

Recitation 5: Using ArcGIS to Visualize Population Density

What is a GIS?

- GIS (Geographic Information System) is a System of computer software, hardware, methods and data, along with personnel who helps to manipulate, analyze and present information that is tied to a spatial location:
 - Spatial information usually a geographic location
 - Information visualization of analysis of data
 - System linking software, hardware, data
 - Personnel a thinking explorer who is key to the power of GIS

Transition from ArcView to ArcGIS 8

ArcMap

ArcToolbox

ArcCatalog

ArcSDE

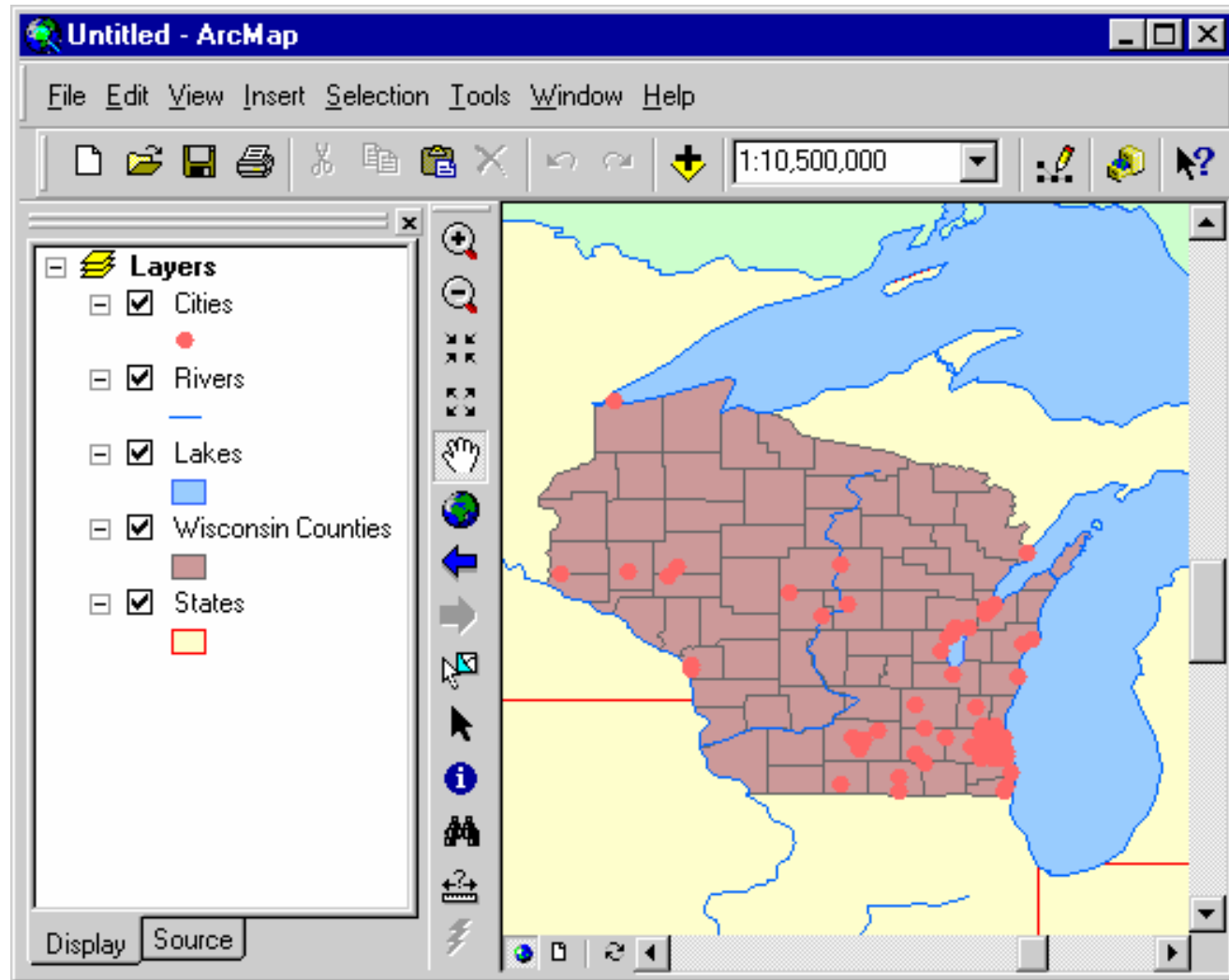
ArcIMS

ArcGIS 8

- ArcMap: feature display and editing, mapmaking, and analysis
- ArcCatalog: exploring and managing the data
- ArcToolbox: performing operations such as data conversion and Geoprocessing tasks

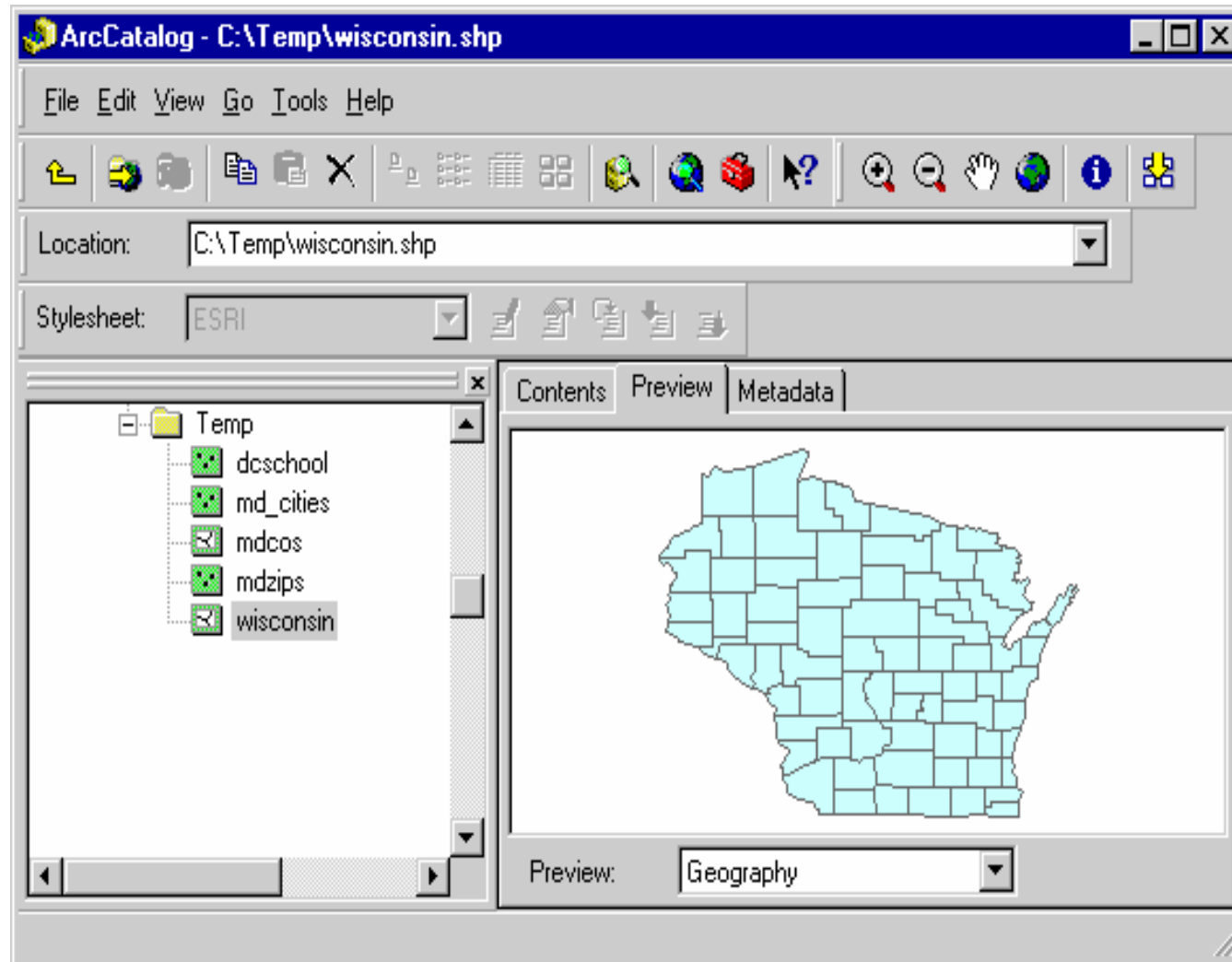
ArcMAP

- Visualize, create, edit, query, analyze, and present the data
- Table of contents
Map display area



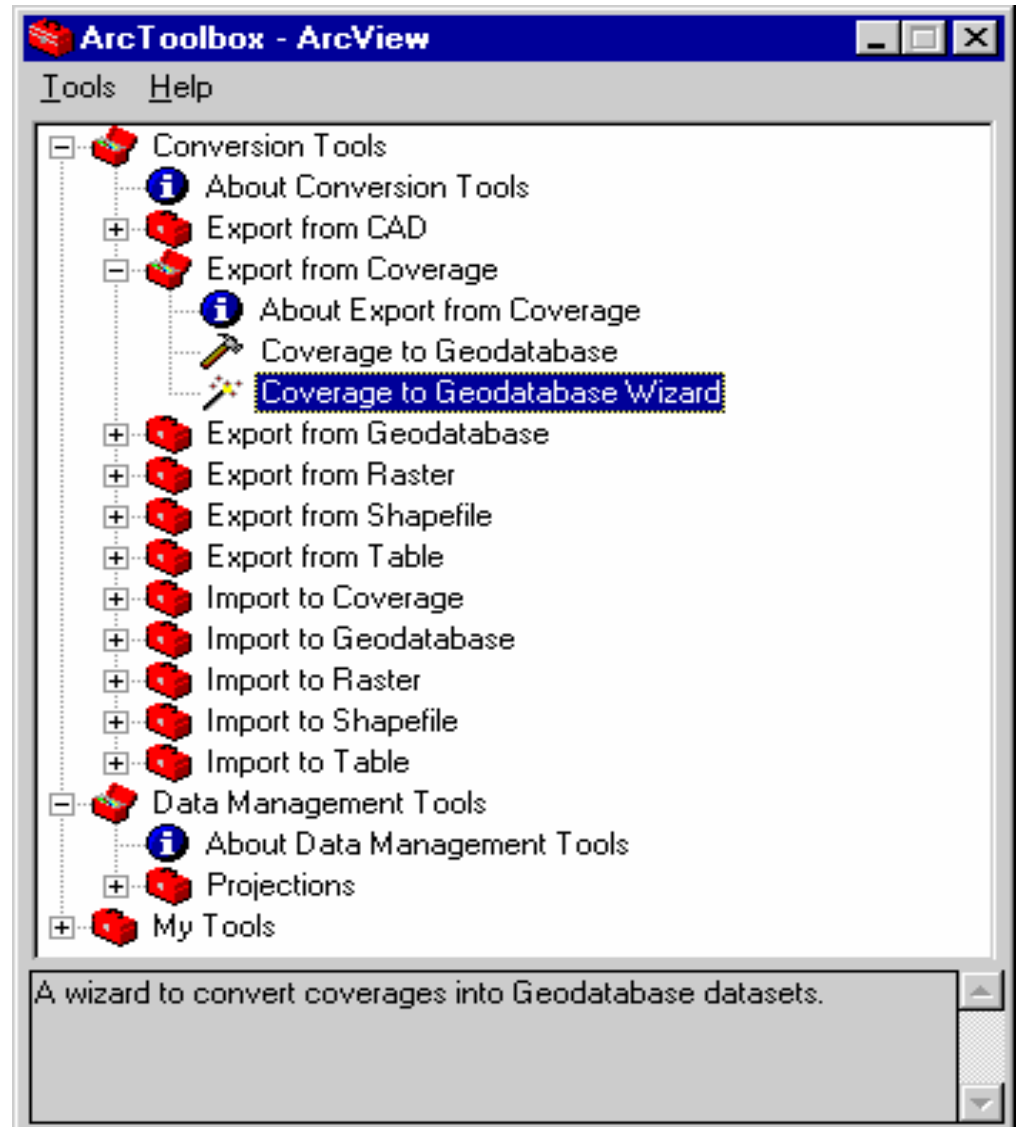
ArcCatalog

- Find, explore, and manage the data
- Similar to windows explorer
- Catalog tree
- Preview
- Metadata



ArcToolbox

- Data conversion tools
- Data management tools
- Geoprocessing tools

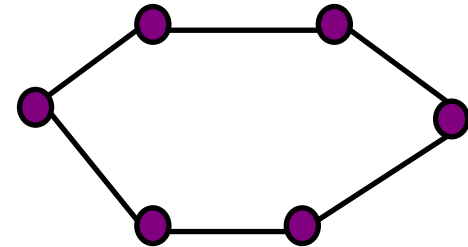


Raster Images

- Raster Images – grids
 - “pixels”
 - A location and value
 - Satellite images and aerial photos

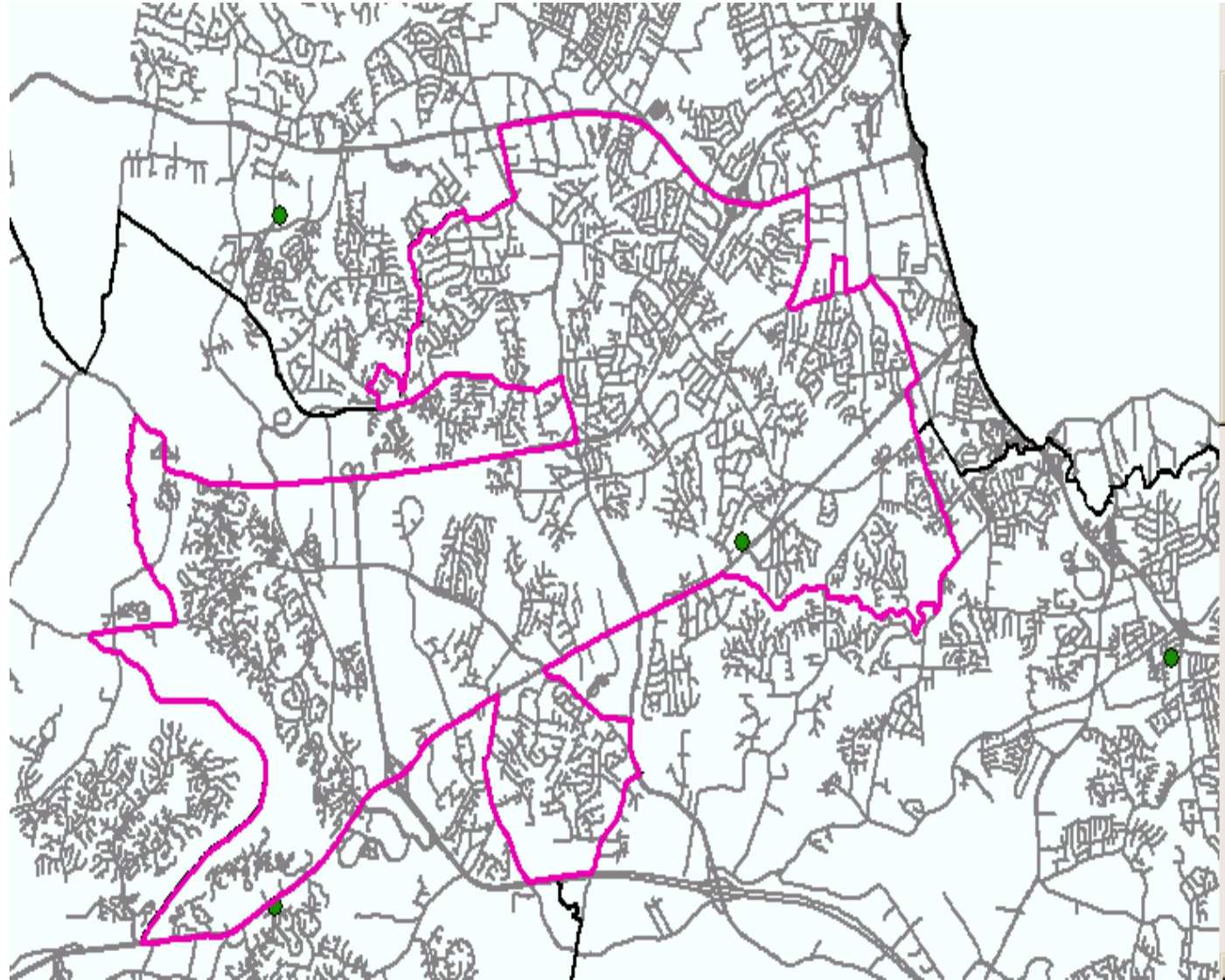
Vector Images

- Vector – grids
 - Points, lines & polygons
 - “features” (house, lake, etc.)
 - Attributes
 - Size, type, length, etc.



Vector GIS

- Point
- Line
- Polygon



Graphic Elements

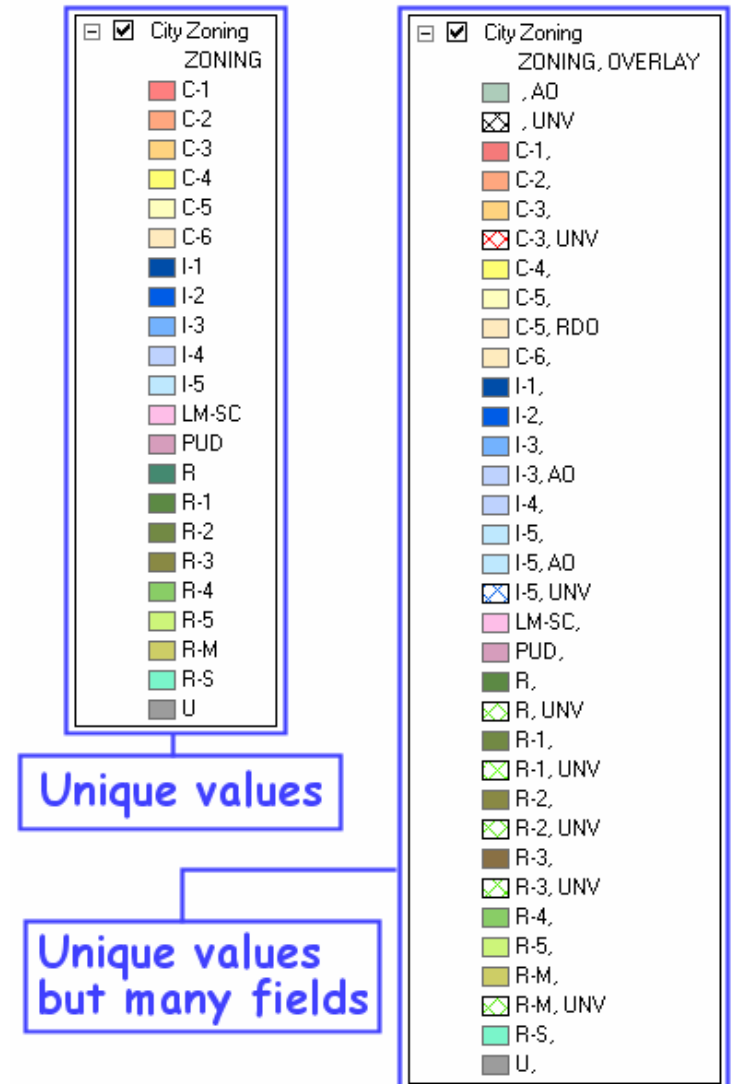
- Use Solid Point Markers
- Use Representative Point Markers
- Use Three to Seven Categories Max
- Route Directions
- Graduated Symbols
- Think about:
 - Shape
 - Orientation
 - Texture
 - Size
 - Value
 - More Value
 - Hue
 - Saturation

Symbology

A variety of fill patterns, colors, shapes & styles

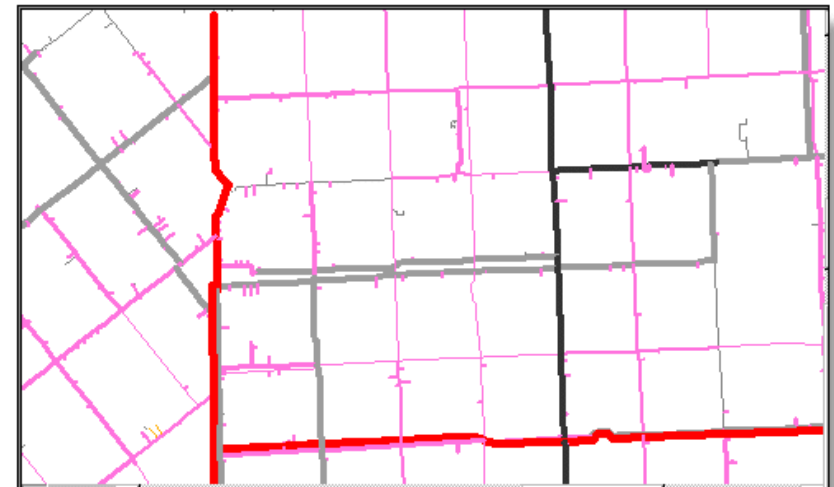
Qualitative Symbolology

- Unique Value
- Unique Value with multiple field



Display Multiple Attributes

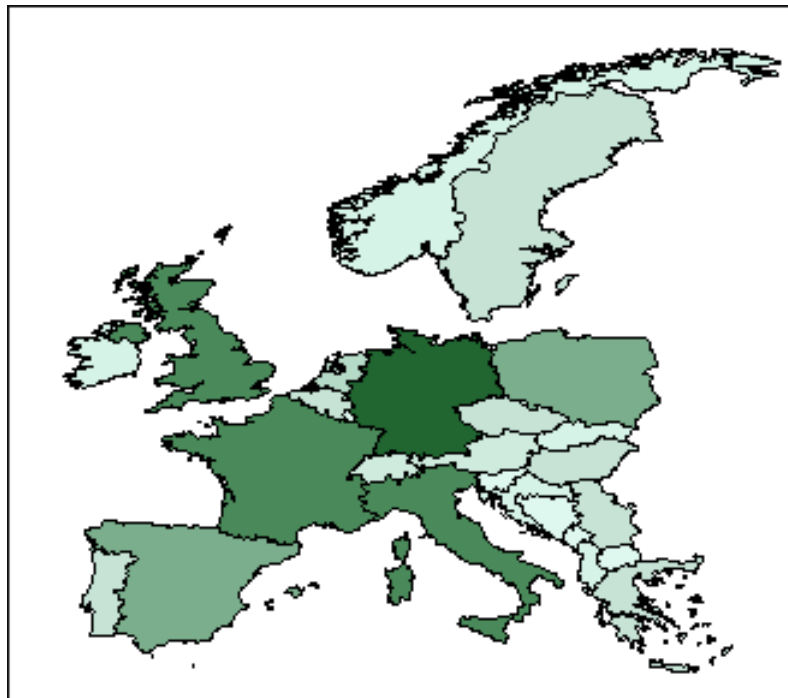
- A water distribution system
- Material (line color)
- Diameter (line width)



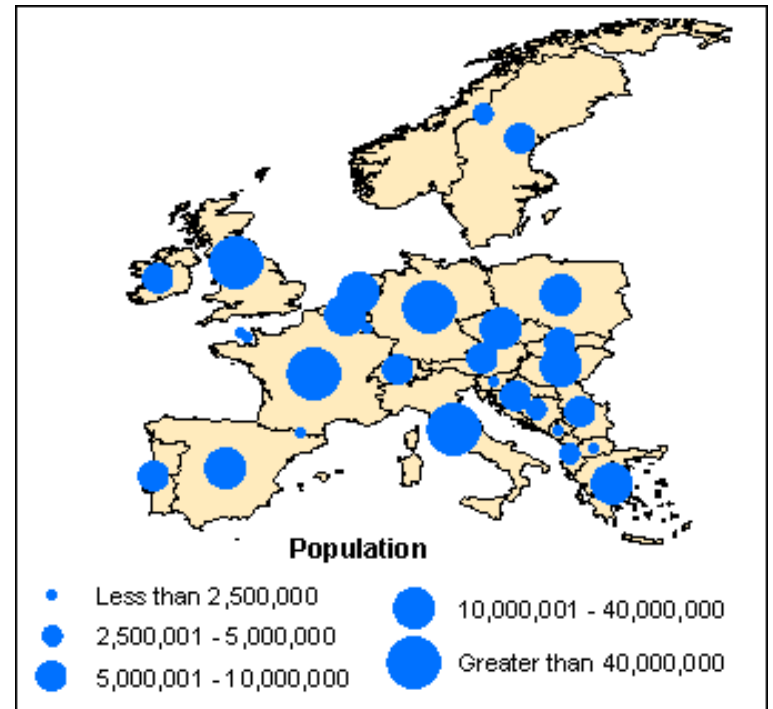
PVC		Cast iron	
— 2.000000 - 3.000000	— 2.000000 - 3.000000	— 2.000000 - 3.000000	— 2.000000 - 3.000000
— 3.000001 - 4.000000	— 3.000001 - 4.000000	— 3.000001 - 4.000000	— 3.000001 - 4.000000
— 4.000001 - 6.000000	— 4.000001 - 6.000000	— 4.000001 - 6.000000	— 4.000001 - 6.000000
— 6.000001 - 10.000000	— 6.000001 - 10.000000	— 6.000001 - 10.000000	— 6.000001 - 10.000000
— 10.000001 - 16.000000	— 10.000001 - 16.000000	— 10.000001 - 16.000000	— 10.000001 - 16.000000
— 16.000001 - 24.000000	— 16.000001 - 24.000000	— 16.000001 - 24.000000	— 16.000001 - 24.000000
— 24.000001 - 30.000000	— 24.000001 - 30.000000	— 24.000001 - 30.000000	— 24.000001 - 30.000000
Ductile iron		Asbestos concrete	
— 2.000000 - 3.000000	— 2.000000 - 3.000000	— 2.000000 - 3.000000	— 2.000000 - 3.000000
— 3.000001 - 4.000000	— 3.000001 - 4.000000	— 3.000001 - 4.000000	— 3.000001 - 4.000000
— 4.000001 - 6.000000	— 4.000001 - 6.000000	— 4.000001 - 6.000000	— 4.000001 - 6.000000
— 6.000001 - 10.000000	— 6.000001 - 10.000000	— 6.000001 - 10.000000	— 6.000001 - 10.000000
— 10.000001 - 16.000000	— 10.000001 - 16.000000	— 10.000001 - 16.000000	— 10.000001 - 16.000000
— 16.000001 - 24.000000	— 16.000001 - 24.000000	— 16.000001 - 24.000000	— 16.000001 - 24.000000
— 24.000001 - 30.000000	— 24.000001 - 30.000000	— 24.000001 - 30.000000	— 24.000001 - 30.000000

Quantitative Symbolology

■ Graduated Color

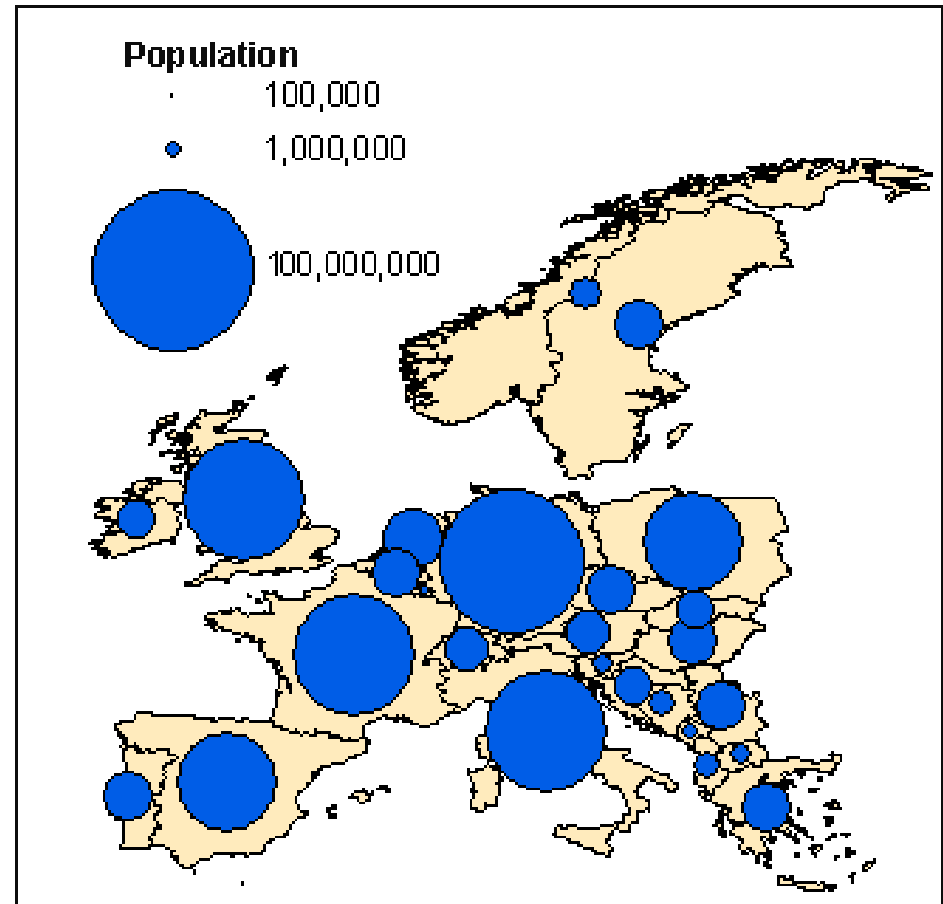


■ Graduated Symbol



Quantitative Symbology

- Symbol size proportional to the population.
- Area/Radius



Color Wheel

- Analogous/Adjacent Schemes use consecutive hues and their tints from the color wheel (colors from three adjacent rows in the table)
- Clash Schemes combines a color with a hue to the right or left and not necessarily adjacent of its complement on the color wheel.

Color Wheel

- Complementary Schemes use direct opposites on the color wheel.

Graphical Hierarchy

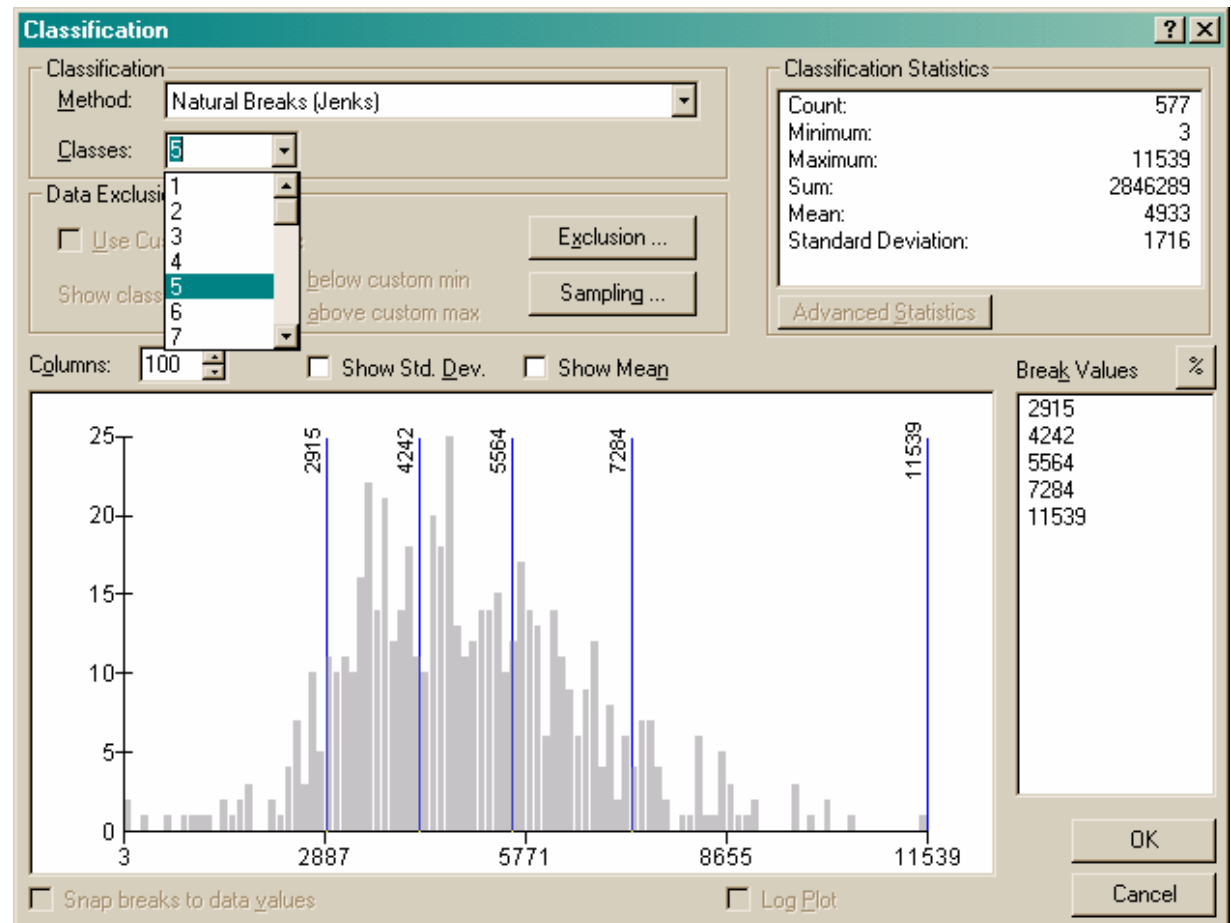
- Goal
 - Direct attention toward or away from available information
- Figure-Ground
 - Visual separation of a scene into recognizable figures and inconspicuous background (ground)

Classifications

- Process of placing data into groups that have a similar characteristic or value
 - Equal Area
 - Equal Interval
 - Natural Breaks
 - Quantile

Classifications

- Natural Breaks



Classifications

- Quantile

Layer Properties

General | Source | Selection | Display | Symbology | Fields | Definition Query | Labels | Joins & Relates

Show:

- Features
- Categories
- Quantities**
 - Graduated colors
 - Graduated symbols
 - Proportional symbols
 - Dot density
- Charts
- Multiple Attributes

Draw quantities using color to show values. Import...

Fields
Value: POP2000
Normalization: <NONE>

Classification
Natural Breaks (Jenks)
Classes: 5 Classify...

Color Ramp:

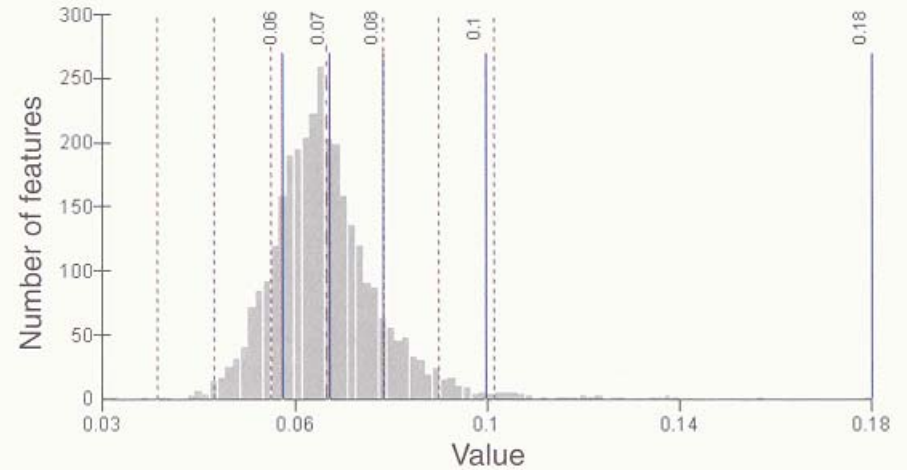
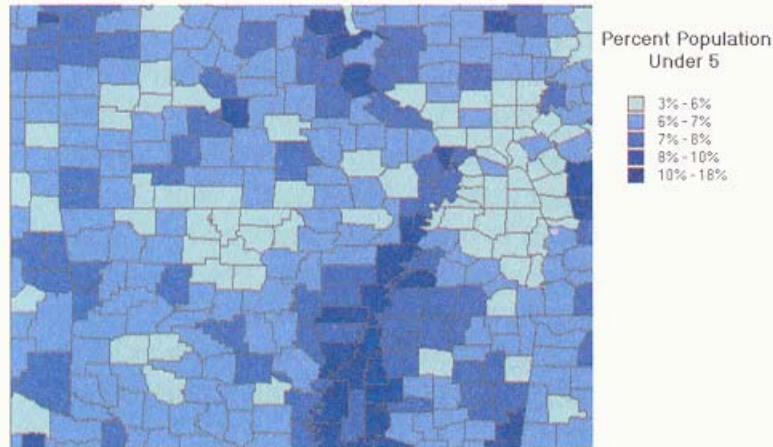
Symbol	Range	Label
	3 - 2915	3 - 2915
	2916 - 4242	2916 - 4242
	4243 - 5564	4243 - 5564
	5565 - 7284	5565 - 7284
	7285 - 11539	7285 - 11539

Show class ranges using feature values

OK Cancel Apply

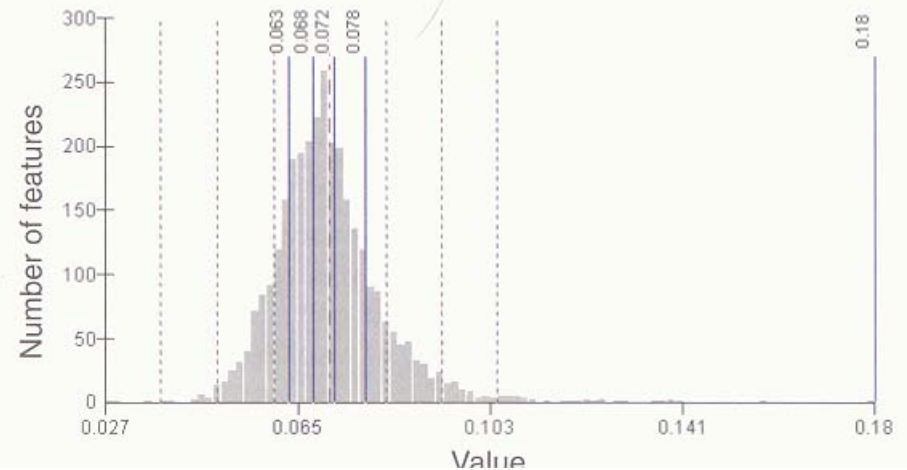
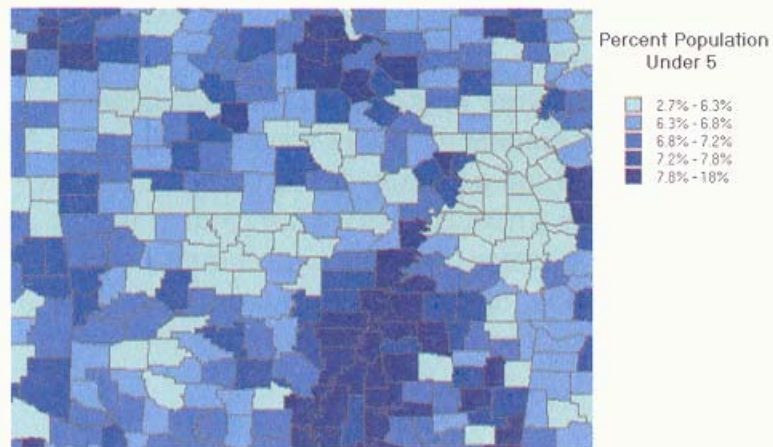
Natural breaks (Jenks)

Classes are based on natural groupings of data values. ArcMap identifies break points by looking for groupings and patterns inherent in the data. The features are divided into classes whose boundaries are set where there are relatively big jumps in the data values.



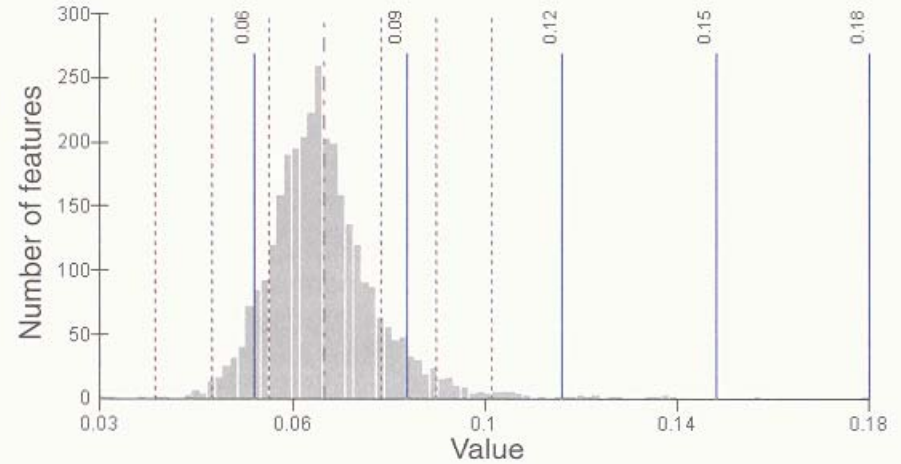
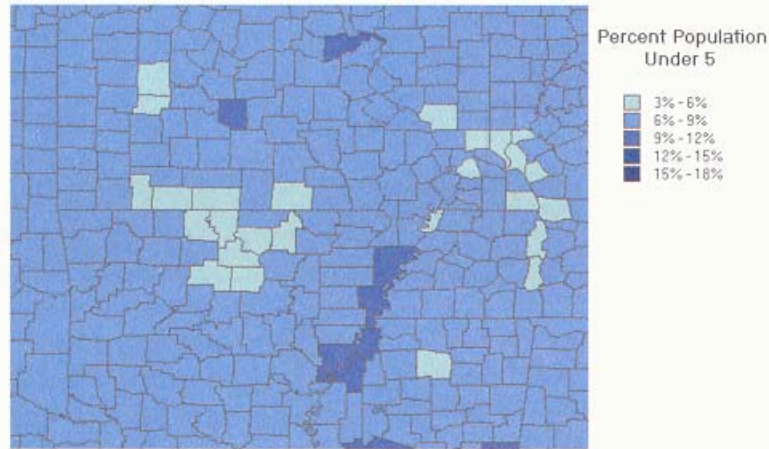
Quantile

Each class contains an equal number of features. A quantile classification is well suited to linearly distributed data. Because features are grouped by the number in each class, the resulting map can be misleading. Similar features can be placed in adjacent classes, or features with widely different values can be put in the same class. You can minimize this distortion by increasing the number of classes.



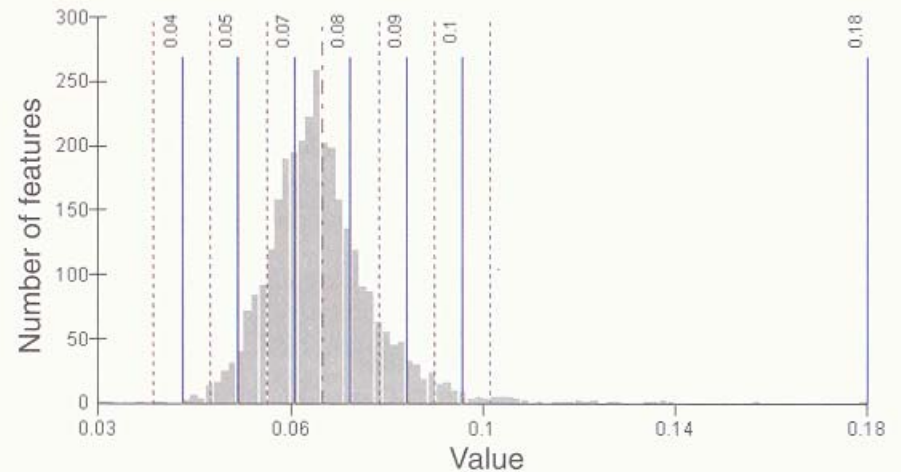
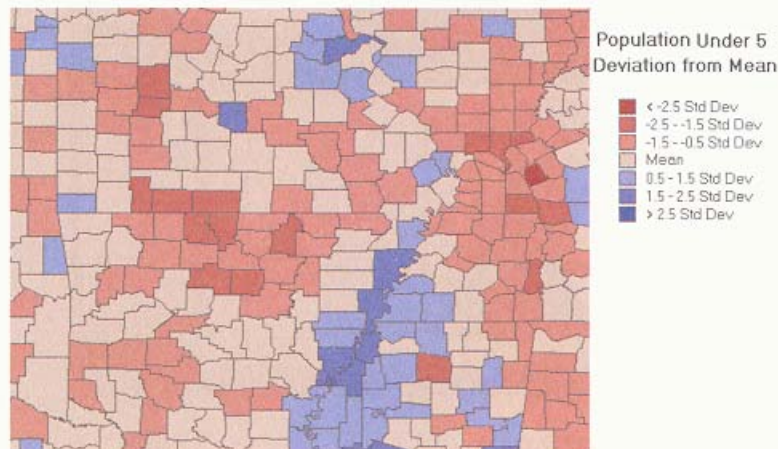
Equal interval

This classification scheme divides the range of attribute values into equal-sized subranges. For example, if features have attribute values ranging from 0 to 300 and you have three classes, each class represents a range of 100 with class ranges of 0–100, 101–200, and 201–300. This method emphasizes the amount of an attribute value relative to other values, for example, to show that a store is part of the group of stores that made up the top one-third of all sales. It's best applied to familiar data ranges such as percentages and temperature.



Standard deviation

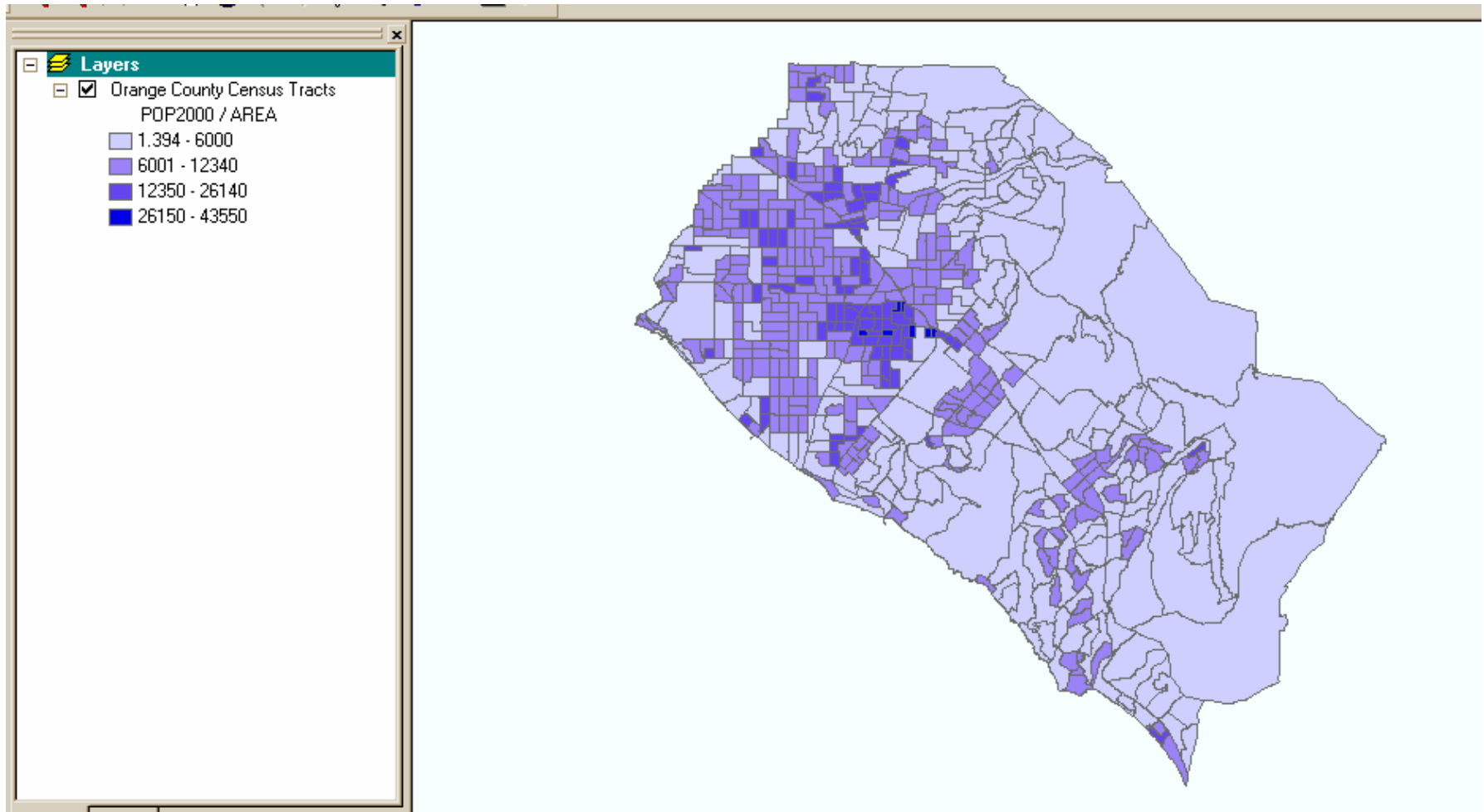
This classification scheme shows you the amount a feature's attribute value varies from the mean. ArcMap calculates the mean value and then generates class breaks by successively adding to it or subtracting from it the standard deviation. A two-color ramp helps emphasize values above (shown in blue) and below (shown in red) the mean.



Normalizing Data





- By percent of total
 - Normalize values by dividing each value by the total of all values (percent of total)
- By the value of another attribute
 - Map population density by dividing population counts by area
- When not to normalize
 - In some cases, data is already normalized
 - Percentage (divorce rate of 0.34)
 - Density (number of people per square mile of 320)

Normalized Data – Population/Area



Map Audience

- Map Use:
- Audience:
- Purpose:
- Advantages:
- Granularity:
- Symbols

Exploration	Presentation
Trained Analyst	General Public
Visual Thinking	Communication
Graphical	Believable
Fine	Coarse
	
Abstract	Mimetic
	

Scale 2:

- Dimensionless ratio of map to ground distances
 - Maps range from 1:5,000 to 1:50,000,000
 - 1:5,000 is large scale, 1:50,000,000 is small scale
- Verbal scale (dimensioned)
 - “1 inch represents 2,000 feet” is the same as 1:24,000
 - “1 foot represents 10,000 miles” is the same as 1:52,800,000

Map Design: Marginal Information

- Concise Title
 - Topic, time, place
 - Ex: 1990 AIDS Incidence in Massachusetts
- Scale
 - Inappropriate for small-scale maps
 - Not needed for familiar large-scale maps
- Direction Indicator
 - North arrow – only for unusual orientations on large-scale maps
 - Use geographic grid on small-scale maps

ArcGIS Comments

- Decide on Descriptive, Understandable Names for
 - Map Document
 - Data Frame
 - Layers
 - Layouts