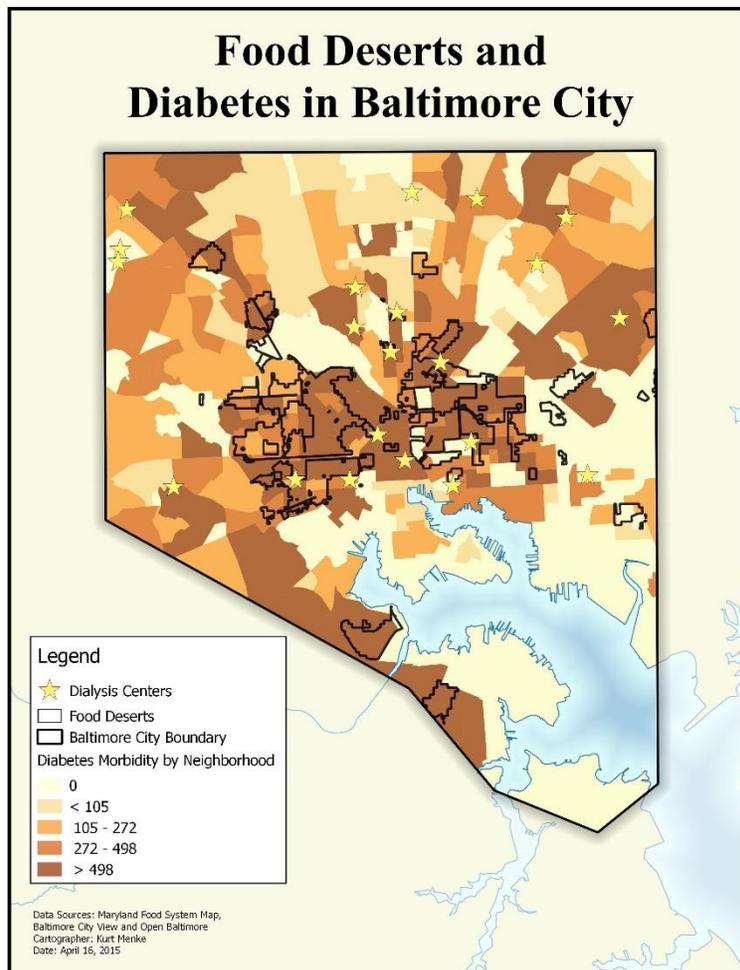


# Community Health Maps Lab Series:

## Lab 5—Cartography With QGIS

**Objective: Understand How To Make a Map in QGIS Desktop**

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This course is a collaborative effort between the National Library of Medicine, the Center for Public Service Communications, and Bird's Eye View.

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## 1. Introduction

You have now learned the basics of how to style data layers in QGIS Desktop. You have also learned several techniques for conducting spatial analyses and generating information. In this lab, you will learn how to produce a publication-quality map. When producing a map it is important to think about both the intended map-reading audience and the message you would like to convey. You will be using some of the data you have produced to create a map that tells part of the story of diabetes in Baltimore City.

## 2. Objective: Understand How To Make a Map in QGIS Desktop

In this lab exercise, you will explore the QGIS Print Composer. This opens as a separate window and allows you to create a publication-quality map of any size. You can export the completed map into several formats, including an image file, a graphics file, or a PDF. You can then disseminate the exported map or include it in a report or presentation. The data for this lab cover Baltimore City. You will create a map highlighting the diabetes by neighborhood totals and food deserts.

- Task 1 – Layer Styling Tricks
- Task 2 – Using the Print Composer
- Task 3 – Exporting the Map

## 3. How Best To Use Video Walkthrough With This Lab

To aid in your completion of this lab, each lab task has an associated video that demonstrates how to complete the task. The intent of these videos is to help you move forward if you become stuck on a step in a task, or if you wish to see every step required to complete the tasks.

We recommend that you do not watch the videos before you attempt the tasks. The reasoning for this is that while you are learning the software and searching for buttons, menus, and other features, you will better remember where these items are and, perhaps, discover other features along the way if you discover them on your own. With that being said, please use the videos in the way that will best facilitate your learning and successful completion of this lab.

## 4. Lab Tasks

### Task 1. Layer Styling Tricks

Watch a [Task 1 Video Walkthrough](#) on YouTube.

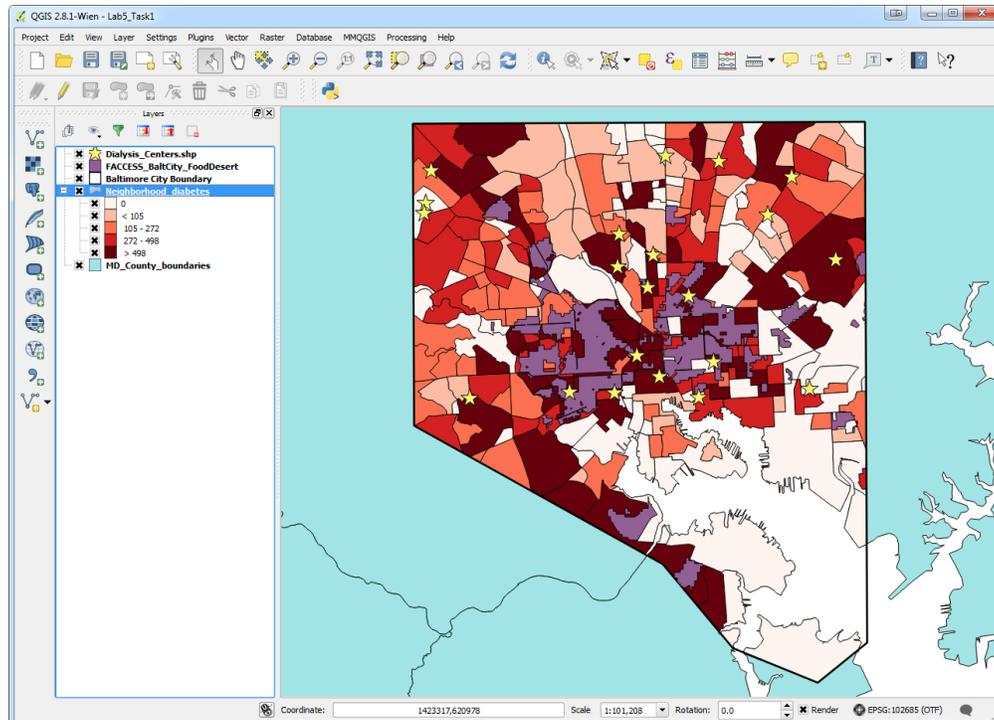
In this task, you will add some data representing food deserts and will learn how to do some more sophisticated layer styling. After completing this task, you will be able to impress your colleagues with inverted polygon shapeburst fills!

- 1) Open QGIS Desktop and open the *Lab5.qgs* project file.
- 2) This map has only three of the layers used in Lab 4, and the labels for the Dialysis centers have been turned off.
- 3) Use the **Add vector layer** button to add the *FACCESS\_BaltCity\_FoodDesert.shp* and *MD\_County\_boundaries.shp* layers to the map canvas.

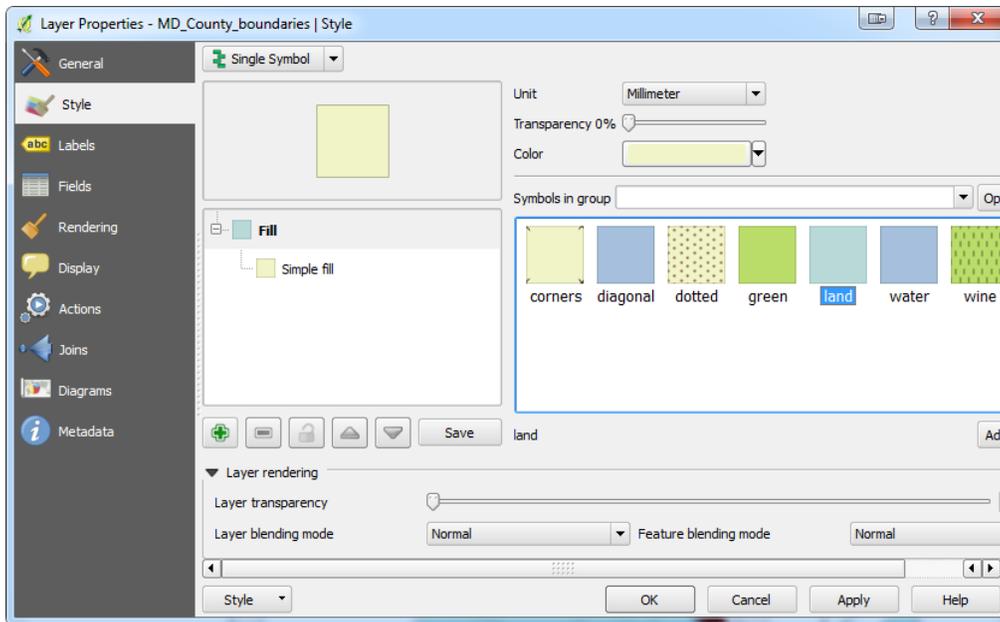
**Food deserts are defined as:**

An area where the distance to a supermarket is more than ¼ mile, the median household income is at or below 185% of the Federal Poverty Level, over 40% of households have no vehicle available, and the average Healthy Food Availability Index score for supermarkets and convenience and corner stores is low (measured using the Nutrition Environment Measurement Survey).

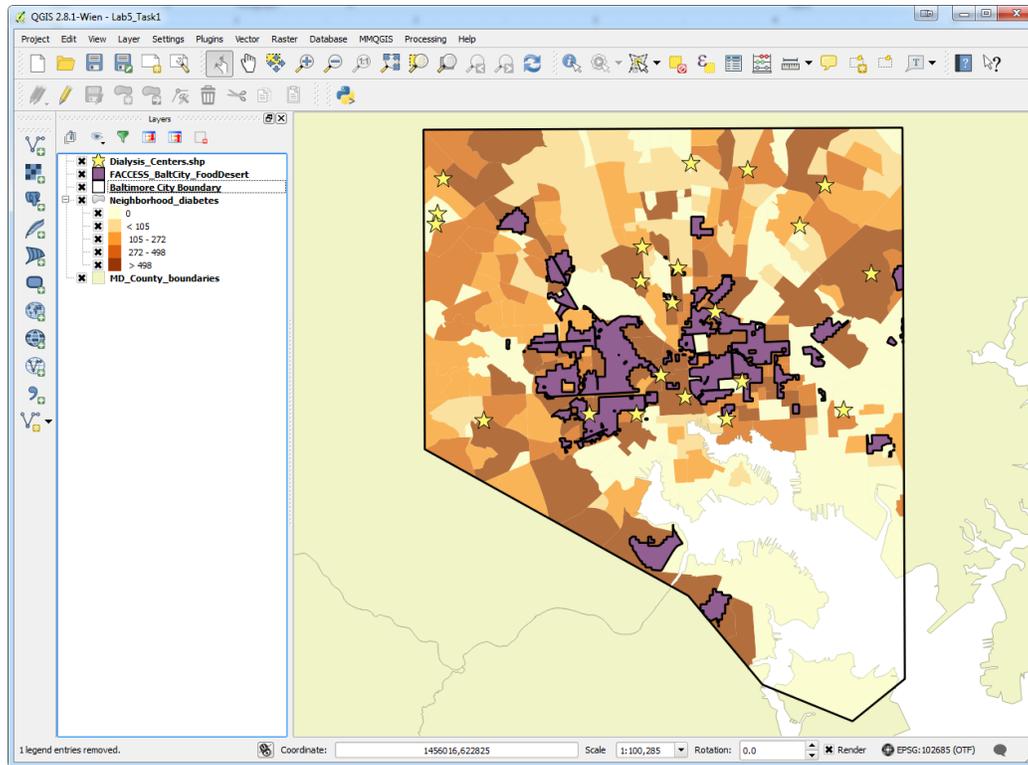
- 4) **Reorder** the layers so that the *MD\_County\_boundaries* is the bottom-most layer and the *FACCESS\_BaltCity\_FoodDesert* layer is underneath *Dialysis\_centers.shp*. The two new layers will come in with random colors.



- 5) Open the **Layer Properties | Style** tab for the *MD\_County\_boundaries* layer. Select the *land* style and click **OK**.



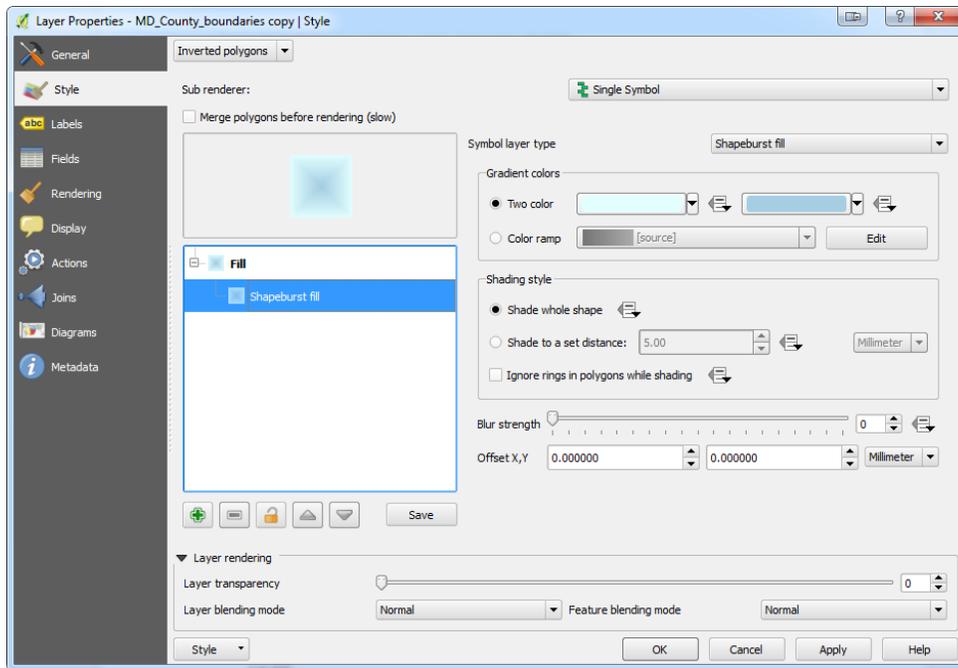
- 6) You will change the styling of the *Neighborhood\_diabetes* layer to a more muted style that will allow the food deserts to also be shown. Open the **Layer Properties | Style** tab for the *Neighborhood\_diabetes* layer and change the color ramp to *YlOrBr*. Click **Apply**.
- 7) The neighborhood boundaries make the map busier than it needs to be. On the **Style** tab, click on the long **Change...** button to the left of **Symbol** to open the **Symbol selector** window. Select **Simple fill** and choose a **Border style** of **No pen**. Click **OK**. This will eliminate the borders.
- 8) Set the layer transparency of this layer to 30%. This will soften the colors and make them less saturated. Click **OK**.



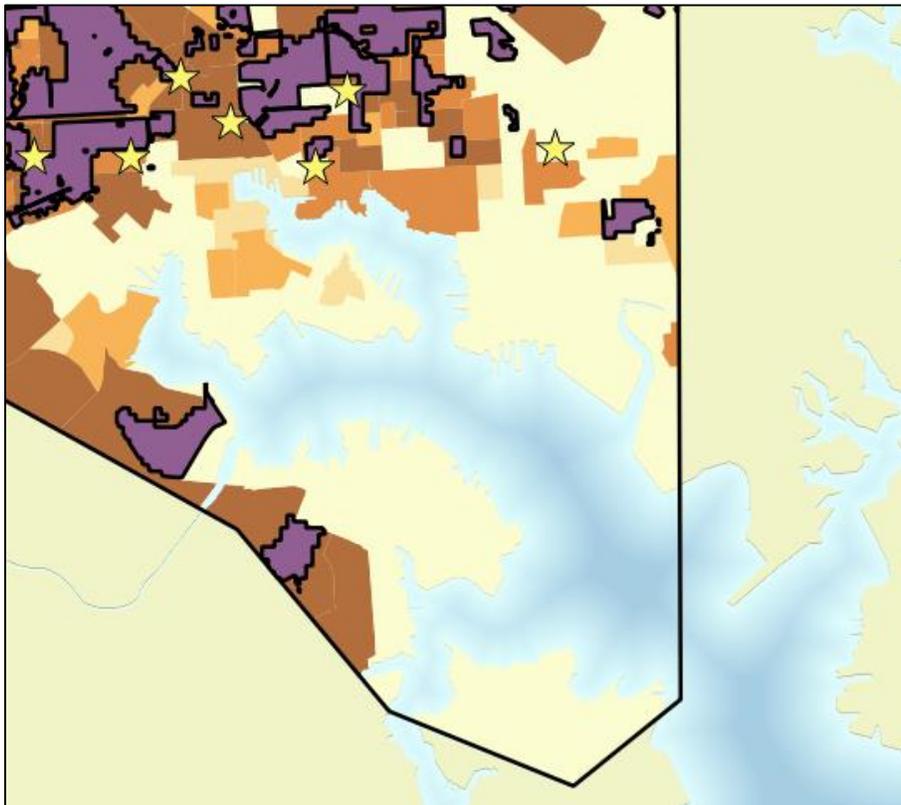
- 9) You have no data representing the Chesapeake Bay. It is simply a white hole in the data layers. To make it blue you could click on Project | Project Properties and change the background color of the map to blue. However, you will learn a more powerful way to represent this feature. Right click on the *MD\_County\_boundaries* layer and choose **Duplicate**. A second copy of it will appear in the Layers Panel.
- 10) Drag the new copy so that it is between the *Neighborhood\_diabetes* and *Baltimore City Boundary* layers in the Layers panel.
- 11) Turn the layer on by clicking the checkbox next to it in the Layers Panel.

You will now learn about inverted polygon styling, which is a way to style data outside the boundaries of a layer. It can be used to create a mask around a feature. Here you will use it to represent the Chesapeake Bay.

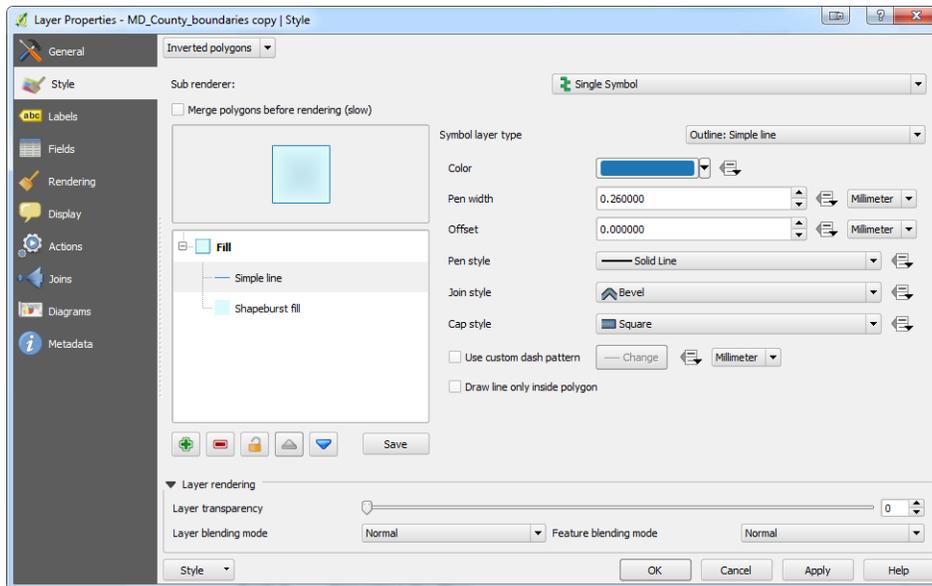
- 12) Open the **Layer Properties | Style** tab for the copied layer.
  - a) From the renderer dropdown choose **Inverted Polygons**.
  - b) Select **Simple fill**.
  - c) Select a **Symbol layer type** of **Shapeburst fill**.
  - d) Under **Gradient colors** you will be using the **Two color** method:
    - i. Color number one will have an RGB value of 225/255/255, which is a light blue.
    - ii. Color number two will have an RGB value of 166/206/227, a darker blue.



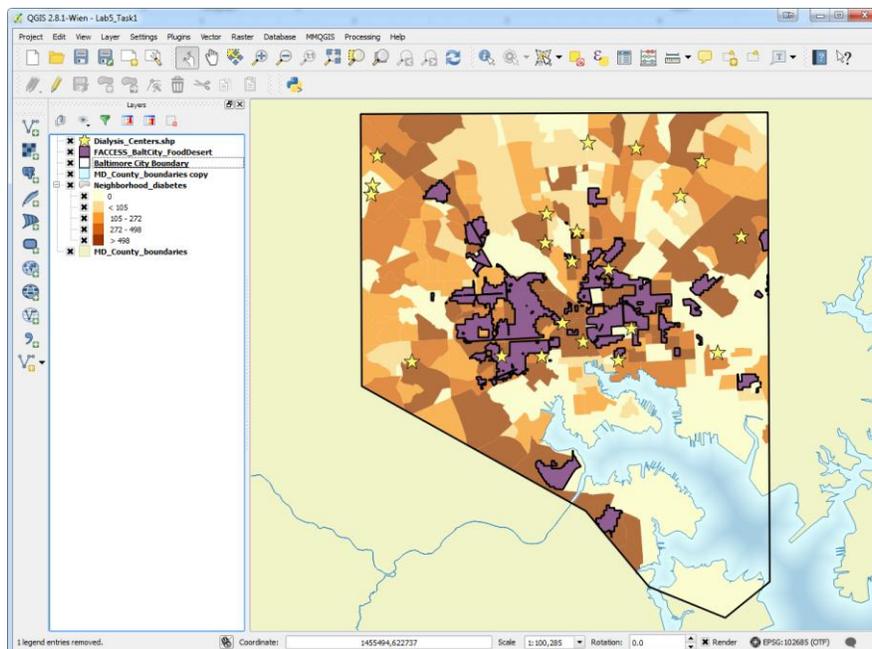
- e) Click **Apply** but do not close the **Layer Properties** window!
- f) The area beyond the extent of the county boundaries, which is the equivalent of the Chesapeake Bay, is now styled with a light blue to darker blue color ramp. It is also using the shapeburst fill style, which fills the area with a gradient based on the distance from the edge.



- g) Now under **Shading style** select **Shade to a set distance** and set the distance to **12**.
- h) Again click **Apply** but do not close the **Layer Properties** window. This gives a little more definition to the center of the channel.
- i) Finally, you will create a shoreline. Click the  button.
- j) Change from a **Symbol layer type** of **Simple fill** to **Outline: Simple line**. Give the line an RGB color of 31/120/180, which is a dark blue. You can create great effects by using composite renderers like this.
- k) Click **OK**.

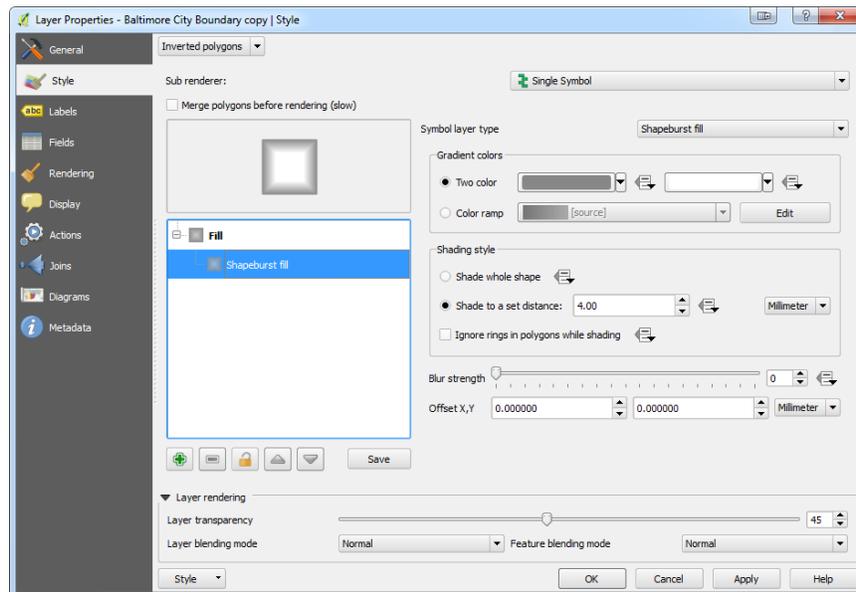


- 13) You have symbolized the Chesapeake Bay without having a Chesapeake Bay layer using an Inverted Polygon Shapeburst Fill!

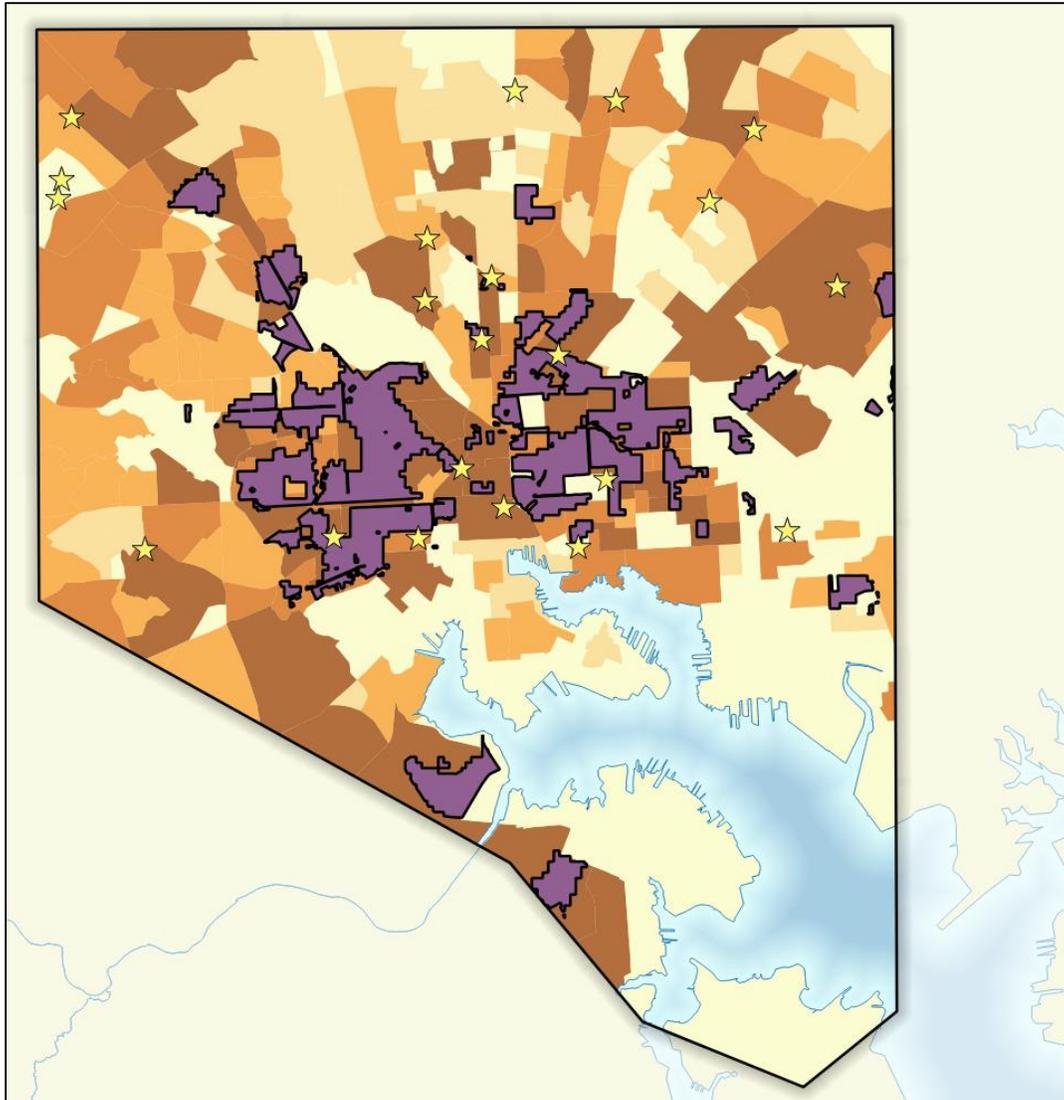


You will now use a similar technique to give more visual weight to Baltimore City.

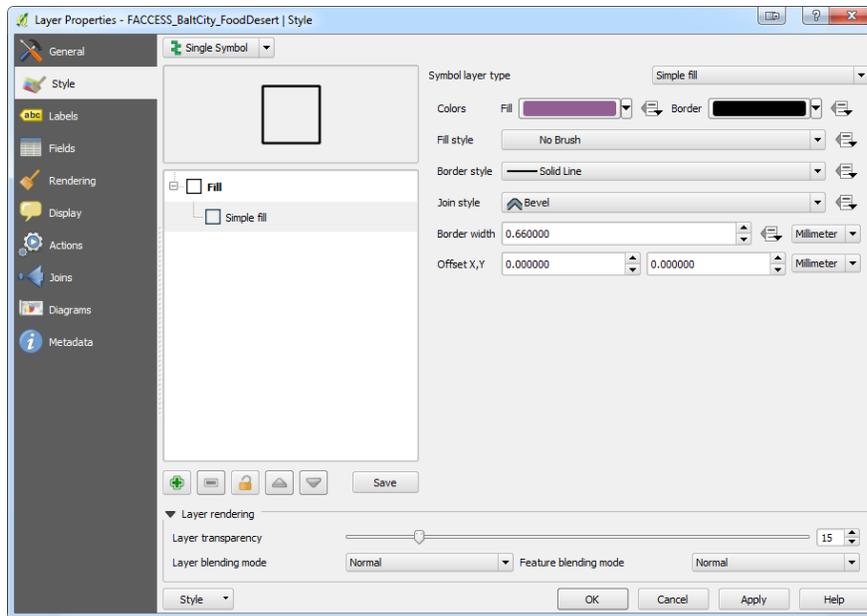
- 14) **Duplicate** the *Baltimore\_City\_Boundary* layer and turn on the new copied layer.
- 15) Open the **Layer Properties | Style** tab and choose an **Inverted polygons** renderer.
  - a) Select **Simple fill** and choose the **Symbol layer type** of **Shapeburst fill**.
  - b) Under **Gradient colors** you will again be using the two color method.
  - c) Color number one will have an RGB value of 135/135/135, which is gray. Color number two will be white.
  - d) Under **Shading style** select **Shade to a set distance** and set the distance to **4**.
  - e) Under **Layer rendering** slide the transparency slider so that **Layer transparency** is **45**.
  - f) Click **OK**.



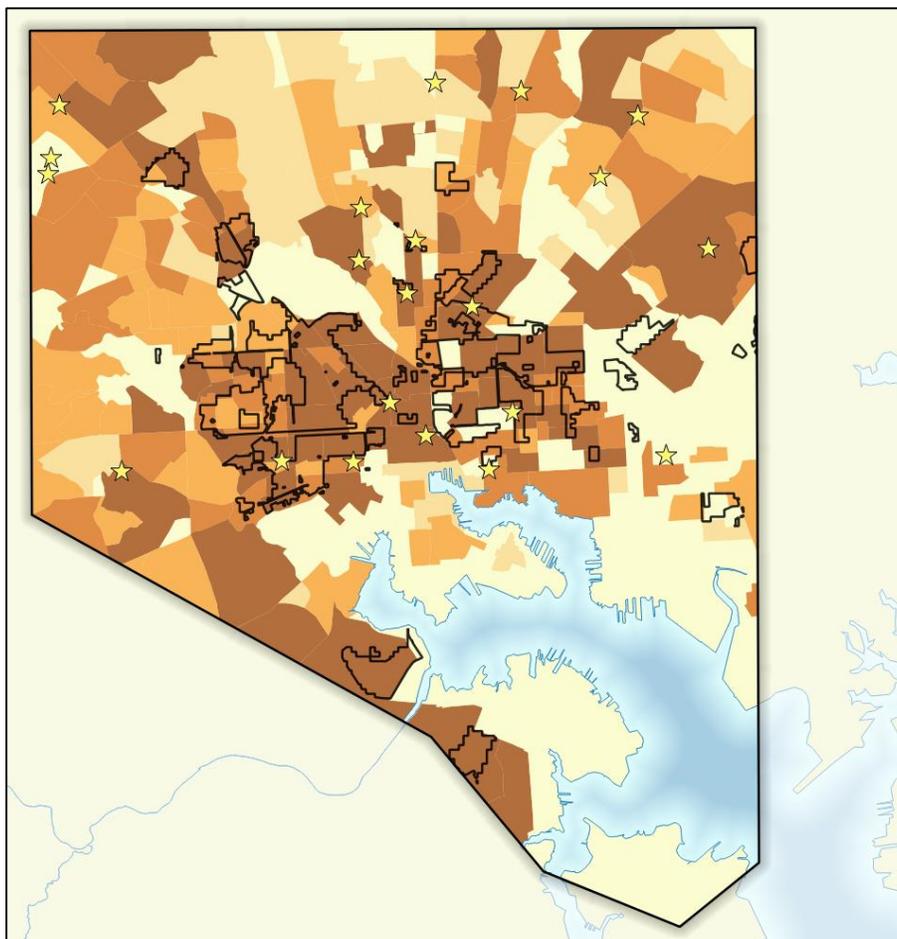
- 16) This styled the area beyond the city limits. You used a gray to white color ramp with a distance of 4, which creates a mask around the city boundary. The layer is also semi-transparent so that you can still see the underlying data. It creates an effect where the area of interest pops off the map and receives more visual weight. The area beyond Baltimore City is underneath the white mask created by this styling so that visually it falls into the background.



- 17) Finally, you will style the Food deserts with no fill and a black outline. Open the **Layer Properties | Style** tab.
- 18) Click on **Simple fill**.
  - a) Choose a **Fill style** of **No brush**.
  - b) Set the **Border width** to *0.66*.
  - c) Under **Layer rendering** slide the transparency slider so that **Layer transparency** is **15**. This will soften the outlines a bit.
  - d) Click **OK**.



19) Your map should now resemble the figure below.



- 20) Save your QGIS project.
- 21) You are now ready to craft a map!

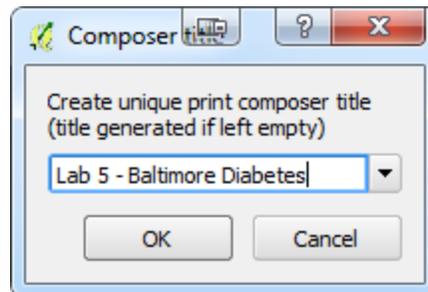
**Note:** QGIS version 2.10, released in the spring of 2015, introduced a new styling feature called Live Layer Effects. This introduces effects like drop shadows and outer and inner glows to layer styling. You can read more about this exciting [new feature](#) on [nyalldawson.net](#).

## Task 2. Using the Print Composer

Watch a [Task 2 Video Walkthrough](#) on YouTube.

Now that all the data are well styled you can compose the map deliverable.

- 1) Open QGIS Desktop and open the QGIS map document from Lab 5 Task 1.
- 2) From the menu bar choose **Project | New Print Composer**.
- 3) Name the Composer “Lab 5 – Baltimore Diabetes”.

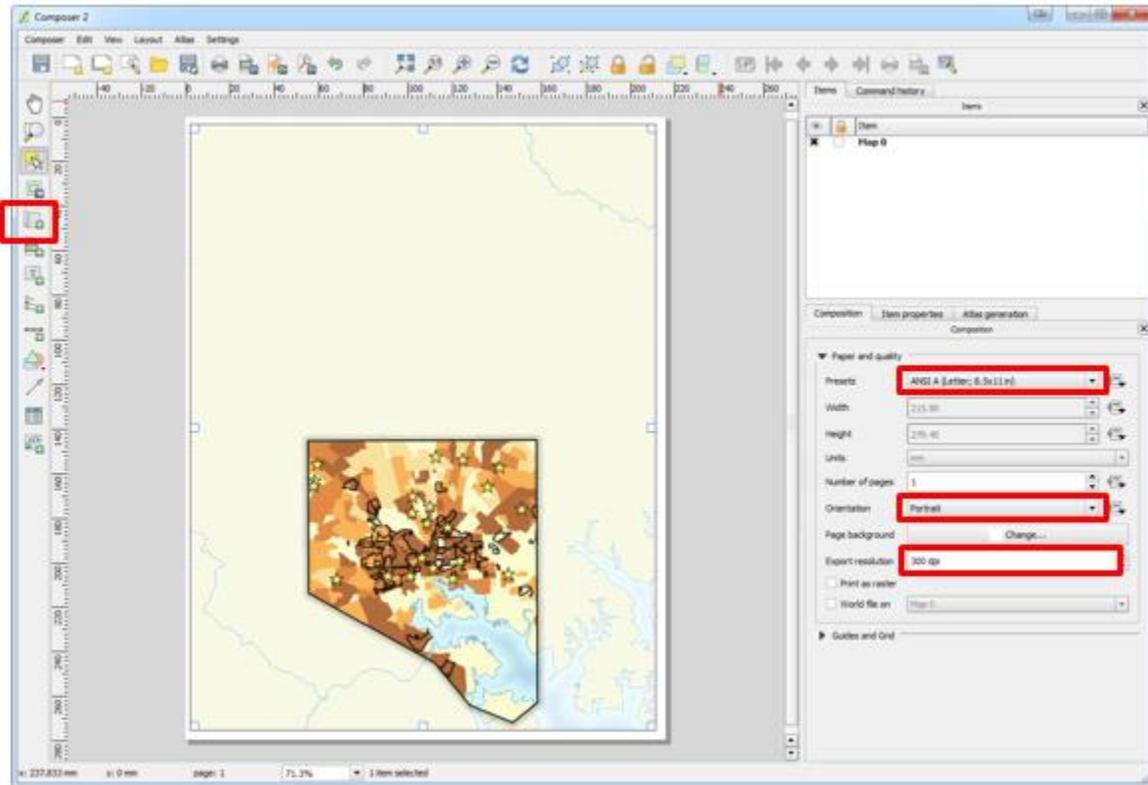


- 4) Click **OK**. The Print Composer will open. This is where you craft your map.

The Print Composer is an application window with many tools that allow you to craft a map. For [detailed information about the Print Composer](#), refer to the QGIS manual.

The main window of the Print Composer displays the piece of paper upon which the map will be designed. There are buttons along the left side of the window that allow you to add various map elements: map, scale bar, photo, text, shapes, attribute tables, etc. Each item added to the map canvas becomes a graphic object that can be further manipulated (if selected) by the **Items** tab on the right side of the composer. Across the top are buttons for exporting the composition and navigating within the composition as well as some other graphic tools (grouping/ungrouping, etc.).

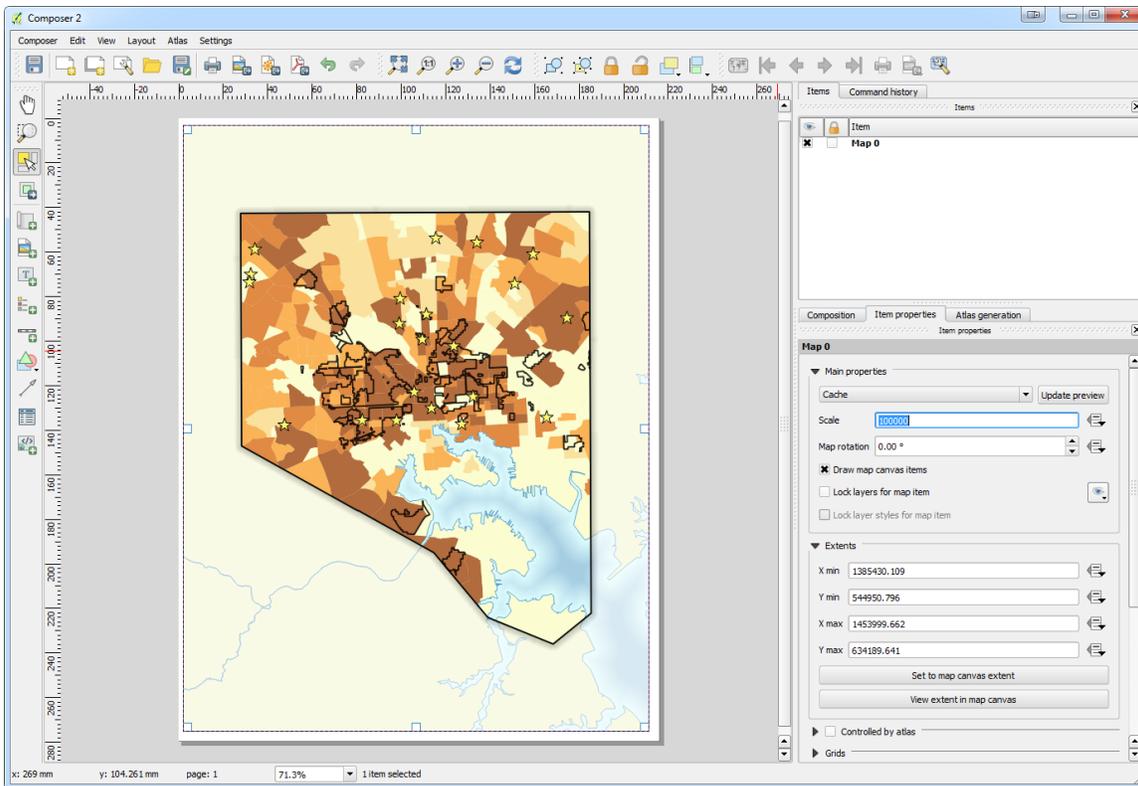
- 5) On the **Composition** tab you can specify details about the overall composition. QGIS is euro-centric so you will have to set **Presets** to *ANSI A* (Letter; 8.5x11 inch) to get a letter-sized sheet.
- 6) Set the **Orientation** to *Portrait*.
- 7) Set the **Export resolution** to *300 DPI*.
- 8) Click on the  button and drag a box on the sheet of paper where the map will go. Cover the entire sheet with the map, leaving a small margin. The map object can be resized after it is added by selecting it and using the handles around the perimeter to resize.



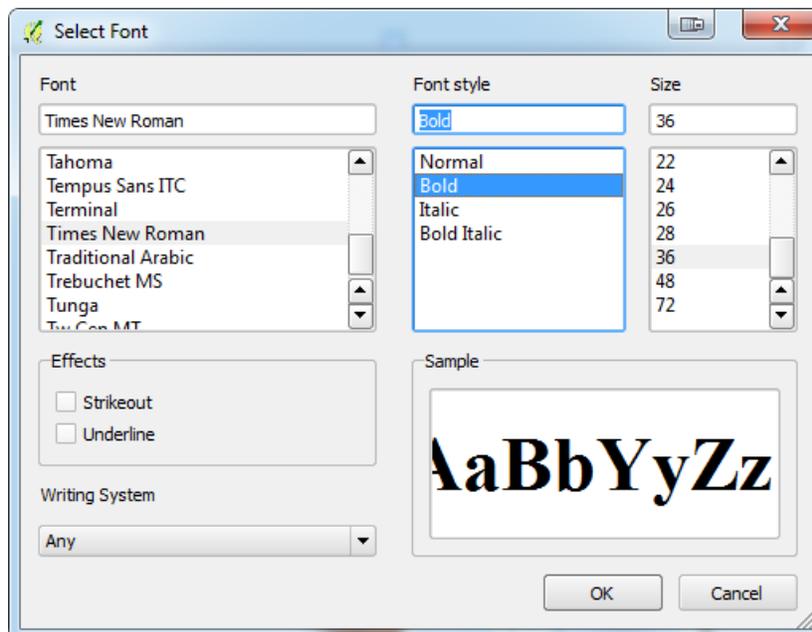
- 9) With the map selected select the **Item properties** tab and click the **Set to map canvas extent** button. That will help orient the map on the sheet of paper as it appears in QGIS Desktop.
- 10) Under **Main properties** set the Scale to *100000* and click the **Update preview** button.
- 11) You can also use the  button to pan the map in the **Print Composer**. This will help you center the map.

**Map extent helpful hints:** Generally, the map will look as it does within QGIS Desktop. However, you may need to change the map extent in QGIS Desktop: go back to the Print Composer and click the  button. It is normal to have some back and forth with QGIS Desktop and the Print Composer before getting the map just right.

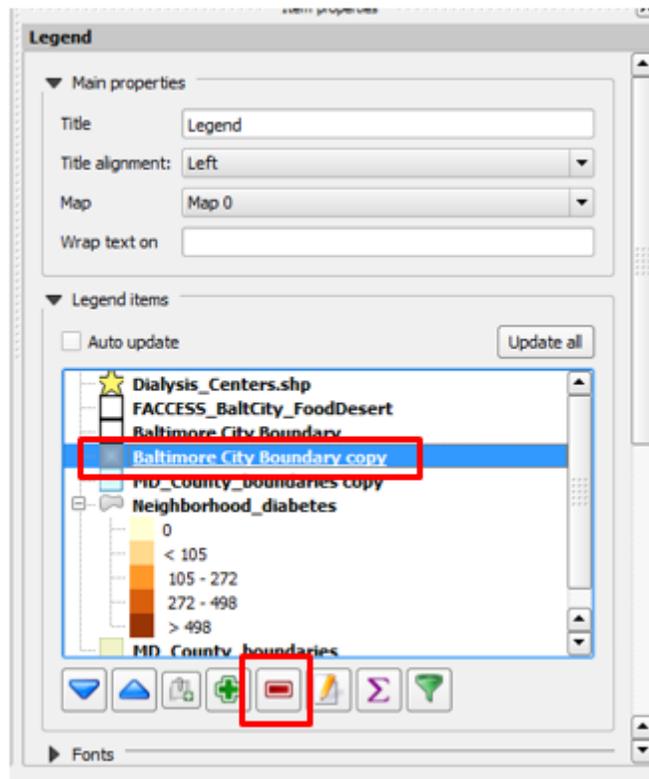
- 12) Work with these settings until the map resembles the figure below.



- 13) Now you will add a title. Click the  button and drag a box across the top of the composition. On the **Item properties** tab enter the following title: *Food Deserts and Diabetes in Baltimore City*.
- 14) Click the **Font** button and set the **Font** to *Times New Roman*, **Size 36** with a **Font style** of **Bold**. Click **OK** to accept the font settings. You may need to resize the text box after these font settings have been made so that the entire title can be seen.

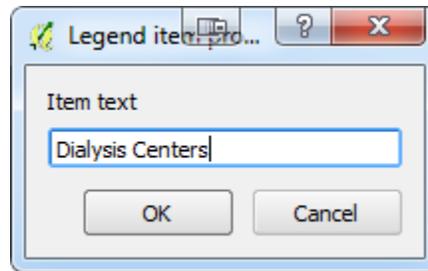


- 15) Under **Appearance**, select a **Horizontal alignment** of *Center*.
- 16) Add a legend using the  button. Drag a box in the empty area south of the western portion of the city to add it to the composition.
- 17) There are several layers that are only being used for cartographic purposes and do not need to be in the legend. Legends are used for data layers that are non-intuitive or require more explanation. You will remove these unnecessary legend entries. On the **Item properties** tab uncheck **Auto update**. Now the buttons below the **Legend items** portion of the **Item properties** tab are available.
- 18) You do not need the copy of the *Baltimore City Boundary* layer in the legend. Select it and click the  button to remove it from the legend.

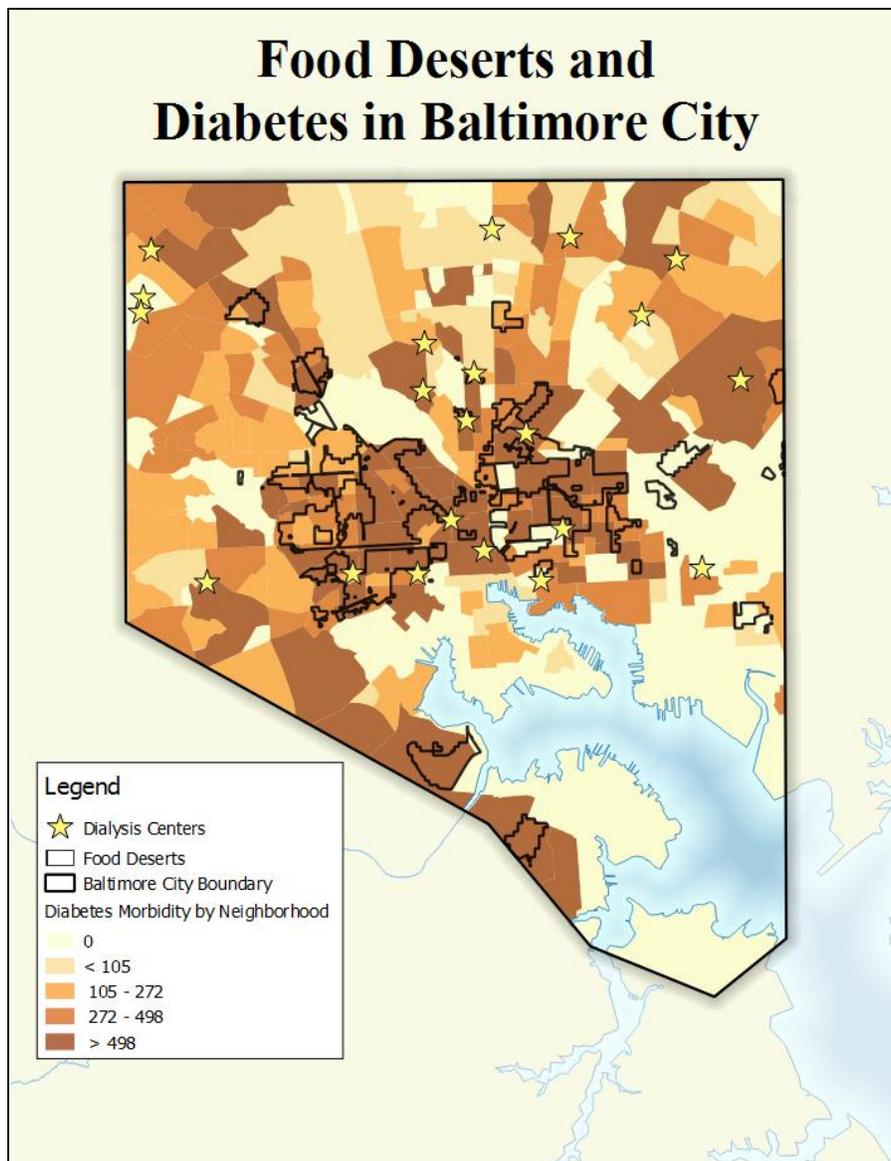


- 19) Also remove the *MD\_County\_boundaries copy* and *MD\_County\_boundaries* layers.
- 20) The Legend still needs some editing. Layers come in to QGIS with the file name as the layer name. As you learned in Lab 2, you can rename these in QGIS Desktop by going to the **Layer Properties** | **General** tab. However, you can also edit these names in the

Legend. Select the *Dialysis\_Centers.shp* legend entry and click the  button. Take out the underscore and the .shp to make it an English readable layer name and click OK.



- 21) Rename the *FACCESS\_BaltCity\_FoodDesert* legend entry to *Food Deserts*.
- 22) Rename the *Neighborhood\_diabetes* legend entry to *Diabetes Morbidity by Neighborhood*.
- 23) Give the legend box a frame by clicking the box on the **Item properties** tab next to **Frame**. Take the default setting.
- 24) Your map composition should now resemble the figure below.

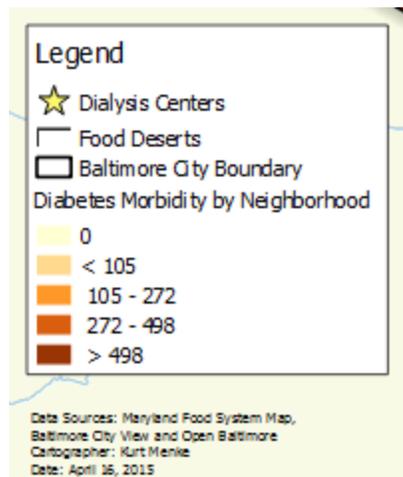


25) Now you will enter some descriptive text that tells the map reader where the data was obtained, who the cartographer was, and the date created. This will be done using the **Add new label** tool, the same tool you used to add the title. Add the label below the legend. Add the following text in the **Main properties** window of the **Items** tab:

- *Data Sources: Maryland Food System Map, Baltimore City View, and Open Baltimore*
- *Cartographer: <your name>*
- *Date: <today's date>*

26) Set the **Font Size** to 8.

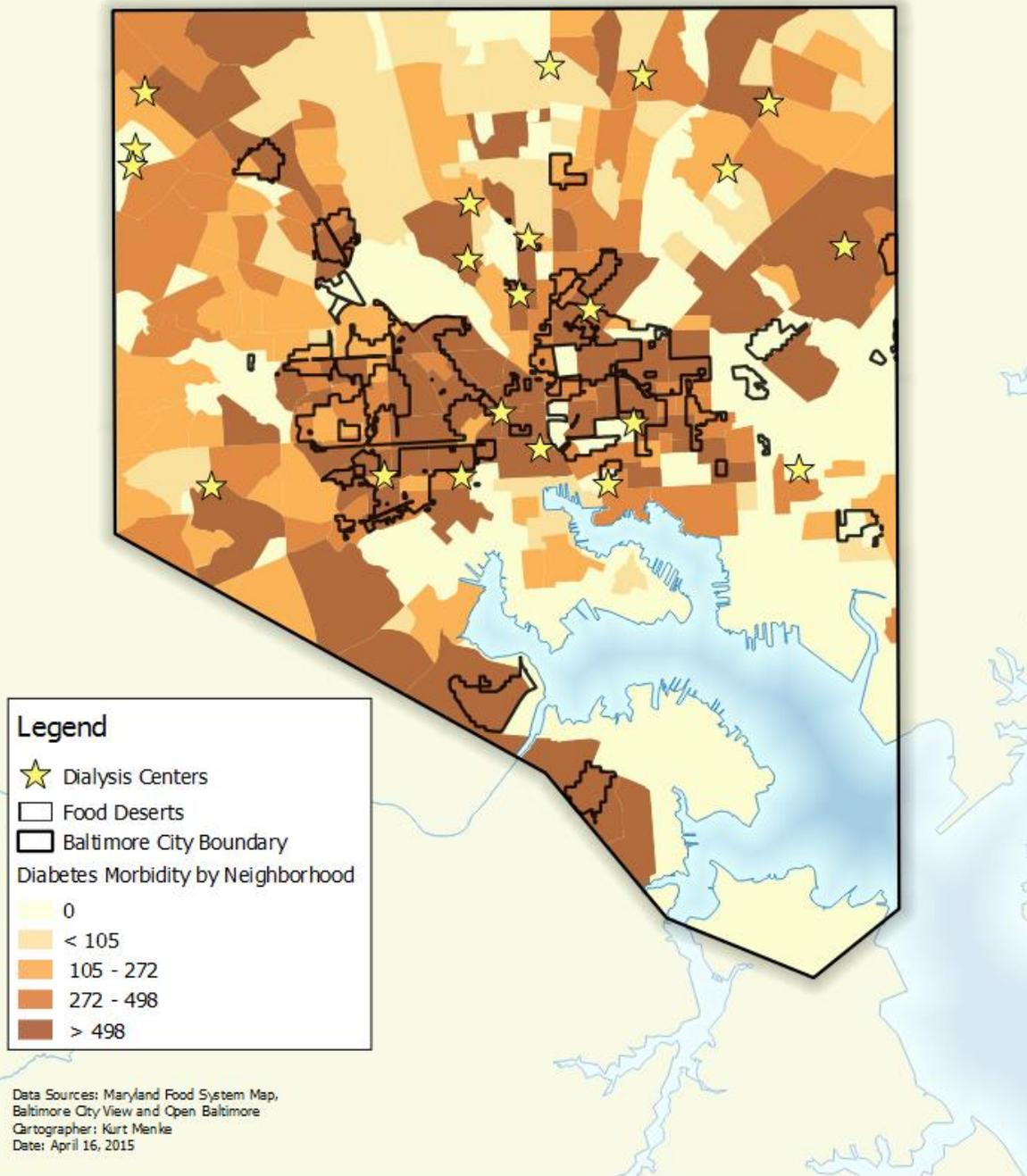
27) Drag the text element so that it lines up with the left side of the legend. With an element selected, you can also use the arrow keys on your keyboard to nudge.



28) Finally, you will give the map a border. Select the map element by clicking on it. On the **Item properties** tab click the box next to **Frame**. Expand the frame section by clicking the black arrow. Set the **Thickness** to *1.00mm*.

29) Your map should now resemble the figure below.

# Food Deserts and Diabetes in Baltimore City



30) Click the  button.

### Task 3. Exporting the Map

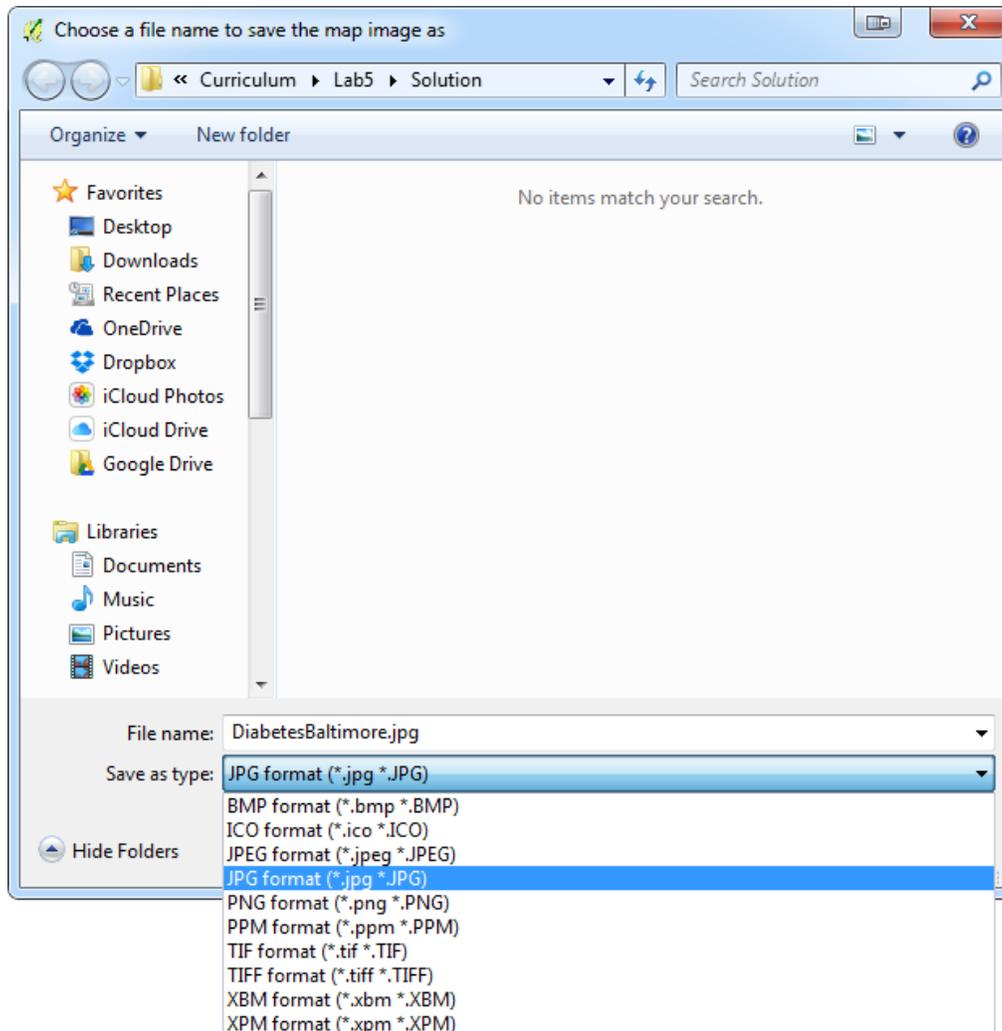
Watch a [Task 3 Video Walkthrough](#) on YouTube.

Now that you have created the map you will export it.

- 1) Open QGIS Desktop and open the QGIS map document from Lab 5 Task 2 if it is not already open.
- 2) From the menu bar choose **Project | Composer Manager**. Select “Lab 5 – Baltimore Diabetes” and click **Show**.
- 3) The buttons below the Settings menu allow you to print the composition and export it into a variety of formats. These same options are available under the Composer menu.



- 4) Click the  button.
- 5) The **Choose a file name to save the map image as** window opens. Navigate to the Lab 5 Data folder. By clicking on the **Save as type** dropdown, you will see the range of image formats you can export to. Choose *JPG*. Name the file and click **Save**. It will be exported at 300 dots per inch (DPI) as this was the setting specified on the **Composition** tab of the Print Composer. You can change this setting any time and re-export the map if necessary.



- 6) Now click the  button. Navigate to the Lab 5 data folder, name the file, and click Save. NOTE: you may get a message stating that not all vector affects can be saved, but this composition should export fine.
- 7) Save your project and exit QGIS.
- 8) Navigate to the directory where you saved these maps. Open them and inspect the output.
- 9) Congratulations, you have made your first maps in QGIS!

## 5. Conclusion

In this lab, you learned some new data styling techniques. You then learned how to use the QGIS Desktop Print Composer to craft a well-designed map and export that map to both an image file and PDF.