Ecumene Boundary Files* are available for download from the Statistics Canada website in the following formats:

- Shapefile
  File extension: .shp
- Geography Markup Language version 3.1.1
  File extension: .gml
- File Geodatabase
  File extension: .gdb

The *2021 Population Ecumene Boundary Files* are also available as map services from the Statistics Canada website in the following formats:

- Esri® REST service
- Web Map Service (WMS)

This reference guide does not provide details on specific software packages available for use with the *2021 Population Ecumene Boundary Files*. Users should contact the appropriate software vendor for such information.

File extension and accented character information

The Shapefile, Geography Markup Language and File Geodatabase files are compressed into WinZip® files (file extension .zip).

Some of the files included in the *2021 Population Ecumene Boundary Files* contain attributes with accented characters. They were successfully tested on desktop versions of ArcGIS® 10.5.1, File Geodatabase and FME Data Inspector 2015.1.

Metadata

The downloadable compressed packages (.zip) include a metadata file (.xml) that describes and validates the structure and content of the *2021 Population Ecumene Boundary Files*.

The same metadata are applied to the Esri® REST service and Web Map Service.

Geographic representation

The *2021 Population Ecumene Boundary Files* are available on the Statistics Canada website in the following geographic representation:

- Projection: Lambert conformal conic
- False easting: 6200000.000000
- False northing: 3000000.000000
- Central meridian: -91.866667
- Standard parallel 1: 49.000000
- Standard parallel 2: 77.000000
- Latitude of origin: 63.390675
- Linear unit: metre (1.000000)
- Datum: North American 1983 (NAD83)
- Prime meridian: Greenwich
- Angular unit: degree
- Spheroid: GRS 1980.

The North American Datum of 1983 (NAD83) is an adjustment of the 1927 datum (NAD27) that reflects the higher accuracy of geodetic surveying.

Users of the *2021 Population Ecumene Boundary Files* can transform the files into the representation that best satisfies their needs, knowing the effects these representations have on angles, areas, distances and direction. Users have the option to choose the best projection in concert with display objectives.

File naming convention

Spatial product file names follow a file naming convention. The file projection, geographic level, geographic coverage, file type, geographic reference date, file format and language are embedded within the file name. Standardizing the names of the files facilitates the storage of compressed files, all having the extension .zip.

Each file name is 13 characters in length. All alphabetic characters are in lower case to maintain consistency.

First character: projection of file

- l - projection in Lambert conformal conic

Next three characters: primary geographic level of file

- pr_ - province/territory
- cd_ - census division
- ecu - ecumene

Next three numbers: geographic code of coverage

- 000 - Canada

Next character: file type

- e - ecumene

Next two numbers: geographic reference date

The geographic reference date is a date determined by Statistics Canada for the purpose of finalizing the geographic framework for which census data are collected, tabulated and reported. For 2021 Census products, the geographic reference date is January 1, 2021.

- 21 - geographic reference date is 2021

Next character: file format

- a - Shapefile (.shp)
- f - File Geodatabase (.gdb)
- g - Geography Markup Language (.gml)
- s - Services (Esri® REST and Web Map Service [WMS])

Final two characters: language

- _e - English
- _f - French

5. Data quality

Spatial data quality elements provide information on the fitness-for-use of a spatial database by describing why, when and how the data are created, and how accurate the data are. The quality elements include information on the lineage, positional accuracy, attribute accuracy, logical consistency and completeness. This information is provided to users for all spatial data products disseminated for the census.

Lineage

Lineage describes the history of the spatial data, including descriptions of the source material from which the data were derived, and the methods of derivation. It also contains the dates of the source material, and all transformations involved in producing the final digital files.

The 2021 Census standard geographic area UID, DGUID, name, type, land area and the relationships among the various geographic levels are found on Statistics Canada's SDI.

Positional accuracy

Positional accuracy refers to the absolute and relative accuracy of the positions of geographic features. Absolute accuracy is the closeness of the coordinate values in a dataset to values accepted as or being true. Relative accuracy is the closeness of the relative positions of features to their respective relative positions accepted as or being true. Descriptions of positional accuracy include the quality of the final file or product after all transformations.

The NGD is not fully Global Positioning Systems (GPS)-compliant. However, every possible attempt is made to ensure that the standard geographic area boundaries maintained in the NGD respect the limits of the administrative entities that they represent (e.g., CD and census subdivision) or on which they are based (e.g., census metropolitan area or census agglomeration). The positional accuracy of these limits is dependent upon source materials used by Statistics Canada to identify the location of limits. In addition, due to the importance placed on relative positional accuracy, the positional accuracy of other geographic data (e.g., road network data) that are stored within the NGD is considered when positioning the limits of the standard geographic areas.

Attribute accuracy

Attribute accuracy refers to the accuracy of the quantitative and qualitative information attached to each feature (e.g., CD name, UID).

As noted under the Lineage section, the attributes (names, types and UIDs) for all standard geographic areas are sourced from Statistics Canada's SDI. The names and types for administrative areas have been updated using source materials from provincial, territorial and federal authorities.

The attribute data associated with the polygons in the cartographic boundary files were verified against the data in the SDI and found to accurately reflect them.

Logical consistency

Logical consistency describes the fidelity of relationships encoded in the data structure of the digital spatial data.

The "Population Ecumene Mask File" was verified to ensure that every CD contains at least one ecumene pocket.

All geographic areas contained in the cartographic boundary files have been verified to have a UID and DGUID that is valid for the 2021 Census.

Consistency with other products

As a result of the generalization of the shoreline, the boundaries in the province and territory, and census division files of this product are not necessarily consistent with the shoreline of the cartographic province and territory, and census division boundary files from the *2021 Census Boundary Files*.

Completeness

Completeness refers to the degree to which geographic features, their attributes and their relationships are included or omitted in a dataset. It also includes information on selection criteria, definitions used and other relevant mapping rules.

The ecumene mask covers over 98.7% of the population of Canada, based on the buffered DB.

The *2021 Population Ecumene Boundary Files* contain two standard geographic area boundary files that are generalized: census division; province and territory. The "Census Division Generalized Cartographic Boundary File" contains all 293 CDs which cover all of Canada. The "Province and Territory Generalized Cartographic Boundary File" contains the 10 provinces and 3 territories covering all of Canada.

Appendix

See Figure 1.1, "Hierarchy of standard geographic areas for dissemination, 2021 Census," from the *Dictionary, Census of Population, 2021*.