

## Putting spatial data online using Mapbox

### Learning objectives:

- Setup a Mapbox account.
- Setup a basemap.
- Import and style your own data.
- Publish your map in a webpage.

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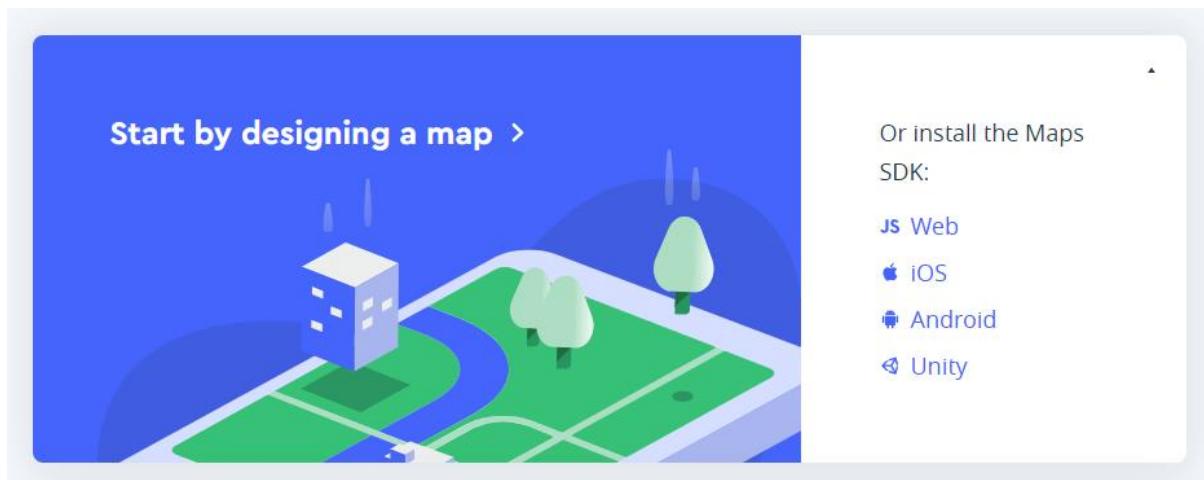
## Setting Up Mapbox

*Use of Mapbox requires you to set up an account. This is free, however if the map you create proves to be popular it may stop working unless you pay for additional usage.*

### Part 1: Creating an Account

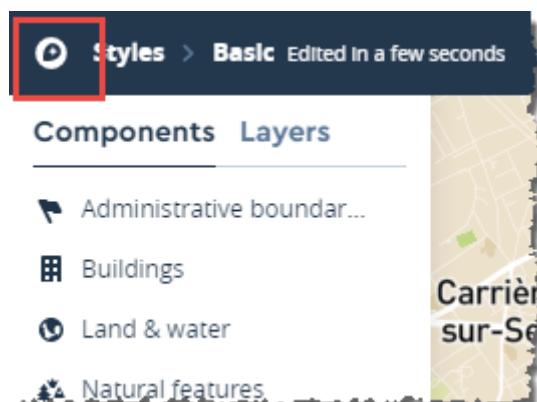
1. Go to the Mapbox website: <https://www.mapbox.com/>
2. Click on the **Start mapping for free** button.
3. Enter a **Username**, your **Email** and a **Password**.
4. Click the **Get Started**.

Mapbox allows you to do many different things and develop for multiple different platforms. As we are just getting started we are going to just create a map to begin with.



5. Click on the big **Start by designing a map** panel.

By default Mapbox will select the 'Mapbox Basic Template' for your map, however you can change this to one of the other background styles that are available. To view the available styles click on the 'back' button, top left of the Mapbox window:



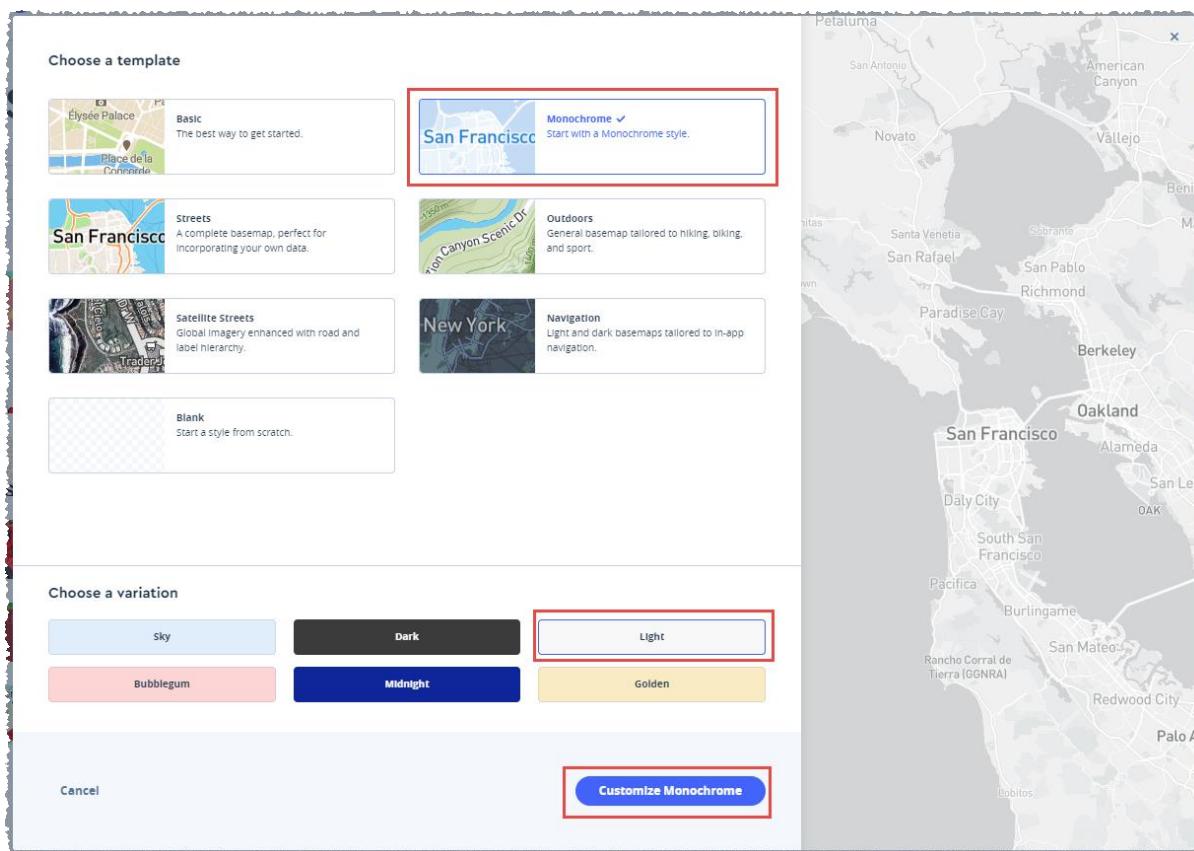
This takes you to the Styles page, pressing the **New Style** button brings up a list of the templates in Mapbox:



The **Monochrome** style is good for highlighting your data for visualisation. The **Streets** style is good for highlighting existing features in urban locations. The **Outdoors** or **Satellite Streets** styles are good for highlighting natural features in rural or wild locations or for marking on locations affected by the natural landscape.

If you want to add data to a map that contains locations that exist in the base data it would be good to use a theme where detailed features are feint such as the monochrome theme. This allows your data to stand out.

6. Select the **Monochrome** template and choose a suitable variation, in this example we will use the **Light** variation. Select the **Customize Monochrome** button to add this style to your account:

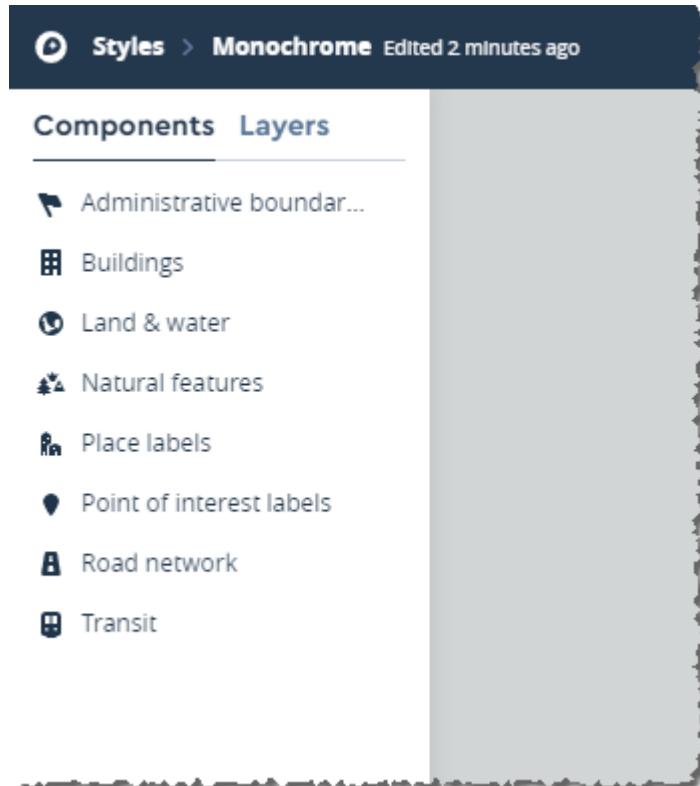


After the style is added to your account you are taken to **Mapbox Studio**.

## Part 2: Setting up your basemap

**IMPORTANT:** Mapbox Studio is entirely web based. It saves your changes as it goes along but it is prone to locking up a bit and going slow. Try not to click on too many things in a rush as it may stop working.

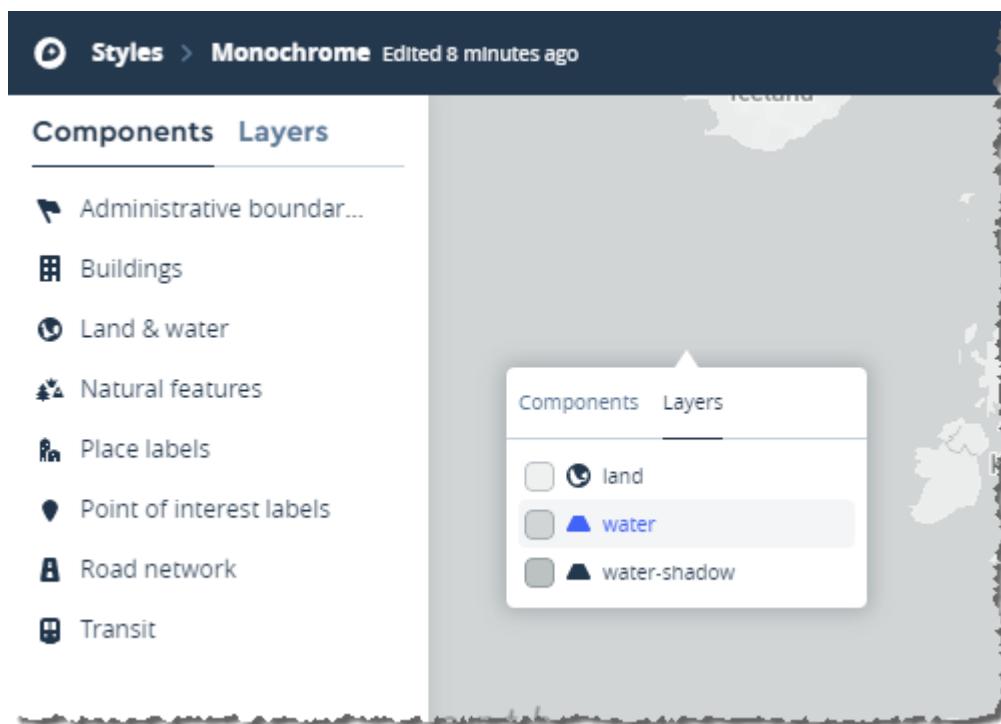
We will first look at the panel on the left hand side:



Mapbox allows styling at two levels:

- A **component** is a collection of related map features that you style as a single unit, e.g. the road network.
- A **layer** is a collection of map features of a single type, e.g. a motorway.

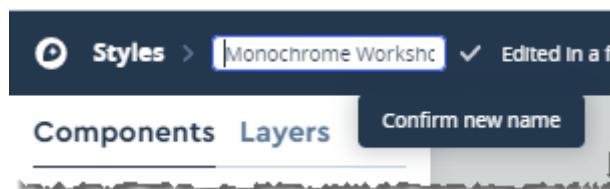
This panel shows all the layers that are being used to style the map in the window and you can change the colour and other parameters of each layer. You can also click on the map to see which layers are being drawn at that point, which is very useful when you want to change a particular thing:



1. Click once on the map in the middle of the ocean, to see which **components** and **layers** are being drawn there.

The very top entry in the left panel is the name of the style, we are going to make changes so it would be good to name your new style.

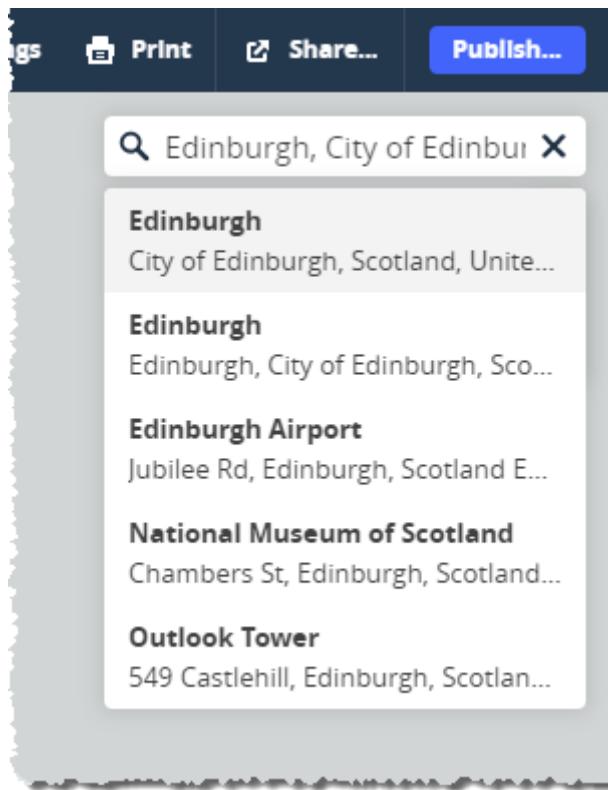
2. Hover over where it says **Monochrome** at the top left of the map, an Edit Icon will appear and you can just click on the text.
3. Change the name to be **Monochrome Workshop**
4. Click on the tick to confirm the name change



If the connection is lost with the web or something else goes wrong you can easily find the style you are working on if you have given it a new name.

Now we can start to make a few more changes to the map. If you want to centre your map on a particular location then you can use the search at the top right of the map:

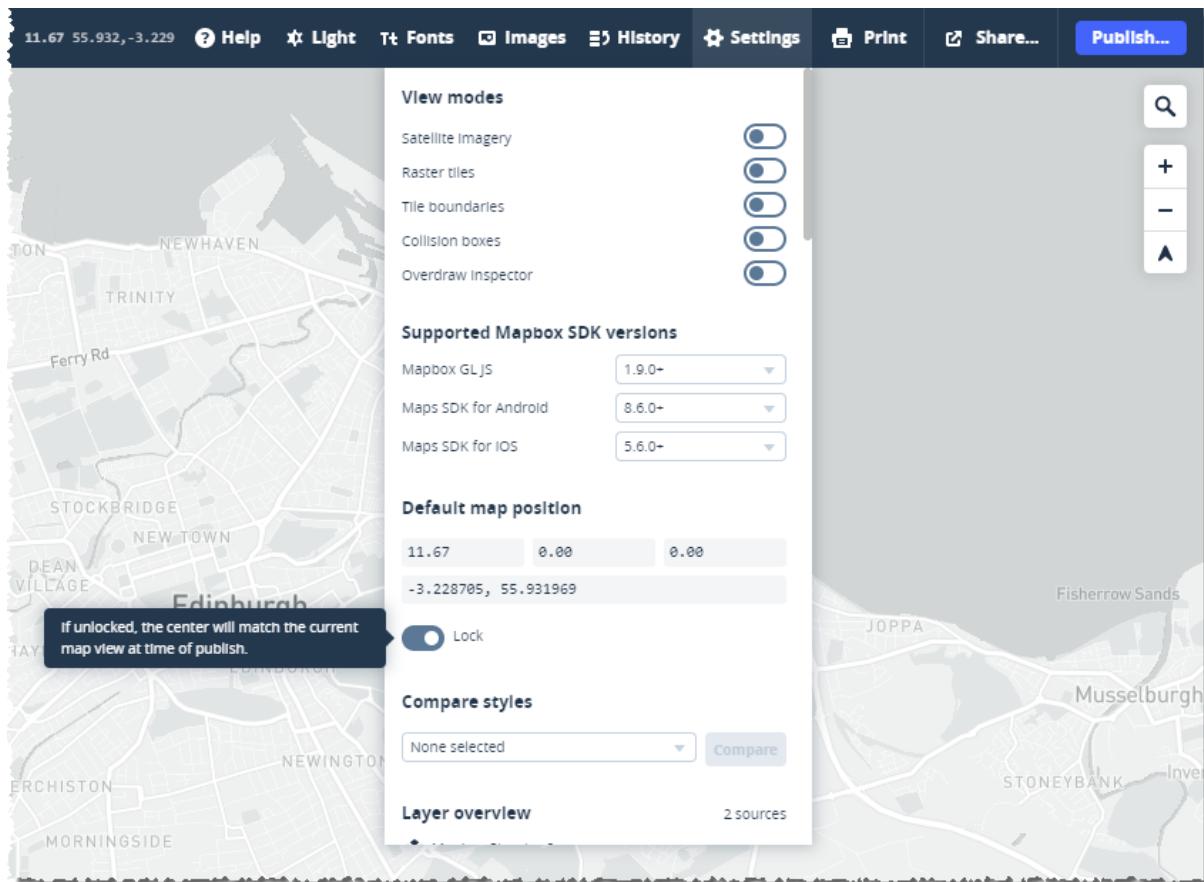
5. Type **Edinburgh** in the **Search box**



6. Choose the top result

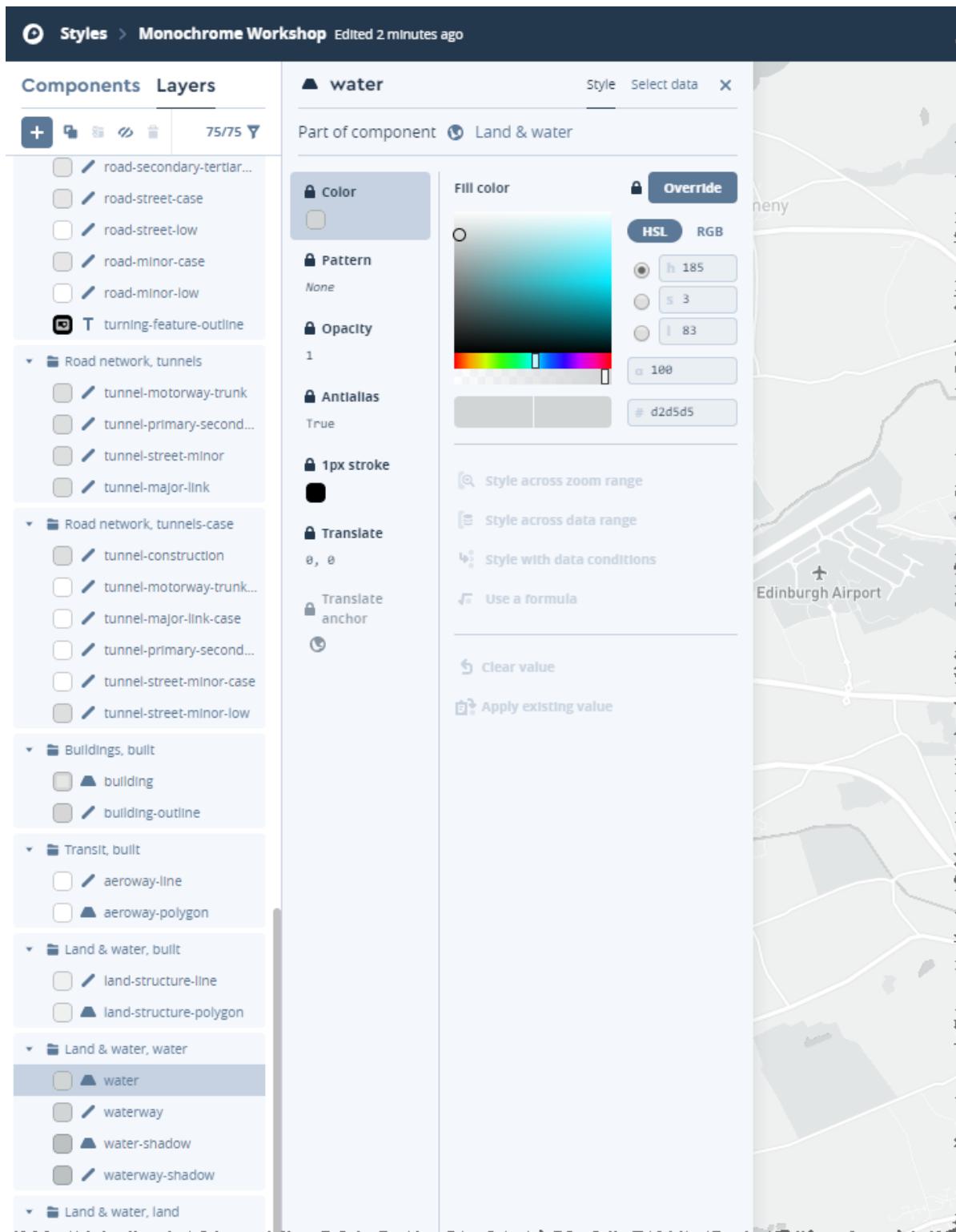
The map will zoom to the city. It is possible to now lock the map so that anyone who looks at it will start at this or any other location you are viewing when you set the lock.

7. Click **Map position** below **Search** at the top right of the screen
8. Expand the **Settings** menu and then toggle the **Lock** switch in the **Default map position** section to lock the map at that location:



We can now have a look at actually changing the cartography. This style is already well suited to displaying data but it would be nice to have a little more colour to highlight natural features.

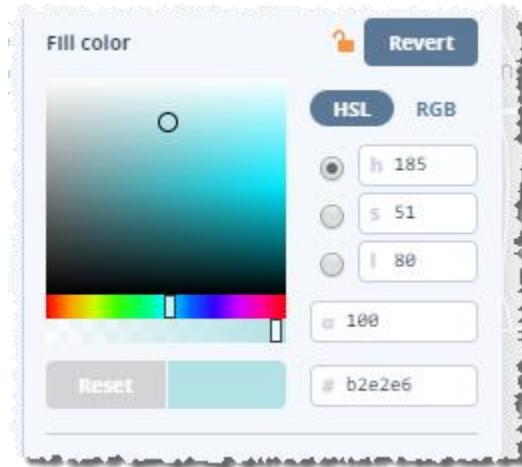
9. Ensure the **Layers** tab is selected in the left hand panel.
10. Scroll to the bottom of the panel to the **Land & water, water** section and click on the **water** item. The existing style settings will be displayed in the panel that appears to the right hand side:



11. Press the **Override** button to allow you to modify (override) the default settings for this layer.

12. Modify the **Fill color** to select a pale blue colour: you can just drag the dot on the colour panel or type in the HSV/RGB/HTML colours if you know the colour you wish to use.

Your new colour will be displayed in the map for the selected features, as well as in the right hand section of the colour bar towards the bottom of the main colour picker:



Whilst you are changing the colour, it is possible to reset the colour back to its original value by clicking on the left hand side of the colour bar, which will say **Reset** when you hover over with your mouse, or by pressing the **Revert** button.

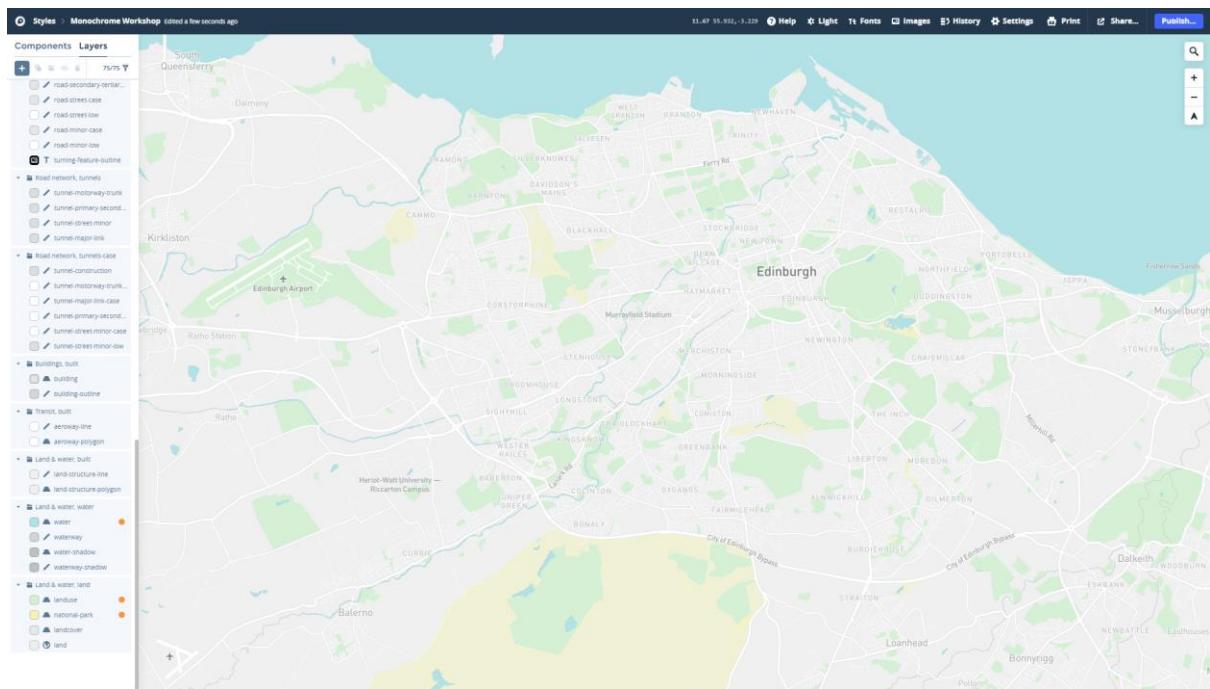
Next we will modify the colour of the **landuse** class of features (in the **Land & water, land** section) selecting a light green colour. The **landuse** category includes natural features such as grassland, parks, cemeteries, agricultural land, woodland etc.:



Finally we will modify the colour used to display **national-park** features (in the **Land & water, land** section) to select a light yellow/orange colour:



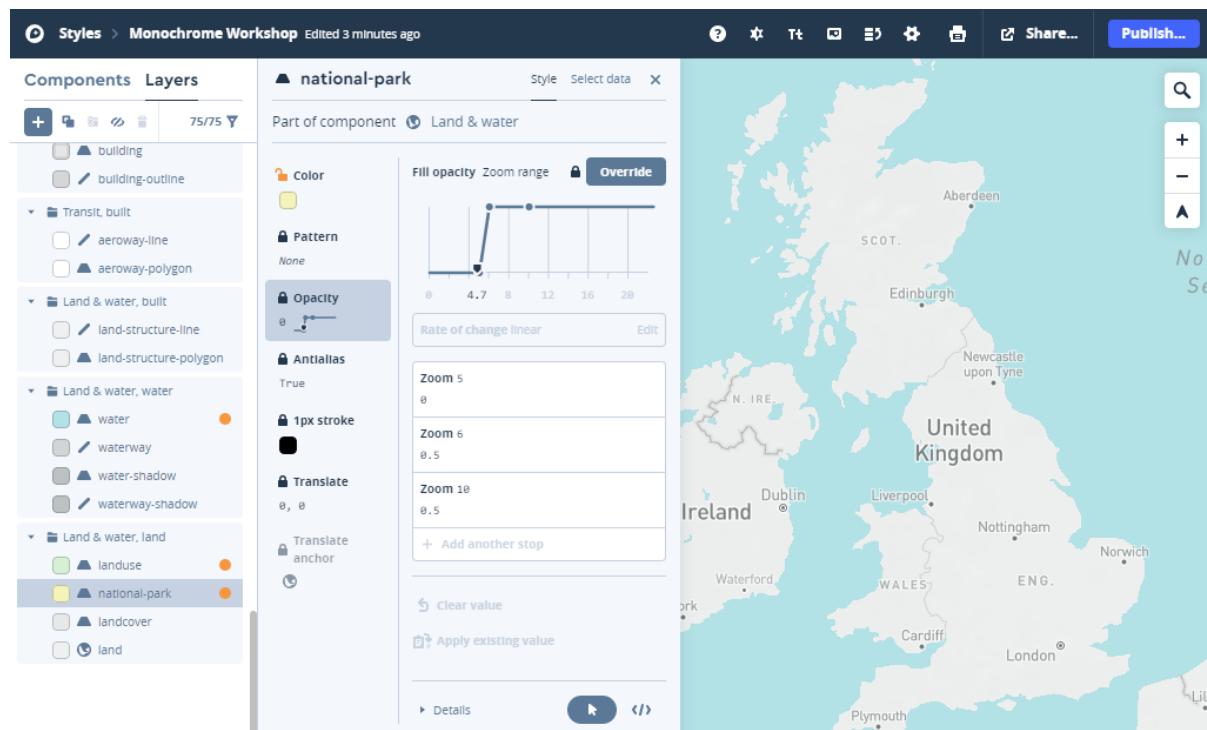
You should end up with a map style that looks similar to the one below:



## Part 3: Compound styles

In this exercise we have modified the colours of three specific features in the dataset but there are many more style options available depending on the type of object (polygon, line, point, text).

You will notice as you zoom in/out of the map that certain elements turn on/off at different zoom levels. For example, when zoomed out to view the whole of the UK, the National Park features are not displayed. This is achieved by modifying the **Opacity** setting:



Mapbox has 22 zoom levels. Level 0 is the most zoomed out view, level 22 is the most zoomed in view. As you zoom in/out the zoom level adjust accordingly and the map is styled according to the rules defined for each layer. Zoom levels are used to control when features turn on/off and also to adjust how they are styled.

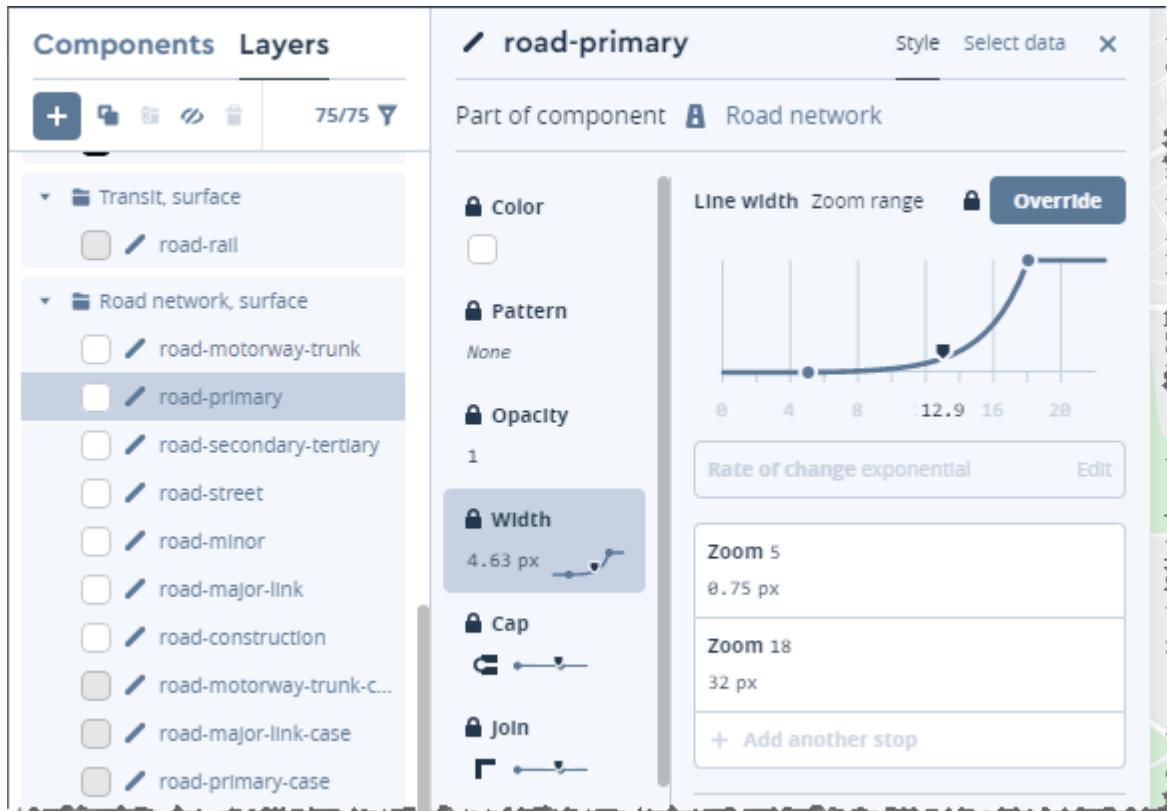
National Parks have two opacity stops defined:

- Zoom level 5: 0
- Zoom level 6: 0.5

This configuration means that at all zoom levels from 0-5 (which are the most zoomed out levels available) the National Park features are drawn with an opacity of 0, i.e. they're fully transparent so are not visible. At zoom levels 6-22, National Parks are drawn with an opacity of 0.5 i.e. they're 50% opaque, which is why you can see through them to the features

underneath. At zoom levels between 5 and 6, the opacity of National Parks changes from 0 to 0.5 on a linear scale.

More complex settings are applied to other types of features in the map, for example **road-primary** features. Primary road features get exponentially wider from 0.75 pixels up to a width of 32 pixels as you zoom in:



The ability to be able to control the style of features using different settings allows users to create very specific cartographic styles.

Feel free to play around with other aspects of the cartography, the **Revert** button will undo any changes to the styling of a layer and reset it back to the default settings. Remember, changes are saved automatically so any changes to the style of a layer will be saved unless you press the **Revert** button.

You have now completed the first part of the practical!

For the next section we will be adding a new dataset to the map.

## Making your own maps with Mapbox

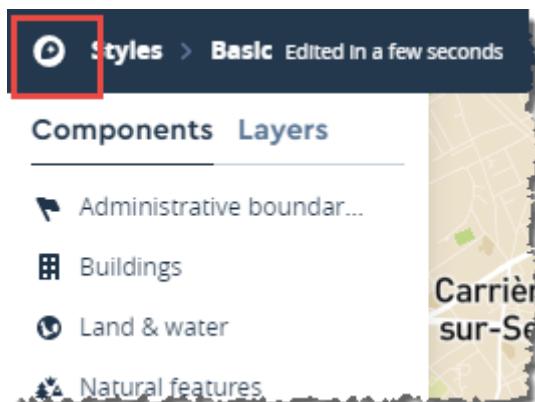
Once we are happy with our basemap we can add our own data. The data you add needn't be a spatial format like Shapefile, KML, or GPX, it can be a CSV file. Adding the data takes time as once uploaded the file is then converted into a format that Mapbox can handle.

It is best to have data in the WGS 84 or web Mercator projections as Mapbox needs latitude and longitude coordinates.

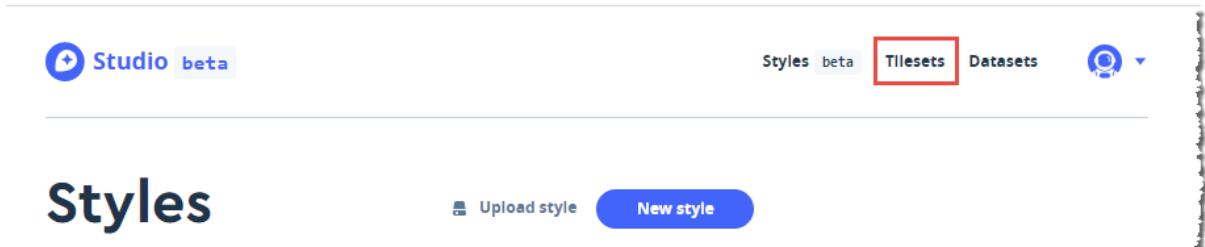
### Part 1: Adding your own data

You can add your own data (or **Tilesets** to use Mapbox terminology) using the Map Studio interface:

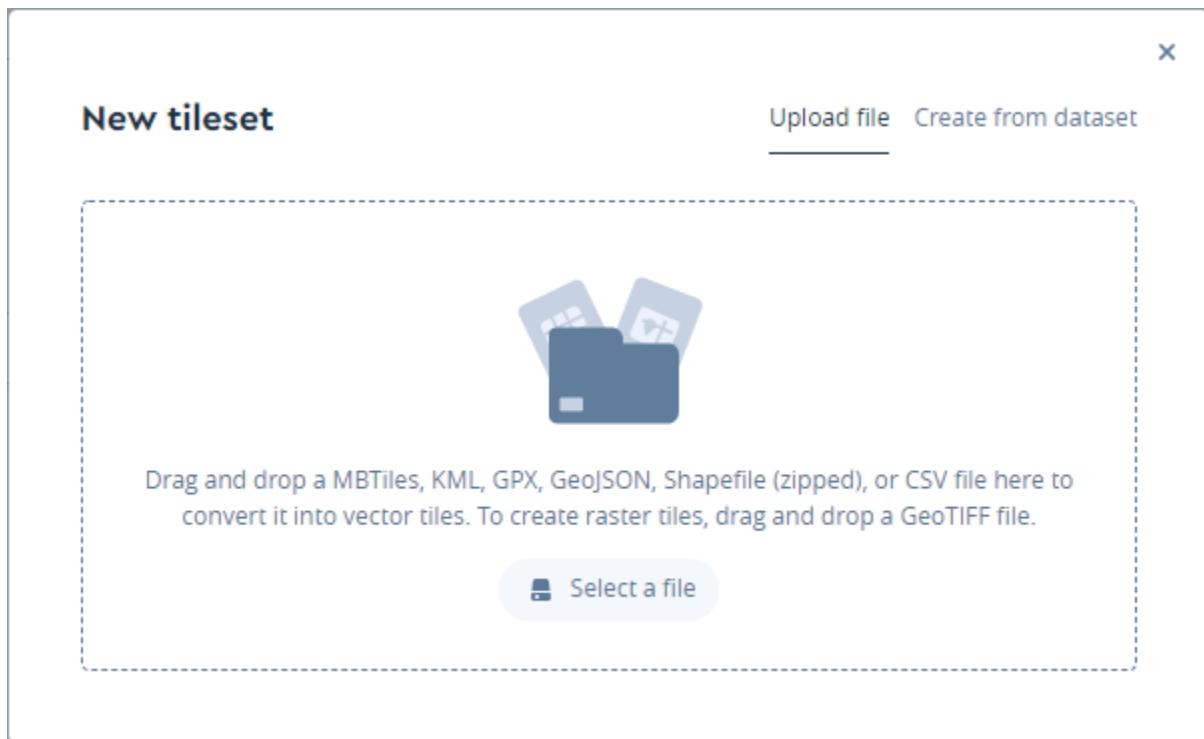
1. Click on the back/Mapbox icon at the top of the panel on the left of the map



2. Click on **Tilesets** item top right of the page, this will take you to the Tilesets administration page in Mapbox Studio:

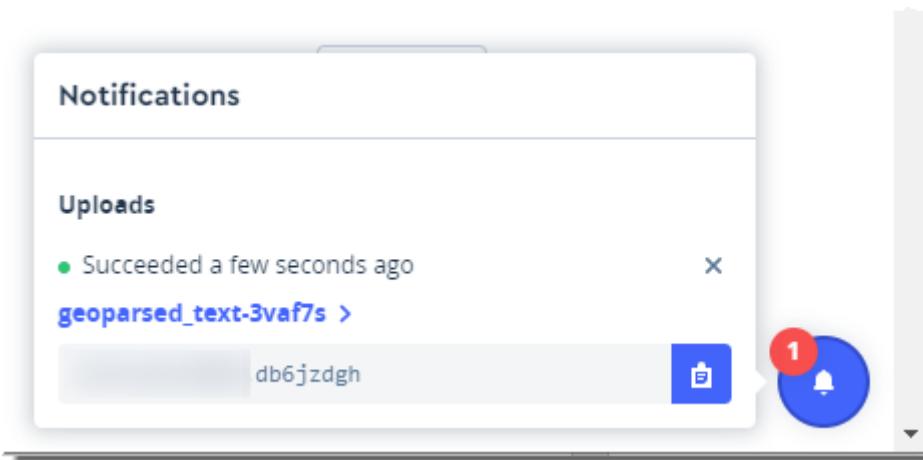


3. Click on the **New tileset** button.
4. In the next window click **Select a file** and browse to the **geoparsed text.csv** file, or drag and drop the file on to this window:



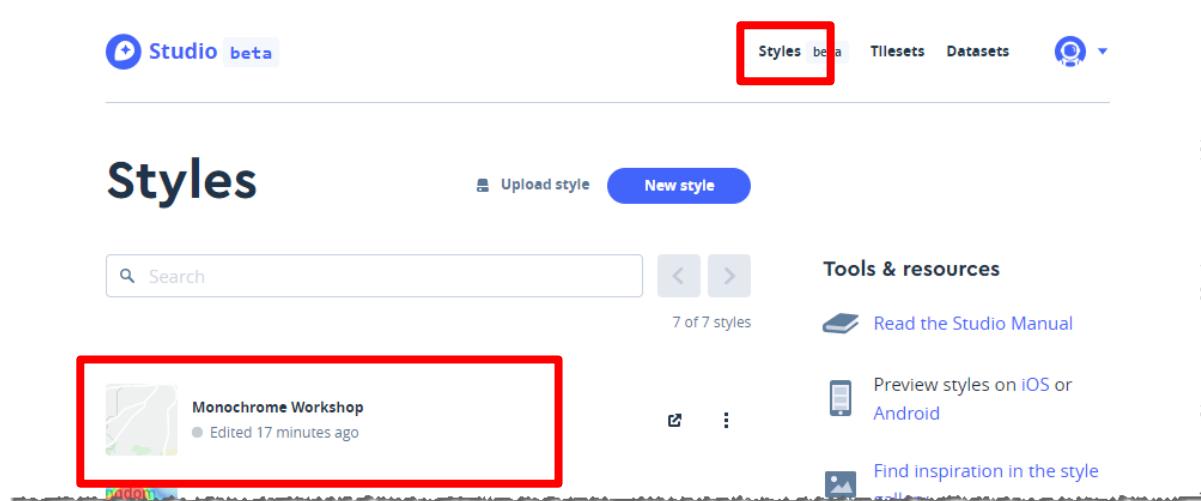
5. Click **Confirm** to begin the upload process.

This bit can take some time as the data uploads and then processes, once the data has been successfully uploaded a confirmation message will be displayed bottom right of the window and the new Tileset will be listed on the Tilesets page of Mapbox Studio:



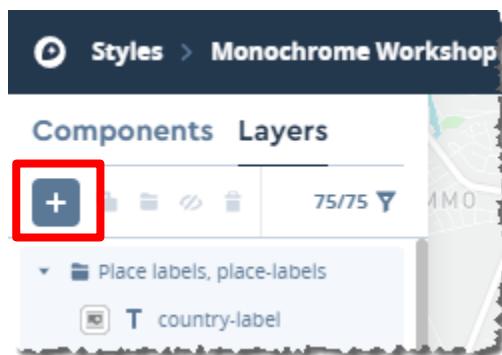
## Part 2: Styling the data

Your data comes in completely un-styled and you have to select the way you want to represent it and how you want it to display. To add the data to your map select the **Styles** option, top right of the window then click on your **Monochrome Workshop** style in the list:

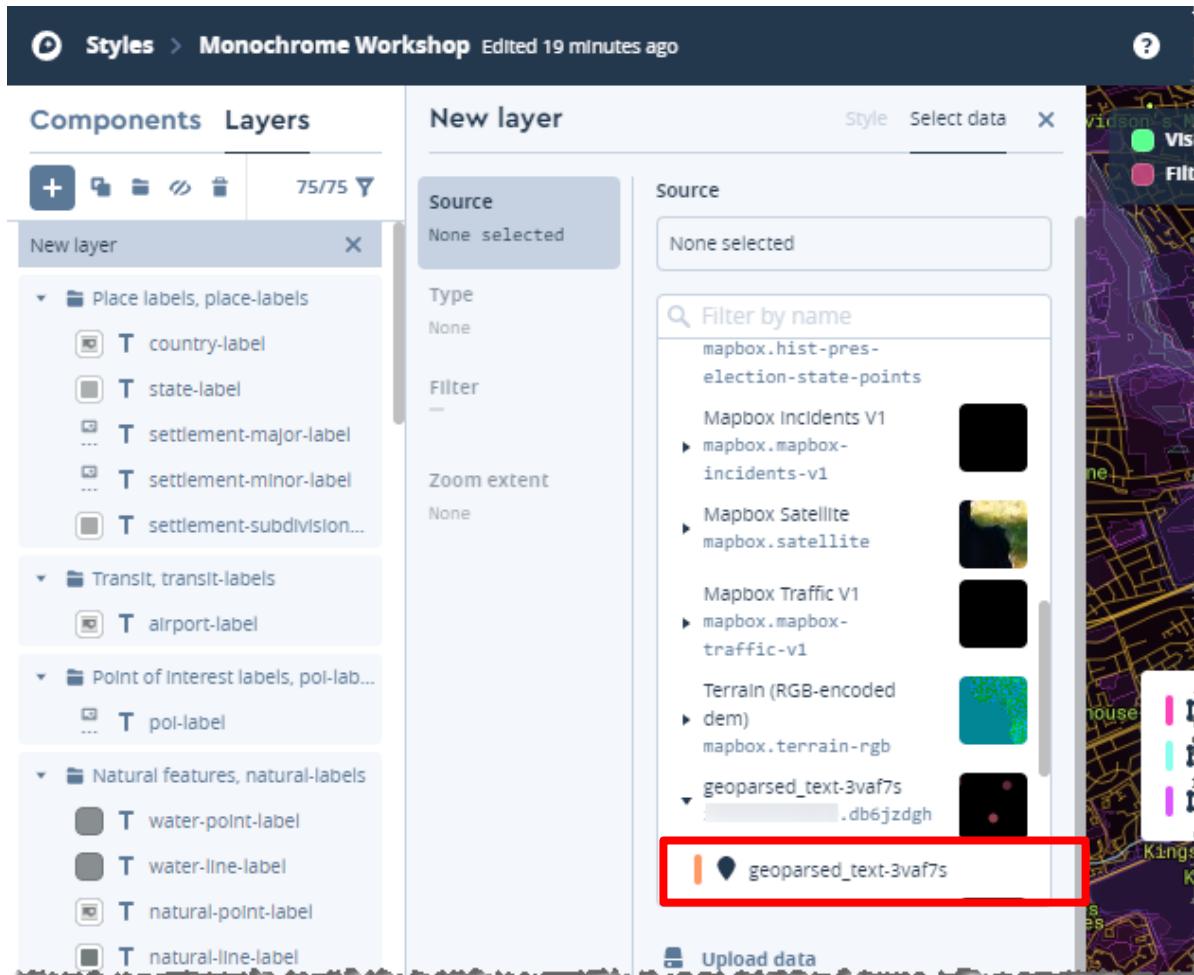


This will open up your familiar customised map. To view and style the data:

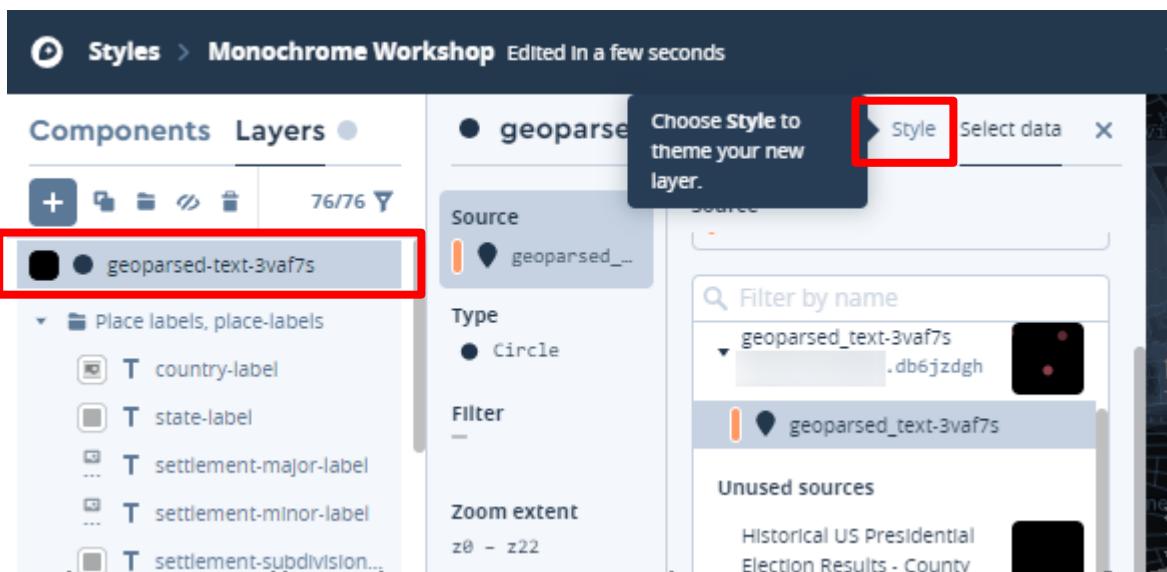
1. Click on the **Add new layer** button (top left):



2. In the Source selection panel select the group called **geoparsed\_text-xx...** at the bottom of the panel list of available data sources. This will expand the group; you then need to click on the item with the same name listed beneath the group heading to set the data source:

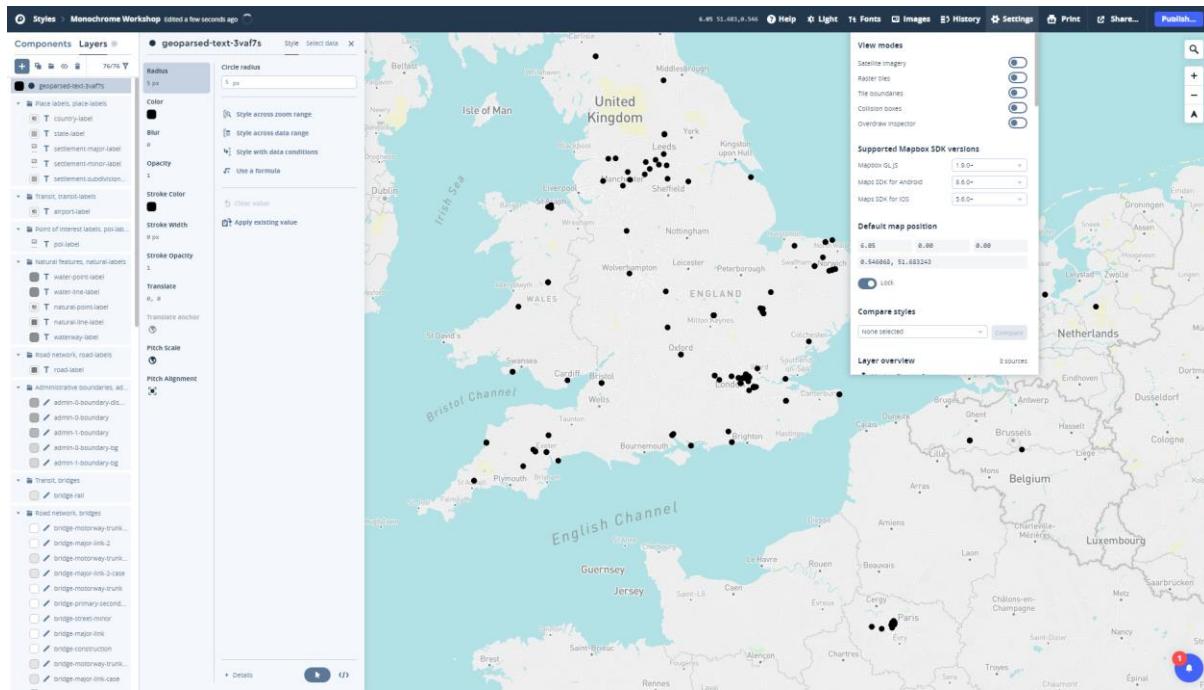


3. It will now appear at the top of the **Layers** panel on the left hand side.



4. To style the data, select the **Style** tab to toggle the **Style Panel**.

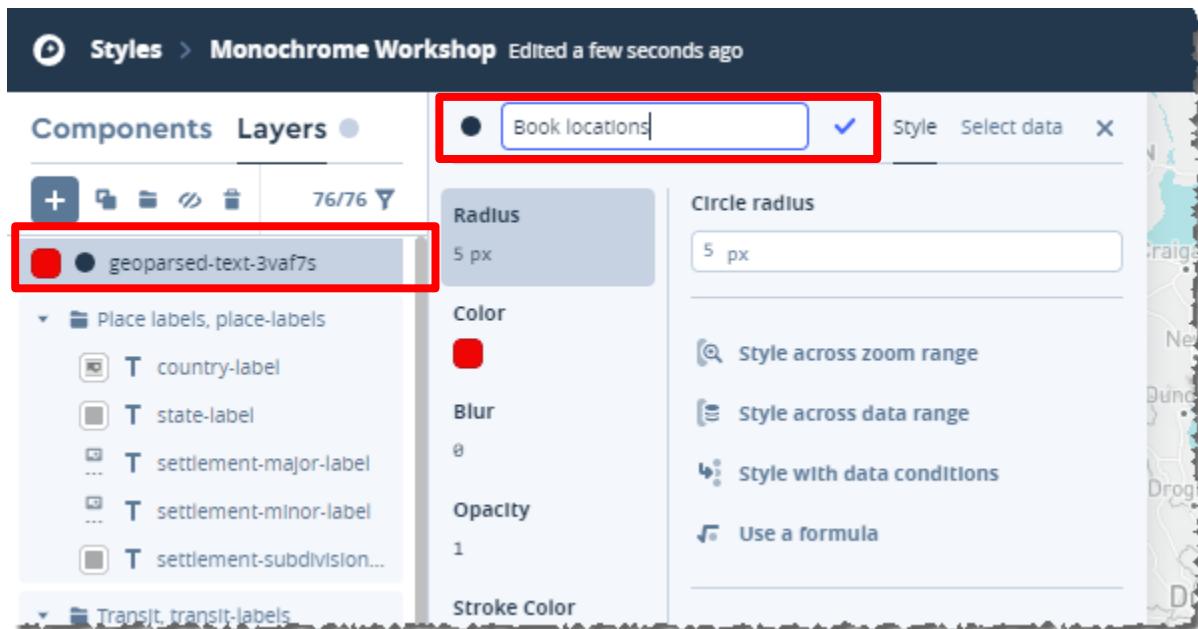
You should now see the **Style Panel** where we can change how your data looks. If you can't see any points on the map, use the scroll wheel on your mouse to zoom out so you can see some, there are a lot around London and Paris. It is a good idea to lock the view to this zoom level: Settings > Default map position > Lock (unlock and then re-lock to update the saved default map position):



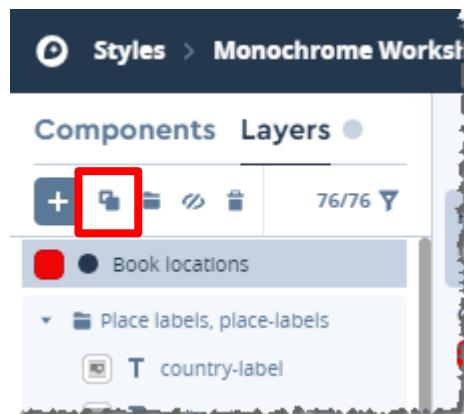
5. We'll start by changing the colour of the dots, in the Style panel click on the black colour swatch underneath the **Color** heading and select a colour of your choice.
6. To add an outline to the dots we need to change the **Stroke Width** to be more than 0. Change the value of the **Stroke Width** property to be **0.5px**.

We are now going to label our points, but to do this we will need to create a new layer as labels cannot be added to the markers we have already got.

7. Before we duplicate the layer we will rename it so it is more user friendly. With the **geoparsed\_text...** layer highlighted in the Layers panel click on the name displayed at the top of the Style panel and change it to **Book locations**:

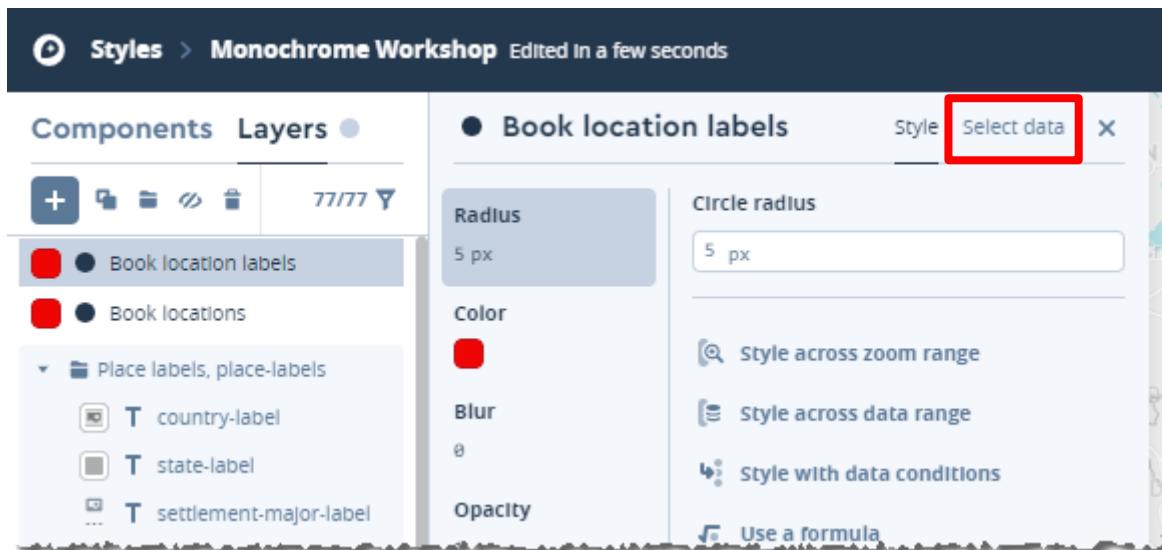


8. With **Book locations** highlighted click on the **Duplicate layer** button above it:

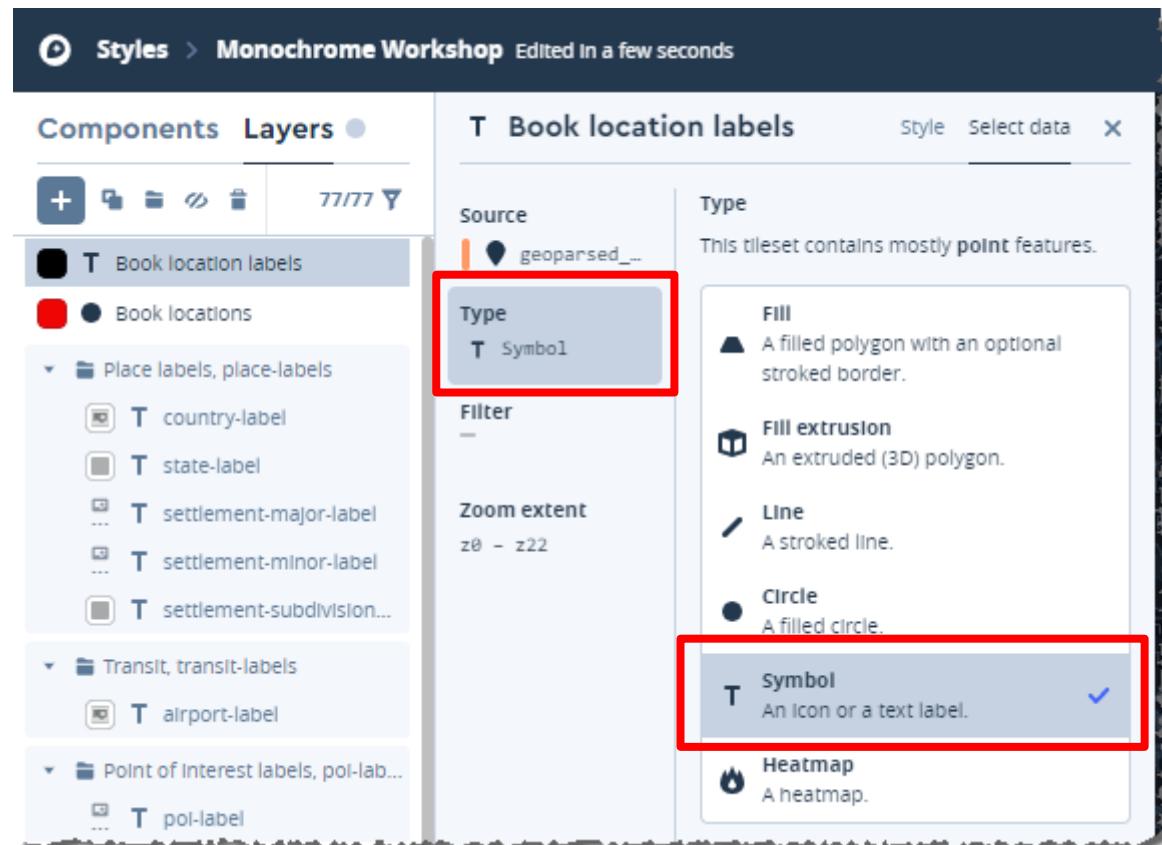


A copy of the layer is now above the original in the leftmost panel. We can edit this to produce the labels.

9. First, change the name from **Book locations copy** to **Book location labels** following the steps above.
10. Toggle to the **Select data** panel form the Style panel:



11. Change the **Type** from **Circle** to **Symbol**, click **Okay** to remove any assigned styles as we are using the copy of our original.



We don't need to change anything else so we can toggle back to the **Style** tab. We now have different options for styling.

12. Select **Text field** and then click on the button beneath **Insert a data field**

The screenshot shows the Mapbox Style Editor interface. On the left, the 'Components' and 'Layers' panels are visible. The 'Layers' panel shows a list of layers including 'Book location labels' (selected) and 'Book locations'. The 'Book location labels' layer has its style configuration open on the right. In the 'Text' tab, the 'Text field' dropdown is open, showing a list of data fields. The 'PlaceName' field is selected and highlighted with a red box. Other fields listed include 'String.', 'Lat #', 'Lng #', and 'Sentence #'. The background map shows various locations in Northern Ireland and Great Britain.

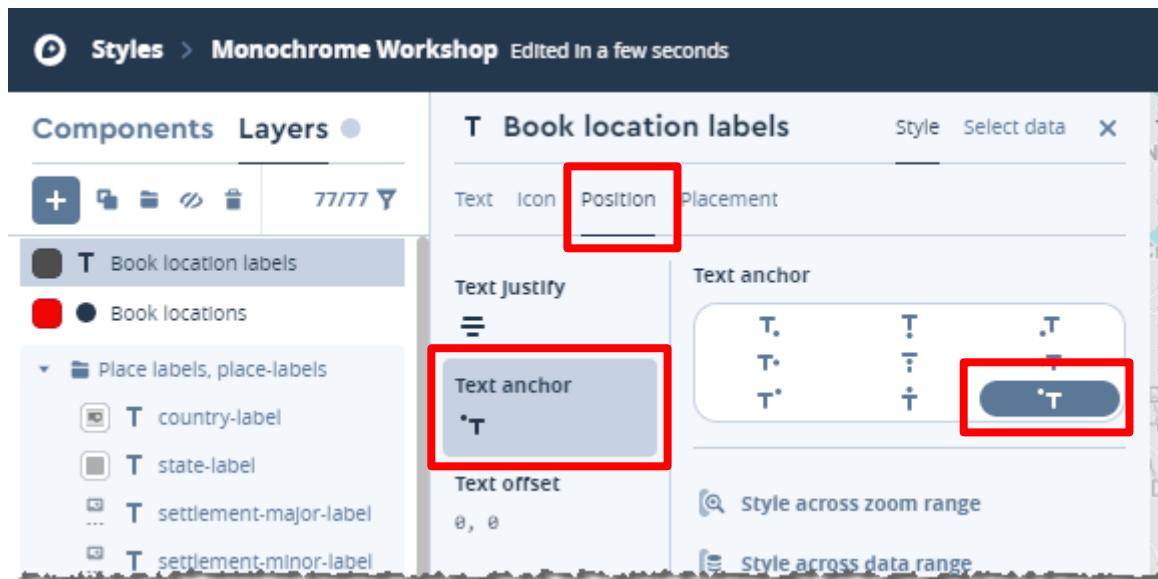
13. Select the **PlaceName** data field to label features using this field.

14. Change the **Color** to be something similar suitable.

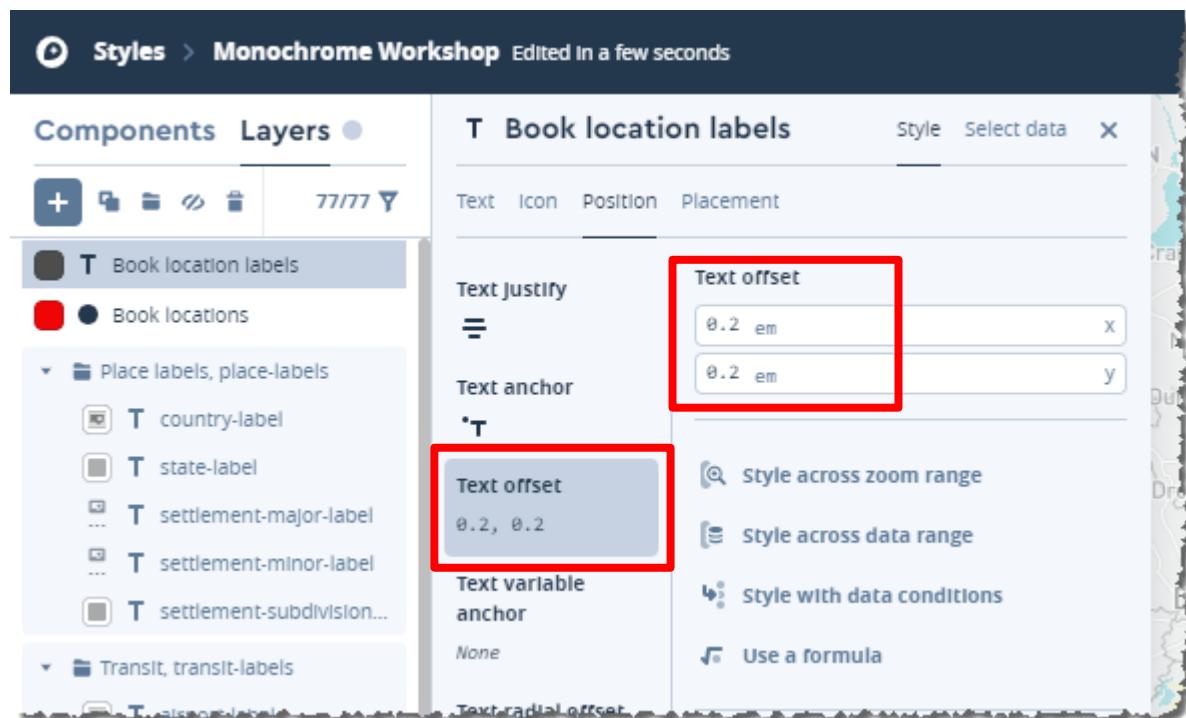
We can leave the rest of the text settings as the defaults but you may notice the labels are on top of the dots:

This screenshot shows the 'Book location labels' layer configuration in the Mapbox Style Editor. The 'Text' tab is active, and the 'Text color' section is expanded. A color picker shows a gradient from red to black, with the current value set to #4d4d4d. The background map displays numerous red dot markers representing book locations across the British Isles and surrounding areas. The 'Components' and 'Layers' panels are also visible on the left.

15. Switch to the **Position** panel and select the **Text anchor** section:



16. Select the option to place the text below and to the right of the point symbol.
17. To tidy up the text placement change the **Text offset** to be **0.2 em** for both the **x** and **y** axes, to give the points a bit of space:

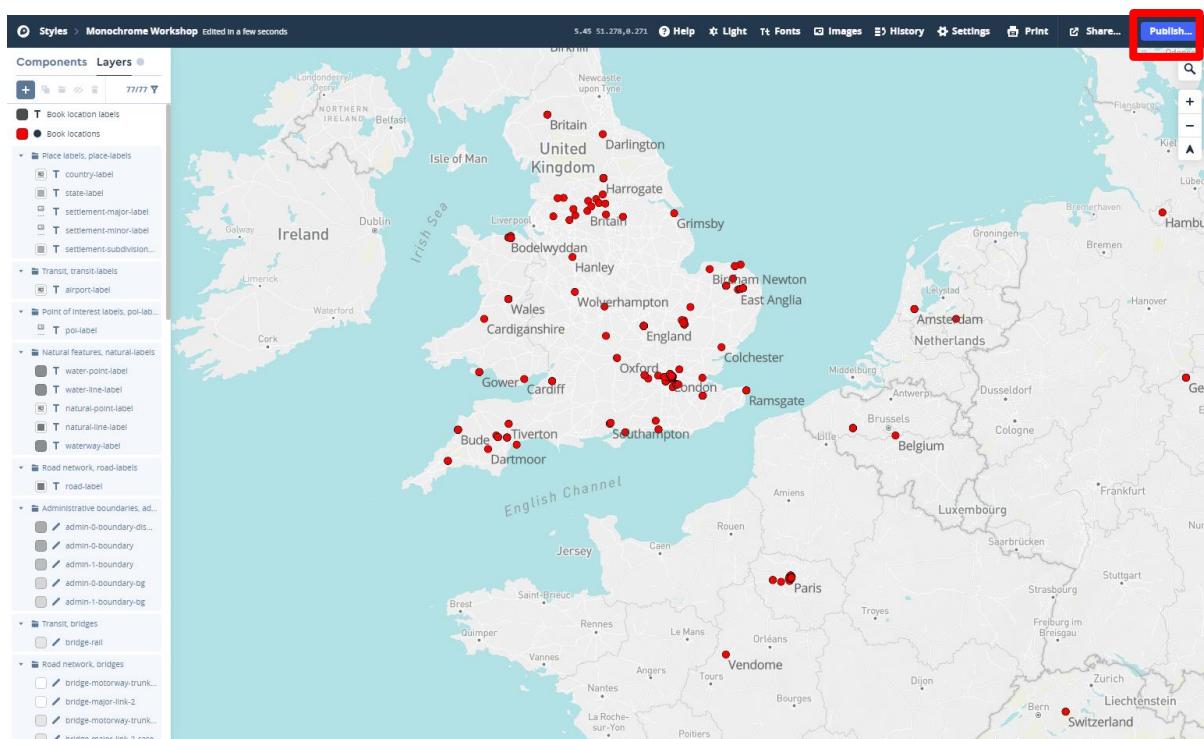


Labels in Mapbox are dynamic so as you zoom in and out different ones will appear and disappear as long as they fit on the map.

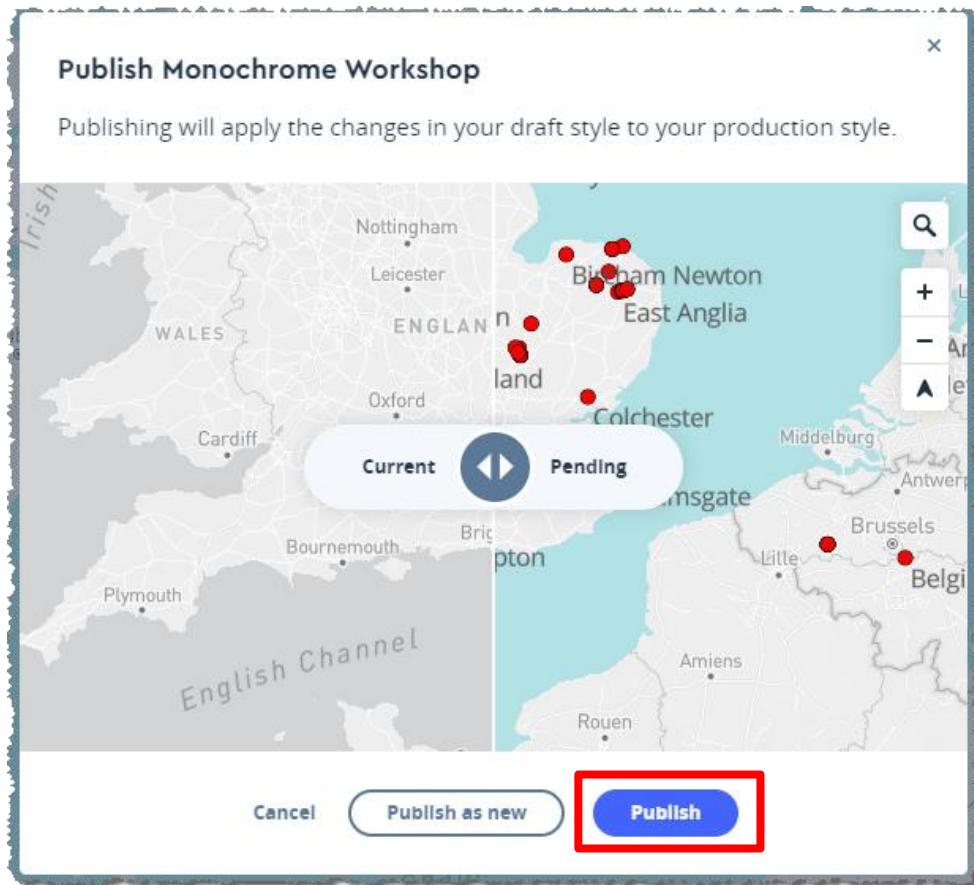
## Part 3: Embedding the map in a webpage

Up till now the map you have been creating is only visible to you. To be able to share your map you need to publish it. Once you have done that you have a range of options on how you can share it. We will look at how to embed this map in to a web page.

1. Make sure you are happy with the zoom level and where the map is centred and toggle the lock **on** (**off** then **on** if it is already on) via **Settings > Default map position**.
2. Click on the **Publish** button, in the panel top right of the map:



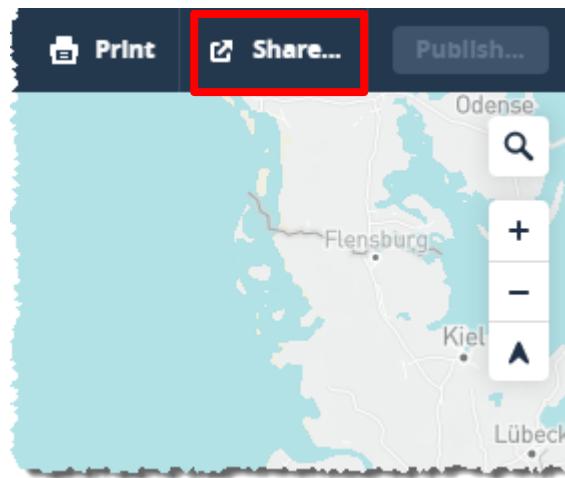
3. On the confirmation window click on the **Publish** button:



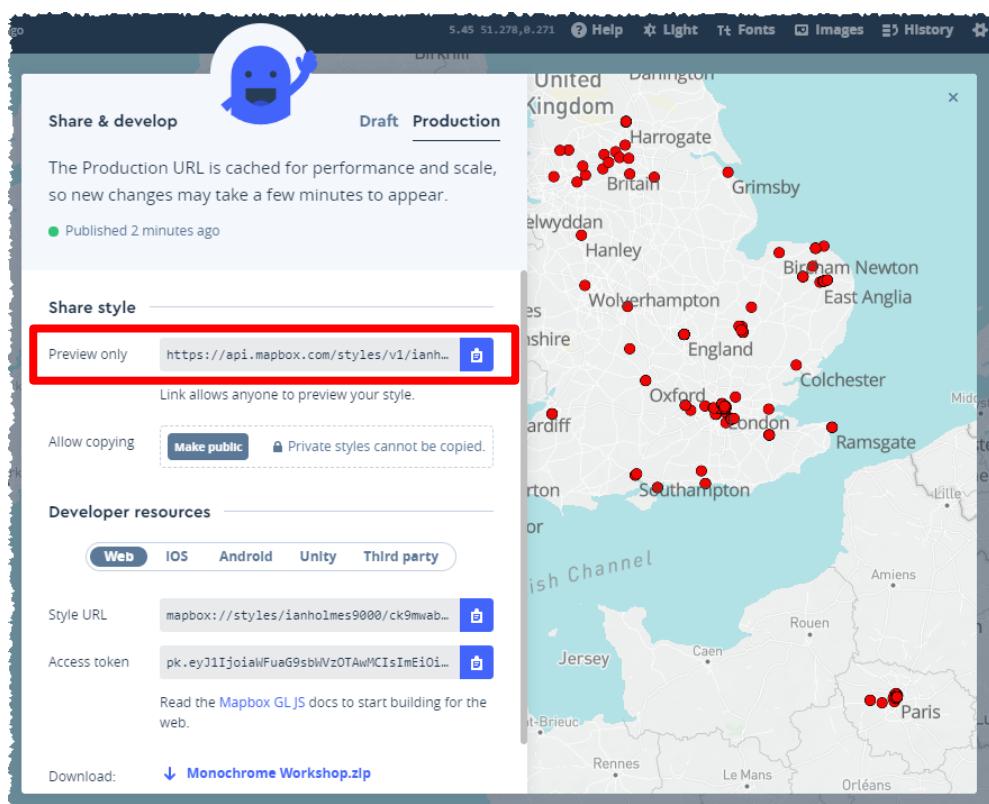
**Tip:** you can click and drag the slider to preview changes to the map since last publication.

**IMPORTANT:** Your map is now **Public**, and anyone with the right URL can see it, although the URLs are not easy to guess. **Do not** use any copyright data as putting it in Mapbox will breach the terms and conditions of its use. **Do not** put any sensitive data you may have created on Mapbox as it can be viewed by anyone!

4. Close the confirmation window.
5. Click on the **Share** button:

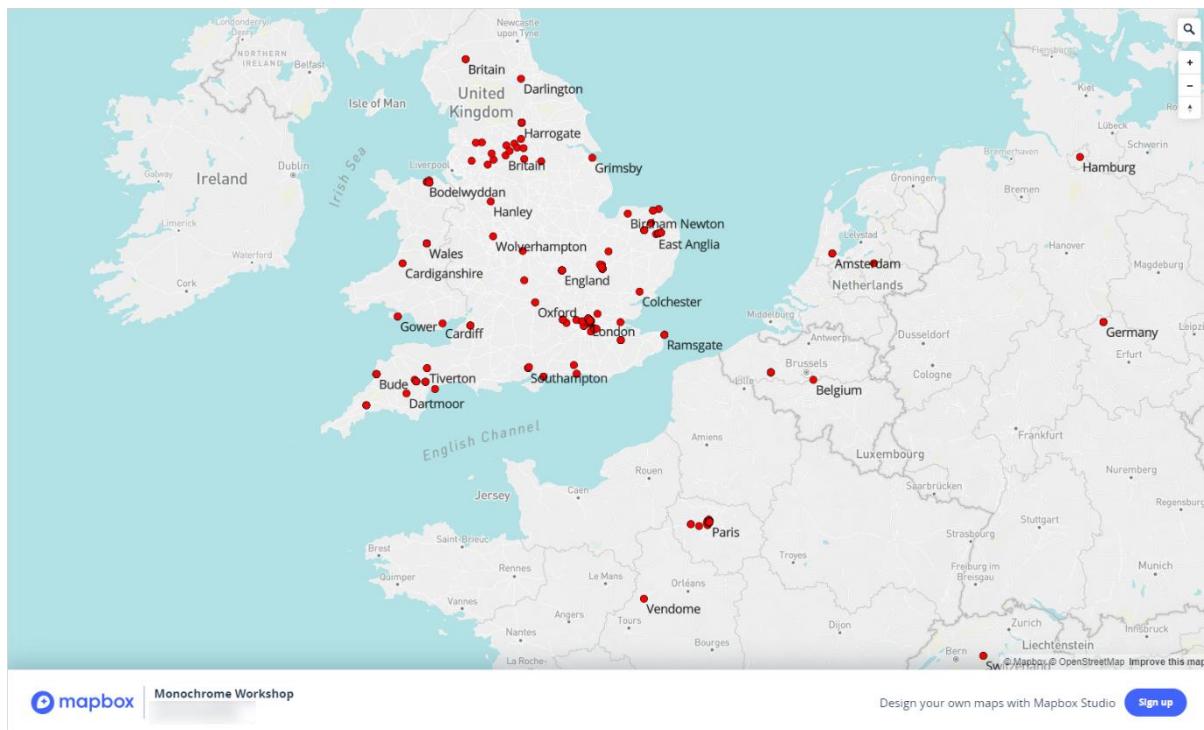


This will display the **Share & develop** panel:



### Share style:

The URL displayed in the **Share style > Preview only** field can be shared with anyone and they will see your map in its own web map interface, with the styling and data set up in the previous steps. Press the copy button, or copy and paste the URL in the **Share style > Preview only** field and open it in a new browser window/tab to see how your map will be displayed to others:



## Developer resources:

The **Developer resources** section lists a few different ways of using your map in other software. Essentially you can use your map as a basemap or backdrop map in other systems, or embed the map in a web page.

### Developer resources

[Web](#)   [iOS](#)   [Android](#)   [Unity](#)   [Third party](#)

Style URL

<mapbox://styles/ianholmes9000/ck9mwab...>



Access token

<pk.eyJ1IjoiaWFuaG9sbWVzOTAwMCIsImEiOi...>



Read the [Mapbox GL JS](#) docs to start building for the web.

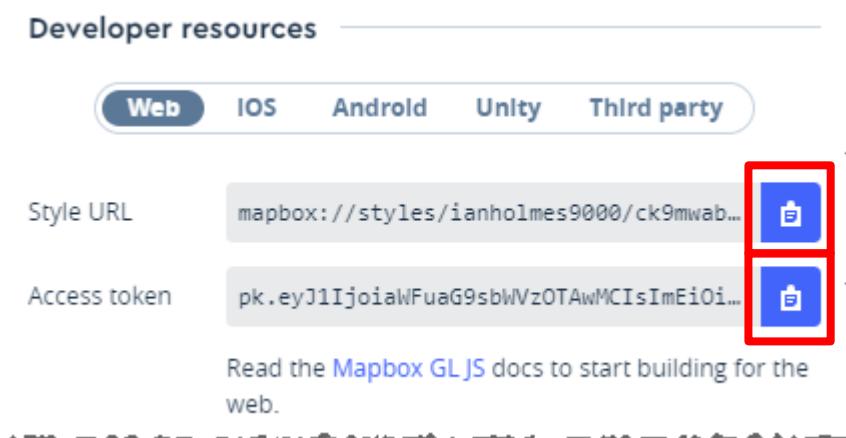
There are lots of ways of using Mapbox maps, we're going to use **Mapbox GL JS**, which is a JavaScript library which can be used to render interactive maps in desktop and mobile environments.

1. Open **MapboxExample.html** file in a text editor such as Notepad++, this example html file was downloaded from <https://docs.mapbox.com/mapbox-gl-js/example/simple-map/>.
2. There are two replacements needed in this file, as shown below:

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
    <title>Mapbox Example</title>
    <meta name="viewport" content="initial-scale=1,maximum-scale=1,user-scalable=no" />
    <script src="https://api.mapbox.com/mapbox-gl-js/v1.10.0/mapbox-gl.js"></script>
    <link href="https://api.mapbox.com/mapbox-gl-js/v1.10.0/mapbox-gl.css" rel="stylesheet" />
    <style>
      body { margin: 0; padding: 0; }
      #map { position: absolute; top: 0; bottom: 0; width: 100%; }
    </style>
  </head>
  <body>
    <div id="map"></div>
    <script>
      mapboxgl.accessToken = 'insert mapbox access token here'; // mapbox access token
      var map = new mapboxgl.Map({
        container: '#map', // container id
        style: 'insert mapbox style url here', // stylesheet location
        center: [50.0, 50.0], // starting position [lng, lat]
        zoom: 5.0 // starting zoom
      });
    </script>
  </body>
</html>
```

Hyper Text M length : 892 lines : 27 Ln:1 Col:16 Sel:0|0 Windows (CR LF) UTF-8 INS ..

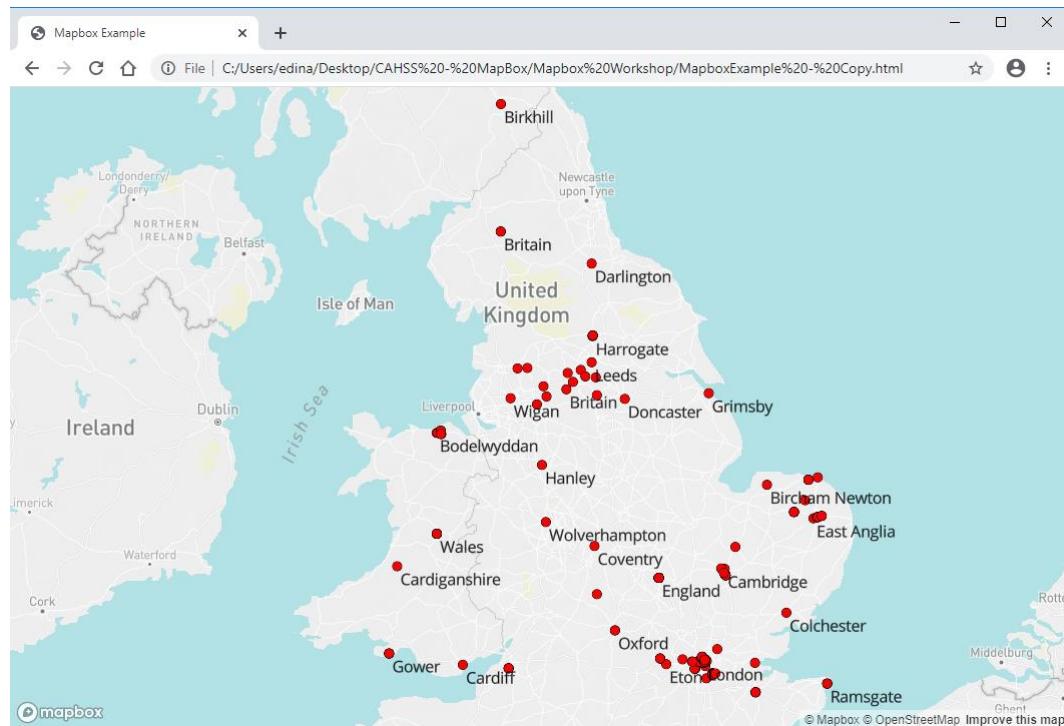
3. The **Access Token** and **Style URL** can be copied from the Developer resources section of the share window for your map:



4. Using the buttons highlighted above **Copy** the Access Token and Style URL in turn and **Paste** the values in to the relevant place in the HTML document.

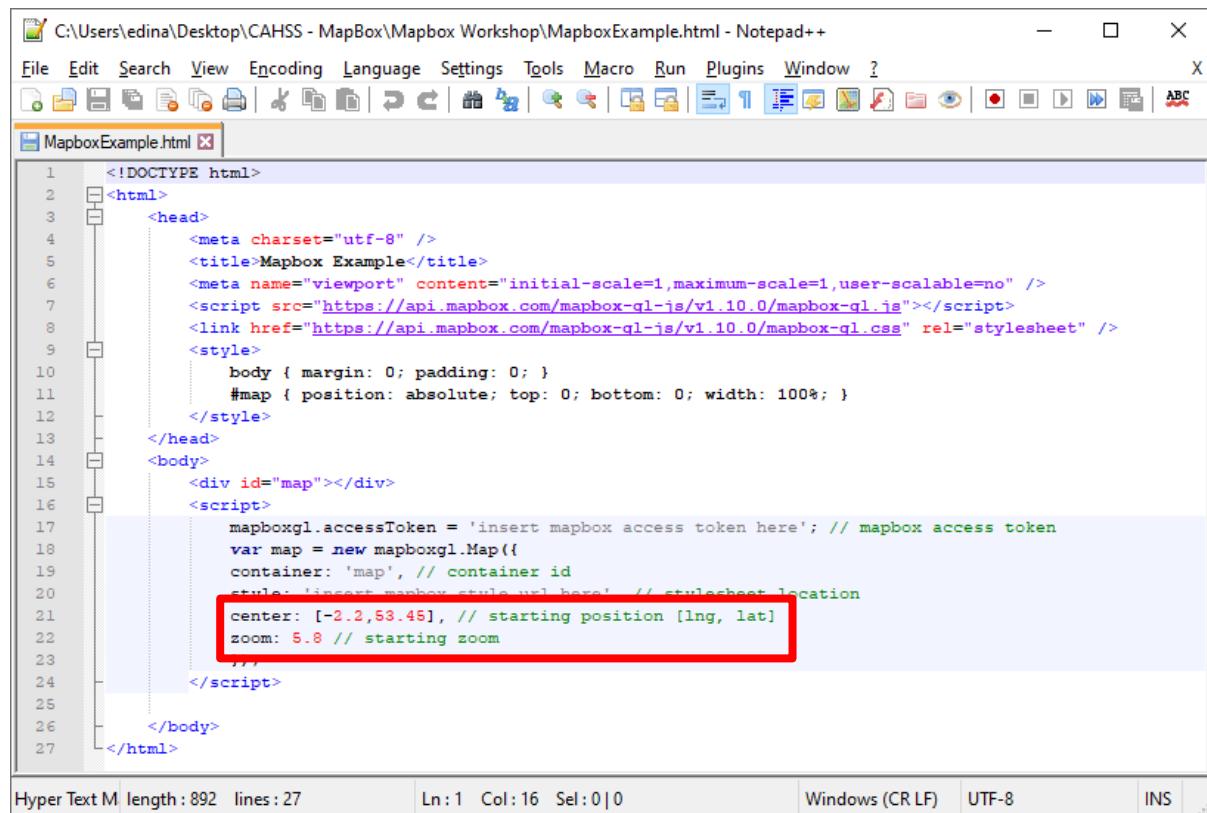
Note that the copied values **must** be in single quotes in the HTML document.

5. Once both values have been entered, **save** your changes.
6. **Open** MapboxExample.html in a web browser to view your web map, it should look similar to the one below:



7. If you wish, you can modify the **center** and **zoom** values in the HTML file – these specify the central point of the map when it is first loaded (using latitude and longitude values) and the zoom level that is used. Remember: Mapbox zoom levels range from 0 to 22, with 0 being the most zoomed out, and 22 being the most zoomed in.

## Putting spatial data online using Mapbox



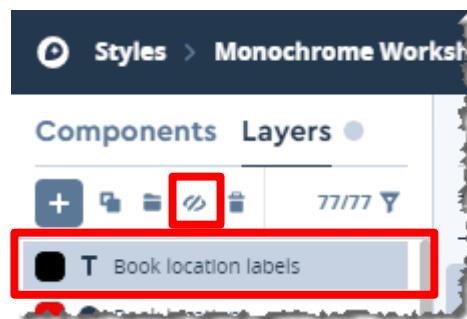
The screenshot shows a Notepad++ window with the file 'MapboxExample.html' open. The code is an example of how to embed a Mapbox map into an HTML page. A red box highlights the JavaScript code within the

## Part 4: Further exercises

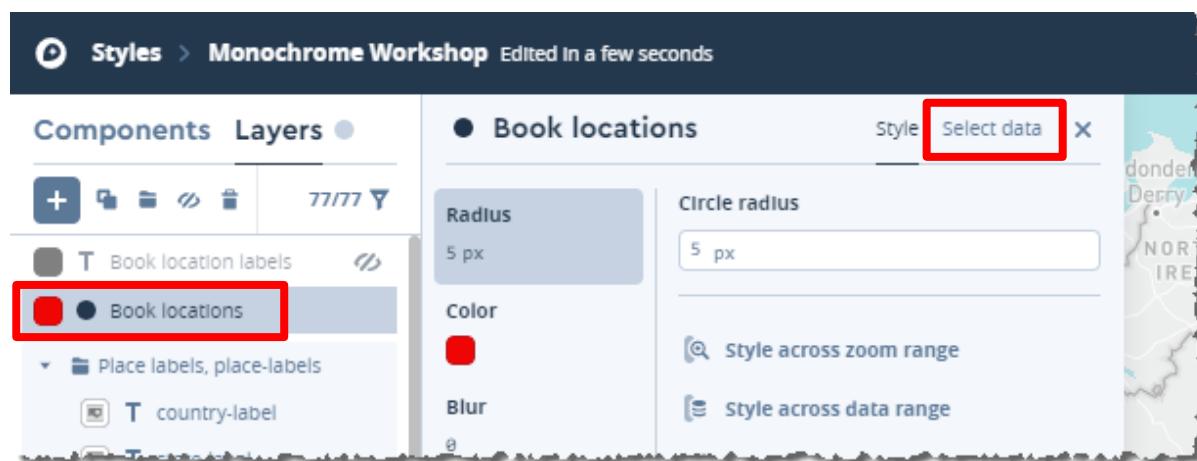
So far we have explored the basic functionality of Mapbox, but there are many more things that can be done with Mapbox, below are a few examples.

### Example 1 – creating a heatmap and adding a custom menu to switch between map styles:

1. Turn off the **Book location labels** by selecting the layer in the layers panel and clicking the **Hide layer** button:



2. Select the **Book locations** layer, and toggle the **Select data** panel



3. Click on the **Type** setting and change the map type to be a **Heatmap**:

**Components Layers**

**Book locations**

**Type** Heatmap

**Source** geoparsed...

**Filter**

**Zoom extent** z0 - z22

**Style** Select data X

**Heatmap** A heatmap.

4. You will be prompted that all existing style information will be lost, this is fine.
5. Go back to the **Style** panel, set the **Opacity** to 0.5, **Radius** to 20, and **Weight** to 0.5:

**Components Layers**

**Book locations**

**Style** Select data X

**Heatmap weight** 0.5

**Color**

**Opacity** 0.5

**Radius** 20 px

**Weight** 0.5

**Intensity** 1

**Heatmap weight** 0.5

**Style across zoom range**

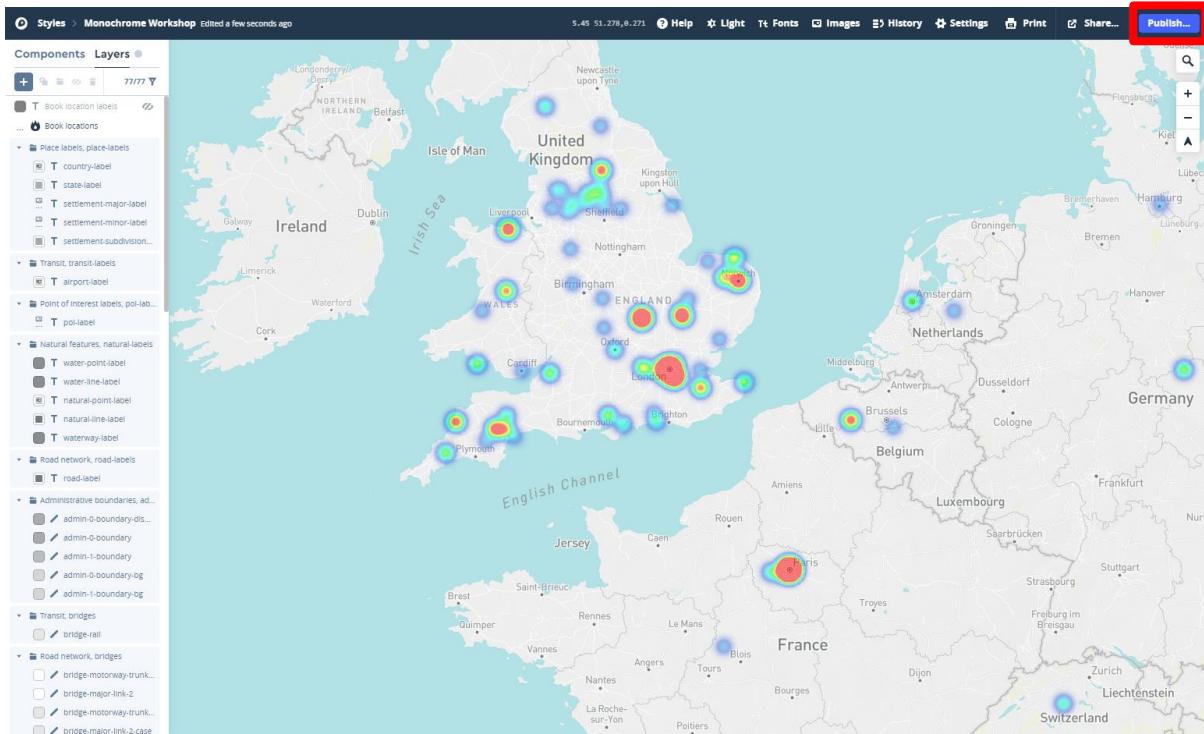
**Style across data range**

**Style with data conditions**

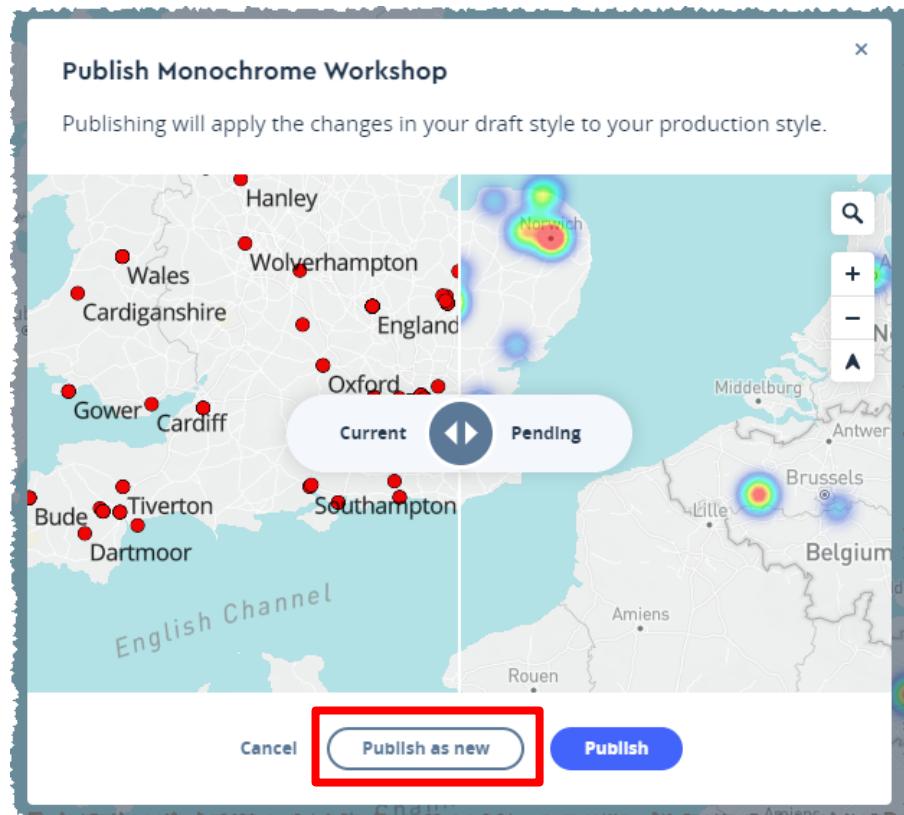
**Use a formula**

**Clear value**

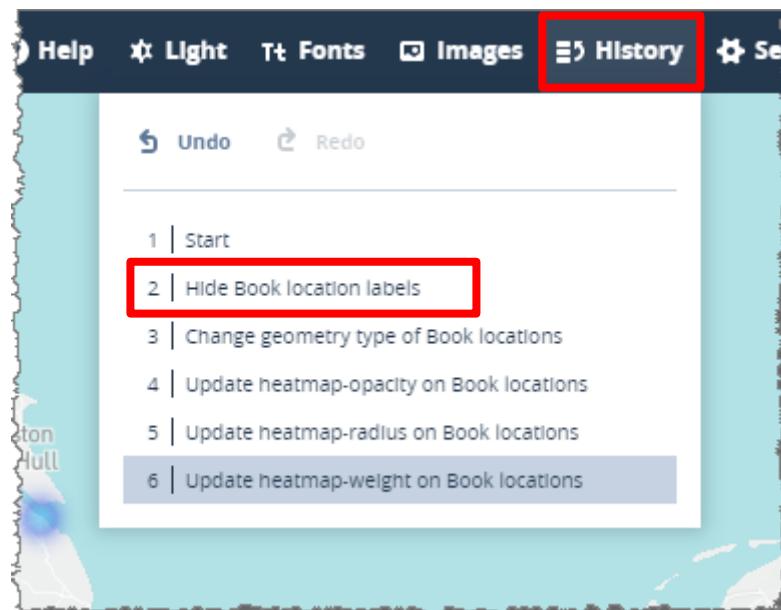
6. Having made these changes your map should look similar to the one below:



7. Click the **Publish** button.
8. On the confirmation window you can use the slider to easily preview the changes from a dot map to a heatmap.
9. Select the option to **Publish as new**, as we wish to create new style rather than overwrite the existing style:

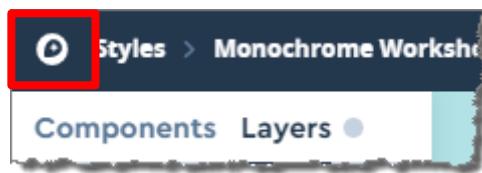


- Having published the heatmap as a new style, you should undo the changes made to the **Monochrome Workshop** style to revert it back to a dot map. You can do this by pressing **CTRL + Z** to undo each step or you can open the **History** menu and select the item before the book location labels were hidden:

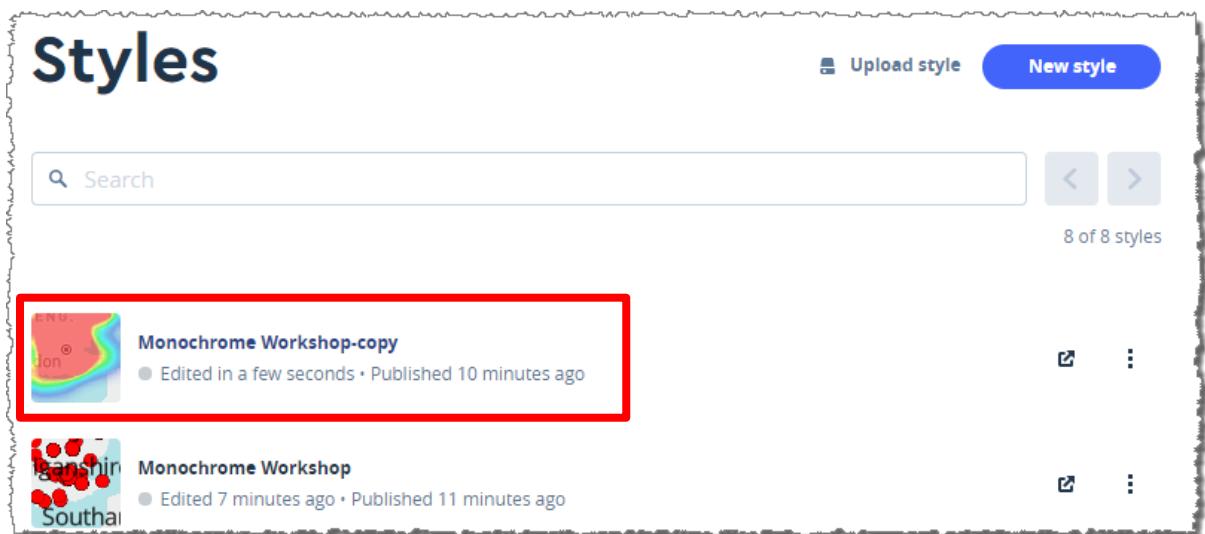


The heatmap will be assigned a default name such as: **Monochrome Workshop-copy**, so we will rename this to make it easier to use.

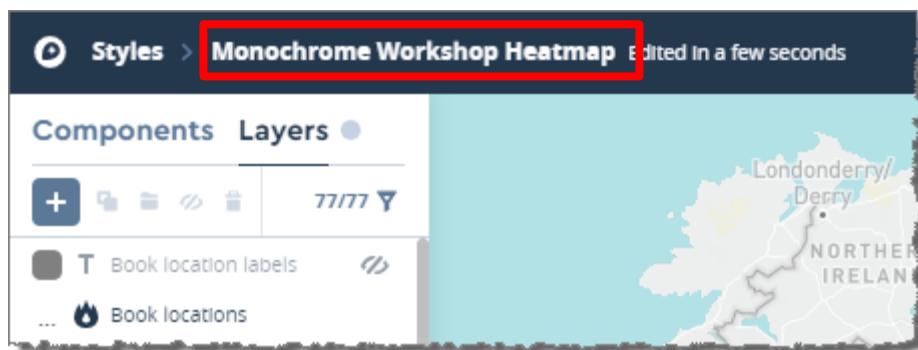
11. Click on the home button to go back to the Styles page:



12. Select the **Monochrome Workshop-copy** style to open the heatmap:



13. In the header bar, rename the heatmap to **Monochrome Workshop Heatmap**:

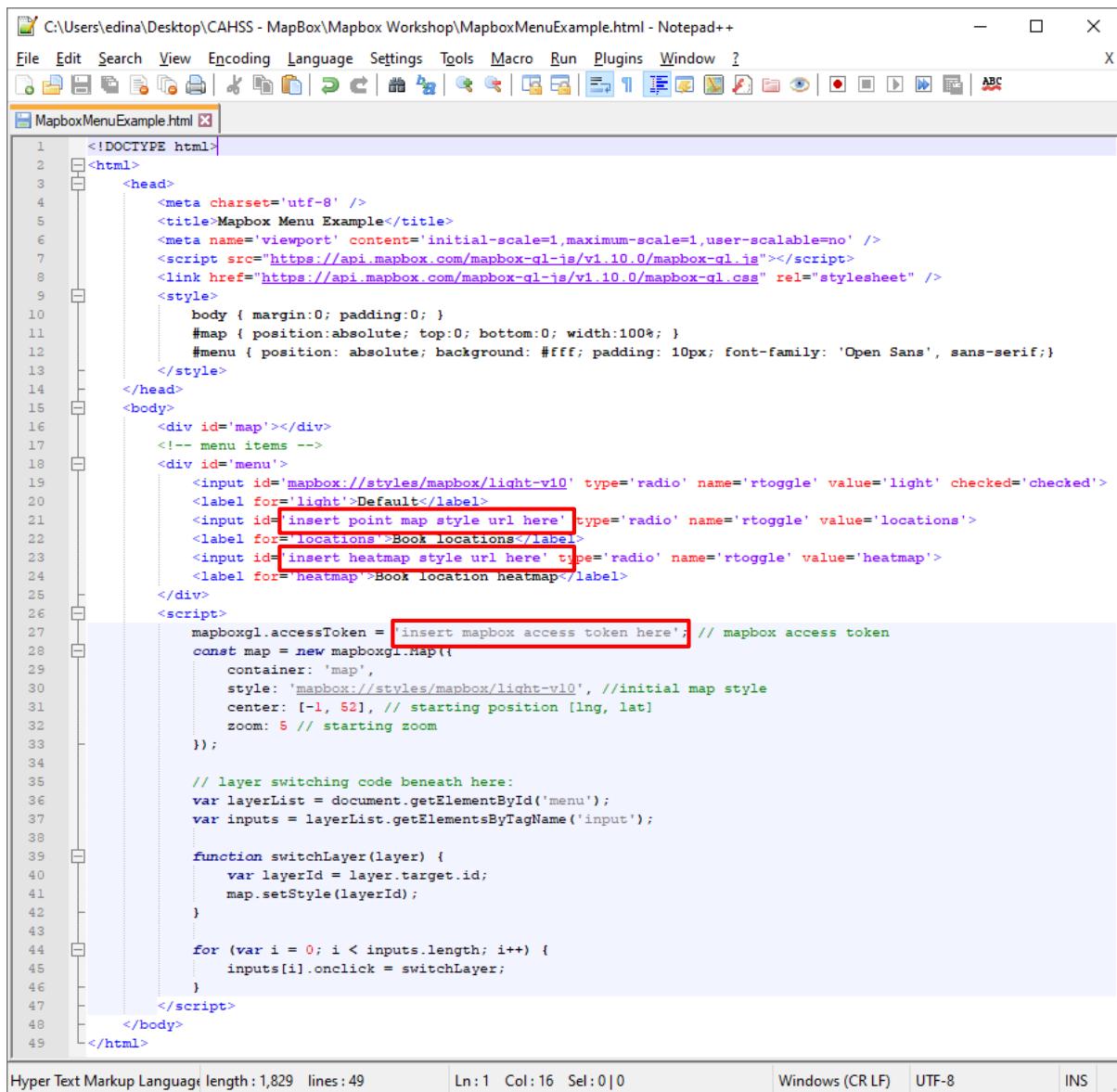


Now we will create a new web page that includes a menu allowing the user to switch between the default monochrome Mapbox style, the dot map we made first and the heatmap we made in the previous section.

14. Open **MapboxMenuExample.html** file in a text editor such as Notepad++, this example html file was downloaded from: <https://docs.mapbox.com/mapbox-gl-js/example/setstyle/>.

15. There are three replacements needed in this file, as shown below:

## Putting spatial data online using Mapbox



```
<!DOCTYPE html>
<html>
  <head>
    <meta charset='utf-8' />
    <title>Mapbox Menu Example</title>
    <meta name='viewport' content='initial-scale=1,maximum-scale=1,user-scalable=no' />
    <script src="https://api.mapbox.com/mapbox-gl-js/v1.10.0/mapbox-gl.js"></script>
    <link href="https://api.mapbox.com/mapbox-gl-js/v1.10.0/mapbox-gl.css" rel="stylesheet" />
    <style>
      body { margin:0; padding:0; }
      #map { position:absolute; top:0; bottom:0; width:100%; }
      #menu { position: absolute; background: #fff; padding: 10px; font-family: 'Open Sans', sans-serif; }
    </style>
  </head>
  <body>
    <div id='map'></div>
    <!-- menu items -->
    <div id='menu'>
      <input id='mapbox://styles/mapbox/light-v10' type='radio' name='rtoggle' value='light' checked='checked'>
      <label for='light'>Default</label>
      <input id='insert point map style url here' type='radio' name='rtoggle' value='locations'>
      <label for='locations'>Book locations</label>
      <input id='insert heatmap style url here' type='radio' name='rtoggle' value='heatmap'>
      <label for='heatmap'>Book location heatmap</label>
    </div>
    <script>
      mapboxgl.accessToken = 'insert mapbox access token here'; // mapbox access token
      const map = new mapboxgl.Map({
        container: 'map',
        style: 'mapbox://styles/mapbox/light-v10', //initial map style
        center: [-1, 52], // starting position [lng, lat]
        zoom: 5 // starting zoom
      });

      // layer switching code beneath here:
      var layerList = document.getElementById('menu');
      var inputs = layerList.getElementsByTagName('input');

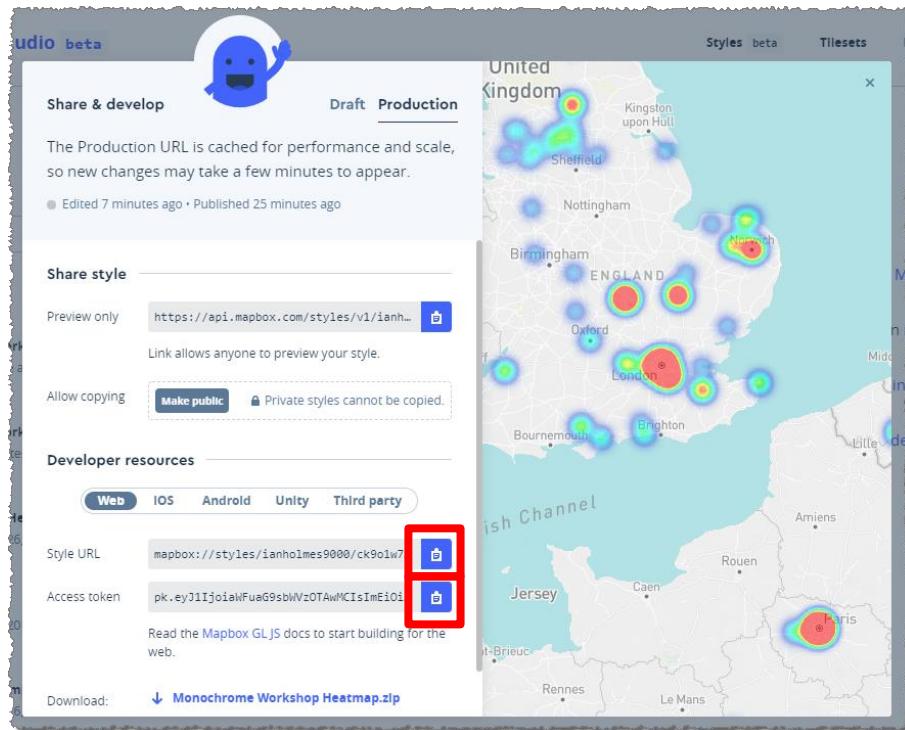
      function switchLayer(layer) {
        var layerId = layer.target.id;
        map.setStyle(layerId);
      }

      for (var i = 0; i < inputs.length; i++) {
        inputs[i].onclick = switchLayer;
      }
    </script>
  </body>
</html>
```

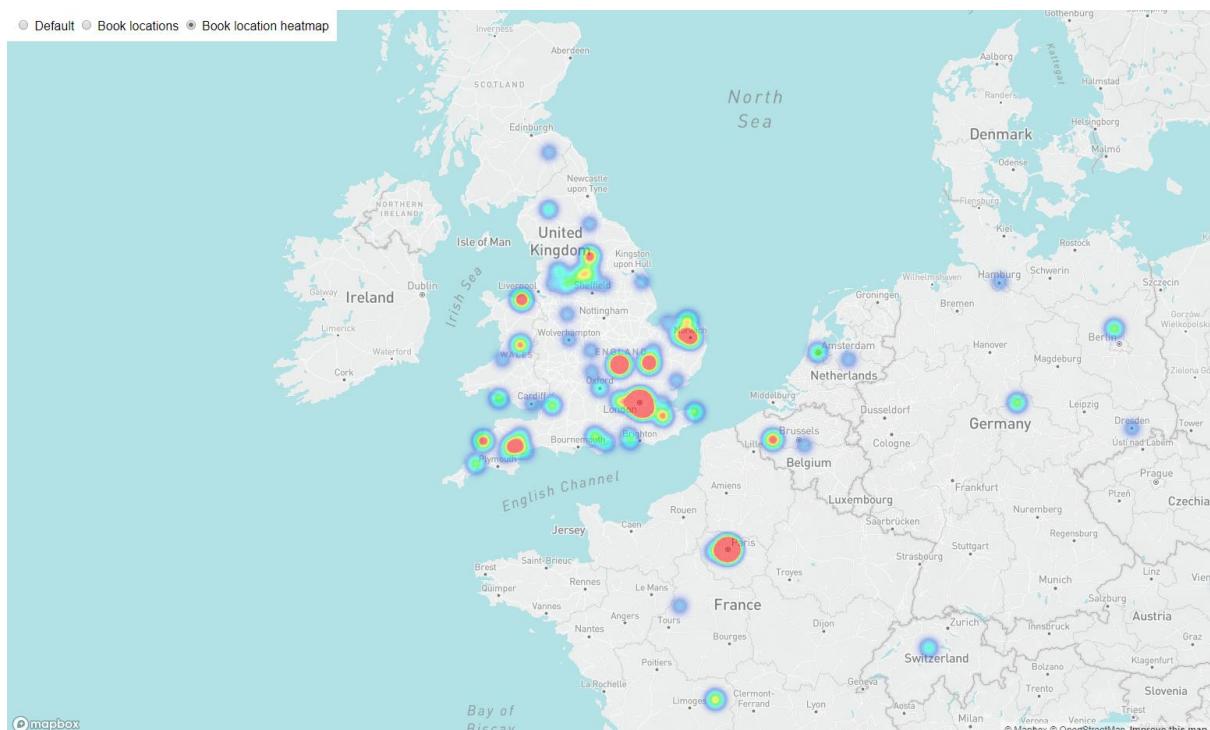
Hyper Text Markup Language length: 1,829 lines: 49 | Ln:1 Col:16 Sel:0|0 Windows (CR LF) UTF-8 INS ...

- a. The two **Map Style URLs** can be found from the **Styles** page in Mapbox Studio by pressing the **share** button to open up the **Share & Develop** window for each style:





- b. Your **Access token** is also displayed on the **Share & develop** window (you only have one Access token, it is unique to you, so it doesn't matter which style you copy it from).
16. Once you have made all three replacements in the html file, **save** your changes and open the file in Chrome to view the results. Your map should look similar to the one below with a short menu top left allowing you to switch between the three map styles:



## **Example 2 – adding a popup to view attribute values from the data**

In this final example we will add some code to our web page so that we can click the point features in our **Book Locations** map style and view the attribute information in a **popup**.

1. Make a copy of the html file used in the previous exercise (**MapboxMenuExample.html**) and call it **MapboxPopupExample.html**
2. Open this new file in a text editor such as Notepad++
3. Copy the code from the next page and paste it on the line immediately above the closing `</script>` tag:

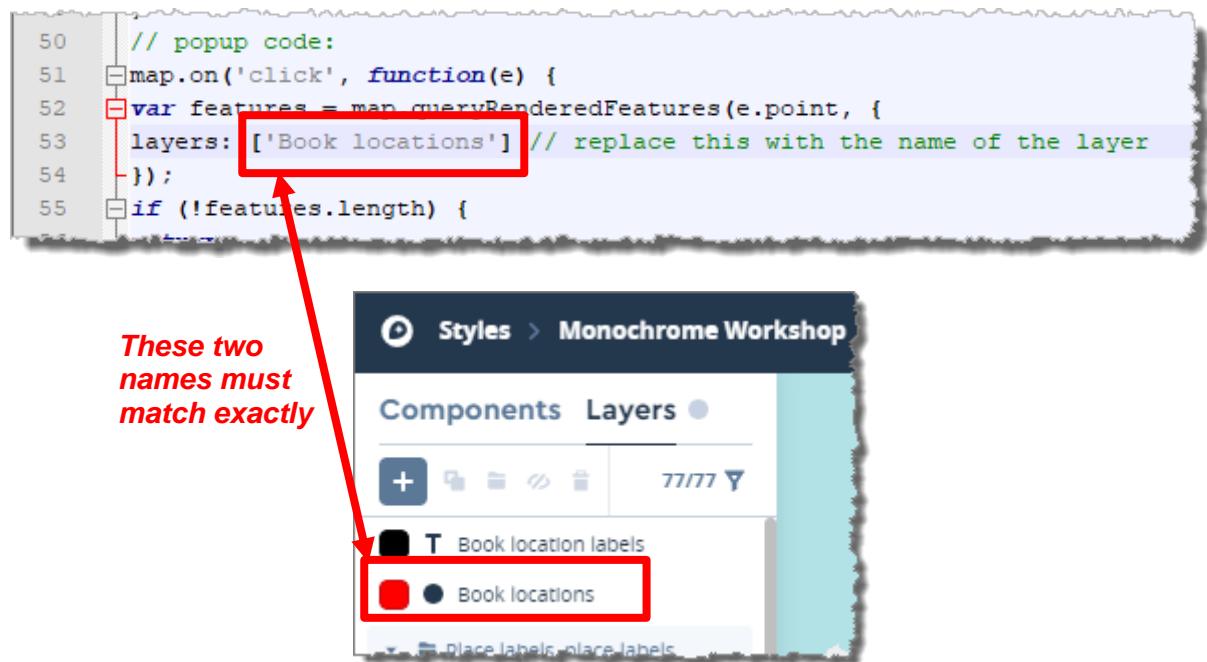


```
46
47   for (var i = 0; i < inputs.length; i++) {
48     inputs[i].onclick = switchLayer;
49   }
50
51   </script>
52   </body>
53   </html>
```

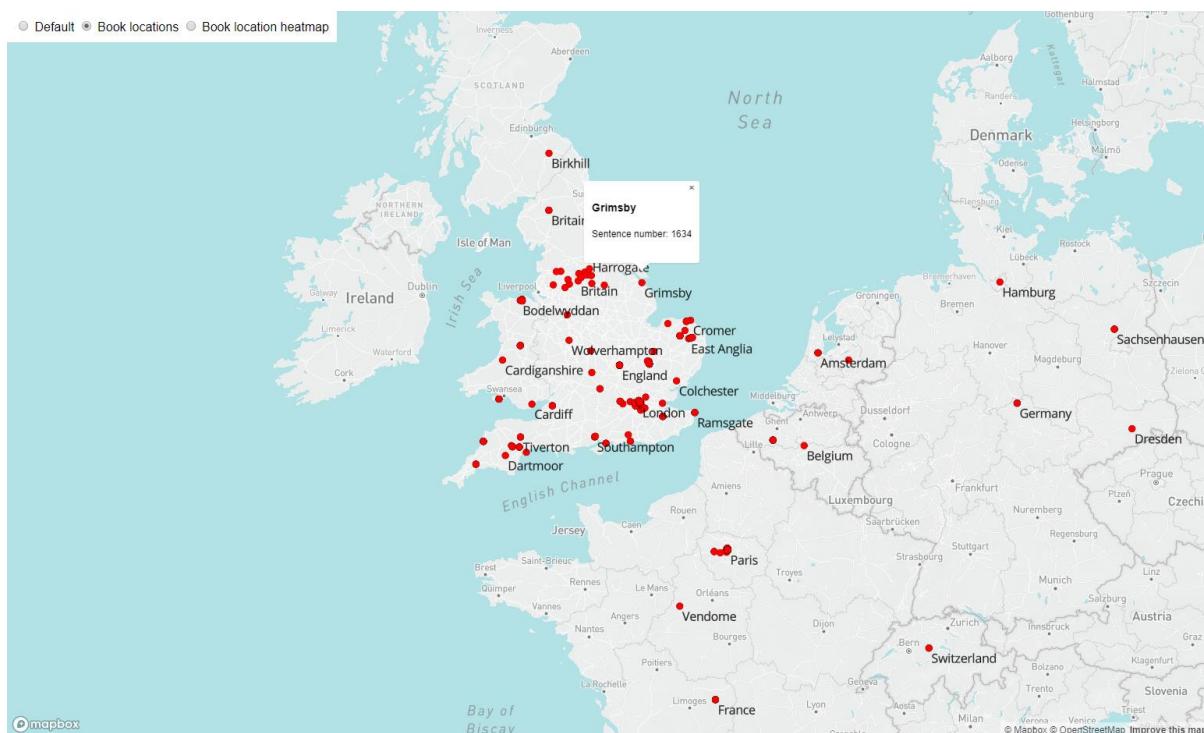
Paste code here

```
// popup code:  
map.on('click', function(e) {  
  var features = map.queryRenderedFeatures(e.point, {  
    layers: ['Book locations'] // replace this with the name of the layer  
  });  
  
  if (!features.length) {  
    return;  
  }  
  
  var feature = features[0];  
  
  var popup = new mapboxgl.Popup({ offset: [0, -15] })  
    .setLngLat(feature.geometry.coordinates)  
    .setHTML('<h3>' + feature.properties.PlaceName + '</h3><p>Sentence number: ' +  
feature.properties.Sentence + '</p>')  
    .setLngLat(feature.geometry.coordinates)  
    .addTo(map);  
});
```

**Note** that the following reference in the HTML code **must** match up with the name of the Layer in your 'Monochrome Workshop' Mapbox style:



4. **Save** your changes to the file and **open** it in Chrome to view the results. When you click on one of the points on the Book locations map you should see a popup showing the name of the location and the sentence number that this location is mentioned in the book:



You have now completed the workshop!

Thank you for attending.

## More Resources:

- Mapbox Studio manual: <https://docs.mapbox.com/studio-manual/overview/>
- Mapbox tutorials: <https://docs.mapbox.com/help/tutorials/>
- Styling Data in Mapbox: <https://docs.mapbox.com/studio-manual/reference/styles/>
- Uploading data to Mapbox: <https://docs.mapbox.com/help/troubleshooting/uploads/>

## Quickstart guides:

- <https://blog.mapbox.com/quickstart-guide-to-mapbox-javascript-api-4b376c68dd46>
- <https://docs.mapbox.com/mapbox-ql-js/example/navigation/>
- <https://docs.mapbox.com/mapbox-ql-js/example/simple-map/>
- <https://docs.mapbox.com/mapbox-ql-js/example/setstyle/>
- <https://docs.mapbox.com/help/tutorials/add-points-pt-1/>
- <https://docs.mapbox.com/help/tutorials/add-points-pt-2/>
- <https://docs.mapbox.com/help/tutorials/add-points-pt-3/>