Census tutorial using the city of Ottawa's wards

Every five years, Statistics Canada uses the Census Program to collect vital data about Canadians that paints a portrait of who we are. Traditionally, the program has been comprised of the Census of Agriculture, the Census of Population and the Mandatory Long-Form Census. The last census was conducted in May 2011.

Unfortunately, the former Conservative government did away with the mandatory long-form census, citing privacy concerns.

In 2011, the National Household Survey replaced the long-form census, which collected everything from immigration patterns to religious affiliation to income, providing data that was the lifeblood for municipalities, community services, businesses and academic research, to name just a few end-users.

Though it collected information similar to the long-form census, the survey was voluntary. The low response rate produced poor-quality data that could not be compared to the numbers from the 2006 Census Program.

Still, at least for journalists, the household survey answers many questions about about our communities:

Which neighborhoods have the highest numbers of high-income earners?

Do certain immigrants gravitate towards particular neighborhoods?

Do federal civil servants live close to the downtown core?

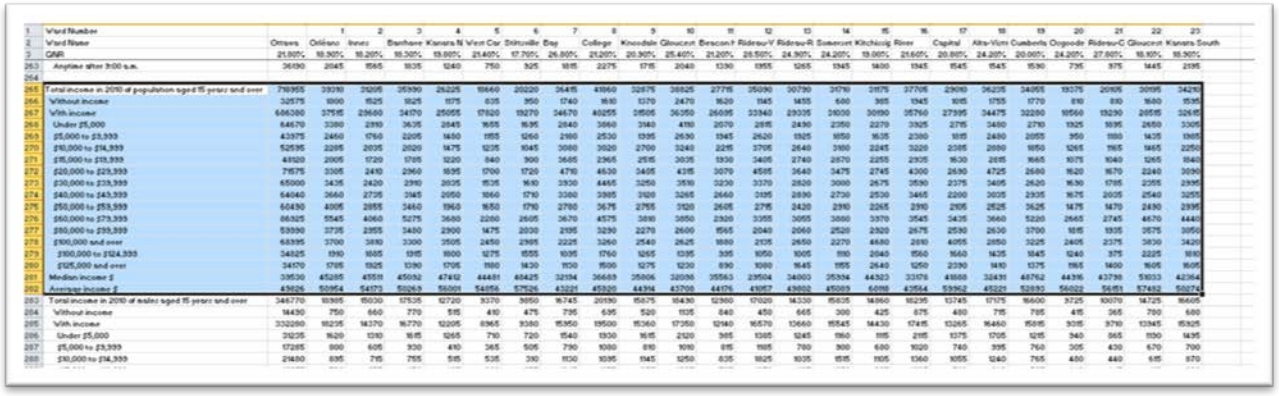
Answers to these questions can lead to interesting stories that don't necessarily produce spectacular headlines, but are worth telling nonetheless. It is for this reason that we will learn how to map the 2011 Household Survey data that has been tailored for city of Ottawa's 23 wards. The city has also combined it with the actual census data that collects basic information such as age and sex.

It's worth noting that Liberal government re-instated the long-form census as one of its first orders of business. But for the time being, we're stuck with the 2011 data.

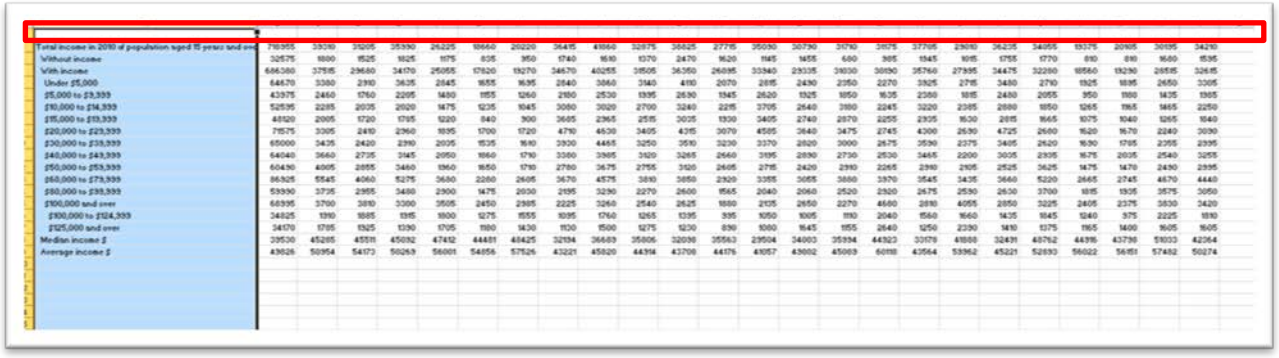
So let's get started.

1. You'll find the survey data (called "2011_NHS_Ward_Data) by navigating to the bottom of the city of Ottawa's open data website that contains the files.
2. Before downloading the file, it's always good practice to read the background information before going too much further.
3. Click on the "Go to resource" tab to the right of the "2011_NHS_Ward_Data".
4. You can see a sample of the table underneath the "Download" tab.
5. Download the table.
6. Move the "2011nhswarddata.csv" file to the folder you're using for this tutorial, open it and study the contents.
7. Save the csv file in Excel format, which will allow us to add worksheets.
8. Working in your Excel file, paste the website's URL into the first available cell in the first row.

9. Copy the table, and paste it into a new worksheet called “workingcopy”
10. Delete the first row.
11. To make it easier to scroll down the table, freeze the ward names to hold them in place.
12. Scroll to row 2265 (if you’ve followed step 10 and deleted the first row).
13. Select that section. (**NOTE:** I’ve reduced the font size to fit the entire table in the screen shot. So just increase the size of the page if you’re struggling to decipher the contents.)

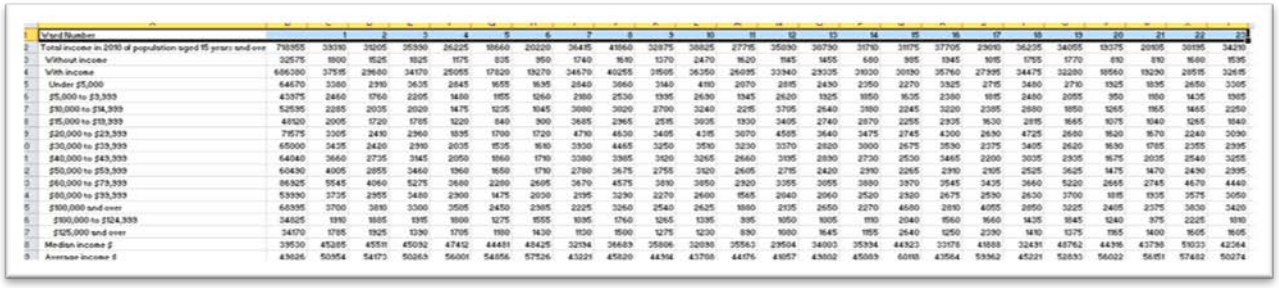


14. Copy the section and paste it into a new worksheet called “Income”.
15. Insert a blank row above the table.

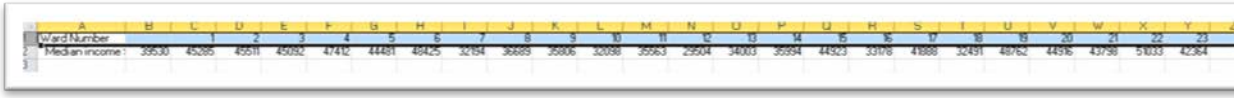


16. Copy the row containing the column heads in the workingcopy table.

17. Paste the contents into the empty row in your “Income” table whose first row should contain the ward numbers.

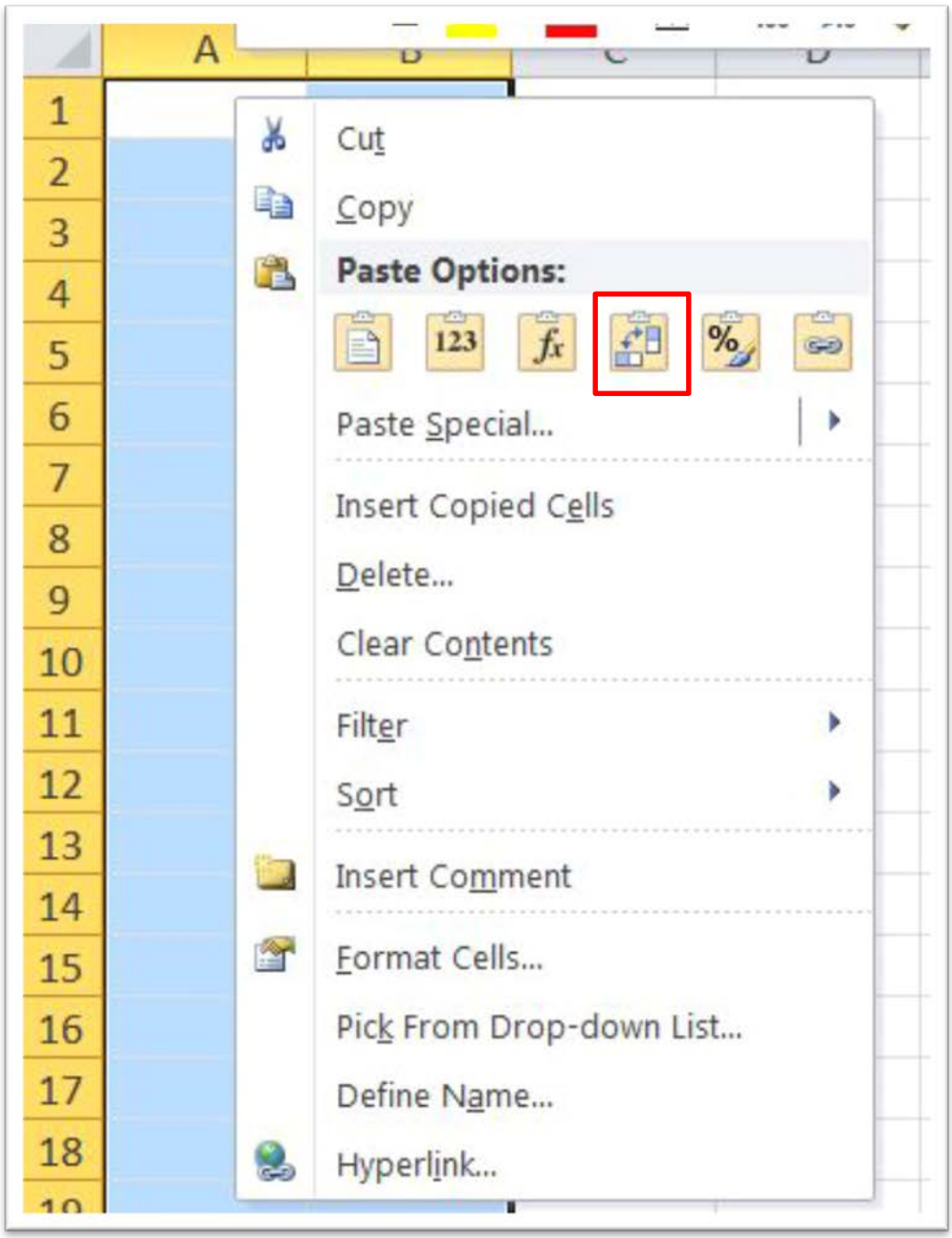


18. Copy this table and paste it into a new worksheet, called “IncomeForMapping”
19. Since we can only visualize one value at a time on a map, we’ll have to choose a category. During our in-class exercise, we selected “Median income”. So let’s go with that one.
20. Delete all the rows under the ward numbers, except for “Median income”

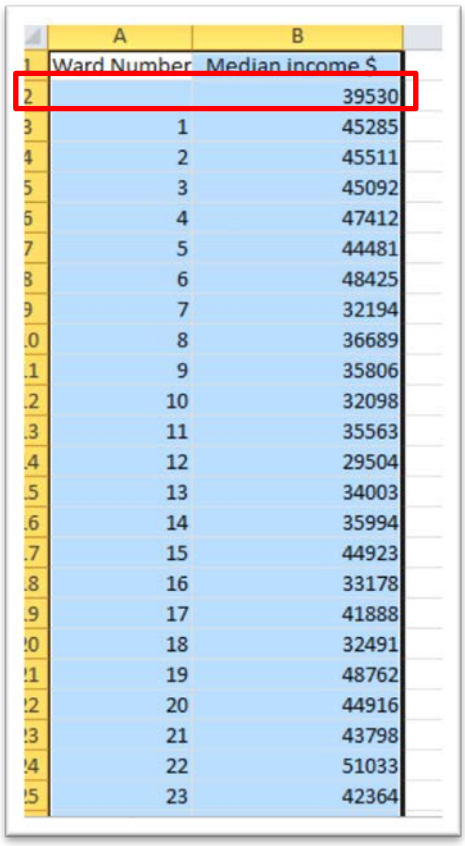


21.
22. Now we must “transpose” the table so that the ward numbers are displayed in a column. The reason will be evident in a little while.
23. To do this, select and copy the table.
24. Go to a new worksheet, right click in cell A1 to obtain your pasting options. Instead of pasting the contents in a regular fashion, we will use the “transposing” option highlighted in the

screen shot below.



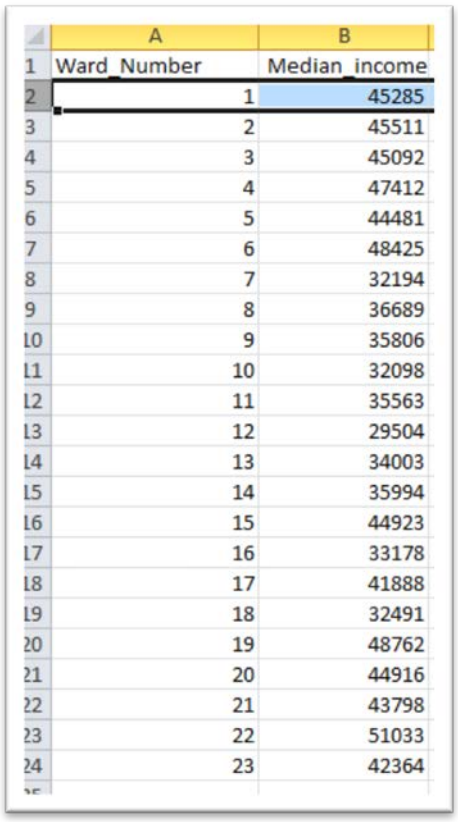
25. Select the transpose icon to change the shape of your table.



	A	B
1	Ward Number	Median income $
2		39530
3	1	45285
4	2	45511
5	3	45092
6	4	47412
7	5	44481
8	6	48425
9	7	32194
10	8	36689
11	9	35806
12	10	32098
13	11	35563
14	12	29504
15	13	34003
16	14	35994
17	15	44923
18	16	33178
19	17	41888
20	18	32491
21	19	48762
22	20	44916
23	21	43798
24	22	51033
25	23	42364

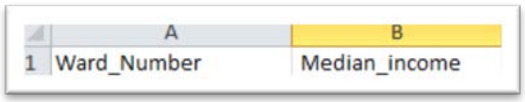
26. Delete row two, which is the income figure for Ottawa as a whole. If you don't delete the row, A2 will show up as a "Null" value in Qgis, which could cause problems as we saw in the

contaminated sites tutorial.



	A	B
1	Ward_Number	Median_income
2	1	45285
3	2	45511
4	3	45092
5	4	47412
6	5	44481
7	6	48425
8	7	32194
9	8	36689
10	9	35806
11	10	32098
12	11	35563
13	12	29504
14	13	34003
15	14	35994
16	15	44923
17	16	33178
18	17	41888
19	18	32491
20	19	48762
21	20	44916
22	21	43798
23	22	51033
24	23	42364

27. As was the case with MySQL, mapping programs like Qgis do not like titles with spaces. So let's use underscores to clean up the column labels.

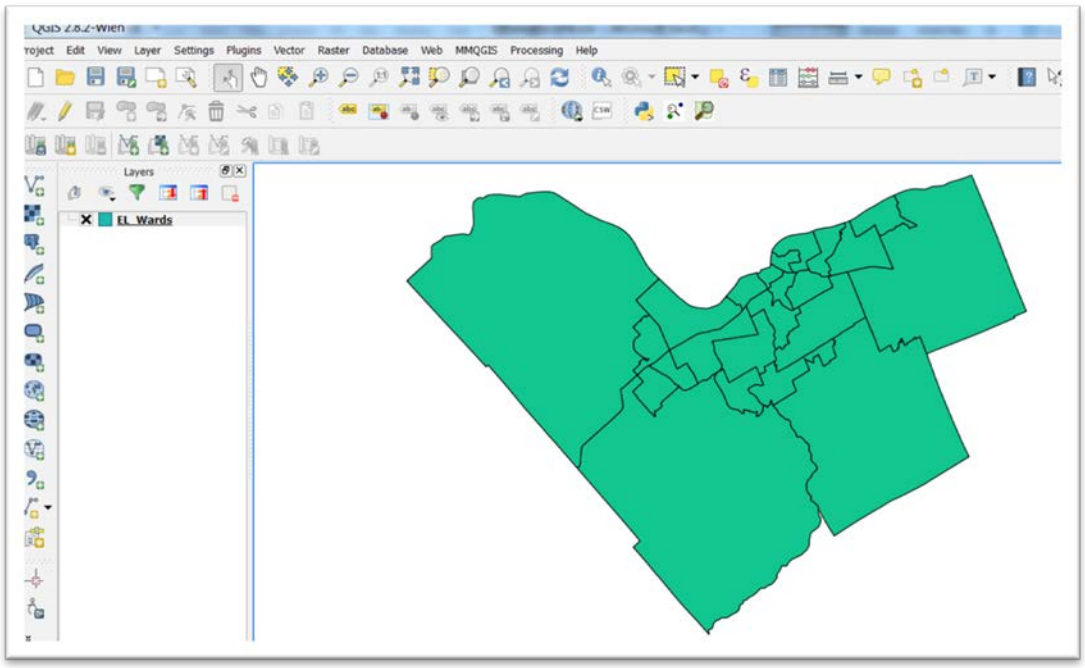


	A	B
1	Ward_Number	Median_income

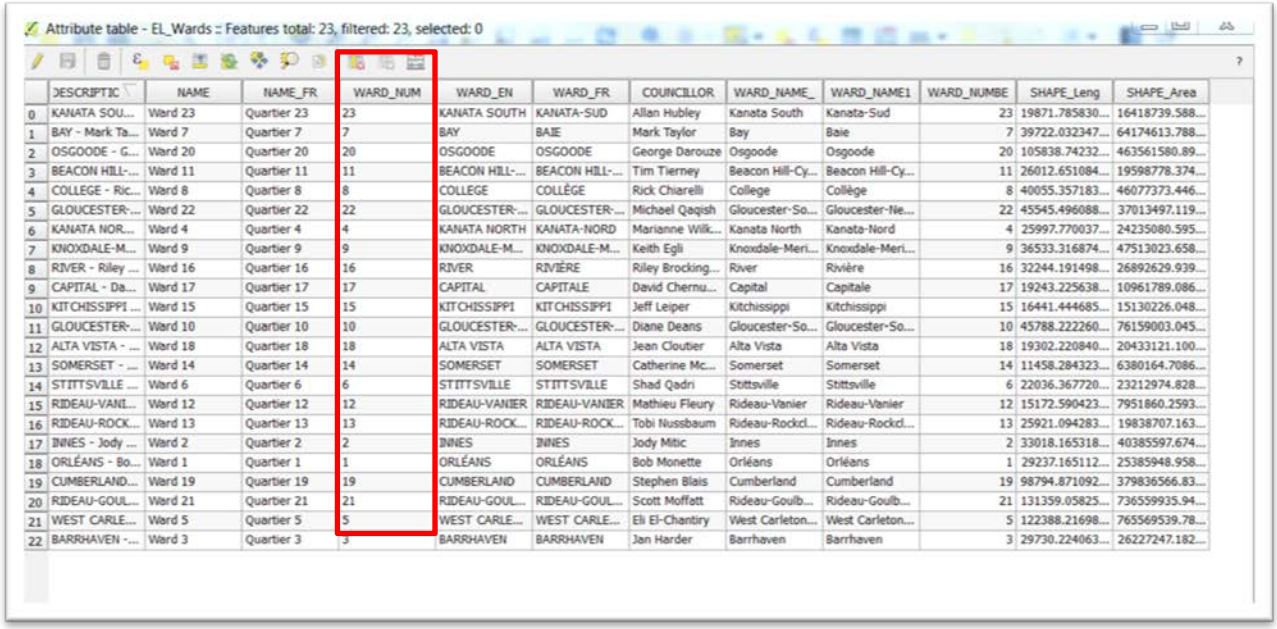
28. You'll also notice that we eliminated the space that was in front on the "M" in Median. Copy this table, open a new file, paste it in, name the file "OttawaIncome", and save it in a csv format.
29. Leave this file for now.
30. Download the city of Ottawa's 2014 Ward file by clicking here. (NOTE: The reason it failed to work in class is because the file was defective, one of the hazards of working with tables on

open data sites. The city of Ottawa kindly provided the clean version that we'll use for this tutorial.)

31. Move the zip file to this tutorial's folder create a subfolder called "Wards_2014" and unzip the contents into that subfolder.
32. Open a new version of Qgis.
33. Import the ward shape file, using the technique we learned in the contaminated sites tutorial. (**NOTE:** Because we'll be using the ward numbers to join the csv file with the income data to the ward file, we don't have to worry about projections as we did in the tutorial with contaminated sites.)
34. Your screen should look like this, though the colour may be different.



35. Right-click on the ward layer to open the attribute table.



	DESCRIPTIC	NAME	NAME_FR	WARD_NUM	WARD_EN	WARD_FR	COUNCILLOR	WARD_NAME_	WARD_NAME1	WARD_NUMBE	SHAPE_Leng	SHAPE_Area
0	KANATA SOU...	Ward 23	Quartier 23	23	KANATA SOUTH	KANATA-SUD	Allan Hubley	Kanata South	Kanata-Sud	23	19871.785830...	16418739.588...
1	BAY - Mark Ta...	Ward 7	Quartier 7	7	BAY	BAIE	Mark Taylor	Bay	Baie	7	39722.032347...	64174613.788...
2	OSGOODE - G...	Ward 20	Quartier 20	20	OSGOODE	OSGOODE	George Darouze	Osgoode	Osgoode	20	105838.74232...	463561580.89...
3	BEACON HILL-...	Ward 11	Quartier 11	11	BEACON HILL-...	BEACON HILL-...	Tim Tierney	Beacon Hill-Cy...	Beacon Hill-Cy...	11	26012.651084...	19598778.374...
4	COLLEGE - Ric...	Ward 8	Quartier 8	8	COLLEGE	COLLÈGE	Rick Chiarelli	College	Collège	8	40055.357183...	46077373.446...
5	GLOUCESTER-...	Ward 22	Quartier 22	22	GLOUCESTER-...	GLOUCESTER-...	Michael Qaqish	Gloucester-So...	Gloucester-Ne...	22	45545.496088...	37013497.119...
6	KANATA NOR...	Ward 4	Quartier 4	4	KANATA NORTH	KANATA-NORD	Marianne Wilk...	Kanata North	Kanata-Nord	4	25997.770037...	24235080.595...
7	KNOXDALE-M...	Ward 9	Quartier 9	9	KNOXDALE-M...	KNOXDALE-M...	Keith Egli	Knoxdale-Meri...	Knoxdale-Meri...	9	36533.316874...	47513023.658...
8	RIVER - Riley ...	Ward 16	Quartier 16	16	RIVER	RIVIÈRE	Riley Brocking...	River	Rivière	16	32244.191498...	26892629.939...
9	CAPITAL - Da...	Ward 17	Quartier 17	17	CAPITAL	CAPITALE	David Chernu...	Capital	Capitale	17	19243.225638...	10961789.086...
10	KITCHISSIPPI ...	Ward 15	Quartier 15	15	KITCHISSIPPI	KITCHISSIPPI	Jeff Leiper	Kitchissippi	Kitchissippi	15	16441.444685...	15130226.048...
11	GLOUCESTER-...	Ward 10	Quartier 10	10	GLOUCESTER-...	GLOUCESTER-...	Diane Deans	Gloucester-So...	Gloucester-So...	10	45788.222260...	76159003.045...
12	ALTA VISTA - ...	Ward 18	Quartier 18	18	ALTA VISTA	ALTA VISTA	Jean Cloutier	Alta Vista	Alta Vista	18	19302.220840...	20433121.100...
13	SOMERSET - ...	Ward 14	Quartier 14	14	SOMERSET	SOMERSET	Catherine Mc...	Somerset	Somerset	14	11458.284323...	6380164.7086...
14	STITTSVILLE ...	Ward 6	Quartier 6	6	STITTSVILLE	STITTSVILLE	Shad Qadri	Stittsville	Stittsville	6	22036.367720...	23212974.828...
15	RIDEAU-VANI...	Ward 12	Quartier 12	12	RIDEAU-VANIER	RIDEAU-VANIER	Mathieu Fleury	Rideau-Vanier	Rideau-Vanier	12	15172.590423...	7951860.2593...
16	RIDEAU-ROCK...	Ward 13	Quartier 13	13	RIDEAU-ROCK...	RIDEAU-ROCK...	Tobi Nussbaum	Rideau-Rockcl...	Rideau-Rockcl...	13	25921.094283...	19838707.163...
17	INNES - Jody ...	Ward 2	Quartier 2	2	INNES	INNES	Jody Mitic	Innes	Innes	2	33018.165318...	40385597.674...
18	ORLÉANS - Bo...	Ward 1	Quartier 1	1	ORLÉANS	ORLÉANS	Bob Monette	Orléans	Orléans	1	29237.165112...	25385948.958...
19	CUMBERLAND...	Ward 19	Quartier 19	19	CUMBERLAND	CUMBERLAND	Stephen Blais	Cumberland	Cumberland	19	98794.871092...	379836566.83...
20	RIDEAU-GOUL...	Ward 21	Quartier 21	21	RIDEAU-GOUL...	RIDEAU-GOUL...	Scott Moffatt	Rideau-Goulb...	Rideau-Goulb...	21	131359.05825...	736559935.94...
21	WEST CARLE...	Ward 5	Quartier 5	5	WEST CARLE...	WEST CARLE...	Eli El-Chantiry	West Carleton...	West Carleton...	5	122388.21698...	765569539.78...
22	BARRHAVEN -...	Ward 3	Quartier 3	3	BARRHAVEN	BARRHAVEN	Jan Harder	Barrhaven	Barrhaven	3	29730.224063...	26227247.182...

36. We'll use the column with the ward number to perform our join.

37. Take a close look at the numbers in the "WARD_NUM" row. They are left-justified, which means Qgis is reading them as text. This is a problem because the ward numbers in the csv file are formatted as actual numbers. In order to perform a join, the numbers MUST be in the SAME format. This means we have to find a way of converting the ward numbers in the csv file into text.

38. A way to do this is to create what's called a csvt file.

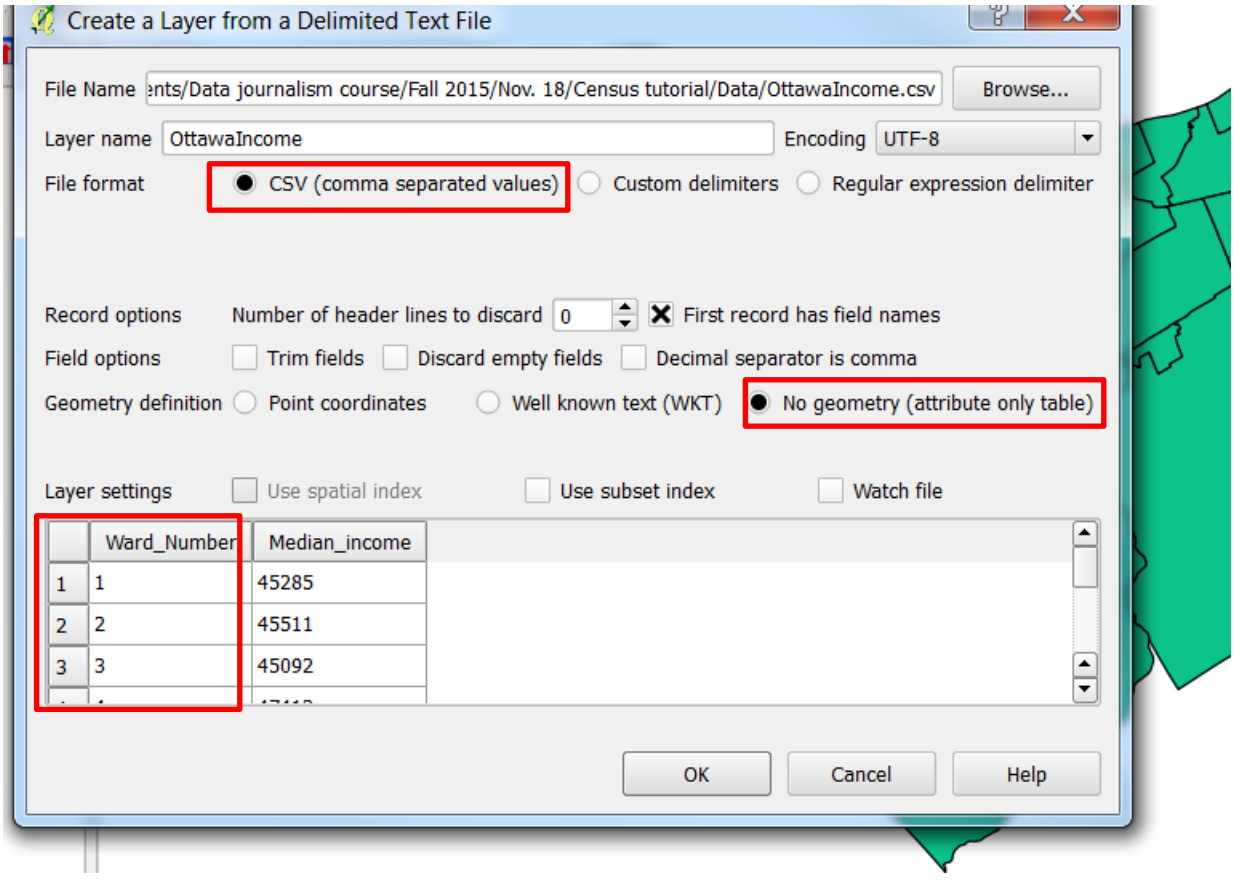
39. Open a "Notepad" or a text editor, Notepad++ or TextWrangler.

40. Now let's specify the datatypes we want in each column. For the "Ward_Number" column, we will specify that we want to convert it to a "string" function. In other words, convert it to a text. Median_income can be left as is, which means an "integer".

41. So our csvt file, looks like this:

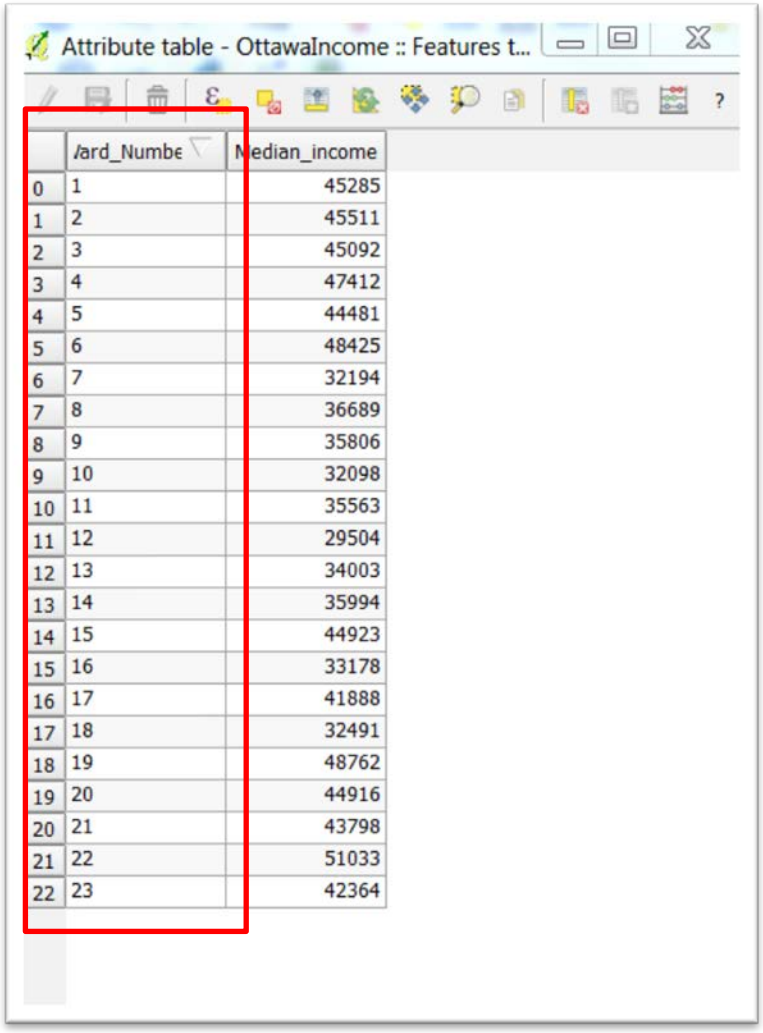
```
1 "String","Integer"
```

42. Now we MUST give it the same name as the csv file, "OttawaIncome" and a "csvt" extension.
43. Save it in the SAME folder as the csv file. (NOTE: the regular Notepad may add an extra "txt" extension after the "csvt" extension. If it does, just delete the "txt" extension.)
44. Using the Steps we learned in the contaminated sites tutorial, import the csv file.
45. Your "Create a Layer from a Delimited Text File" dialog box should look like this:



46. Select OK.

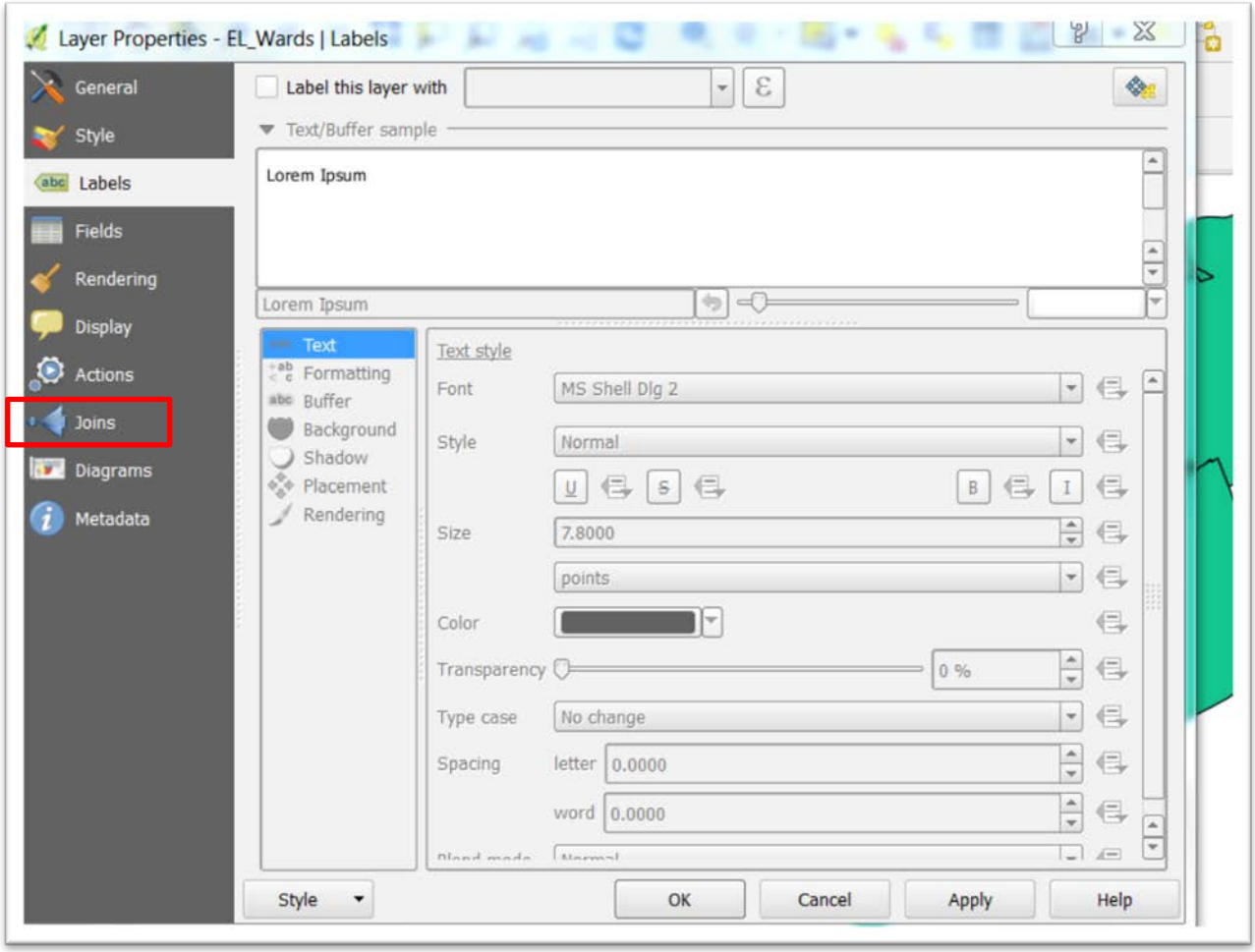
47. Open the attribute table to see the numbers are left-justified.



	/ard_Numbe	Median_income
0	1	45285
1	2	45511
2	3	45092
3	4	47412
4	5	44481
5	6	48425
6	7	32194
7	8	36689
8	9	35806
9	10	32098
10	11	35563
11	12	29504
12	13	34003
13	14	35994
14	15	44923
15	16	33178
16	17	41888
17	18	32491
18	19	48762
19	20	44916
20	21	43798
21	22	51033
22	23	42364

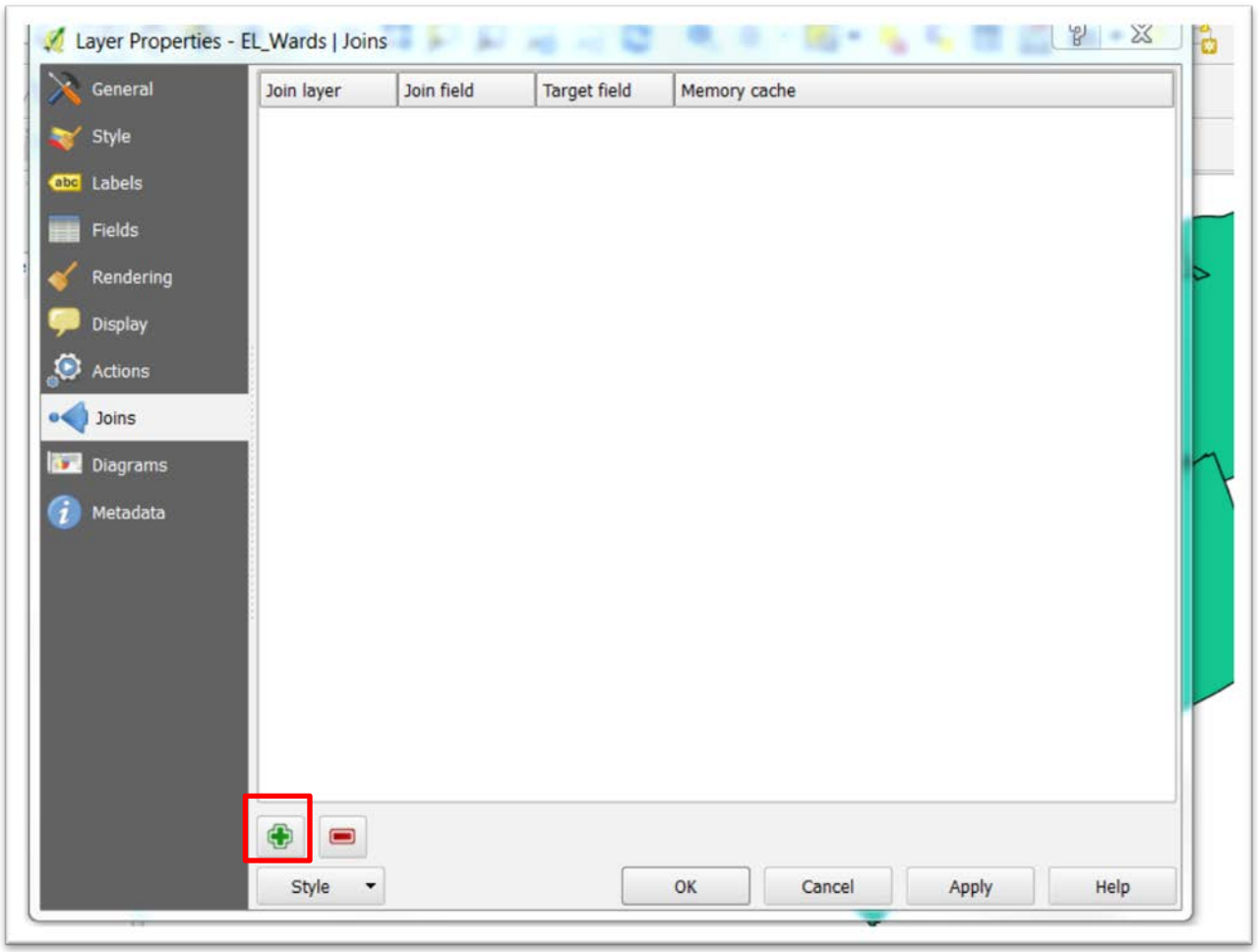
48. Close the table.

49. Right-click on the “El_Wards” layer, go to “Properties”.

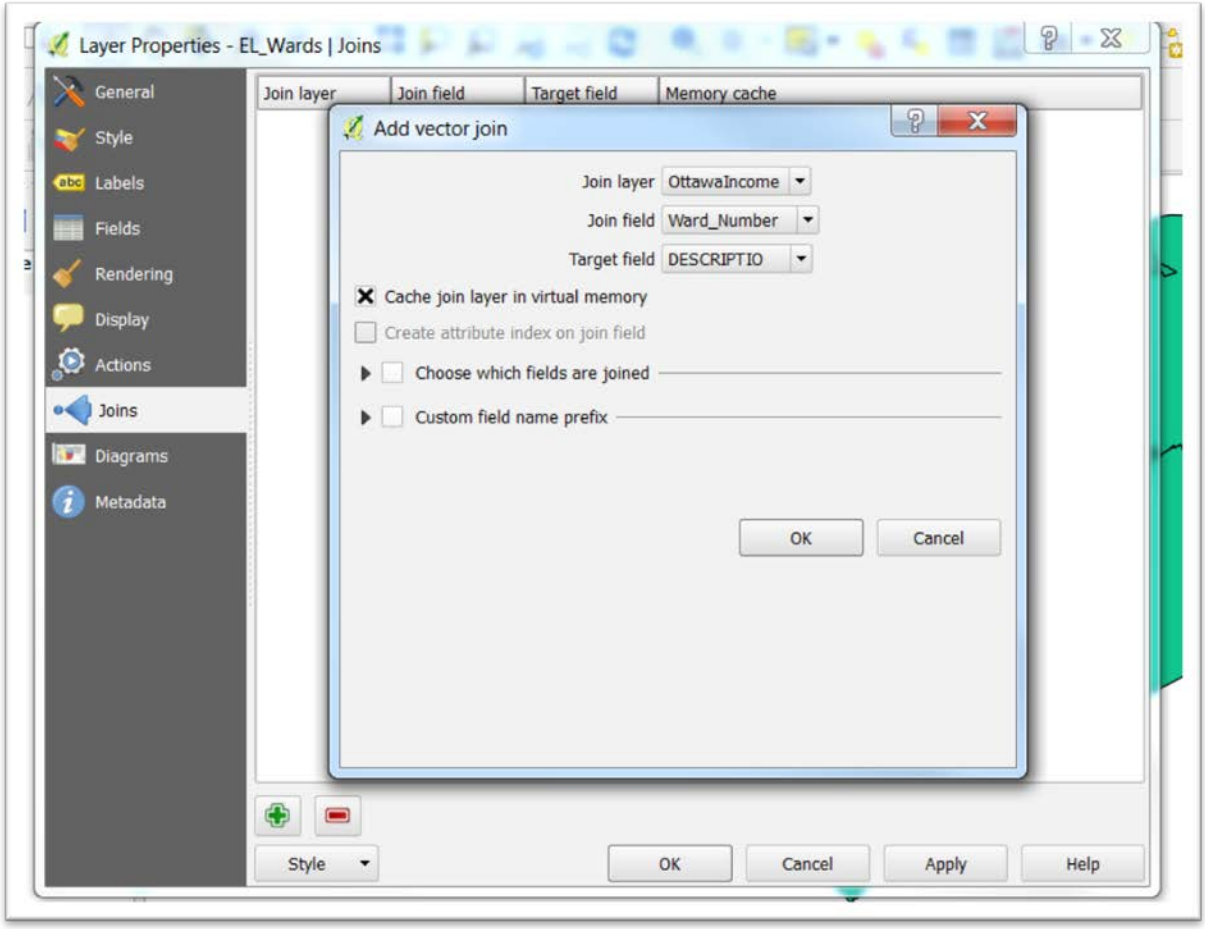


50. Select “Joins”.

51.

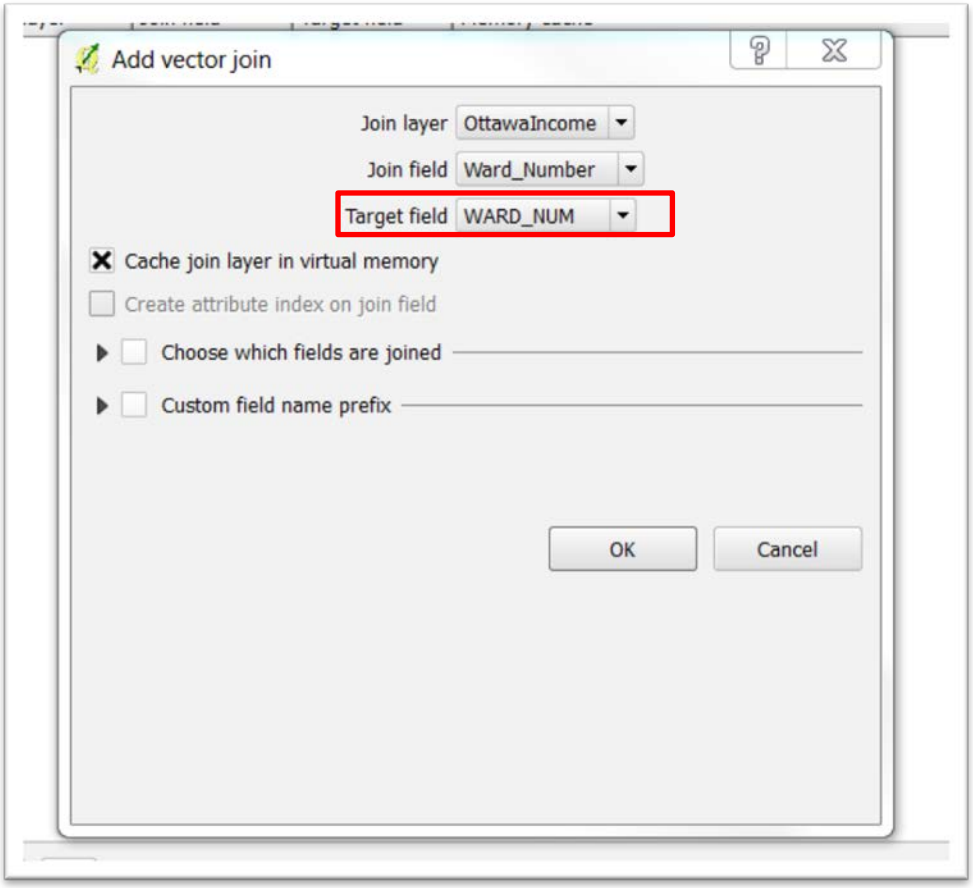

Layer Properties - EL_Wards | Joins
General
Style
Labels
Fields
Rendering
Display
Actions
Joins
Diagrams
Metadata
Join layer
Join field
Target field
Memory cache
Style
OK
Cancel
Apply
Help

52. Click the green cross.



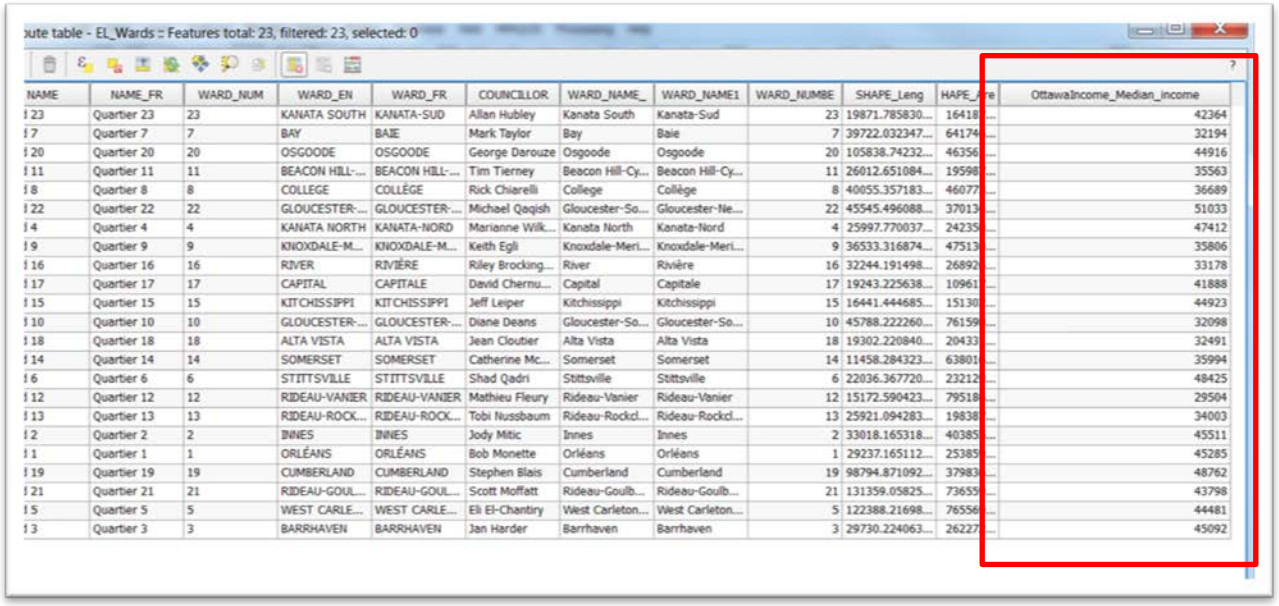
53. Our “Join layer” is “OttawaIncome”. The”Join field” is the Ward_Number. The “Target field”, or the field to which we will join the “Ward_Number” is the “WARD_NUM. Select the “Target

field's" drop-down menu to obtain the "WARD_NUM".



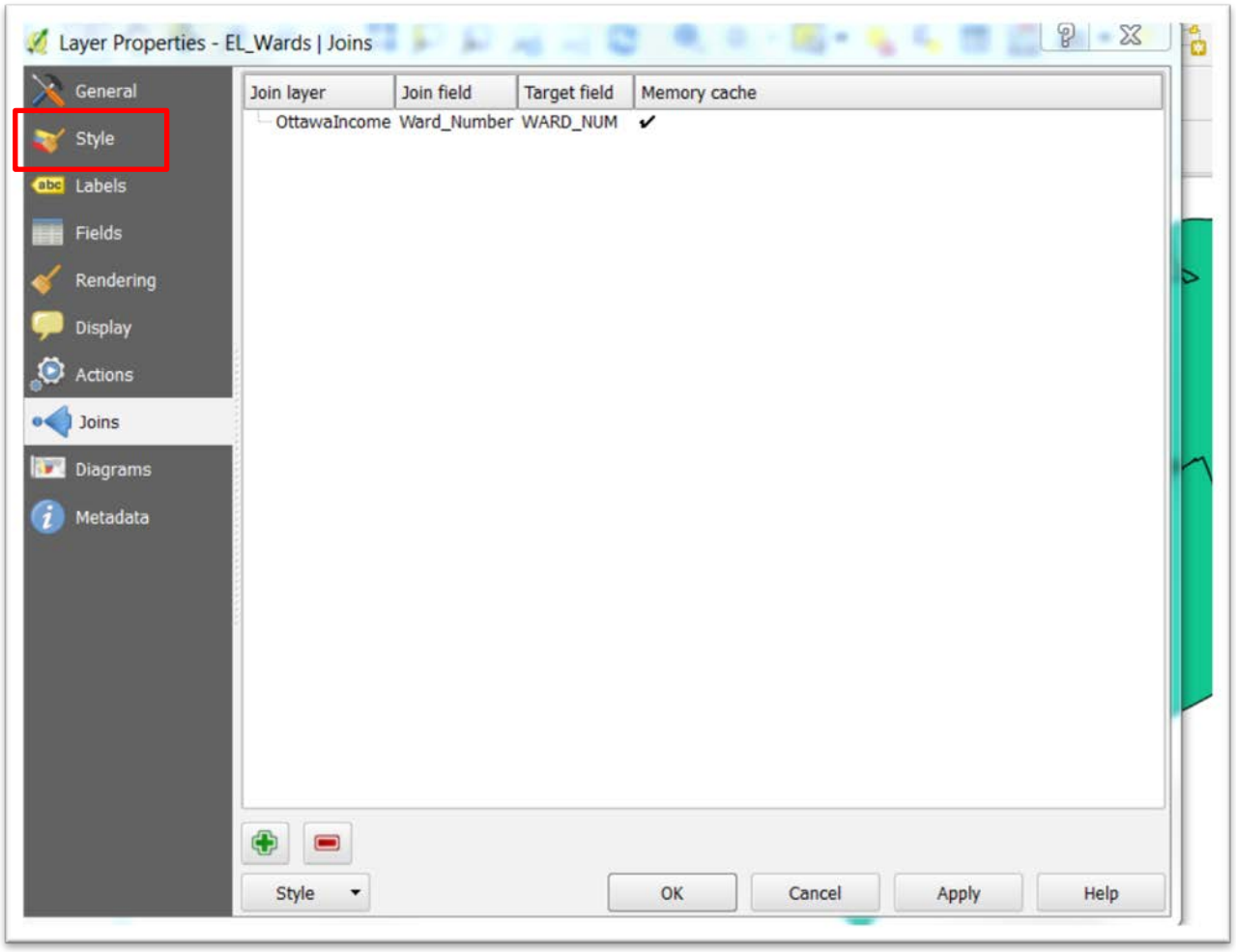
54. Select OK, Apply, then OK again.

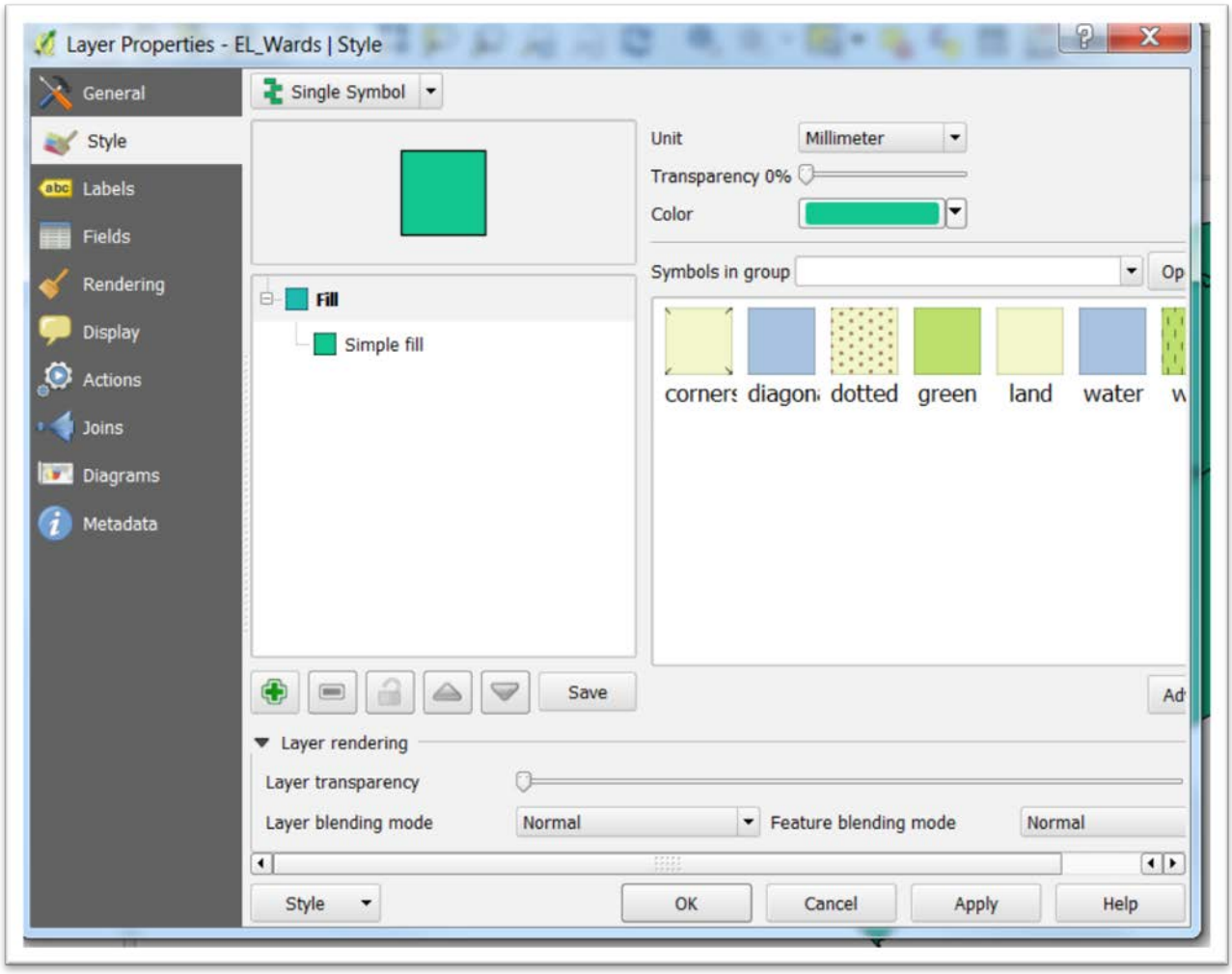
55. Open the attribute table, and scroll to the far right to see median income numbers.



NAME	NAME_FR	WARD_NUM	WARD_EN	WARD_FR	COUNCILLOR	WARD_NAME_	WARD_NAME1	WARD_NUMBE	SHAPE_Leng	HAPE_Are	OttawaIncome_Median_income
23	Quartier 23	23	KANATA SOUTH	KANATA-SUD	Allan Hubley	Kanata South	Kanata-Sud	23	19871.785830...	16418...	42364
7	Quartier 7	7	BAY	BAIE	Mark Taylor	Bay	Baie	7	39722.032347...	64174...	32194
20	Quartier 20	20	OSGOODE	OSGOODE	George Darouze	Osgoode	Osgoode	20	105838.74232...	46356...	44916
11	Quartier 11	11	BEACON HILL-...	BEACON HILL-...	Tim Tierney	Beacon Hill-Cy...	Beacon Hill-Cy...	11	26012.651084...	19598...	35563
8	Quartier 8	8	COLLEGE	COLLÈGE	Rick Chiarelli	College	Collège	8	40055.357183...	46077...	36689
22	Quartier 22	22	GLOUCESTER-...	GLOUCESTER-...	Michael Qaqish	Gloucester-So...	Gloucester-Ne...	22	45545.496088...	37013...	51033
4	Quartier 4	4	KANATA NORTH	KANATA-NORD	Marianne Wilk...	Kanata North	Kanata-Nord	4	25997.770037...	24235...	47412
9	Quartier 9	9	KNOXDALE-M...	KNOXDALE-M...	Keith Egli	Knoxdale-Meri...	Knoxdale-Meri...	9	36533.316874...	47513...	35806
16	Quartier 16	16	RIVER	RIVIÈRE	Riley Brocking...	River	Rivière	16	32244.191498...	26892...	33178
17	Quartier 17	17	CAPITAL	CAPITALE	David Chernu...	Capital	Capitale	17	19243.225638...	10961...	41888
15	Quartier 15	15	KITCHISSIPPI	KITCHISSIPPI	Jeff Leiper	Kitchissippi	Kitchissippi	15	16441.444685...	15130...	44923
10	Quartier 10	10	GLOUCESTER-...	GLOUCESTER-...	Diane Deans	Gloucester-So...	Gloucester-So...	10	45788.222260...	76159...	32098
18	Quartier 18	18	ALTA VISTA	ALTA VISTA	Jean Cloutier	Alta Vista	Alta Vista	18	19302.220840...	20433...	32491
14	Quartier 14	14	SOMERSET	SOMERSET	Catherine Mc...	Somerset	Somerset	14	11458.284323...	63801...	35994
6	Quartier 6	6	STITTSVILLE	STITTSVILLE	Shad Qadri	Stittsville	Stittsville	6	22036.367720...	23212...	48425
12	Quartier 12	12	RIDEAU-VANIER	RIDEAU-VANIER	Mathieu Fleury	Rideau-Vanier	Rideau-Vanier	12	15172.590423...	79518...	29504
13	Quartier 13	13	RIDEAU-ROCK...	RIDEAU-ROCK...	Tobi Nussbaum	Rideau-Rockcl...	Rideau-Rockcl...	13	25921.094283...	19838...	34003
2	Quartier 2	2	INNES	INNES	Jody Mitic	Innes	Innes	2	33018.165318...	40385...	45511
1	Quartier 1	1	ORLÉANS	ORLÉANS	Bob Monette	Orléans	Orléans	1	29237.165112...	25385...	45285
19	Quartier 19	19	CUMBERLAND	CUMBERLAND	Stephen Blais	Cumberland	Cumberland	19	98794.871092...	37983...	48762
21	Quartier 21	21	RIDEAU-GOUL...	RIDEAU-GOUL...	Scott Moffatt	Rideau-Goulb...	Rideau-Goulb...	21	131359.05825...	73655...	43798
5	Quartier 5	5	WEST CARLE...	WEST CARLE...	Eli El-Chantiry	West Carleton...	West Carleton...	5	122388.21698...	76556...	44481
3	Quartier 3	3	BARRHAVEN	BARRHAVEN	Jan Harder	Barrhaven	Barrhaven	3	29730.224063...	26227...	45092

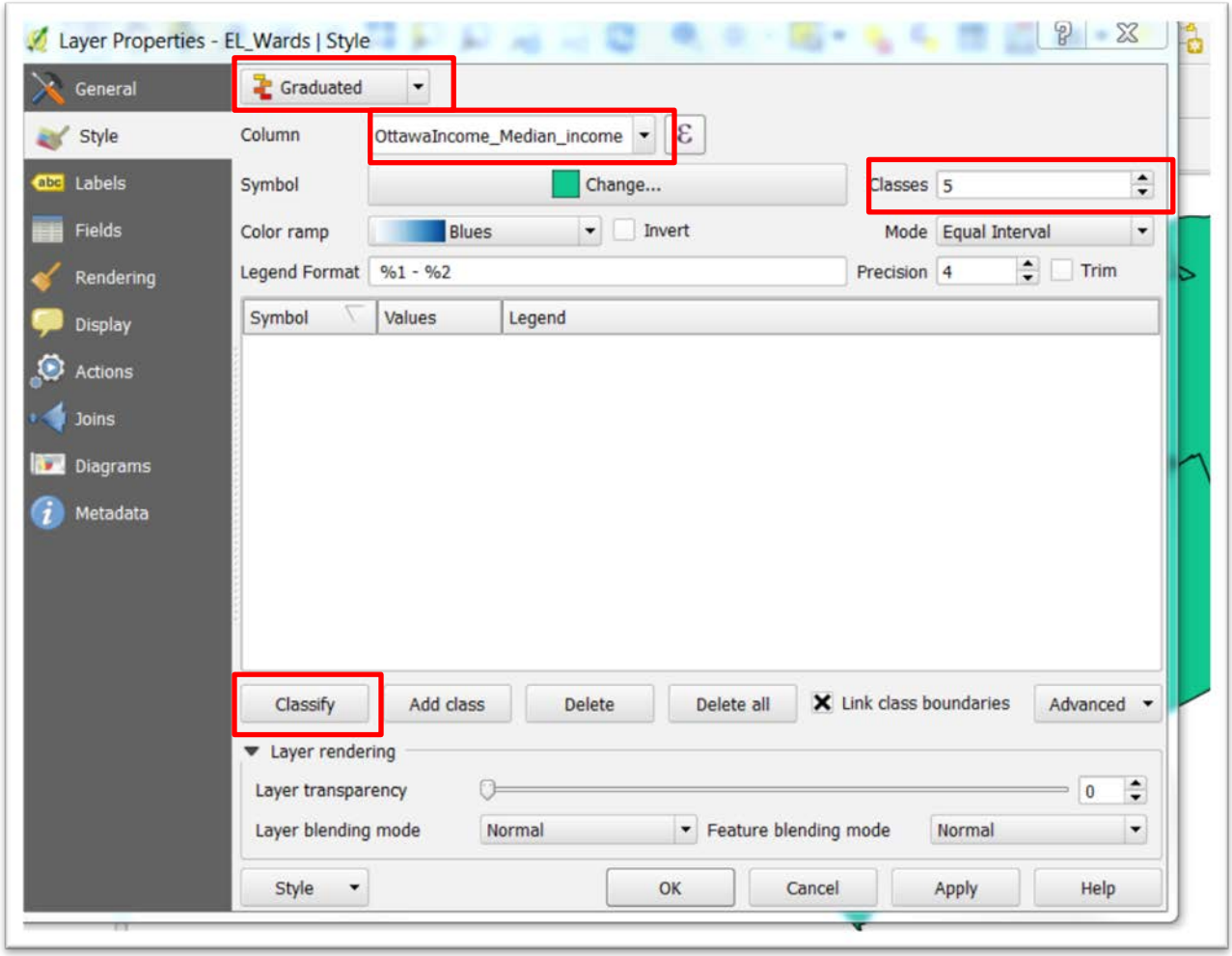
56. Close the attribute table, right click on the “EL_Wards” layer, and return to properties, and select the “Style” option.


Layer Properties - EL_Wards | Joins
General
Style
Labels
Fields
Rendering
Display
Actions
Joins
Diagrams
Metadata
Join layer
Join field
Target field
Memory cache
OttawaIncome
Ward_Number
WARD_NUM
✔
Style
OK
Cancel
Apply
Help



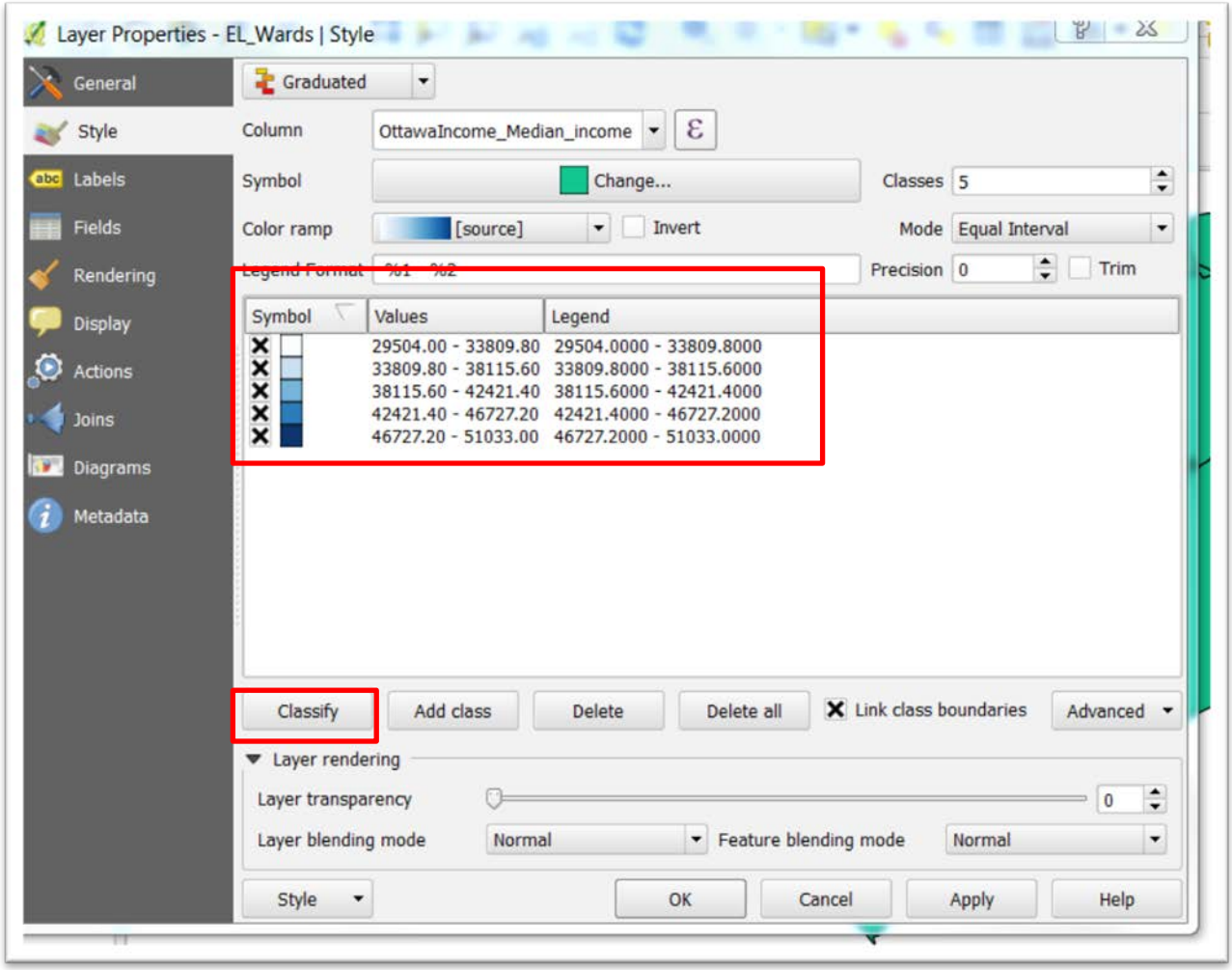
57. As we did in the contaminated sites tutorial, select "Graduated", and specify the value we wish to visualize, which in

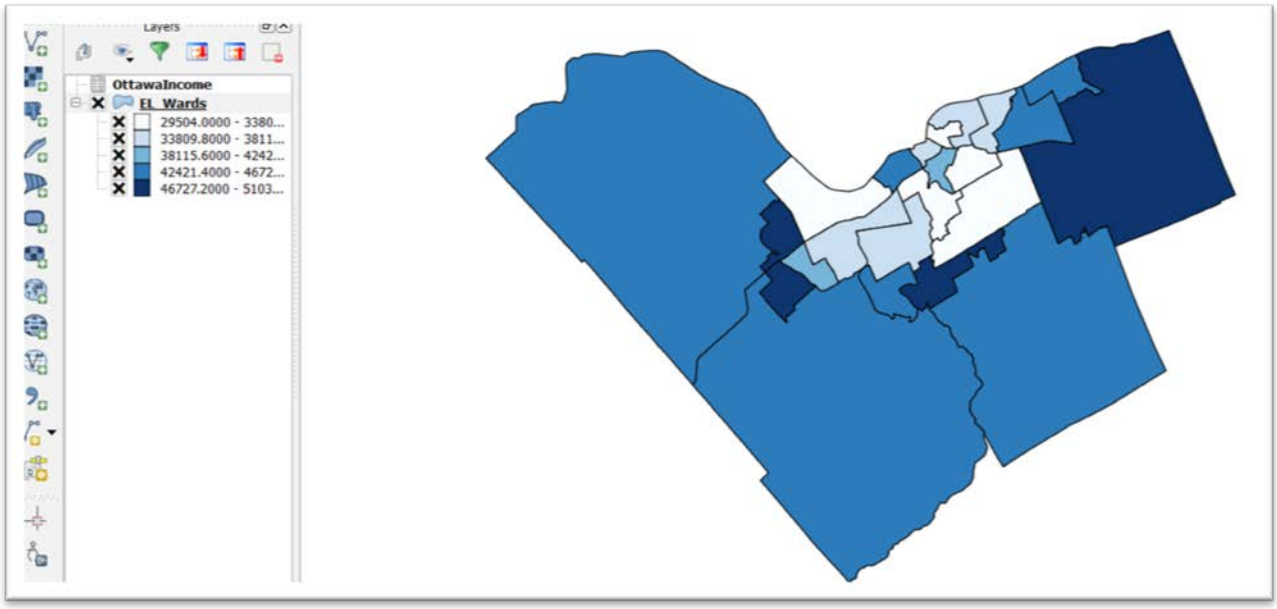
this case is the median income.



58. Qgis defaults to five categories, which can be changed using the “Advanced” feature. Let’s stick with five. You can also change the “Colour ramp”.

59. Select the “Classify” tab to make the categories appear.

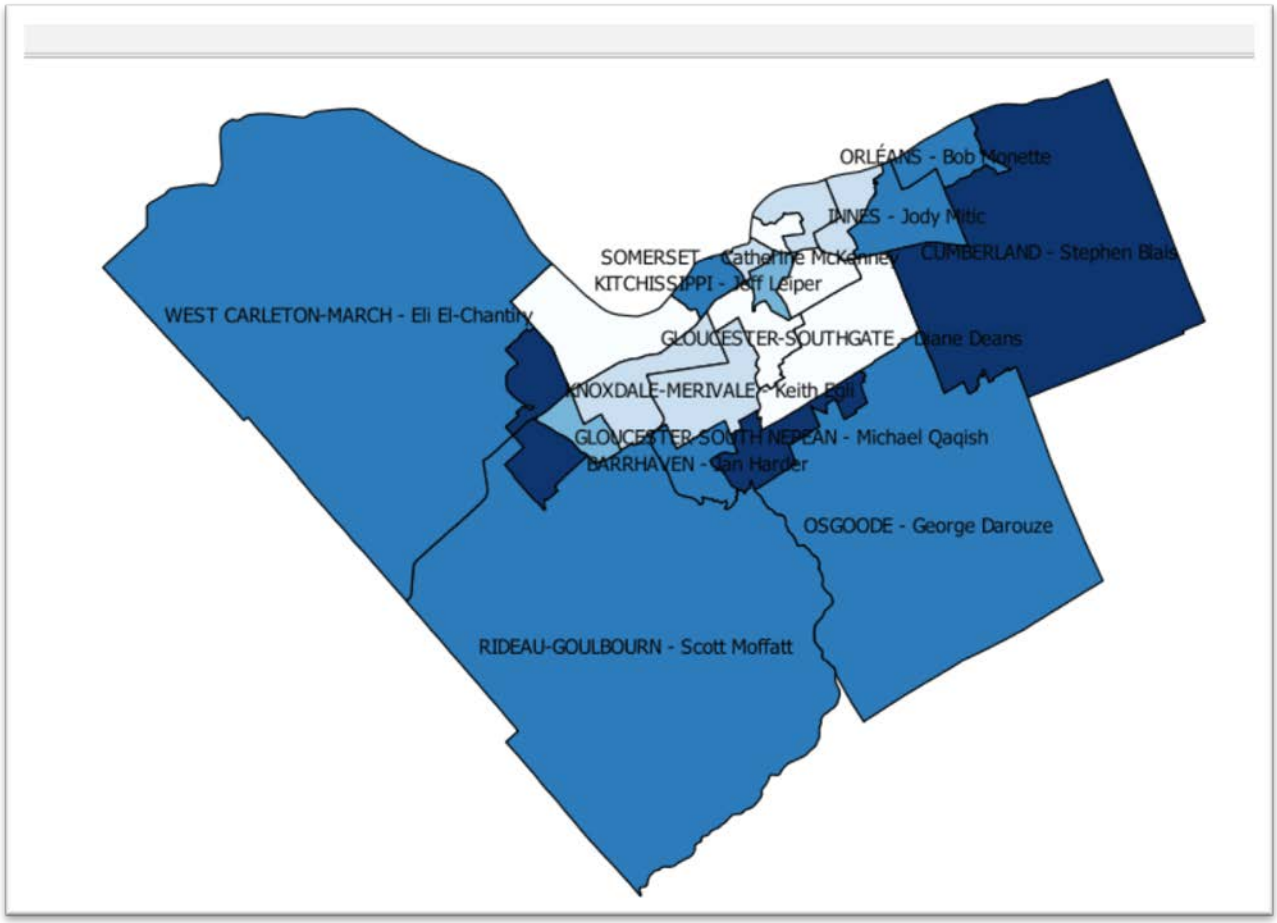




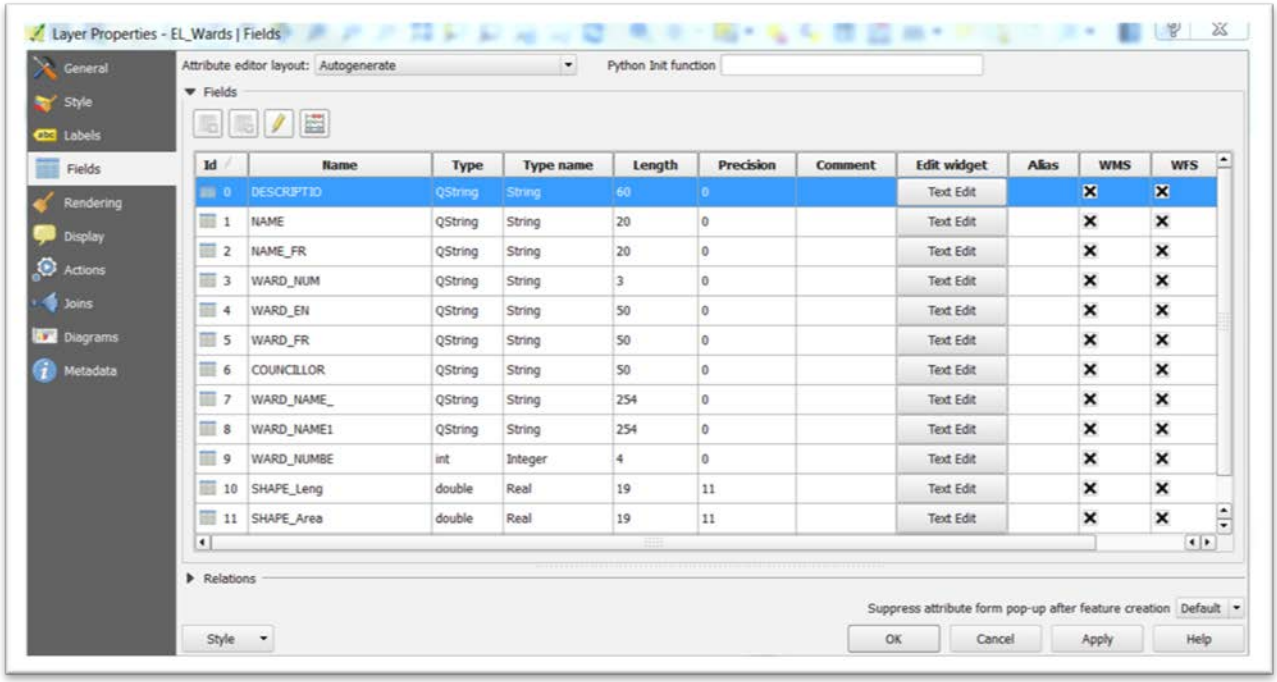
60. Not bad. You make the numbers in the “Legend” easier to read by deleting the numbers after the decimal point.

61. To make it easier to identify the wards, let’s activate the labels.

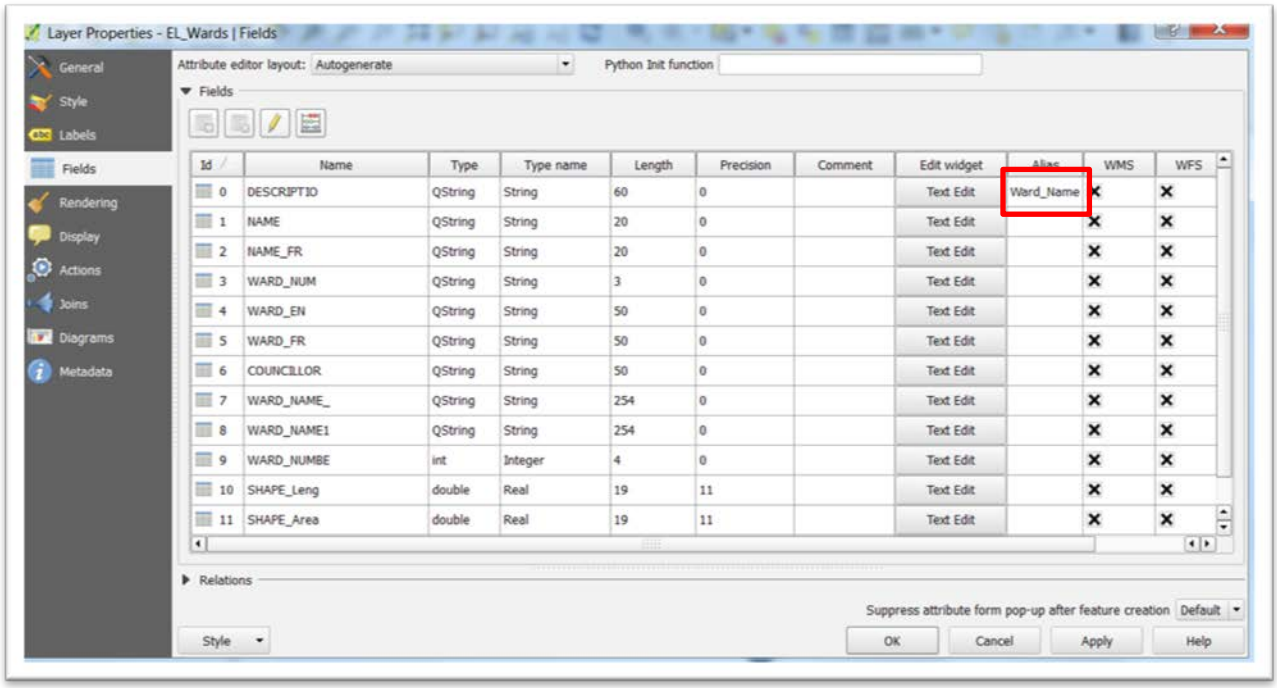
62. Return to the properties section, select “Labels”, specify that you want to “Label this layer with” the “DESCRIPTIO” column, which we can improve by assigning it an alias, something we learned in MySQL. You can also specify the font size, and colour. Let’s stick with the default settings.



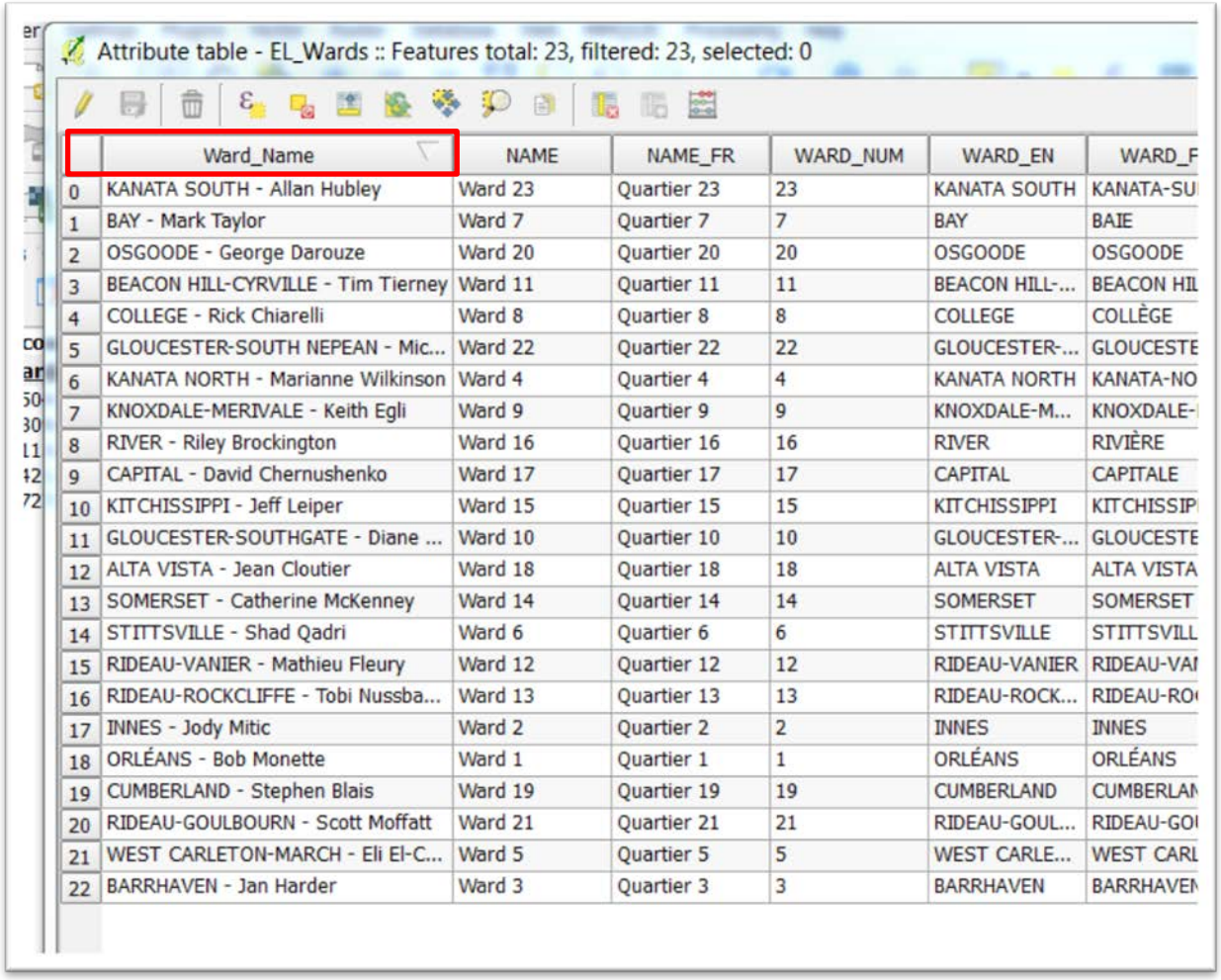
63. Now let's give that strangely named column better name. Return to properties, select "Fields".



64. In the Alias column, type "Ward_Name", select "Apply" and "OK".



65. Open the attribute table to see the new title.

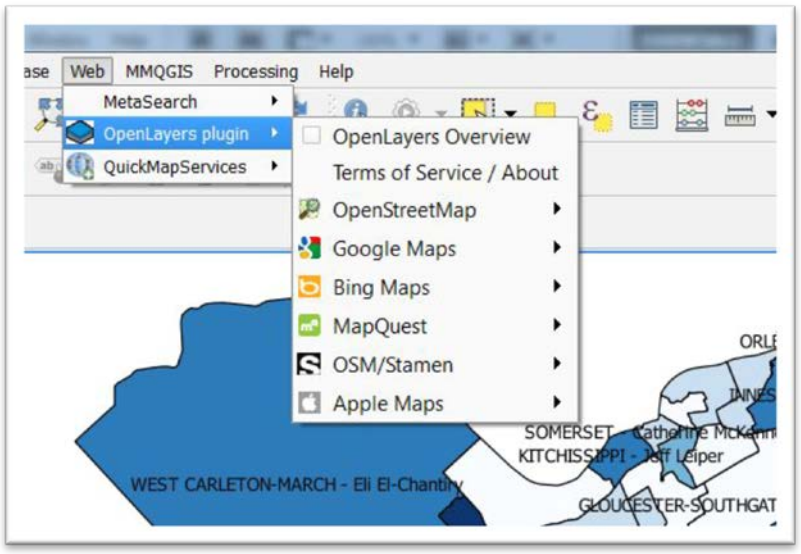


	Ward_Name	NAME	NAME_FR	WARD_NUM	WARD_EN	WARD_F
0	KANATA SOUTH - Allan Hubley	Ward 23	Quartier 23	23	KANATA SOUTH	KANATA-SU
1	BAY - Mark Taylor	Ward 7	Quartier 7	7	BAY	BAIE
2	OSGOODE - George Darouze	Ward 20	Quartier 20	20	OSGOODE	OSGOODE
3	BEACON HILL-CYRVILLE - Tim Tierney	Ward 11	Quartier 11	11	BEACON HILL-...	BEACON HIL
4	COLLEGE - Rick Chiarelli	Ward 8	Quartier 8	8	COLLEGE	COLLÈGE
5	GLOUCESTER-SOUTH NEPEAN - Mic...	Ward 22	Quartier 22	22	GLOUCESTER-...	GLOUCESTE
6	KANATA NORTH - Marianne Wilkinson	Ward 4	Quartier 4	4	KANATA NORTH	KANATA-NO
7	KNOXDALE-MERIVALE - Keith Egli	Ward 9	Quartier 9	9	KNOXDALE-M...	KNOXDALE-
8	RIVER - Riley Brockington	Ward 16	Quartier 16	16	RIVER	RIVIÈRE
9	CAPITAL - David Chernushenko	Ward 17	Quartier 17	17	CAPITAL	CAPITALE
10	KITCHISSIPPI - Jeff Leiper	Ward 15	Quartier 15	15	KITCHISSIPPI	KITCHISSIP
11	GLOUCESTER-SOUTHGATE - Diane ...	Ward 10	Quartier 10	10	GLOUCESTER-...	GLOUCESTE
12	ALTA VISTA - Jean Cloutier	Ward 18	Quartier 18	18	ALTA VISTA	ALTA VISTA
13	SOMERSET - Catherine McKenney	Ward 14	Quartier 14	14	SOMERSET	SOMERSET
14	STITTSVILLE - Shad Qadri	Ward 6	Quartier 6	6	STITTSVILLE	STITTSVILL
15	RIDEAU-VANIER - Mathieu Fleury	Ward 12	Quartier 12	12	RIDEAU-VANIER	RIDEAU-VAI
16	RIDEAU-ROCKCLIFFE - Tobi Nussba...	Ward 13	Quartier 13	13	RIDEAU-ROCK...	RIDEAU-RO
17	INNES - Jody Mitic	Ward 2	Quartier 2	2	INNES	INNES
18	ORLÉANS - Bob Monette	Ward 1	Quartier 1	1	ORLÉANS	ORLÉANS
19	CUMBERLAND - Stephen Blais	Ward 19	Quartier 19	19	CUMBERLAND	CUMBERLAN
20	RIDEAU-GOULBOURN - Scott Moffatt	Ward 21	Quartier 21	21	RIDEAU-GOUL...	RIDEAU-GOU
21	WEST CARLETON-MARCH - Eli El-C...	Ward 5	Quartier 5	5	WEST CARLE...	WEST CARL
22	BARRHAVEN - Jan Harder	Ward 3	Quartier 3	3	BARRHAVEN	BARRHAVEN

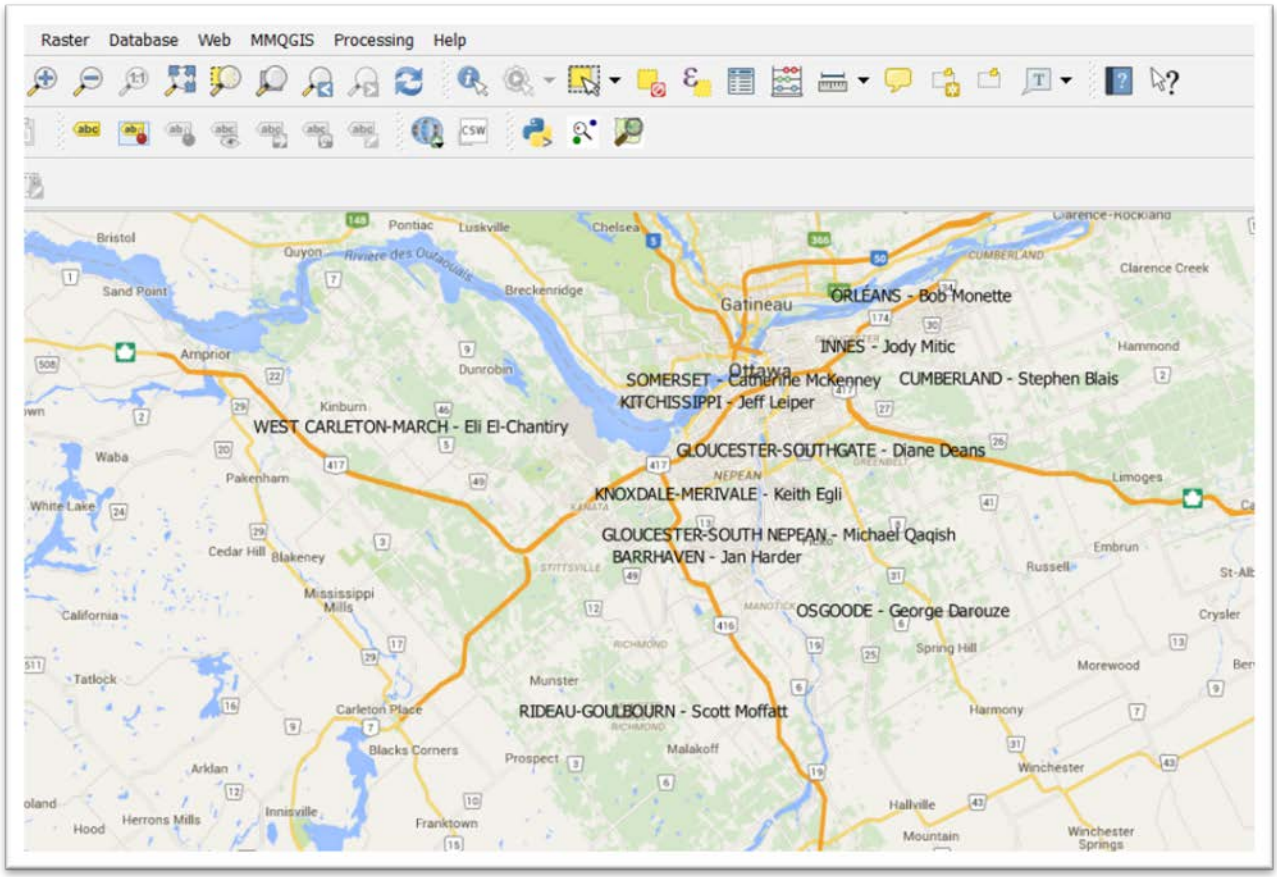
66. Close the attribute table.

67. Our map still needs a feature that allows us to get a better sense of the areas of the city these wards encompus. To do this, we'll have to add a base map.

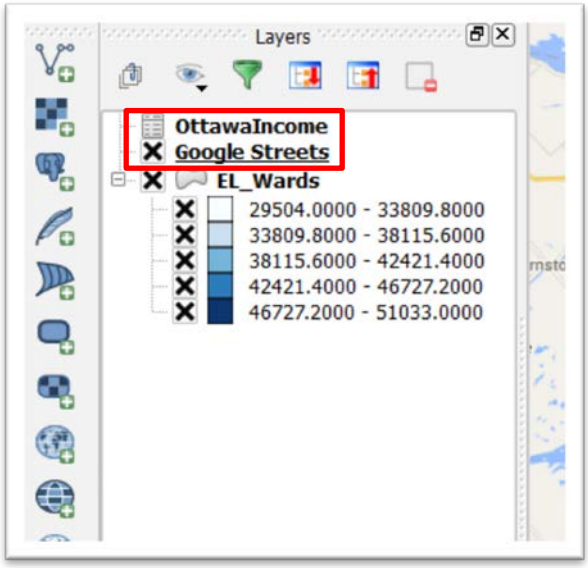
68. Select the “Web” section of the menu above.



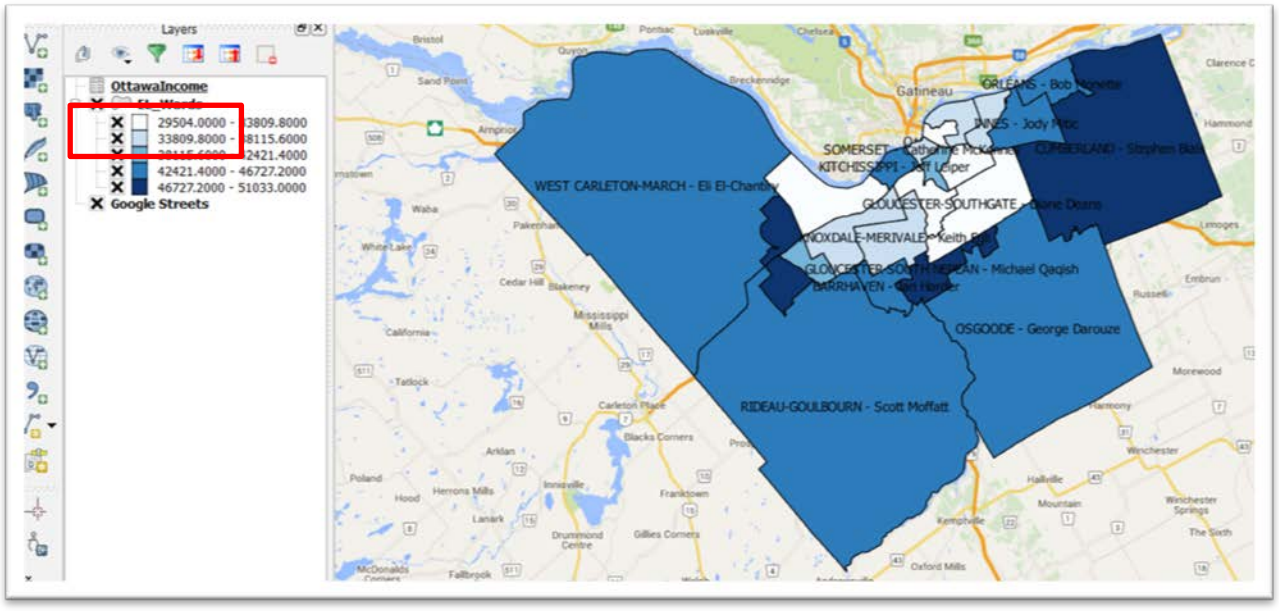
69. You can select a number of options. Click on the arrow to the right of “Google Maps, and choose “Google Streets”.



70. The map has obscured the wards, because it sits above the ward layer in the table of contents to the left.



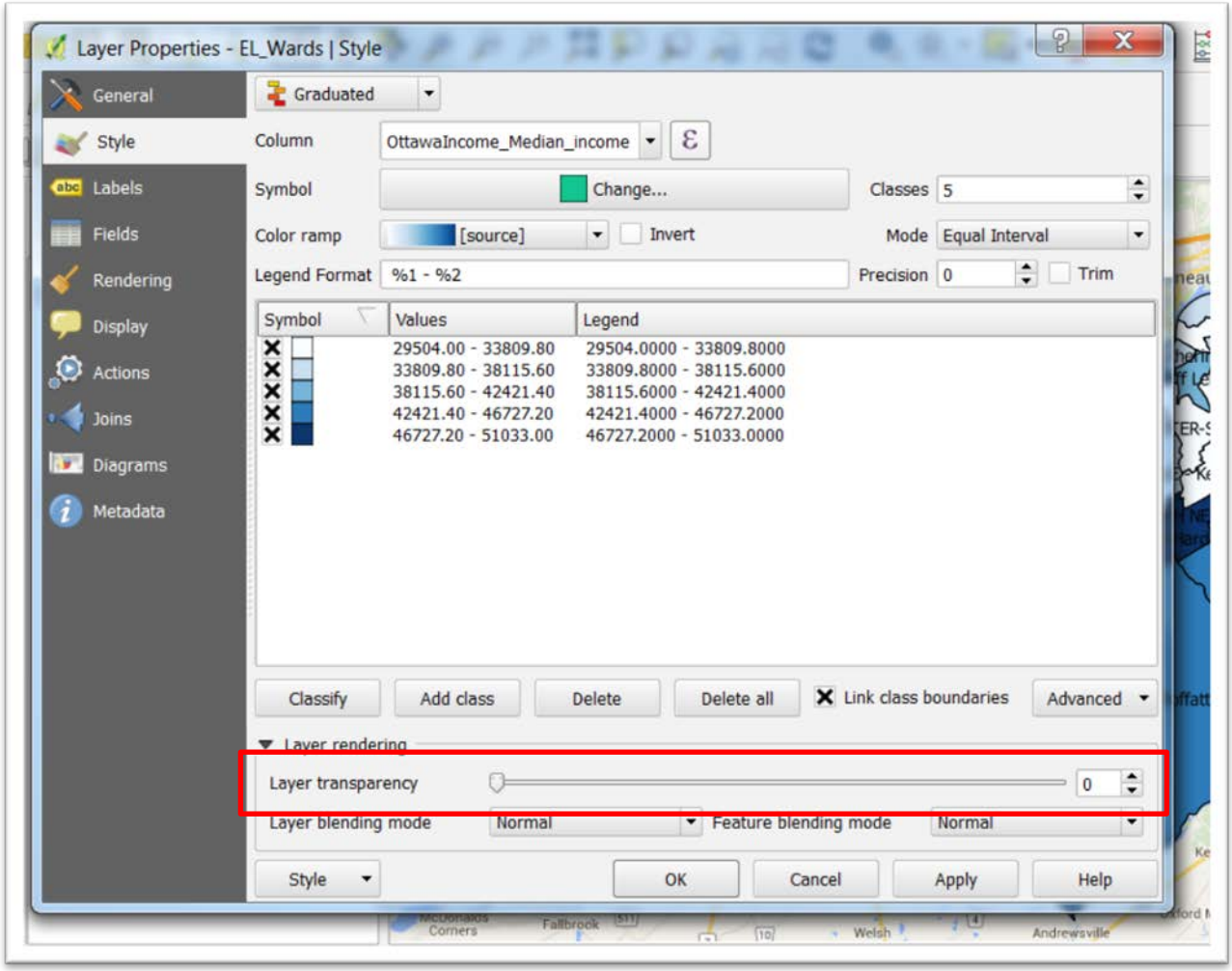
71. Right-click on the “Google Streets” layer and drag it below the “El_Wards” layer.



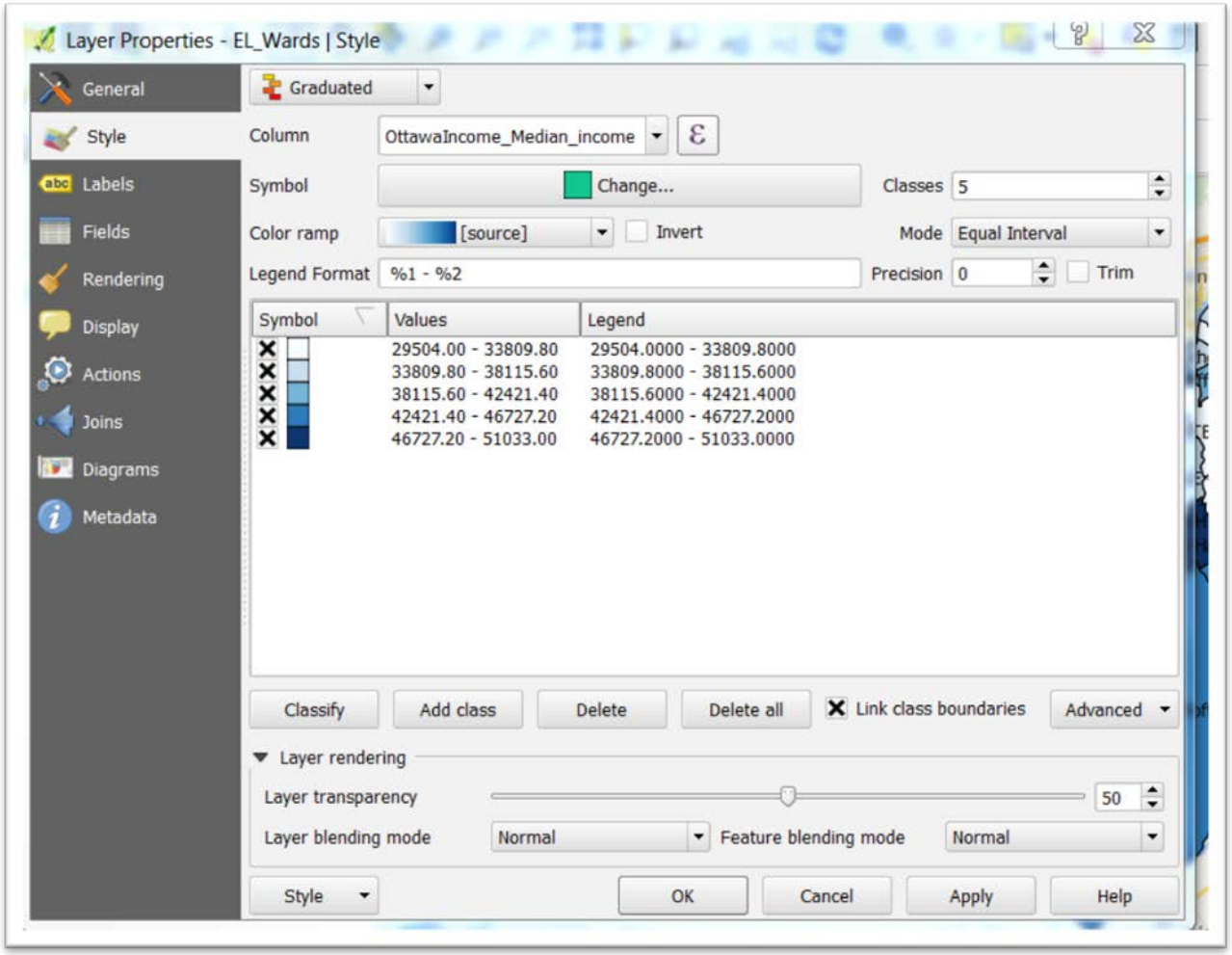
72. It’s still difficult to see the streets. So let’s make the ward shape file more transparent.

73. Return to properties, “Style” and adjust the setting on the “Layer transparency” section towards the bottom of the dialog

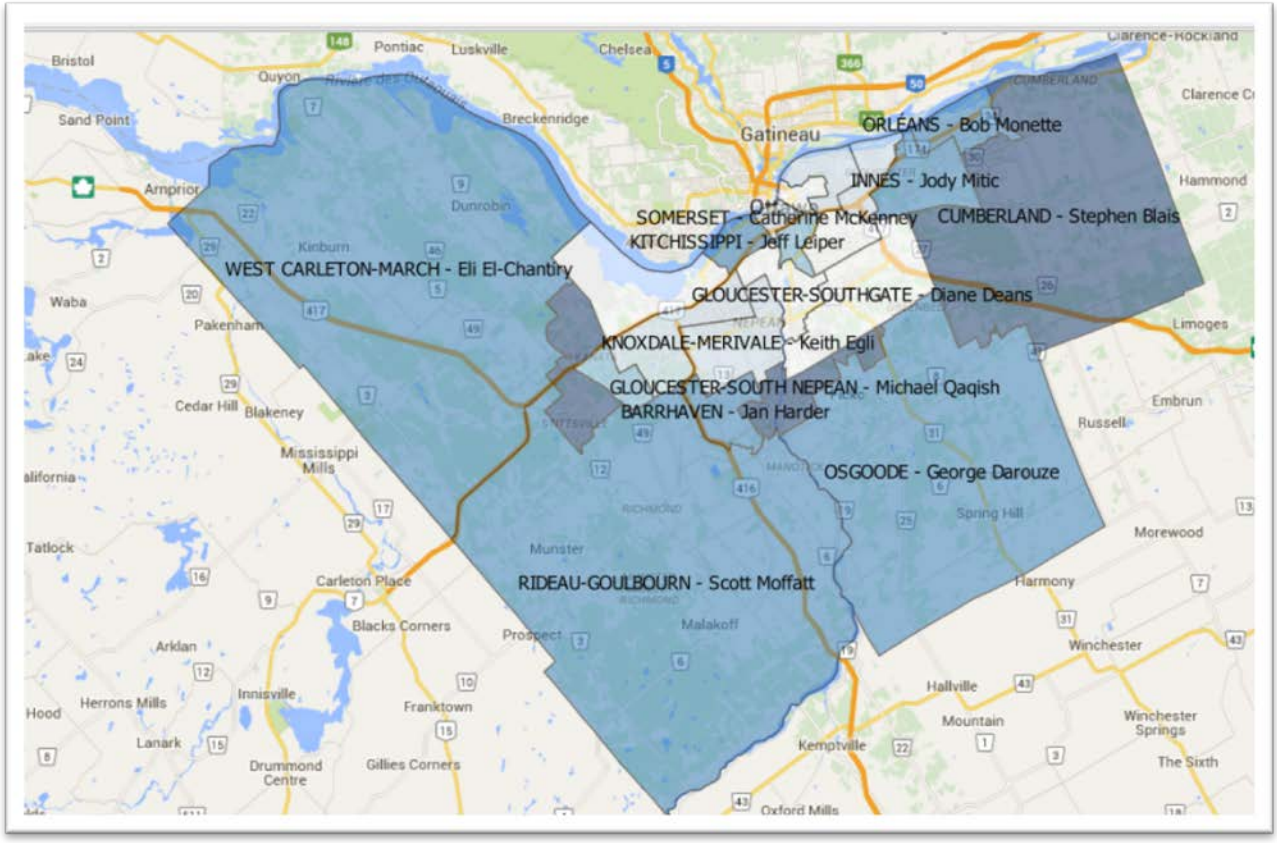
box.


Layer Properties - EL_Wards | Style
General
Style
Labels
Fields
Rendering
Display
Actions
Joins
Diagrams
Metadata
Graduated
Column
OttawaIncome_Median_income
Symbol
Change...
Classes
5
Color ramp
[source]
Invert
Mode
Equal Interval
Legend Format
%1 - %2
Precision
0
Trim
Symbol
Values
Legend
29504.00 - 33809.80
29504.0000 - 33809.8000
33809.80 - 38115.60
33809.8000 - 38115.6000
38115.60 - 42421.40
38115.6000 - 42421.4000
42421.40 - 46727.20
42421.4000 - 46727.2000
46727.20 - 51033.00
46727.2000 - 51033.0000
Classify
Add class
Delete
Delete all
Link class boundaries
Advanced
Layer rendering
Layer transparency
0
Layer blending mode
Normal
Feature blending mode
Normal
Style
OK
Cancel
Apply
Help

74. Change it to 50 per cent. If that's too transparent, then try 30 per cent.



75. Select “Apply” and “OK”.

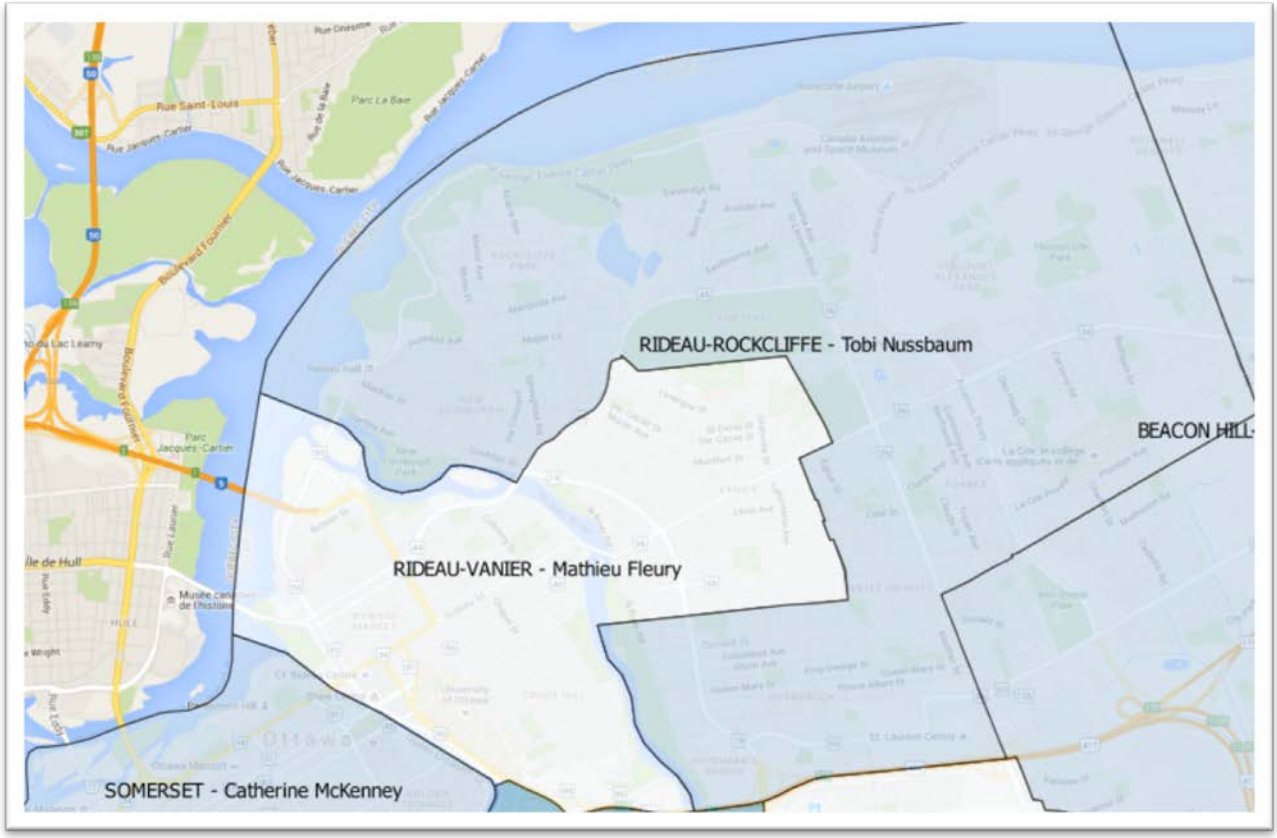


76. Now it’s easier to see the streets.

77. Take some time to zoom in on the various wards to see what territory they take in. The wards also display the names of the councillors. If you don’t like these labels, return to the “Labels” portion of the layer properties box and choose the title that only contains the ward name.

78. When we get a closer look at Rideau-Rockliffe, a ward that arguably possesses the highest number of millionaire homes per capita, we can see why the median income is low compared to other wards. It takes in many lower-income neighborhoods the

farther south you move from the Ottawa River.



79. Take some time to explore some of the other wards, which amounts to testing your data in the real world.