2

Map design

In this chapter, you'll learn all the steps necessary to symbolize common types of maps. Most analytical maps convey information with polygons or points using either qualitative or numeric attributes. Sometimes, but less often, lines are the primary interest. For polygons, symbolization mostly uses color fill and boundary lines. For points, it's the size, shape, color fill, and boundary lines of point markers. For lines, it's the type of line (for example, solid or dashed), width, and color. Symbolization is easy to implement because ArcMap uses attribute values to automate drawing; for example, it can draw all food pantry facilities in a city with a black square point marker of a certain size and all soup kitchen facilities with a black circle of a certain size by using an attribute with a type of facility code values.

Learning objectives

- Symbolize maps using qualitative attributes
- Symbolize maps using quantitative attributes
- Create custom numeric classes
- Create normalized and density maps
- Create dot density maps
- Create fishnet maps
- Create group layers

TUTORIAL 2-1

Creating point and polygon maps using qualitative attributes

Placing objects of all kinds into meaningful classes or categories is a major goal of science. Classification in tabular data is accomplished using attributes with codes that have mutually exclusive and exhaustive qualitative values. For example, a code for size could have the values low, medium, and high. Any instance of the features with this code is displayed in only one of the classes (the values are mutually exclusive) and there are no more size classes (the values are exhaustive). In this tutorial, you learn how to symbolize mapped features—points, lines, and polygons—by class membership as available in code attributes.

Start ArcMap and open a map document

1. **On the taskbar, click Start > ArcGIS > ArcMap 10.8.x.**
2. **Open Tutorial2-1.mxd from the Maps folder.** ArcMap opens a map with no layers added. You add the needed layers next.
3. **Save the map document to the Chapter2 folder of MyExercises.**

Add and display polygons using a single symbol

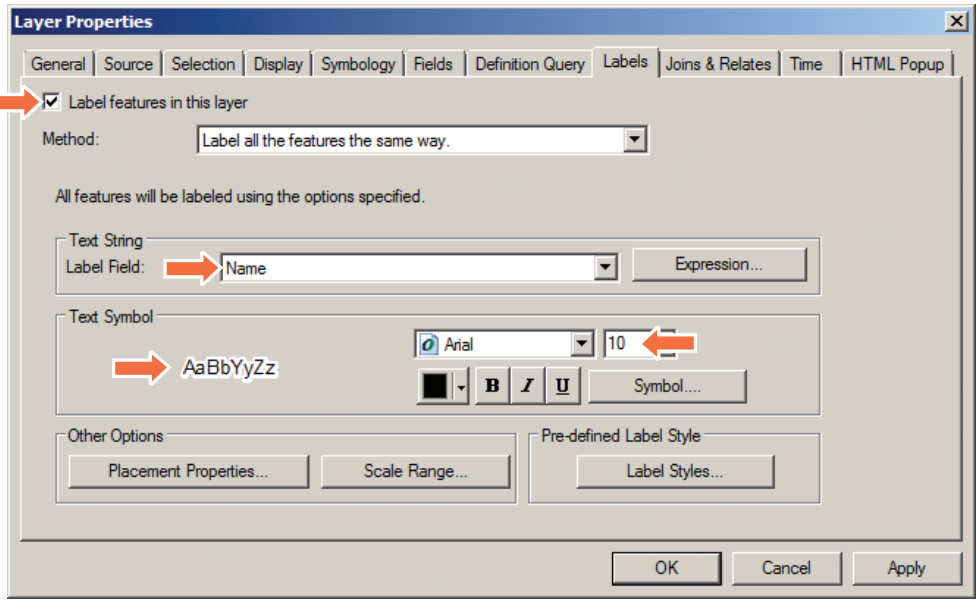
The first layer of your map is an outline of New York City neighborhoods used as a reference layer.

1. **Click the Add Data button, browse through the Data folder to NYC.gdb, and click Neighborhoods > Add.** ArcMap draws the neighborhoods for New York City as filled polygons.
2. **In the Table Of Contents window, click the polygon symbol and select Hollow symbol, type an outline width of 1.15, and select an outline color of Black. Click OK.**
3. **In the Table Of Contents window, right-click the Neighborhoods layer, click Properties, and click the Labels tab.**
4. **Click the *Label features in this layer* check box. For Label Field, select Name, and select 10 as the Text Symbol size.**

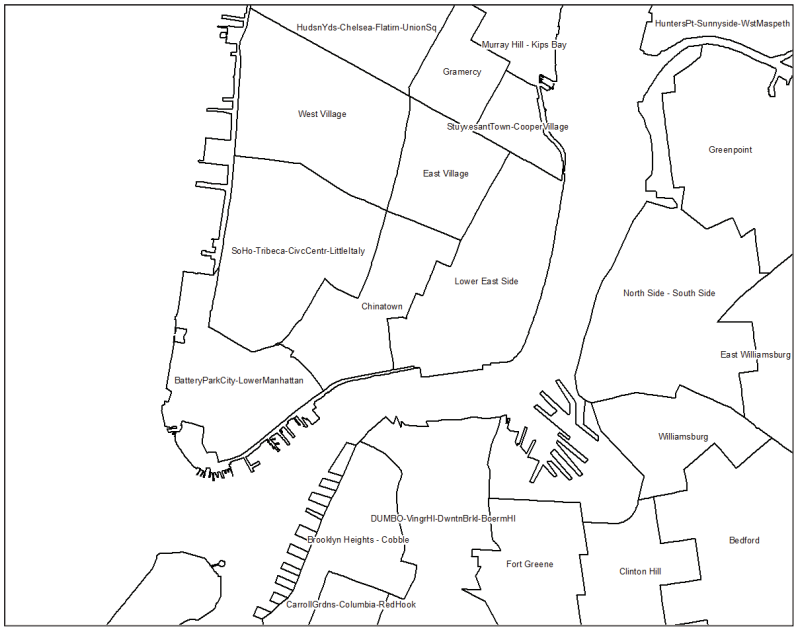
Next, you add a white halo to the label to make the labels stand out and be more legible.

5. **Click the Symbol button > Edit Symbol button > Mask tab > Halo option button.**

6 **Type** 1.5 **for Size and click OK > OK > OK.**



7 **Click Bookmarks > Lower Manhattan.** ArcMap zooms to this neighborhood and a few neighborhoods in the surrounding boroughs.



Note: The font size 10 labels for neighborhoods may appear larger or smaller than those shown on the book's map. If you'd like to change the size of labels for your window, use the steps in this section. Likewise, you can change the font size for labels in the Your Turn assignment, which is next.

YOUR TURN

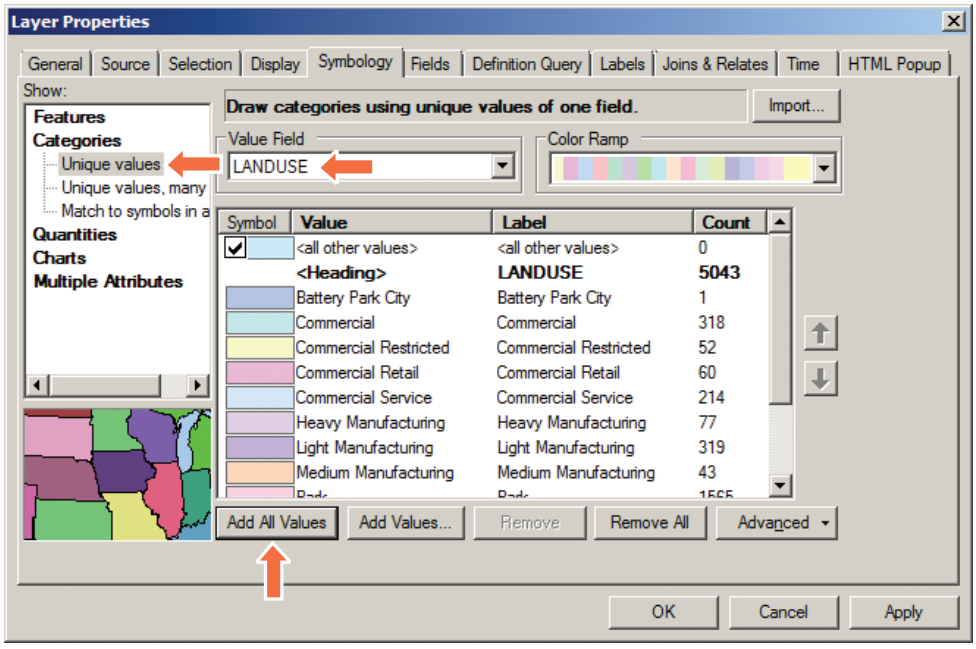
Add the Water feature class from NYC.gdb with a blue symbol and no outline. Label the layer using the field LANDNAME with Times New Roman, Bold, and Italic font of size 12. Drag this layer below Neighborhoods. The two layers you added are from different sources, so the boundaries do not match perfectly. Note: When labeling the Water feature class, you'll see that some labels are repeated. You can get just one label to appear by clicking the Placement Properties button at the lower left of the Labels tab and selecting Remove duplicate labels.

Add and display polygons using unique symbols

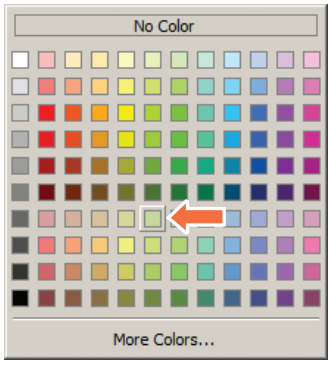
The next layer you add has zoning polygons with various classes of land use. Zoning restricts land use to approved kinds; for example, areas zoned as residential cannot have businesses located within them.

1. **Click the Add Data button, browse through the Data folder to NYC.gdb, and click ZoningLandUse > Add.**
2. **After adding the ZoningLandUse layer, drag it below the Neighborhoods layer in the table of contents.**
3. **In the Table Of Contents window, right-click the ZoningLandUse layer and click Properties > Symbology tab.**
4. **In the Show panel, click Categories > Unique Values.**
5. **Under Value Field, click LANDUSE and click Add All Values.**

ArcMap assigns colors unique to each land use. Next, you'll assign colors that are commonly used in zoning maps.



6 **Double-click the symbol next to Battery Park City, click Fill Color, and choose Apple Dust (column 6, row 7 of the color palette) for the color and Gray 30% as the outline color. Click OK.**



7 **Assign a Gray 30% outline to the remaining symbols using the following colors (with column number, row number of the color palette included in parentheses).** You can change all the outline colors by multiple selection (pressing and holding the Shift key), right-clicking, and choosing Properties for Selected Symbol(s).

- Commercial, Rose Quartz (2,1)
- Commercial Restricted, Medium Coral (2,8)
- Commercial Retail, Tulip Pink (2,9)
- Commercial Service, Rose Dust (2,7)
- Heavy Manufacturing, Blackberry (11,10)
- Light Manufacturing, Lepidolite Lilac (11,1)
- Medium Manufacturing, Lilac Dust (11,7)

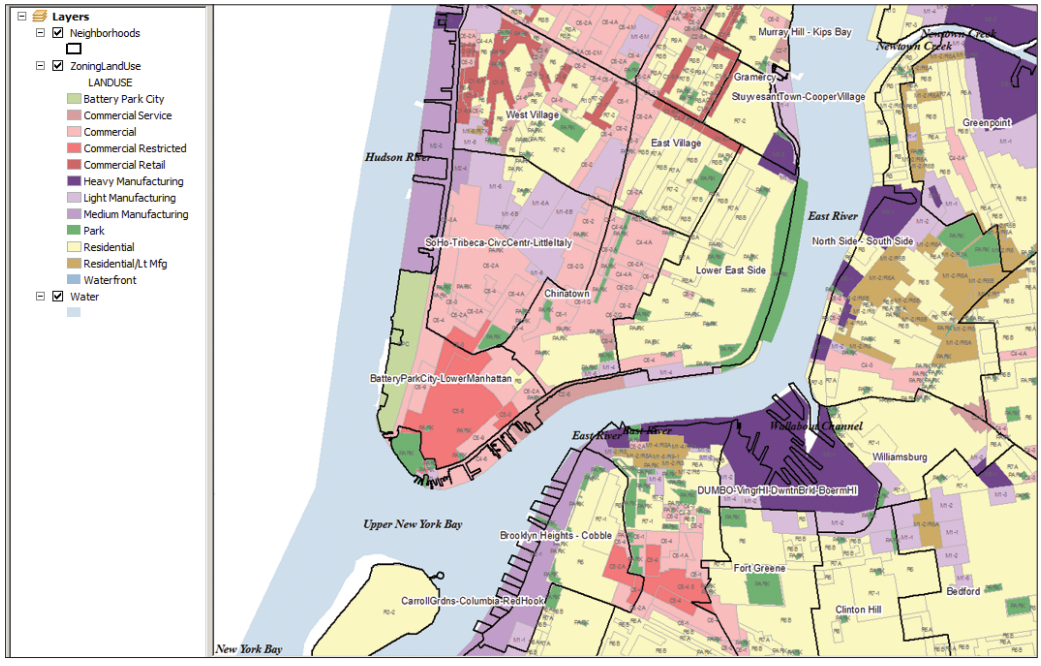
- Park, Medium Apple (7,3)
- Residential, Yucca Yellow (5,1)
- Residential/Lt Mfg, Light Sienna (4,9)
- Waterfront, Blue Gray Dust (9,7)

8 **Click Apply > OK.**

Label zoning features

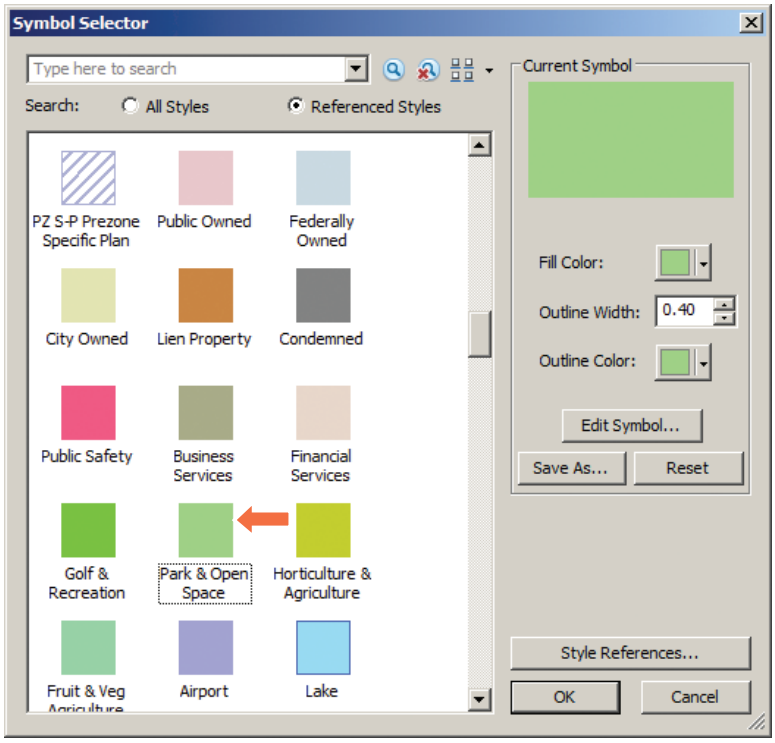
1 **In the Table Of Contents window, right-click the ZoningLandUse layer and click Properties > Labels tab.**

2 **Click Label features in this layer, select ZONE as the Label field, select 6 as the Text Symbol size, select Gray 60% as the color, and click OK.** The result is a subtle label for zoning details.



YOUR TURN

ArcMap has predefined symbols for some zoning and land-use features. To view these, double-click the Park symbol > Style References > Civic > OK. Scroll through the Civic polygon symbols and choose Park & Open Space. When finished, deselect Civic under Style References.



Add points and create a definition query

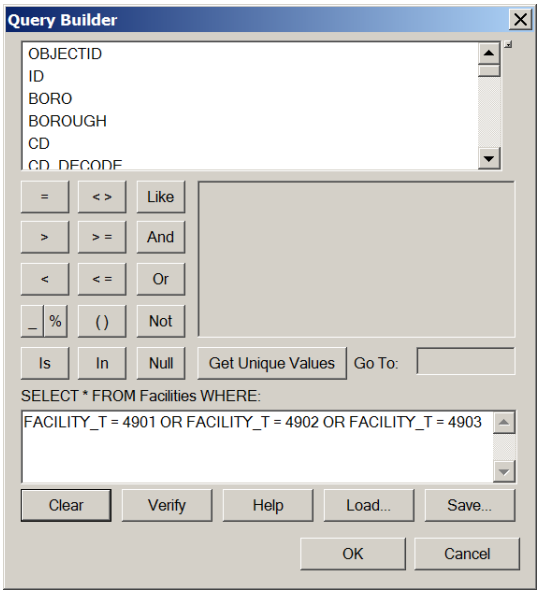
Often a map layer has more classes of features than you want to display. In this case, you can use a definition query to select the desired subset from the larger collection. Below, you add a new layer to your map document: Facilities, which has various government and nonprofit facilities that provide services. Only three classes out of over 100 are needed for the map. Classes have both a numeric code (Facility_T) and a corresponding text code (Facttype__1), and the three needed facility classes are 4901 = Soup Kitchen, 4902 = Food Pantry, and 4903 = Joint Soup Kitchen and Food Pantry. While in common language, you use *and* to connect members of a collection, such as the three food facility types, in a query you must use *or*.

1. **Click the Add Data button, browse through the Data folder to NYC.gdb, and click Facilities > Add.**
2. **In the Table Of Contents window, right-click the Facilities layer and click Properties > Definition Query tab.**
3. **Click the Query Builder button.**
4. **In the Query Builder window, double-click FACILITY_T.**
5. **Click = as the logical operator.**
6. **Click Get Unique Values.** The resulting list has all unique values in the FACILITY_T attribute.

7 **In the Unique Values list, double-click 4901.**

8 **Click Or, double-click FACILITY_T, click = as the logical operator, and double-click 4902.**

9 **Repeat step 8, except use 4903 instead of 4902.** The completed query, FACILITY_T = 4901 OR FACILITY_T = 4902 OR FACILITY_T = 4903, yields a layer with only food type facilities. If your query has an error, edit it in the lower panel of the Query Builder, or click Clear and repeat steps 4 through 8.



10 **Click OK > OK to execute your query and close the Layer Properties window.**

Display points using unique symbols

Next you symbolize food facilities using unique symbols.

1 **In the Table Of Contents window, right-click the Facilities layer and click Properties > Symbology tab.**

2 **In the Show panel, click Categories > Unique Values.**

3 **Click Factype__1 as the Value field and click Add All Values.**

ArcMap assigns random unique symbols for each food facility type. Next, you assign three specific unique symbols.

4 **Double-click the symbol next to Food Pantry and select Esri symbol Square 1 and size 12. Click OK.**

5 **Double-click the symbol next to Joint Soup Kitchen and Food Pantry and select Esri symbol Cross 2, size 12. Click OK.**

6 **Double-click the symbol next to Soup Kitchen and select Esri symbol Circle 1, size 12. Click OK.**

7 **Clear the check box next to <all other values> and click OK.**