EnvSci 360 – Computer and Analytical Cartography

Lecture 8

Cartographic Representations and Other Advanced Symbology Techniques

Storing Symbology

* In an **MXD**   Exercise1.mxd
  – Only lives in the map document
* In a **Layer File**   LandUse.lyr
  – May be shared among users and MXDs

Both store pointers to data sources (either with relative or full paths)

Map and Layer Packages

✳ Map packages (.mpk)

– Contains a map document (.mxd) and the data referenced by the layers it contains, packaged into one file.

http://desktop.arcgis.com/en/arcmap/latest/map/working-with-arcmap/creating-a-map-package.htm

✳ Layer package (.lpk)

– Includes both the layer properties (the .lyr) and the dataset referenced by the layer.

http://desktop.arcgis.com/en/arcmap/latest/map/working-with-arcmap/creating-a-layer-package.htm

ArcPublisher/ArcReader

* **ArcPublisher**: Extension to ArcGIS that allows a map (all layers with their symbology, labels, queries, full layout, etc.) to be "published" as PMF

* **ArcReader**: Free software to read PMFs
  – Similar in concept to Adobe PDF files read in free Acrobat Reader

* You can package data with PMF or point to local, network, or Web data sources

See http://www.esri.com/software/arcgis/arcreader/

Storing Symbology

Cartographic Representations

– Stored <u>with</u> the feature geometry <u>inside</u> geodatabase feature classes

- Column(s) added to feature class attribute tables

- A feature class can have more than one representation associated with it, allowing the same data to be displayed uniquely on different maps for different purposes

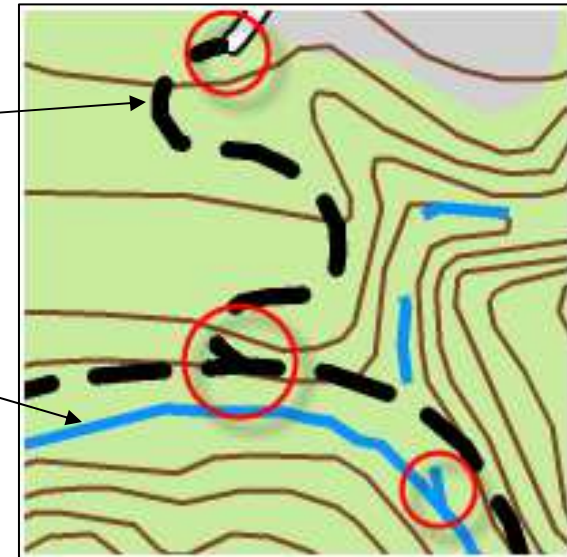http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/what-are-representations-.htm

Why Use Representations?

✳ **Improve the display of features in ArcMap for cartography, based on rules**
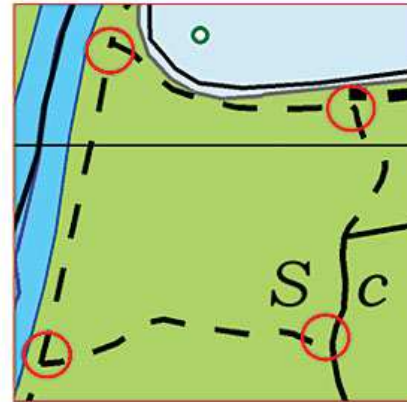
Trails, roads, and rivers

Conventional symbology

Representation symbology

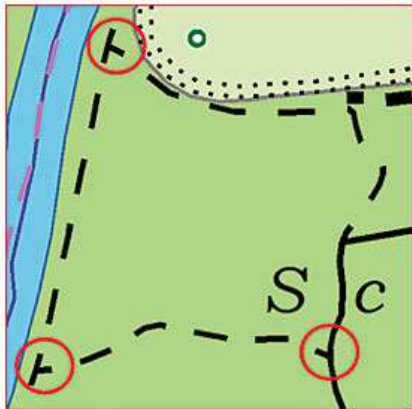# *Why Use Representations?*
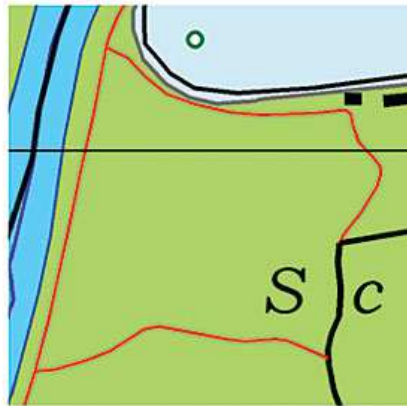
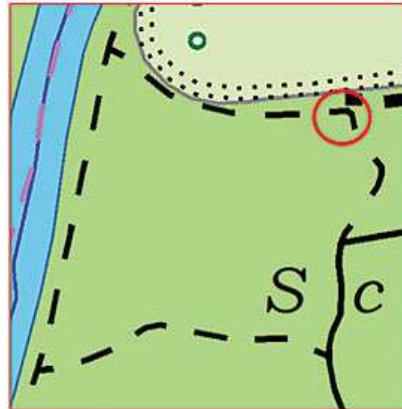
Stage 1 – Linear Features

(Tracks)

Stage 2 – GIS Dash Symbol

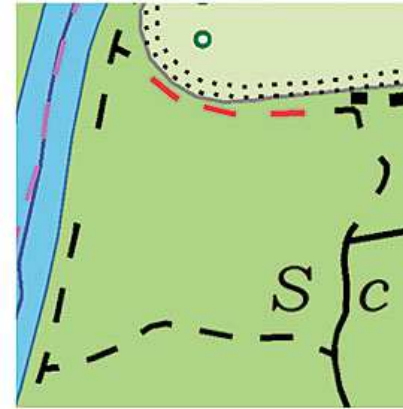(Bad joins and bends)

Example: *Converting existing symbology*

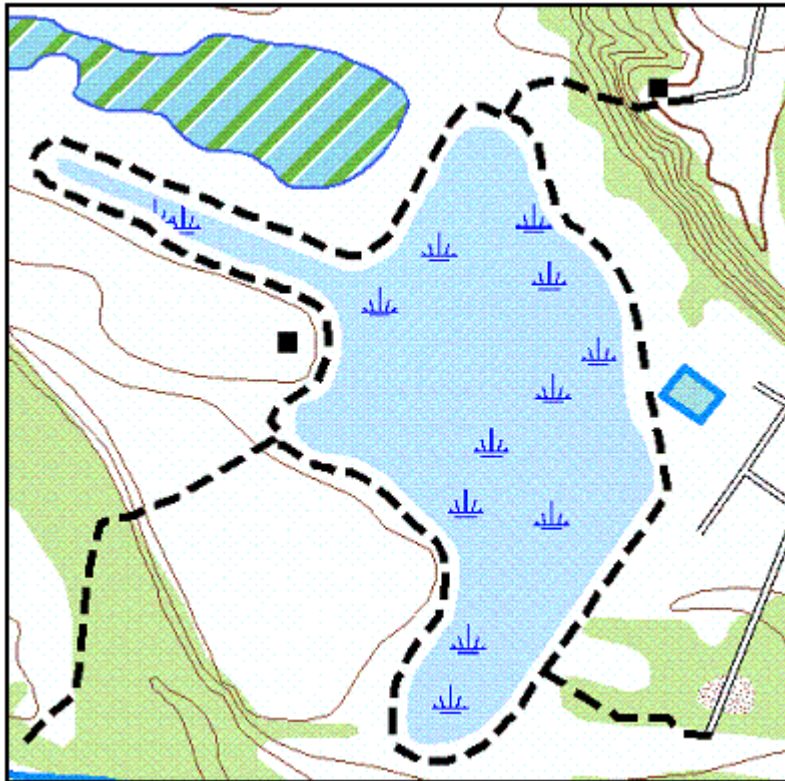Stage 3 – Automatic Representation

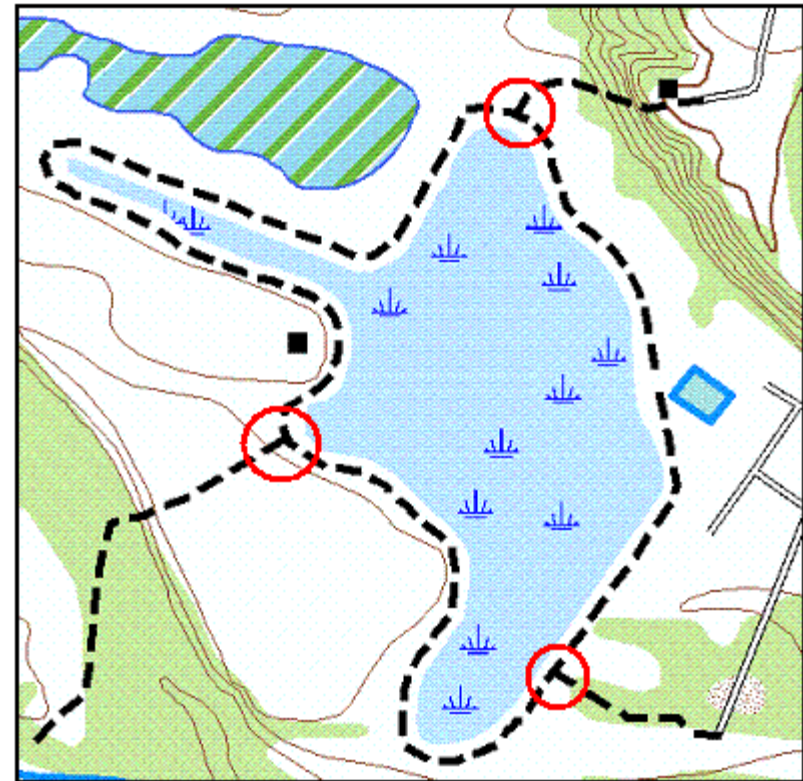Stage 4 – Graphic Override

Stage 5 – Free Representation

Why Use Representations?

Example: *Converting existing symbology*

Line features in a feature class drawn with a default dashed line symbol

Line features in a feature class representation drawn with a stroke symbol layer and a dash geometric effect
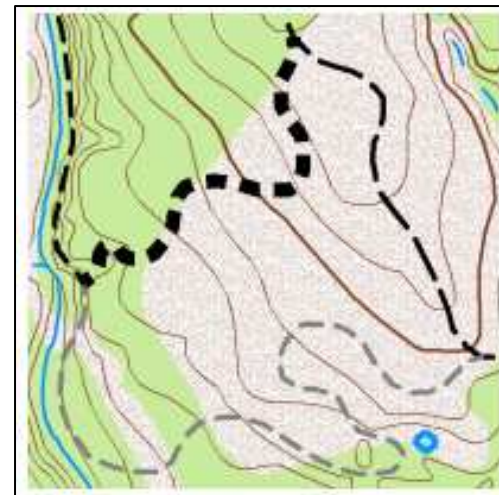
Why Use Representations?

* **Customize the display of individual features within a feature class (rule overrides)**
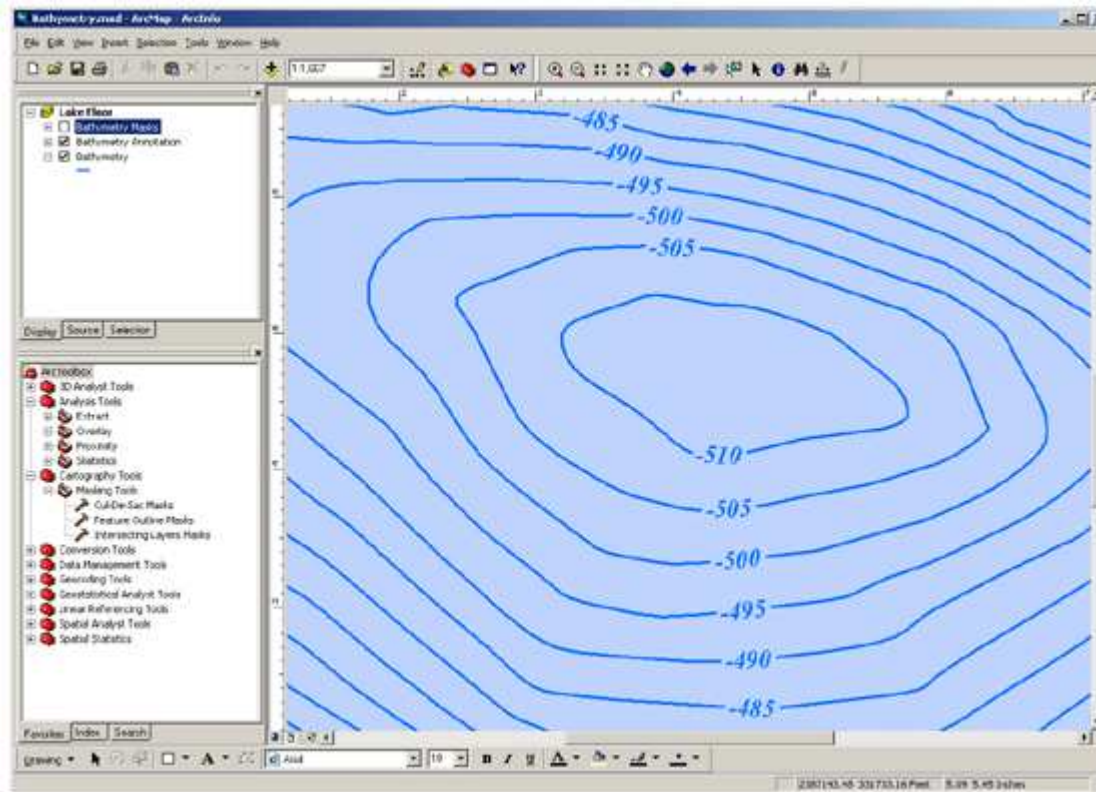

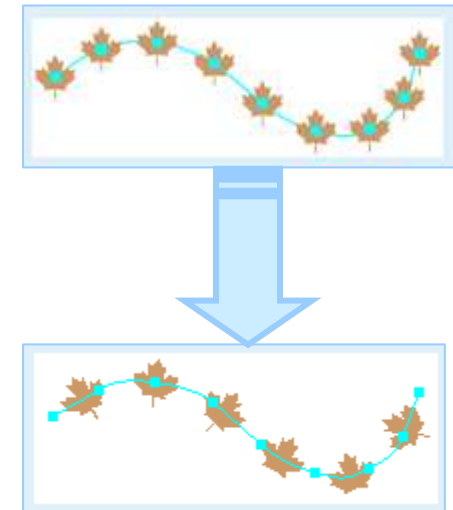Trail line features symbolized with a dashed stroke representation rule

Stroke weight and color overridden to emphasize different trail types

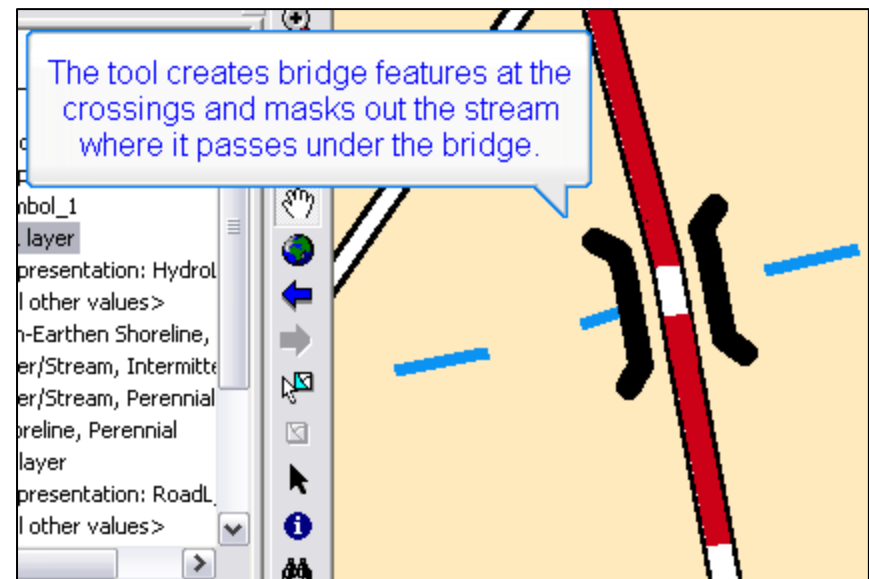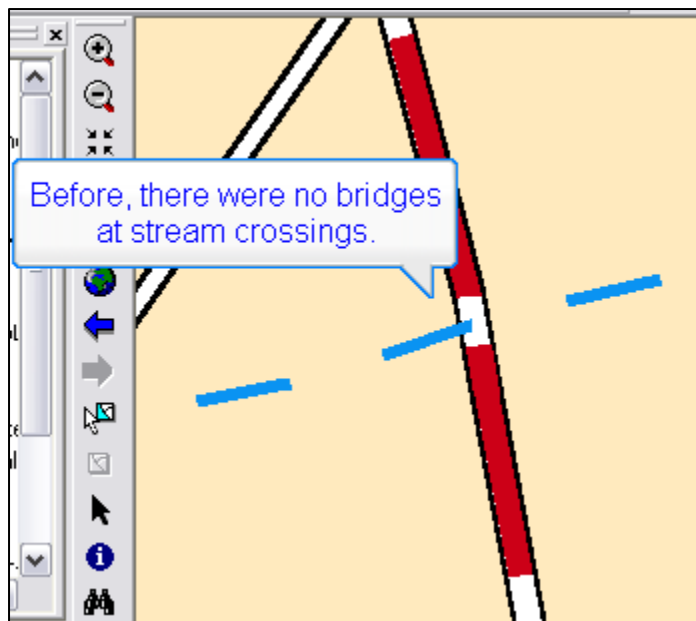# *Why Use Representations?*

✸ **Feature masking for labels**

✸ **Orientation of marker symbols**

Why Use Representations?

✳ **Creating overpasses**

For more, see: http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/frequently-asked-questions-about-representation.htm and http://desktop.arcgis.com/en/arcmap/latest/map/main/mapping-and-visualization-in-arcgis-for-desktop.htm
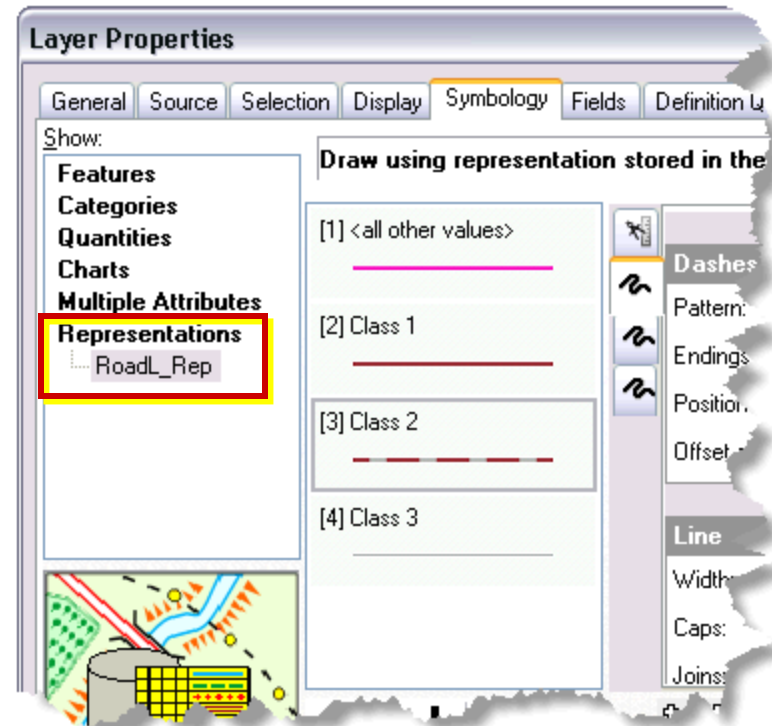
Creating Representations

✳ Symbolize the data in ArcMap, then right-click the feature class in the table of contents and choose 'Convert Symbology to Representation…'

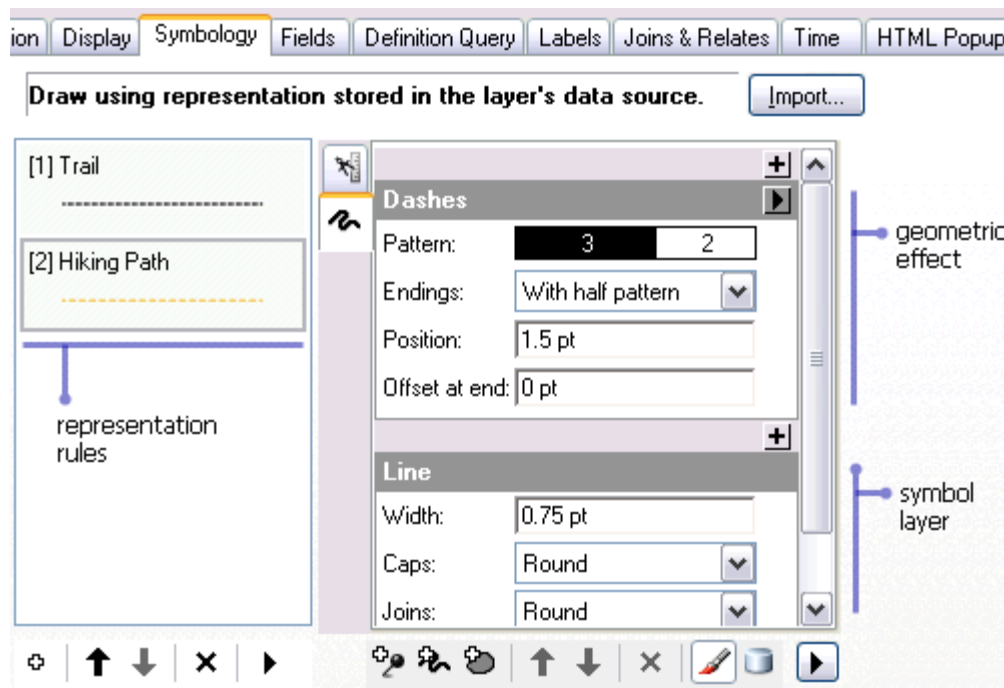– Must use ArcEditor or ArcInfo license
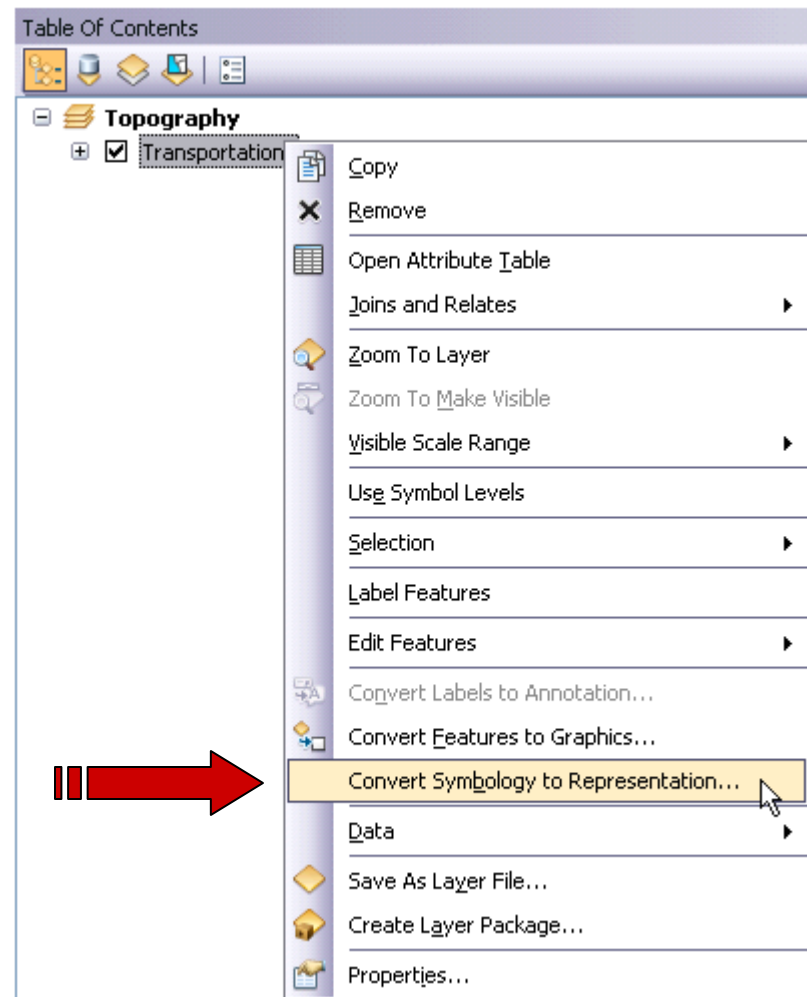
Using Representations

* The Symbology tab on the Layer Properties dialog box will show a 'Representations' heading in the left column if at least one representation is present.

* Choose a representation from this column to use to draw the features. Modify the properties of the rules if desired.
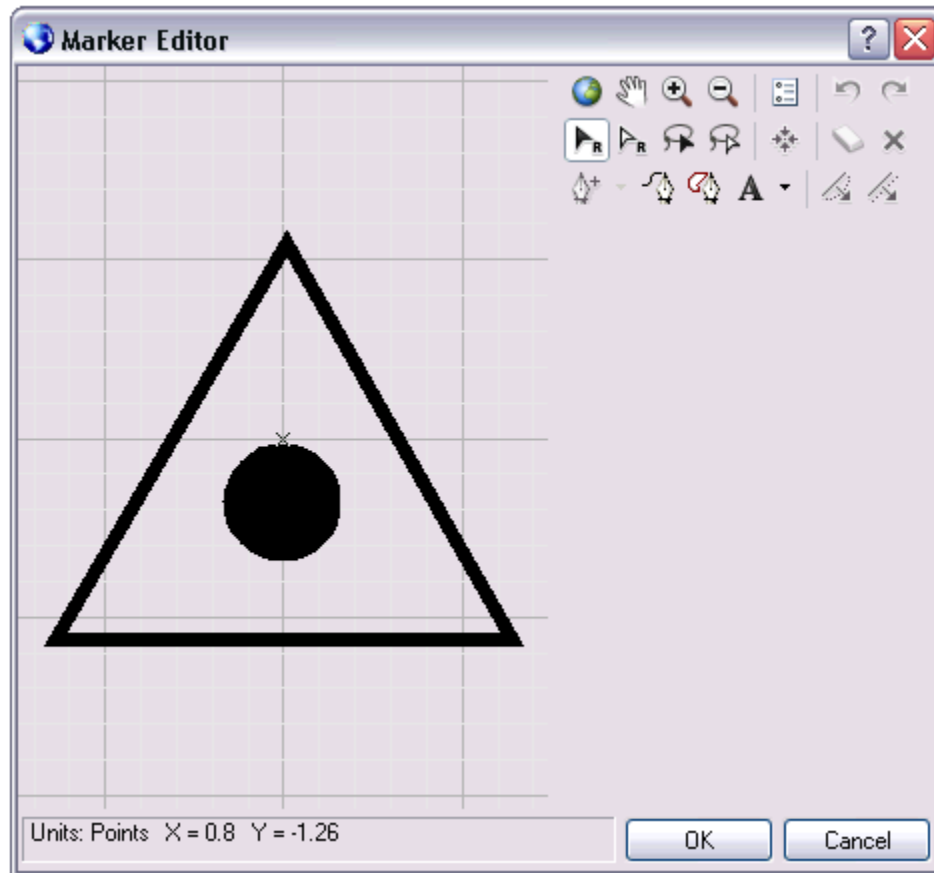
Working With Representations

✳ See "A quick tour of representations" in the ArcGIS Desktop Help

  – **http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/a-quick-tour-of-cartographic-representations.htm**
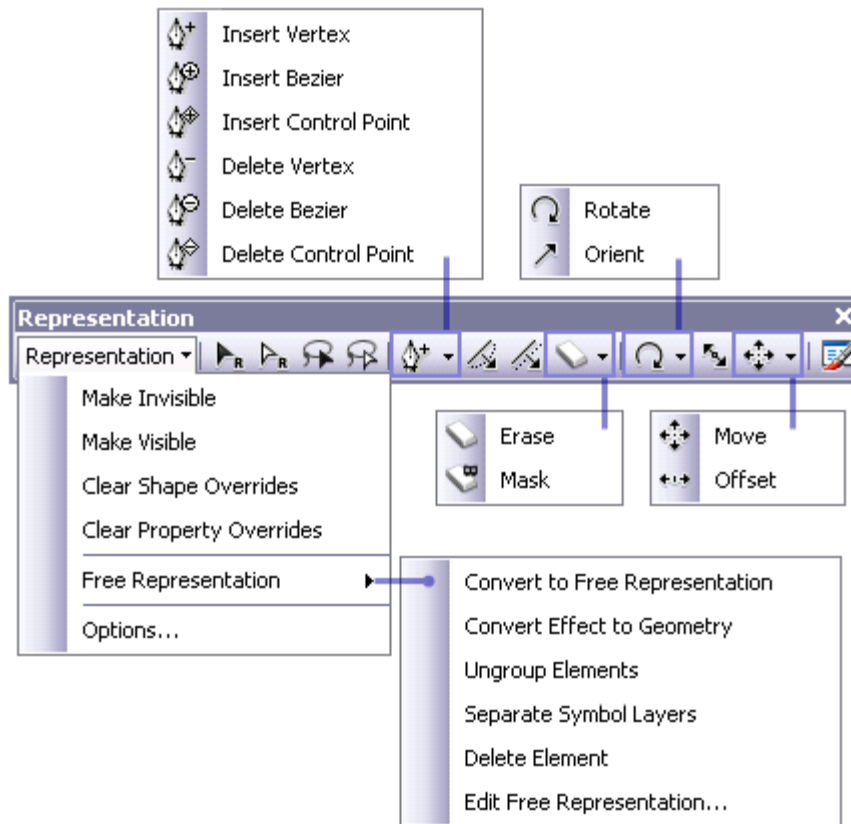

Modify rules to adjust symbol layer properties, add geometric effects, and modify marker placement styles

Working With Representations

Use the Marker Editor dialog box to modify representation markers

Working With Representations

Use the Representation Toolbar to create and modify overrides (exceptions made to a representation rule on individual features)

A free representation has its own representation rule not associated with any other feature, allowing full customization and control over appearance.

Also See...

* ArcNews article "Putting the "Art" Back into Cartography"
  - **http://www.esri.com/news/arcnews/winter0506articles/putting-the-art.html**
* Other Representation Help topics, including the Tutorial
* Cartography Tools Toolbox

  – Some require Advanced license, not Standard

  http://desktop.arcgis.com/en/arcmap/latest/tools/cartography-toolbox/cartography-toolbox-license.htm
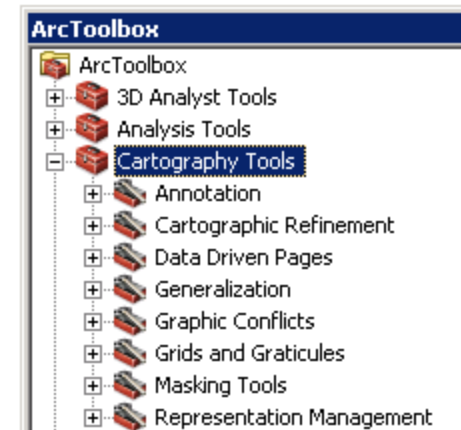
Generalization

* Processes that refine features for display at smaller scales or to improve aesthetic or cartographic quality
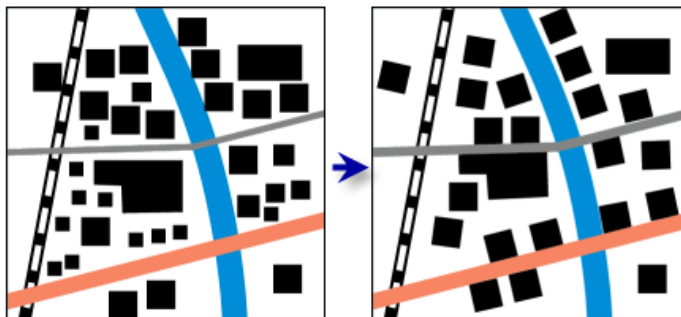 - Simplify, smooth, thin, aggregate, collapse, merge, delineate

http://desktop.arcgis.com/en/arcmap/latest/tools/cartography-toolbox/an-overview-of-the-generalization-toolset.htm

Generalization
- Aggregate Points
- Aggregate Polygons
- Collapse Dual Lines To Centerline
- Collapse Road Detail
- Create Cartographic Partitions
- Delineate Built-Up Areas
- Merge Divided Roads
- Simplify Building
- Simplify Line
- Simplify Polygon
- Smooth Line
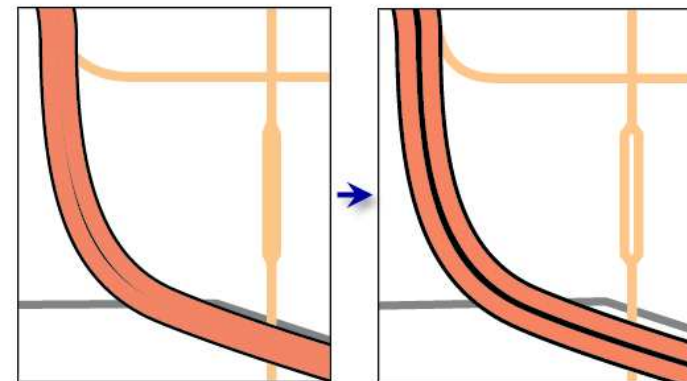- Smooth Polygon
- Thin Road Network

Graphic Conflicts Tools

✳ Detect and resolve graphic conflicts among symbolized features

Graphic Conflicts
- Detect Graphic Conflict
- Propagate Displacement
- Resolve Building Conflicts
- Resolve Road Conflicts

Resolve Building Conflicts

Resolve Road Conflicts

http://desktop.arcgis.com/en/arcmap/latest/tools/
cartography-toolbox/an-overview-of-the-graphic-
conflicts-toolset.htm

Style Manager

✳ **Organize styles and their contents (symbols and map elements). You can cut, copy, paste, rename, and modify any style contents, and you can create new styles, symbols, and map elements.**
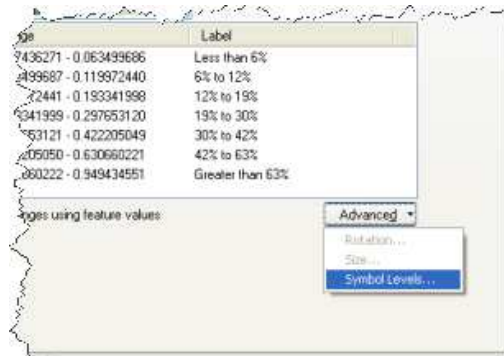
From Customize menu in ArcMap

http://desktop.arcgis.com/en/arcmap/latest/map/styles-and-symbols/managing-style-contents.htm
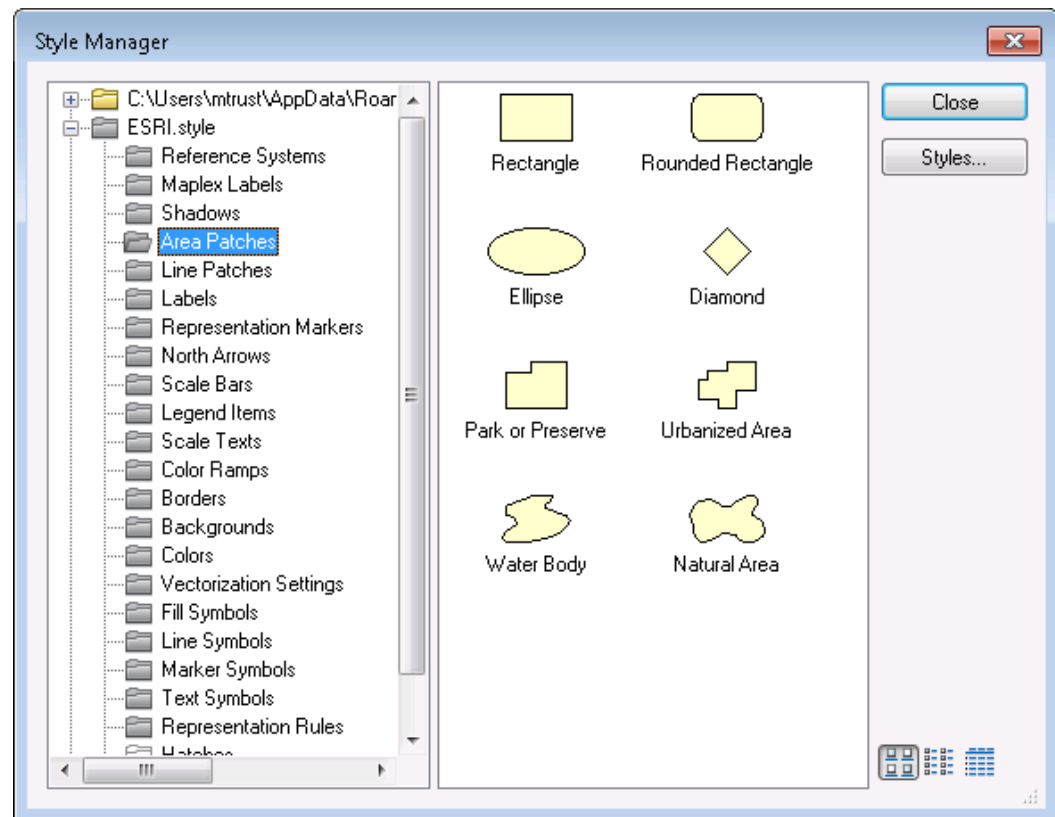
Symbol Levels

* Not part of Representations
* May be used with any vector data symbology
* Use with any license level

Without using advanced symbolization
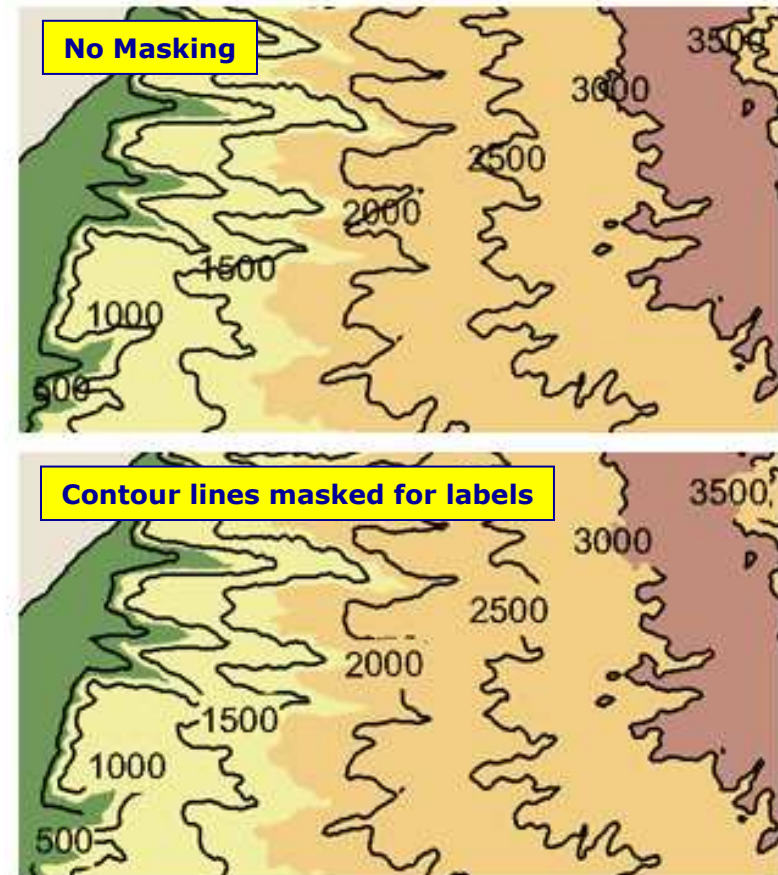
Using Symbol Level Drawing

Symbol Levels

✳ Polygon example – Dissolve to merge adjacent polygons that share common values

http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/dissolving-polygon-boundaries-using-symbol-level-drawing.htm
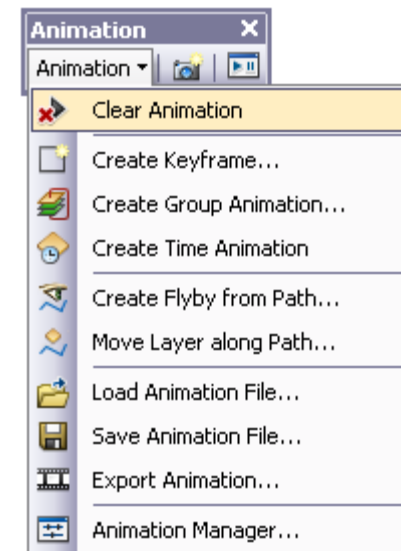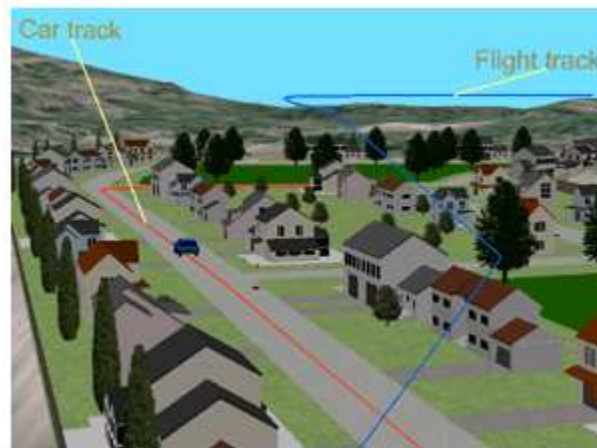
Masking

* Not part of Representations

* A drawing technique used to hide parts of layers that are drawn underneath symbols and annotation

* Requires Advanced license level

No Masking

Contour lines masked for labels

http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/using-masking.htm

Animation

✳ Visualize changes through time or along a path
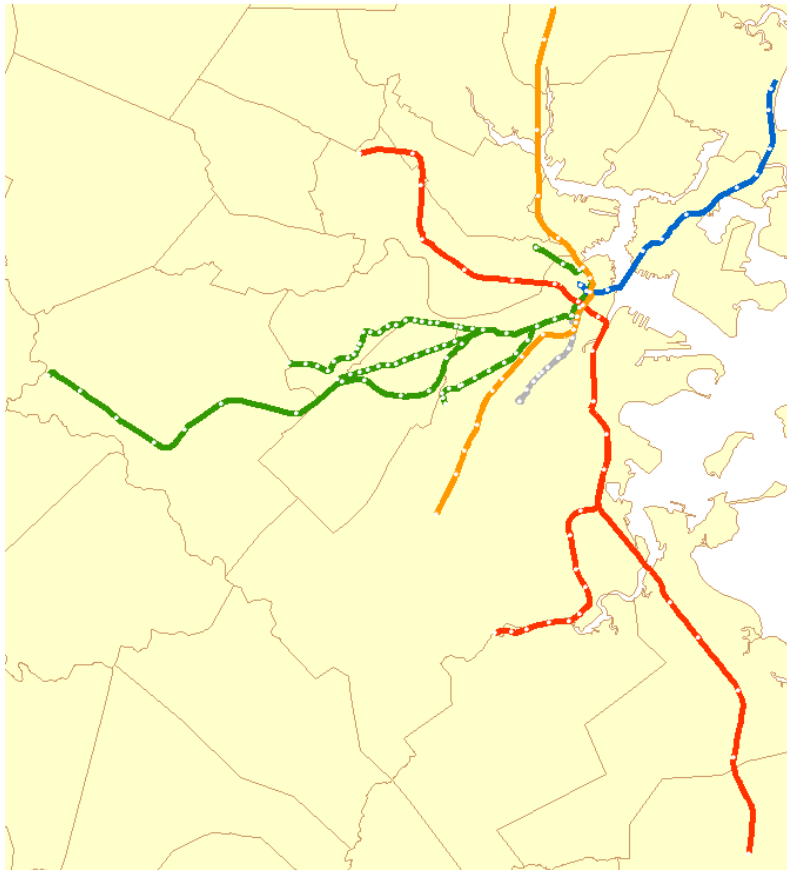 – 2-D: ArcMap
  – 3-D: ArcScene, ArcGlobe

http://desktop.arcgis.com/en/arcmap/latest/map/animation/what-is-an-animation.htm
https://www.youtube.com/watch?v=2gF8cujoOic
https://www.youtube.com/watch?v=tGOTmgthQxE
https://www.youtube.com/watch?v=qQaj233WAa0
https://www.youtube.com/watch?v=4EWzymZ6qD0

Cartograms

* Maps on which the geographic features are distorted (shape, area, distance, location) in the interests of a specific objective

  – To reveal patterns or promote legibility

  – Examples:

    • The size of a geographical area is drawn proportionately to the value of the data it contains (Good example: **election maps** – see http://www-personal.umich.edu/~mejn/election/2016/).

    • Linear cartogram of **subway system** map.

Cartograms

Real geometry of data

Data as a cartogram

Cartograms

Regional map of UK – real geography

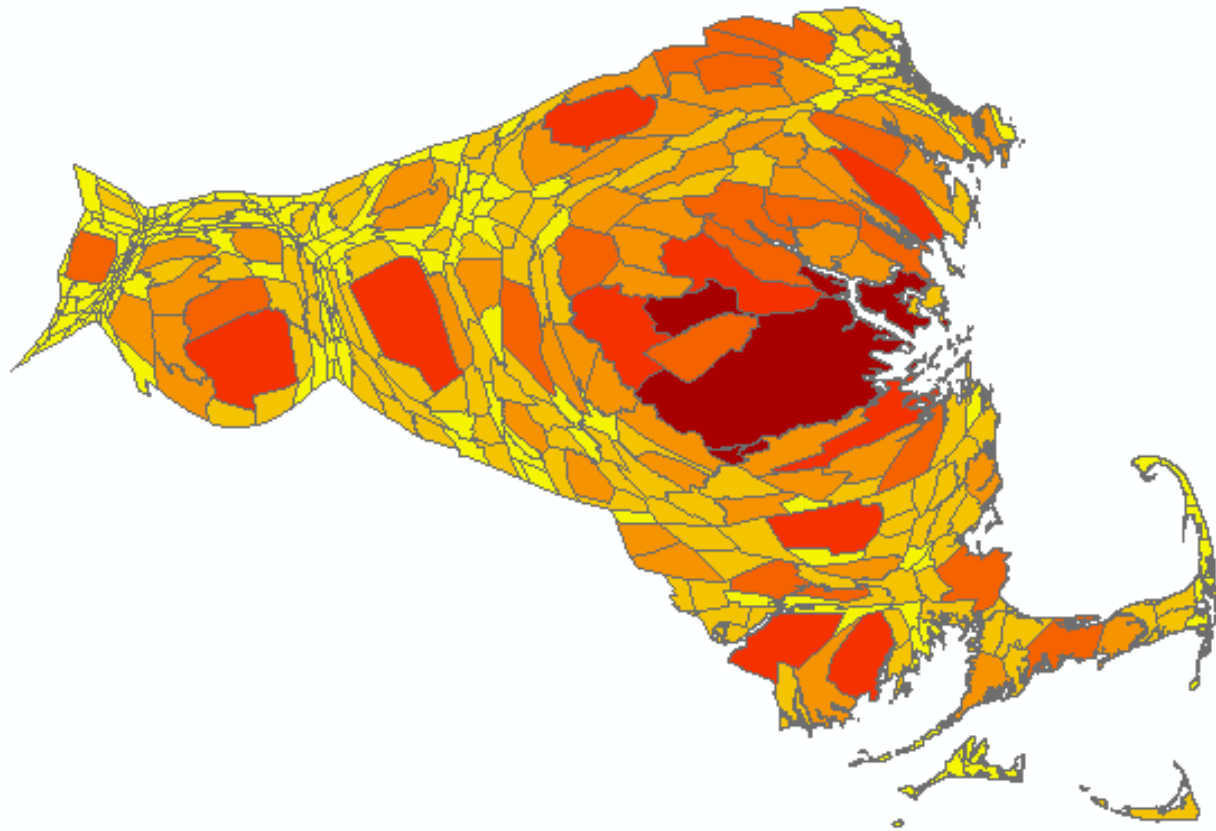Equal population cartogram transformation
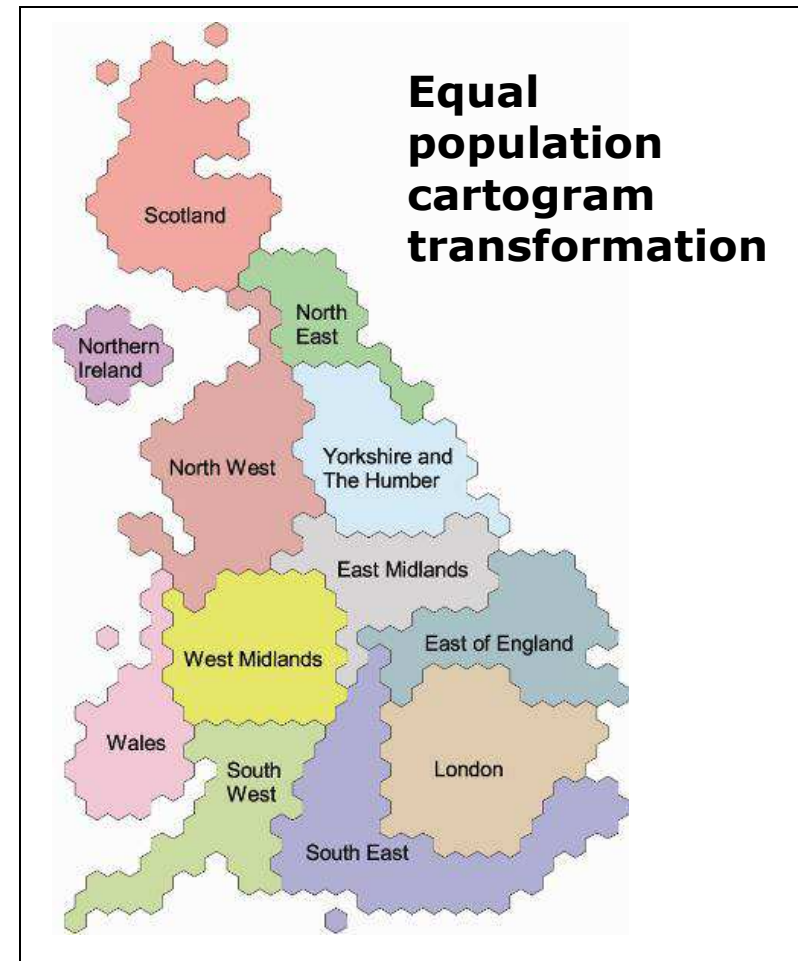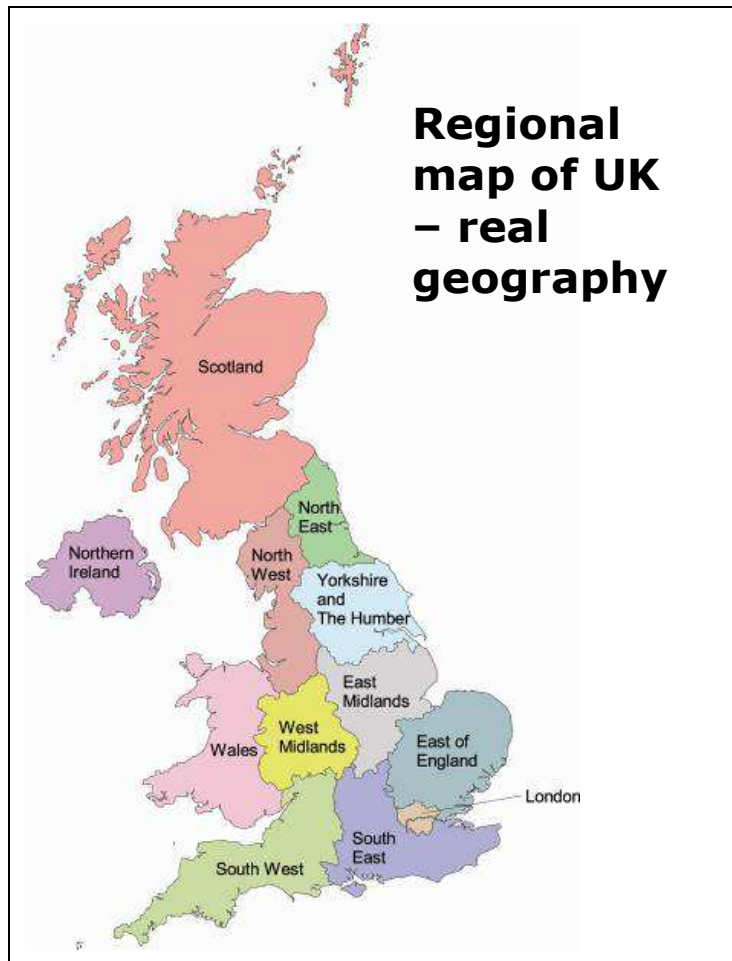
Cartograms in ArcMap

* Cartogram Geoprocessing Tool – creates new feature class based on a desired field. Output has the attributes of the original spatially-correct version, so they can be queried, etc.

  https://geonet.esri.com/blogs/aitorcalero/2015/08/03/creating-cartograms-with-arcgis-for-desktop-1031
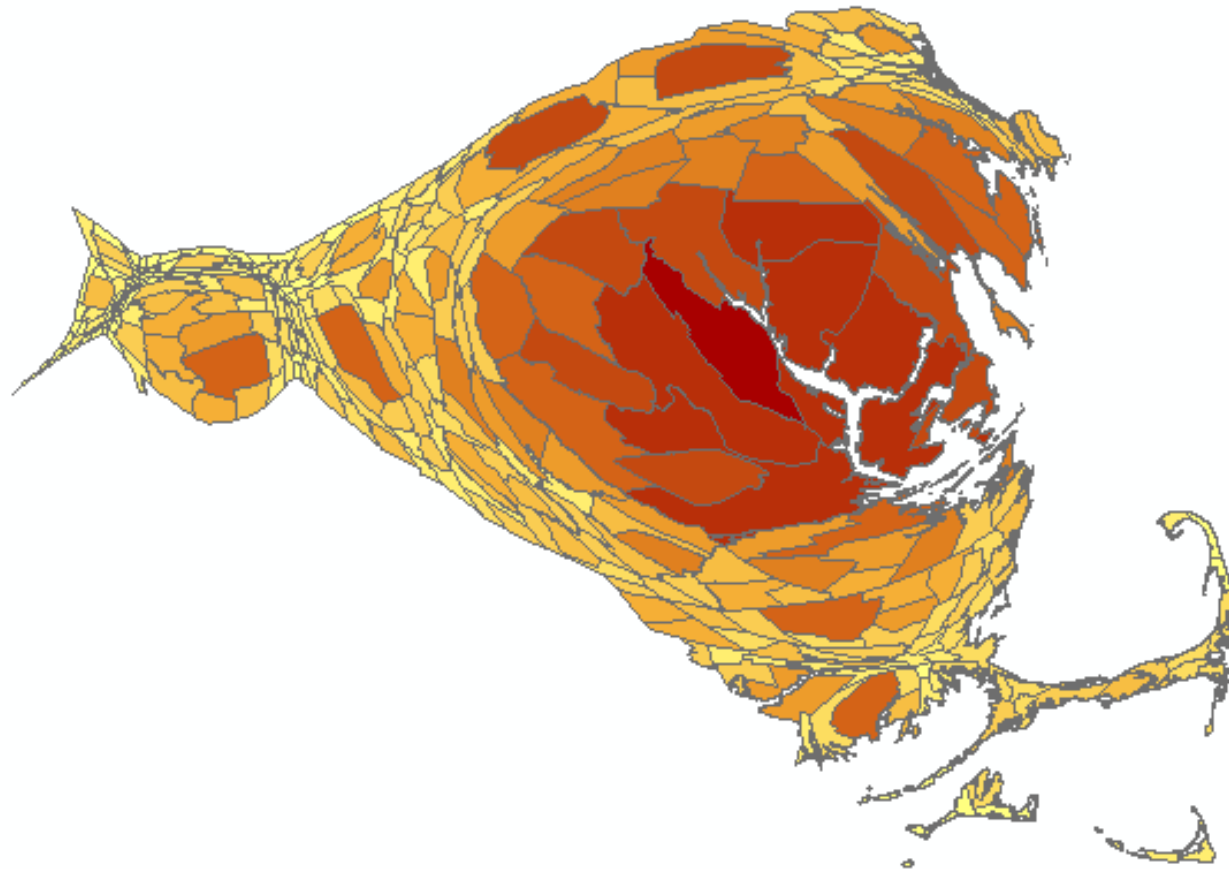
  http://www.arcgis.com/home/item.html?id=d348614c97264ae19b0311019a5f2276

Cartograms in ArcMap

Mass. 2000 population raw values being used to size the polygons:

Cartograms in ArcMap

Mass. 2000 pop density (Somerville is #1):
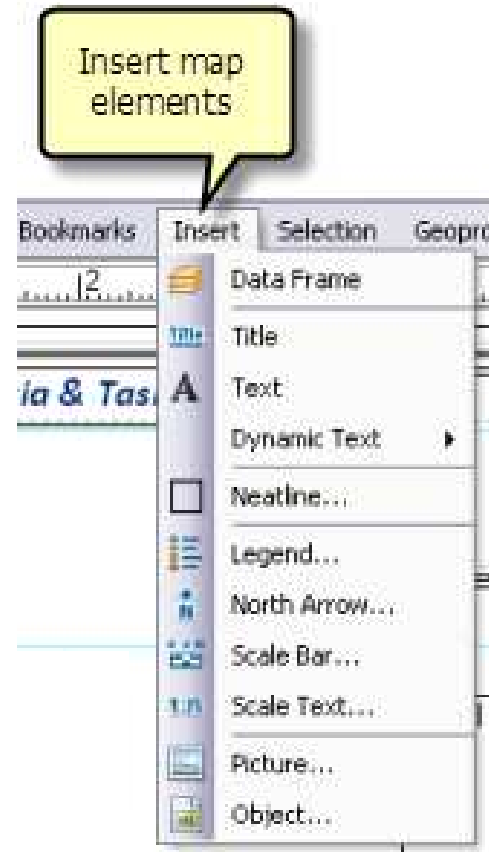
Graphs

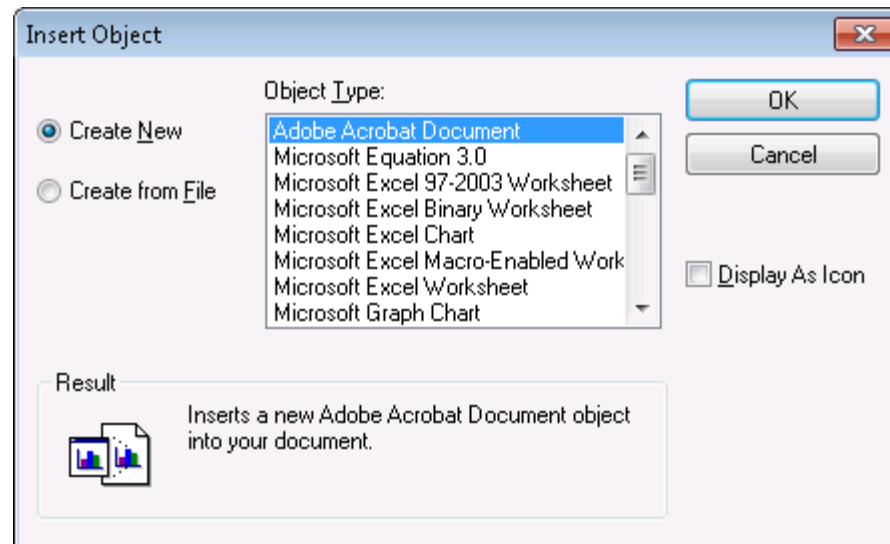✳ Add to layout; colors can be matched to data symbology
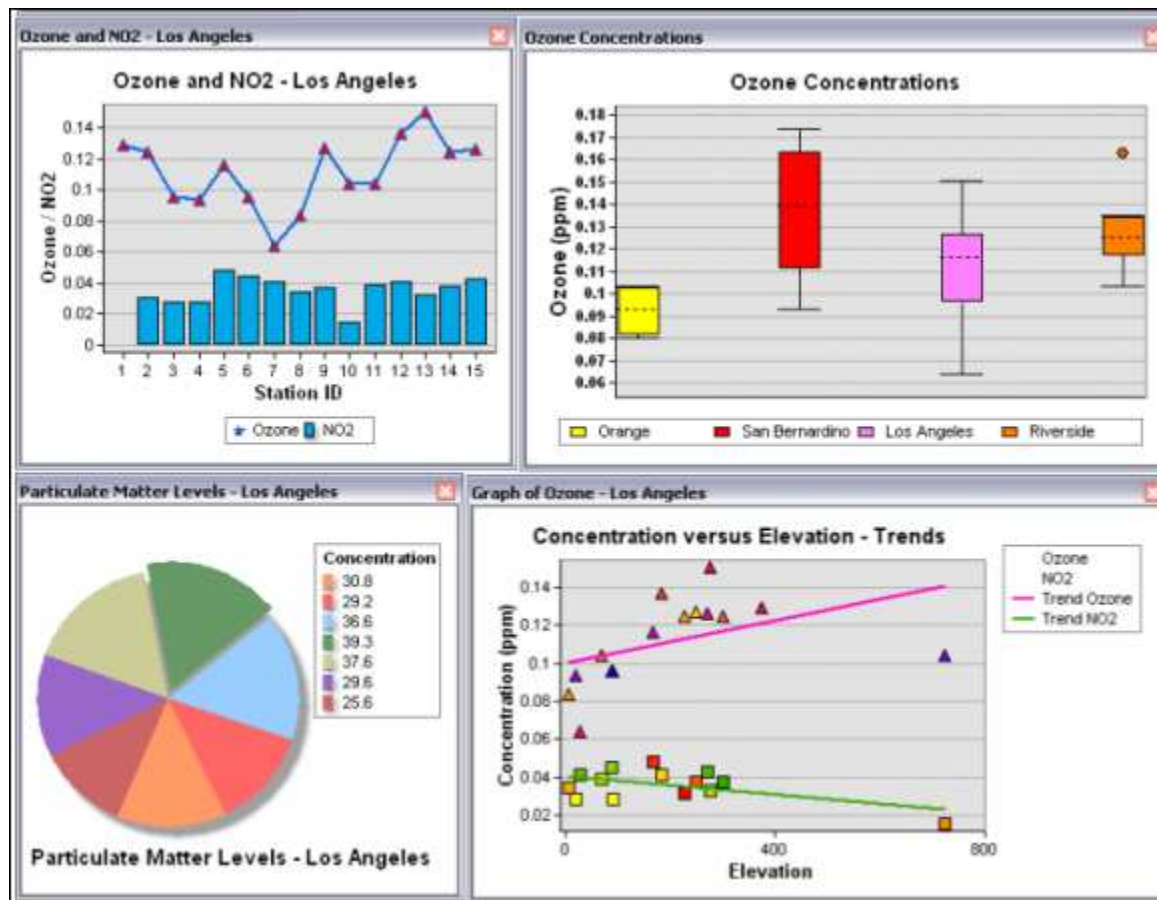
Inserting Graphics

* Ornament a map
* Group related parts of a map together
* Identify a map with an organization
* Emphasize a part of the map

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/an-overview-of-working-with-graphics.htm
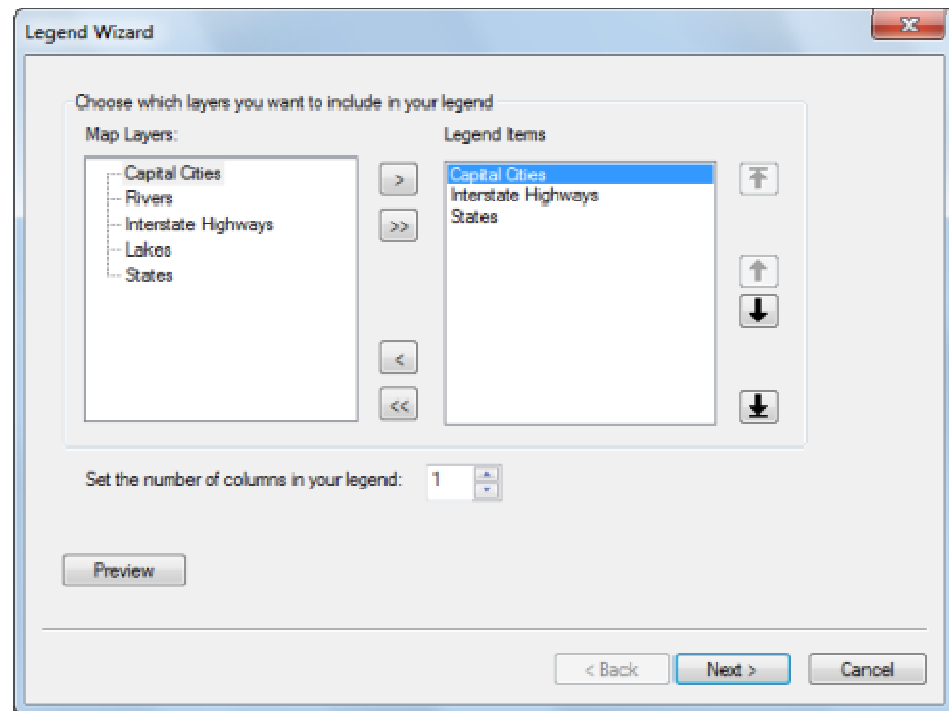
Inserting Objects

❋ Add other Windows objects -- which can be dynamic -- to a layout

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/working-with-graphic-elements-pictures-and-neatlin.htm

Modifying Legends

✳ Create legend using the Legend Wizard

✳ Double-click legend to open the Legend Properties dialog box to modify the legend

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/working-with-legends.htm

Create a new legend patch:
http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/working-with-legend-patch-shapes.htm

Dynamic Legends

✳ New at 10.1

If the Only show classes that are visible in the current map extent check box is checked, a legend item class will only appear in the legend if a feature from that class is in the current extent. If no features from that legend item are in the current extent, the entire item will be removed from the legend.

You can also add feature counts to your legend by checking the Show feature count check box.
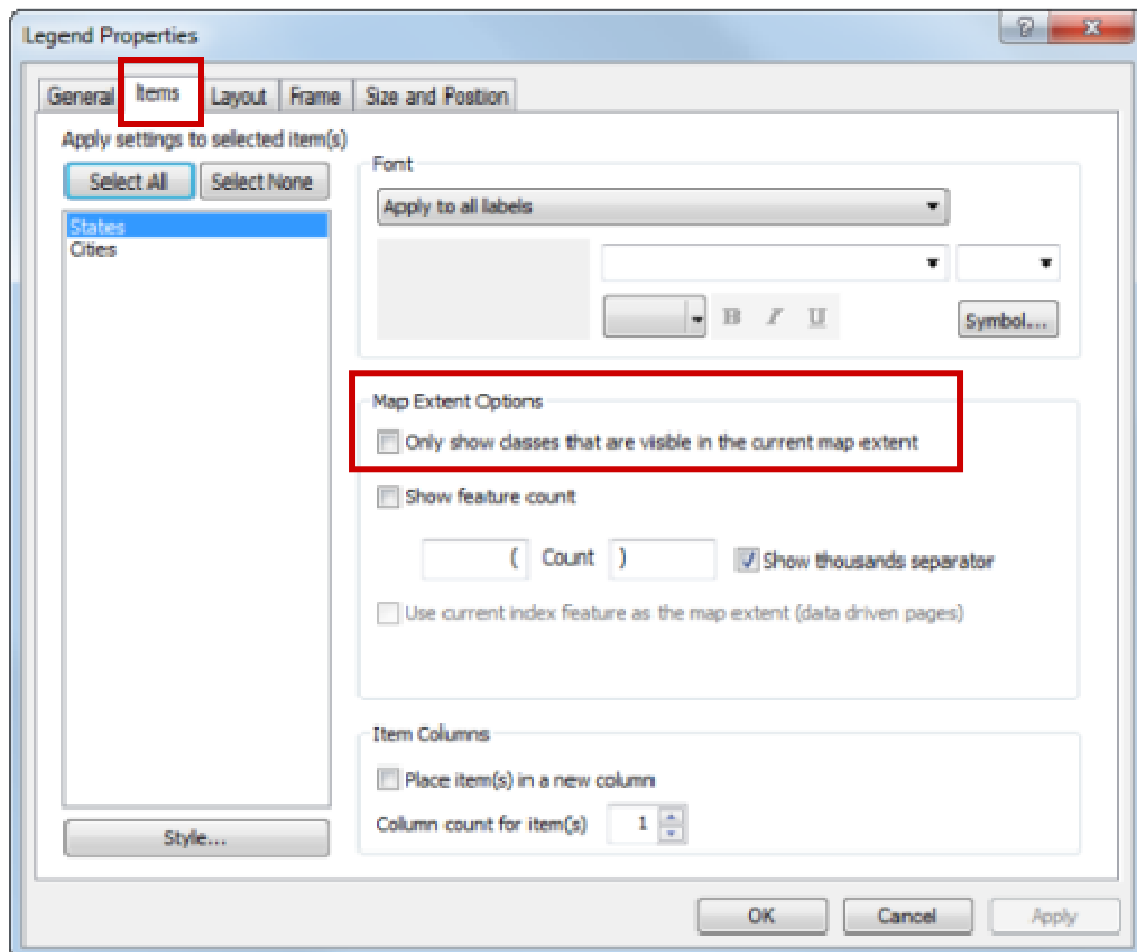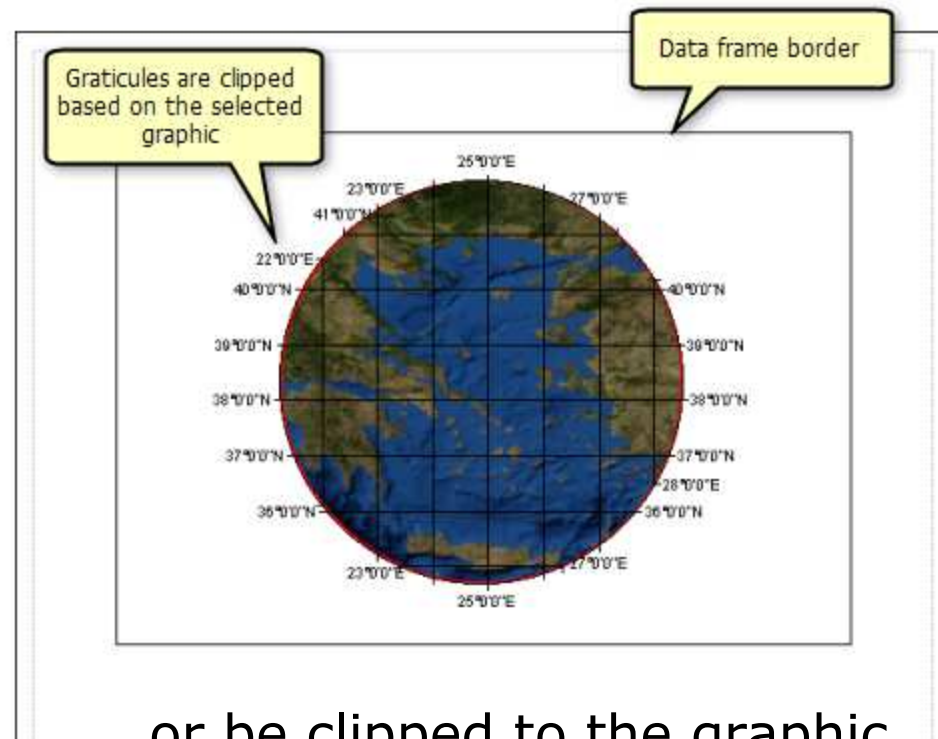
Clipping the Data Frame

✳ Clip to graphic shape, extent of another data frame, or current data driven page extent

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/clipping-the-data-frame.htm

Clipping with Grids and Graticules

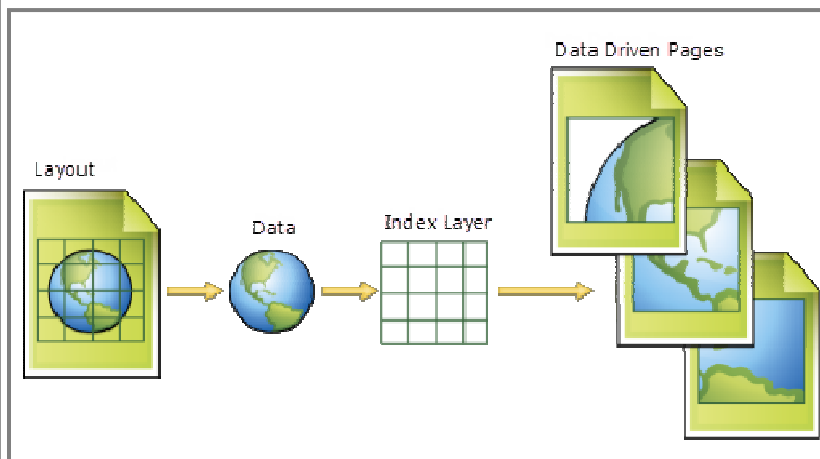✳ Grids and graticules may be left to fill the data frame…
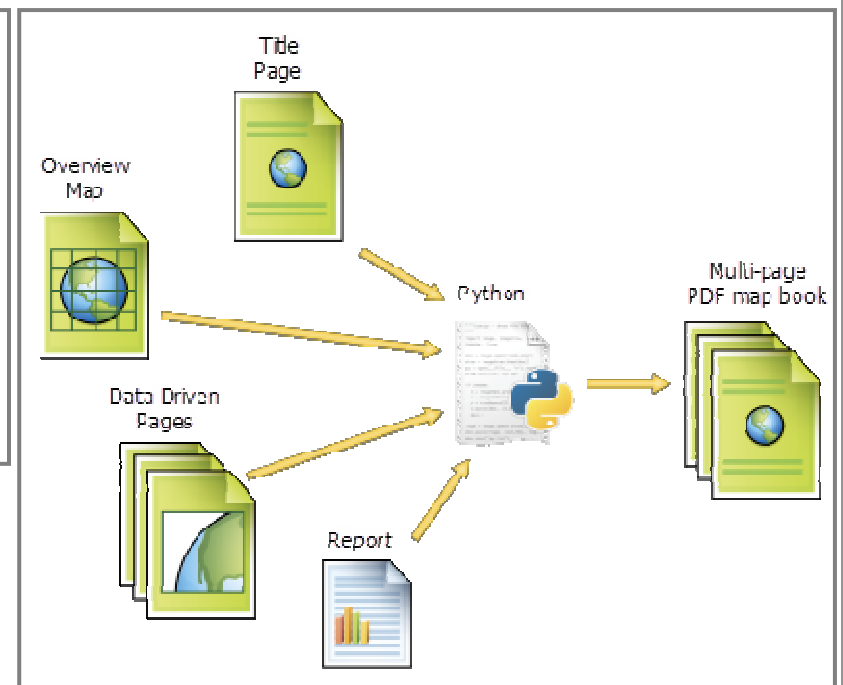

… or be clipped to the graphic

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/clipping-the-data-frame.htm

Data Driven Pages

✳ Create a series of layout pages from a single map document, for viewing or printing a page at a time or as a "map book"
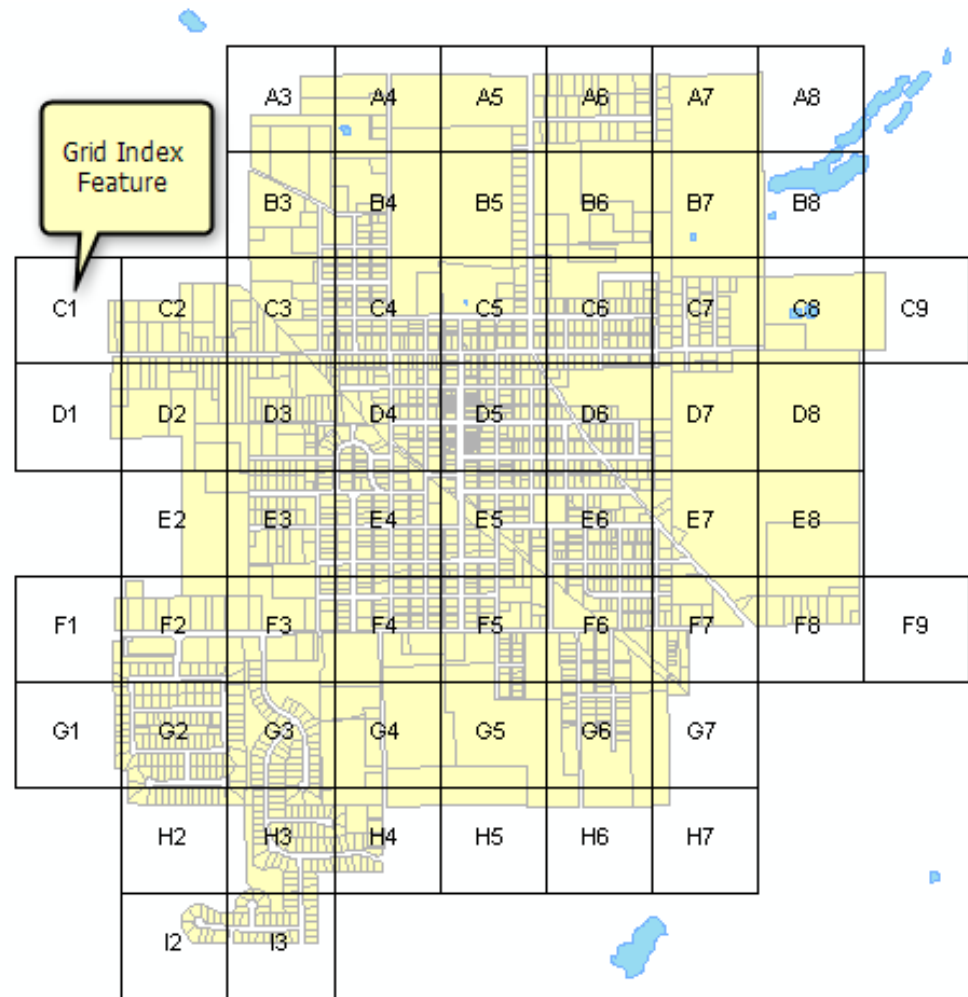

http://desktop.arcgis.com/en/arcmap/latest/map
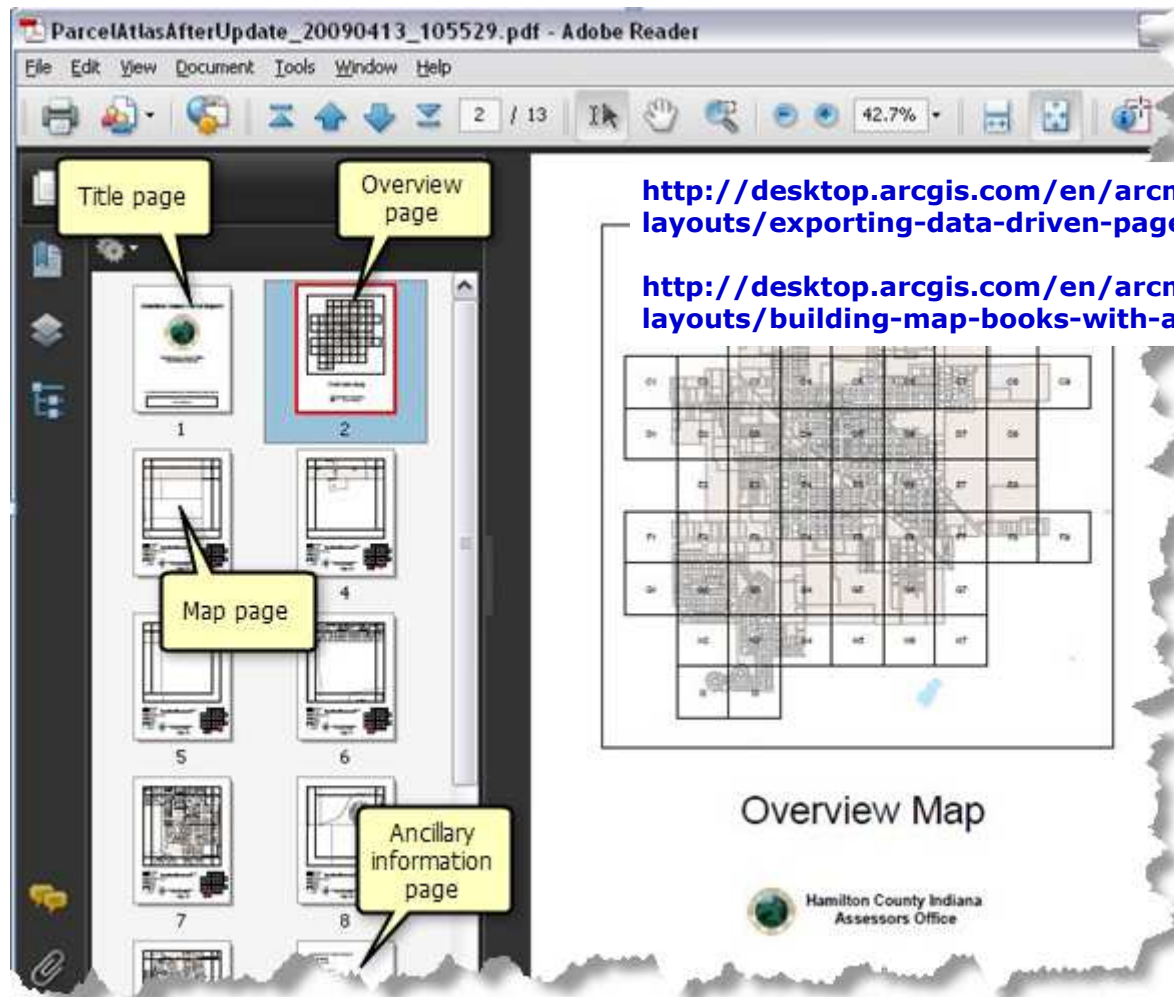/page-layouts/what-are-data-driven-pages-.htm

Data Driven Pages
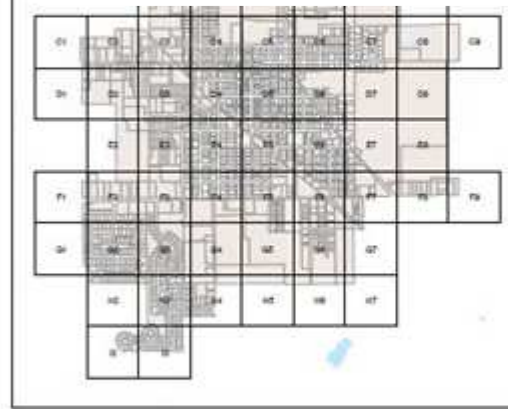
Index layer can be grid or any polygon layer

Map Books

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/exporting-data-driven-pages.htm

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/building-map-books-with-arcgis.htm

Dynamic Text

✳ Dynamic text is text placed on a map layout that changes based on the current properties of the map document, data frame, and Data Driven Page, such as:

- – A user name

- – The date a map document was saved

- – The file path for the map document

- – The page numbers and names that update automatically for each page in a series of Data Driven Pages

http://desktop.arcgis.com/en/arcmap/latest/map/page-layouts/what-is-dynamic-text-.htm

Map Automation Using Geoprocessing

* Use **arcpy.mapping**, a Python scripting module designed to:
  – manipulate the contents of existing map documents (.mxd) and layer files (.lyr)
  – automate exporting and printing
  – automate map production; it extends the capabilities of Data Driven Pages and is **required to build complete map books** because it includes functions to export to, create, and manage PDF documents.

  http://desktop.arcgis.com/en/arcmap/latest/map/working-with-arcmap/map-automation-using-geoprocessing.htm

Other Resources

* http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/helpful-resources-for-layer-display.htm
* http://desktop.arcgis.com/en/arcmap/latest/map/working-with-layers/how-to-set-layer-transparency.htm (Common layer display tasks)
* http://resources.arcgis.com/en/communities/mapping/home/
* https://blogs.esri.com/esri/arcgis/category/mapping/
* https://blogs.esri.com/esri/arcgis/2013/06/04/favorites-cartographers/