

Heat map tutorial

Heat or thematic maps help readers identify hotspots for certain income groups, contaminated sites, cancer clusters, and so on. Think of a heat map as a pivot table for the eyes. Instead of grouping contaminated sites or cancer clusters by location sorted in descending order, the heat map uses colours to pinpoint the location with the highest concentration or the greatest number of whatever it is you're writing about.

The colour, then, symbolizes the key attribute: an area with the highest concentration of contaminated sites; cities with the greatest percentage of people who live in apartments; cities with the highest per-capita energy use; wards with the highest per-capita rates for certain crimes.

In this tutorial, we'll use crime data from the Ottawa Police Service's [website](#), and the boundary file that contains Ottawa's wards, to identify break-and-enter hotspots. We'll use the per capita numbers, which typically allow us to compare the number of break-ins for every 100,000 people, a standard rate that Statistics Canada and police forces use, even in areas that have less than 100,000 people. Using a 100,000 base makes sense when comparing cities, provinces or countries that have large populations. It makes less sense when comparing wards in Ottawa, that in 2012 had an average population of 40,600. It may make more sense to talk about break-and-enters for every 10,000 people.

So before we get to the tutorial, a few more words about per capita or per person rates.

Per capita rates allow us to compare crimes in wards with different populations, which could lead to stories about the ward where your house is most likely to get burgled, or where you're more likely to get assaulted.

To get the per capita rates in the table we'll use for this tutorial, we divide the actual number of times the offence was committed by the ward's population. Let's take Kitchissippi ward -- one that will figure prominently in this tutorial -- as an example. In 2012, the latest year for which the Ottawa crime stats are available, there were 248 break-and-enters. A lot compared to the other wards, but a number that could be influenced by Kitchissippi's size compared to the more sparsely populated wards.

To obtain the rate, of break-and-enters, we divide the number 248 by 41,250, the ward's 2012 population to get the number .006. That is, there were .006 break-ins for every 41,250 people. The problem with this number is that it's too small for people to understand, and even more awkward to describe in a story.

But if we multiply that number by something bigger to allow us to express the number as an occurrence for every 1,000 10,000 or 100,000 people, then it becomes a number or rate that people understand. This is why Statistics Canada and police forces use a base of 100,000, a number that makes sense because police forces operate out of large cities. But what if you're comparing geographic boundaries within a city? Does it still make sense to use 100,000 as your base? Perhaps.

Because Ottawa's wards are thinly populated compared to large cities, it may make more sense to express the crimes as occurring for every 10,000 people. So multiplying .006 by 10,000 -- in essence, moving the

decimal place four spaces to the right -- giving us 60. Or expressed more conversationally, according to Ottawa police statistics, the Kitchissippi ward had 60 break-ins for every 10,000 people in 2012. As long as you explain your methodology, then you can use whatever base makes sense when calculating rates. And, more importantly, it allows us to compare Kitchissippi to the other wards, which means creating a heat map.

Let's begin!

- 1) Download the [data set](#) we'll be using for this tutorial.
- 2) Upload the table to Fusion Tables.

Import new table ✕

Column names are in row 1 ▾

1	Offence	Actual	Year	Ward	Ward number	Popu...	Perc...
2	Break and Enter	248	2012	Kitchis...	15	41,250	60
3	Break and Enter	266	2012	Rideau-Vanier	12	47,950	55
4	Break and Enter	226	2012	Alta Vista	18	45,300	50
5	Break and Enter	176	2012	Somerset	14	38,400	46
6	Break and Enter	152	2012	Capital	17	37,250	41
7	Break and Enter	151	2012	Rideau-Rockcliffe	13	38,950	39

Rows before the header row will be ignored.

New to Fusion Tables? Cancel « Back Next »

Take a peek! [Play with a data set](#) or [try a tutorial](#).

3) Keep selecting the “Next” tab until you arrive at the table.

BreakandEnters2012

Imported at Sun Feb 16 15:27:19 PST 2014 from BreakandEnters2012.xlsx.

Edited at 6:27 PM

File Edit Tools Help Rows 1 Cards 1

Filter No filters applied

1-23 of 23

Offence	Actual	Year	Ward	Ward number	Population_2011	Percapita
Break and Enter	248	2012	Kitchissippi	15	41,250	60
Break and Enter	266	2012	Rideau-Vanier	12	47,950	55
Break and Enter	226	2012	Alta Vista	18	45,300	50
Break and Enter	176	2012	Somerset	14	38,400	46
Break and Enter	152	2012	Capital	17	37,250	41
Break and Enter	151	2012	Rideau-Rockcliffe	13	38,950	39
Break and Enter	103	2012	Osgoode	20	27,000	38
Break and Enter	176	2012	College	8	53,300	33
Break and Enter	150	2012	River	16	48,900	31
Break and Enter	78	2012	Rideau-Goulbourn	21	27,000	29
Break and Enter	94	2012	Beacon Hill-Cyrville	11	34,150	28
Break and Enter	100	2012	Knoxdale-Merivale	9	39,850	25
Break and Enter	111	2012	Bay	7	45,700	24
Break and Enter	79	2012	Kanata North	4	34,200	23
Break and Enter	58	2012	West Carleton-March	5	25,350	23
Break and Enter	96	2012	Gloucester-Southgate	10	47,650	20
Break and Enter	88	2012	Cumberland	19	44,400	20
Break and Enter	78	2012	Gloucester-South Nepean	22	43250	18
Break and Enter	71	2012	Innes	2	40,100	18
Break and Enter	45	2012	Stittsville-Kanata West	6	28,300	16
Break and Enter	69	2012	Kanata South	23	45550	15
Break and Enter	78	2012	Barrhaven	3	52,050	15
Break and Enter	57	2012	Orleans	1	49,200	12

4) You’ll notice that there is no option for mapping because the table lacks geographic coordinates. We could, of course, create a chart, but we want to make a heat map. To do so, we’ll have to merge it with a file that contains geographic coordinates Fusion Tables can

read; in this case, the city of Ottawa 2012 wards file. You can find on the city's [open data site](#). Or, you can also download a cleaned-up version of the file by clicking [here](#). **(NOTE: Clicking on the “here” link will open up the file in a new browser. Use the “save as” option under the “File” section to place the kml file onto your hard drive.** This second option I’ve provided is a cleaner version compared to the kml file on the city’s website.)

- 5) Download either one of the KML (keyhole markup language) files.
- 6) Upload the kml file to Fusion Tables.

CityWards2010
 Imported at Wed Feb 12 18:38:06 PST 2014 from CityWards2010.kml.
 Edited on February 12, 2014

File Edit Tools Help Rows 1 Cards 1 **Map of geometry**

Filter No filters applied

1-69 of 69

description	name	DESCRIPTIO	WARD_NUM	geometry
	BARRHAVEN	ALTA VISTA	18	KML...
	BAY	BARRHAVEN	3	KML...
	BEACON HILL-CYRVILLE	BAY	7	KML...
	CAPITAL	BEACON HILL-CYRVILLE	11	KML...
	CAPITAL	CAPITAL	17	KML...
	COLLEGE	COLLEGE	8	KML...
	CUMBERLAND	CUMBERLAND	19	KML...
	GLOUCESTER-SOUTH NEPEAN	GLOUCESTER-SOUTH NEPEAN	22	KML...
	GLOUCESTER-SOUTHGATE	GLOUCESTER-SOUTHGATE	10	KML...
	INNES	INNES	2	KML...
	KANATA NORTH	KANATA NORTH	4	KML...
	KANATA SOUTH	KANATA SOUTH	23	KML...
	KITCHISSIPPI	KITCHISSIPPI	15	KML...
	KNOXDALE-MERIVALE	KNOXDALE-MERIVALE	9	KML...
	ORLEANS	ORLEANS	1	KML...
	OSGOODE	OSGOODE	20	KML...
	RIDEAU-GOULBOURN	RIDEAU-GOULBOURN	21	KML...
	RIDEAU-ROCKCLIFFE	RIDEAU-ROCKCLIFFE	13	KML...
	RIDEAU-VANIER	RIDEAU-VANIER	12	KML...
	RIVER	RIVER	46	KML...

7) Now we'll merge this table with the table containing the 2012 break-and-enter statistics. Because both tables have a ward number, that is what we'll use to join the two files.

8) Go the "File" on the menu and select the "Merge" option.

CityWards2010
Imported at Wed Feb 12 18:38:06 PST 2014 from CityWards2010.kml.
Edited on February 12, 2014

File Edit Tools Help Rows 1 Cards 1 Map of geometry

Share...
New table...
Open...
Rename...
Make a copy
About this table
Geocode...
Merge...
Find a table to merge with...
Create view...
Import more rows...
Download...

	DESCRIPTIO	WARD_NUM	geometry
	ALTA VISTA	18	KML...
	BARRHAVEN	3	KML...
LE	BAY	7	KML...
	BEACON HILL-CYRVILLE	11	KML...
	CAPITAL	17	KML...
	COLLEGE	8	KML...
	CUMBERLAND	19	KML...
	NEPEAN	22	KML...
	SOUTHGATE	10	KML...
	INNES	2	KML...
	KANATA NORTH	4	KML...

9) Select the “BreakandEnters2012” table.

Merge: Select a table

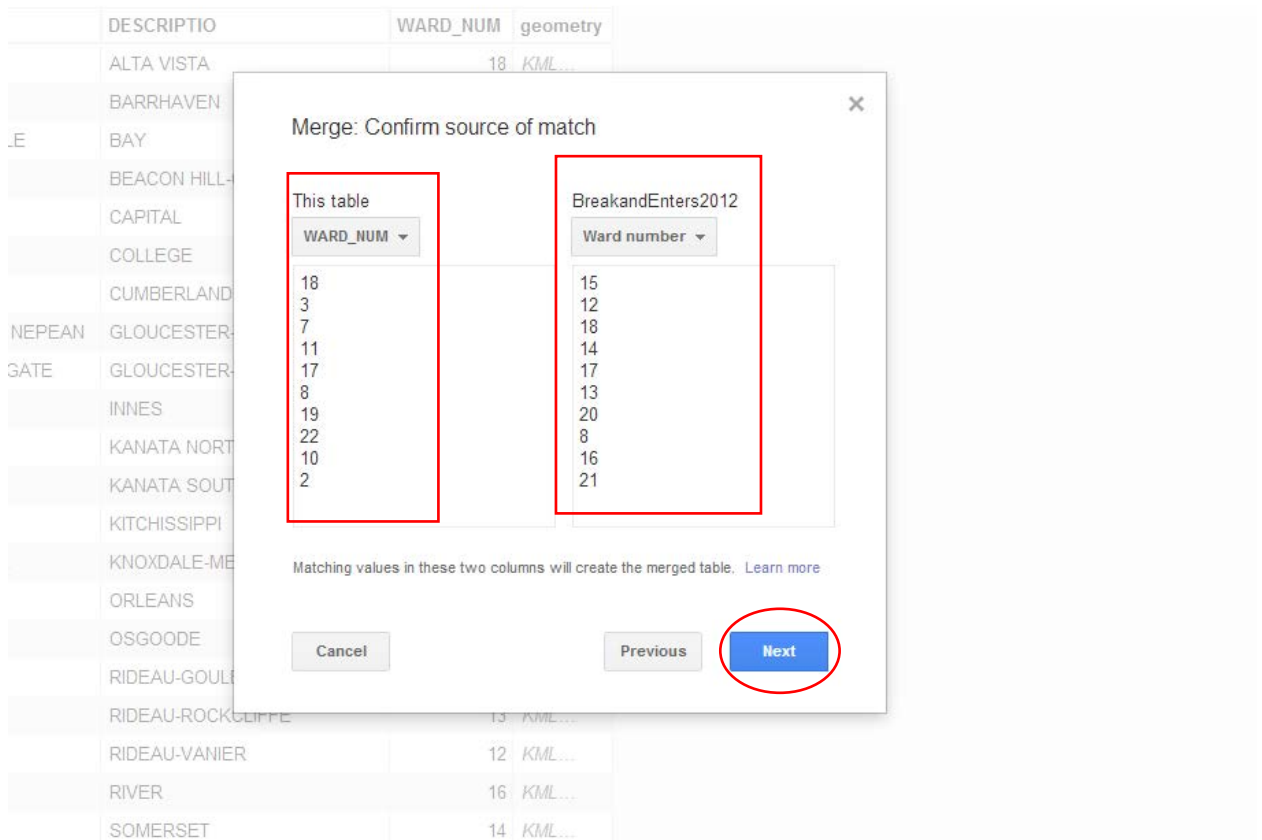
Tables

	TITLE	LAST MODIFIED
<input checked="" type="checkbox"/>	BreakandEnters2012	6:27 PM
<input type="checkbox"/>	RevokedCharitiesOntario	Feb 15
<input type="checkbox"/>	RevokedCharitiesOntario2010-2014	Feb 15
<input type="checkbox"/>	Merge of PotOffences and CityWards2010	Feb 12
<input type="checkbox"/>	CityWards2010	Feb 12
<input type="checkbox"/>	PotOffences	Feb 12
<input type="checkbox"/>	RevokedCharitiesOntario2010-2014	Feb 12

Or paste a web address here:

10) Once the selection is made, select the “Next” tab.

- In the “Merge: Confirm source of match” dialog box, make sure you’ve selected the ward number fields from both tables.



- Select the “Next” tab .
- Merge the two and view the new table.

Merge of CityWards2010 and BreakandEnters2012

Edited at 6:36 PM

File Edit Tools Help Rows 1 Cards 1 Map of geometry

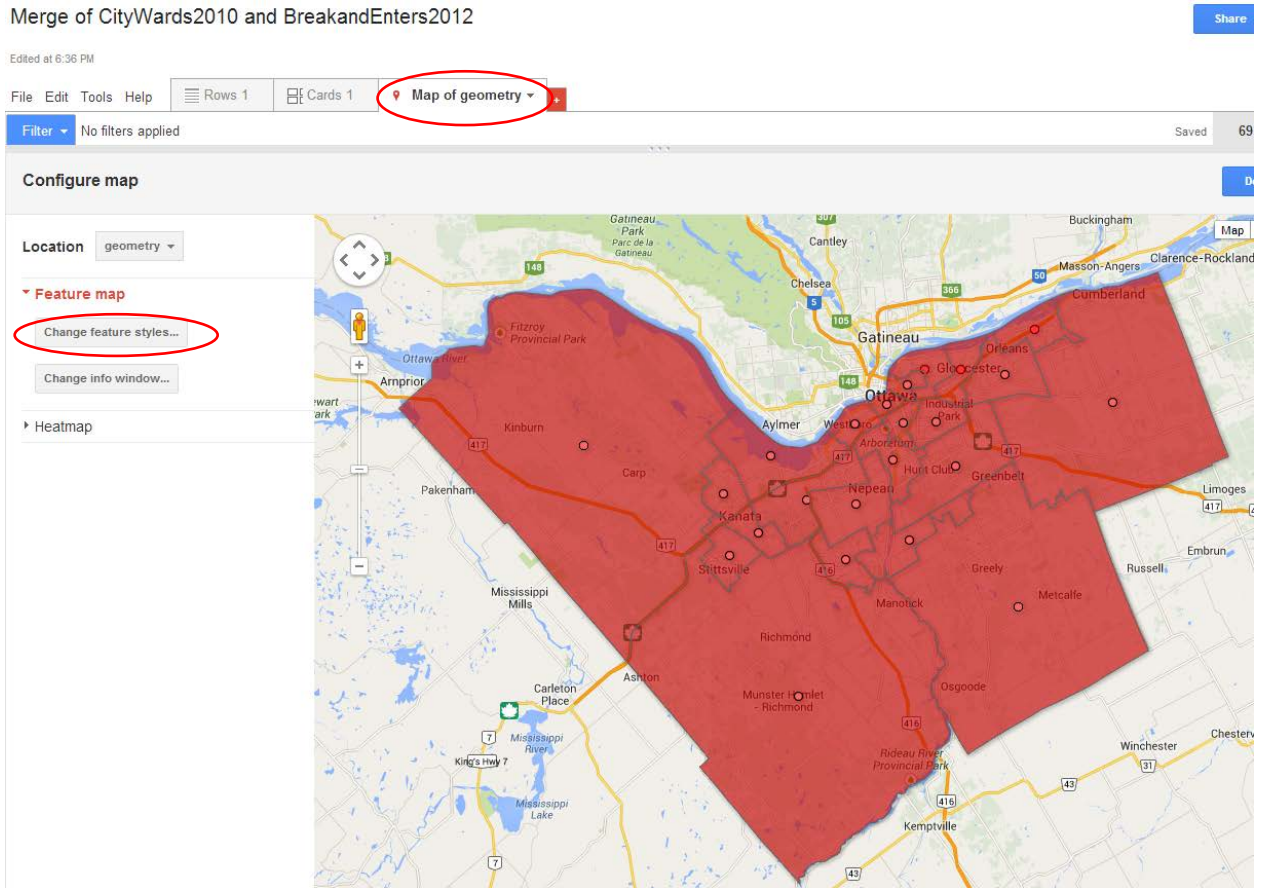
Filter No filters applied

1-69 of 69

WARD_NUM	description	name	DESCRIPTIO	geometry	Offence	Actual	Year	Ward	Population_2011	Percapita
		ALTA VISTA		KML...						
		BARRHAVEN		KML...						
		BAY		KML...						
		BEACON HILL-CYRVILLE		KML...						
		CAPITAL		KML...						
		COLLEGE		KML...						
		CUMBERLAND		KML...						
		GLOUCESTER-SOUTH NEPEAN		KML...						
		GLOUCESTER-SOUTHGATE		KML...						
		INNES		KML...						
		KANATA NORTH		KML...						
		KANATA SOUTH		KML...						
		KITCHISSIPPI		KML...						
		KNOXDALE-MERIVALE		KML...						
		ORLEANS		KML...						

14) The two tables are now merged, producing an option to map the result. (**NOTE:** I've used the kml file from the city's website, which is why you're seeing the points in each ward. The cleaned-up version that I provide does not have these markers because they were manually removed.)

15) Select the "Map of geometry" option.



16) While we can see the outlines of the wards, the entire map is the same colour. We'll have to use the "Change features styles" feature to assign colours to each polygon or ward.

- 17) Select the “Change features styles” tab, which will produce a dialog box.

Merge of CityWards2010 and BreakandEnters2012

Edited at 6:36 PM

File Edit Tools Help

Rows 1

Cards 1

Map of geometry

Filter No filters applied

Configure map

Location geometry

Feature map

Change feature styles...

Change info window...

Heatmap

Change map feature styles

Points
Marker icon

Polygons
Fill color
Border color
Border width

Lines
Line color
Line width

Legend
Automatic legend

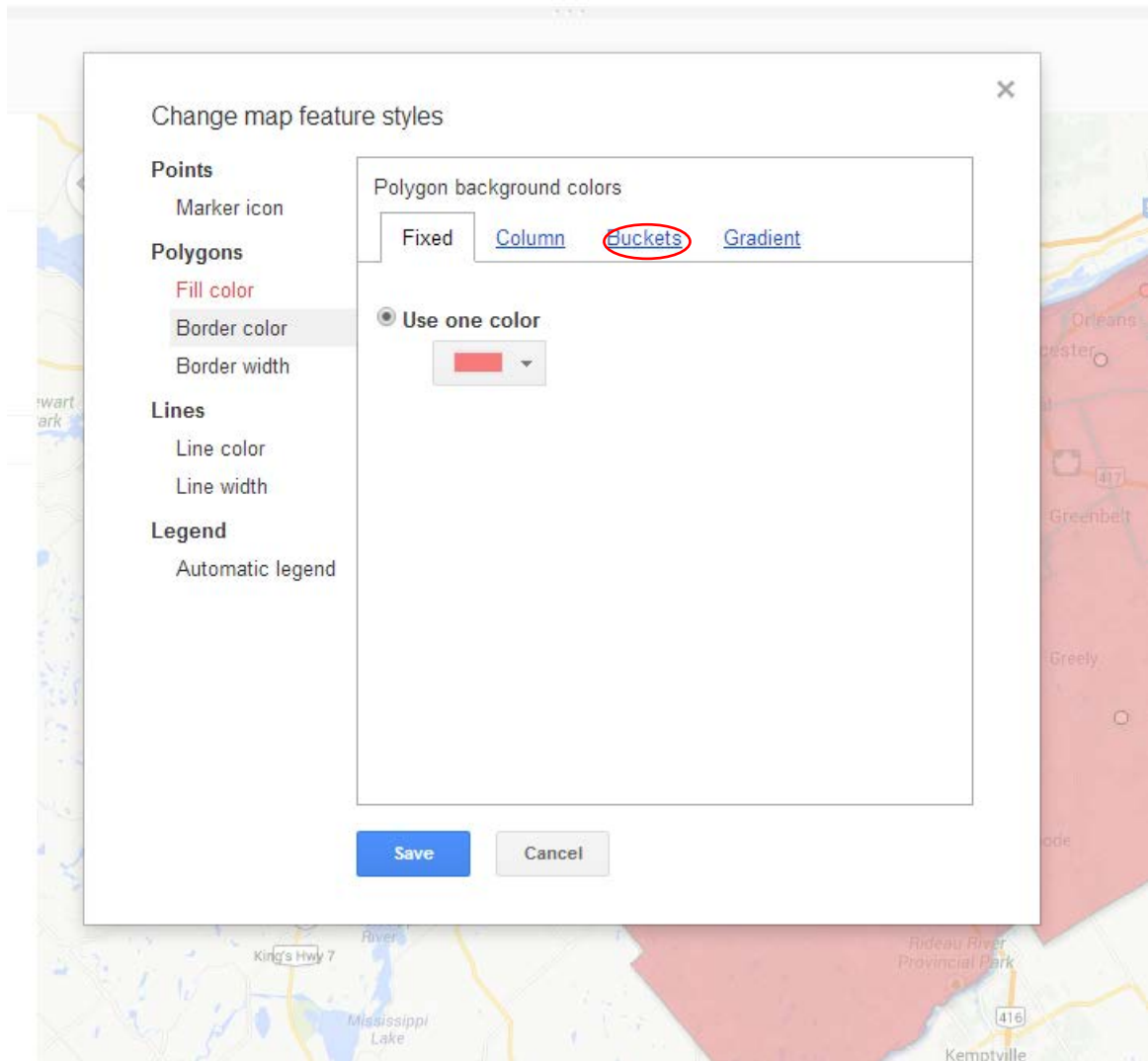
Map marker icons
Fixed Column Buckets

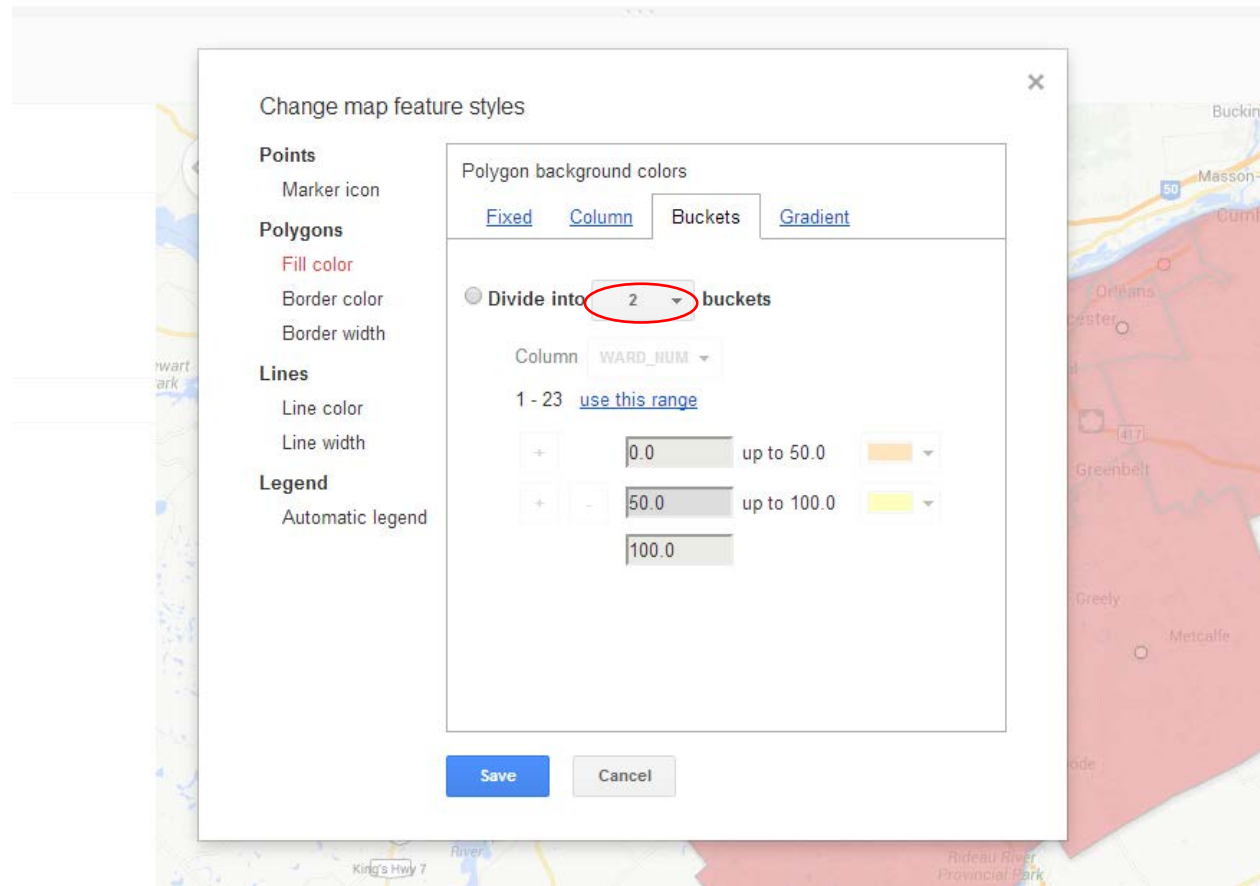
Use one icon

Save Cancel

- 18) Select the “Fill color” option under the Polygon section in the menu to the left, and then select the “Buckets” menu at the

top.





19)

20) A bucket is the term Fusion Table uses to describe each category into which you will drop or place certain values. We will drop the wards containing certain values into each of the buckets we've assigned. The colours will indicate which wards have the highest break-and-enter rates, with the darkest hues representing the hot spots.

21) To figure out how many buckets or categories we want, it's necessary to have another look at the table in your work sheet to figure out what makes the most sense.

22) Open your Excel worksheet (**NOTE:** this is where it's handy to work with at least two screens) and sort the numbers in the

per capita section in descending order.

	A	B	C	D	E	F	G	H
1	Offence	Actual	Year	Ward	Ward number	Population	Percapita	
2	Break and Enter	248	2012	Kitchissippi	15	41,250	60	
3	Break and Enter	266	2012	Rideau-Vanier	12	47,950	55	
4	Break and Enter	226	2012	Alta Vista	18	45,300	50	
5	Break and Enter	176	2012	Somerset	14	38,400	46	
6	Break and Enter	152	2012	Capital	17	37,250	41	
7	Break and Enter	151	2012	Rideau-Rockcliffe	13	38,950	39	
8	Break and Enter	103	2012	Osgoode	20	27,000	38	
9	Break and Enter	176	2012	College	8	53,300	33	
10	Break and Enter	150	2012	River	16	48,900	31	
11	Break and Enter	78	2012	Rideau-Goulbourn	21	27,000	29	
12	Break and Enter	94	2012	Beacon Hill-Cyrville	11	34,150	28	
13	Break and Enter	100	2012	Knoxdale-Merivale	9	39,850	25	
14	Break and Enter	111	2012	Bay	7	45,700	24	
15	Break and Enter	79	2012	Kanata North	4	34,200	23	
16	Break and Enter	58	2012	West Carleton-March	5	25,350	23	
17	Break and Enter	96	2012	Gloucester-Southgate	10	47,650	20	
18	Break and Enter	88	2012	Cumberland	19	44,400	20	
19	Break and Enter	78	2012	Gloucester-South Nepean	22	43250	18	
20	Break and Enter	71	2012	Innes	2	40,100	18	
21	Break and Enter	45	2012	Stittsville-Kanata West	6	28,300	16	
22	Break and Enter	69	2012	Kanata South	23	45550	15	
23	Break and Enter	78	2012	Barrhaven	3	52,050	15	
24	Break and Enter	57	2012	Orleans	1	49,200	12	
25								

23) The trick with a heat map is to make your hot spots stand out. Hence, you don't want to create too many buckets. or intervals. Let's create intervals of seven: wards with 12 to 19 will be the first bucket; wards with 19 to 26 the second; wards with 26 to 33 the third; wards with 33 to 40 the fourth; wards with 40 to 47 the fifth; wards with 47 to 54 the six; the wards with 54 to 61 being the seventh.

	A	B	C	D	E	F	G	H
1	Offence	Actual	Year	Ward	Ward number	Population	Percapita	
2	Break and Enter	248	2012	Kitchissippi	15	41,250	60	
3	Break and Enter	266	2012	Rideau-Vanier	12	47,950	55	
4	Break and Enter	226	2012	Alta Vista	18	45,300	50	
5	Break and Enter	176	2012	Somerset	14	38,400	46	
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18	Break and Enter	88	2012	Cumberland	19	44,400	20	
19	Break and Enter	78	2012	Gloucester-South Nepean	22	43250	18	
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21	Break and Enter	45	2012	Stittsville-Kanata West	6	28,300	16	
22	Break and Enter	69	2012	Kanata South	23	45550	15	
23	Break and Enter	78	2012	Barrhaven	3	52,050	15	
24	Break and Enter	57	2012	Orleans	1	49,200	12	
25								

24)

25) These buckets are the ones we've chosen for this tutorial.

However, the choices you make depend on the story you're trying to tell.

26) So let's return to Fusion Table's buckets section. We want to divide into seven buckets, based on the values in the "per capita"

column.

Change map feature styles

Points
Marker icon

Polygons
Fill color
Border color
Border width

Lines
Line color
Line width

Legend
Automatic legend

Polygon background colors

[Fixed](#) [Column](#) [Buckets](#) [Gradient](#)

Divide into **7** buckets

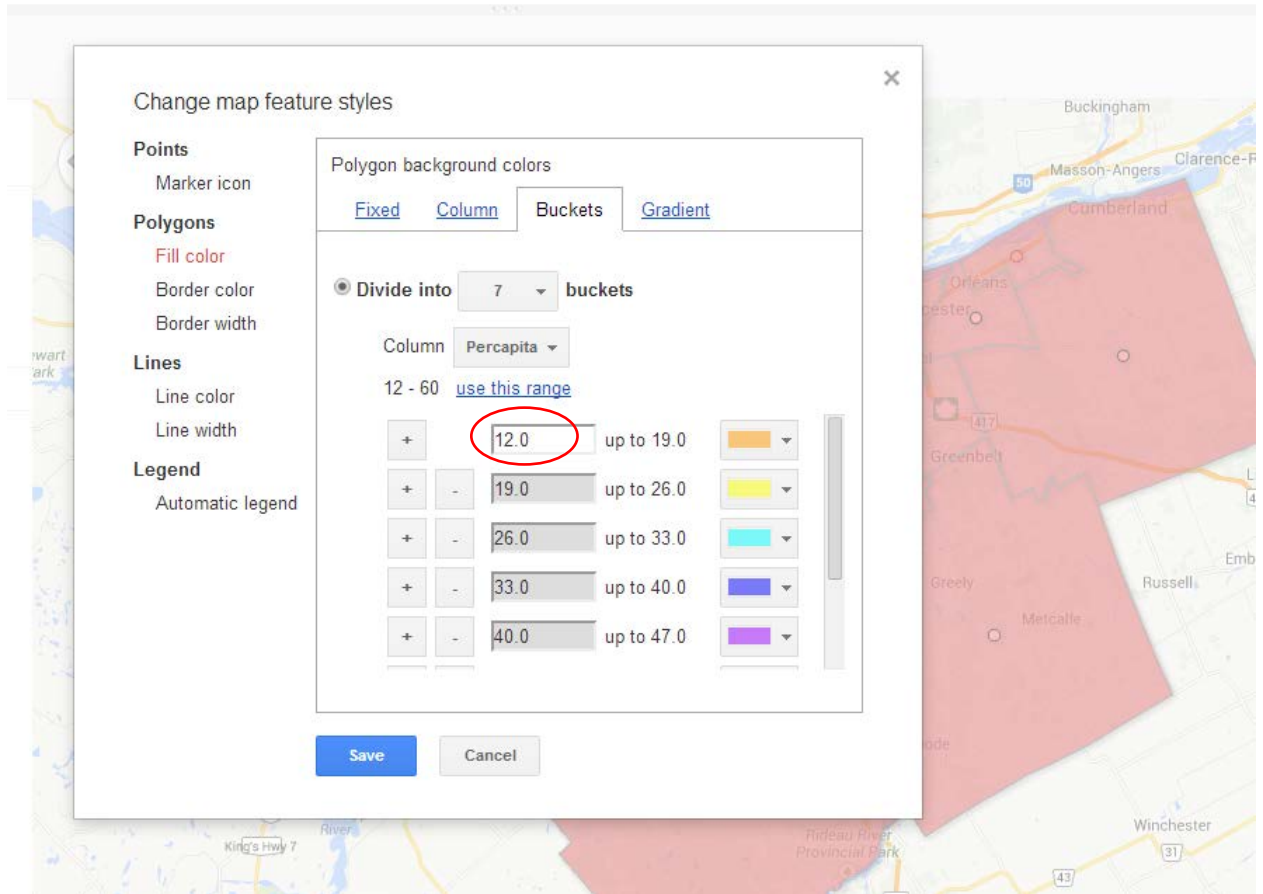
Column **Percapita**

12 - 60 [Use this range](#)

+		0.0	up to 14.286	
+	-	14.286	up to 28.571	
+	-	28.571	up to 42.857	
+	-	42.857	up to 57.143	
+	-	57.143	up to 71.429	

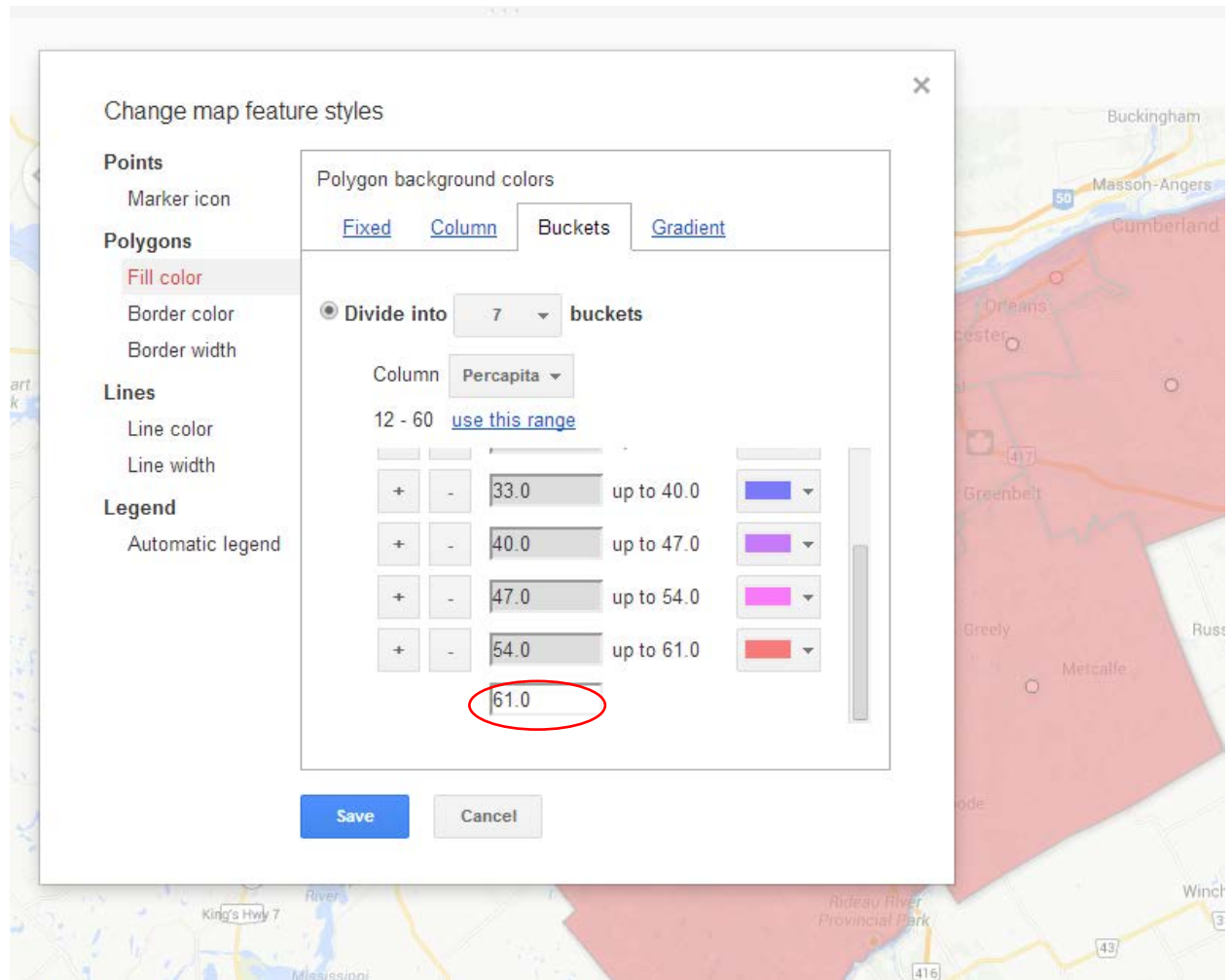
Save **Cancel**

27) Specify that you want to use the 12 to 60 range.

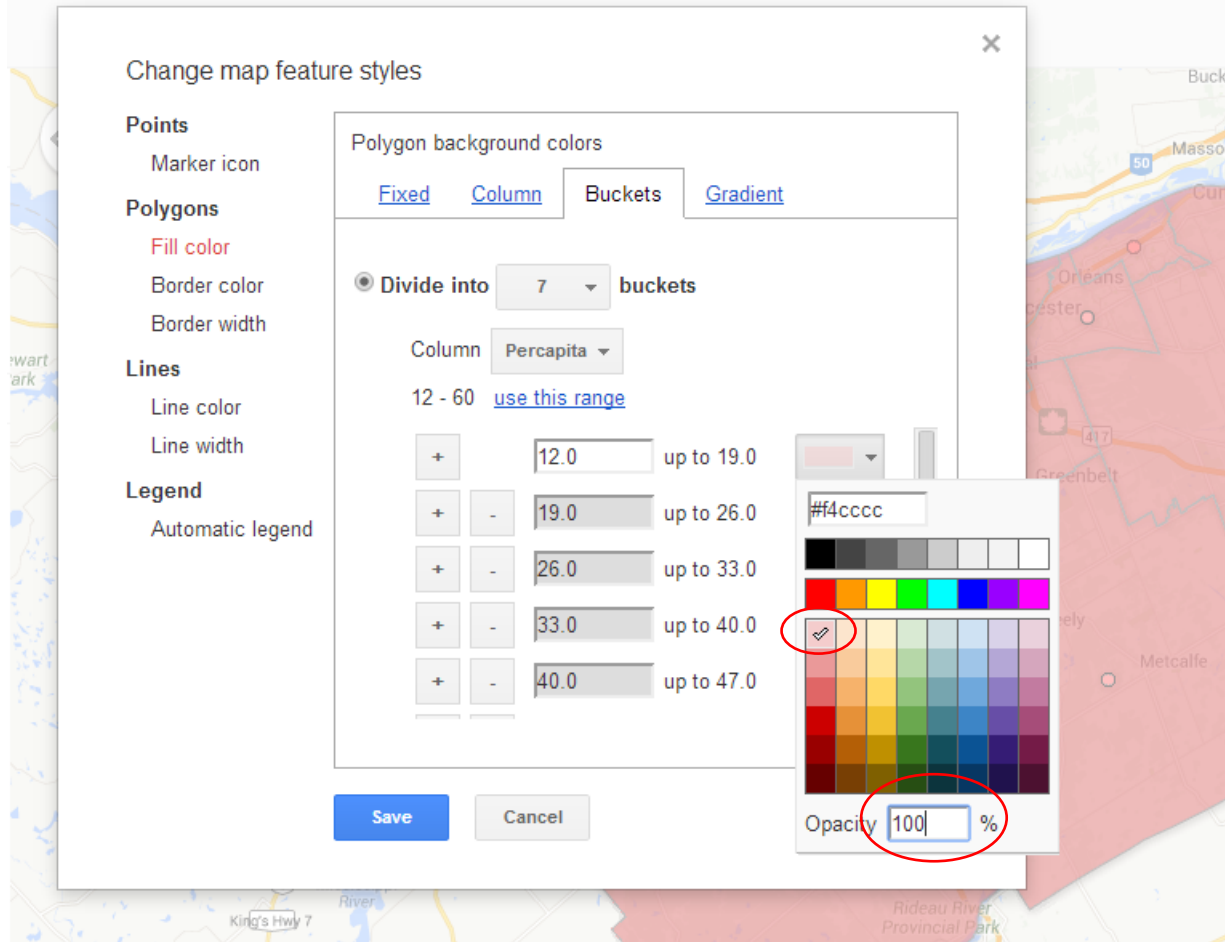


28) You can see that the lowest part of the range is the lowest value in our table. Use the vertical scroll bar to see the highest

value.

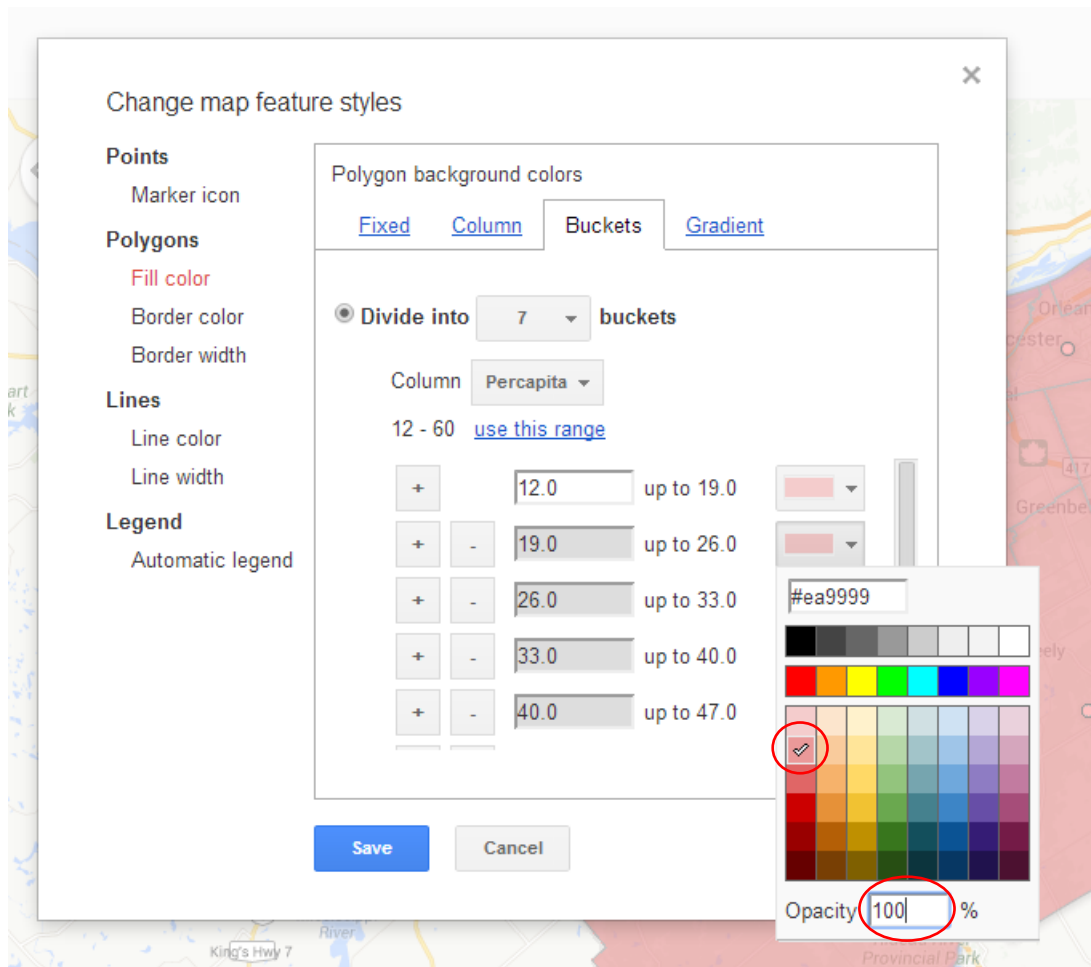


- 29) You'll notice that the highest value is actually 61, not 60. That's because if you just made 60 the highest value that it would only go to 59, therefore excluding that category, which is the one we want. Fusion Table remedies this by making the highest value 61. Now it's time to assign each bucket a category.
- 30) Use the vertical scroll bar to get to the lowest value of the range. And click on the arrow to the bottom right of the colour tab. Let's use the red colour ramp. First, increase the "Opacity" from 50% to 100%, and then select the lightest colour.



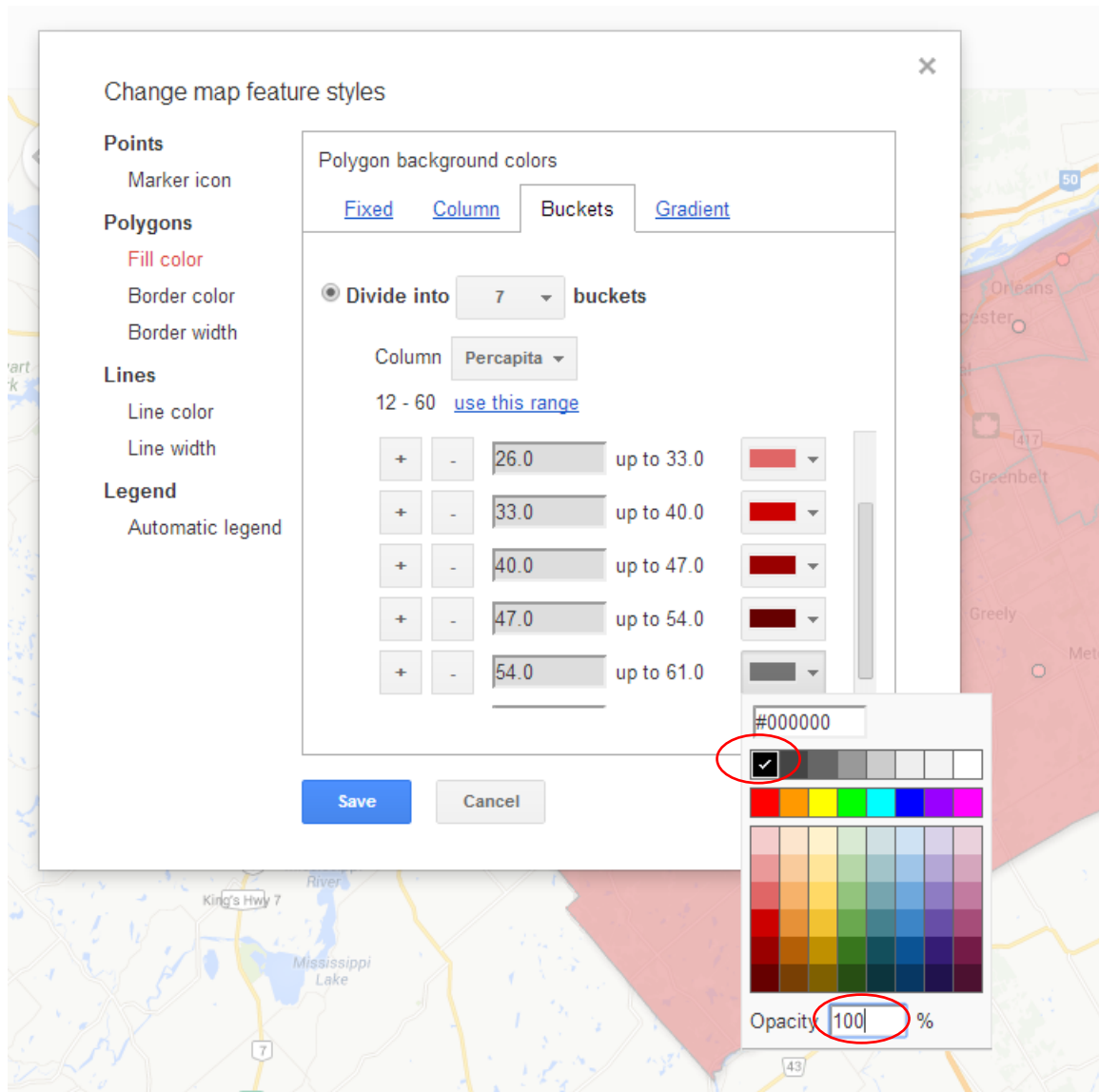
31)

- 32) Repeat the process for the subsequent category, assigning it the next darkest colour.



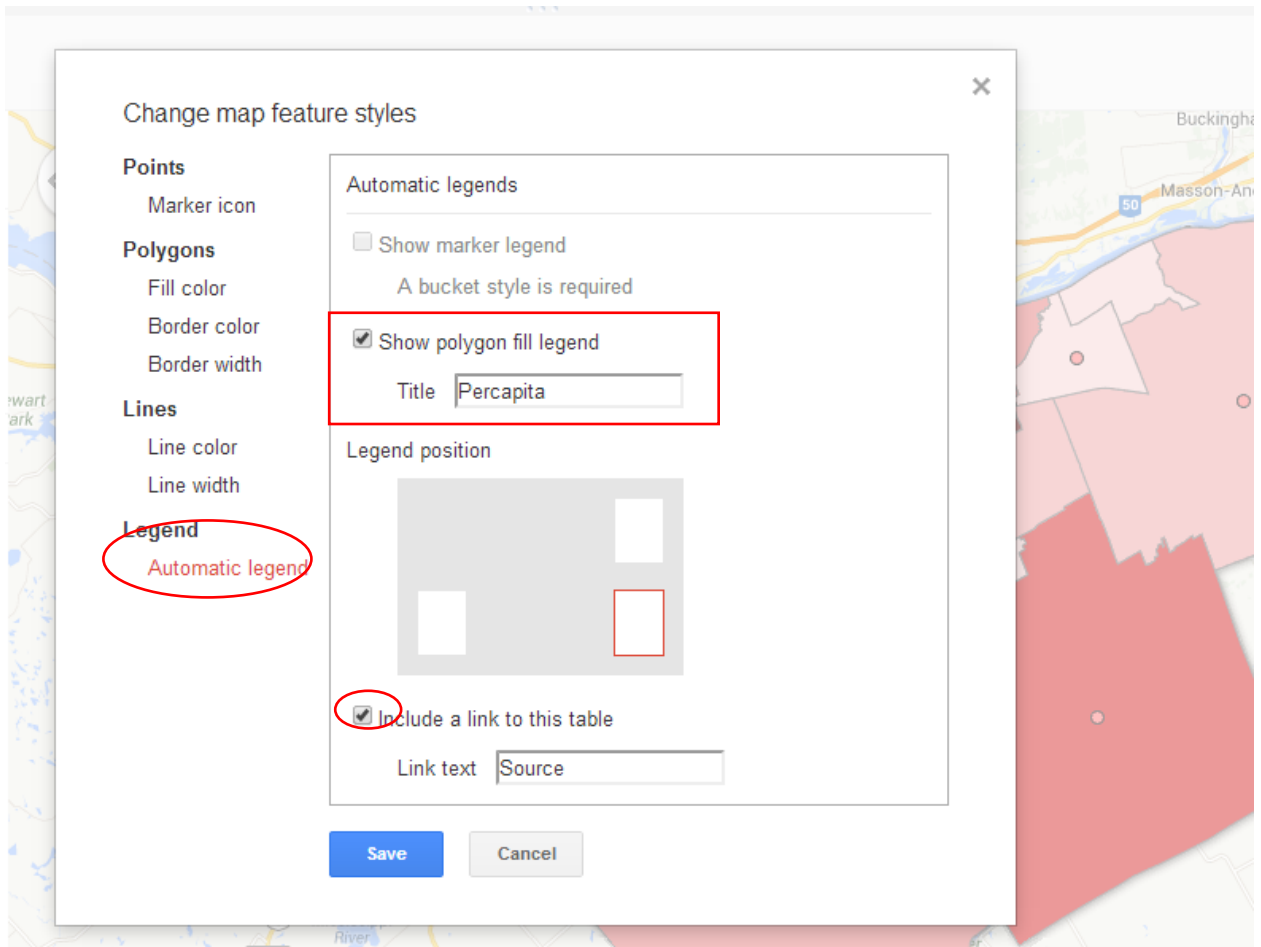
- 33) Repeat the process for the next four categories.
- 34) Since we've run out of categories for the highest number (there are ways to obtain more colour ramps that go beyond what Fusion Tables provides), let's choose the darkest colour, which will

be sure to attract people's attention.

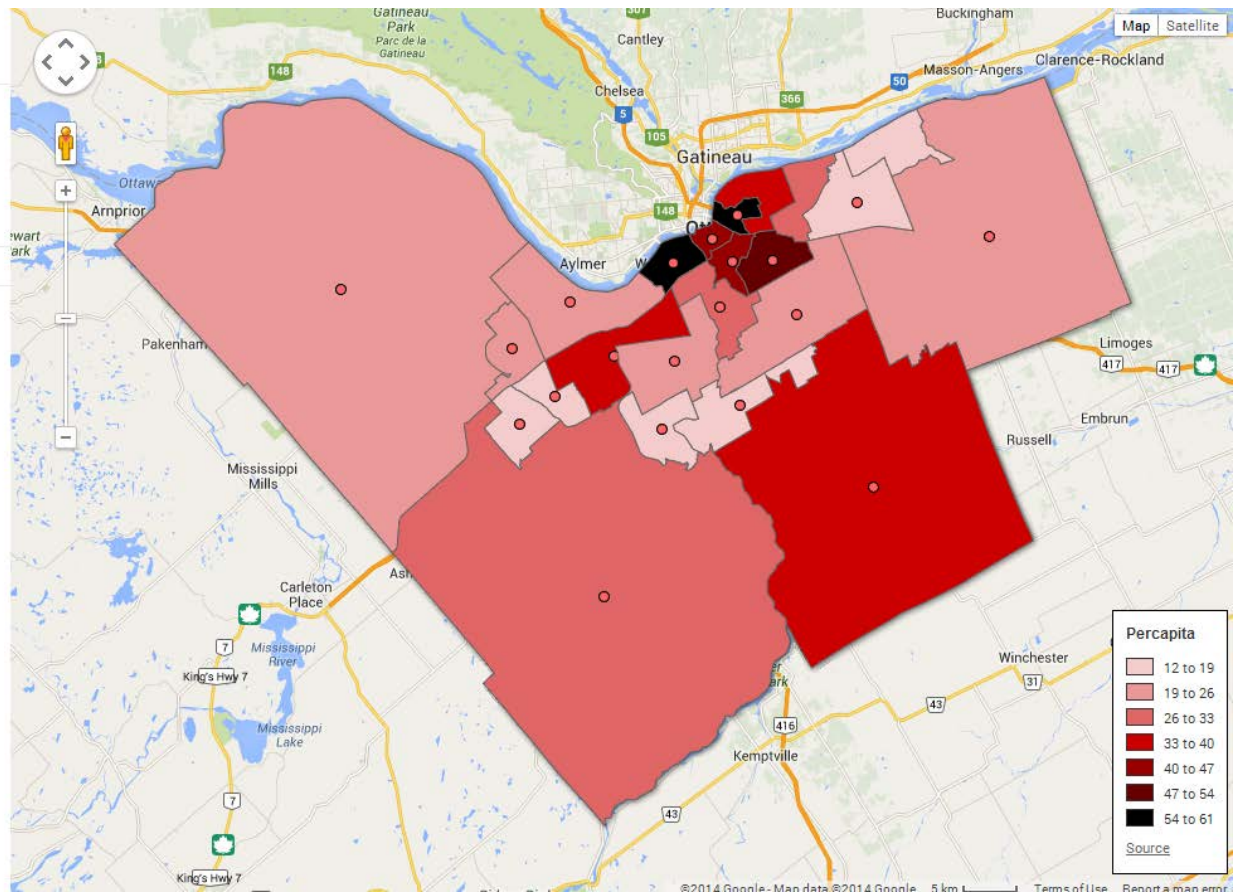


- 35) Before saving the result, let's give the map a legend that explains what the colours mean.
- 36) Select "Automatic legend" and check the box to the left of the "Show polygon fill legend" option, and make sure the column

in the "Title" box is "Per capita".

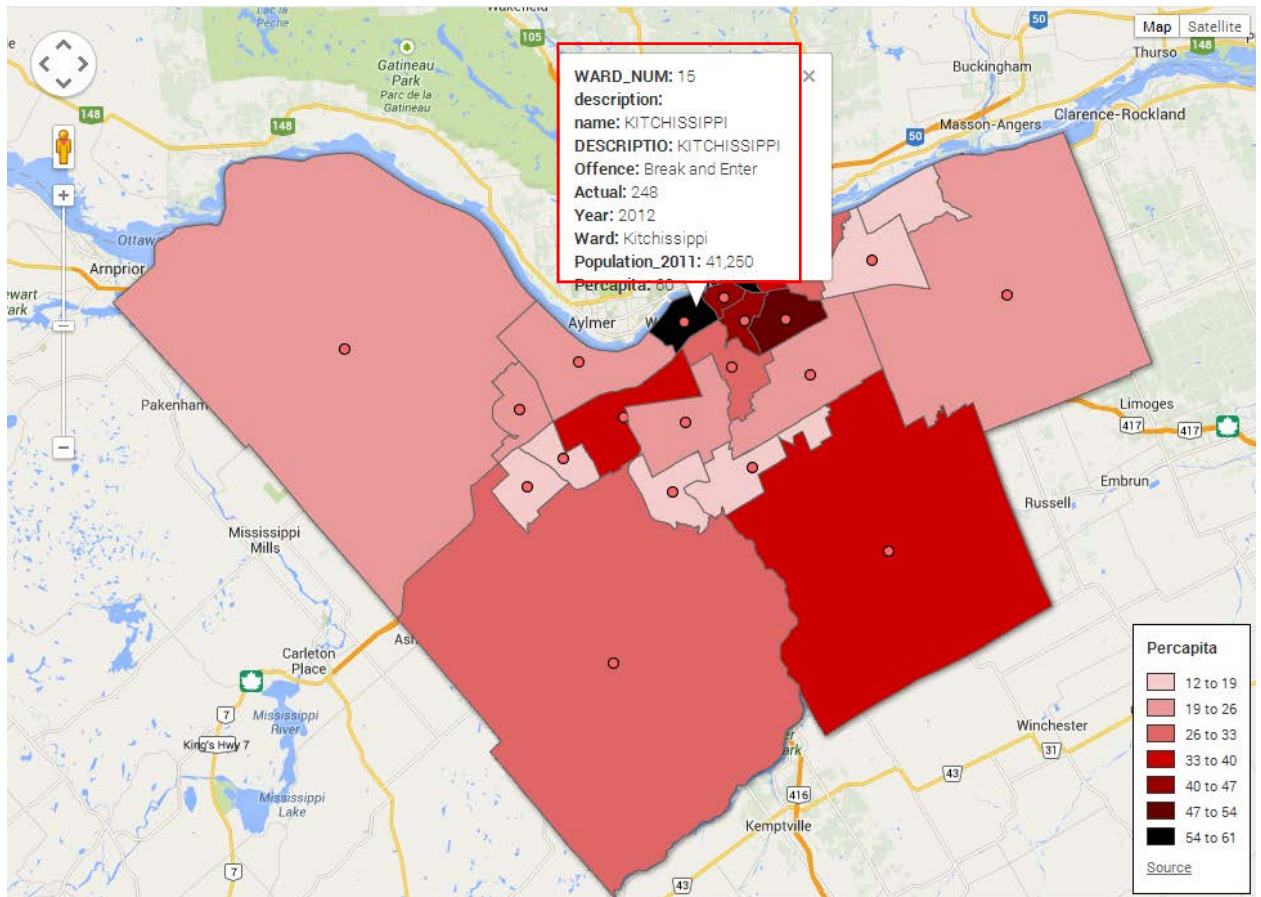


37) Save the result.



38) You'll notice the dots in each ward. Again, if you used the cleaned up version, your map will not have these extra geographic markers. They represent a quirk in the city's kml file that can be removed with a bit of manipulation. But for the purposes of this tutorial, let's just leave them be if you downloaded the version

from the city's website. Click on the two hot spots.



- 39) Let's clean up the pop-window, repeating the steps outlined in steps 28 through 35 in the first Fusion Table [tutorial](#).
- 40) Congratulations on creating your first heat map. Be sure to "share" the result and get the embed code described in steps 43

to 44 in the [first Fusion Table tutorial](#).

