

# Mapping Geographic Data in Tableau

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# Mapping Geographic Data in Tableau Workshop Handout

This handout was developed with Tableau 2021.4 by Jane Zhao,  
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## Objectives

Participants will be able to

- 1) learn the map types that Tableau can create
- 2) create symbol map, filled map, dual axis map, and layered map
- 3) correct wrong geodata

## Outline

1. Workshop objectives
2. Tableau's two basic map types
3. Creating a symbol map that uses color and size
4. Creating a filled map that uses color
5. Editing unknown or ambiguous locations
6. Creating a dual axis map
7. Tableau map layers

### I. Tableau's two basic map types: symbol map and filled map

Geographic data is data that describes a physical location. Tableau has two basic map types to map location data: a symbol map and a filled map. A symbol map uses symbols to represent a central point of a geographic region. A filled map is the boundaries of a geographic region filled with color.

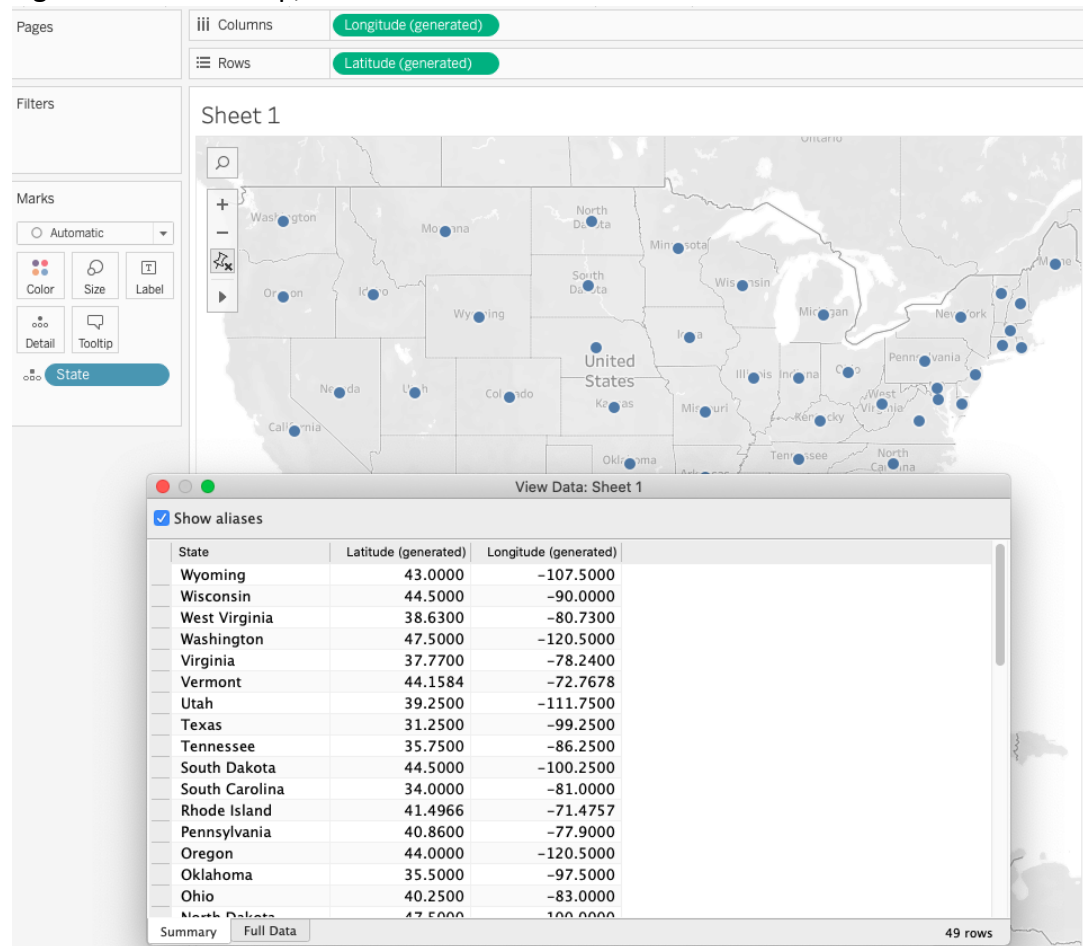
#### A symbol map

In order to plot a point on a map, you will need to have a latitude and longitude coordinate. For the dataset that doesn't have latitude and longitude coordinates, such as the sample superstore dataset, Tableau's powerful internal database can recognize common geographic information types like countries, states, and zip codes. Then, it automatically assigns coordinates to those places. This process is called geocoding. In Tableau, all geocoded fields will have a globe icon associated with it.

Activity 1.1 - Using the sample superstore data, create a symbol map to show which U.S. states had the most sales and earned the most profit.

1. Connect to the sample superstore Excel file

- a. Identify the four geocoded dimensions and two geocoded measures with the globe icon.
  - b. Note the two geo measure fields are italic, which means they are generated by Tableau.
2. Create a US state map by double clicking State dimension
    - a. Tableau automatically adds the State field to Detail on the Marks card.
    - b. Tableau puts the Latitude and Longitude fields on Columns and Rows.
    - c. Right click on the map, choose View Data...



- d. We can see Tableau assigned geographic coordinates to each state. This is because it recognizes the data for the U.S. State field and compares it to its internal geo-database. Using that comparison, Tableau assigned geographic coordinates to each state.
3. Use Size to visualize sales
    - a. Drag Sales from Measures to Size on the Marks card.
    - b. Increase the size of the circles so it's easier to see which states had the most sales.
    - c. *Note: It's important to note that Tableau will assign the smallest circle size to the lowest value and the largest circle size to the highest value. Everything in between is represented by a proportional size based on the actual sales value. So it's not a good idea to put a measure with potentially negative values on Size.*

*Because it's not immediately clear whether a mark with a negative number is positive or negative.*

4. Use Color to visualize profit
  - a. Drag Profit to Color on the Marks card.
  - b. Click Color on the Marks card and edit the color
    - i. change color to red-blue diverging. Red circles indicate the state lost money and blue circles indicate the state made profit.
    - ii. add a black border around the circles, and remove the halo. This makes the circle stand out more on the gray map image.
5. Adjust the background map settings.
  - a. From the Tableau menu, Map -> Map Layers. The Map Layers pane will appear on the left panel.
  - b. Control Background
    - i. Change our map style – Dark, Light, or Normal
    - ii. Change the washout
  - c. Control map layers, such as borders and names.
    - i. Unselect Land Cover, and select Coastline. You can see how the map view changes with each selection.
    - ii. Options
      1. Some options, such as streets and highways, can be turned on only when the map is sufficiently zoomed in (currently grayed out)
      2. Hover over the map and click the magnifying glass. Let's search for Texas, and now we can turn on Streets and Highways.
    - iii. When all the Map Layers are turned off, we see circle points on the view. It looks more like a scatter plot.
    - iv. In Tableau, the latitude is essentially our y-axis and the longitude is our x-axis. So when creating a map, we are basically creating a scatterplot. Map is the background. This is how Tableau plots the geographic coordinates.
    - v. Maps in Tableau can be thought of as scatterplots, but the background image of a map helps you orient yourself almost instantly with the different geographic territories being displayed.
  - d. Add optional data layer

### **A filled map**

While a symbol map draws a symbol at the intersection of each latitude and longitude pair, filled maps draw a polygon around the entire border based on the more data points in the Tableau internal geodatabase server.

While a symbol map uses size and color to visualize two fields, filled maps use color to visualize one field.

When all the background map layers are turned off, a symbol map plots points, in contrast, a fill map plots polygons.

**Activity 1.2 - Using the sample superstore data, create a filled map to show the US regions.**

*Note: Region is not a geo field. You can't use it directly to create a map. However, there is a hierarchical relationship between Region and State.*

- Use State field to create a map
  - a. Double click State from the data pane, by default, Tableau generates a symbol map, placing a circle at the intersection of Longitude and Latitude for each state.
- Change the default map to a filled map
  - a. Choose 'filled maps' under Show Me, or go to Marks drop down menu and choose 'Map'. You will see that the single circles on each state have been converted to nice, smooth polygons that trace the entire border of each state.
  - b. Map-> Map Layers, if we turn off all the map layers, we see polygons (i.e. boundaries of the states). Turn back on the map layers
- Drag Region to the Color mark card.

**DIY - Using the sample superstore data, create a filled map to show which US state had the most sales.**

- Drag State from the data pane and drop it to the view area
- Drag Sales from the data pane and drop it to the Color mark card
- The map is shaded in proportion to the sale values.

## II. Edit unknown or ambiguous locations

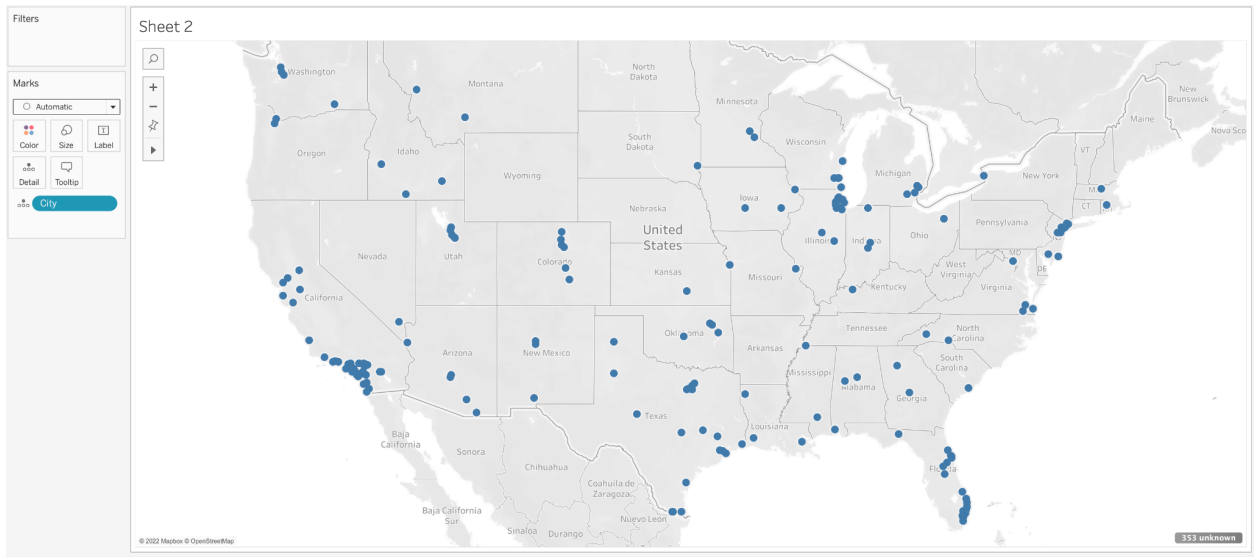
Sometimes Tableau will not recognize one or more of the location names in your data. When this happens those values are marked as unknown in the lower right corner of the map view. This may happen if there is a location or abbreviation that Tableau does not recognize, or if the location is ambiguous and could exist in multiple places.

When this happens, you can add additional information to the view to define locations, or can edit the unknown location names to map to known locations.

**Activity 2.1: Using the sample superstore data, show which city had the most sales and profit.**

- Create a map using City field
  - Double click City on the data pane. By default, Tableau creates a symbol map
  - From the Marks drop down menu, choose Map. There is no change. The symbol map remains as a symbol map, it doesn't change to a filled map.  
*Note: Filled maps are not available for cities or airports in Tableau. That means that in Tableau internal geodatabase the City layer is represented by points not by polygons, so it is not possible to use a Filled Map.*
  - From the Marks drop down menu, choose Circle or Automatic. This changes the chart type back to the default view.

- Click on the 353 unknown locations at the lower right corner



- Click on Edit Locations

Special Values for [City]

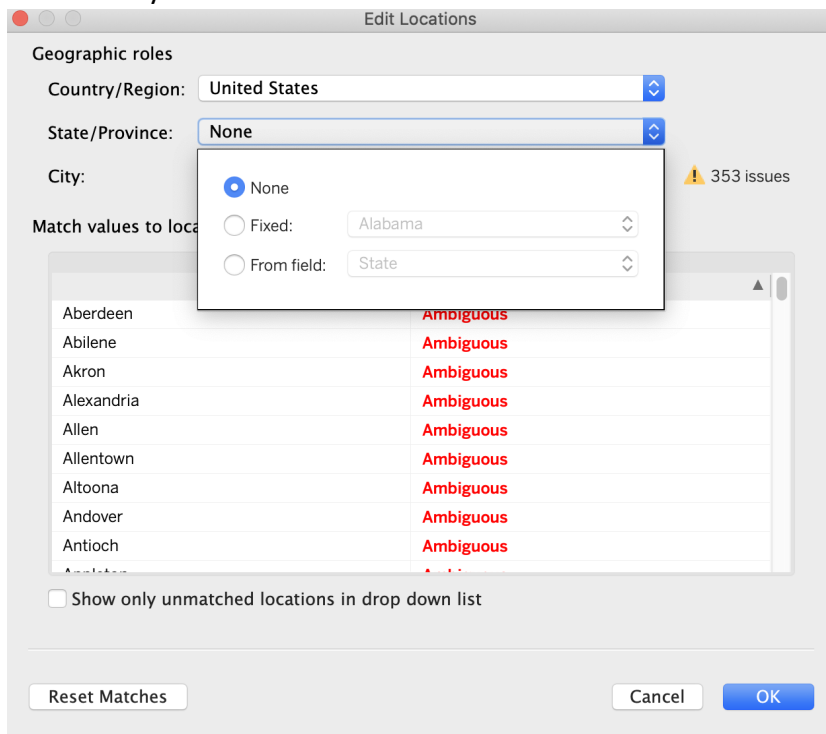
There are 353 values that have unknown geographic locations.  
What do you want to do?

**Edit Locations...**  
Correct the unknown locations.

**Filter data**  
Exclude the special values from the view and calculations.

**Show data at default position**  
Show the special values at a default position on the axis. For example, Null values are shown at 0.

- fix some ambiguous locations by specifying the Country/Region and/or State/Province for each city



- From State/Province drop down menu, choose From field: State. This fixes all the 353 unknown locations.
- Drag Sales to Size, Profit to Color to finish the map

Tips: As we have seen, Tableau relies on its internal geodatabase to provide default map coordinates. But, if you don't use precise geographic references, some ambiguity can occur and the likelihood of retrieving an exact result decreases. Try to make your location as distinguishing as possible. For example, create a data hierarchy in the data pane(city and state, or county and state) and pass it as Location in the visual query.

### III. Create a dual axis map - sample superstore data

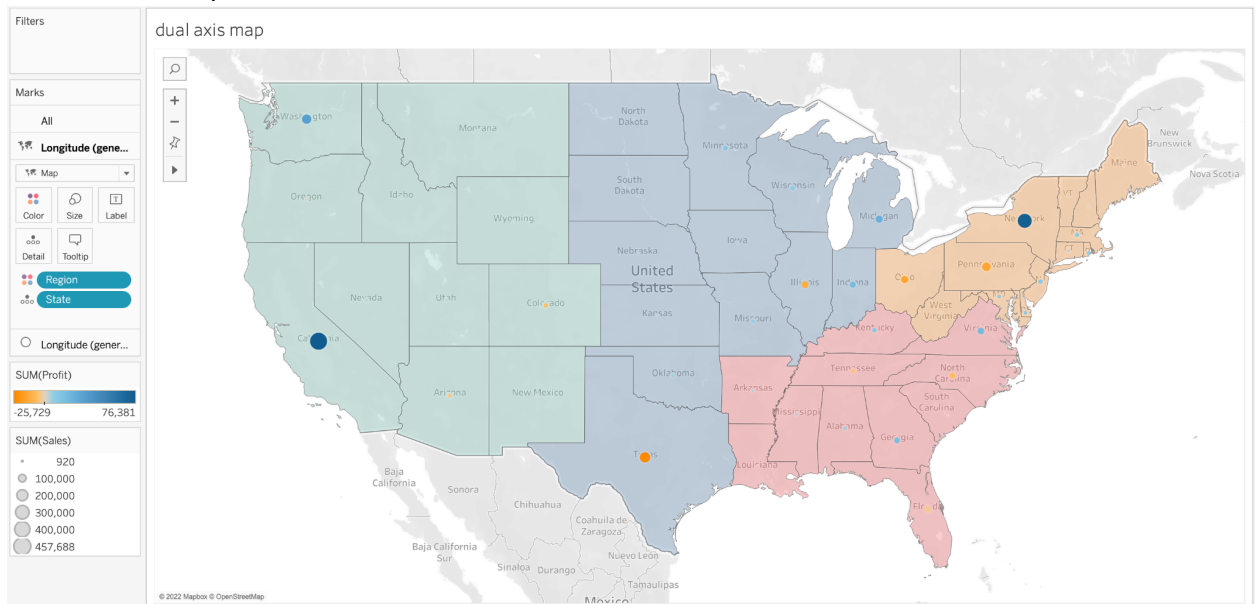
A dual-axis map is a map with two sets of geographic data overlaid on top of one another. For example, a filled map of U.S. region with data points for each state layered on top. You can't turn a layer on and off. For each layer, you can control color and size separately.

This type of map is useful any time you want to combine two maps into one to help provide additional context that would not be available when showing only one map or the other.

**Activity 3.1: Using the sample superstore data, combine a filled region map with a symbol map showing sales and profit of each state.**

- Create a filled region map
  - Double click State

- Choose Map from the Marks drop down menu
- Drag Region to Color on the Marks card
- Create a symbol map
  - Drag Longitude to the Columns shelf again
  - With the second Longitude on the Columns selected,
    - remove Region from the Marks card,
    - change its chart type to Circle
    - drag Sales to Size
    - drag Profit to Color
- Overlay the symbol map
  - Select the second Longitude pill, click the little triangle button, from its the drop down menu, choose Dual axis
- Select the first Longitude pill on the Columns shelf
  - click on Color, change its opacity to around 25%
- The finished map look like below



Note: if you add a filter, both maps will be filtered.

#### IV. Tableau Map Layers

In addition to using Tableau's internal geo-database server to retrieve location data, you can also connect your map data files directly. For a complete list of spatial files supported by Tableau, go to [https://help.tableau.com/current/pro/desktop/en-us/maps\\_shapefiles.htm](https://help.tableau.com/current/pro/desktop/en-us/maps_shapefiles.htm).

In its latest version 2021.4, Tableau expands its map capabilities extensively, making a significant leap forward. It enables creating layered maps easier than ever before. It allows users to add map layers from multiple spatial data sources without having to join, blend or use relationships



to combine the data. This is super useful when there is no clear relationship between the disparate data sources and the user just wants to overlay the spatial data on the same map.

#### Activity 4.1 - Viewing Boston crime rate in district and neighborhood

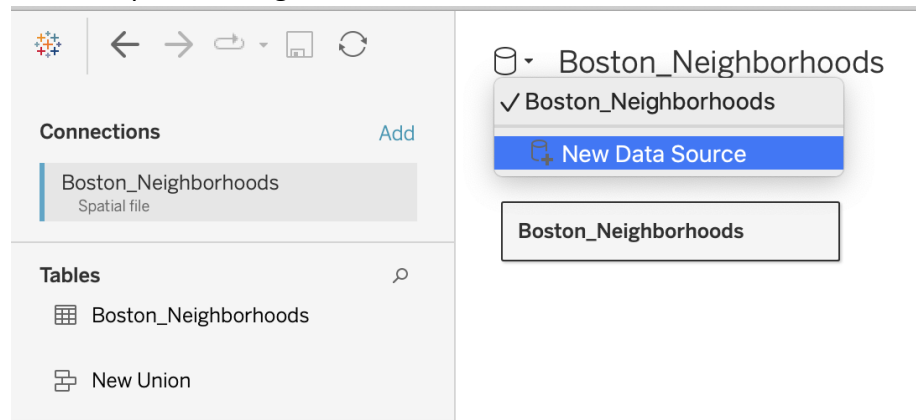
We will use the following two spatial files and one Excel file:

- Boston neighborhood boundaries: Boston\_Neighborhoods.shp
- Boston police district: Police\_Districts.shp
- Boston crime rate 2021: Boston-crime-rate-2021-lat-0-removed.xlsx

*Note: when you download a shape file, it will be downloaded as a zip file. The zip file contains several files including the .shp file. These zipped files need to stay together in one folder.*

there is no clear relationship between these two spatial files and the Excel file. We will connect them as individual separate data sources (i.e. we will not join, blend, or relate the disparate data).

- Connect to the spatial file of Boston\_Neighborhood
  - Tableau -> Connect -> Spatial file;
  - Choose the downloaded Boston\_Neighborhood.zip file or if you have unzipped the zip file, navigate to the inside of the folder and connect to the Boston\_Neighborhood.shp file.
- Connect to the spatial file of Police\_Districts
  - On the Data Source interface, go to New Data Source as shown in the screen-captured image below.



- Or go back to the Tableau start page, and repeat the steps of connecting to a spatial file.
- Do not use the Add button on the left navigation of the data source interface as this will require you to combine your data sources using one of the four methods (i.e. join, union, blend, or relationship) to form a single data source with multiple connections
- Connect to the Excel file of Boston-crime-rate-2021-lat-0-removed.xlsx
  - Click the data source icon, from the drop down menu, choose New Data Source
  - To a file -> Microsoft Excel, locate the file and select it

- Double click the Sheet 1
- The connected data sources look like below

**Data** Analytics <

- Boston-Crime-Rate-2021 (Boston-crime-rate-2021-lat-0-removed)
- Boston\_Neighborhoods
- Police\_Districts

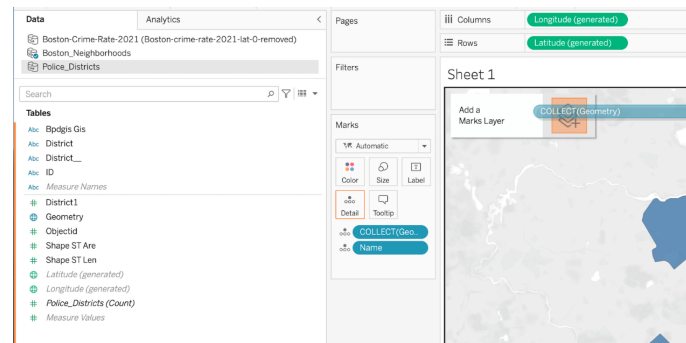
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**Tables**

- Abc Day Of Week
- Abc District
- # Incident Number
- Abc Location
- # Month
- 📅 Occurred On Date
- # Offense Code
- Abc Offense Code Group
- Abc Offense Description
- Abc Street
- Abc Ucr Part
- # Year
- Abc *Measure Names*
- # Hour
- 🌐 Lat
- 🌐 Long
- # Reporting Area
- # Shooting
- # *Boston-Crime-Rate-2021 (Count)*
- # *Measure Values*

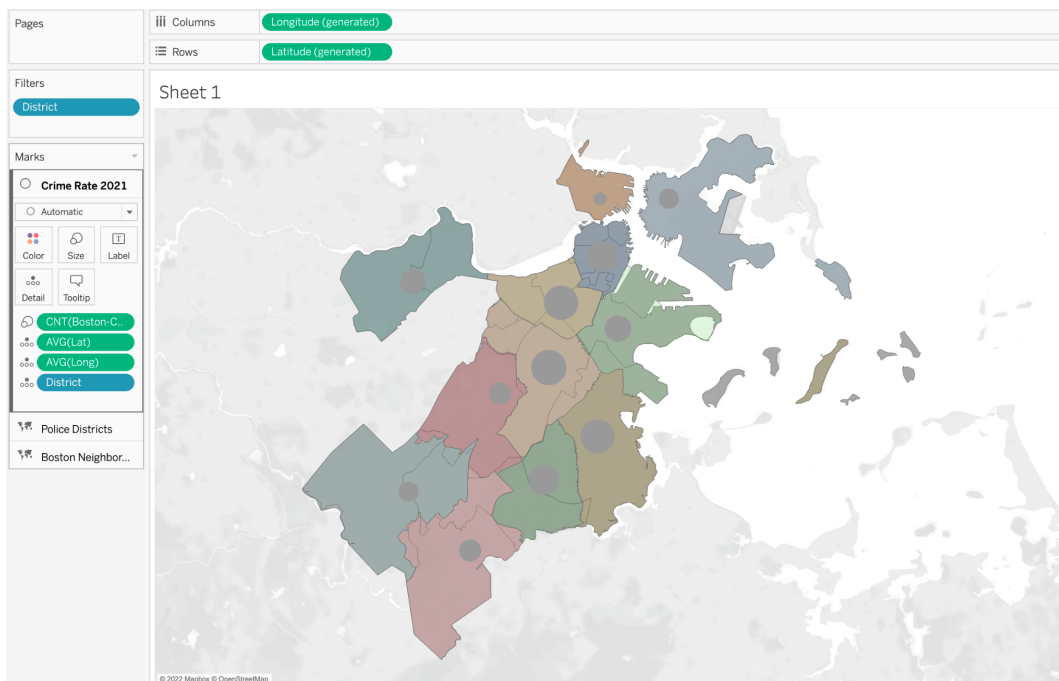
- Build our first map with the first data source Boston Neighborhood
  - Click Boston\_Neighborhoods to select the data source
  - Drag Geometry to the view area
  - Drag Name to Detail mark card
- Add the second map layer Police District
  - Click Police\_Districts to select the data source

- Drag Geometry field into the map layers button that appears in the top-left of the view



- Drag District to the Color mark card
- This is like having two separate sheets stacked on top of each other geographically
- Double click on the map layer name “Geometry 2” and rename it to “Police Districts” and change its color opacity to 50%
- Double click on the first map layer name “Geometry” and rename it to “Boston Neighborhood”.
- Add the third layer Boston Crime Rate 2021
  - Click to select the crime rate Excel file
  - Select both Lat and Long fields and drop it to the map layers button
  - Change the map layer name from “Lat” to “Crime Rate 2021”
  - Drag District field and drop it to Detail mark card
  - Drag District field to Filters shelf, exclude Null and External from the list  
*Note: since the data sources are not connected, the filter will not affect the other two map layers.*
  - Drag Boston-Crime-Rate-2021(Count) and drop it to the Size mark card

- The finished viz looks like below



- Settings of each map layer
  - To hide a layer - select the layer, click on the Control Layer Visibility icon to the left of the layer name
  - To disable mark selection - from the layer drop-down menu, select Disable Selection. This prevents users from selecting marks from the layer in the view and just let the layer serve as a background
  - To change layer order - drag a layer until the orange indicator arrow appears, and drop it to the new location.

## DIY activities

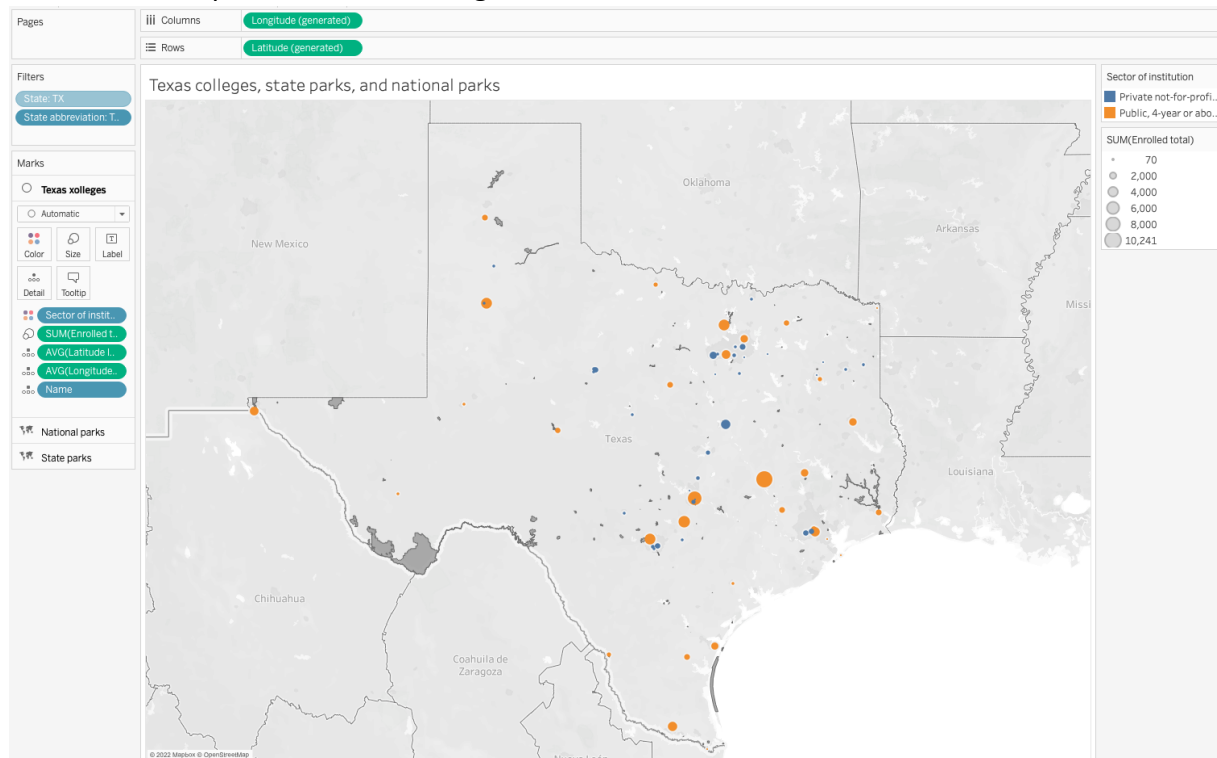
### Goals:

- Explore the IPEDS Excel file data, the Texas state park spatial file data, and the national parks spatial file data
- Visualize colleges in Texas, and show whether the college is public or private and its enrolled total
- Visualize state parks and national parks in Texas

### Steps:

- Create a symbol map with the IPEDS Excel file
  - Connect to the IPEDS Excel file
  - Create a new worksheet and name it Texas colleges
  - Drag Latitude location of institution and Longitude location of institution to the view
  - Drag Name to Detail on the Marks card
  - Drag Enrolled total to Size on the Marks card

- Drag Sector of institution to Color on the Marks card
- Create a three-layers map including Texas colleges, Texas state park, and national parks in Texas
  - add new data sources for tpwe-statepark-boundaries.zip file and NPS\_-\_Land\_Resources\_Division\_Boundary\_and\_Tract\_Data\_Service.zip file
  - Create the first map layer with Texas state park
  - Create the second map layer with national parks in Texas and filter to show only parks in Texas
  - Create the third map layer with Texas colleges
  - The finished map will look something similar below



Note: if the first layer is created with the Excel file of Texas colleges, the connected shape files won't plot. So spatial shape files have to be used to create the first map layer when you are using both spatial file and Excel file to create maps.

## References

- Using Map Layers with Unconnected Data Sources <https://interworks.com/blog/2022/02/07/advance-with-assist-using-map-layers-with-unconnected-data-sources/>
- Tableau Map Layers <https://datavis.blog/2020/12/02/tableau-map-layers/>
- Create Geographic Layers for Maps [https://help.tableau.com/current/pro/desktop/en-us/maps\\_marks\\_layers.htm](https://help.tableau.com/current/pro/desktop/en-us/maps_marks_layers.htm)