ArcMap 101

Resource Note #16

Community Social Profile Project

October 2008

Preface

- The Resource Note is intended to increase our understanding of and broaden our knowledge base on key subject areas that are fundamental in building our capacity in numeric and geographic analysis.
- It is not an in-depth or comprehensive discussion of the subject matter.
- It highlights certain relevant and important areas that deserve our attention and consideration.
- It can also serve as a “how-to” guide with instructions to perform certain task
- It is intended to be informal and informative.

Introduction

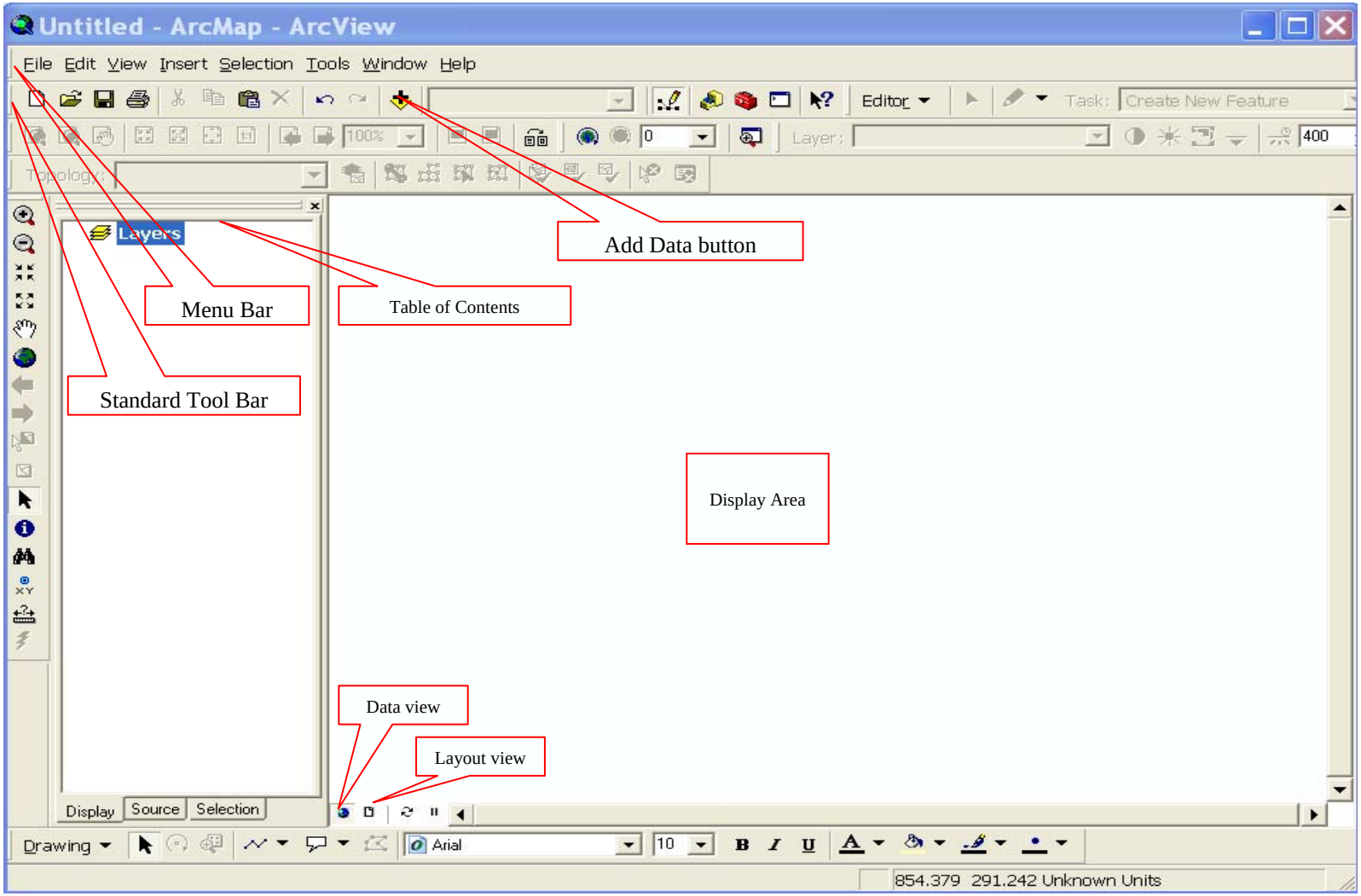
- This is the 16th Resource Note, previous notes include:

1	Census Geography	11	Community Social Profile Template (part 1)
2	Census Data	12	Some quick ways to access census data
3	PCensus Database	13	Community Social Profile Template (part 2)
4	Geocoding	14	Mapping Migration and Commuting data
5	Cartographic Principles	15	Census of Argriculture
6	Thematic Mapping		
7	2006 Census		
8	Population Pyramid		
9	PCensus DBX v8.5		
10	GIS Data and File Management		

Introduction

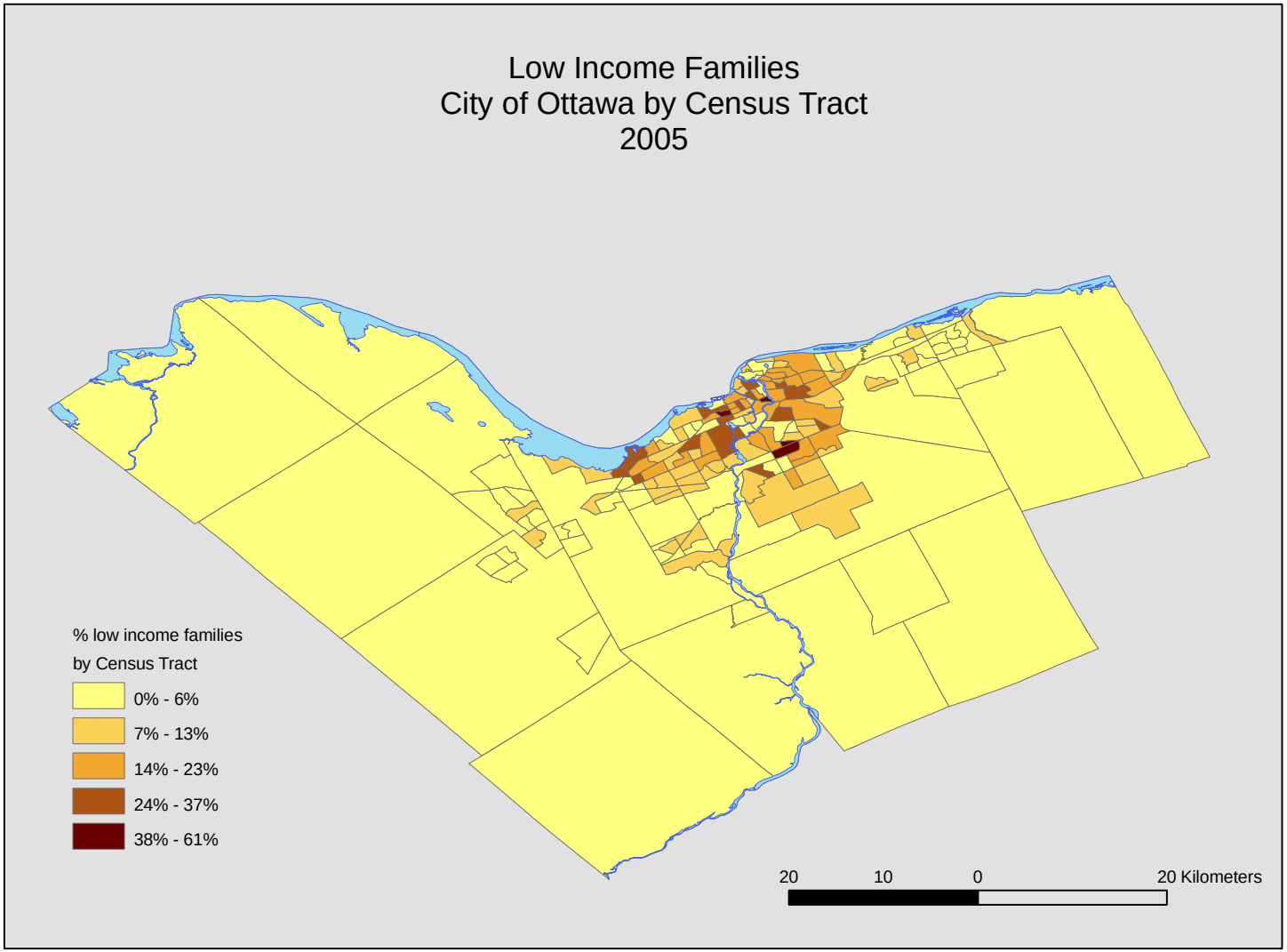
- This resource note is a simplified “how-to” guide to create a thematic map using the ArcMap software (ArcMap 9.2)
- For more detailed instructions to perform additional tasks, please refer to the mapping tutorials and online ArcMap Desktop Help from ESRI
- Please refer to previous Resource Notes on related specific areas

ArcMap Interface



Example

- To create a thematic map showing low income families in the City of Ottawa (as shown)
  - Using 2006 Census
  - Using Census Tract as display spatial unit
  - Displaying percentage of low income families



Source: Statistics Canada, 2006 Census

Add datafile and shapefile

- To create a map, ArcMap requires two sets of data, one on the boundaries of the displaying geographic units (shapefile), the other on the variable(s) to be mapped (datafile)
- Datafile
  - Data on low income families from PCensus datafile
- Shapefiles
  - 2006 Census Tract for the City of Ottawa
  - Water layer from DMTI
  - Road network layer from DMTI

Datafile

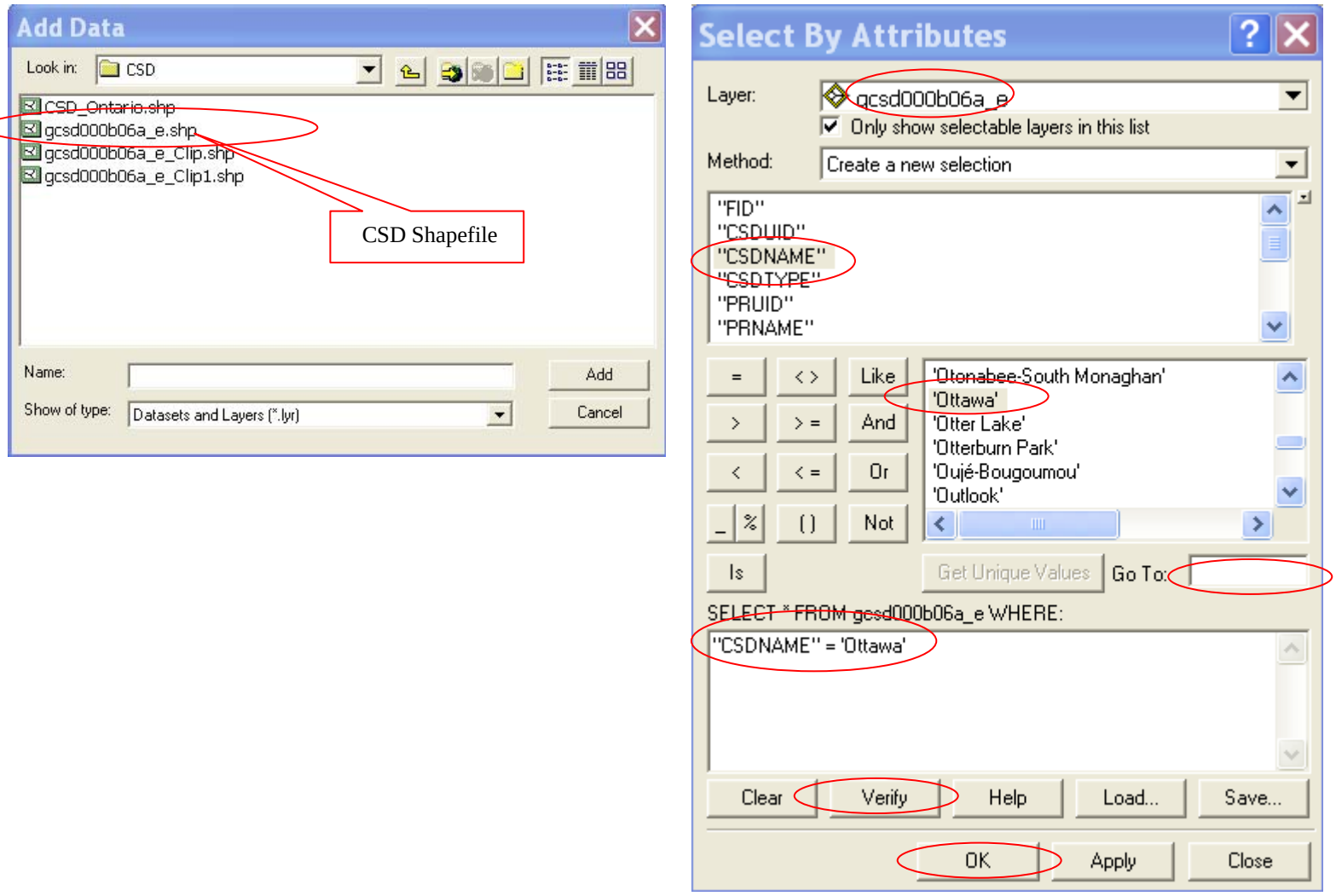
- The datafile to be used in this example is created from using the PCensus DBX version 8.5
- It contains the data on low income families by Census Tract for the City of Ottawa
- For a step-by-step guide to extract the datafile, please refer to Resource Note#9 – PCensus DBX version 8.5

Census Tract Shapefile

- To create a Census Tract shapefile for the City of Ottawa in two steps:-
  - First, create a CSD (Census Subdivision) shapefile for the City the Ottawa
  - Secondly, selected all the CTs that are within the CSD boundary of Ottawa

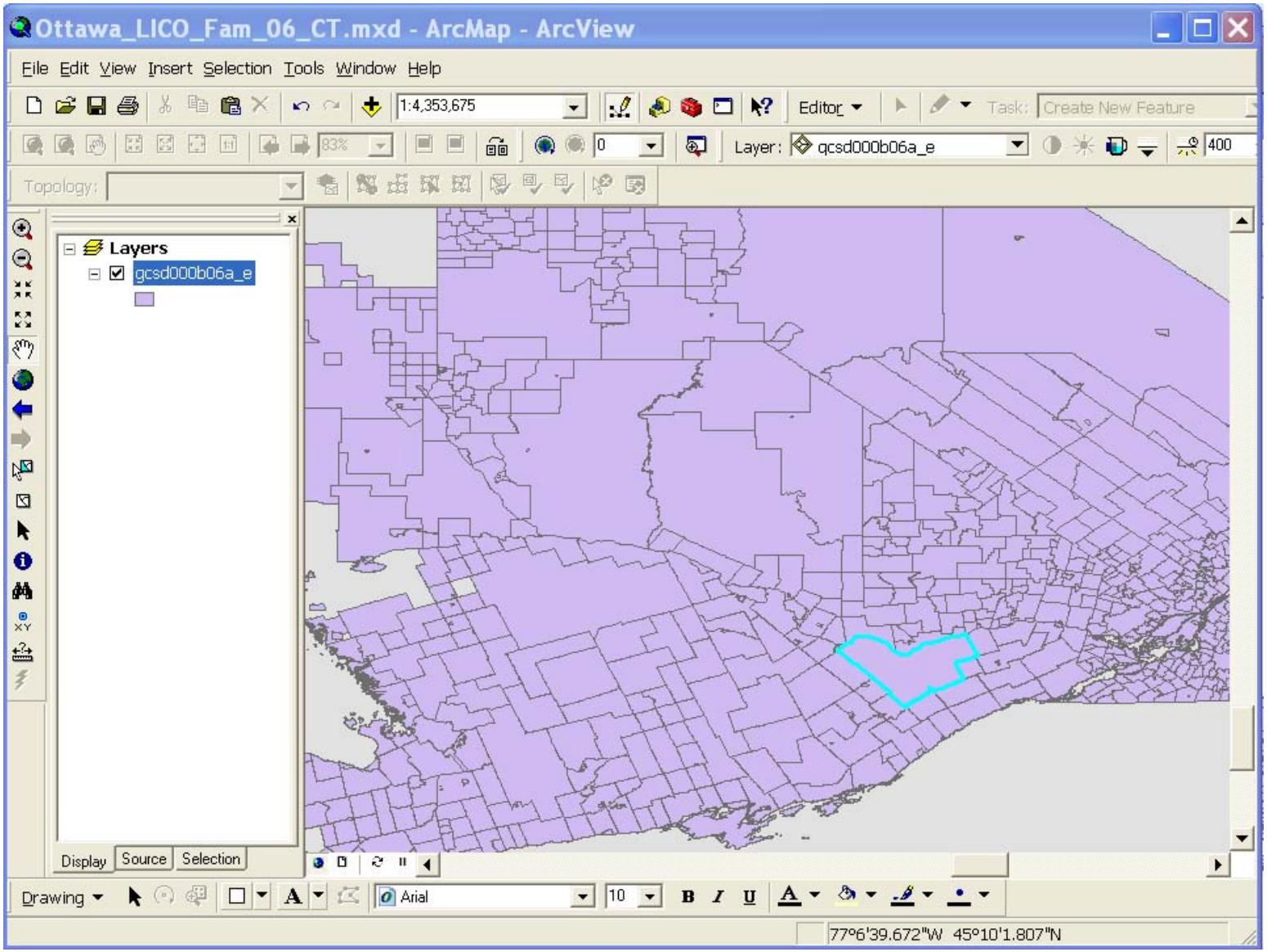
CSD Shapefile

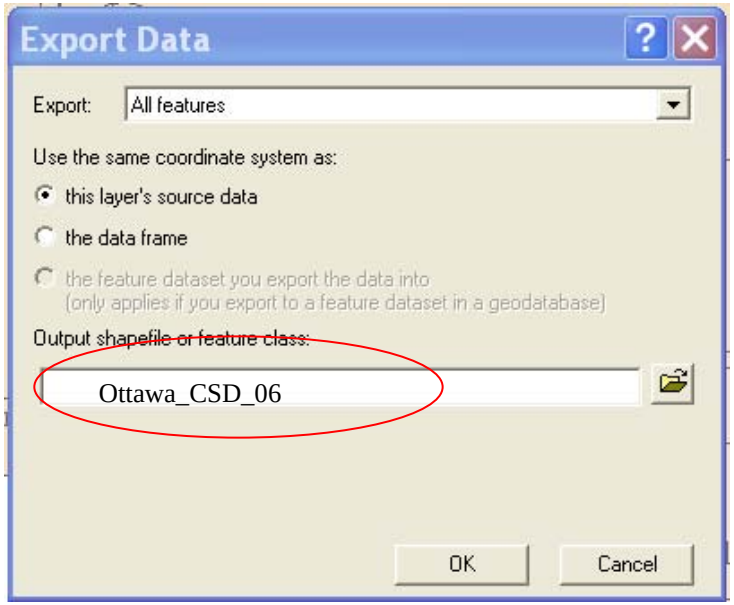
- In the Standard Tool Bar, click the Add Data button
- From the dropdown window, select the provincial CSD shapefile (filename: gcsd000bo6a_e)
- Click the Selection button and choose “Select by Attributes”
  - Highlight “CSDNAME” in the window and click the (=) sign
  - Scroll down to the list of CSD names and double click on “Ottawa” or type in “Ottawa” in the “Go to” window
  - ‘CSDNAME=Ottawa’ will appear in the lower window
  - Click “Verify” to ensure correct spelling
  - Click OK

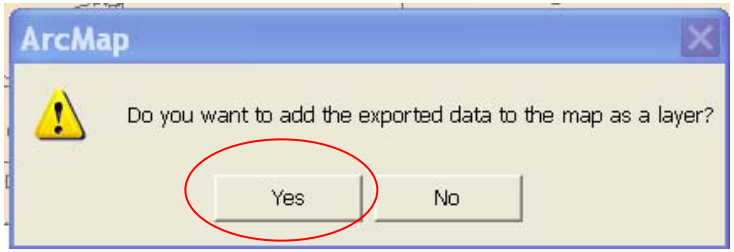

Add Data
Look in: CSD
CSD_Ontario.shp
gcsd000b06a_e.shp
gcsd000b06a_e_Clip.shp
gcsd000b06a_e_Clip1.shp
CSD Shapefile
Name:
Add
Show of type: Datasets and Layers (*.lyr)
Cancel
Select By Attributes
Layer: gcsd000b06a_e
Only show selectable layers in this list
Method: Create a new selection
"FID"
"CSDUID"
"CSDNAME"
"CSDTYPE"
"PRUID"
"PRNAME"
= <> Like
> >= And
< <= Or
_ % ( ) Not
Is
'Otonabee-South Monaghan'
'Ottawa'
'Otter Lake'
'Otterburn Park'
'Oujé-Bougoumou'
'Outlook'
Get Unique Values
Go To:
SELECT * FROM gcsd000b06a_e WHERE:
"CSDNAME" = 'Ottawa'
Clear
Verify
Help
Load...
Save...
OK
Apply
Close

Ottawa CSD Shapefile

- The boundary of the City of Ottawa will be highlighted on the map
- Save the CSD shapefile
  - In the Table of Content (TOC), right click on the CSD layer (gcsd000b06a_e)
  - Click Data > Export Data
  - Name the shapefile
  - Add exported data to the map

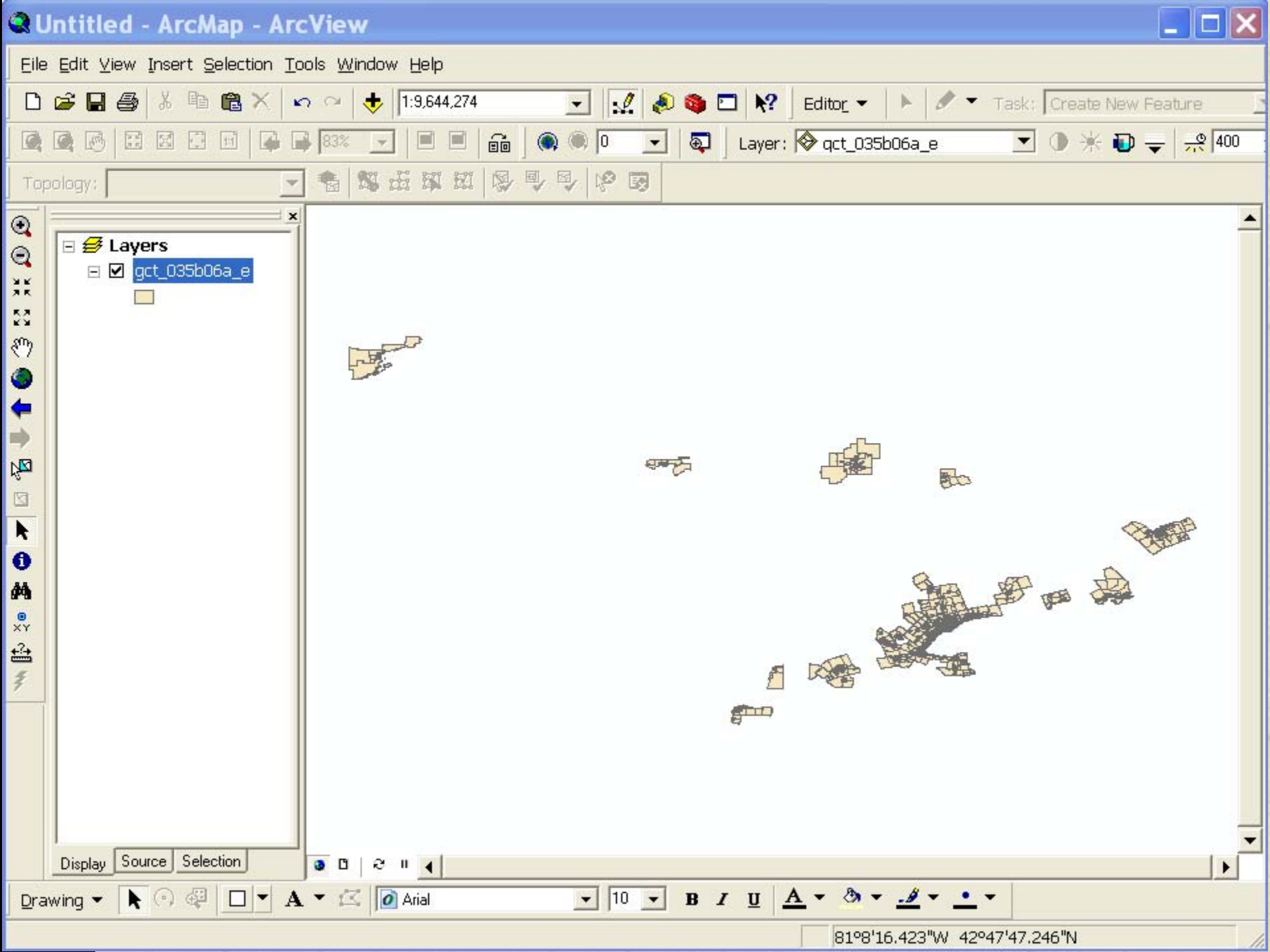

Ottawa_LICO_Fam_06_CT.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:4,353,675
Editor
Task:
Create New Feature
Layer:
qcsd000b06a_e
Topology:
Layers
qcsd000b06a_e
Display
Source
Selection
Drawing
Arial
10
77°6'39.672"W 45°10'1.807"N

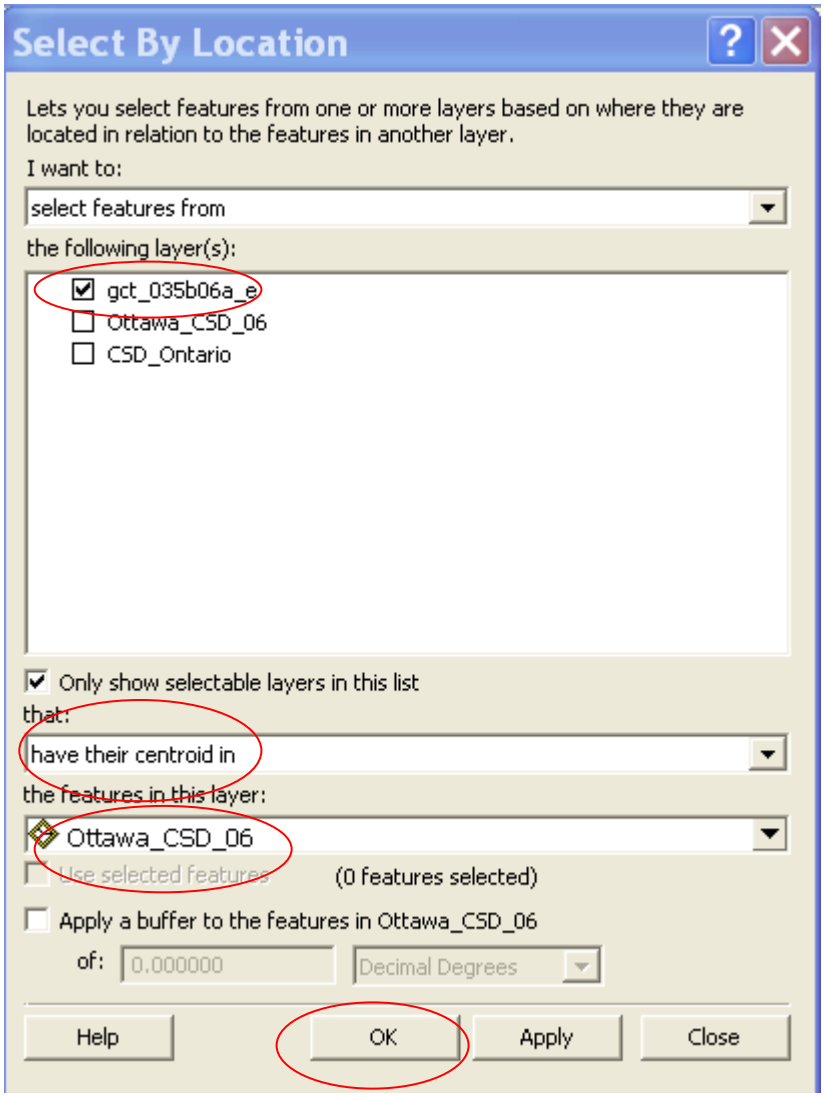

Export Data
Export:
All features
Use the same coordinate system as:
this layer's source data
the data frame
the feature dataset you export the data into
(only applies if you export to a feature dataset in a geodatabase)
Output shapefile or feature class:
Ottawa_CSD_06
OK
Cancel

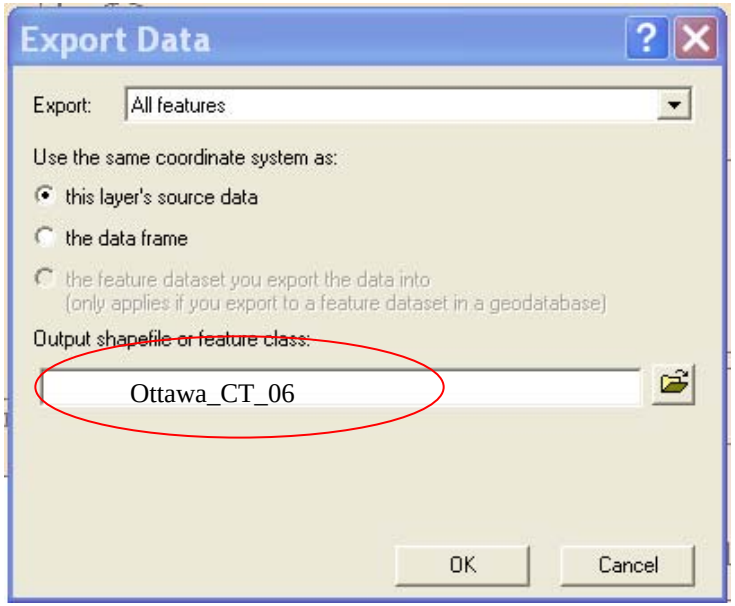

ArcMap
Do you want to add the exported data to the map as a layer?
Yes
No

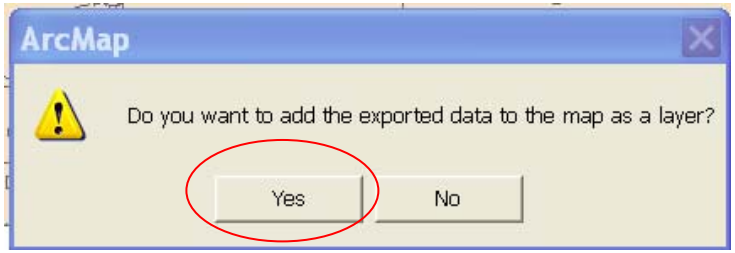
Ottawa CT Shapefile

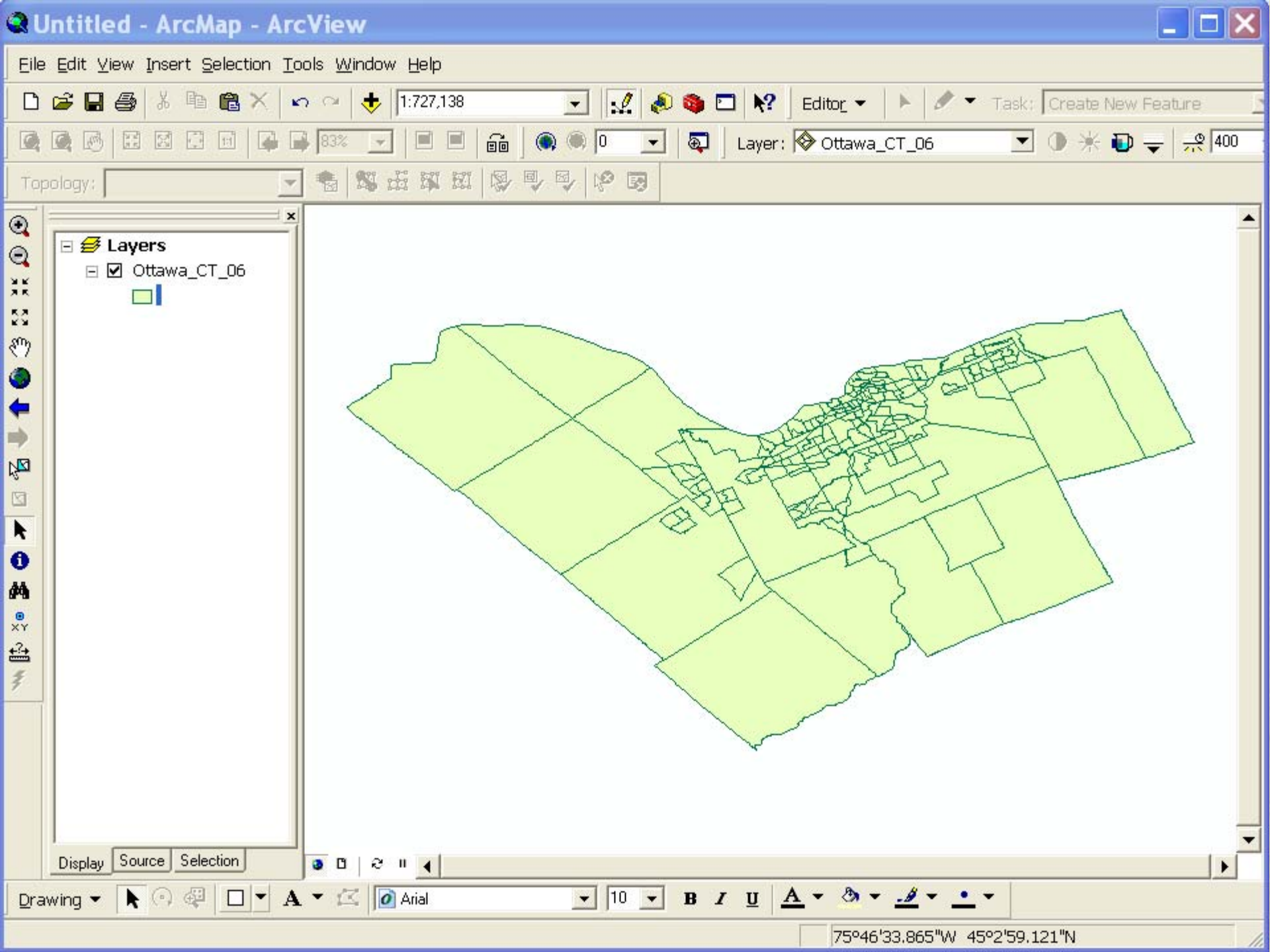
- In the Standard Tool Bar, click the Add Data button
- From the dropdown window, select the provincial CT shapefile (gct_035b06a_e)
- Click the “Selection” button and choose “Select by Location”
  - Check the CT Shapefile
  - In the next window, from the dropdown list, click “have their centroids in”
  - In the next window, click the Ottawa CSD layer
  - Click OK
  - The CTs within the City of Ottawa will be highlighted
  - Click Data> Export Data
  - Name the shapefile
  - Add exported data to the map


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:9,644,274
Editor
Task:
Create New Feature
Layer:
qct_035b06a_e
Topology:
Layers
qct_035b06a_e
Display
Source
Selection
Drawing
Arial
10
81°8'16.423"W 42°47'47.246"N


Select By Location
Lets you select features from one or more layers based on where they are located in relation to the features in another layer.
I want to:
select features from
the following layer(s):
gct_035b06a_e
Ottawa_CSD_06
CSD_Ontario
Only show selectable layers in this list
that:
have their centroid in
the features in this layer:
Ottawa_CSD_06
Use selected features
(0 features selected)
Apply a buffer to the features in Ottawa_CSD_06
of:
0.000000
Decimal Degrees
Help
OK
Apply
Close

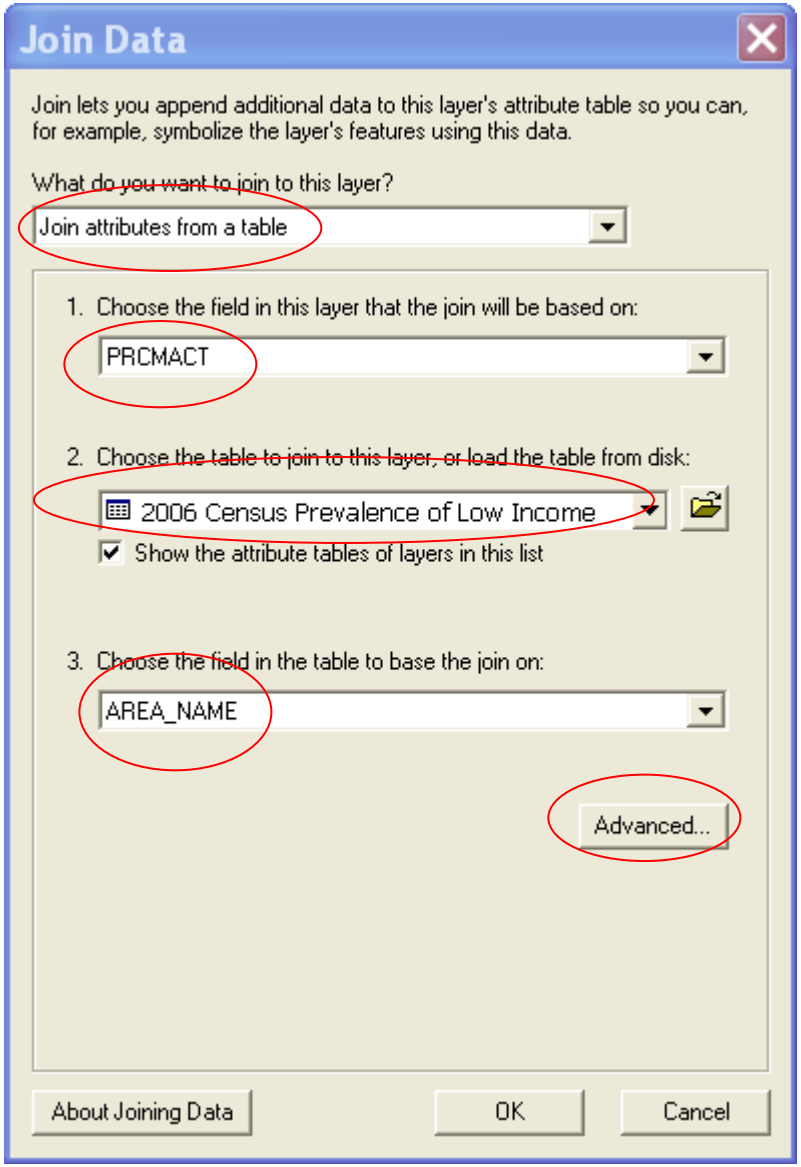

Export Data
Export:
All features
Use the same coordinate system as:
this layer's source data
the data frame
the feature dataset you export the data into
(only applies if you export to a feature dataset in a geodatabase)
Output shapefile or feature class:
Ottawa_CT_06
OK
Cancel


ArcMap
Do you want to add the exported data to the map as a layer?
Yes
No


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:727,138
Editor
Task:
Create New Feature
Layer:
Ottawa_CT_06
Topology:
Layers
Ottawa_CT_06
Display
Source
Selection
Drawing
Arial
10
75°46'33.865"W 45°2'59.121"N

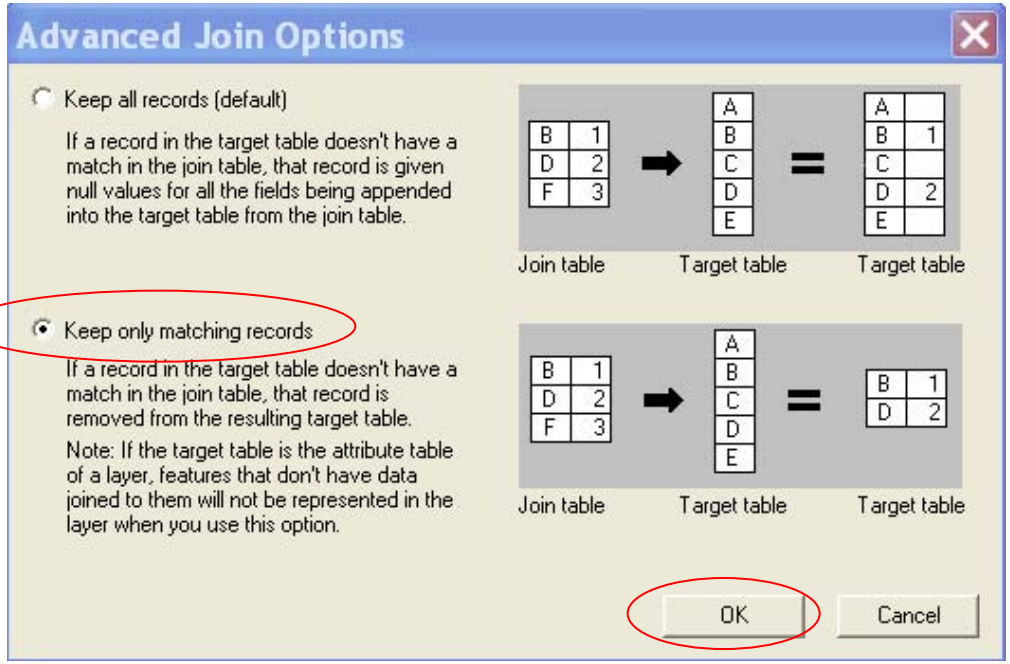
Joining datafile and shapefile

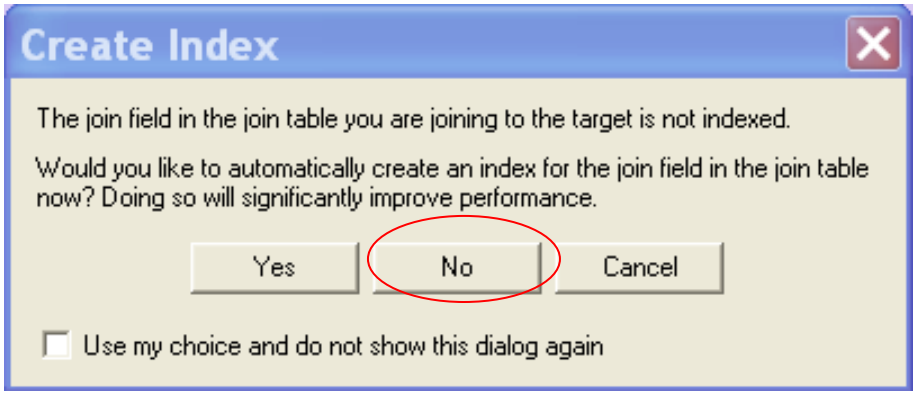
- In order to create the thematic map, it is necessary to join the datafile to the shapefile
- In the TOC
  - Right click on the CT layer
  - From the dropdown list, click Joins and Relates > Join
  - From the 1st window, click “Join attributes from a table”
  - From the 2nd window, click “PRCMACT” – CT number on the shapefile
  - From the 3rd window, click the PCensus datafile that contains the Low Income data at the CT level
  - From the 4th window, click “Area_Name” – CT number on the datafile
  - Click “advanced”


Join Data
Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.
What do you want to join to this layer?
Join attributes from a table
1. Choose the field in this layer that the join will be based on:
PRCMACT
2. Choose the table to join to this layer, or load the table from disk:
2006 Census Prevalence of Low Income
Show the attribute tables of layers in this list
3. Choose the field in the table to base the join on:
AREA_NAME
Advanced...
About Joining Data
OK
Cancel

Joining datafile and shapefile

- In the Advanced Join Options window, click “ keep only matching records
- In the “Create Index” window, click “No”


Advanced Join Options
Keep all records (default)
If a record in the target table doesn't have a match in the join table, that record is given null values for all the fields being appended into the target table from the join table.
Join table
Target table
Target table
Keep only matching records
If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.
Note: If the target table is the attribute table of a layer, features that don't have data joined to them will not be represented in the layer when you use this option.
Join table
Target table
Target table
OK
Cancel


Create Index
The join field in the join table you are joining to the target is not indexed.
Would you like to automatically create an index for the join field in the join table now? Doing so will significantly improve performance.
Yes
No
Cancel
Use my choice and do not show this dialog again

Joined table

- You can see if the two files are joined successfully by examining the contents of the joined table
- In TOC, right click on the CT layer, click “Open Attribute Table”
- The data of the two files are combined into one

Shapefile

+

Datafile

↓

Joined table

Attributes of % low income families

FID	Shape *	CTUID	CMAUID	PRUID	PRCMACT
0	Polygon	5050001.01	505	35	355050001.01
1	Polygon	5050001.04	505	35	355050001.04
2	Polygon	5050001.05	505	35	355050001.05
3	Polygon	5050001.06	505	35	355050001.06
4	Polygon	5050001.07	505	35	355050001.07
5	Polygon	5050001.08	505	35	355050001.08
6	Polygon	5050002.01	505	35	355050002.01

Attributes of 2006 Census Prevalence of Low Income

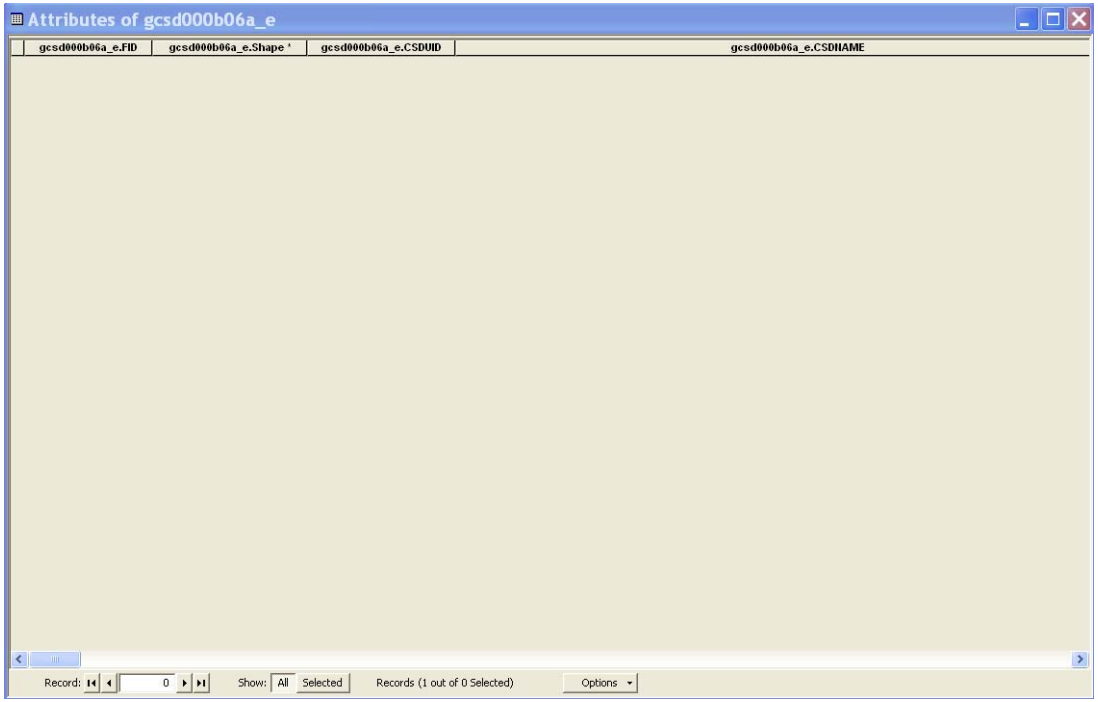
OID	AREA_NAME	CODE	XCOORD	YCOORD	ILOT	ILOTL	ILOTLX	ILOH	ILOHL	ILOHLX	ILOM	ILOML	ILOMLX
0	355050001.01	355050001.01	-75.64879	45.37285	1860	43	35	1160	33	26	55	0	18
1	355050001.04	355050001.04	-75.65031	45.35739	810	5	4	650	3	2	40	25	0
2	355050001.05	355050001.05	-75.63816	45.3651	1500	14	10	1225	8	5	50	40	44
3	355050001.06	355050001.06	-75.6318	45.36236	1625	19	15	1220	12	11	60	42	42
4	355050001.07	355050001.07	-75.61352	45.36969	1125	13	11	855	8	5	20	0	0
5	355050001.08	355050001.08	-75.61248	45.37428	1225	15	11	1010	11	9	35	29	0
6	355050002.01	355050002.01	-75.67649	45.36148	950	2	2	855	3	2	15	0	0

Attributes of % low income families

Ottawa	Ottawa_C	Ottawa_CT_0	Ottawa	Ottawa	Ottawa_CT_06.P	Ottawa	2006 C	2006 Census Pr	2006 Census Pr	2006 Ce	2006 Cen	2006 Cen	2006 Census	2006 C
0	Polygon	5050001.01	505	35	355050001.01	0	0	355050001.01	355050001.01	-75.648	45.37285	1860	43	
1	Polygon	5050001.04	505	35	355050001.04	0	1	355050001.04	355050001.04	-75.650	45.35739	810	5	
2	Polygon	5050001.05	505	35	355050001.05	0	2	355050001.05	355050001.05	-75.638	45.3651	1500	14	
3	Polygon	5050001.06	505	35	355050001.06	0	3	355050001.06	355050001.06	-75.631	45.36236	1625	19	
4	Polygon	5050001.07	505	35	355050001.07	0	4	355050001.07	355050001.07	-75.613	45.36969	1125	13	
5	Polygon	5050001.08	505	35	355050001.08	0	5	355050001.08	355050001.08	-75.612	45.37428	1225	15	
6	Polygon	5050002.01	505	35	355050002.01	0	6	355050002.01	355050002.01	-75.676	45.36148	950	2	
7	Polygon	5050002.02	505	35	355050002.02	0	7	355050002.02	355050002.02	-75.664	45.35336	1020	6	
8	Polygon	5050002.04	505	35	355050002.04	0	8	355050002.04	355050002.04	-75.693	45.3415	345	4	

Failure to join tables

- The join process is unsuccessful when the joined attribute table is empty

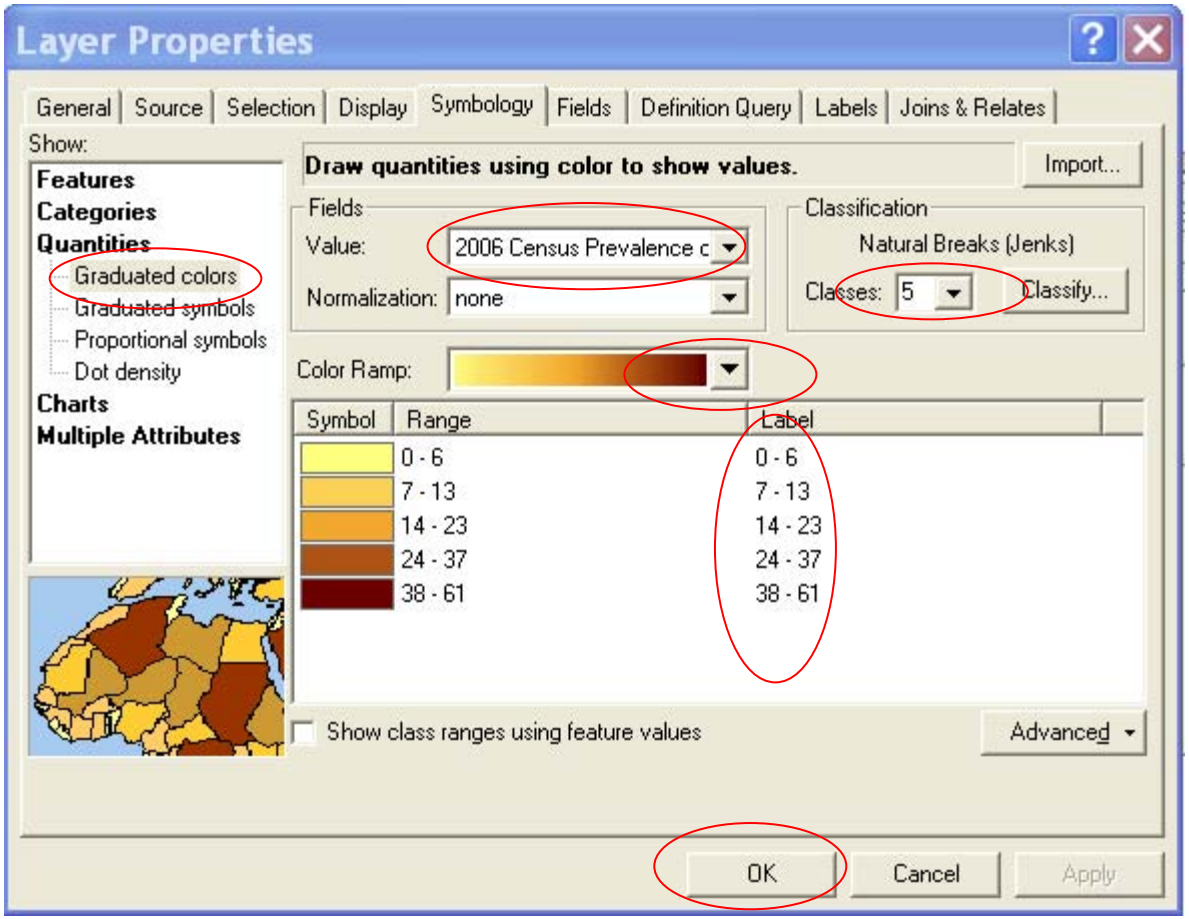


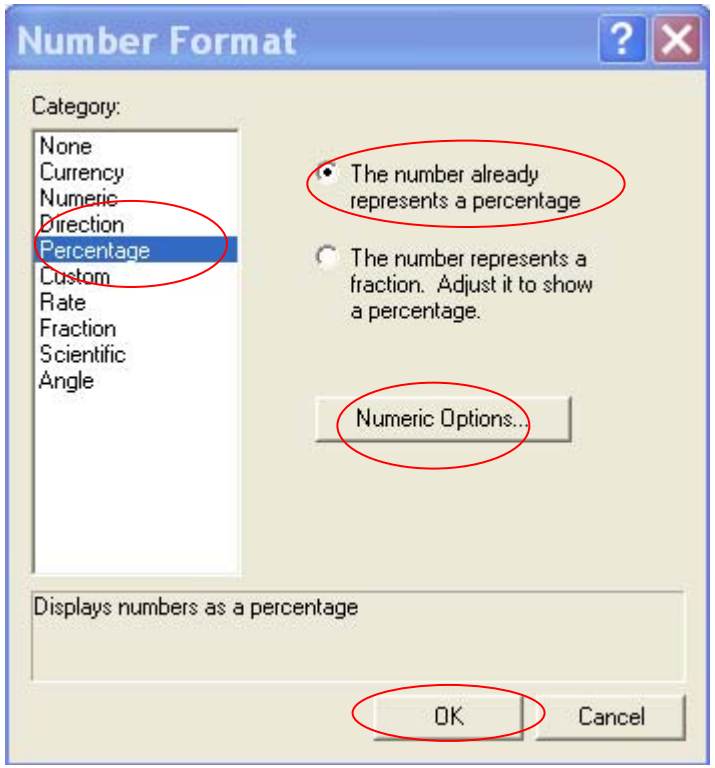
Failure to join tables

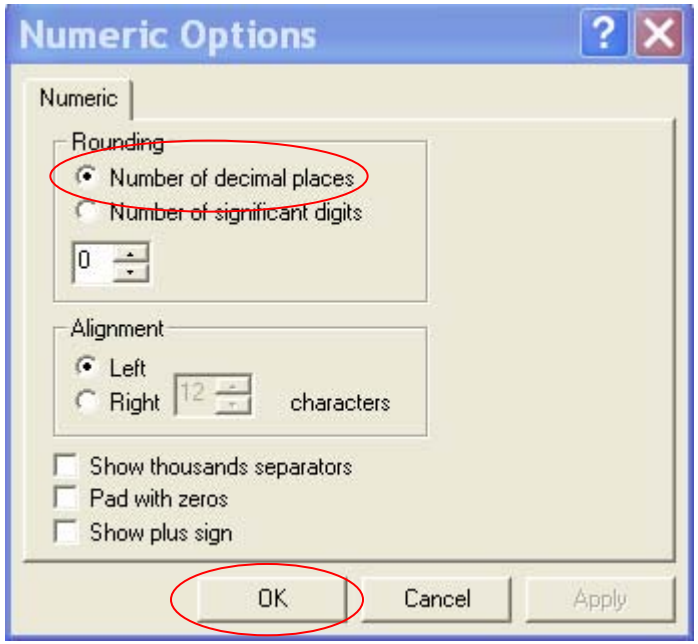
- There are many reasons that tables cannot be joined successfully, for example:
  - Un-matching geographical units (joining DA attribute table to a CT shapefile)
  - Incorrect geographical unit field specified (using “AREA_NAME” instead of “CODE”)

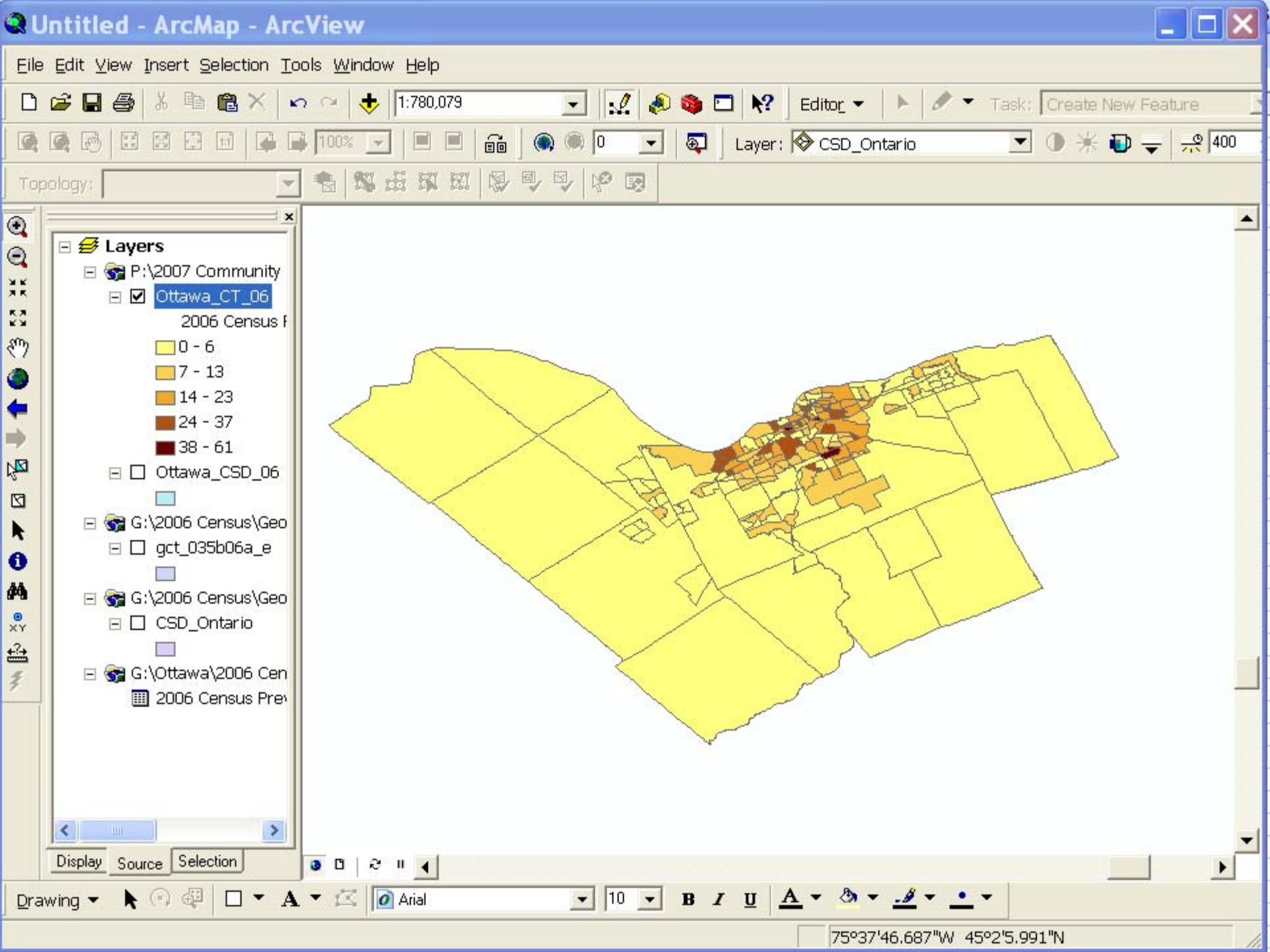
Symbolizing

- To symbolize is to represent quantity on a map
- Double click on the CT layer, the Layer Properties window will appear
  - In the “Show” window, click “Quantities” > Graduated Colors
  - In the Fields window, scroll down and highlight “2006 Census Prevalence of Low Income ILOTL” – low income families
  - In the Color Ramp window, scroll down and choose a color ramp or accept the default
  - The number of classifications can be changed, the default is five classes
  - Adding percentage to the classification range
    - Click on the “Label” heading > Format Labels
      - In “Number format” window – change to percentage
      - In “Numeric Option” window – select rounding options
  - Click OK
- For more information on thematic mapping, please refer to Resource Note #6 – Thematic Mapping: Mapping Spatial Data”


Layer Properties
General
Source
Selection
Display
Symbology
Fields
Definition Query
Labels
Joins & Relates
Show:
Features
Categories
Quantities
Graduated colors
Graduated symbols
Proportional symbols
Dot density
Charts
Multiple Attributes
Draw quantities using color to show values.
Import...
Fields
Value:
2006 Census Prevalence c
Normalization:
none
Classification
Natural Breaks (Jenks)
Classes:
5
Classify...
Color Ramp:
Symbol
Range
Label
0 - 6
7 - 13
14 - 23
24 - 37
38 - 61
0 - 6
7 - 13
14 - 23
24 - 37
38 - 61
Show class ranges using feature values
Advanced
OK
Cancel
Apply

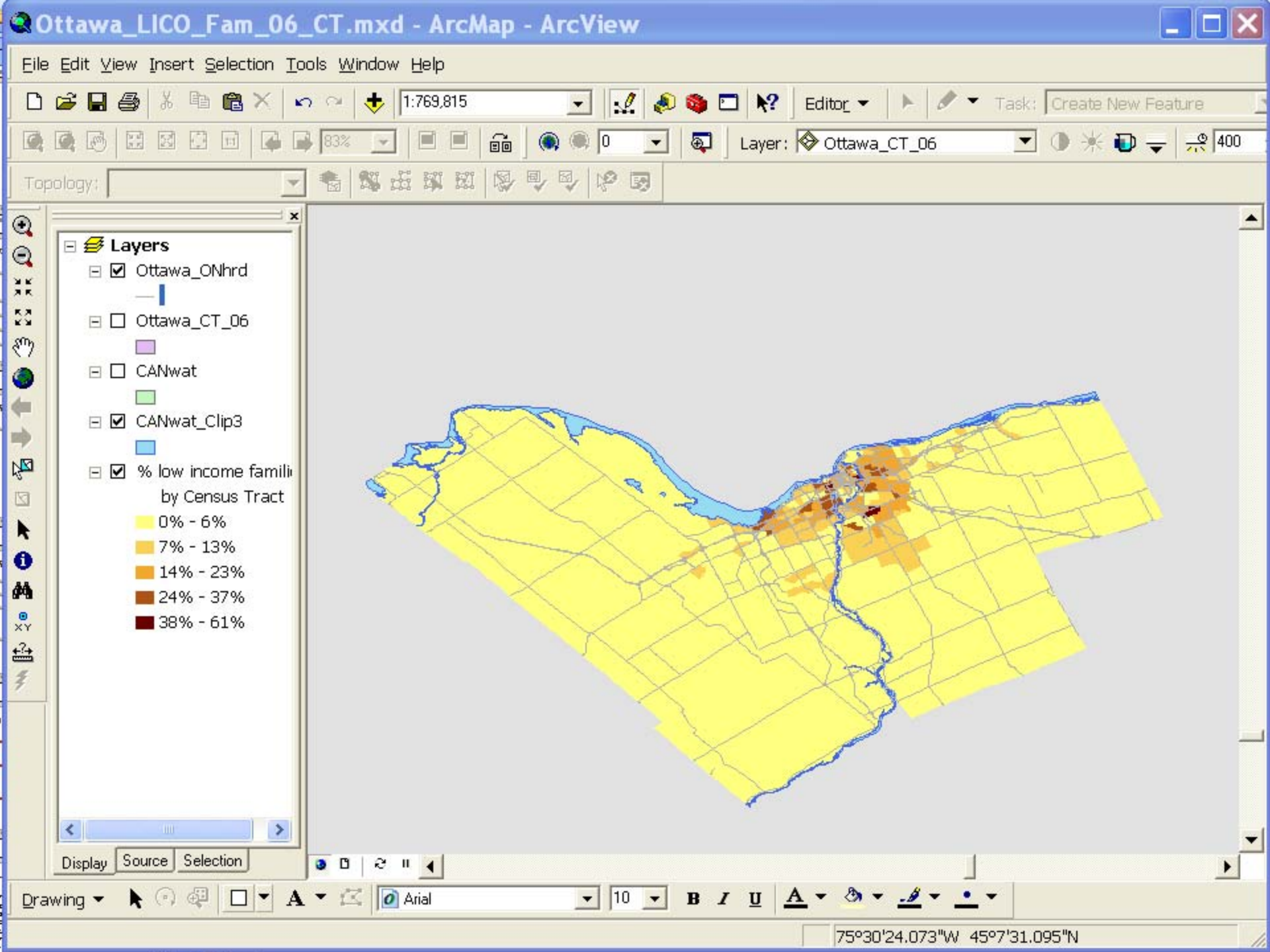

Number Format
Category:
None
Currency
Numeric
Direction
Percentage
Custom
Rate
Fraction
Scientific
Angle
The number already represents a percentage
The number represents a fraction. Adjust it to show a percentage.
Numeric Options...
Displays numbers as a percentage
OK
Cancel


Numeric Options
Numeric
Rounding
Number of decimal places
Number of significant digits
0
Alignment
Left
Right
12
characters
Show thousands separators
Pad with zeros
Show plus sign
OK
Cancel
Apply


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:780,079
Editor
Task:
Create New Feature
Layer:
CSD_Ontario
Topology:
Layers
P:\2007 Community
Ottawa_CT_06
2006 Census
0 - 6
7 - 13
14 - 23
24 - 37
38 - 61
Ottawa_CSD_06
G:\2006 Census\Geo
gct_035b06a_e
G:\2006 Census\Geo
CSD_Ontario
G:\Ottawa\2006 Cen
2006 Census Prev
Display
Source
Selection
Drawing
Arial
10
75°37'46.687"W 45°2'5.991"N

Adding other layers

- One can add a road network to provide more geographic references to the readers
- For the City of Ottawa, a layer showing the water features will be very useful
- Both road network and water feature layers can be found in the DMTI datafile

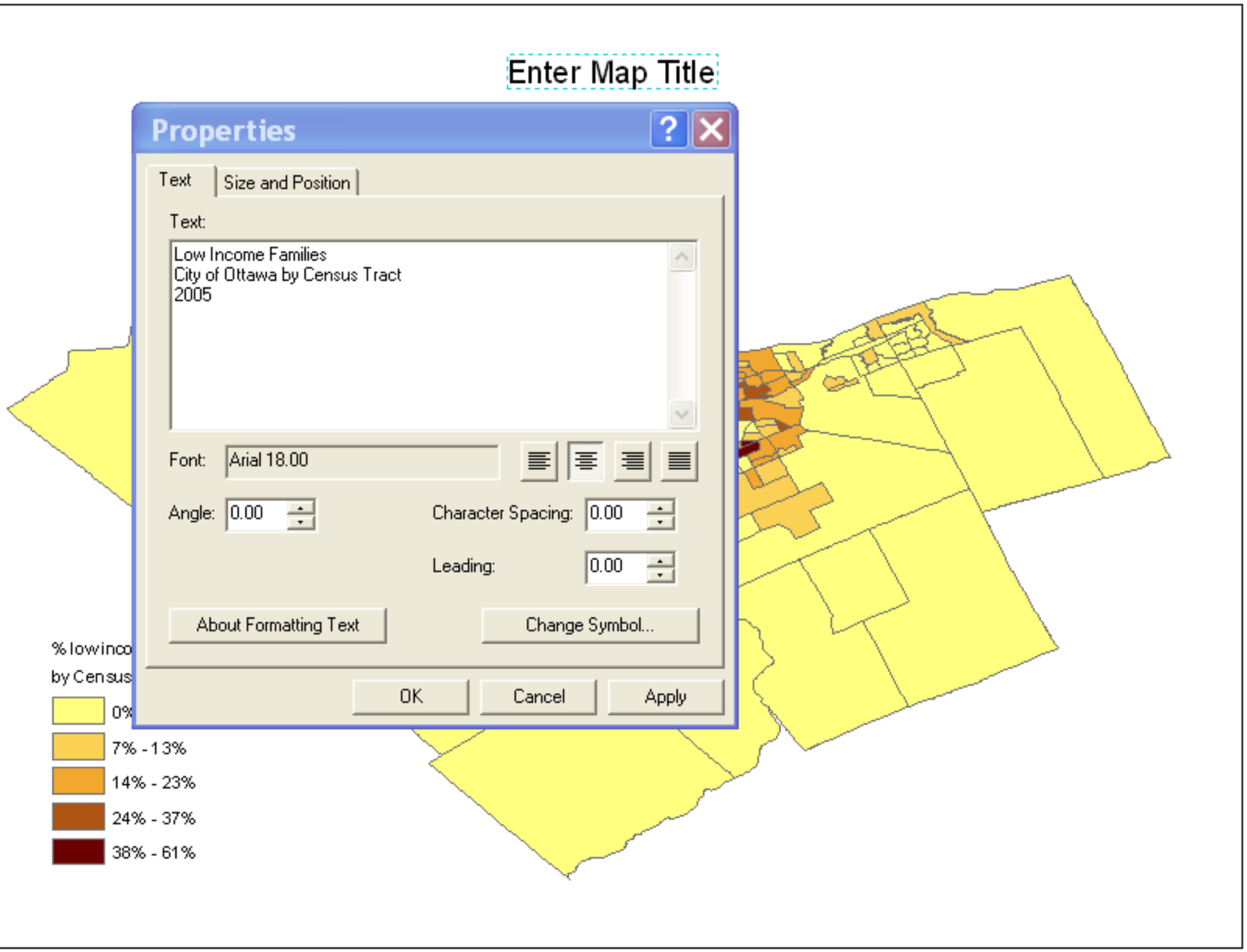

Ottawa_LICO_Fam_06_CT.mxd - ArcMap - ArcView
File Edit View Insert Selection Tools Window Help
1:769,815
Editor
Task: Create New Feature
Layer: Ottawa_CT_06
Topology:
Layers
Ottawa_ONhrd
Ottawa_CT_06
CANwat
CANwat_Clip3
% low income famili
by Census Tract
0% - 6%
7% - 13%
14% - 23%
24% - 37%
38% - 61%
Display
Source
Selection
Drawing
Arial
10
75°30'24.073"W 45°7'31.095"N

Completing the map

- The following information is usually required to complete the map
  - Title
  - Legend
  - North Star
  - Scale Bar
  - Source
- For more information on this, please refer to Resource Note # 5 – Cartographic Principles: Making Maps

Adding a title

- Switch from “Data View” to “Layout View”
- From the Menu Bar. Click “Insert” > Title
  - Enter text
  - Choose font size and colour


Enter Map Title
Properties
Text
Size and Position
Text:
Low Income Families
City of Ottawa by Census Tract
2005
Font:
Arial 18.00
Angle:
0.00
Character Spacing:
0.00
Leading:
0.00
About Formatting Text
Change Symbol...
OK
Cancel
Apply
% low inco
by Census
0%
7% - 13%
14% - 23%
24% - 37%
38% - 61%

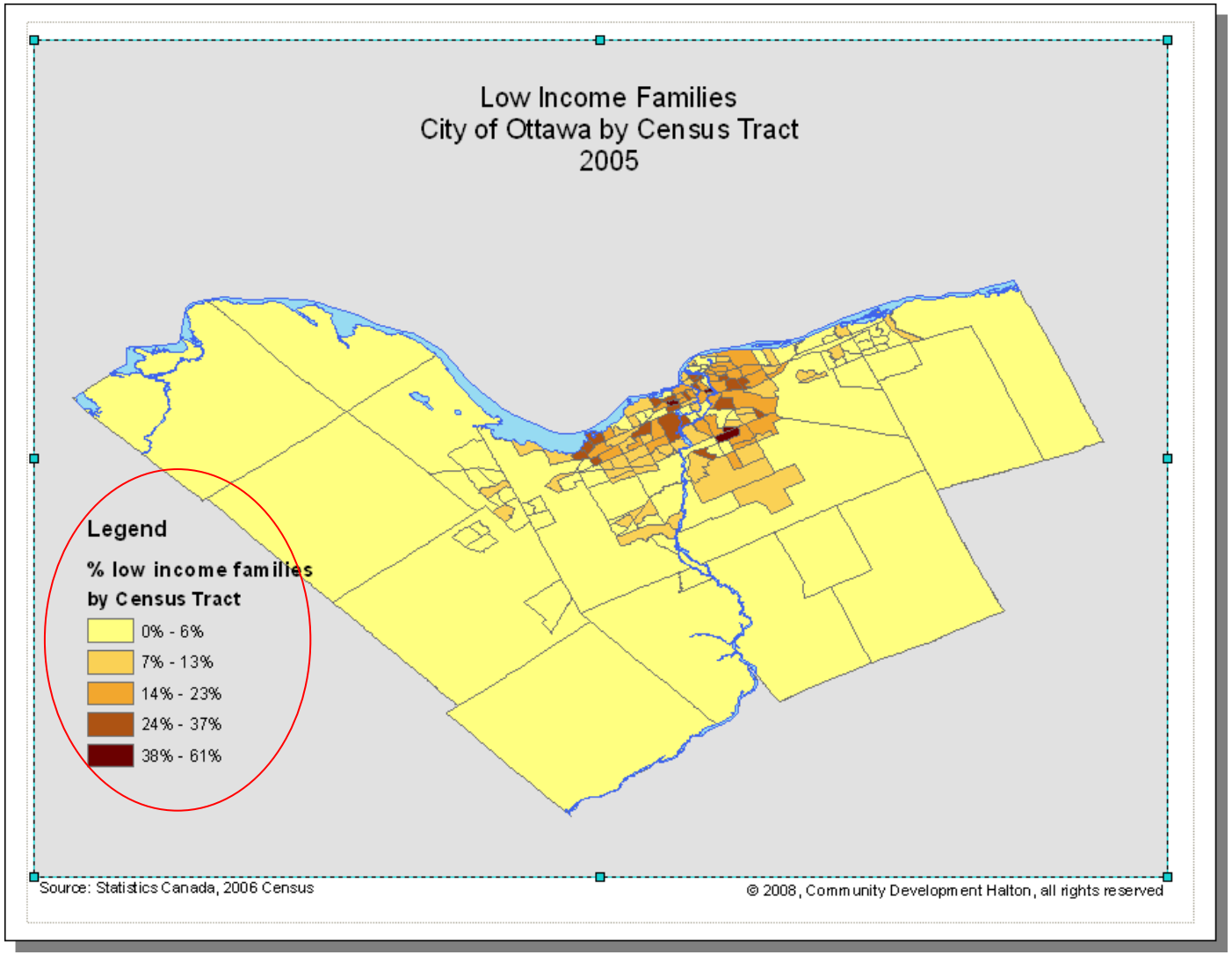
Adding a legend

- From the Menu Bar. Click “Insert” > Legend
  - In the Legend Wizard window, choose the layers to be included
  - Follow the instructions > Finish
  - If you want to change the description of a particular legend, you can change that by clicking on the description in the TOC – place the cursor on the text and click once
  - You can change the appearance of the legend by double clicking on the legend and go to Legend Properties window

Add a legend

- In the Legend Properties window, click “Style”
  - In the “Legend Item Selector” window, scroll up and down to select the style you want
- In the Legend Properties window, click “Symbol”
  - In the “Symbol Selector” window, change font size and appearance


Legend Wizard
Choose which layers you want to include in your legend
Map Layers:
% low income families
Legend Items
% low income families
Set the number of columns in your legend:
1
Preview
< Back
Next >
Cancel


Low Income Families
City of Ottawa by Census Tract
2005
Legend
% low income families
by Census Tract
0% - 6%
7% - 13%
14% - 23%
24% - 37%
38% - 61%
Source: Statistics Canada, 2006 Census
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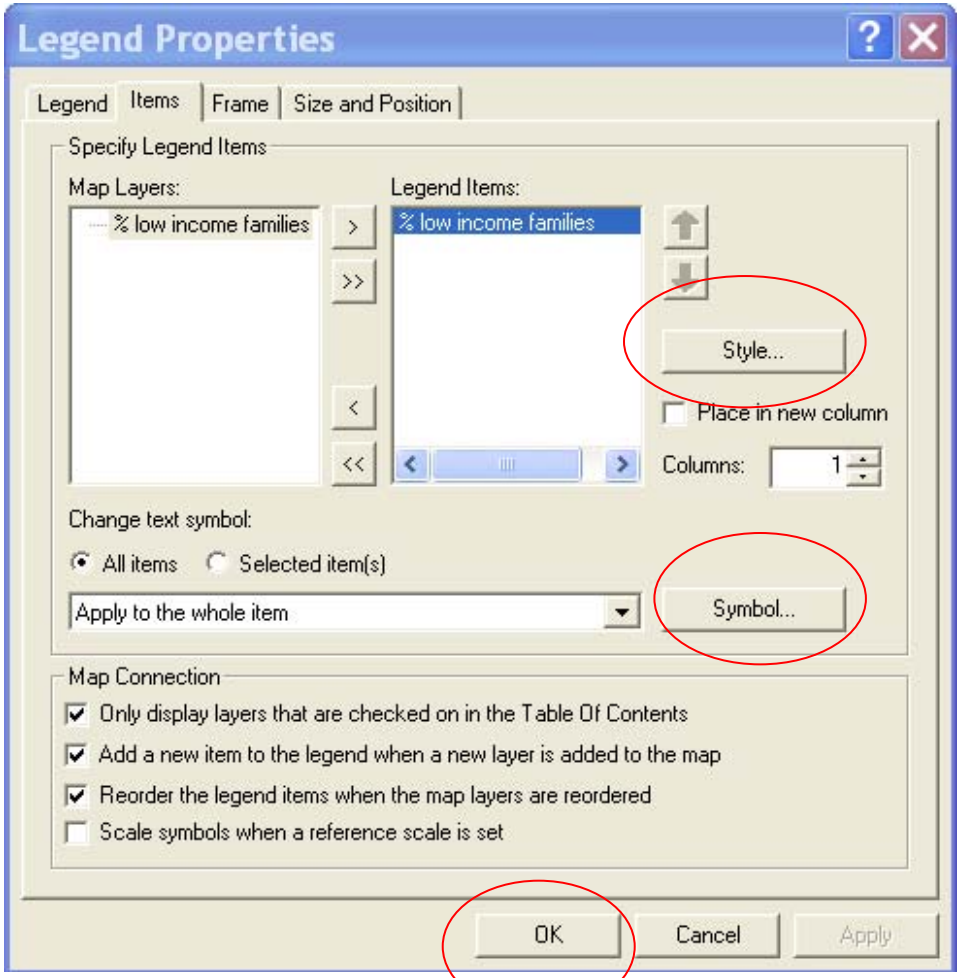
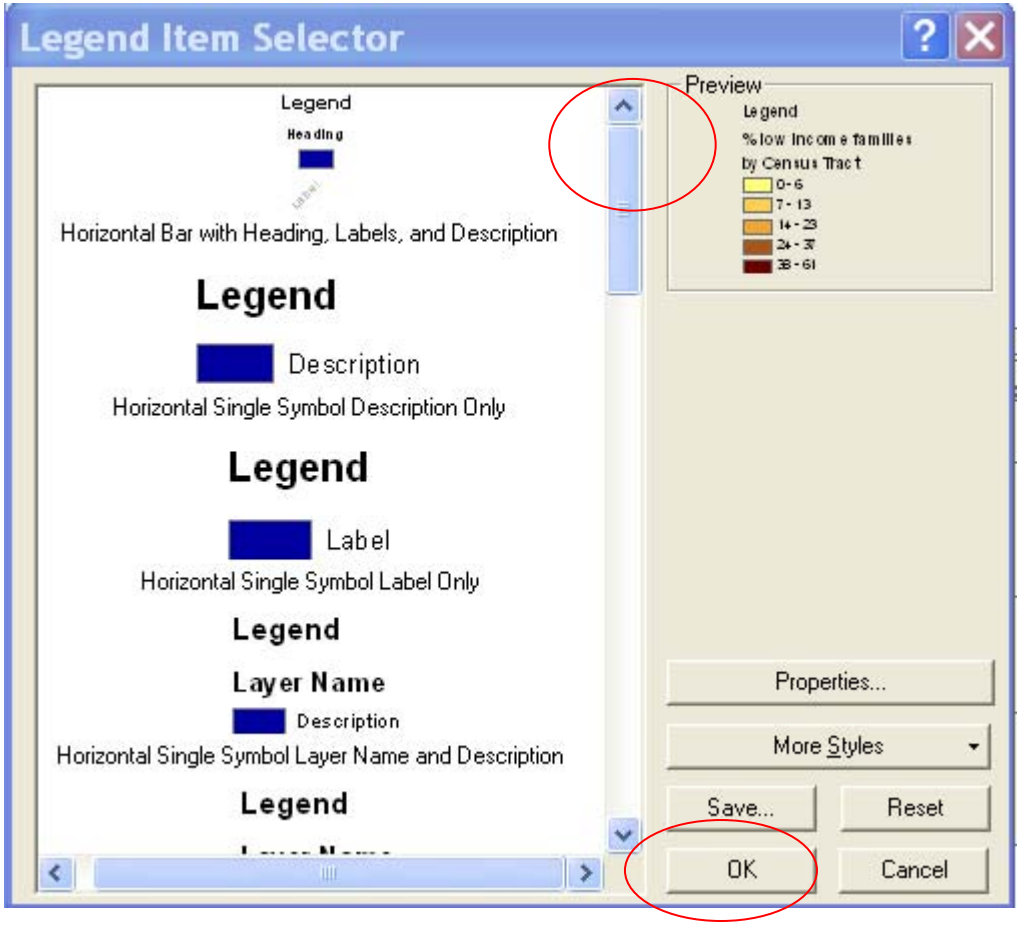
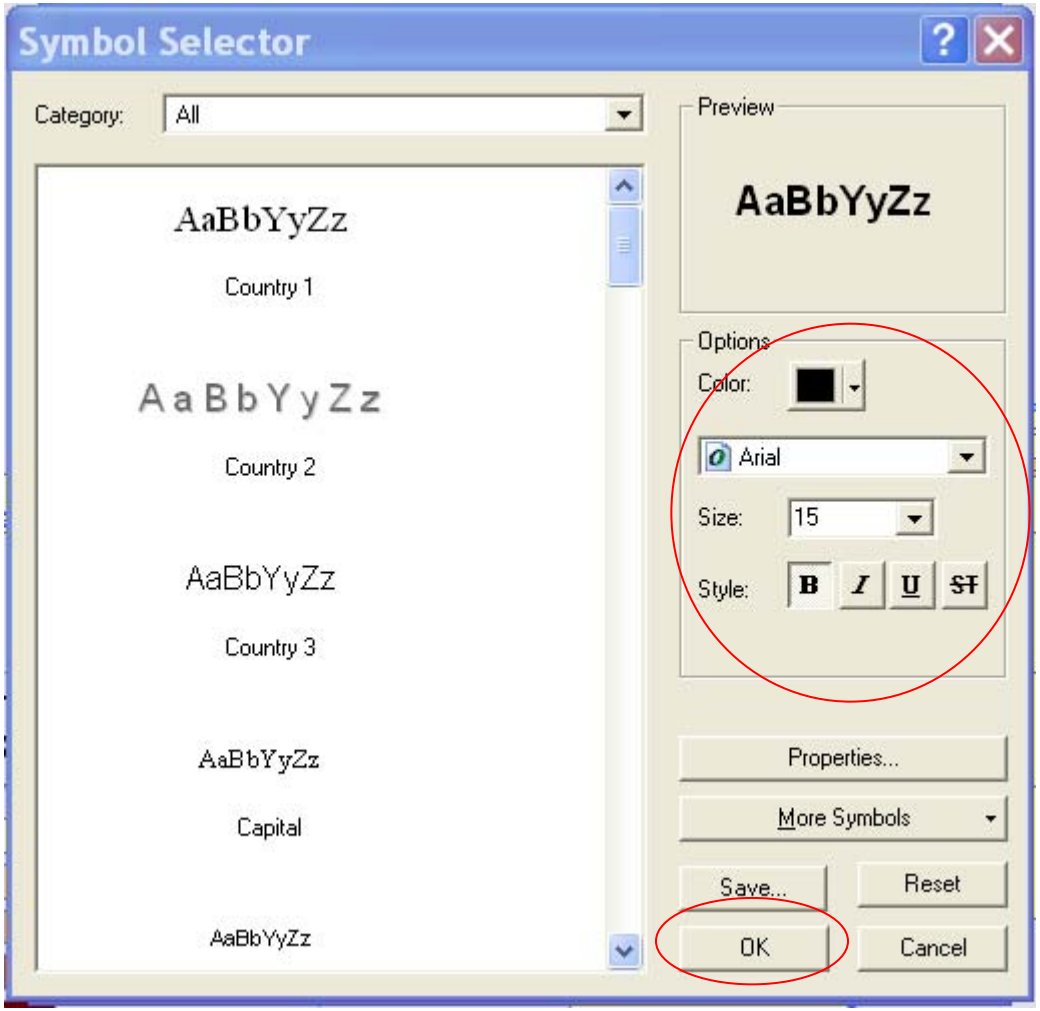
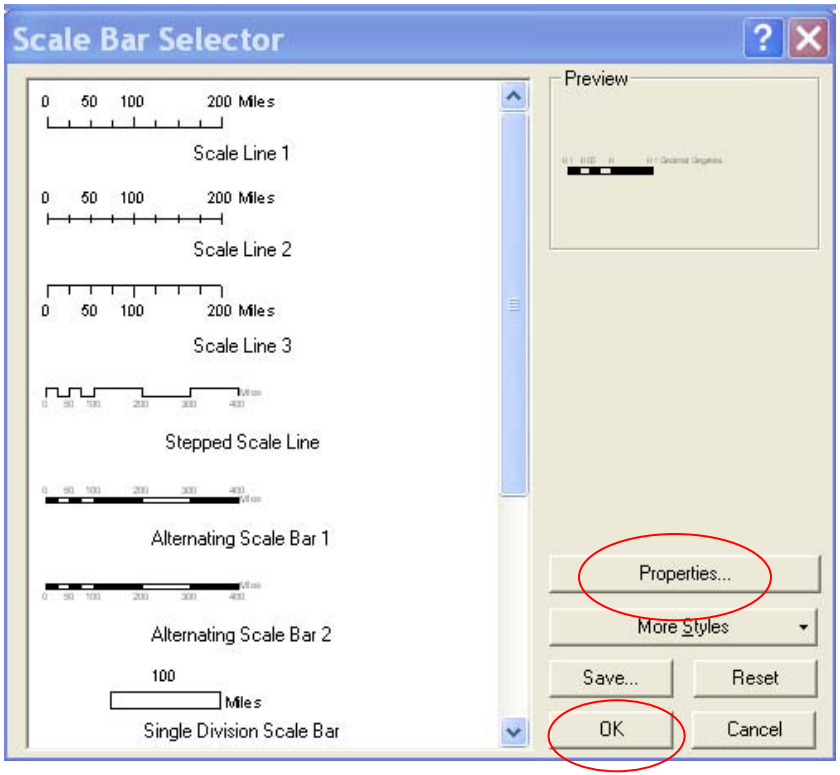

Legend Properties
Legend
Items
Frame
Size and Position
Specify Legend Items
Map Layers:
% low income families
Legend Items:
% low income families
Style...
Place in new column
Columns:
1
Change text symbol:
All items
Selected item(s)
Apply to the whole item
Symbol...
Map Connection
Only display layers that are checked on in the Table Of Contents
Add a new item to the legend when a new layer is added to the map
Reorder the legend items when the map layers are reordered
Scale symbols when a reference scale is set
OK
Cancel
Apply

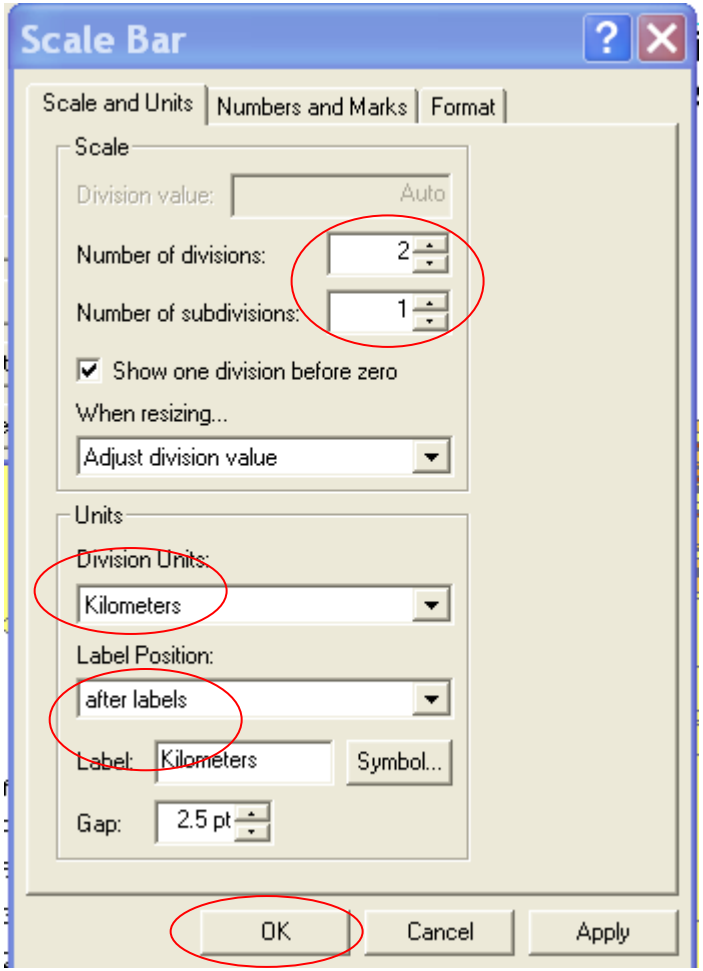

Legend Item Selector
Legend
Heading
Horizontal Bar with Heading, Labels, and Description
Legend
Description
Horizontal Single Symbol Description Only
Legend
Label
Horizontal Single Symbol Label Only
Legend
Layer Name
Description
Horizontal Single Symbol Layer Name and Description
Legend
Preview
Legend
% low income families
by Census Tract
0 - 6
7 - 13
14 - 23
24 - 37
38 - 61
Properties...
More Styles
Save...
Reset
OK
Cancel


Symbol Selector
Category:
All
Preview
AaBbYyZz
AaBbYyZz
Country 1
AaBbYyZz
Country 2
AaBbYyZz
Country 3
AaBbYyZz
Capital
AaBbYyZz
Options
Color:
Arial
Size:
15
Style:
B
I
U
ST
Properties...
More Symbols
Save...
Reset
OK
Cancel

Adding a scale bar

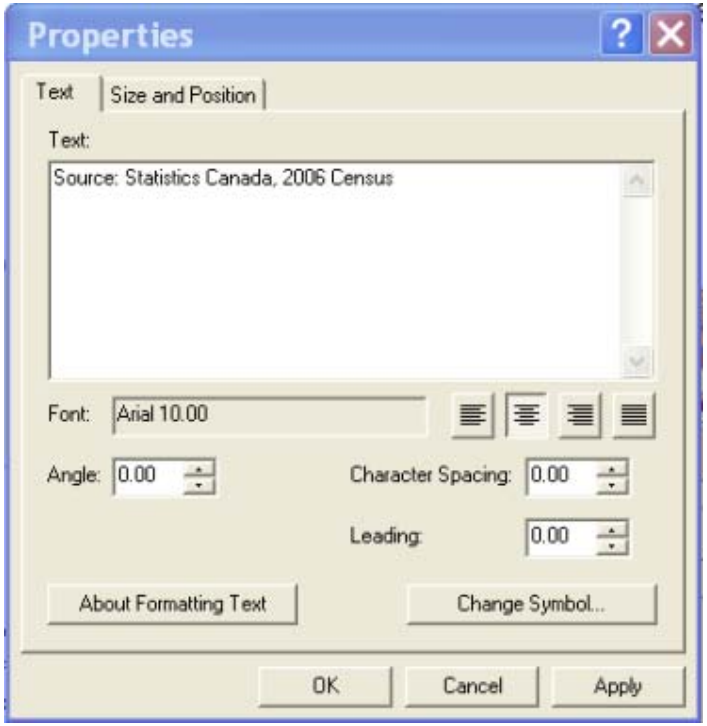
- From the Menu Bar. Click “Insert” > Scale bar
  - In the “Scale Bar Selector” window, click “Properties”
    - In the “Scale Bar” window, choose
      - Scale and units, numbers and marks, and format

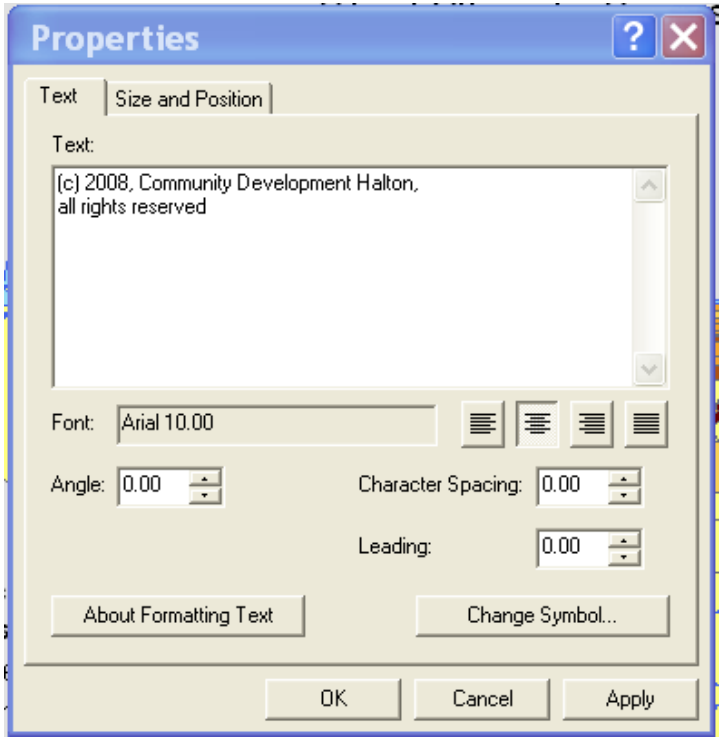

Scale Bar Selector
0 50 100 200 Miles
Scale Line 1
0 50 100 200 Miles
Scale Line 2
0 50 100 200 Miles
Scale Line 3
Stepped Scale Line
Alternating Scale Bar 1
Alternating Scale Bar 2
100 Miles
Single Division Scale Bar
Preview
Properties...
More Styles
Save...
Reset
OK
Cancel


Scale Bar
Scale and Units
Numbers and Marks
Format
Scale
Division value:
Auto
Number of divisions:
2
Number of subdivisions:
1
Show one division before zero
When resizing...
Adjust division value
Units
Division Units:
Kilometers
Label Position:
after labels
Label:
Kilometers
Symbol...
Gap:
2.5 pt
OK
Cancel
Apply

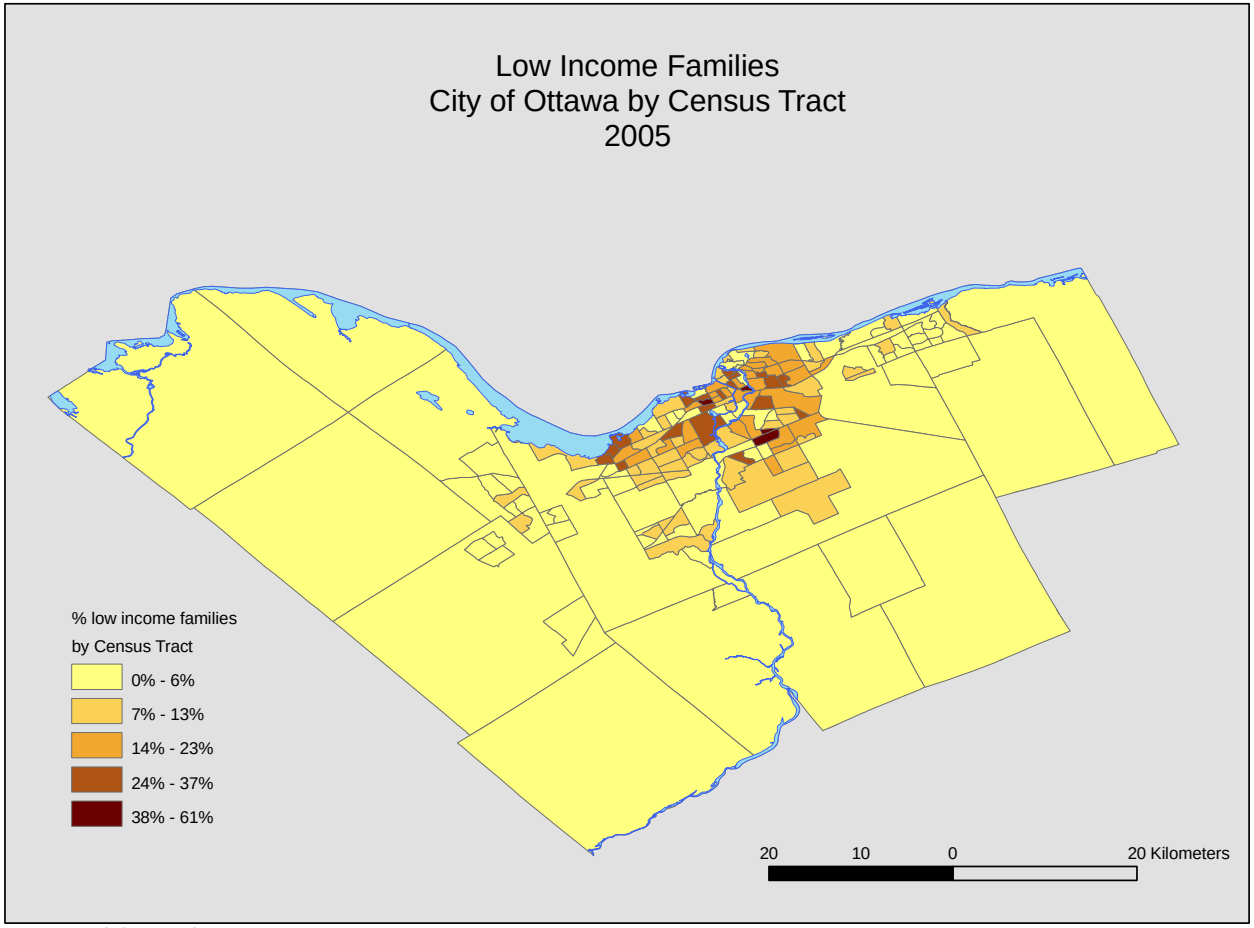
Adding sources

- From the Menu Bar. Click “Insert” > Text





Final Map



Source: Statistics Canada, 2006 Census

Any questions or comments?

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Thank You

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