Practical 2

Learning objectives:

- **To work with a vector base map within a GIS and overlay point data.**
- **To practise using Ordnance Survey mapping data of Great Britain.**
- **To learn how to further manipulate ArcGIS to display maps.**
- **To use the GIS to select features from one layer using information from another.**

Vector Mapping: Symbolising Vector Data.

We will create a map showing the location of settlements and urban areas in the UK. We will practise how to symbolise points lines and polygons and do some simple geo-processing to combine files of the same geometry.

Part 1: Bringing vector data into ArcMap

1. Open a "new map file" by clicking on the Icon in the top left corner of the interface.

You cannot have two map files open at the same time in ArcGIS so if you have still got Practical 1 open it will ask you to save changes and close it. We will need to set the projection for the layer again using the same process as before.

2. Right click on the **Layers** icon at the top of the table of contents then click on the **Properties** item at the bottom.
3. In the data frame properties dialogue box, click on the **Coordinate System** tab and in the Select a Coordinate System part navigate to the **British National Grid** by clicking on the following folders:

`Predefined → Projected Coordinate Systems → National Grids → Europe → British National Grid`

Now you can begin to bring in the vector data to ArcMap.

4. Click on the **Add Data** button on the tool bar:

You should already be connected to the **Intro to Visualising Data** folder so select it from the list.

5. Double click on **Practical 2** to open it.

6. Use **Shift and click** to select the following files then click **Add**:

- `n_coast_polyline.shp`
- `n_settlmnt_point.shp`
- `n_urban_region.shp`
- `s_coast_polyline.shp`
- `s_settlmnt_point.shp`
- `s_urban_region.shp`

This is vector map data in Shape file format. The data is Ordnance Survey Strategi data, available to download from Digimap's Ordnance Survey Collection Data Download service.

You should now see a map of the whole of Great Britain similar to the one shown below:

NOTE: The data appears in two halves, one for the north of the country and one for the south. The data is split into 2 tiles. In the rest of this practical we will look at ways of symbolising and manipulating the data so that the data appears as a single continuous dataset.

At this point it is also a good idea to **save** our map again; do this in the same way as before:

1. Click **File** then **Save as…**
2. Save the file in the same folder as the data: **Intro to Visualising Data.**
3. Replace **Untitled** with a suitable name such as **Practical2.**

Part 2: Merging vector datasets

The first way we are going to get the north and south data to match is to actually **merge** the two halves of each dataset into a new single dataset.

The merge operation will only work on files that have the same geometry type, points with points, lines with lines etc. The process will run very smoothly with these datasets as they have identical attributes.

The merge tool is in **ArcToolbox**, this is a large set of different tools that can be used on the map data. It opens within the ArcMap interface:

1. **Click** on the **ArcToolbox** button.
2. **Click** on the plus next to **Data Management Tools.**
3. **Click** on the plus next to **General.**
4. **Double Click** on **Merge** to open the tool.

5. **Click** on the **Browse button** to find the datasets.
6. **Select** both the **coast_polyline** files; you will need to do this one at a time.
7. Change the **Output Dataset** file name at the far right to be **Full Coastline.shp**

8. The **Field Map** table allows you to set which columns are put in the merged file. We will leave these the unchanged.
9. Click **OK** to start the merge.

A message will appear at the bottom right of your screen when the merge is complete. The new, merged Shapefile will automatically be added to the map.

10. **Close** ArcToolbox by clicking in the **X** at the top right corner.

Now we have the full coastline as a single file we can give it the right symbology which will be consistent across the whole dataset.

11. Clear the **n_coast_polyline** and **s_coast_polyline** layers from the map by unchecking their boxes.
12. Click on the line symbol below **Full Coastline** to open up the **Symbol Selector** dialogue box.

13. Scroll down the list of predefined styles till you find **Coastline** and click on it.
14. Click **OK** to apply the change to the map. You should now have a blue coastline.
15. Save your work and we can then move on to the next section

Part 3: Simple map symbologies

If you aren't doing any analysis with your files and don't need to merge your datasets you can simply make them look the same.

1. Switch the two **urban_region** files back on in the table of contents.

2. Zoom in to the centre of the UK around the Sheffield area.

3. Right-click on the **n_urban_region** file in the table of contents and click on **Properties…**

4. Switch to the **Symbology** tab

5. We are going to do a simple edit to these polygons but it is good to know where the Symbology tab is as we will be using it again a lot more.

6. Click on the coloured square in the **Symbol** area of the tab.

You will now see the symbol selector that we used for the coastline.

7. Set the **Fill Color** to **gray 20%** and the **Outline Color** to **No Color**.

8. Click **OK** on the **Symbol Selector** and **Apply** and **OK** on the **Layer Properties**. The map should update to reflect the changes.

9. Repeat this process for the **s_urban_region**. You won't be able to see the division between the two tiles anymore.

10. Save your work and we can then move on to the next section

Part 4: Importing map symbologies

There are other ways you can change the symbology of a layer. We are now going to import a set of symbology rules using an AVL file. AVL files are an old format from the early days of ESRI GIS software; however they still work and are still readily available.

There are AVL and their new replacement LYR files available for some Ordnance Survey datasets in the Digimap help pages.

1. Switch on both the **sttlmnts_point** files in the table of contents.
2. Right click on the **n_sttlmnts_point** file and click on **Properties.**
3. Select the **Symbology** tab.
4. Click on the **Import** button.

5. Select **Import symbology definition from an ArcView 3 legend file (.avl).**
6. Click on the **Browse** button and navigate to the **Practical 2** folder.

7. Select **n_sttlmnts_point.avl** file then click **Open**.

8. Click **OK** on the **Import Symbology** box.

9. A new dialogue box called Import Symbology Matching Dialog will open. Make sure that the **Value Field** matches the drop down list, they should both say **LEGEND**, then click **OK**.

10. Click **Apply** and **OK** on the **Layer Properties** window.

You can see in the table of contents that the cities are now marked by yellow squares. These squares vary in size depending on the status of the settlement, largest for city and smallest for village.

16. Save your work and we can then move on to the next section.

Part 5: Symbologies based on categories

As we saw when we imported the symbology in the previous section you can change a symbol used for a feature based upon one of its attributes. We can now recreate the symbolisation from the AVL file based on the settlement status.

1. Right-click on the **s_sttlmnts_point** layer and click on **Properties…**

2. Select the **Symbology** tab.

3. Where the tab has **Features… Single Symbol** change this to **Categories… Unique Values.**

4. Change the value field to **LEGEND.**

5. Click **Add All Values**, you may have to wait a moment while it checks all the records. You should end up with the same three categories as we imported before.

6. Uncheck the **<all other values>** box at the top of the list, where you would select the symbol for features with a null value.

7. Double-click on the point in the **Symbol** column for the **City Attribute Point** to open the **Symbol Selector**.

8. Change the **Symbol** to **Square 2**, the **size** to **11** and the **Color** to **Solar Yellow**.

9. Repeat this process for the **Town** and **Village Attribute Points** but decrease the **Size** to **9** and then **6**.

You can now see that the symbols on the map look the same for both the north and south settlement points. The only difference in the **Table of Contents** is that there is the heading **LEGEND** for the south points.

You can go back into the **Symbology** tab on the **Layer Properties** window to change the **Labels** of entries in the **Table of Contents**. Here we can tidy up what appears in the table of contents; this will also help later when we come to make a legend for a printable map.

10. Right-click on the **s_sttlmnts_point** layer and click on **Properties.**

11. Select the **Symbology** tab.

12. Click on the word **LEGEND** in the Label column and Delete it.

13. Click on the entries on the label column and remove the words **Attribute Point** to make the Table of Contents tidier.

14. Use the arrows reorder the entries to have **City** at the top and **Village** at the bottom.

15. Save your work and then move on to the next section

This is the end of the basic exercises,

there is one further part if you have time.

Part 6: Further categories to symbolise by.

1. Open a "**new map file**" by clicking on the Icon in the top left corner of the interface.

2. Click on the **Add Data** icon on the tool bar: and add the **Glasgow_Deprivation_Scores.shp** file from the **Practical 2** Folder.

3. **Right-click** on the file in the **Table of Contents** and click **Open Attribute Table.**

4. You can see that each polygon has the following attributes:

   a. **NAME:** This is the Postcode Sector e.g. G66 7.

   b. **POP:** Population from the 2001 census.

   c. **CSCORE:** Carstairs Deprivation score based on factors such as car ownership, distance to amenities, employment rate etc.

   d. **DEPCAT:** The Deprivation values placed into one of 7 categories.

   e. **AREA:** The area of the Postcode Sector in square kilometres.

You can now try out the following examples of different ways to symbolise the map.

Deprivation Map

Here we will use the deprivation categories and a colour ramp to create a heat map of deprivation in Glasgow.

1. Right click on the layer in the **Table of Contents** and open the **Symbology tab**

2. Click **Categories… Unique values** at the top left of the tab.
3. Select the **Value Field** as **DEPCAT.**
4. Click the **Add All Values** button.
5. Pick the yellow to purple **Colour Ramp**.

Population Map

Here we will colour the Postcode Sectors based on their population.

1. Right click on the layer in the **Table of Contents** and open the **Symbology tab.**

2. Click **Quantities… Graduated Colors** at the top left of the tab.

3. Select **POP** as your value field, and increase the number of classes to 10 in the **Classification** section.

4. By default ArcMap uses **Natural Breaks (Jenks)** to define the classes, click on the **Classify** button to look at other options. We find the **Equal Interval** option is best for straight forward values such as these.

Population Density Map

Here we will change the previous map to show population density rather than population.

1. Go back to the Symbology tab and click the **Normalization** drop-down arrow and select the **AREA** field to normalize the data.

ArcMap divides the **Population** field by the **Area** to create a density ratio.

2. Set the Classification to **Natural Breaks (Jenks)** with at least **10 Classes**.
3. The final map shows the values are now people per kilometre squared rather than just the number of people.

NOTE: This method produces a simple density map based on the populations of the postcode sectors. ArcGIS can be used to produce density surface maps based on point data but you would first need to know which methodology you are going to use to produce the map as this greatly affects the result. There is an online course on the ESRI Virtual Campus called **Performing Spatial Interpolation Using ArcGIS 10** which will teach you the different methods.

You have now completed the second practical!

Save your work and we can then move on to Practical 3