MAP BASICS: PART 2

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HONR 39900: Foundations of Geospatial Analytics

Fall 2021

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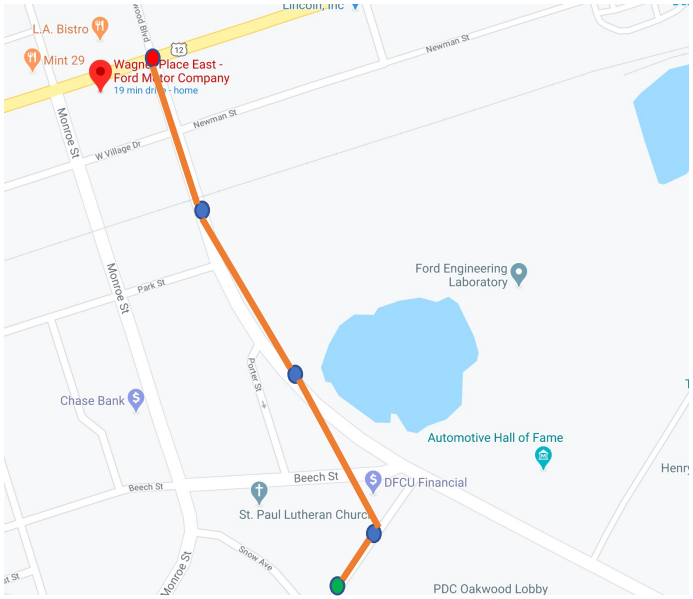
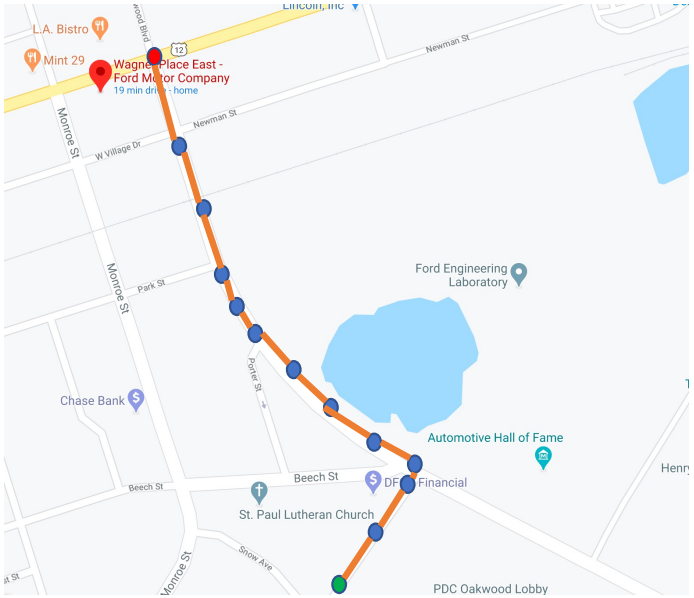
Topics

- Part 1: What are maps? (Chapter 1 of *PostGIS in Action*)
  - Graphs as maps
  - Data which make up maps
  - Spatial data types
  - Spatial databases
- Part 2: Basic map creation and visualization
  - Preprocessing spatial data
  - Map design principles
  - Mapping via Python
  - Mapping via QGIS

What are Maps?

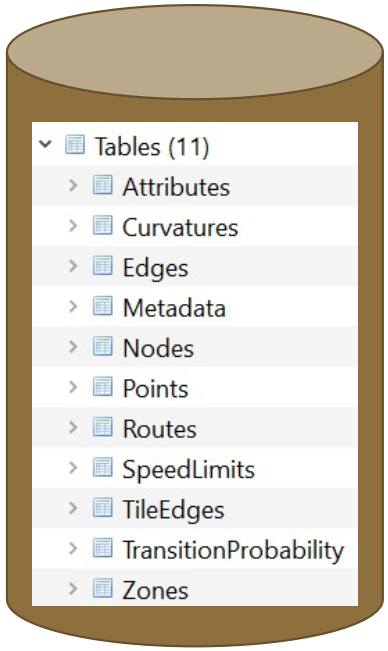
- Think of a map as a graph, with nodes and edges (edges connecting nodes)
  - A straight line drawn between nodes = edge
  - More data (ideally at each change in road curvature, get a new point) = cleaner map





What are Maps?

- Maps can also be a database



Curvatures
- edgeId
- startDist
- heading
- curvature
- tripId

Nodes
- id
- lat
- lon
- geoHash

TransitionProbability
- eFromId
- eToId
- txId
- destId
- freq

TileEdges
- tileId
- edgeId
- startPointIdx

Metadata
- name
- value

Edges
- id
- tileId
- fromNodeId
- toNodeId
- hwyTypeId
- length
- travelDirection
- frequency
- defaultZone

Routes
- id
- routeId
- name
- idx
- nd

Points
- edgeId
- idx
- lat
- lon

Attributes
- edgeId
- startDist
- name
- value

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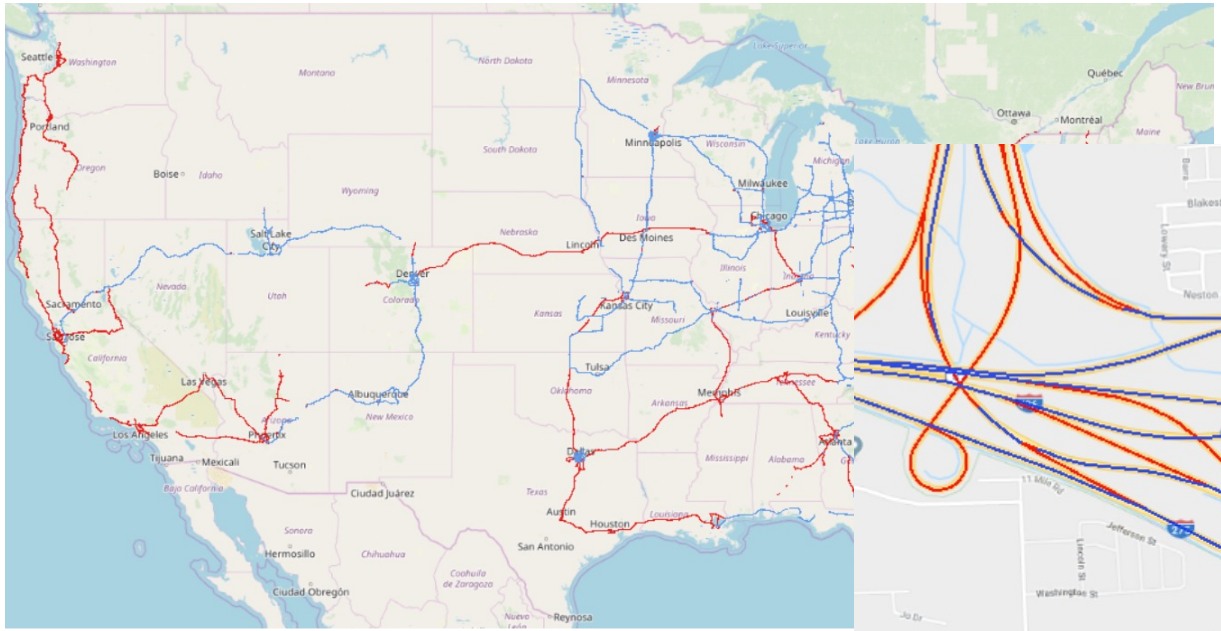
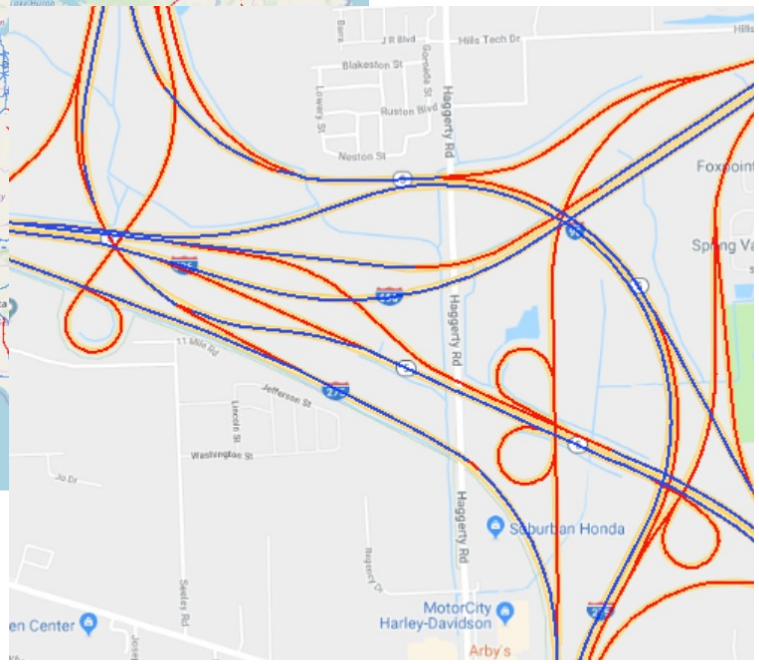
What are Maps?

- Visualizing map database and attributes associated with vector data (lines and points) – *think back to the idea of a* ***graph***





Segment ID

Segment length

Min lane width

Max lane width

Left avg LMC

Right avg LMC

ADAS availability

Has pothole

Construction

…

…

…

Map Design Principles

- What makes a map “good” or “readable”?

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Map Design Principles

- What makes a map “good” or “readable”?

OPINION

Obama's Divided Nation

ama presides over
ica more divided
any time in 50
ry that was riven
g racial lines gath-
2008 to elect its
ident. That presi-
four years dividing
the basis of eco-
The campaign re-
vealed no evi-
dence that Mr.
Obama will close
the chasm he has
created between
his voters and
those he attacked
and vilified.

It may be true
that Mitt Romney
failed to respond

R.I.
Conn.
Del.
D.C.

Obama Romney

Source: AP

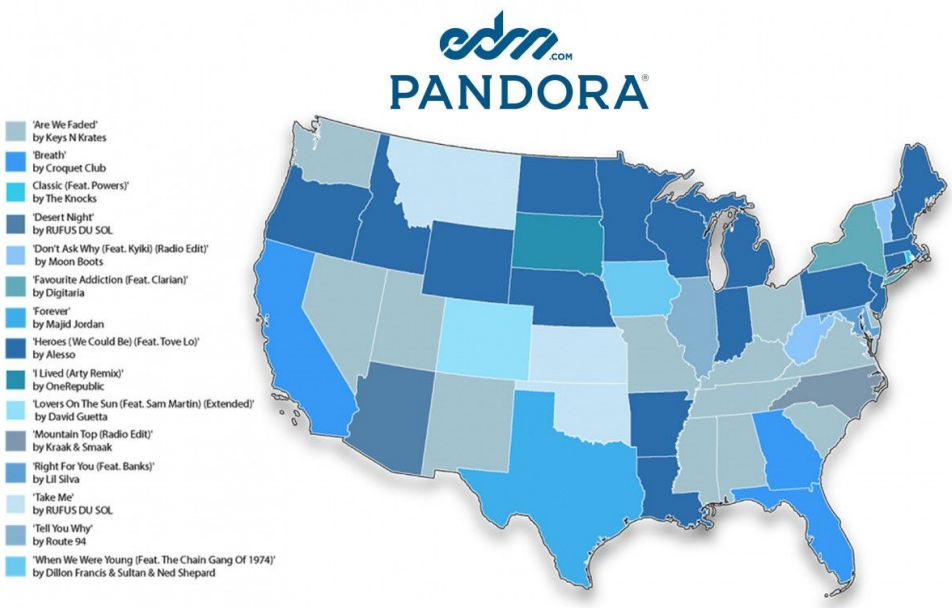
drawn attention to what hap-

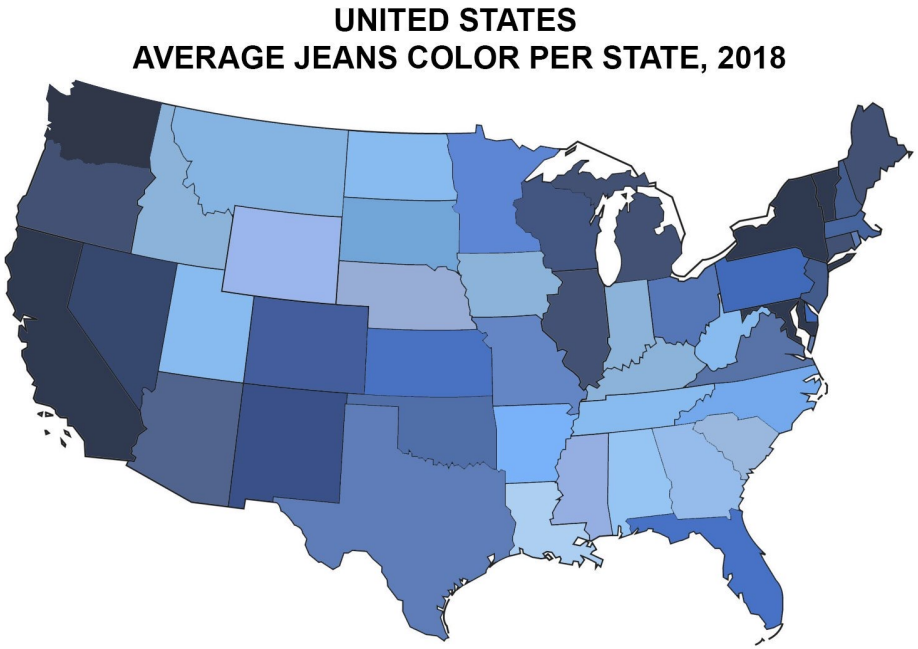
Obama spokestotum replied:

problem with pols, e
verbally facile as Mr.
that in crunch time,
reverts to No. 1. Exi
that 9% of the electo
who to vote for jus
Tuesday; and amo
42% said Mr. Oban
Sandy response—t
tie photo-op—wa
factor. Of those,
voted for Mr. Ob
Mr. Christie is o
politico who is
Yes, Republic
across two pres
that there are
how crudely
issue like ill
Blowing up th
if you thoug
day's results

Map Design Principles

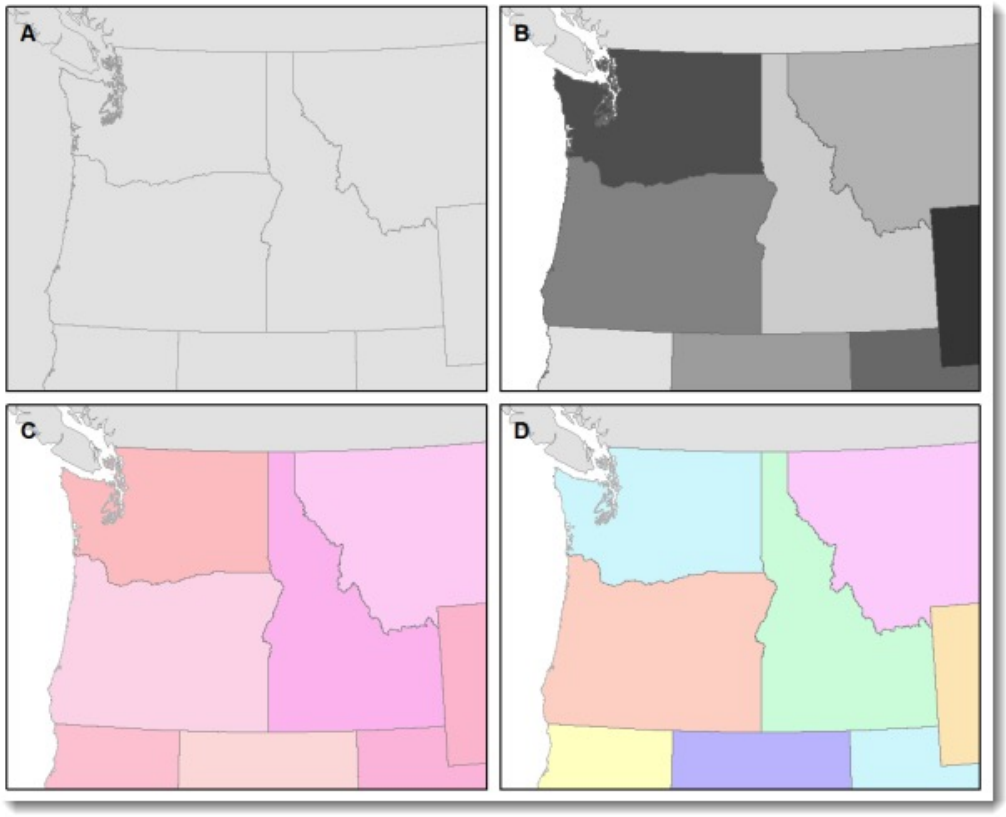
- Ok, last two…





Map Design Principles: Visual Contrast

- Visual contrast which relates to how map features and page elements contrast with each other and their background.
- A well-designed map with a high degree of visual contrast can result in a crisp, clean, sharp-looking map.
- The higher the contrast between features, the more something will stand out, usually the feature that is darker or brighter.
- A map that has low visual contrast can be used to promote a more subtle impression.

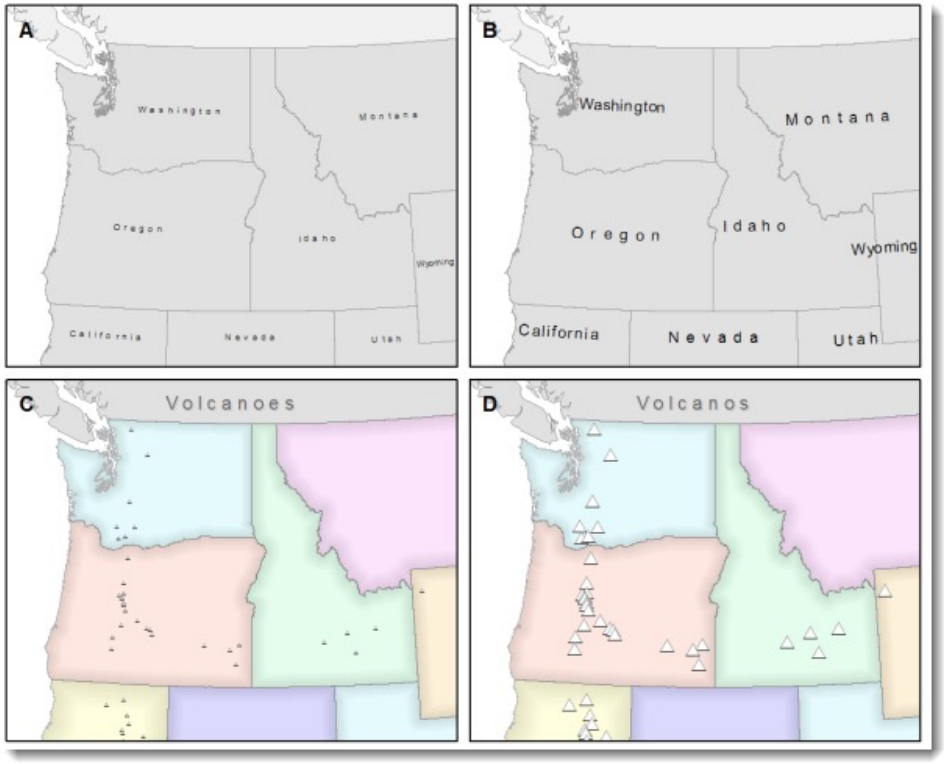


Map Design Principles: Legibility

- Legibility depends on good decision-making for selecting symbols that are familiar and choosing appropriate sizes so that the results are effortlessly seen and easily understood.

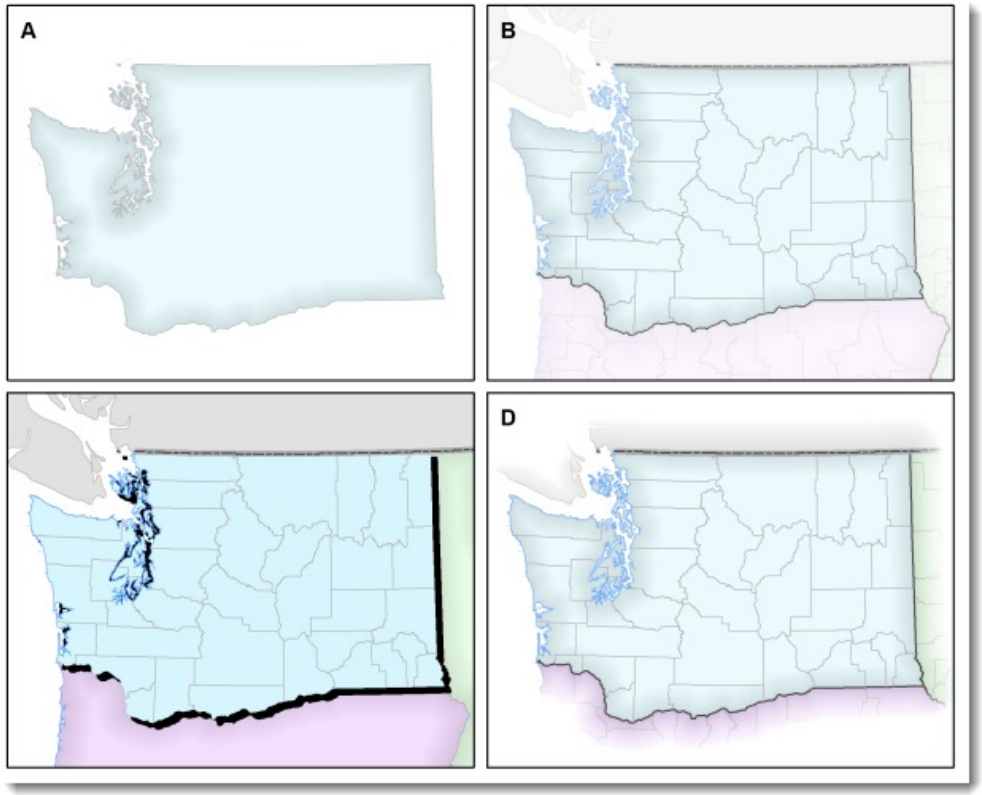
- Geometric symbols are easier to read at smaller sizes; more complex symbols require larger amounts of space to be legible.

- Visual contrast and legibility are the basis for seeing. In addition to being able to distinguish features from one another and the background, the features need to be large enough to be seen and to be understood for your mind to decipher what you eyes are detecting.



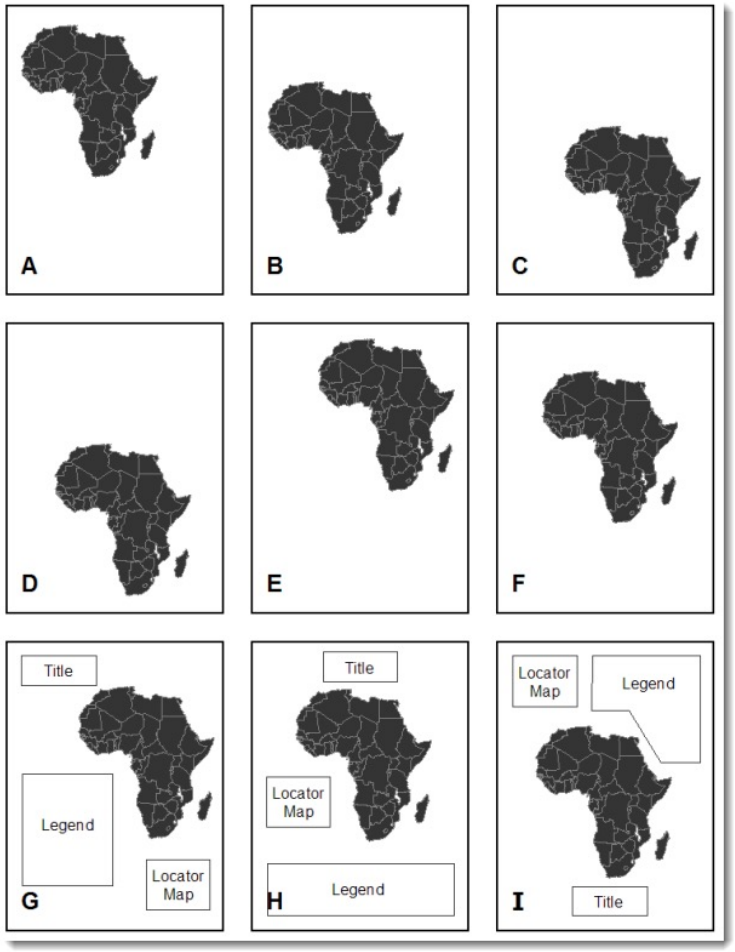
Map Design Principles: Figure-Ground

- Figure-ground organization is the spontaneous separation of the figure in the foreground.
- This helps in the over-arching goal to make your map as legible, valuable, and accessible as possible.
- Take, for example, the image on the right. The figure-ground approach here is focused on county-level separation of the map.



Map Design Principles: Hierarchical Organization

- he internal graphic structuring of the map (and the page layout more generally) is fundamental to helping people read your map.
- Some page elements (e.g., the map) will seem more important than others (e.g., the title or legend). This visual layering of information within the map and on the page helps readers focus on what is important and enables them to identify patterns.
- Balance results from two primary factors, visual weight and visual direction.



Visualizing Maps via Python

- Please use today's in-class notebook to follow along: https://github.com/gouldju1/honr39900-foundations-of-geospatial-analytics/blob/master/Lectures/Week 3/week_3_class.ipynb

- Today's data are also available on GitHub!

Visualizing Maps via QGIS

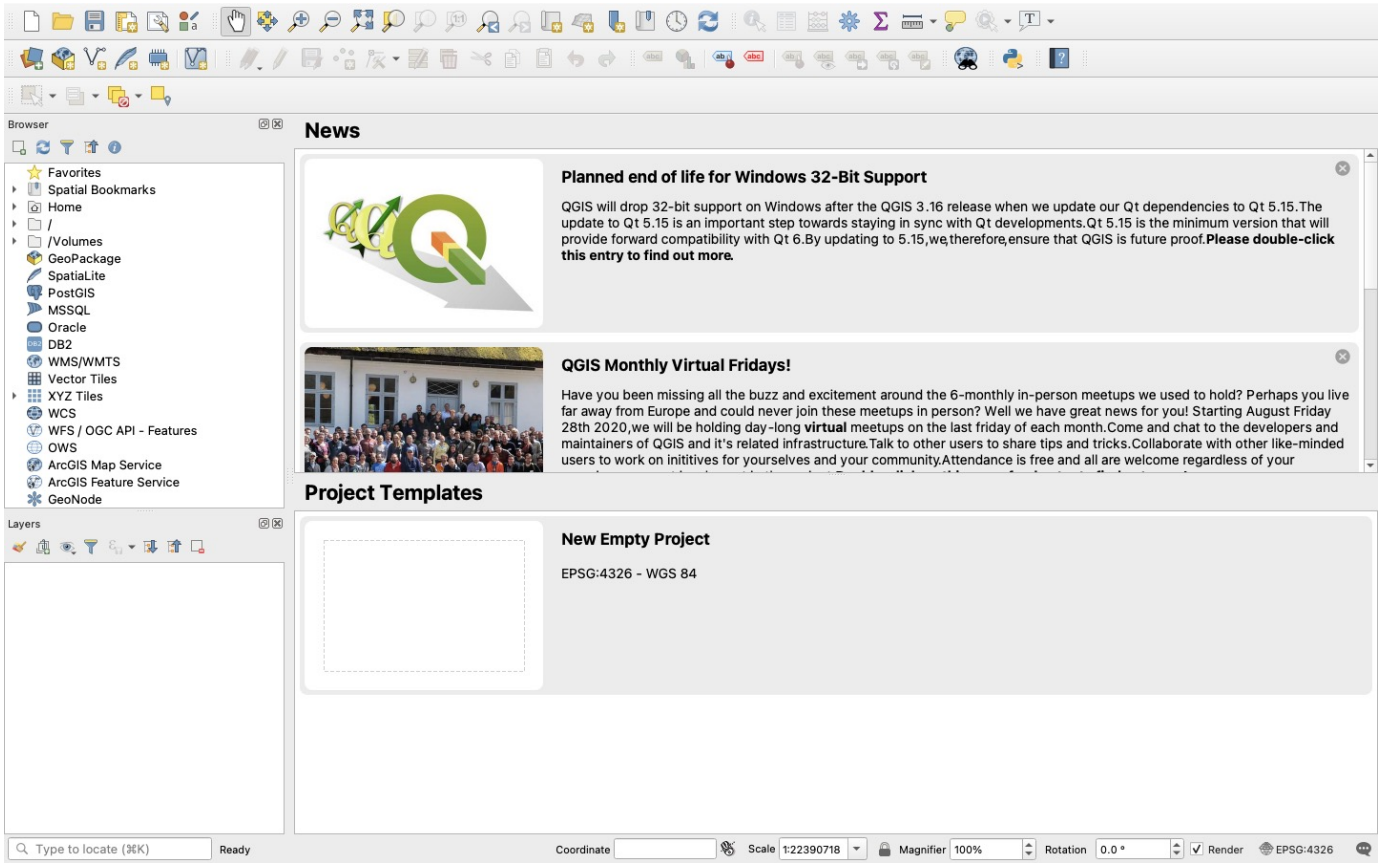
- What is QGIS?
  - Open source version of Esri's ArcGIS. It has virtually the same functionality and is free!

- You should have already installed it, but if not, please do that now: https://qgis.org/en/site/forusers/download.html

- We will use the same data as in the previous example (well, our pre-processed version).

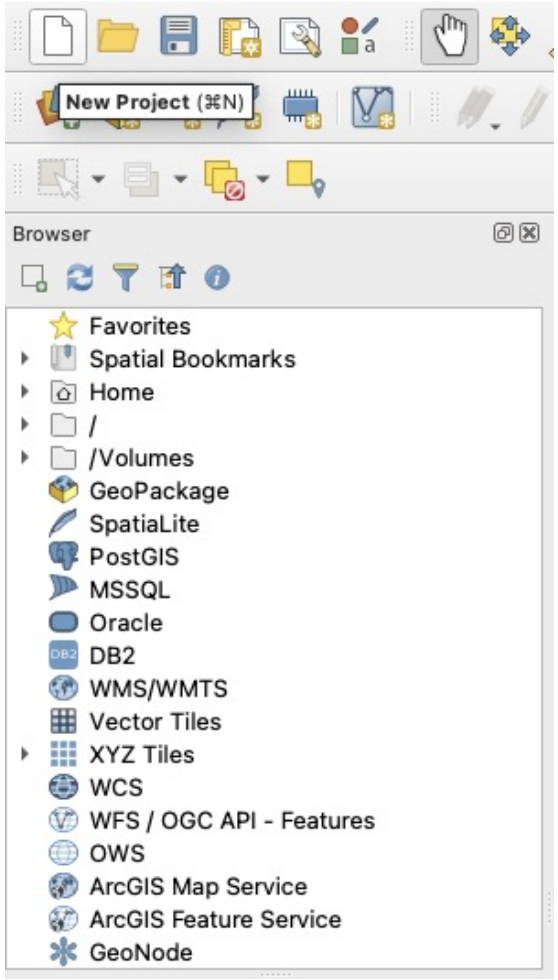
Visualizing Maps via QGIS

- Home page, after opening the app



Visualizing Maps via QGIS

- Create a new project
- Upon clicking, the screen will be white.



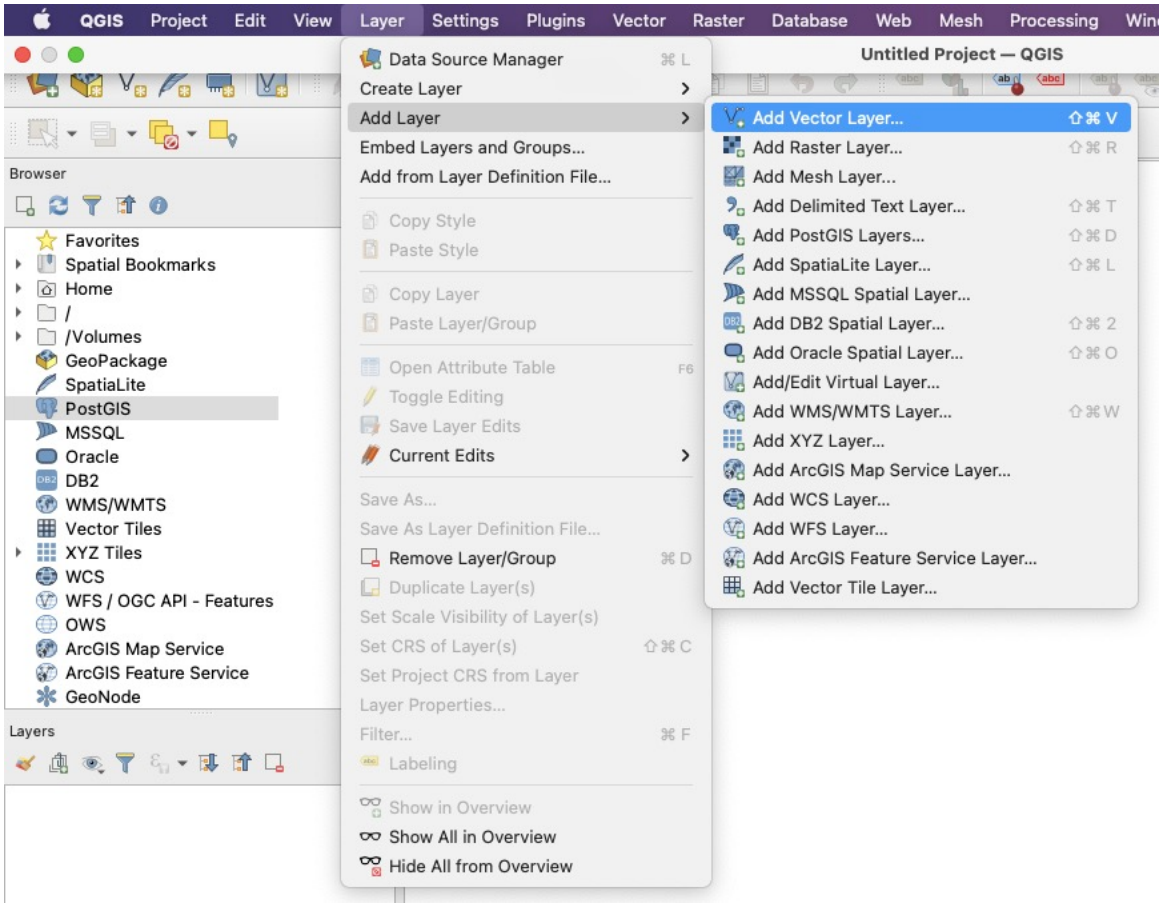
Visualizing Maps via QGIS

- We can create our layer using two methods:
  - Shapefile (as we did in our notebook)
  - merged.csv (the result of preprocessing in the notebook)

- I will show you both…

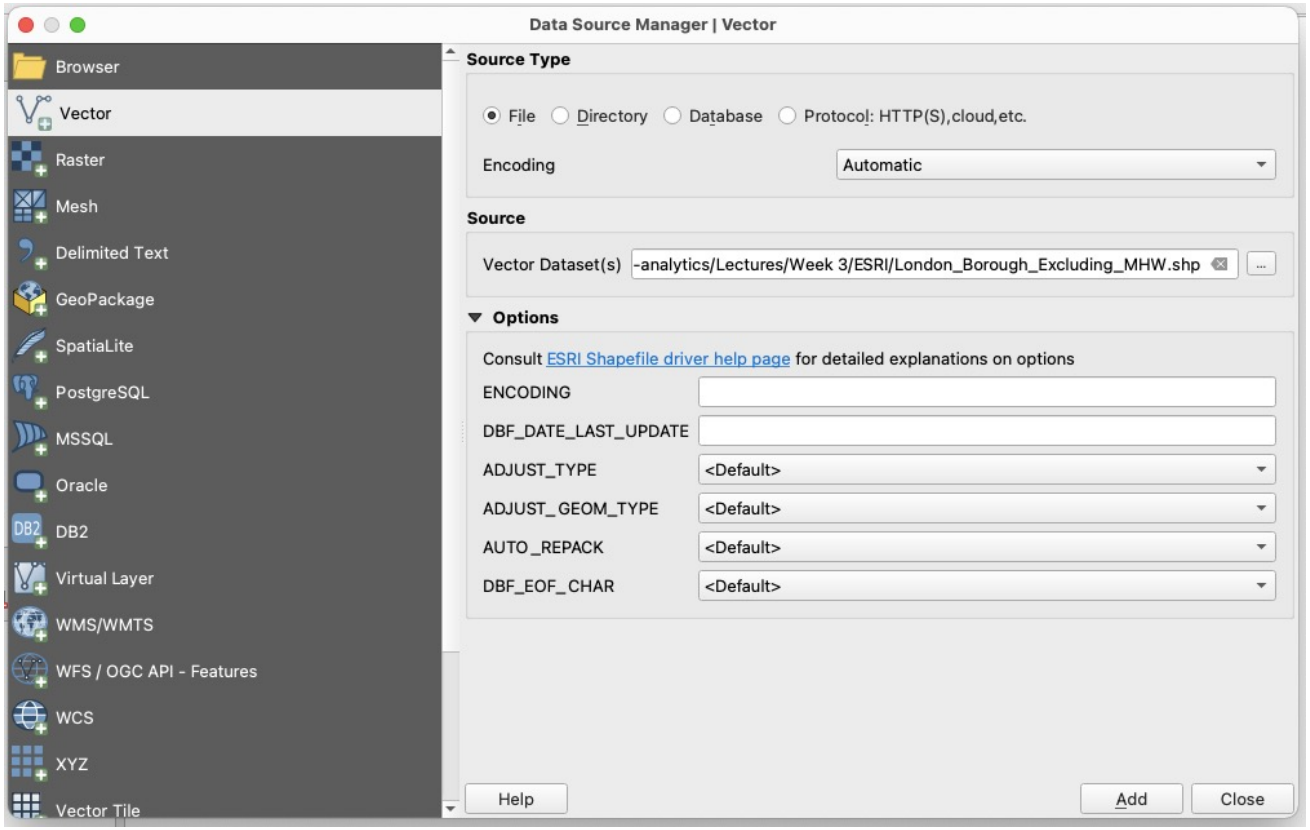
Visualizing Maps via QGIS

- Now, insert a new vector layer, given that we have the shapefile of the London boroughs.



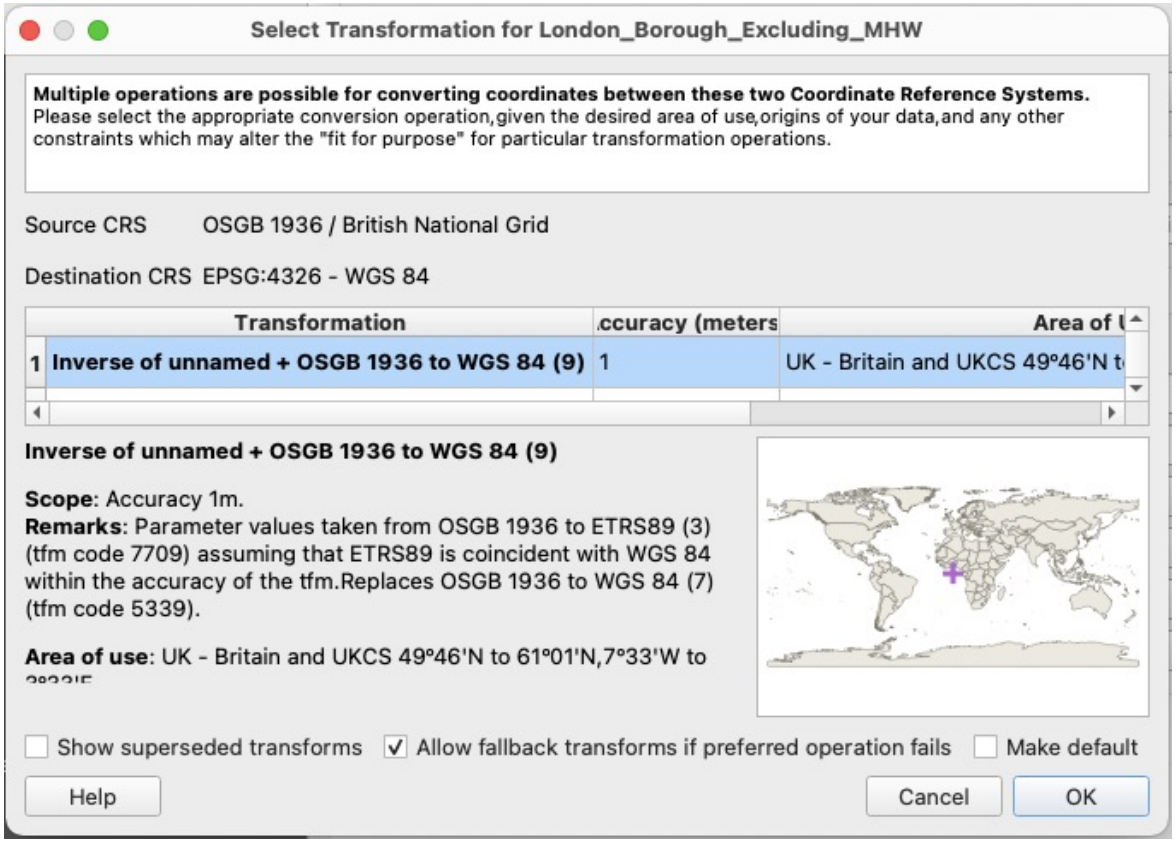
Visualizing Maps via QGIS

- Your Data Source Manager prompt should look like this.



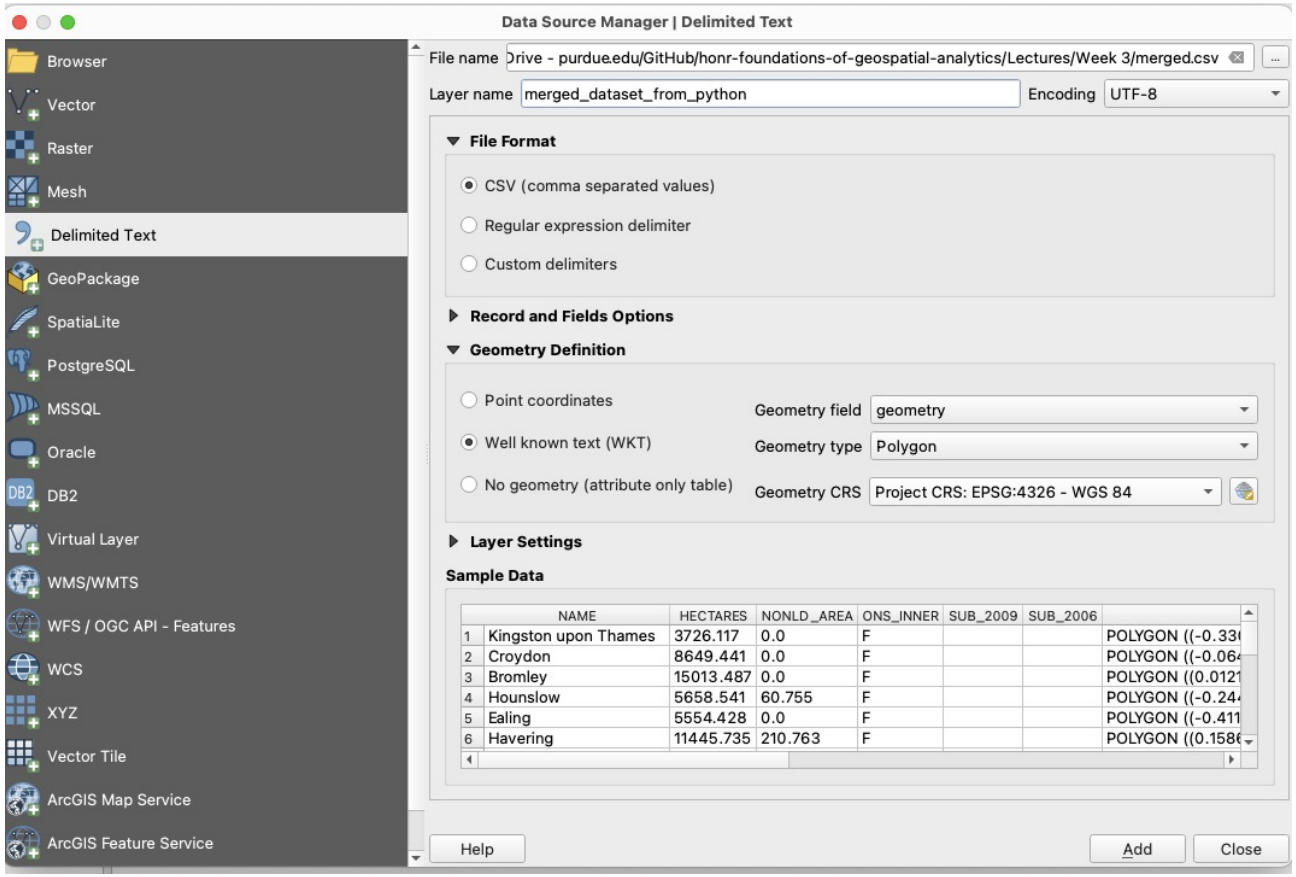
Visualizing Maps via QGIS

- Keep the defaults for handling the shapefile layer and hit OK.



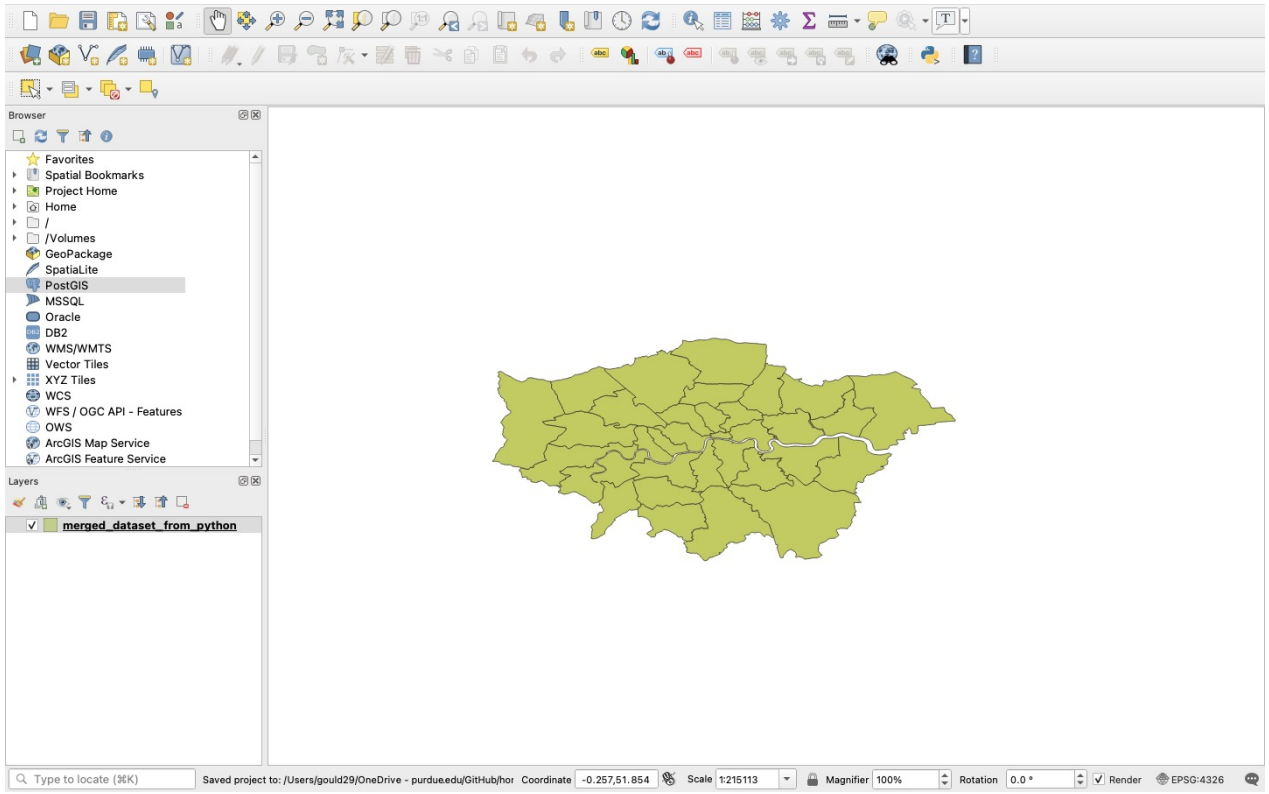
Visualizing Maps via QGIS

- To create the layer from the merged.csv file, your Data Source Manager should look like this.
- Note the Geometry Definition parameters…



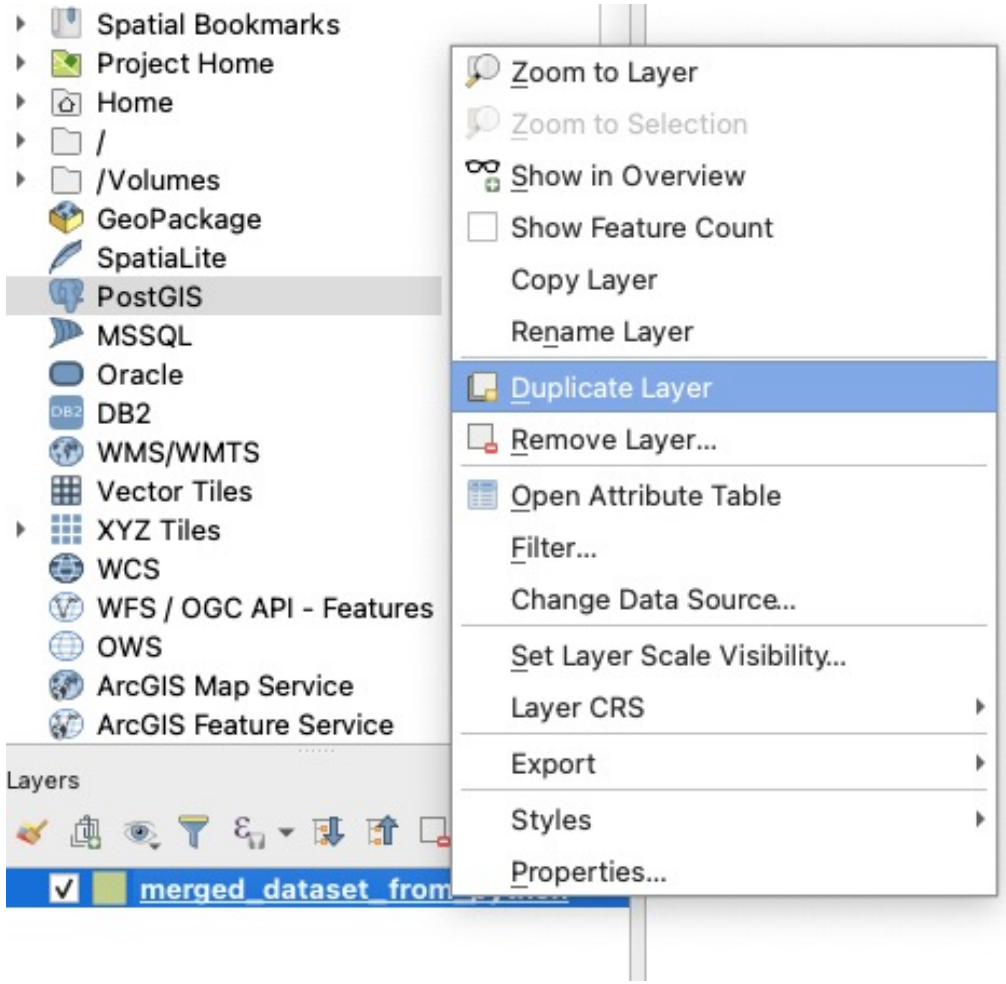
Visualizing Maps via QGIS

- We have a map!
- But, like last time, this has no value. Let's go ahead and add values and create a choropleth map, as we did via matplotlib and geopandas.



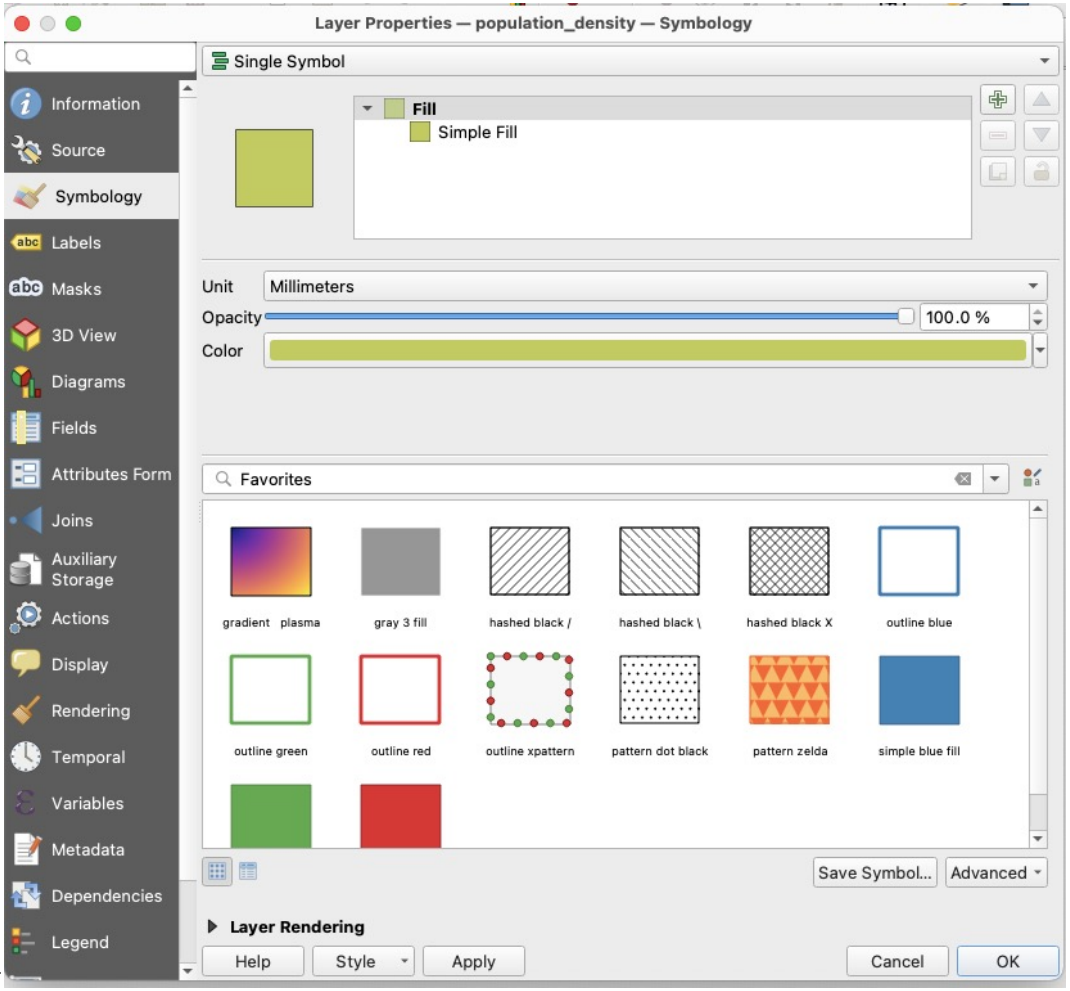
Visualizing Maps via QGIS

- Duplicate the existing layer and rename it as:
  - population_density
- You can do these by right-clicking the layer



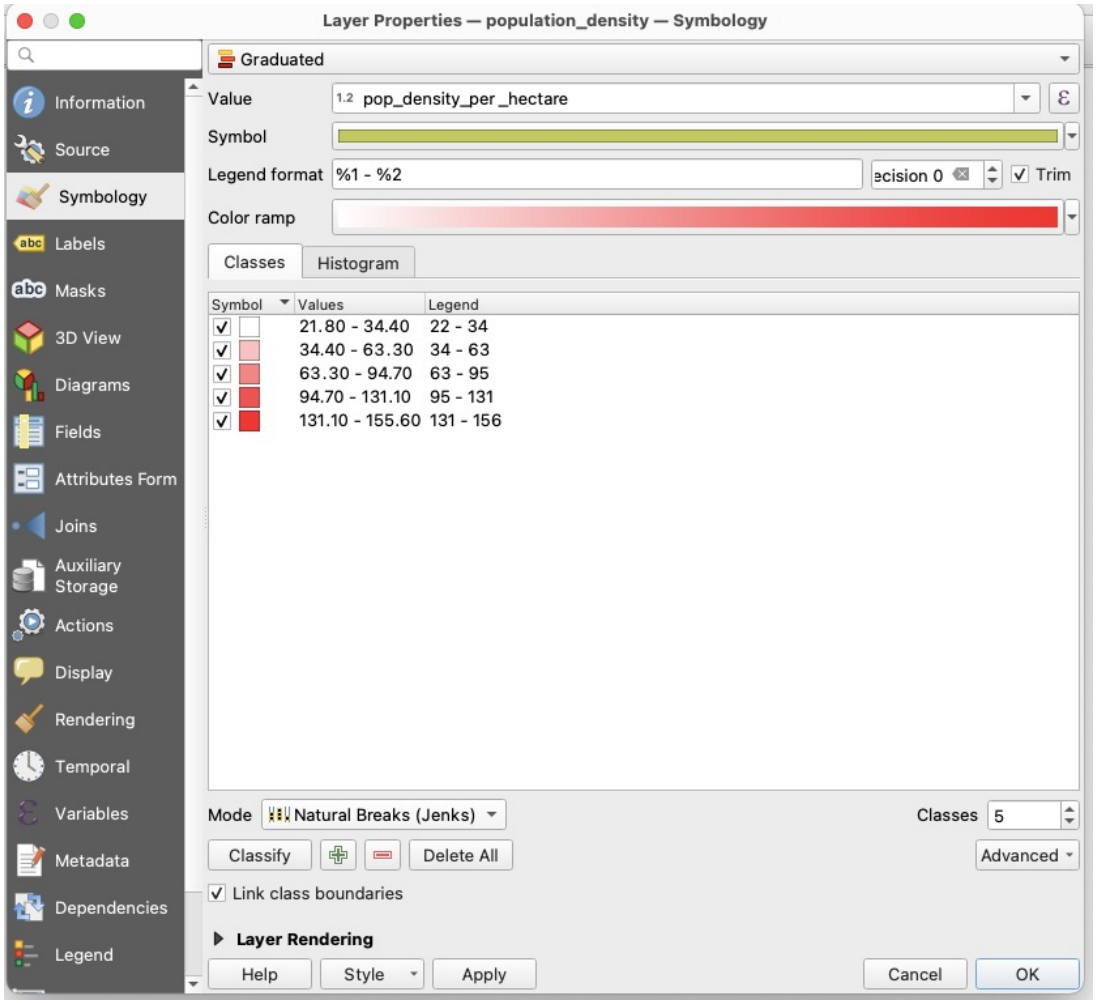
Visualizing Maps via QGIS

- Right-click the new layer again and open properties tab
- Navigate to Symbology



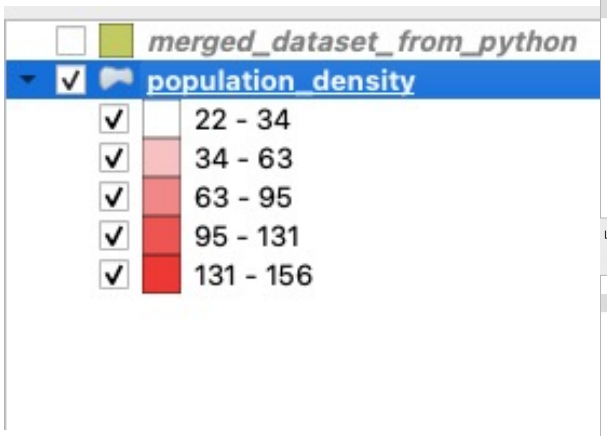
Visualizing Maps via QGIS

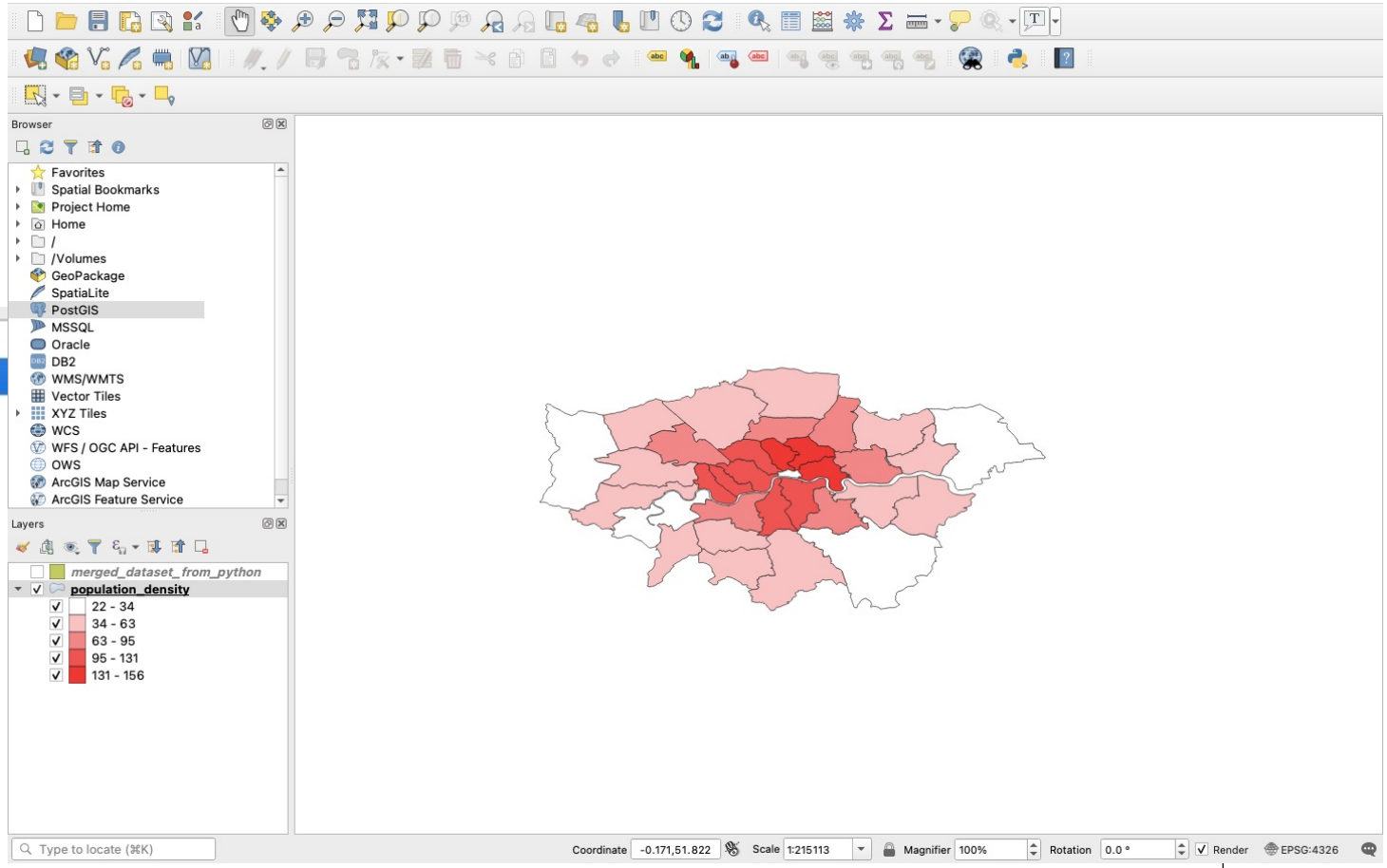
- Make the following changes:
  - Single Symbol to Graduated
  - Value = pop_density_per_hectare
  - Precision 2
  - Mode = Natural Breaks (Jenks)
  - Classes = 5



Visualizing Maps via QGIS

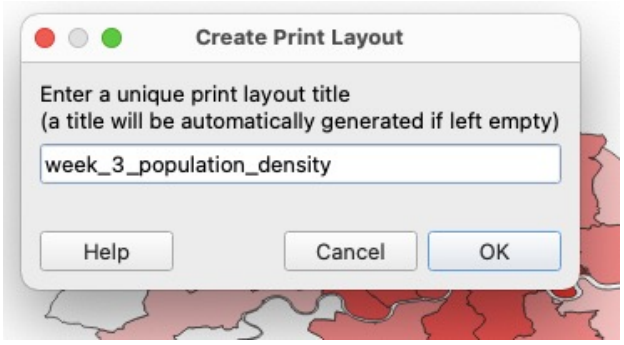
- Uncheck the original layer to hide it, and show the new population density layer

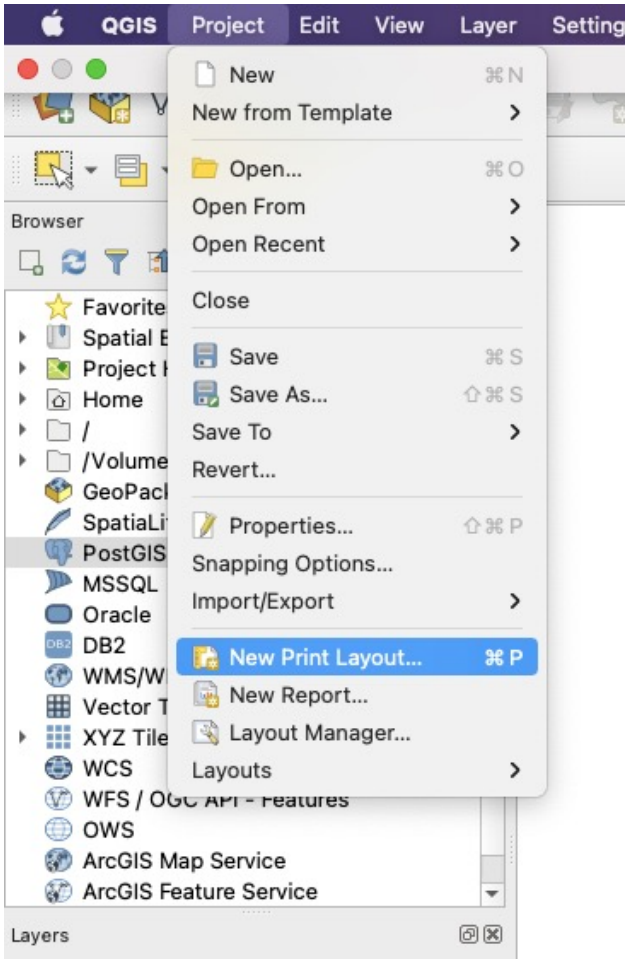




Visualizing Maps via QGIS

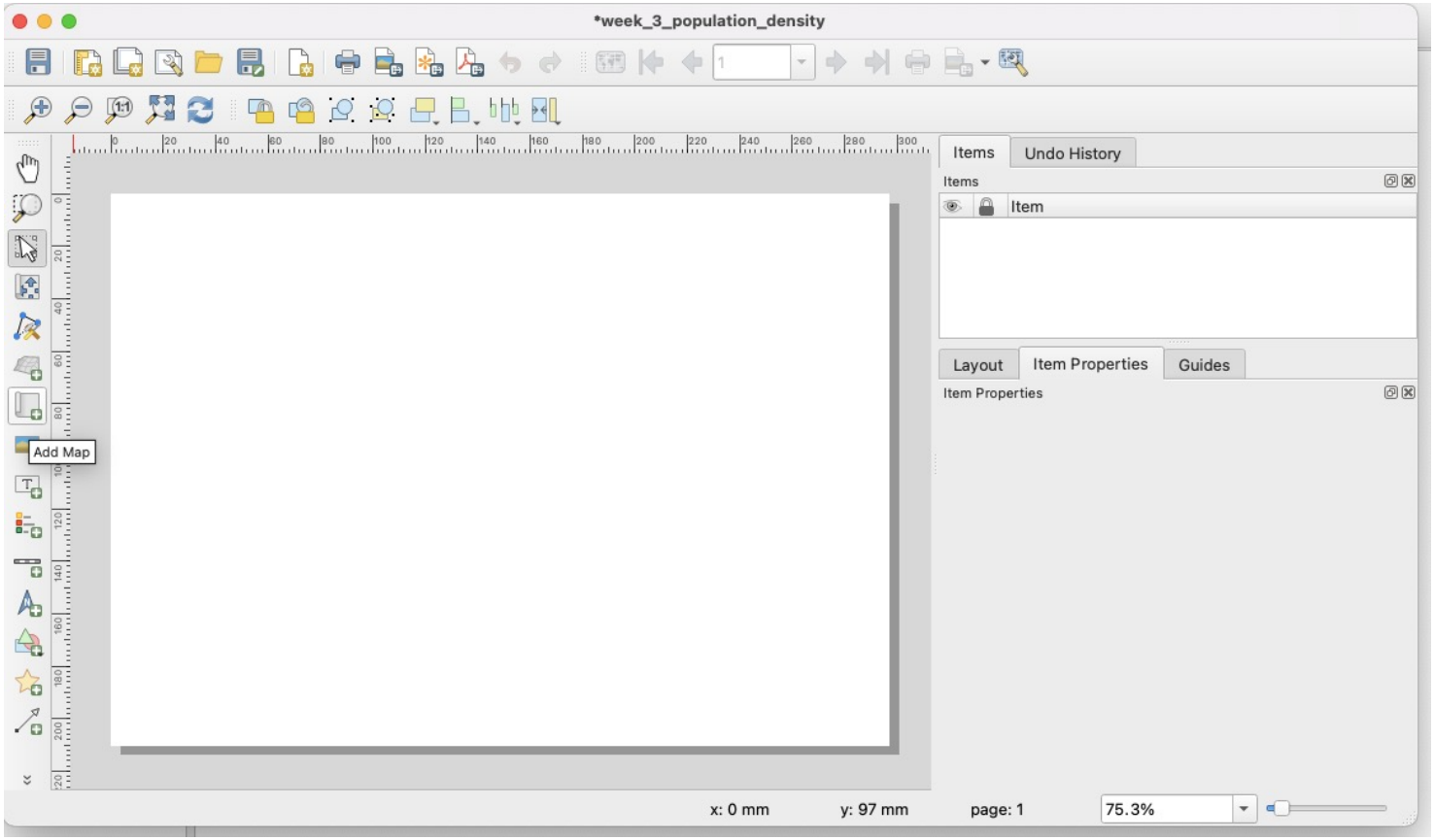
- Great, now let's add some labels to enable our viewers to understand the map and its underlying data…
- To do this, we will create a new print layout
- Give it a fun name, like:





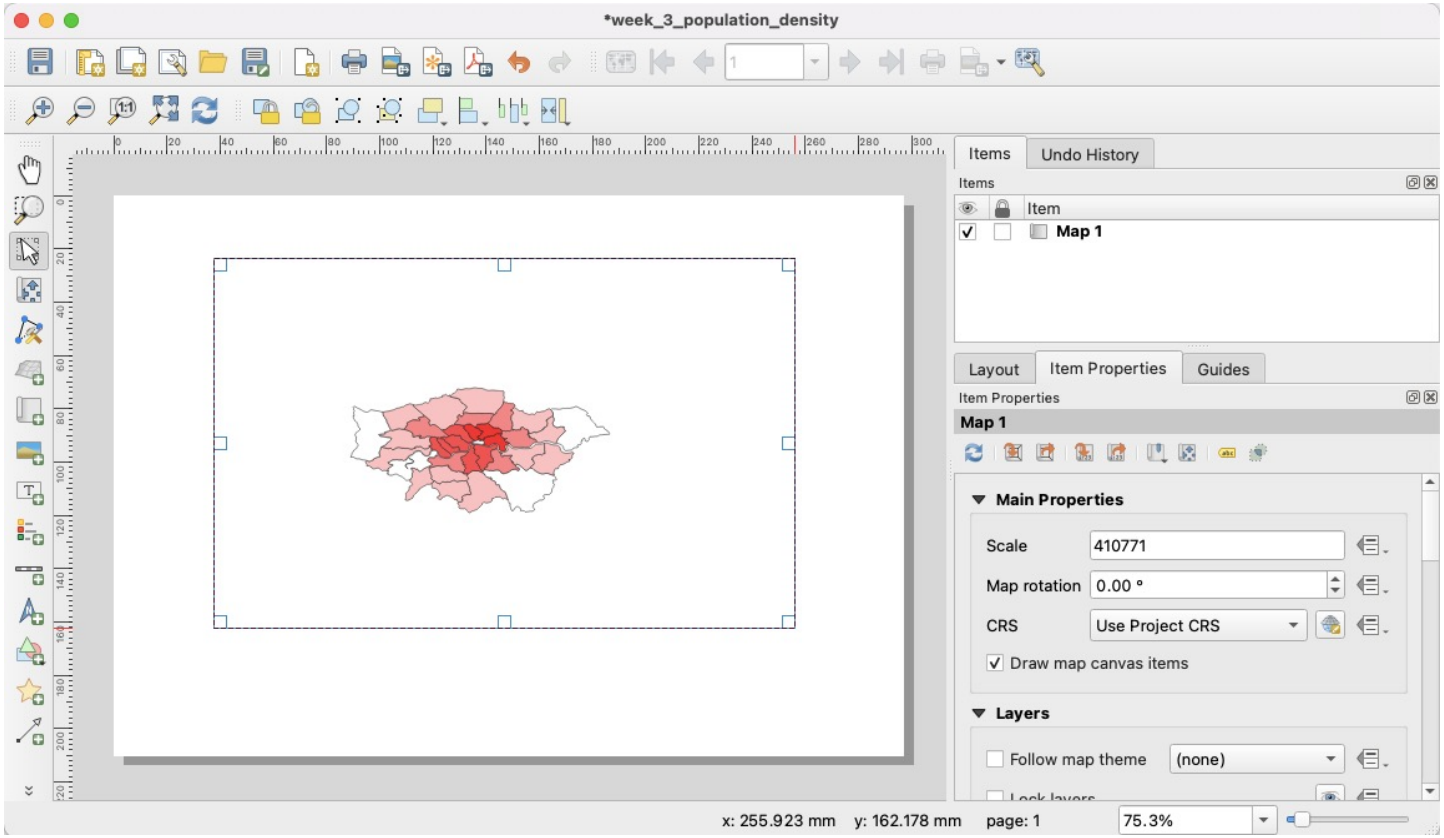
Visualizing Maps via QGIS

- Add our map



Visualizing Maps via QGIS

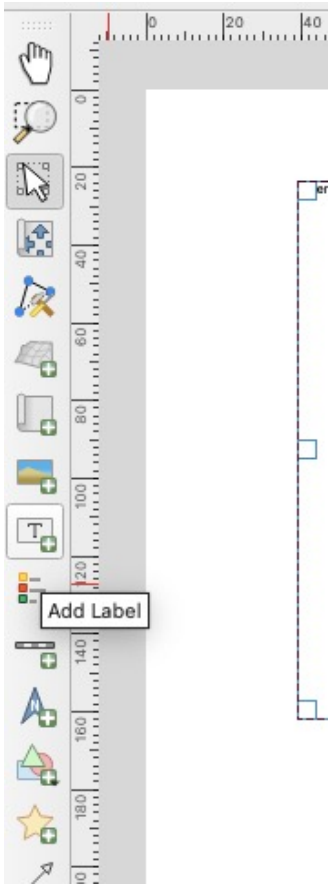
- This will prompt a dragging tool; center the map in the middle of the page, as depicted right

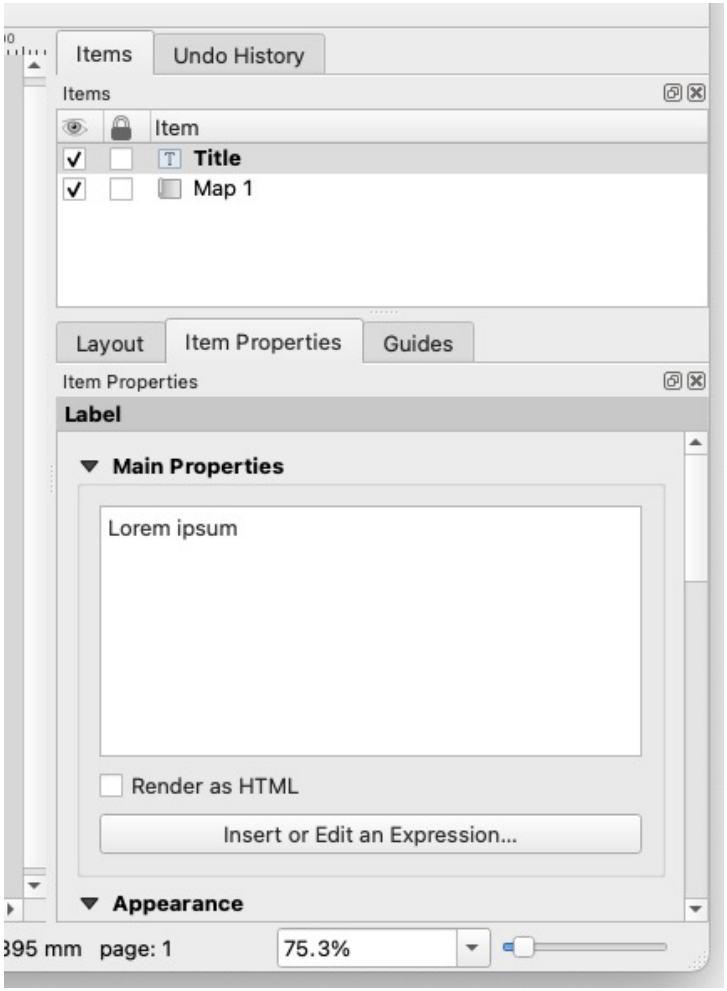


Visualizing Maps via QGIS

- Let's add a title by adding a label

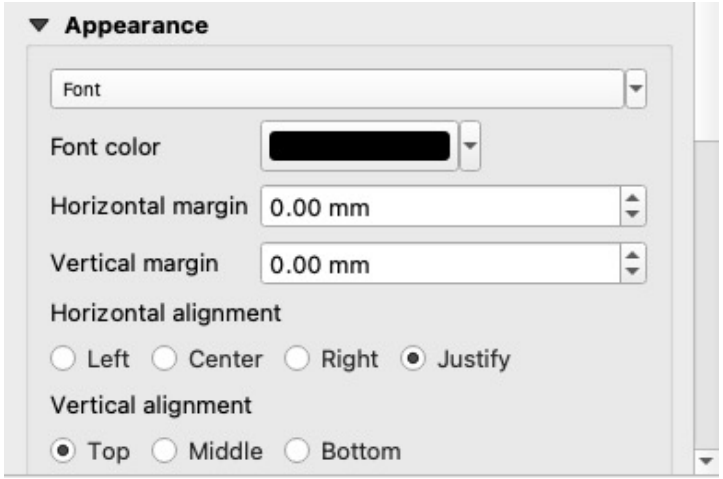
- Once you've added the label, rename the item as "title" and click the item to alter its appearance

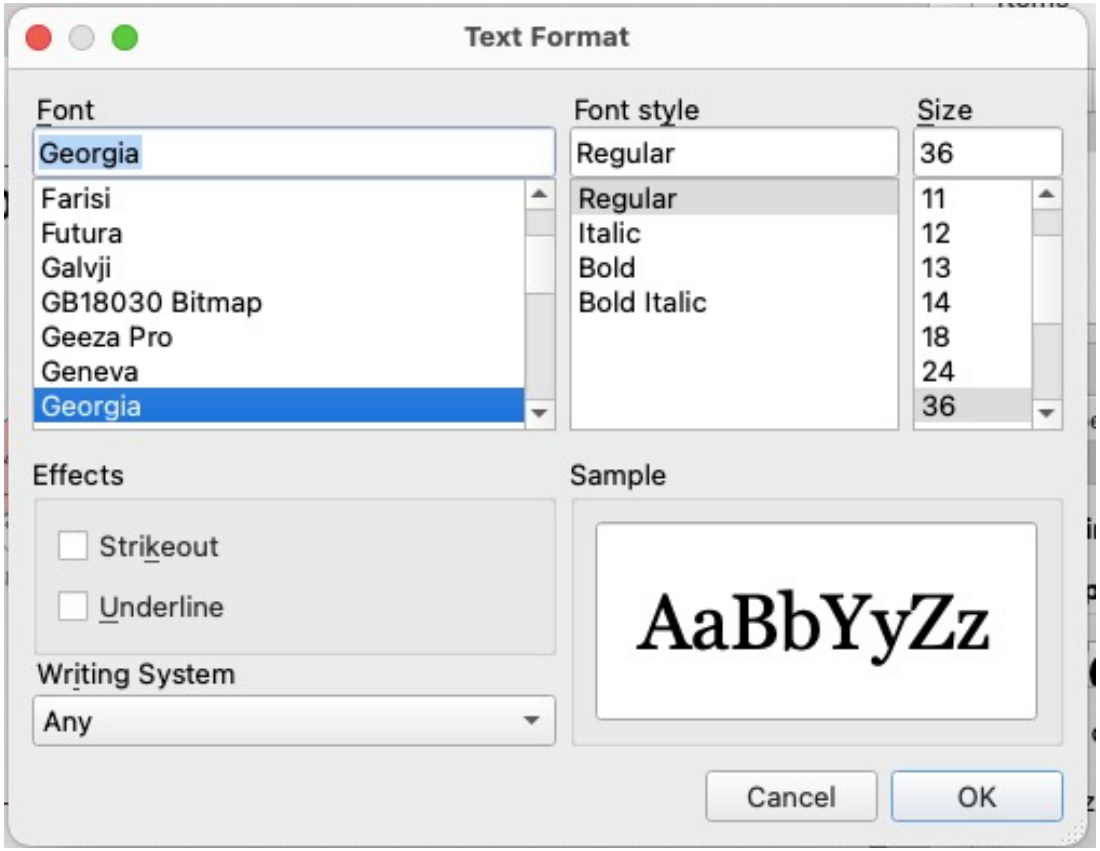




Visualizing Maps via QGIS

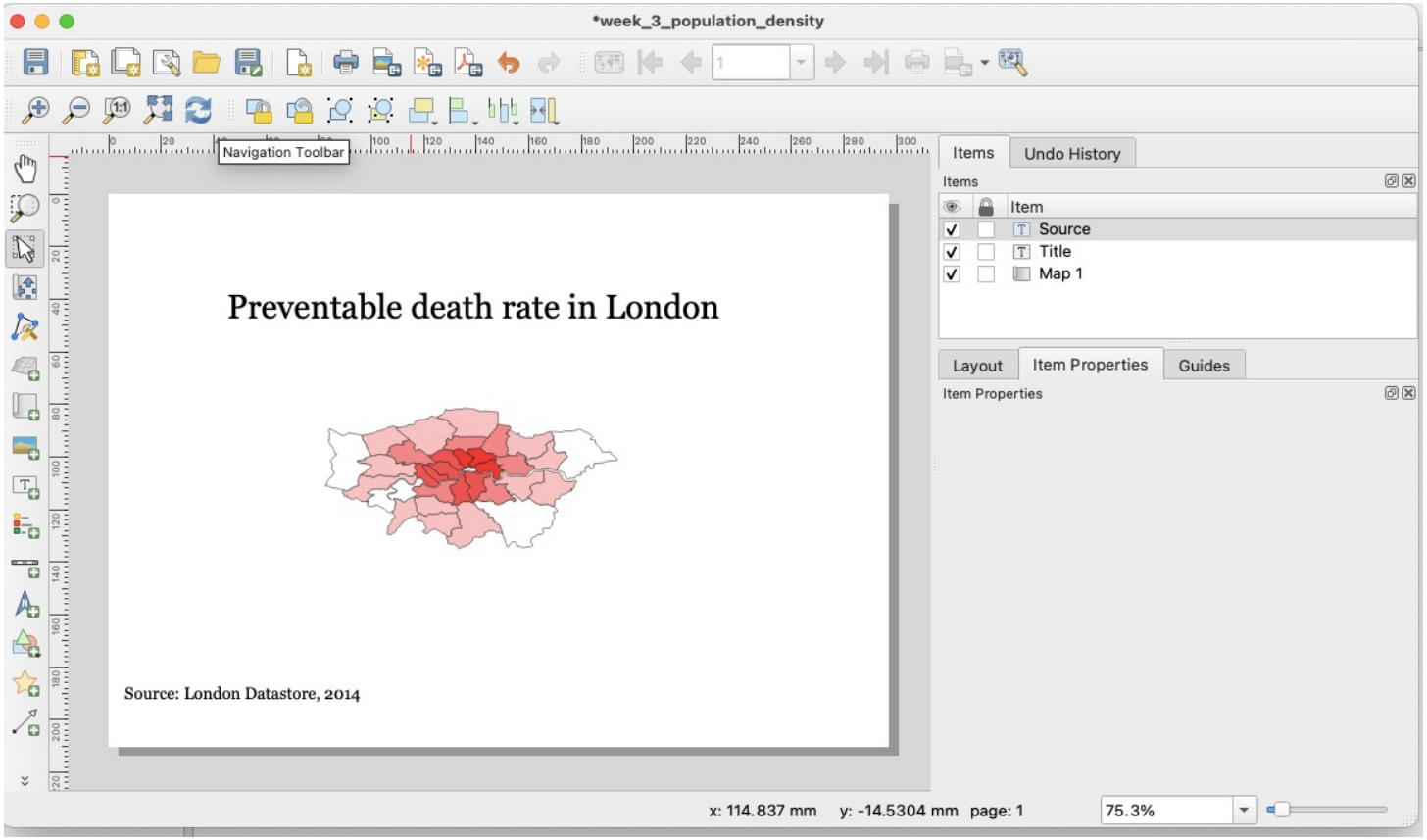
- To adjust font and size, please click “Font” under “Appearance” tab
- Pick anything you like!





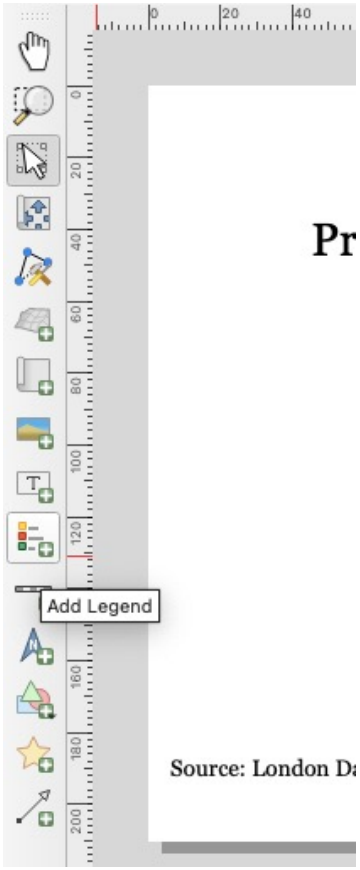
Visualizing Maps via QGIS

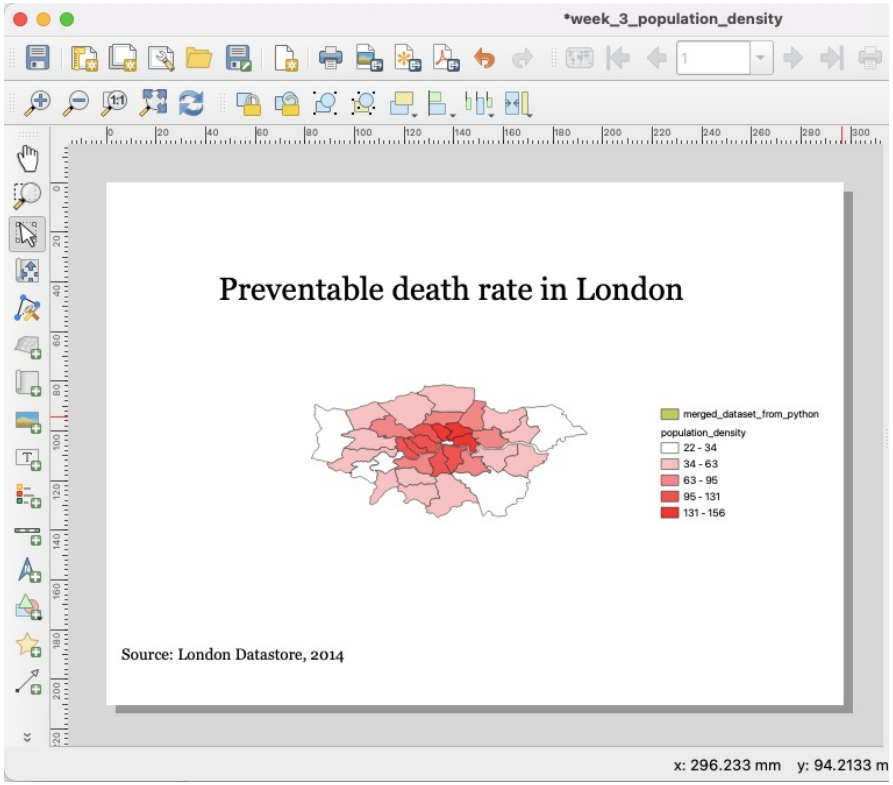
- Do the same thing to add a source label…



Visualizing Maps via QGIS

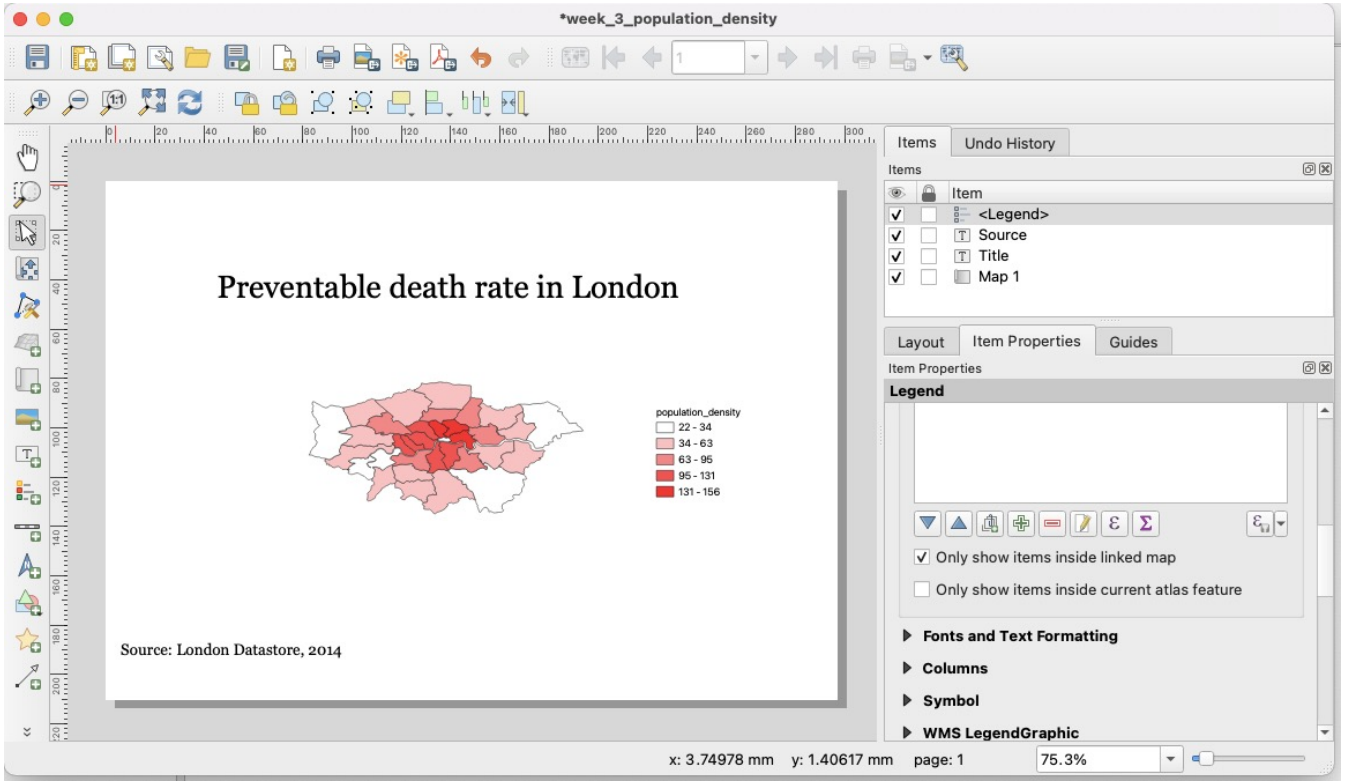
- Now, we need to add a legend
- Drag it where you'd like. I suggest the right-hand side of the map.
- Uh oh – the legend is showing the original, attribute-less layer. Let's eliminate it.





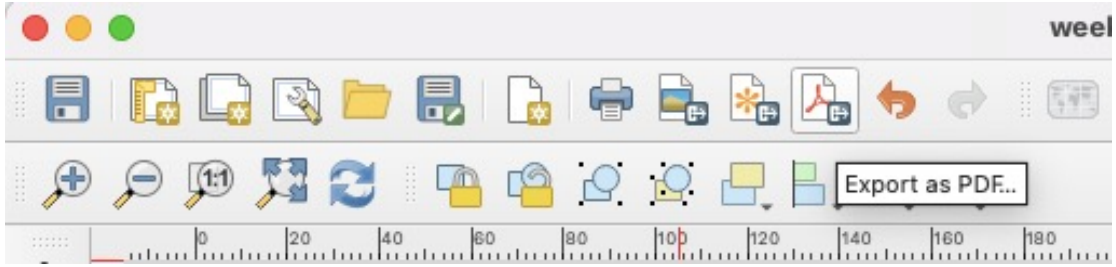
Visualizing Maps via QGIS

- To eliminate the unused, original layer:
  - Under “Item Properties” check the “Only show items inside linked map” box



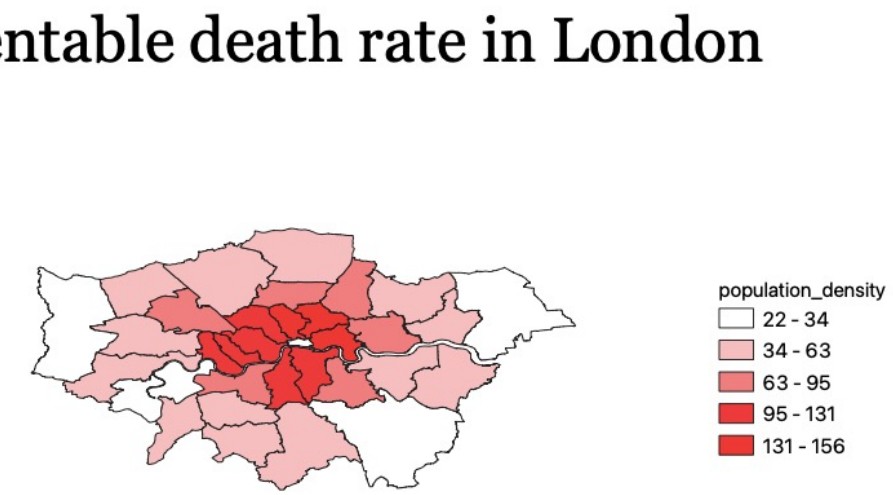
Visualizing Maps via QGIS

- From here, you can save the project and export in a variety of formats



Visualizing Maps via QGIS

- Final map!



Source: London Datastore, 2014