CartoVista

Mapping Concepts Guide

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cartovista.com

About CartoVista

CartoVista makes it possible to create detailed analyses and optimized communications by putting data on a map. With innovative solutions, **CartoVista** solves business problems and enables communication in a wide range of industries.

The company's head office is located at:
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For more information on our products and professional services, please visit our website (www.cartovista.com).

Technical Support

If you encounter problems working with **CartoVista**, our technical support experts can help. Technical support includes referrals to documentation, assistance with error messages and suggestions for causes of error messages.

Technical Support is available in North America Monday - Friday from 8:00 am - 4:00 pm EST, excluding holidays. Please remember to include your serial number or contract number when contacting technical support.

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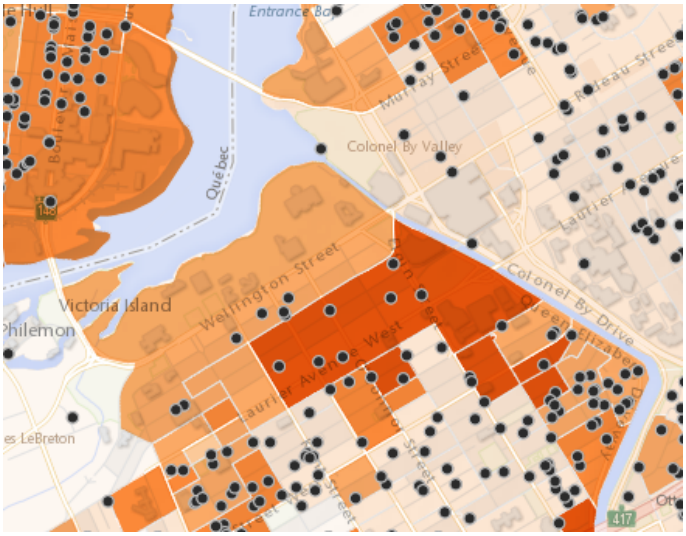
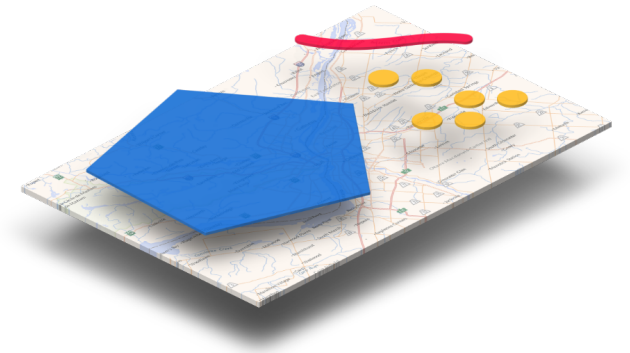
If we take a closer look at a **CartoVista** map, we see that it is commonly made of multiple **layers** of data in **vector** format, such as **points**, **polylines** and **polygons**. This spatial data can be interactive to react to the user's actions. Under this interactive data, a multi-zoom **base map** in **raster** format allows users to navigate easily on the territory.





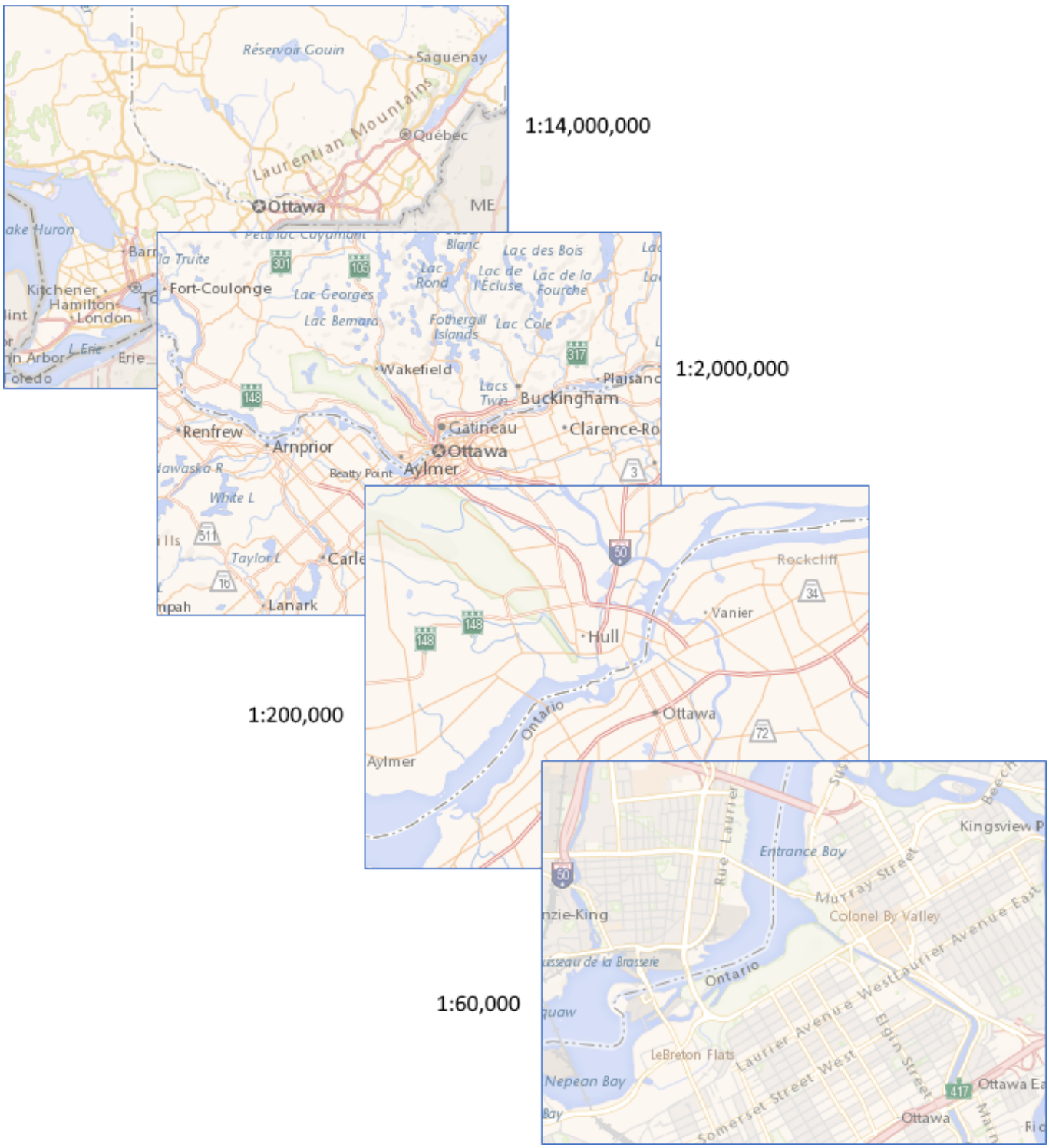
The following is an introduction to basic mapping concepts and the way they are implemented with **CartoVista**:

Base Map

A **base map** is the representation of a territory that usually includes roads, lakes and municipalities. It is used to provide a geographic context for visualizing data. There are many ways to represent the territory. The most commonly used base maps are **Road Base Maps** and **Aerial Base Maps**.

Road Base Map	Aerial Base Map
	

A **tile base map** is a combination of raster images at multiple map scales. As you zoom in, more detailed information is displayed.



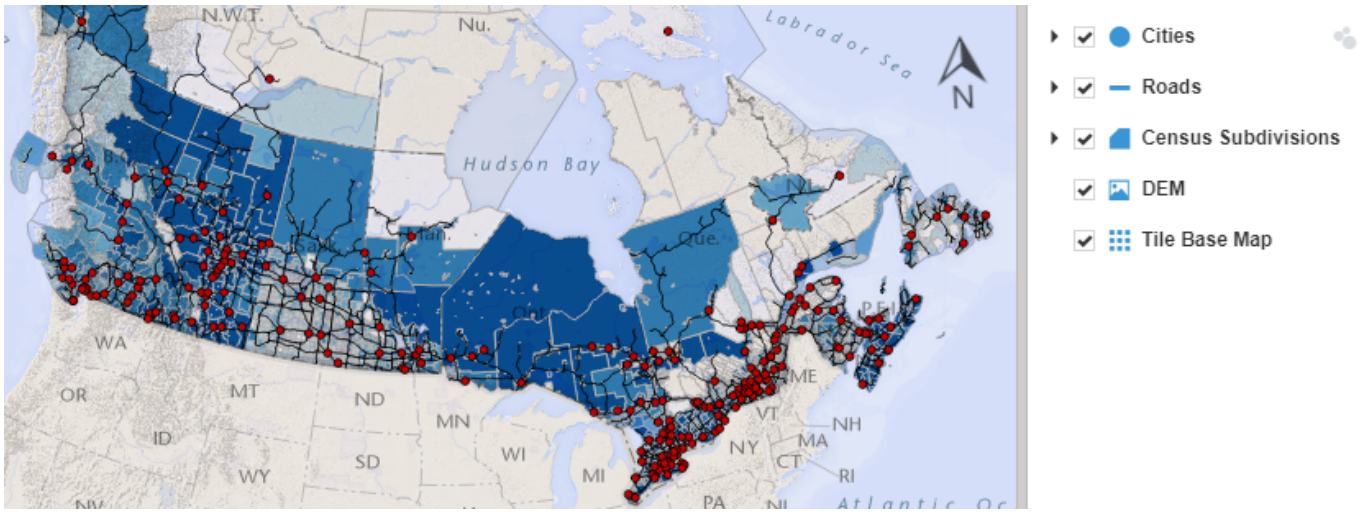
Map Scale

A **map scale** is the ratio that compares a distance on a map to the actual distance on the ground. It is typically denoted as 1:X, where 1 represents one unit on the map, and X represents the number of corresponding units in the real world.

Small-Scale Map	Large-Scale Map
Large area, such as a continent or a country (e.g., 1:50,000,000).	Small area, such as a city block-level (e.g., 1:10,000).
	

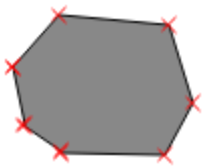
Layers

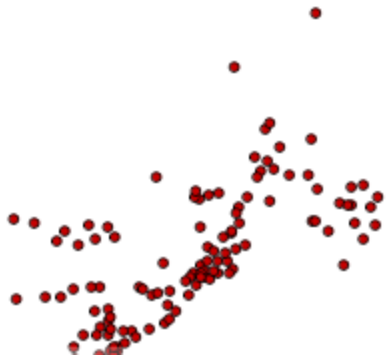
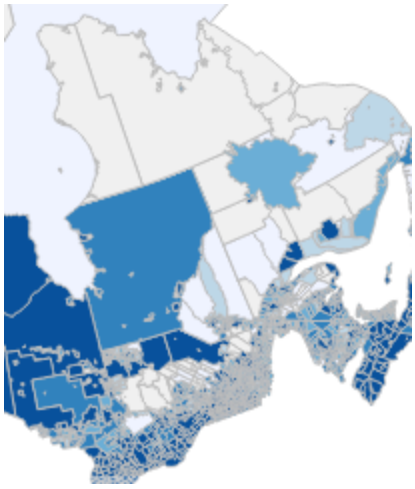
A **layer** is a collection of features of the same geometry type (points, polylines, polygons or images) forming a level of detail in the map (e.g., cities, roads, census subdivisions, DEM). Each layer is independent from the others. The superposition of all the layers provides a global view of the map.



Map Features (Vector Format)

Map features are **vector** objects (points, polylines or polygons). These objects have a location (X and Y coordinates), size and shape which can be described by mathematical formulas.

Point	Polyline	Polygon
Feature defined by a single x,y coordinate pair.	Feature defined as a set of sequential coordinate pairs.	Feature defined as a closed shape of connected coordinate pairs.
		

Point	Polyline	Polygon
E.g.: cities, shops, clients. 	E.g.: roads, rivers, railroads. 	E.g.: lakes, boundaries. 

Vector objects keep the same appearance (color, stroke width, level of detail) when viewed at different map scales.

1:12,000,000	1:6,000,000	1:3,000,000
		

Images and Tile Base Map (Raster Format)

A **raster** image is generally composed of a rectangular grid of pixels or points of color. In mapping, images are used for special layers such as tile base map, aerial or satellite photographs, digital elevation models (DEM), etc.

Image	Tile Base Map
	

Images are meant to be viewed at specific map scales. The graphic quality is based on the pixel size and the area it represents on the ground. When an image is viewed outside of its optimal map scale, it looks pixelated.

1:24,000,000	1:3,000,000	1:750,000
		

Tabular Data

Each map feature corresponds to a row in a map file, which generally contains various data columns (e.g., name, description, statistics, etc.).

Map File Table: CAN_Cities_P

Drag a column here to group by this column.

UNIQUE_ID	City	Province_EN	Province_FR	Type_EN	Type_FR
Contains:	Contains:	Contains:	Contains:	Contains:	Contains:
1	Victoria	British Columbia	Colombie-Britannique	Provincial Capital	Capitale provinciale
2	Regina	Saskatchewan	Saskatchewan	Provincial Capital	Capitale provinciale
3	Toronto	Ontario	Ontario	Provincial Capital	Capitale provinciale
4	Ottawa	Ontario	Ontario	National Capital	Capitale nationale
5	Québec	Quebec	Québec	Provincial Capital	Capitale provinciale
6	Fredericton	New Brunswick	Nouveau-Brunswick	Provincial Capital	Capitale provinciale
7	Charlottetown	Prince Edward Island	Île-du-Prince-Édouard	Provincial Capital	Capitale provinciale

242 of 242 rows

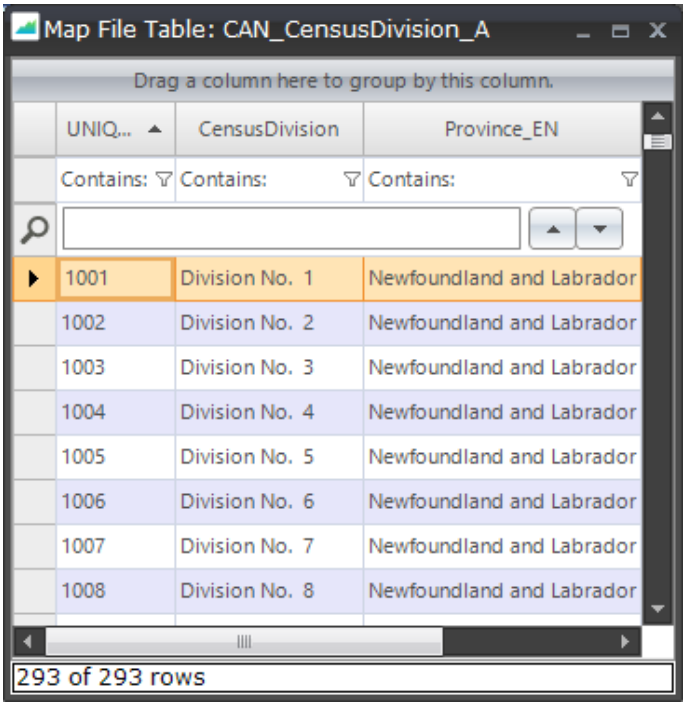
Here are the most common types of data column:

Type	Description	Example
String	Alphanumeric characters including letters, digits and space.	Name: Victoria
Float	Decimal numbers.	Population Density: 4,109.76 inhab./km^2
Integer	Whole numbers (not a fraction or decimal).	Population: 80,017 inhabitants

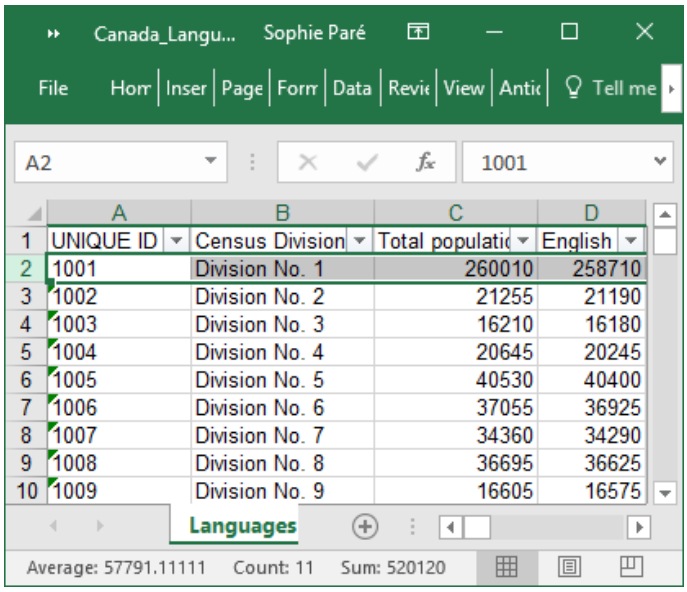
Join Map Features and Tabular Data

It is possible to join map features to external tabular data when both files share a common unique identifier.

Map Features File (e.g., TAB)	Tabular Data File (e.g., XLSX)
CAN_CensusDivision_A.DAT CAN_CensusDivision_A.ID CAN_CensusDivision_A.MAP CAN_CensusDivision_A.TAB	Canada_Languages.xlsx



UNIQ...	CensusDivision	Province_EN
1001	Division No. 1	Newfoundland and Labrador
1002	Division No. 2	Newfoundland and Labrador
1003	Division No. 3	Newfoundland and Labrador
1004	Division No. 4	Newfoundland and Labrador
1005	Division No. 5	Newfoundland and Labrador
1006	Division No. 6	Newfoundland and Labrador
1007	Division No. 7	Newfoundland and Labrador
1008	Division No. 8	Newfoundland and Labrador



	UNIQUE ID	Census Division	Total populati	English
2	1001	Division No. 1	260010	258710
3	1002	Division No. 2	21255	21190
4	1003	Division No. 3	16210	16180
5	1004	Division No. 4	20645	20245
6	1005	Division No. 5	40530	40400
7	1006	Division No. 6	37055	36925
8	1007	Division No. 7	34360	34290
9	1008	Division No. 8	36695	36625
10	1009	Division No. 9	16605	16575

Map and Data Sources

Here are a few examples of the most common file formats used to create maps with **CartoVista**. For the complete list, see the Supported Formats of the **CartoVista Publisher** (https://cartovista.com/support/documentation/).

Type	Format	Extension
Vector	MapInfo Tables	TAB
	ESRI Shape Files	SHP
	ESRI File Geodatabase	GDB
	Keyhole Markup Language	KML, KMZ
Raster	Tagged Image File Format	GEOTIFF
	Joint Photographic Expert Group 2000 Format	JPEG2000
	Enhanced Compression Wavelet	ECW
Tabular Data	Microsoft Excel Spreadsheets	XLS, XLSX
	Comma Separated Values Files	CSV

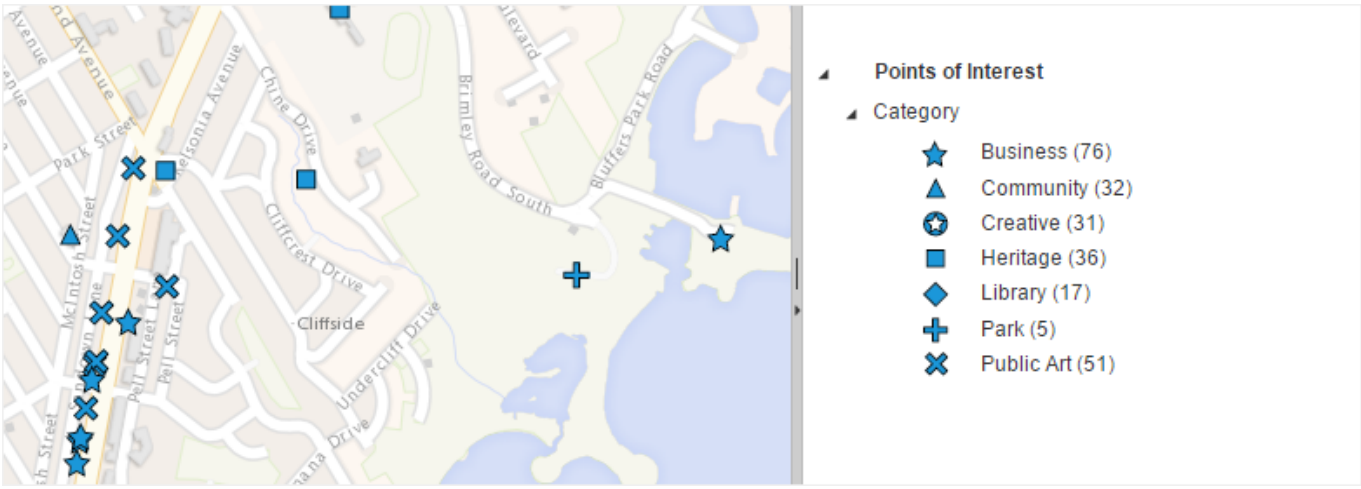
Data can also be provided by a spatial or non spatial database such as Microsoft SQL Server, Oracle or PostgreSQL. These database can contain vector, raster and tabular data.

Thematic Analyses

The spatial distribution of tabular data can be represented on a map with various graphic styles (color, size, symbol, etc.). Here are a few examples. For more detailed information, see the **CartoVista Viewer** documentation (https://cartovista.com/support/documentation/).

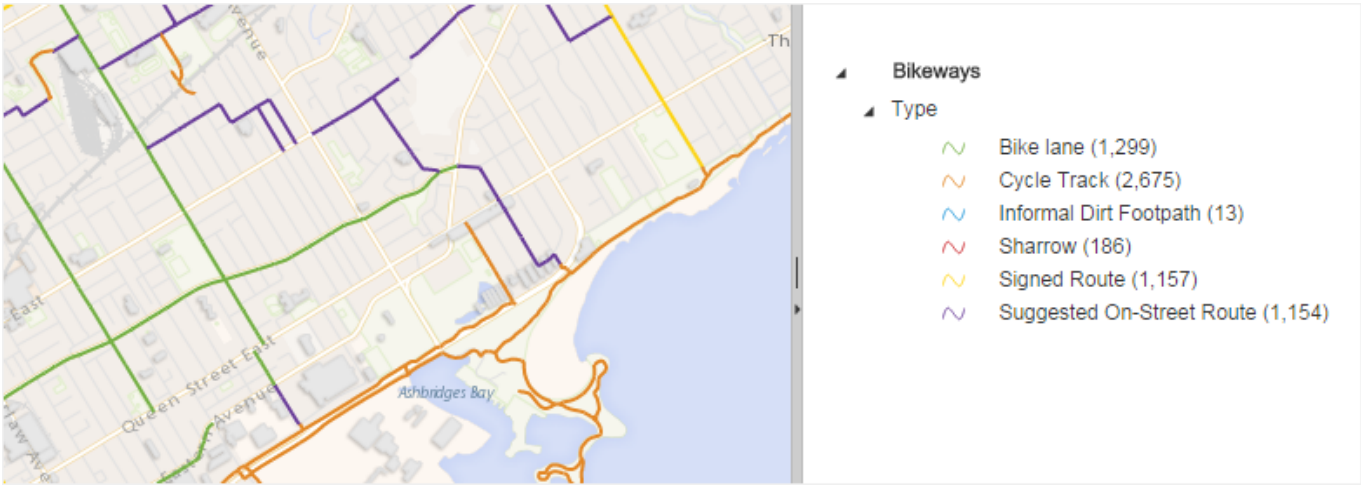
Shapes

This type of thematic analysis is commonly used to show categories of a thematic data as a classification, using different symbol shapes. It is applicable to **point** layers with **string** data only.



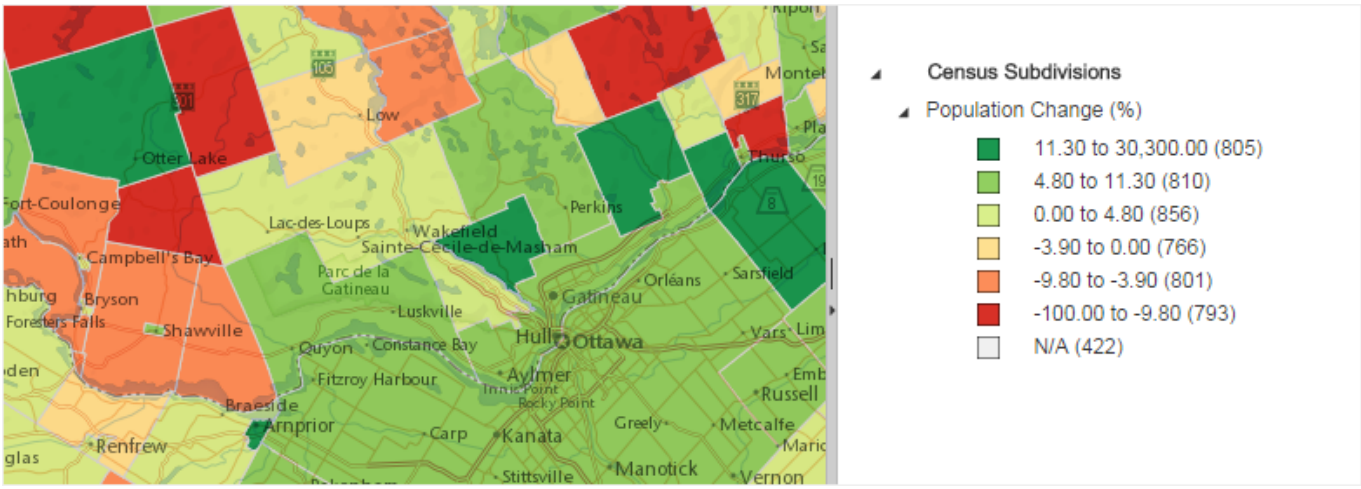
Color Categories

This type of thematic analysis is commonly used to show categories of a thematic data as a classification, using different colors. It is applicable to **point**, **polyline** or **polygon** layers with **string** data.



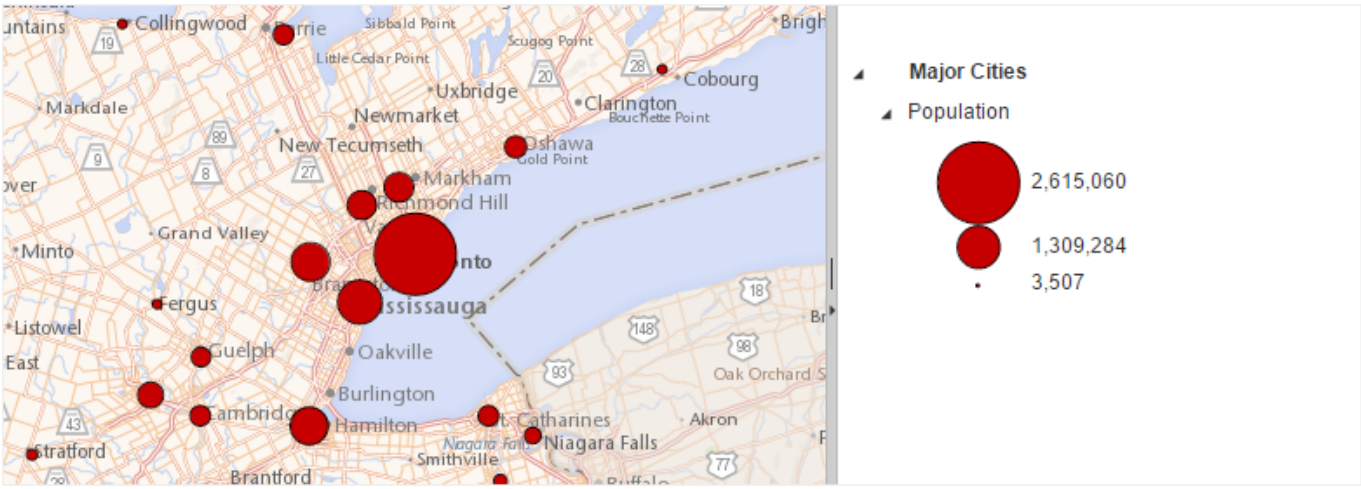
Color Ranges

This type of thematic analysis helps you compare your data by displaying color ranges. It is applicable to **point**, **polyline** or **polygon** layers with **numeric** data.



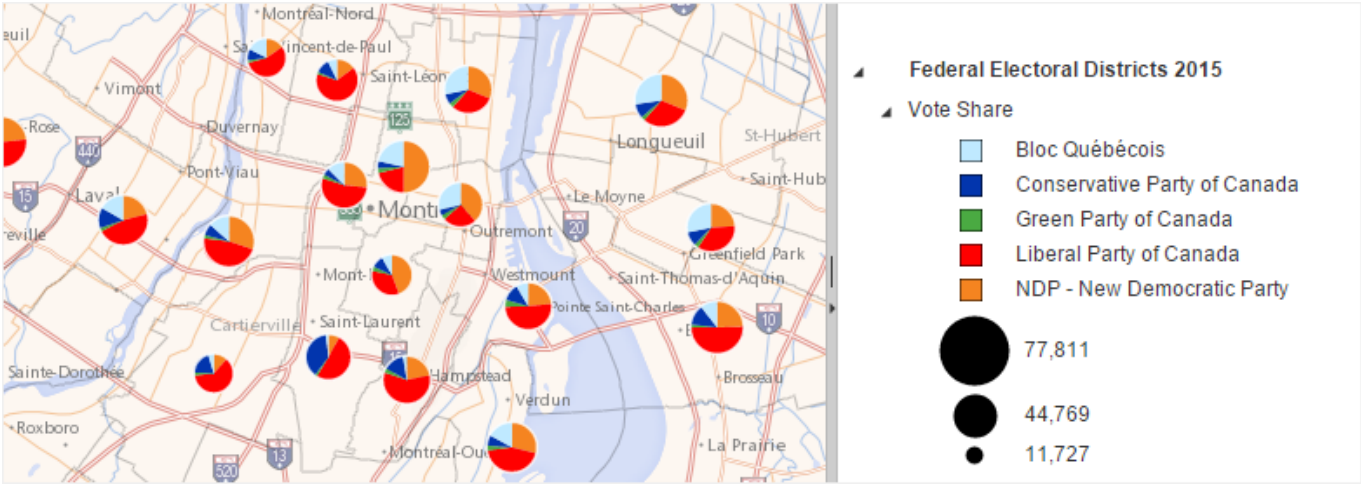
Graduated Size

This type of thematic analysis is used to apply a size graduation to map features. The larger the map feature is, the higher the value is. It is applicable to **point** or **polyline** layers with **numeric** data.



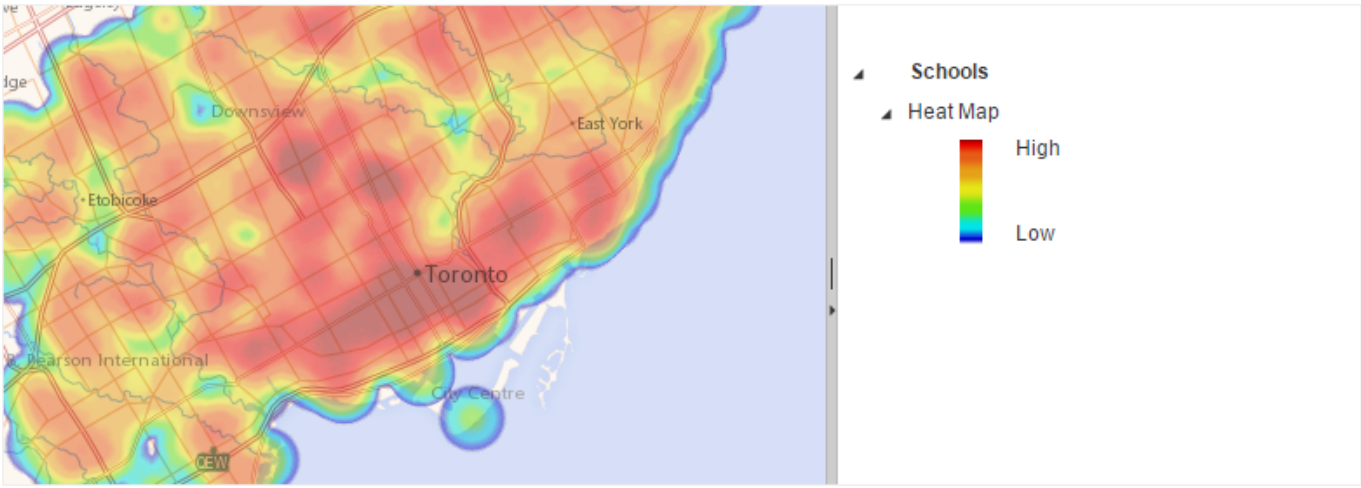
Pie Charts

This type of thematic analysis adds a pie chart at the centroid of every map feature. It is applicable to **point**, **polyline** or **polygon** layers with **numeric** data. To have access to this type of thematic analysis, you must select multiple thematic data with the same data unit. Each thematic data will be represented with a unique color. The area of each sector will indicate the category's relative importance in relation to others.



Heat Map

This type of thematic analysis uses a gradient of colors to display the geographic distribution of a **point** layer. In general, low-density areas are represented with cold colors (blue, green) while areas of high-density are displayed with warmer tones (yellow, orange, red). A heat map can also show the intensity of a **numeric** data.

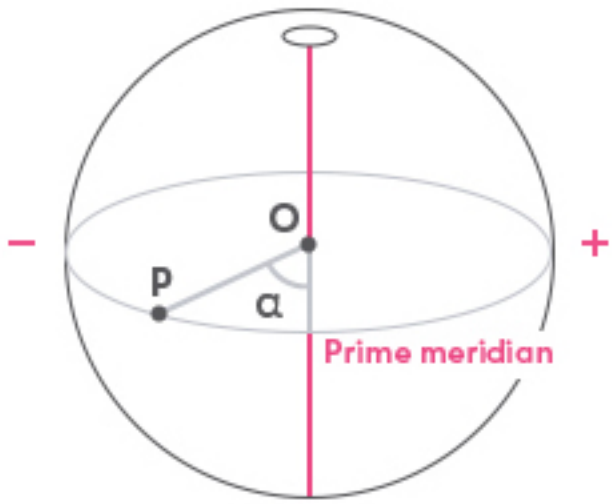
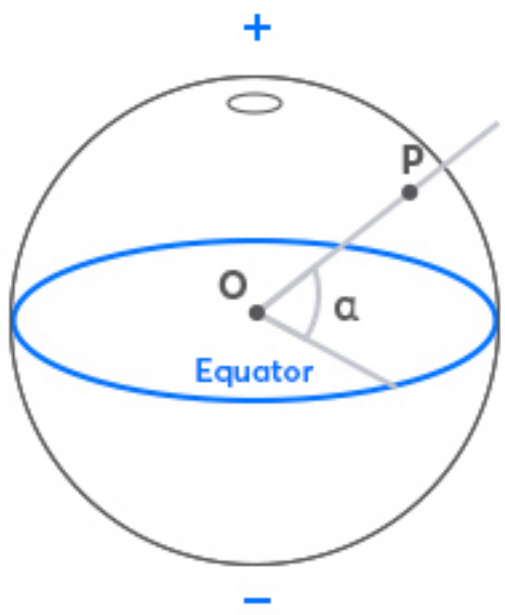


Coordinate Systems

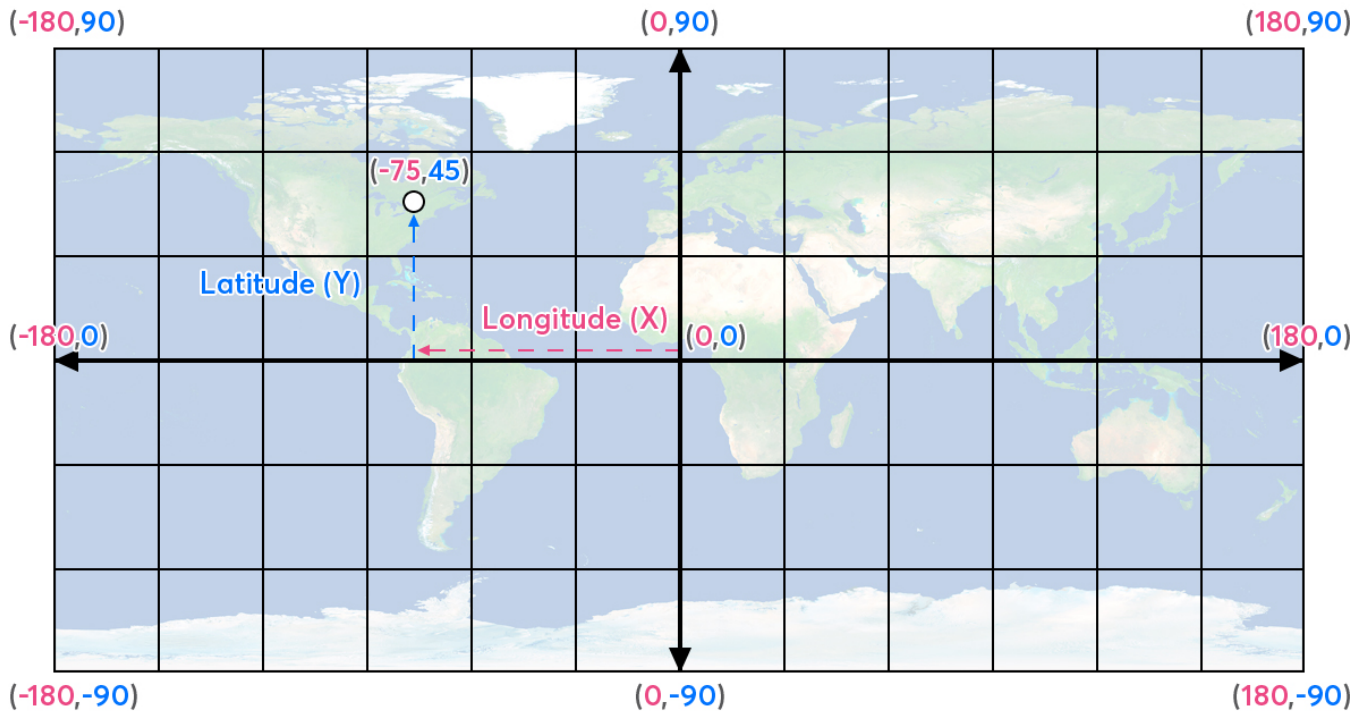
There are two common types of **coordinate systems** used in mapping: **geographic** and **projected**.

Geographic Coordinate System

A **geographic** coordinate system is a global or spherical system such as **latitude-longitude**.

Longitude (X)	Latitude (Y)
Longitude is defined in reference to the **prime meridian** called the **Greenwich meridian**. If a point is located to the East of the Greenwich meridian, the longitude is positive. If it is located to the West of the Greenwich meridian, the longitude is negative.	Latitude is defined in reference to the **parallel** which passes through the centre of the sphere and contains the great circle representing the **Equator**. If a point is located above the Equator, the latitude is positive. If it is below the Equator, the latitude is negative.
	

On a plan representation of the geographic coordinate system, angles are converted to X and Y coordinates. The origin (0,0) is defined as the intersection between the Equator and the Prime Meridian (Greenwich Meridian). The X positive values are on the East of the Prime Meridian and the Y positive values are on the North of the Equator. The X coordinate is in the range [-180;180] and the Y coordinate is in the range [-90;90]. For example, Ottawa is located approximately at (-75,45).



Projected Coordinate System

A **projected** coordinate system is based on a **map projection**, such as spherical Mercator or Lambert Conformal Conic. Map projections apply mathematical formulas to portray the spherical surface of the Earth on a flat surface, resulting in some distortions of the following properties: conformality, distance, direction, scale and area.

Spherical Mercator (ESPG: 3857)	Lambert Conformal Conic (ESPG : 42304)
	

It is important to pay attention to the projection of each map file. Sometimes, you will be asked to pick the right projection to display the map features at the right position.

Correct Position	Incorrect Position
	

CartoVista
See what was inaccessible.