Introduction

This procedural guide is intended to show UWO patrons how to create a thematic map using Canadian Census Data. This exercise uses Canadian Census Digital Cartographic Boundary files that have been provided by Statistics Canada to the University of Western Ontario for academic/research usage by faculty, students and staff.

For this exercise we will map 2001 Median Family Income of the City of London at the Census Tract (CT) level. Of course, the same steps outlined here can be used for other census measurement levels (ex. Dissemination Areas) or other CMAs or CAs.

Make sure you have the following programs installed on your computer workstation:
- ArcGIS 9.x
- WinZip 10 (or another file extraction program)
- Beyond 20/20 (available through IDLS)
- MS Excel

Step 1 – Download Census Cartographic Boundary Data

Digital Cartographic Boundary (DCB) files can be downloaded via the World Wide Web by UWO patrons from the Internet Data Library System (IDLS) at http://idls.uwo.ca.   In your web browser, navigate to the IDLS page and select "**Advanced Search**".

To narrow down the search results, enter the following search parameters: **London** for *Geography*, **Census Tract (CT)** for *Measurement Level*, **Census-Canada-2001** for *Subjects*, and **Map** for *File Type*.

Advanced File Search

Field	Operator	Value
File Name	AND	
Author or Organization	AND	
Abstract	AND	
Geography	AND	London
Measurement Level	AND	Census Tract (CT)
Subjects	AND	Census - Canada - 2001
File Type	AND	Map
Date	AND	

Click the Search button. Make sure that the search result shows Census of Canada – London Census Tracts. Click on the **Download ArcView format file** to download the file *gct_555b02a_e.zip* (ZIP format).

Census of Canada, 2001: Cartographic Boundary File Map of Census Metropolitan Areas: London, Ontario at the Census Tract (CT) level (CBF)
File type: Map;
Access restrictions: DLI
HTML Links: / Download ArcView format file (ZIP, 230,869 bytes) / Download MapInfo format file (ZIP, 263,217 bytes) / Documentation (PDF, 353 kb) /
File description

Once the ZIP file has finished downloading, extract the file using **WinZIP** or another file extraction program.

Step 2 – Cartographic Boundary File Conversion

The boundary file *gct_555b02a_e.e00* is in ARC/INFO interchange file format (E00) and will need to be converted to an ESRI Coverage type to view in ArcMap. Coverages should then be converted to ESRI Shapefiles. To translate the file:

a) Open **ArcCatalog** from your Windows Start Menu.

b) In the main ArcCatalog menu, click on *Tools>Customize…* and make sure there is a checkmark in the checkbox beside the **ArcView 8x Tools** option. If not, check it and close the window. This will bring up the Conversion Tools menu button in ArcCatalog.

c) Click on the Conversion Tools button and select **Import From Interchange File**. For the Input File, select *gct_55b02a_e.e00*. For the Output dataset, browse to a suitable location and make sure to type in a name for the output, such as "*London_CT*" (no spaces!). Click OK.

You can now view the data. Open **ArcMap** from the Windows Start Menu. Use the Add Data button   and browse to your newly created Coverage file *London_CT*. Once you add the data, you should be able to see the Census Tract boundaries of London.

Shapefiles are easier to transfer to other computers and also editable within ArcGIS, therefore you should now convert the Coverage to a Shapefile.

d) Right-click on the *London_CT* layer name in the ArcMap Table of Contents to open a context menu.

e) Select *Data>Export Data…* to bring up the Export Data window. Make sure to export All Features, and to use the same coordinate as this layers source data. Browse to a Save location and give the Shapefile a meaningful name (you can name it *London_CT* if you like, it will not overwrite the Coverage file). Click OK and add it to the map.

Step 3 – Download Census Attribute Data

By looking in the Attribute table of the Census Cartographic Boundary file you will notice that there is no census data – such as population counts, density, education, income, etc. This needs to be downloaded from IDLS (http://idls.uwo.ca) and then joined to the Cartographic Boundary file in ArcMap. Please note that you must have the Beyond 20/20 Professional Browser to accomplish the rest of this exercise. UWO patrons can download this browser from IDLS.

Just like you did for the Census Cartographic Boundary file, in your web browser navigate to the IDLS page and select "**Advanced Search**".

To narrow down the search results, enter the following search parameters: **Family Income** for *File Name*, **Census Tract (CT)** for *Measurement Level*, **Census-Canada-2001** for *Subjects*, and **Any** for *File Type*.

Advanced File Search

File Name	AND ⌄	Family Income
Author or Organization	AND ⌄	
Abstract	AND ⌄	
Geography	AND ⌄	
Measurement Level	AND ⌄	Census Tract (CT) ⌄
Subjects	AND ⌄	Census - Canada - 2001 ⌄
File Type	AND ⌄	Any ⌄
Date	AND ⌄	

Click the Search button. Make sure that the search result shows Census of Canada, 2001, Table 95F0436XCB01002: 2000 Family Income (4)… Click on the **Get B20/20 Data** to download the table (IVT format). Open the file with Beyond 20/20.

***** Note: Beyond 20/20 Professional Browser can be downloaded by UWO community members through IDLS. When you download the Census table file, look to the right of the download link to find the **About Beyond 20/20** link. Clicking this link will give instructions on how to download the software.*

Step 4 – Format Census Attribute Data for use in ArcGIS

In the Beyond 20/20 browser, you will now format the table so it is usable in ArcGIS. If your have not done so, open the IVT file with **Beyond 20/20**.

a) Reposition the data in the Columns and Rows of the Table, so that the **Geography (Census Tracts)** are along the side of the table and the **2000 Family Income** along the top. (This is easily accomplished by dragging the label header, in this case "Geography", to the side of the viewer.)

b) Now Subset the data to include only London Census Tracts. Highlight the **Geography** heading and then select *Dimension* from the main menu and then select *Search*.

c) In the Search Window, select the "Field" **English Desc**, make sure the "Type of Selection" is **Reduce**, and type **555** into the "Text to Find" box. (555 is the Census Tract code for London). See graphic below. Click OK.
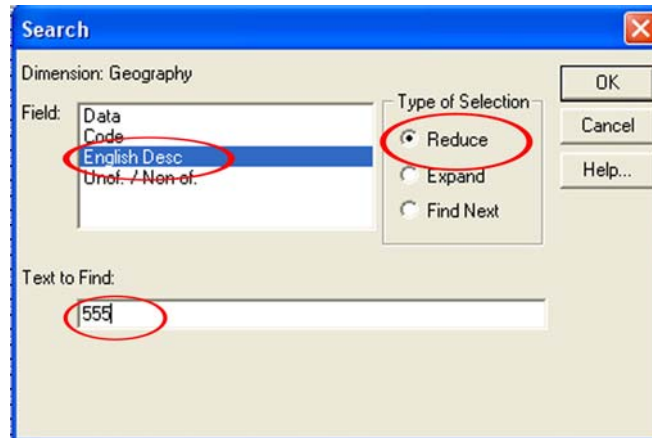
d) Save the table as a DBF file, by selecting *File>Save As...* Make sure the file type is .dbf and give it a new name, example *London_Income.dbf* (Do **NOT** use the same name as your shapefile!). Close Beyond 20/20.

Step 5 – Join the Data Tables in ArcGIS

To execute the spatial join, there must be at least one field in each of the tables being joined that match, ie. a common attribute. In the case of census data every Census Tract has been given a unique identification code by Statistics Canada. We can use these codes to execute a one-to-one join of the data table and the boundary file.

If you have closed **ArcMap**, you will need to reopen it and add your London Census Tract Boundary Shapefile (*London_CT.shp*).

a) Right click on the London Census Tract Boundary layer name and click *Open Attribute Table*. Take a look at the attribute information in this table. Notice that the field **CTNAME** holds the census tract ID information needed to execute the join. Leave the attribute table open.

b) Add the *London_Income* DBF table to ArcMap. Right click on the DBF file layer name and click *Open*. Notice that the Census Tract ID information is located in the **GEOGRAPHY** field, but the entries do not match the CTNAME field exactly. See graphic below.

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c) To make them match we will have to "trim" the entries in the GEOGRAPHY field to include only the first 7 digits. To so right click on the field name GEOGRAPHY in the table and select *Calculate Values…* to bring up the *Field Calculator*. When the message box pops up, click YES to continue.

d) In the Field Calculator, under *Type* select the **String** radio button; click on **Left( )** in the *Functions* box; and click on **GEOGRAPHY** in the *Fields* box. At the text box at the bottom of the window, you will need to type in **,7** (comma 7) after **[GEOGRAPHY]** but before the last bracket **)**.

In the text box at the bottom of the window you should have the following:

Left（[GEOGRAPHY],7）
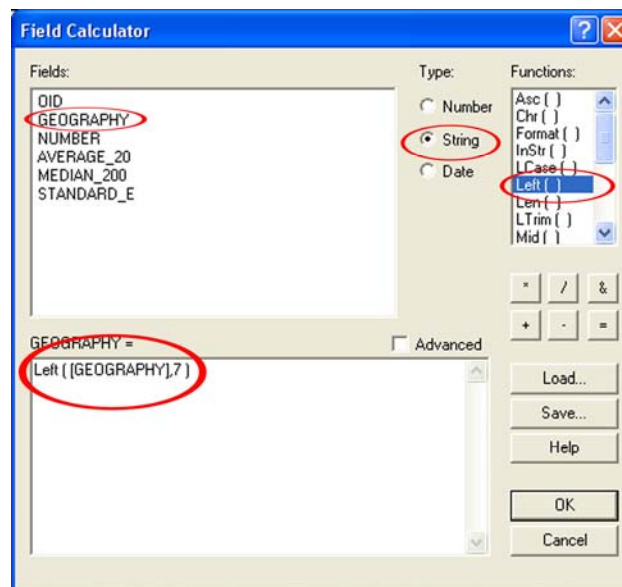
Click OK. Check the attribute table of *London_Income* to see the result. Close both tables.

e) Now we are ready to join the tables. Right Click on the London Census Tracts boundary layer and select *Joins and Relates>Joins…* Enter **CTNAME** as the field in the layer that the join will be based on. ArcGIS should automatically select the **London_Income** table as the table to join to the layer, and the **GEOGRAPHY** field as the field to base the join on in that table. If not, select these options. Click OK and Click YES to Index the fields if prompted.

f) Reopen the Attribute table of the London Census Tract Boundary (*London_CT.shp)* layer. Scoll right to see the joined fields.

g) You can now export this file as a new shapefile that contains all joined attribute data. To do so:

Right click on the *London_Census Boundaries* layer and select **Data>Export Data***…* to bring up the Export Data window. Make sure to export All Features, and to use the same coordinate as this layers source data. Browse to a Save location and give the Shapefile a meaningful name (example: *London_CT_Income_Join*). Click OK and add it to the map.

Step 6 – Create the Thematic Map

You are now ready to create your thematic map based on a classification method

a) Right click on the newly exported shapefile *London_CT_Income_Join* and select **Properties**. Click on the *Symbology* tab and select **Quantities>Graduated Colors** as the colour scheme.

b) Select **Median Income** as the Fields Value to use for the classification and select the number of classes to use. (If you would like to classify using a different method, click the **Classify…** button to explore the options available.)

c) Change the colour ramp to something more meaningful if necessary.
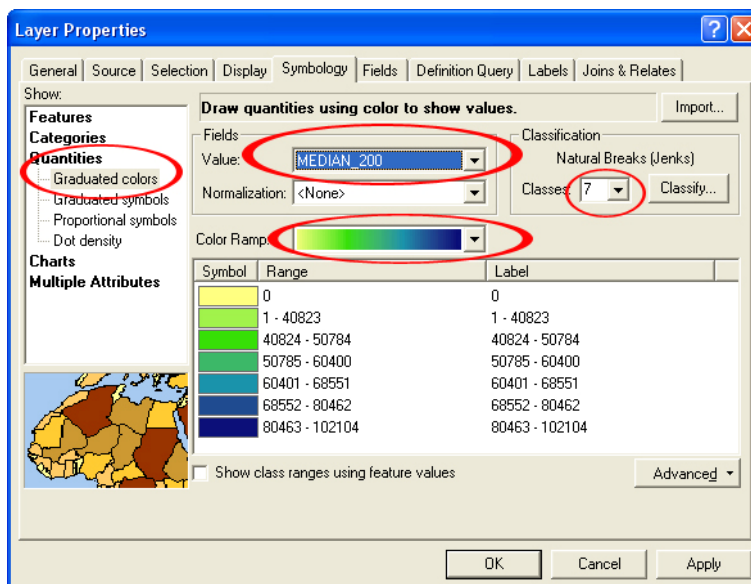
Click OK.

You should now have a map similar to the graphic below. It is up to you how your map will look. Try switching to **Layout view** and adding the elements of a proper map.