Chapter 7

Buffering in QGIS Desktop

Summary: How far away is that? How many are too close? These are some of the most compelling mapping questions journalists can ask. A buffer is one of the most useful tools to provide answers. As we learned in Chapter 7's discussion on page 155, buffering is an analysis that can be used to determine what features are within a critical spatial distance from another feature. Journalists can draw buffers around points that represent polluting factories, and then see how many other points, such as daycares, are within close proximity. Or they can draw buffers along railways, to see how many homes are within a danger zone in the case of derailments, or buffers around sections of pipelines can locate First Nations communities that might have concerns about spills.

Specifically, the buffering tool allows you to draw circular boundaries around points, or rectangular boundaries on either side of lines or around the outside of polygons. The buffers are created as new shapefiles or feature classes. These new layers make it easier to identify, count or otherwise analyze other features that fall within the specified distance of the point, line or polygon features.

For this tutorial, we will see how close discarded contaminated needles and syringes come to play structures and parks. These are stories that the <u>Toronto Star</u> and <u>CBC</u> <u>News</u> have told, respectively.

For this tutorial, please be sure to use the "Long term release version" 2.14.



Skills you will learn: This tutorial will show you how to create buffers in QGIS.

Open QGIS, name the project and save it. Select the "Project Properties" dialog box under "Project" from the menu below. Select the box to the left of the "Enable 'on the fly' CRS transformation" option.

The Coordinate Reference System for the wards is "NAD83(CSRS)/MTM zone 9 EPSG:2951"



Make sure the reference system appears in the Selected CRS section of the dialog box.

Select Apply, and then OK

Import the Ottawa wards shape file that should already be in one of your folders. If not, then you must download it from the city's <u>open data</u> website, and extract the wards shape file from the zip folder.

To Download the csv file, right-click on "<u>GeoCoded_FullSyringeFile</u>" and save it to your folder. If your browser opens the table to display the csv file, just use the browser's "save as" option.

Continue to save your entire QGIS project in the same folder that will contain your files and layers.

Upload the "GeoCoded_FullSyringeFile" to QGIS.

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(**NOTE:** Fortunately, there is no need to create a "csvt" file as we did in the QGIS tutorial "<u>7 13 SpatialJoinsQGISDesktop</u>." This is because we don't want to convert

any of the numbers to text, or vice-versa. A "csvt" file is only necessary if you want to reformat the values to correspond with the values in a second file, or layer in QGIS.)

Selecting "OK" produces a second dialog box containing the file's coordinate system –NAD83 – which is different from that of the Ward. However, because we've told Qgis to project on the fly, it knows to force a match between the coordinate systems.

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Select "OK" and save your project.



As is our custom when importing a file to QGIS or ArcMap, open the attribute table to ensure that you have all the values.

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4	-75.691182	45.421781	1790 GREY N	Mar	27	2012	AM	WARD 1	1
5	-75.691182	45.421781	399 PRINCES	Jul	25	2012	PM	WARD 1	1
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11	-75.780672	45.36905	1479 LAUNAY	Nov	23	2010	PM	WARD 1	1
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14	-75.691182	45.421781	1605 ORLEAN	Mar	30	2009	PM	WARD 2	2
15	-75.691182	45.421781	2525 CLEROU	Oct	30	2008	PM	WARD 2	2
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20	-75.649372	45.432091	335 MCARTH	Sep	28	2006	PM	WARD 12	2
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26	-75.688322	45.427752	217 RIDEAU ST	May	2	2006	AM	WARD 12	2
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31	-75.687621	45.43113	285 KING ED	Jul	29	2006	AM	WARD 12	2
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33	-75.691712	45.43229	172 GUIGUES	Aug	28	2006	PM	WARD 12	2
34	-75.691182	45.421781	74 MARIER AVE	Sep	26	2005	PM	WARD 12	2
35	-75.689282	45.432326	360 ST PATRI	Sep	19	2005	PM	WARD 12	2
36	-75.691182	45.421781	200 LAFONTA	Sep	10	2005	AM	WARD 12	2
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There are **832** discarded syringes or needles (two terms we'll use interchangeably), an important number to keep in mind.

Right-click on the GeoCoded_FullSyringeFile layer and select the "Save As" option.

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We want to save the layer as a shape file, browse to the appropriate folder and – THIS IS KEY – change the projection system under "Selected CRS" to "NAD83(CRS)/MTM zone 9", the coordinate system that corresponds with that of the coordinate system for the wards and parks file that we will eventually import.

Now that you have the shape file. You can remove the GeoCoded_FullSyringe csv version.

Now let's import the shape file that contains all the park locations in Ottawa.

To do this, we'll have to visit the city's open data portal, and navigate to parks.

Download the shape file ("Parks:SHP"), and save it in the same folder that contains your other files for this QGIS tutorial.

Unzip the folder, select the shape file, and then upload the shape file to QGIS



If the parks don't appear, as in the screen grab above, open the Parks layer's attribute table to select the correct projection, which in this case is the same as the "Wards_2014 file".



De-select the other two layers to get a closer look at the park locations.

Open the attribute table to look at the data.

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1	57 Byron Linear	Parc du tram	579 Byron Av	579, avenue 8	Active Recrea	Loisirs dynami	1	1	no/non	15	Kitchissippi	Kitchissippi	0	NULL	AGEL	2016-0
	12 McNabb Park	Farc McNabb	435 Bronson	435, avenue 8	Active Recrea	Loisirs dynami	2	2	no/non	14	Somerset	Somerset	0	yes/oui	NEEL	2016-
6	38 Glebe Commu.	Centre comm	690 Lyon Stre	690, rue Lyon	Active Recrea	Loisirs dynami	4	4	no/non	17	Capital	Capitale	0		AUEL	2016-
4	41 Judy Laughton	Parc Judy-Lou	241 Goldridge	241, promena	Active Recrea	Loisirs dynami	0	0	no/non		Kanata North	Kanata-Nord	0	NOLL.	NEKL.	2016-0

We have useful information, especially addresses, which will come in handy when we want to test our data in the field by visiting the parks and speaking to parents in nearby homes who have young children.

The idea is to find out how many of the 832 discarded needles were close to parks where children play.

You can turn the other layers back on. It's now time to create the buffers around the parks, setting a distance of 50 metres.

To do this, select the "Parks" layer, go to the "Vector" section in the menu above, "Geoprocessing tools", and then "Buffer(s)".



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Make sure radio button to the left of "Buffer distance" is selected, and plug in 50 (for 50 metres). Also, select the radio button to the left of "Dissolve buffer results." Browse to the section where you're saving the files, and name this one "50MetresbufferAroundParks", or something similar. In other words, a title – albeit, a long one -- that indicates the contents of the file.

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Browse to location where you want to store the file and save it.

Save your project, which is something you should do regularly.

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Once it's done, close the dialogue box, and you'll see the layer added to your menu.

Now we have created a 50m buffer around all the city of Ottawa parks.

We'll use a query that will place the discarded needles or syringes within those 50 metre buffers. Select the new buffered layer, "BufferedParks50M". Right-click on this layer to make sure the projection system is ""NAD83(CSRS)/MTM zone 9 EPSG:2951".



Go to "Vector" in your menu above, and then "Spatial Query".

In the screen grab below, your "source layer" is the syringe shape file. Under the dialog box's "Where the feature" section, select "Within"; that is, you want all the locations where the discarded items are within the 50M buffers. Your "Reference features of" section is the newly-created parks layer with the buffers.

Note: If you're using version 2.18.0, you may have to install a spatial query plug-in if it doesn't appear in your menu.

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QGIS has selected72 discarded syringes that are within 50 metres of the city parks. Close the dialogue box, and right-click on the "GeoCoded_FullSyringeFile" and open the attribute table.

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96	-75.69118199	45.421781000	411 CORKST	Aug	20	2010	PM	WARD 7	7
97	-75.79910099	45.357650000	2880 CARLIN	Apr	7	2010	AM	WARD 7	7
98	-75.79478400	45.348393000	1095 RAMSEY	Jun	15	2009	PM	WARD 7	7
99	-75.79156100	45.360731000	807 MAPLEW	Apr	11	2009	PM	WARD 7	7
100	-75.78013400	45.373378000	1071 AMBLES	Oct	1	2008	AM	WARD 7	7
101	-75.79365099	45.356350999	903 PINECRE	Мау	18	2008	PM	WARD 7	7
102	-75.79700099	45.355161000	2881 RICHMO	Apr	17	2008	AM	WARD 7	7
103	-75.69142300	45.401857000	175 THIRD AVE	Jun	7	2006	PM	WARD 17	7
104	-75.66364000	45.408479000	1551 RIVERSI	Apr	9	2006	PM	WARD 17	7
105	-75.79568100	45.362560000	348 ZEPHYR A	Apr	2	2006	AM	WARD 7	7
106	-75.68685000	45.410581000	64 ISABELLA ST	Oct	13	2005	PM	WARD 17	7
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108	-75.68587100	45.400188000	111A HOLMW	Apr	19	2005	PM	WARD 17	7
109	-75.78542199	45.363810999	2525 CARLIN	Dec	29	2004	AM	WARD 7	7
110	-75.78786100	45.340949999	3045 BASELIN	Мау	21	2013	PM	WARD 8	8
111	-75.69118199	45.421781000	2 HAMMILL CRT	Jul	4	2012	AM	WARD 8	8
112	-75.69118199	45.421781000	55 CENTREPO	Aug	31	2012	PM	WARD 8	8
113	-75.76188600	45.351799999	1980 BASELIN	Aug	8	2012	PM	WARD 8	8
114	-75.71144099	45.362659999	147 MEADOW	Oct	15	2011	PM	WARD 8	8
115	-75.69118199	45.421781000	194 ROBERTS	Nov	4	2011	PM	WARD 8	8
116	-75.74755100	45.363540000	1212 AMESBR	Jun	7	2011	PM	WARD 8	8

The query has highlighted the relevant syringe locations.

Close the attribute table.

We will now create a new layer of these selected files. To do this, right-click on the layer and choose the "Save as" option.

Call the new file "GeoCoded_SyringesWithin50MofParks" and hit the "Save" tab.

Now – AND THIS IS KEY -- we want to select the "Save only selected features" option in the dialog box's "Encoding" section. You'll also notice that the projection corresponds to the projection for the parks and wards. If it doesn't, change the setting to make sure it does.

Save vector layer as Format ESRI Shapefile Save as Documents/Data Journalism Book/Tutorials/Chap	pter seven/Sryinges/GeoCoded_SyringesWithin50MofParks.shp	P X ▼ Browse
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)	-75.69053200	45.390520000	177 HOPEWEL	Jun	1	2010	AM	WARD 17	17
L	-75.70377100	45.408079999	456 BRONSO	Sep	22	2009	PM	WARD 14	14
2	-75.67553599	45.419778000	55 MANN AVE	Aug	8	2012	PM	WARD 12	12
3	-75.69089099	45.432659999	208 GUIGUES	Nov	3	2009	AM	WARD 12	12
	-75.67915000	45.433242000	110 COBOUR	Nov	3	2007	PM	WARD 12	12
5	-75.70937600	45.410038999	770 SOMERS	Jun	25	2009	AM	WARD 14	14
5	-75.68594799	45.418914999	17 MACDONA	Dec	4	2009	PM	WARD 14	14
,	-75.69068099	45.435310000	290 CATHCAR	Aug	2	2007	PM	WARD 12	12
3	-75.68572100	45.418843000	52 MACLAREN	Aug	8	2009	PM	WARD 14	14
,	-75.64676799	45.372866000	1560 HEATHE	Jul	16	2010	PM	WARD 10	10
10	-75.69033199	45.434418000	244 BRUYERE	Jun	17	2009	PM	WARD 12	12
1	-75.65383099	45.374170999	1412 WALKLE	Sep	23	2008	PM	WARD 10	10
12	-75.63469100	45.431691000	1081 CUMMIN	Мау	9	2013	PM	WARD 11	11
13	-75.62818099	45.441330000	735 CARSON'	Mar	23	2010	AM	WARD 13	13
14	-75.70216399	45.412902000	562 SOMERS	Apr	22	2008	PM	WARD 14	14
15	-75.69171199	45.432290000	172 GUIGUES	Aug	28	2006	PM	WARD 12	2
16	-75.66962100	45.426859999	1235 DONALD	Jul	8	2008	PM	WARD 11	11
17	-75.68878100	45.416041000	330 ELGIN ST	Aug	29	2007	PM	WARD 14	14
18	-75.70859299	45.410316000	760 SOMERS	Mar	8	2013	AM	WARD 14	14
19	-75.69084700	45.431657999	310 ST PATRL	Мау	19	2011	AM	WARD 12	12
20	-75.67915000	45.433242000	110 COBOUR	Мау	5	2011	PM	WARD 12	12
21	-75.70859299	45.410316000	760 SOMERS	Aug	23	2013	AM	WARD 14	14
22	-75.69109699	45.431548999	300 ST PATRL	Jul	29	2013	AM	WARD 12	12

Open the new file's attribute table

The query has joined the syringes that fall within a 50-metre radius of parks to the actual parks themselves, allowing us to visit those locations and the houses nearby to talk to people who may have seen the discarded items.

You can export save the layer as a csv file that has now become a tip sheet for locating parks where syringes have been found. The <u>Toronto Star</u> and <u>CBC News</u> used this technique tell their stories.

Make sure that only the Wards_2014 and the "Needles50MetresFromParks" layers are selected to see what the points look like on the map



This buffer distance is arbitrary. If, for instance, you discover after a bit of research that 100M is a better distance, then you can always perform a second spatial query to obtain more results.

Buffer can also be erected around <u>play structures</u>, a layer located on the city's open data portal, daycare locations, or schools. In short, areas where children play. By themselves, the locations of parks mean very little. However, when we locate them close to features like discarded needles, then you have a potential story.

For one last query, let's determine which wards have the highest number of needles within a 50-metre walking distance to parks.

To do this, we'll select the two layers that are highlighted: "GeoCoded_SyringesWithin50MofParks" and "Wards_2014". Right click on "Wards_2014", go to "Vector" on the menu at the top, select "Analysis tools", and then "Points in Polygon(s)".

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Layers Panel	Count Points in Polygon Input polygon vector layer wards-2014_shp Input point vector layer GeoCoded_SyringesWithin50MofParks Input point vector layer attributes to aggregate Day WardNo X Y year
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Your "Input polygon vector layer is your "wards-2014_shp". Your "Input point vector layer" is your "GeoCoded_SyringsWithin50MofParks". Your "Statistical method for attribute aggregation" is "sum." Just below the "Output count field name" change the default "PNT CNT" (point count) to a label that makes more sense, such as "COUNT".

Browse to the correct folder, and give the new layer a title that reveals the information about the contents, something like

"GeoCoded_SyringesWithin50MofParksWithinWards".

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• ₩ + + +		File name: GeoCoded_SyringesWithin50MofParksWithinWards Save Files of type: Shapefiles (*.shp *.SHP) Cancel Encoding: UTF-8 OK Close

If you're using Qgis version 2.18.0, the process for obtaining the count-in-polygon tool is slightly different. This version does not have the "vector>analysis" section. Instead, you must go to "Processing", then "Toolbox, which opens opens a toolbox on the right side.



From there go to "QGIS geoalgorithms", "vector analysis tools", and finally "Count points in polygon".





Which ever version you're using, save the file, and then select "OK" when you return to the "Count Points in Polygon" dialogue box.



Close the box, and check out the new layer.

Layers Panel Image: Constraint of the system Image: Constraint of the system <t< th=""><th></th></t<>	
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De-select all the other layers.



As we saw in the Fusion Table, and previous Qgis tutorials, when we merge tables, as we have done with this points-points-in-polygon query, we obtain a uniform colour on our file's layer.

Opening the attribute table reveals that there actually is data behind this bland exterior.

Sort the COUNT column in descending order.

				1			Lunces survey				Lauren a	1
DESCRIPTIO	NAME	NAME_FR	WARD_NUM	WARD_EN	WARD_FR	COUNCILLOR	WARD_NAME_	WARD_NAME1	WARD_NUMBE	SHAPE_Leng	SHAPE_Area	Count
MANATA SOU	Waru 23	Quarber 23	23	KARATA SOUTH	KARATA-SUD	Allah Hubley	Kanata South	Kanala-Suu	23	198/1./83830	10418/39.388.	0
BAY - Mark Ta	Ward 7	Quartier 7	7	BAY	BAJE	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.	0
BEACON HILL	Ward 11	Quartier 11	11	BEACON HILL+	BEACON HILL	Tim Tierney	Beacon Hill-Cy	Beacon Hill-Cy	11	26012.651084	19598778.374.	1
COLLEGE - Ric	Ward 8	Quartier 8	8	COLLEGE	COLLÈGE	Rick Chiarelli	College	Collège	8	40055.357183	46077373.446.	1
GLOUCESTER	Ward 22	Quartier 22	22	GLOUCESTER	GLOUCESTER	Michael Qaqish	Gloucester-So	Gloucester-Ne	22	45545.496088	37013497.119.	0
KANATA NOR	Ward 4	Quartier 4	4	KANATA NORTH	KANATA-NORD	Marianne Wilk	Kanata North	Kanata-Nord	4	25997.770037	24235080.595.	0
KNOXDALE-M	Ward 9	Quartier 9	9	KNOXDALE-M	KNOXDALE-M	Keith Egli	Knoxdale-Meri	Knoxdale-Meri	9	36533.316874	47513023.658	0
RIVER - Riley	Ward 16	Quartier 16	16	RIVER	RIVIÈRE	Riley Brocking	River	Rivière	16	32244.191498	26892629.939.	1
CAPITAL - Da	Ward 17	Quartier 17	17	CAPITAL	CAPITALE	David Chernu	Capital	Capitale	17	19243.225638	10961789.086.	3
KITCHISSIPPI	Ward 15	Quartier 15	15	KIT CHISSIPPI	KITCHISSIPPI	Jeff Leiper	Kitchissippi	Kitchissippi	15	16441.444685	15130226.048	3
GLOUCESTER	Ward 10	Quartier 10	10	GLOUCESTER	GLOUCESTER	Diane Deans	Gloucester-So	Gloucester-So	10	45788.222260	76159003.045	2
ALTA VISTA	Ward 18	Quartier 18	18	ALTA VISTA	ALTA VISTA	Jean Cloutier	Alta Vista	Alta Vista	18	19302.220840	20433121.100.	0
SOMERSET	Ward 14	Quartier 14	14	SOMERSET	SOMERSET	Catherine Mc	Somerset	Somerset	14	11458.284323	6380164.7086.	31
STITTSVILLE	Ward 6	Quartier 6	6	STITTSVILLE	STITTSVILLE	Shad Qadri	Stittsville	Stittsville	6	22036.367720	23212974.828	0
RIDEAU-VANL	Ward 12	Quartier 12	12	RIDEAU-VANIER	RIDEAU-VANIER	Mathieu Fleury	Rideau-Vanier	Rideau-Vanier	12	15172.590423	7951860.2593	25
RIDEAU-ROCK	Ward 13	Quartier 13	13	RIDEAU-ROCK	RIDEAU-ROCK	Tobi Nussbaum	Rideau-Rockd	Rideau-Rockcl	13	25921.094283	19838707.163.	3
INNES - Jody	Ward 2	Quartier 2	2	INNES	DINES	Jody Mitic	Innes	Innes	2	33018.165318	40385597.674.	0
ORLÉANS - Bo	Ward 1	Quartier 1	1	ORLÉANS	ORLÉANS	Bob Monette	Orléans	Orléans	1	29237.165112	25385948.958.	0
CUMBERLAND	Ward 19	Quartier 19	19	CUMBERLAND	CUMBERLAND	Stephen Blais	Cumberland	Cumberland	19	98794.871092	379836566.83.	0
RIDEAU-GOUL	Ward 21	Quartier 21	21	RIDEAU-GOUL	RIDEAU-GOUL	Scott Moffatt	Rideau-Goulb	Rideau-Goulb	21	131359.05825	736559935.94	0
WEST CARLE	Ward 5	Quartier 5	5	WEST CARLE	WEST CARLE	Eli El-Chantiry	West Carleton	West Carleton	5	122388.21698	765569539.78.	0
BARRHAVEN	Ward 3	Quartier 3	3	BARRHAVEN	BARRHAVEN	Jan Harder	Barrhaven	Barrhaven	3	29730.224063	26227247.182	0

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	DESCRIPTIO	NAME	NAME_FR	WARD_NUM	WARD_EN	WARD_FR	COUNCILLOR	WARD_NAME_	WARD_NAME1	WARD_NUMBE	SHAPE_Leng	SHAPE_Area	Count 🗸
13	SOMERSET	Ward 14	Quartier 14	14	SOMERSET	SOMERSET	Catherine Mc	Somerset	Somerset	14	11458.284323	6380164.7086	31
15	RIDEAU-VANI	Ward 12	Quartier 12	12	RIDEAU-VANIER	RIDEAU-VANIER	Mathieu Fleury	Rideau-Vanier	Rideau-Vanier	12	15172.590423	7951860.2593	25
9	CAPITAL - Da	Ward 17	Quartier 17	17	CAPITAL	CAPITALE	David Chernu	Capital	Capitale	17	19243.225638	10961789.086	3
10	KITCHISSIPPI	Ward 15	Quartier 15	15	KITCHISSIPPI	KITCHISSIPPI	Jeff Leiper	Kitchissippi	Kitchissippi	15	16441.444685	15130226.048	3
16	RIDEAU-ROCK	Ward 13	Quartier 13	13	RIDEAU-ROCK	RIDEAU-ROCK	Tobi Nussbaum	Rideau-Rockcl	Rideau-Rockcl	13	25921.094283	19838707.163	3
1	BAY - Mark Ta	Ward 7	Quartier 7	7	BAY	BAJE	Mark Taylor	Вау	Baie	7	39722.032347	64174613.788	2
11	GLOUCESTER	Ward 10	Quartier 10	10	GLOUCESTER	GLOUCESTER	Diane Deans	Gloucester-So	Gloucester-So	10	45788.222260	76159003.045	2
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	1
4	COLLEGE - Ric	Ward 8	Quartier 8	8	COLLEGE	COLLÈGE	Rick Chiarelli	College	Collège	8	40055.357183	46077373.446	1
B	RIVER - Riley	Ward 16	Quartier 16	16	RIVER	RIVIÈRE	Riley Brocking	River	Rivière	16	32244.191498	26892629.939	1
0	KANATA SOU	Ward 23	Quartier 23	23	KANATA SOUTH	KANATA-SUD	Allan Hubley	Kanata South	Kanata-Sud	23	19871.785830	16418739.588	0
2	OSGOODE - G	Ward 20	Quartier 20	20	OSGOODE	OSGOODE	George Darouze	Osgoode	Osgoode	20	105838.74232	463561580.89	0
5	GLOUCESTER	Ward 22	Quartier 22	22	GLOUCESTER	GLOUCESTER	Michael Qaqish	Gloucester-So	Gloucester-Ne	22	45545.496088	37013497.119	0
6	KANATA NOR	Ward 4	Quartier 4	4	KANATA NORTH	KANATA-NORD	Marianne Wilk	Kanata North	Kanata-Nord	4	25997.770037	24235080.595	0
7	KNOXDALE-M	Ward 9	Quartier 9	9	KNOXDALE-M	KNOXDALE-M	Keith Egli	Knoxdale-Meri	Knoxdale-Meri	9	36533.316874	47513023.658	0
12	ALTA VISTA	Ward 18	Quartier 18	18	ALTA VISTA	ALTA VISTA	Jean Cloutier	Alta Vista	Alta Vista	18	19302.220840	20433121.100	0
14	STITTSVILLE	Ward 6	Quartier 6	6	STITTSVILLE	STITTSVILLE	Shad Qadri	Stittsville	Stittsville	6	22036.367720	23212974.828	0
17	INNES - Jody	Ward 2	Quartier 2	2	INNES	DINES	Jody Mitic	Innes	Innes	2	33018.165318	40385597.674	0
18	ORLÉANS - Bo	Ward 1	Quartier 1	1	ORLÉANS	ORLÉANS	Bob Monette	Orléans	Orléans	1	29237.165112	25385948.958	0
19	CUMBERLAND	Ward 19	Quartier 19	19	CUMBERLAND	CUMBERLAND	Stephen Blais	Cumberland	Cumberland	19	98794.871092	379836566.83	0
20	RIDEAU-GOUL	Ward 21	Quartier 21	21	RIDEAU-GOUL	RIDEAU-GOUL	Scott Moffatt	Rideau-Goulb	Rideau-Goulb	21	131359.05825	736559935.94	0
21	WEST CARLE	Ward 5	Quartier 5	5	WEST CARLE	WEST CARLE	Eli El-Chantiry	West Carleton	West Carleton	5	122388.21698	765569539.78	0
	BARRHAVEN	Ward 3	Quartier 3	3	BARRHAVEN	BARRHAVEN	Jan Harder	Barrhaven	Barrhaven	3	29730.224063	26227247.182	0

Sort the "Count" column in descending order.

Somerset and Rideau-Vanier are the wards with the highest number of syringes within 50 metres of parks. No surprise, given those wards are in busy downtown areas. Nonetheless, we now know where to go to begin interviewing people.

Using the steps we learned in the "<u>MakingChoroplethinQgis</u>" tutorial, let's colour code the map, give it labels, and then import a base map.



Buffering has allowed us to locate areas of the city where discarded syringes and needles obtained through a freedom-of-information request have become problematic, and worthy of further investigation.

Using the steps from the <u>ArcGIS Online</u> tutorial, we could upload the colour-coded layer, or layers with the geographic coordinates of the discarded syringes, to ArcGIS Online.

It should be noted that QGIS has an option for uploading files to the cloud and symbolizing them. However, it is the opinion of these authors that the QGIS option is still a work in progress, and therefore not as user-friendly as ArcGIS Online.

One of the advantages to learning different methods for visualization data, is that can use various combinations to obtain the results we want.