

# SECTION 6

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# INTRODUCTION: Advanced GIS Training

# Welcome

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- **Introduction**
  - Instructor: Greg Carlino
  - Email: [carlinog@gvmc.org](mailto:carlinog@gvmc.org)
  
- **Attendee Introductions**
  - Your Name
  - Department or Group
  - What you do
  - Prior GIS Experience?

# Logistics

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- **Schedule**

- Begin 8:30am
- Breaks at least every 90 minutes
- Lunch from about Noon to 1:00pm
- Finish by 4:00pm or sooner

- **Facilities (REGIS Training Lab)**

- Break Room with refrigerator, Rico's Deli on 1<sup>st</sup> floor near main entrance.
- Restrooms near side entrance to REGIS
- Telephones – available, please ask

# Overview of REGIS GIS applications

- Increasing functionality from ArcIMS to ArcView and ArcEditor



ArcView – Desktop GIS for Mapping,  
Data Integration, and Analysis



ArcEditor – Desktop GIS with Advanced  
Geographic Data Editing and Management

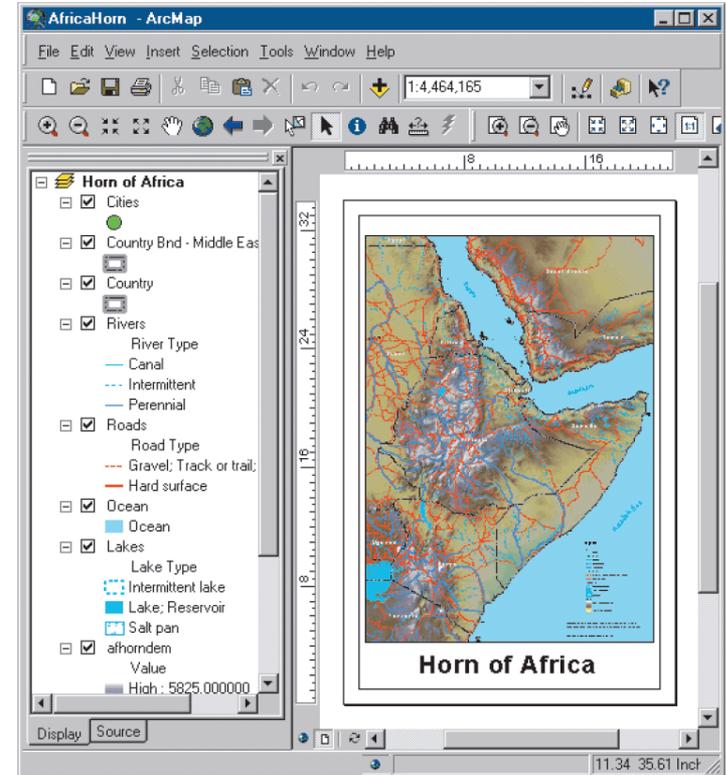
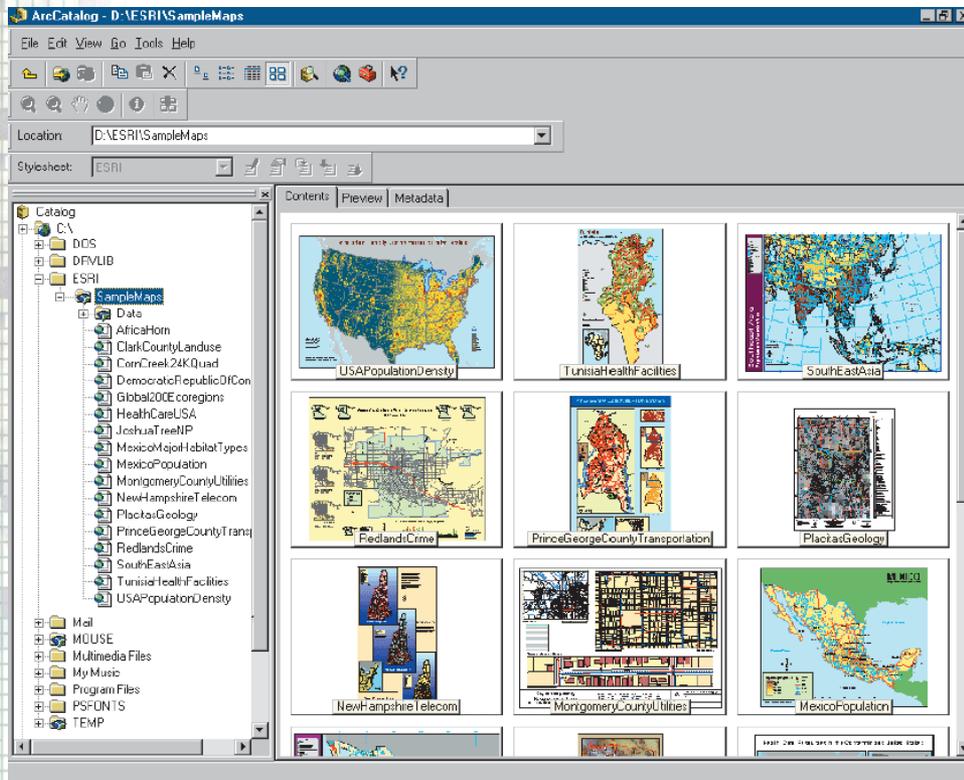


ArcInfo – Complete Desktop GIS with  
Advanced Geoprocessing and Analysis



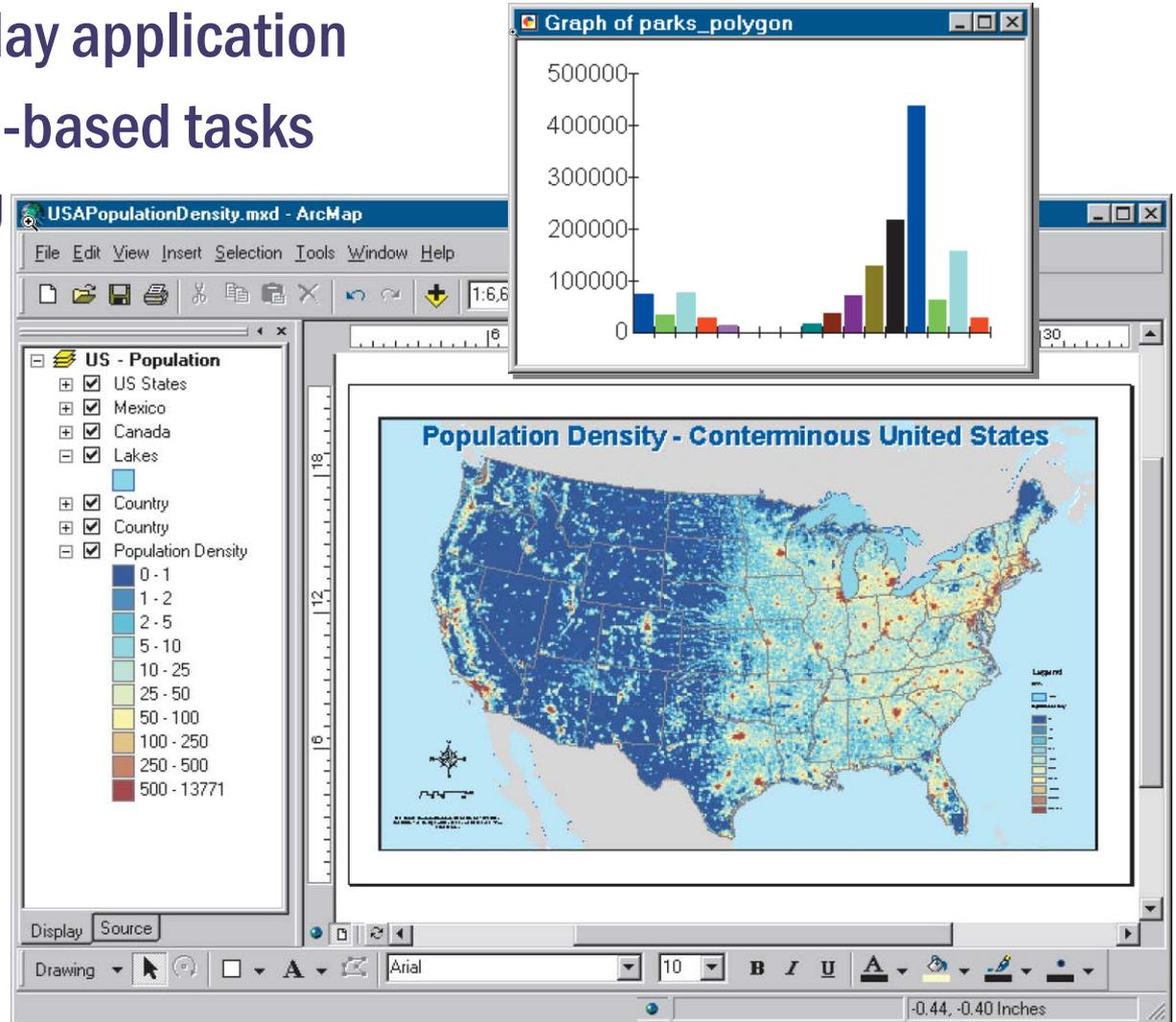
# Overview of ArcGIS applications

- All ArcGIS products share common applications
- ArcMap and ArcCatalog



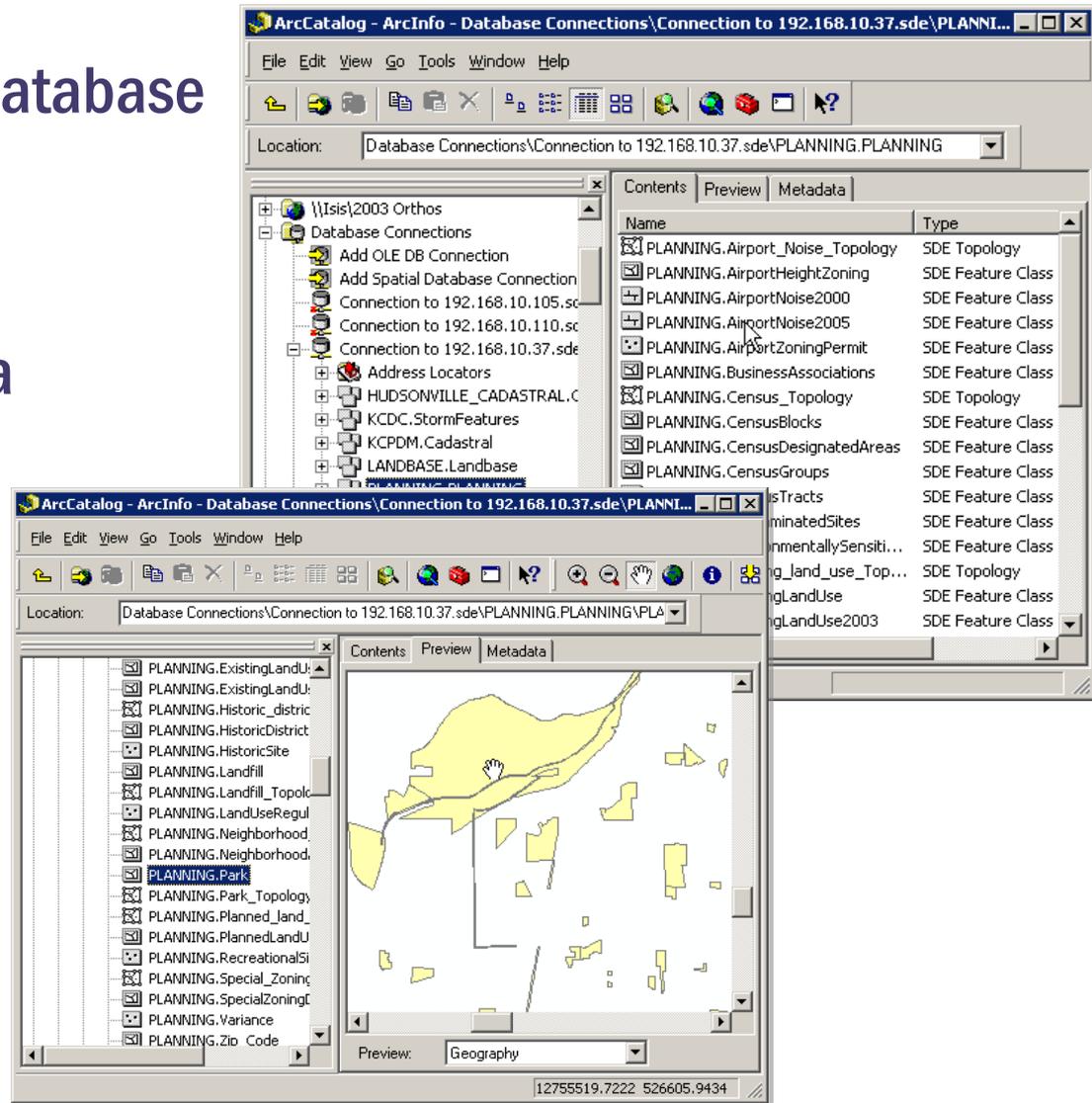
# ArcMap

- Primary display application
- Perform map-based tasks
  - Displaying
  - Editing
  - Querying
  - Analyzing
  - Charting
  - Reporting



# ArcCatalog

- A window into your database
- Browse your data
- Manage your data
- Create and view data documentation (metadata)



# ArcToolbox

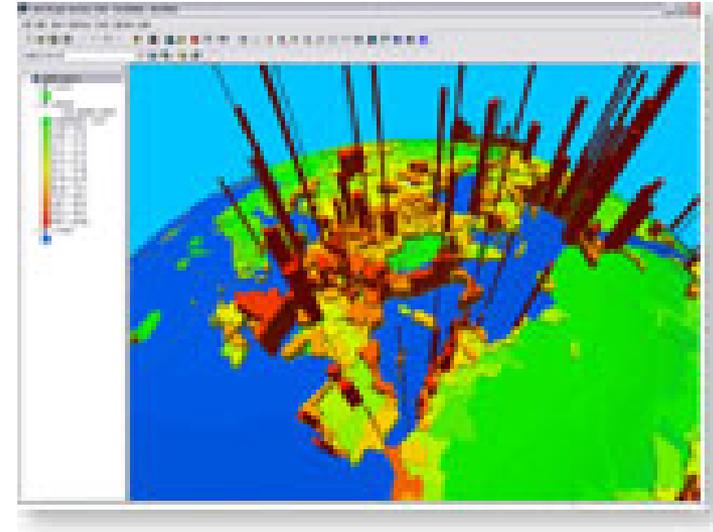
- Geographic processing functions
  - Data management, analysis and conversion
  - Tools vary between the ArcGIS applications



# Introduction to ArcGIS Extensions

- **3D Analyst**

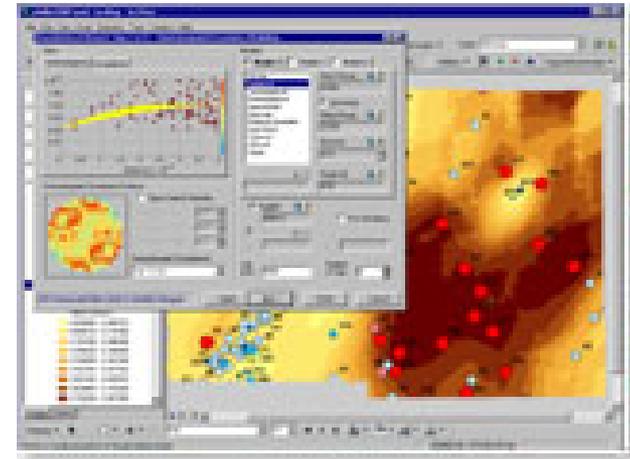
- view a surface from multiple viewpoints
- query a surface
- determine what is visible from a chosen location on a surface
- create a realistic perspective image that drapes raster and vector data over a surface
- record or perform three-dimensional navigation.
- create three-dimensional views directly using your GIS data
- analyze three-dimensional data using cut/fill, line-of-sight, and terrain modeling



# Introduction to ArcGIS Extensions

- **Spatial Analyst**

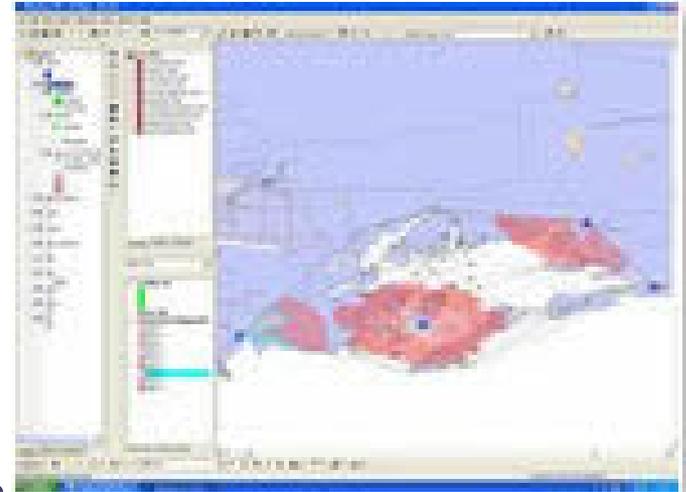
- adds a set of advanced spatial modeling and analysis tools
- you can:
  - find suitable locations
  - find the best path between locations
  - perform integrated raster/vector analysis
  - perform distance and cost-of-travel analyses
  - perform statistical analysis based on the local environment, small neighborhoods, or predetermined zones
  - generate new data using simple image processing tools
  - interpolate data values for a study area based on samples; and clean up a variety of data for further analysis or display.



# Introduction to ArcGIS Extensions

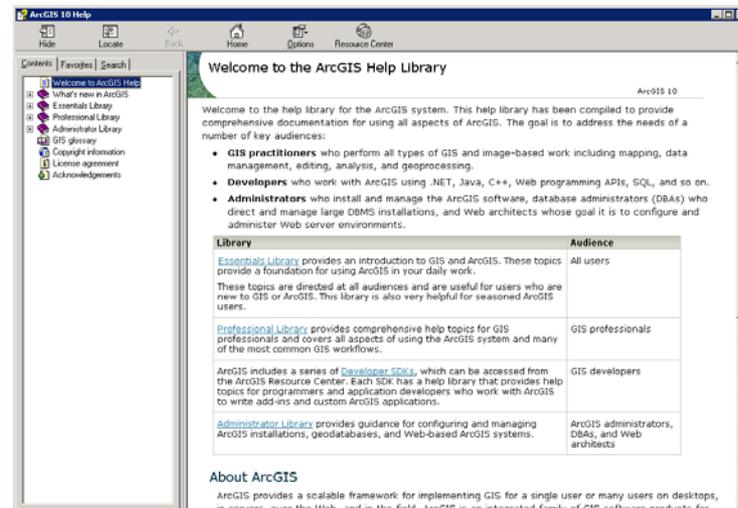
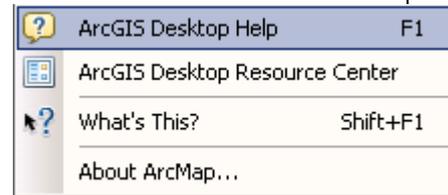
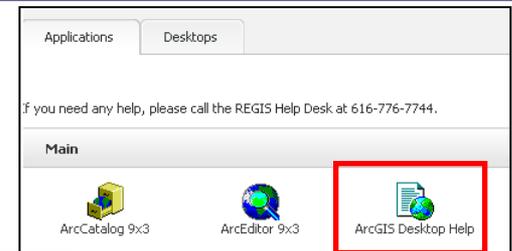
- **Network Analyst**

- Network Analyst is a powerful extension that provides network-based spatial analysis including routing, travel directions, closest facility, and service area analysis.
- dynamically model realistic network conditions, including turn restrictions, speed limits, height restrictions, and traffic conditions, at different times of the day.
- conduct drive-time analysis, point-to-point routing, route directions, service area definition, shortest path, optimum route, closest facility, or origin-destination analysis.



# Help Resources

- Launch via REGIS Login Page or
- Launch by pressing F1 in ArcView or by going to the Help drop-down menu and selecting ArcGIS Desktop Help.
- REGIS Help Desk
  - Telephone – 776-7744
  - E-mail – [regis@gvmc.org](mailto:regis@gvmc.org)



# Section 6 Exercises

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## 6.1 – ArcGIS I Review

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# SECTION 7

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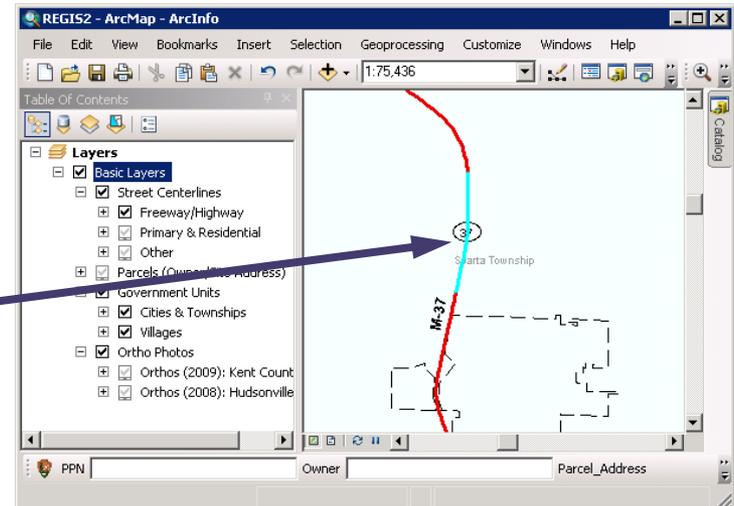
# SPATIAL DATA INTRODUCTION

# Features and attributes

- Feature classes are tables that store spatial data
- Each feature has a record in the table
  - Unique identifier links feature and attributes

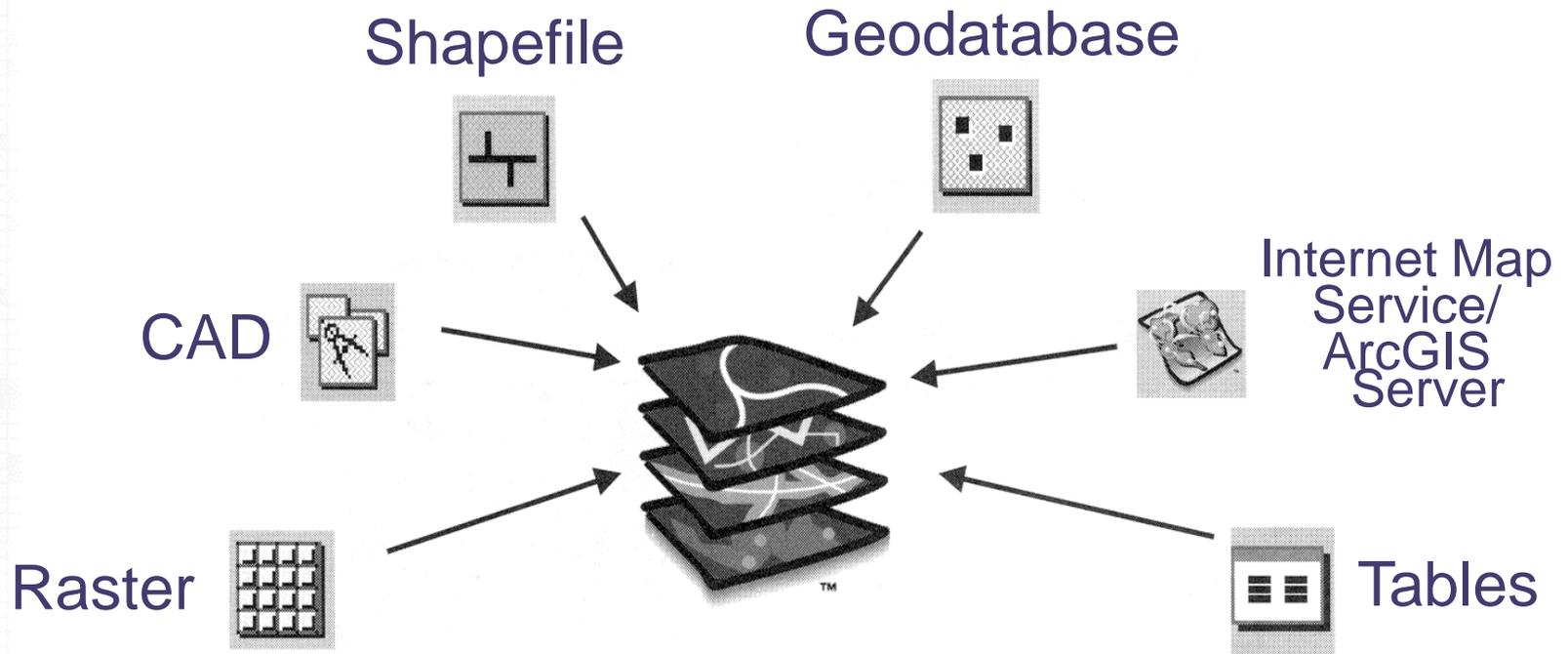
Object ID *	SHAPE.LEN	F_ZLEV	T_ZLEV	KCRC Category	Snow Route Number	CLASSNUMBER	ONEWAY	NOTES
16946	304.512417	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16962	2325.393009	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15968	906.241498	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15995	671.276716	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15998	133.171557	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16457	777.065378	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16462	6676.51577	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16464	279.627734	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16893	150.976386	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
16900	17.529618	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15534	20.429985	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
15536	690.35966	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>

OID = 16462  
(Feature Identifier)



# Spatial data formats

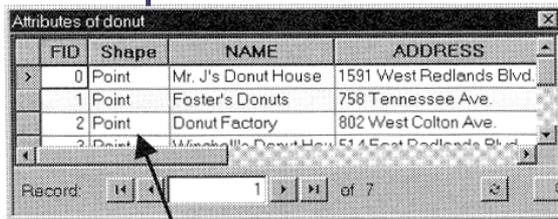
- ArcGIS can work with spatial data in multiple formats



# Data format: Shapefile

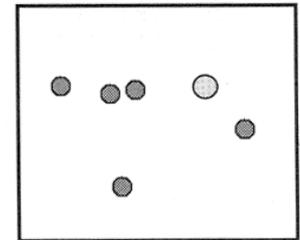
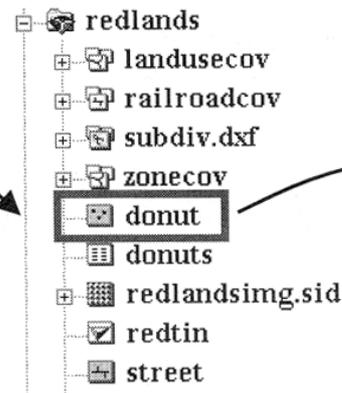
- Single feature class
- Can store points, lines or polygons
- Attributes stored in dBASE table

## Shapefile .dbf table



FID	Shape	NAME	ADDRESS
0	Point	Mr. J's Donut House	1591 West Redlands Blvd.
1	Point	Foster's Donuts	758 Tennessee Ave.
2	Point	Donut Factory	802 West Colton Ave.
3	Point	Mr. J's Donut House	514 East Redlands Blvd.

“Shape” field  
accesses separate  
coordinate files



Donut shapefile

# Data format: Geodatabase

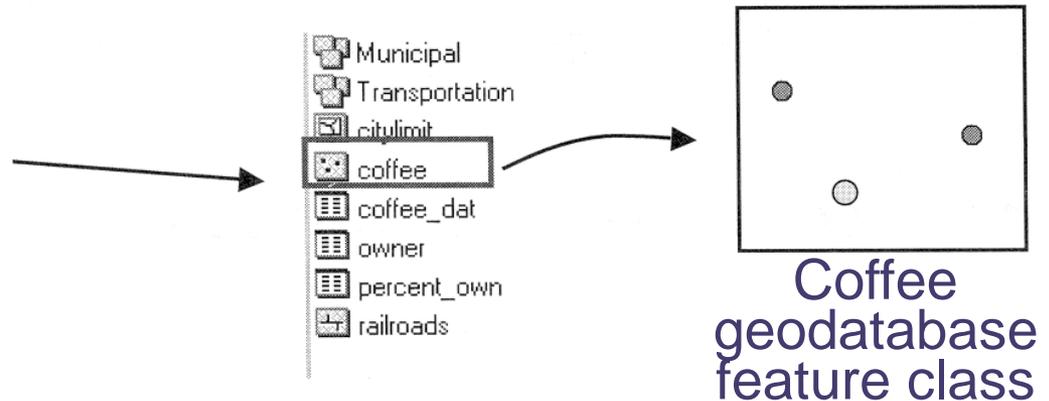
- Stores spatial features and their attributes in the same RDBMS
- Feature classes can be stand-alone or grouped in a feature dataset
- Feature datasets model spatial relationships

RDBMS table

FID	Shape	NAME
1	Point	Grounds-R-Us
2	Point	Melissas Coffee Place
3	Point	Coffee and Sons

Record: 1

“Shape” field  
accesses separate  
coordinate file



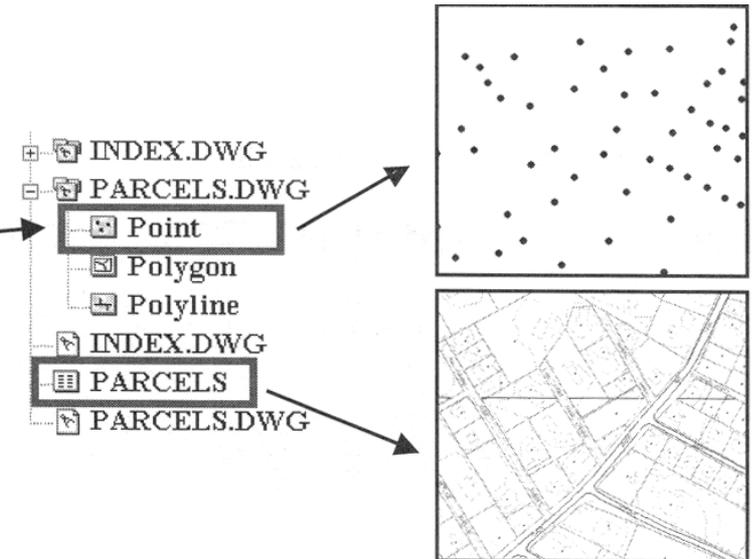
# Data format: CAD files

- Computer-Aided Design files (.dxf, .dwg, .dgn)
- Logical collection
  - Access one or all feature class(es) at a time
- Edit after conversion to shapefile or geodatabase feature class

## CAD file (read-only attribute tables)

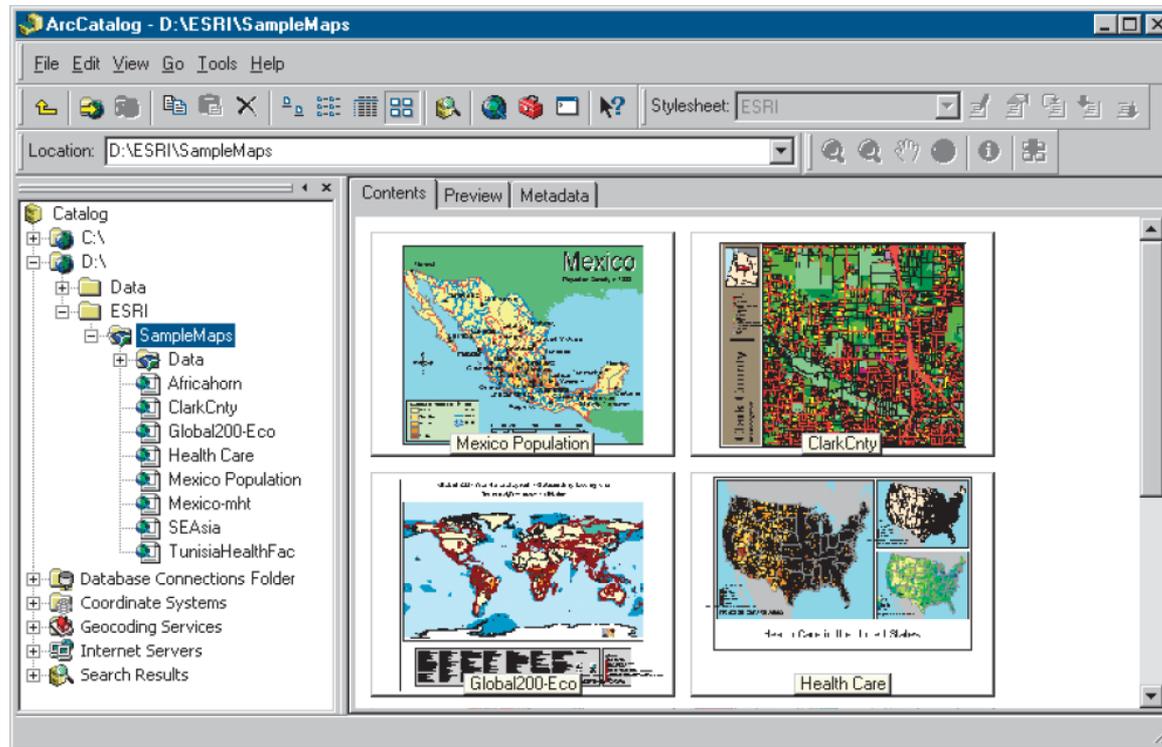
FID	Shape	Entity	Handle	Layer	Color	Linetype	Elev	Thickness
1	Point Z	Insert	93CB	LOT-D	7	CONTINU	0	0
2	Point Z	Insert	93D0	LOT-D	7	CONTINU	0	0
3	Point Z	Insert	93D5	LOT-D	7	CONTINU	0	0
4	Point Z	Insert	93DA	LOT-D	7	CONTINU	0	0
5	Point Z	Insert	93DF	LOT-D	7	CONTINU	0	0

“Shape” field accesses read-only coordinates



# Using ArcCatalog

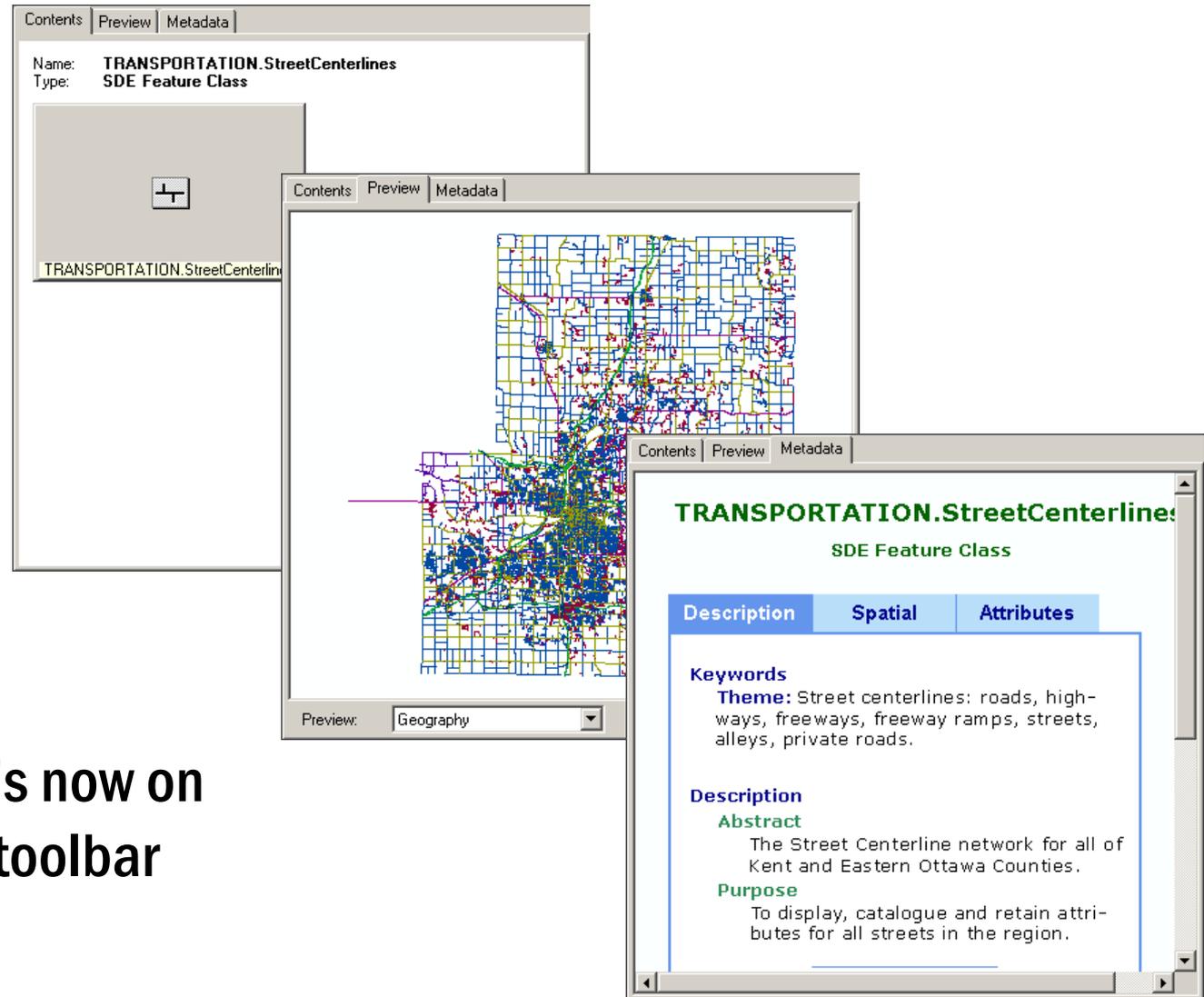
- Provides a uniform view of all your data



- Define or modify table and feature class definitions
- Manage data: copy, rename, delete

# ArcCatalog: Three ways to view data

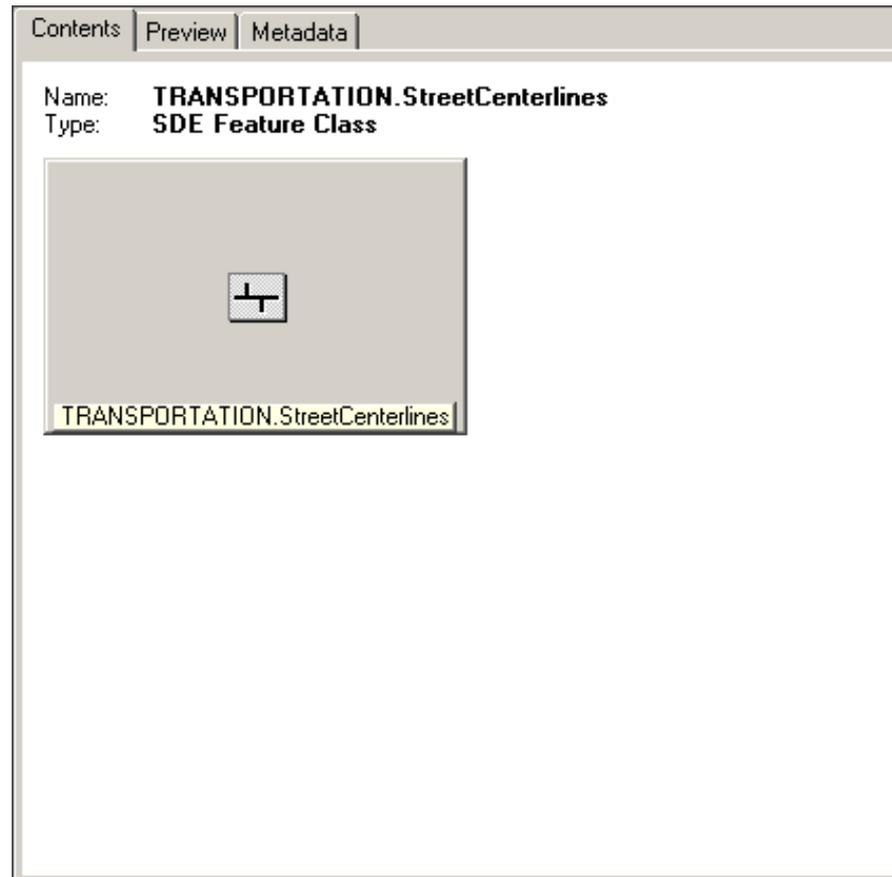
- Contents
- Preview
- Metadata



ArcCatalog is now on  
ArcMap's toolbar

# ArcCatalog: The Contents tab

- Large icons
- List
- Details
- Thumbnails
  - Data
  - Layers
  - Maps



# ArcCatalog: The Preview tab

- Geography or Table view
  - Choose from pulldown menu
  - Build custom views

The screenshot displays the ArcCatalog interface with two overlapping windows. The background window shows a map view of a street network, with a 'Preview' dropdown menu set to 'Geography'. The foreground window shows a table view of the same data, with a 'Preview' dropdown menu set to 'Table'. The table contains the following data:

STREET_NAME	STRE	SUF	TRAFFIC_AL	TR	SUBTYPE	SHAPE*
LINCOLN	ST		Bidirectional	No	Primary	Polyline
COIT	AVE	NE	Bidirectional	No	Primary	Polyline
BINDER	CT	SE	Bidirectional	No	Private	Polyline
HIDDEN CREEK	CIR	NE	Bidirectional	No	Private	Polyline
MARGARET	AVE	SE	Bidirectional	No	Secondary	Polyline
			Bidirectional	No	Alley	Polyline
			Bidirectional	No	Private	Polyline
			Bidirectional	No	Secondary	Polyline
40TH	AVE		Bidirectional	No	Secondary	Polyline
COLLINGWOOD	AVE	SW	Bidirectional	No	Secondary	Polyline
SUNRISE	CT	SE	Bidirectional	No	Private	Polyline
ALPENA	DR	NE	Bidirectional	No	Private	Polyline
BURTON	ST	SE	Bidirectional	No	Primary	Polyline

# ArcCatalog: The Metadata tab

- Create and display metadata in a variety of ways

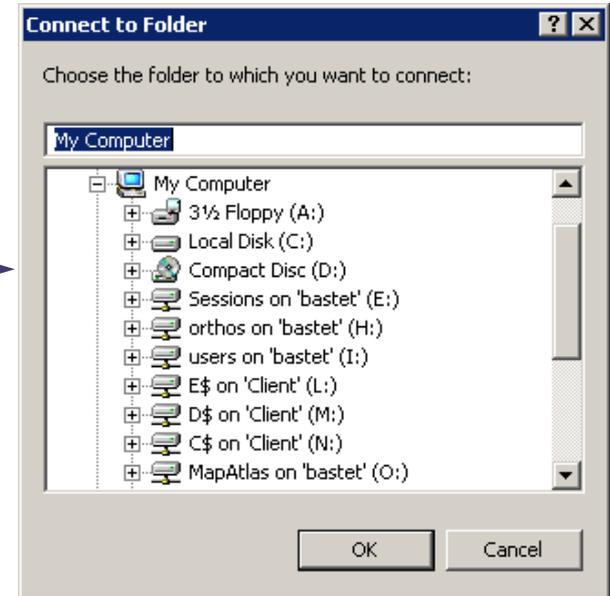


# Connecting to folders

- Connect to any folder in your network



- Connect through Network Neighborhood to store a Uniform Naming Convention (UNC) path
  - Example  
\\servername\foldername\filename.ext
  - Use UNC in layer files or map documents
- Disconnect from folders



# Section 7 Exercises

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## 7.1 – Using ArcCatalog

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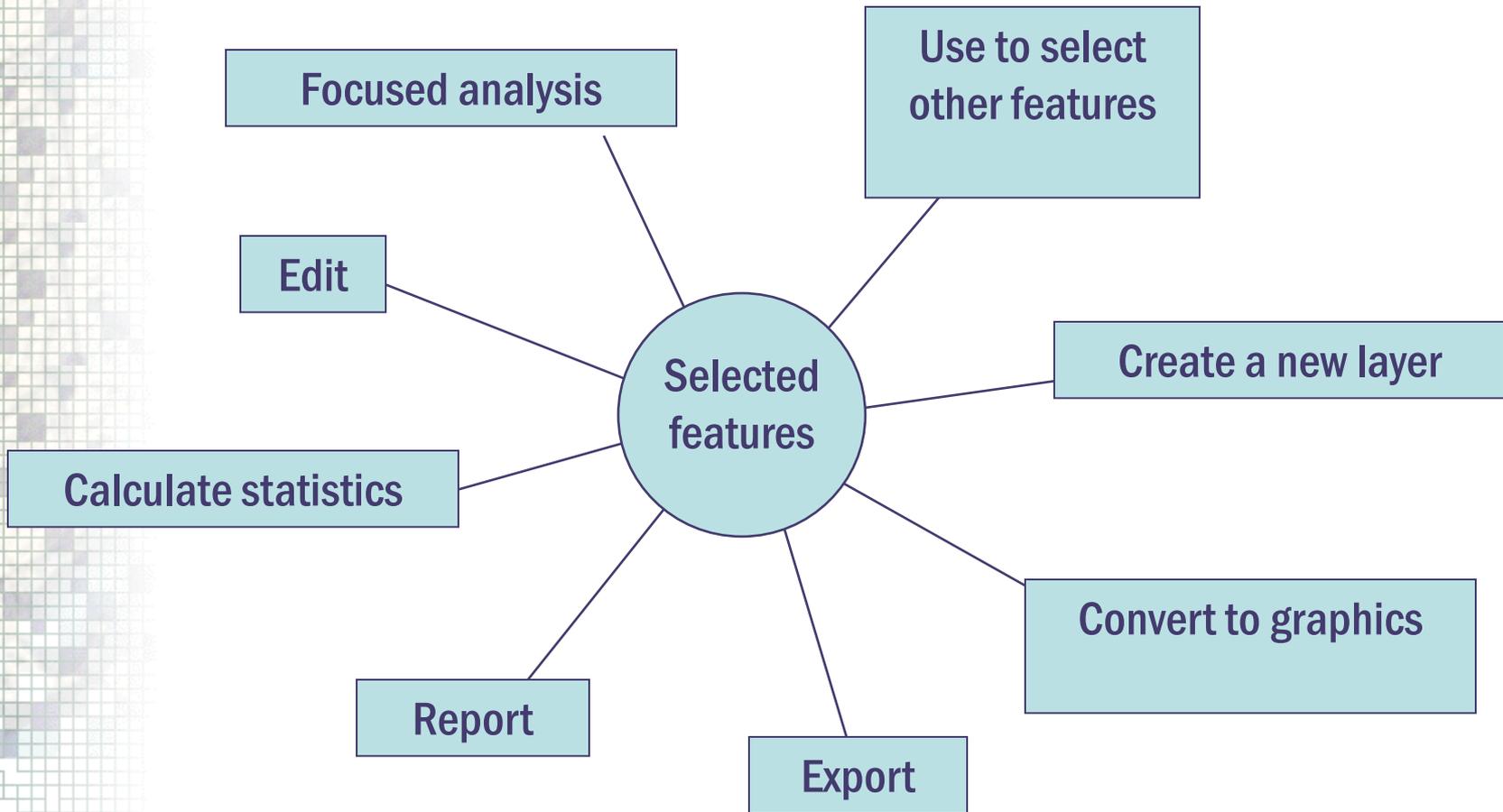
# SECTION 8

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# SELECTING DATA

# Why do you need a selection?

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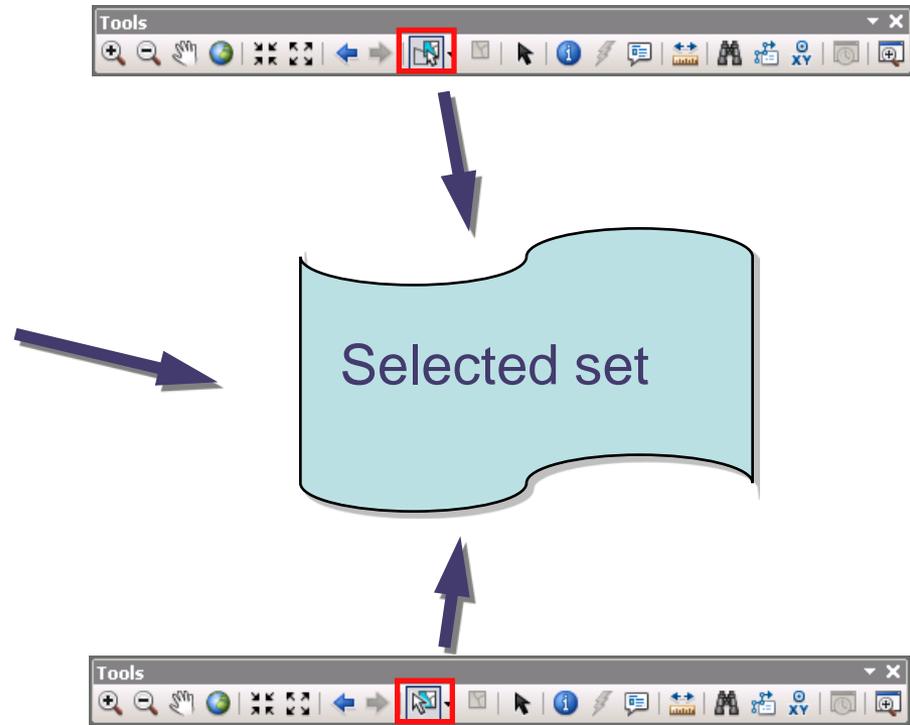
# Available selection tools

- Interactive, attributes, location, graphics

Selectable (no features selected)		
Freeway/Highway	<input checked="" type="checkbox"/>	0
Cities & Townships	<input checked="" type="checkbox"/>	0
Villages	<input checked="" type="checkbox"/>	0
Primary & Residential	<input checked="" type="checkbox"/>	0
Other	<input checked="" type="checkbox"/>	0
Parcels (Owner/Site Address)	<input checked="" type="checkbox"/>	0
Not Selectable		
Orthos (2009): Kent County C...		
Orthos (2008): Hudsonville Color		

Selection menu

## Interactive selection method



Select features by drawing a polygon

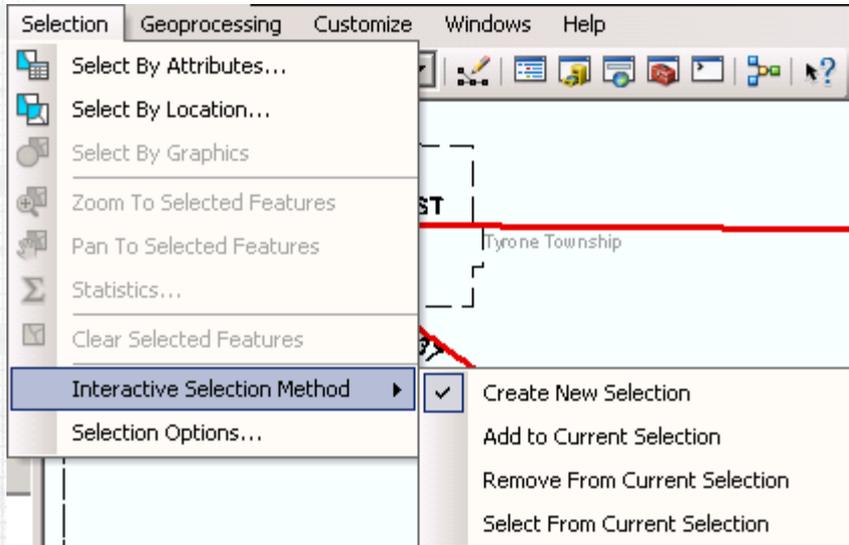
# Selection layers

- Specify from Table of Contents tab
  - Layer to select from using interactive selection tool

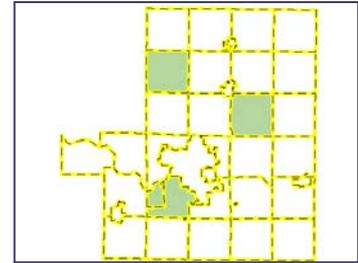


# Selection methods

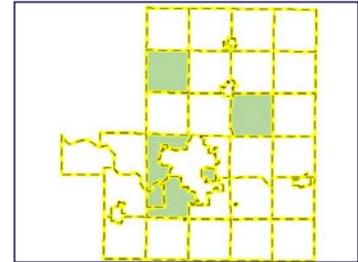
- Specify from Selection menu



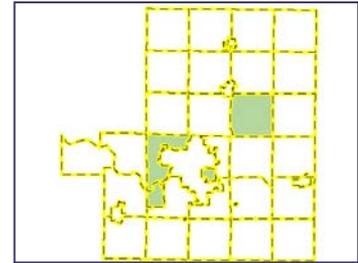
Create new selection



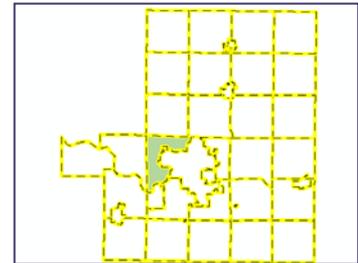
Add to the selection



Remove from the selection

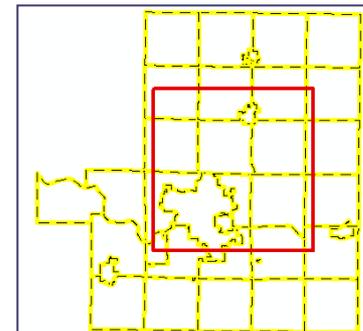
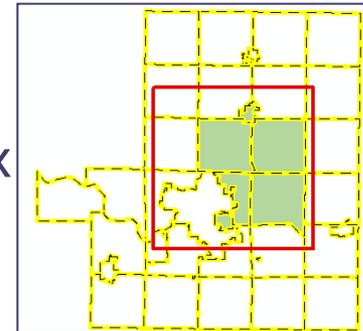
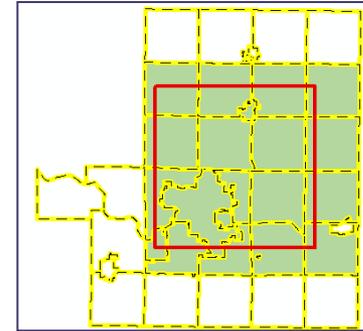


Select from selection



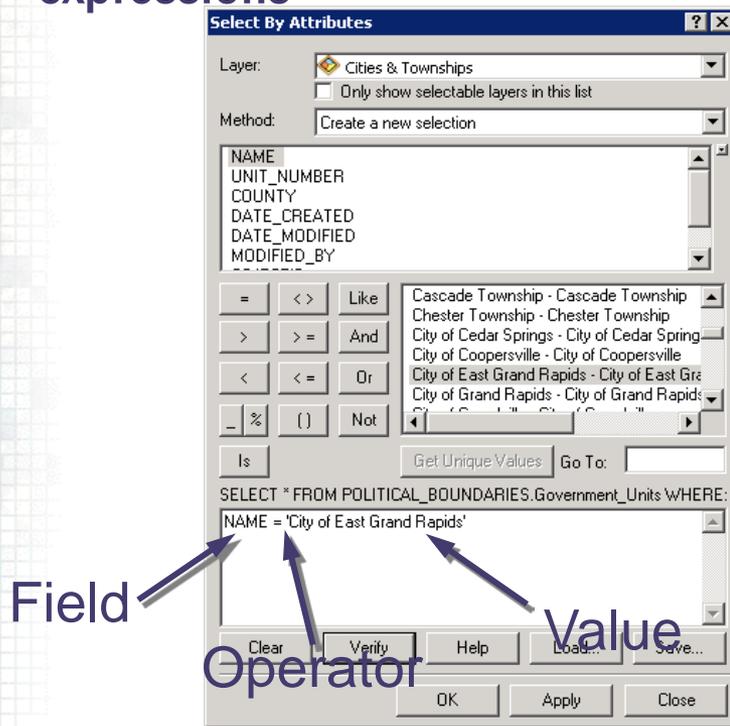
# Interactive selection options

- **Options from Selection menu**
  - Select features partially or completely within the box or graphic(s)
  - Select features completely within the box or graphic(s)
  - Select features that the box or graphic are completely within

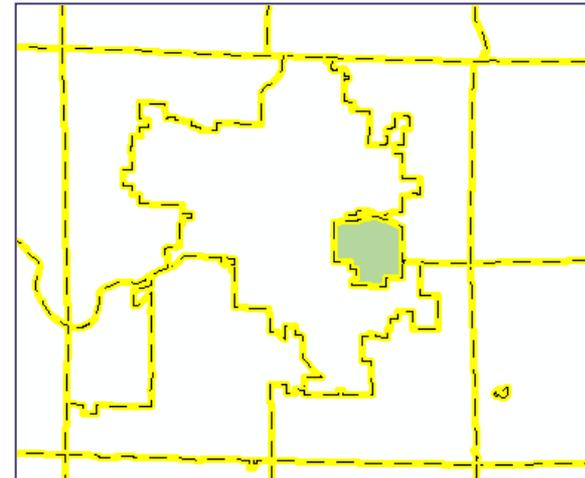


# Attribute selection

- Use an SQL statement to select features
- Save and reload selection expressions

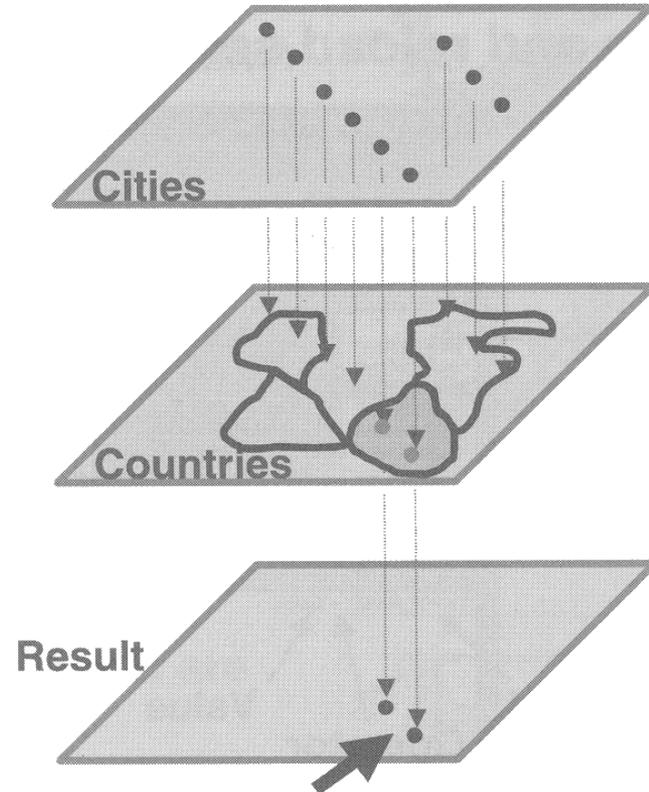
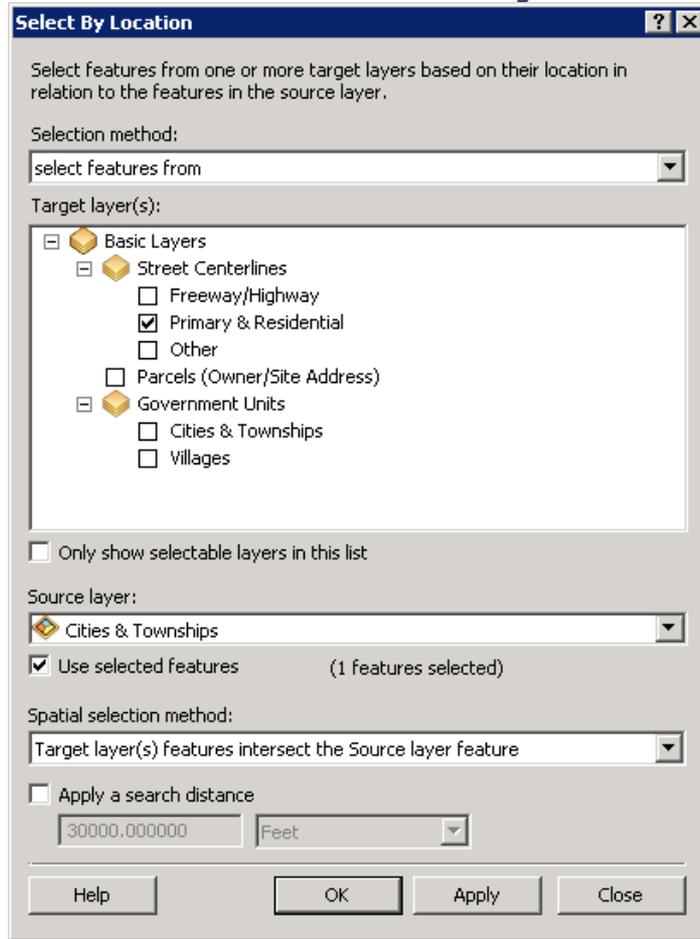


For current selection:  
Add to  
Remove from  
Select from



# Select by location (Spatial query)

- Use features in one layer to select features in another

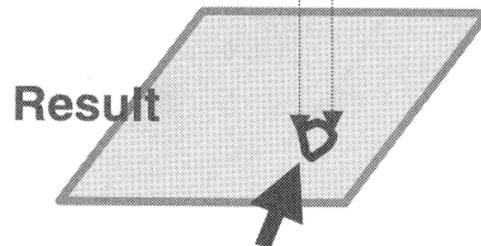
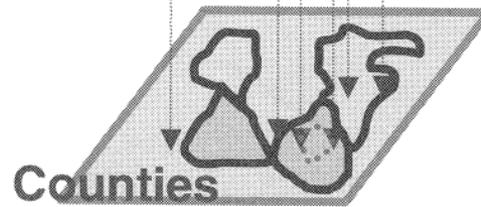
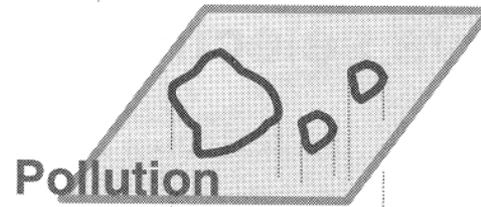


Cities intersected by  
*selected* countries

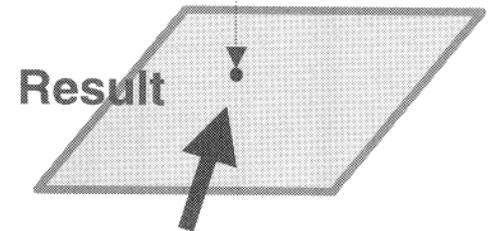
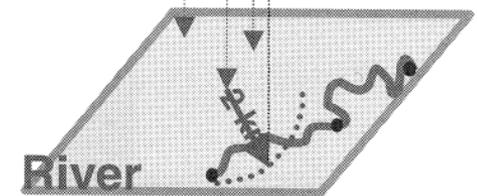
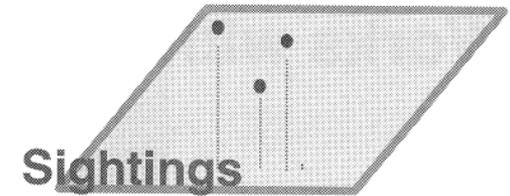
# Location selection methods

- **Select by location offers many selection methods**

- Intersects
- Contains
- Are contained by
- Shares a line segment
- Shares a point
- Within a distance
- Are identical
- Others...



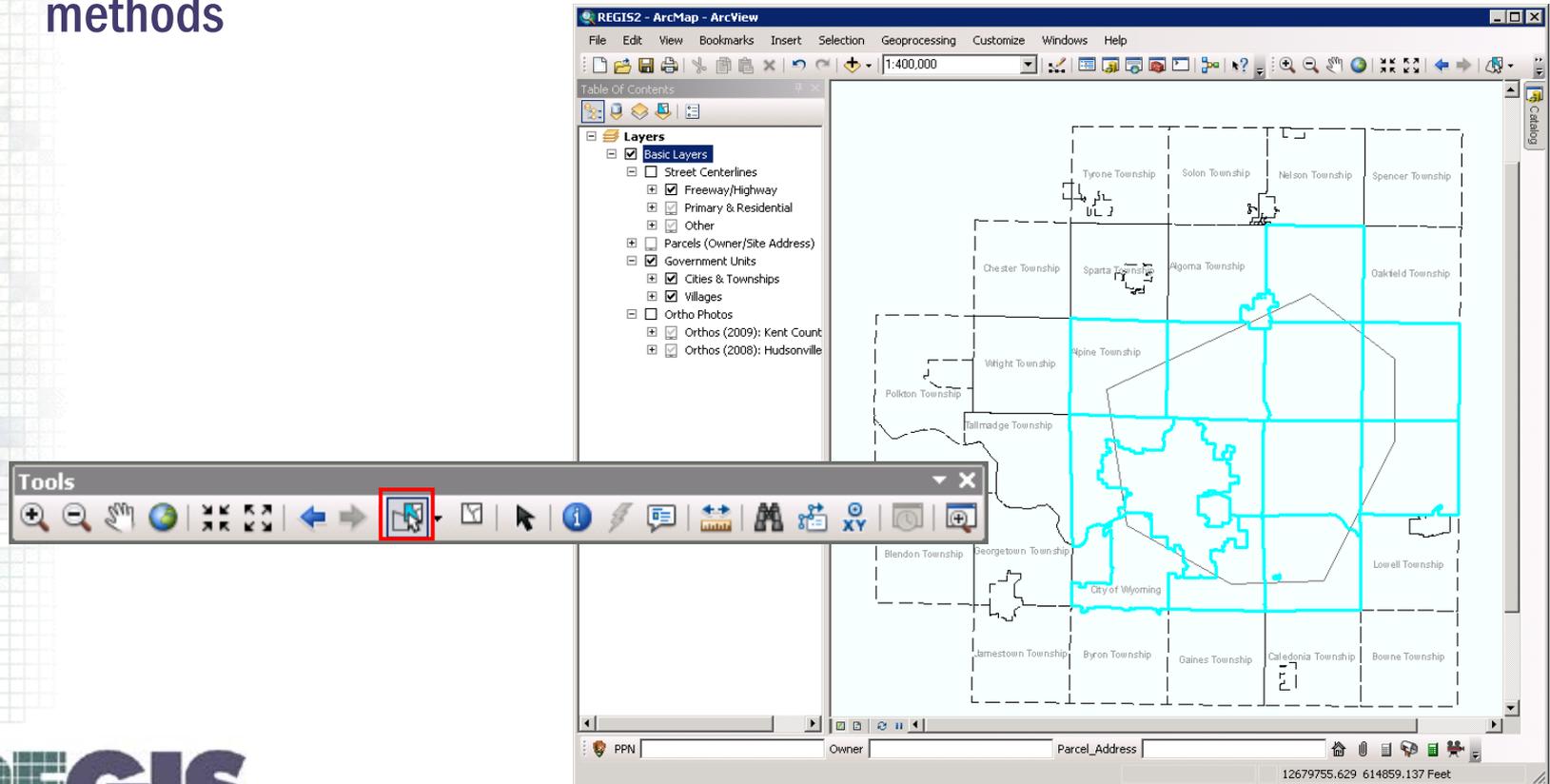
Polluted areas completely within selected countries



Animal sightings within a distance of 2 km from rivers

# Select by shape or graphic

- Draw a shape or graphic to select features
- Works with interactive selection methods



# Calculating summary statistics

- Select
  - Features
  - Layer
  - Field

The screenshot shows the ArcMap interface with the Selection menu open. The 'Statistics...' option is highlighted in red. Below the menu, the Selection Statistics dialog box is open, displaying a Frequency Distribution chart and summary statistics for 15 features selected from the 'Cities & Townships' layer, based on the 'SHAPE\_AREA' field.

**Selection Statistics**  
15 features selected from 1 layers  
Layer: Cities & Townships  
Field: SHAPE\_AREA

**Statistics:**  
Count: 15  
Minimum: 91162234.449  
Maximum: 1264159664.40682  
Sum: 11956915161.7717  
Mean: 797127677.451448  
Standard Deviation: 344174596.157099

**Frequency Distribution**

Area Range	Frequency
91162234.4 - 443197251.5	2
443197251.5 - 795232268.6	1
795232268.6 - 1147267285.6	7
1147267285.6 - 1499534571.1	1
1499534571.1 - 1851801856.6	1

# Section 8 Exercises

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**8.1 – Select Features Interactively**

**8.2 – Select By Attributes**

**8.3 – Select By Location**

**8.4 – Select By Graphics**

**8.5 – Using Selections**

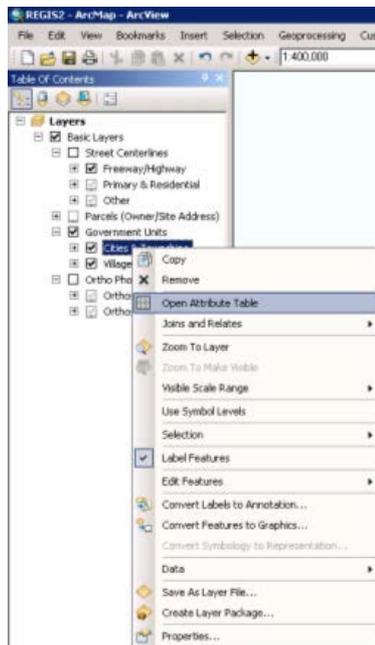
# SECTION 9

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# WORKING WITH TABLES

# Tables

- Descriptive information about features
- Each feature class has an associated table
- One row for each geographic feature



A screenshot of the 'Table' window in ArcMap, displaying a data table for the 'Cities & Townships' layer. The table has the following columns: Name, Unit Number, County, Date Created, Date Modified, and Mox. The data is as follows:

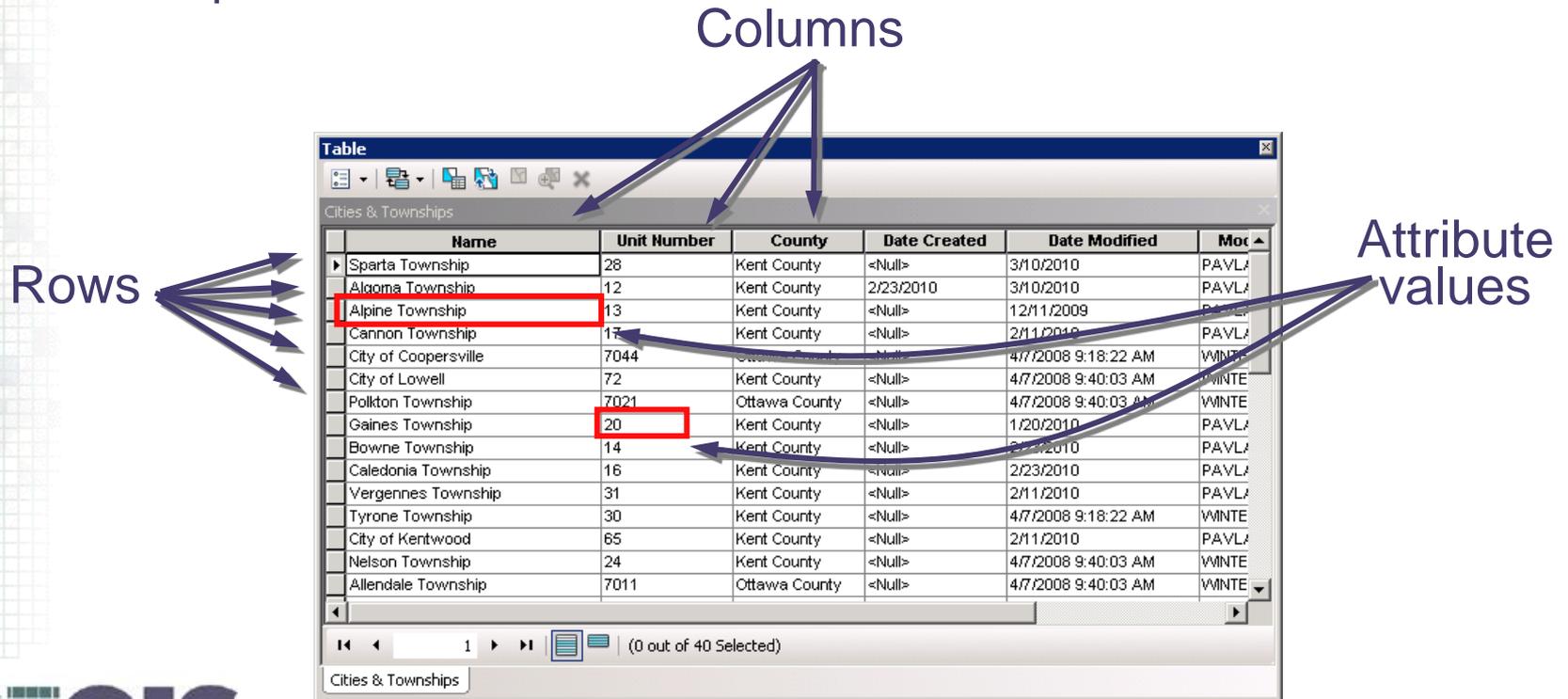
Name	Unit Number	County	Date Created	Date Modified	Mox
Sparta Township	28	Kent County	<Null>	3/10/2010	PAVL
Algoma Township	12	Kent County	2/23/2010	3/10/2010	PAVL
Alpine Township	13	Kent County	<Null>	12/11/2009	PAVL
Cannon Township	17	Kent County	<Null>	2/11/2010	PAVL
City of Coopersville	7044	Ottawa County	<Null>	4/7/2008 9:18:22 AM	WMTE
City of Lowell	72	Kent County	<Null>	4/7/2008 9:40:03 AM	WMTE
Polkton Township	7021	Ottawa County	<Null>	4/7/2008 9:40:03 AM	WMTE
Gaines Township	20	Kent County	<Null>	1/20/2010	PAVL
Bowne Township	14	Kent County	<Null>	2/23/2010	PAVL
Caledonia Township	16	Kent County	<Null>	2/23/2010	PAVL
Yergennes Township	31	Kent County	<Null>	2/11/2010	PAVL
Tyrone Township	30	Kent County	<Null>	4/7/2008 9:18:22 AM	WMTE
City of Kentwood	65	Kent County	<Null>	2/11/2010	PAVL
Nelson Township	24	Kent County	<Null>	4/7/2008 9:40:03 AM	WMTE
Allendale Township	7011	Ottawa County	<Null>	4/7/2008 9:40:03 AM	WMTE

The table window also shows a status bar at the bottom indicating '(0 out of 40 Selected)'.

# Understanding table anatomy

- Basic table properties

- Records/rows and fields/columns
- Column types can store numbers, text, dates
- Unique column names



# Table manipulation

- Open table in ArcMap or preview in ArcCatalog
  - Sort ascending or descending
  - Freeze/Unfreeze columns
  - Statistics
- In ArcMap
  - Select records
  - Modify table values

The screenshot shows the 'Table' window in ArcMap. The table contains the following data:

Number	County	Date Cre	Moc	
	Kent County	<Null>		
	Kent County	2/23/2010		
	Kent County	<Null>		
	Kent County	<Null>		
	Ottawa County	<Null>		
	Kent County	<Null>		
	Ottawa County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Kent County	<Null>		
	Ottawa County	<Null>		
	Ottawa County	<Null>		
	Kent County	<Null>	4/7/2008 9:40:03 AM	WINT
	Ottawa County	<Null>	4/7/2008 9:40:03 AM	WINT
	Ottawa County	<Null>	12/21/2009	PAVL
	Kent County	<Null>	3/10/2010	PAVL
	Kent County	<Null>	2/4/2010	PAVL
	Kent County	2/4/2010	2/11/2010	PAVL

The context menu is open, showing options: Sort Ascending, Sort Descending, Advanced Sorting..., Summarize..., Statistics..., Field Calculator..., Calculate Geometry..., Turn Field Off, Freeze/Unfreeze Column, Delete Field, and Properties... The status bar at the bottom indicates 'out of 40 Selected'.

# ArcGIS tabular formats

---

- Each ArcGIS spatial format has a native tabular format
  - Coverage: INFO
  - Shapefile: dbf
  - Geodatabase: RDBMS } ArcGIS can convert between formats
- Create a link between related tables
- Some spatial formats can link with multiple tabular formats



# Associating tables

- Can store attributes in feature tables or separate table
- Associate tables with common column key values
- Must know table relationships (cardinality)

Feature attribute table

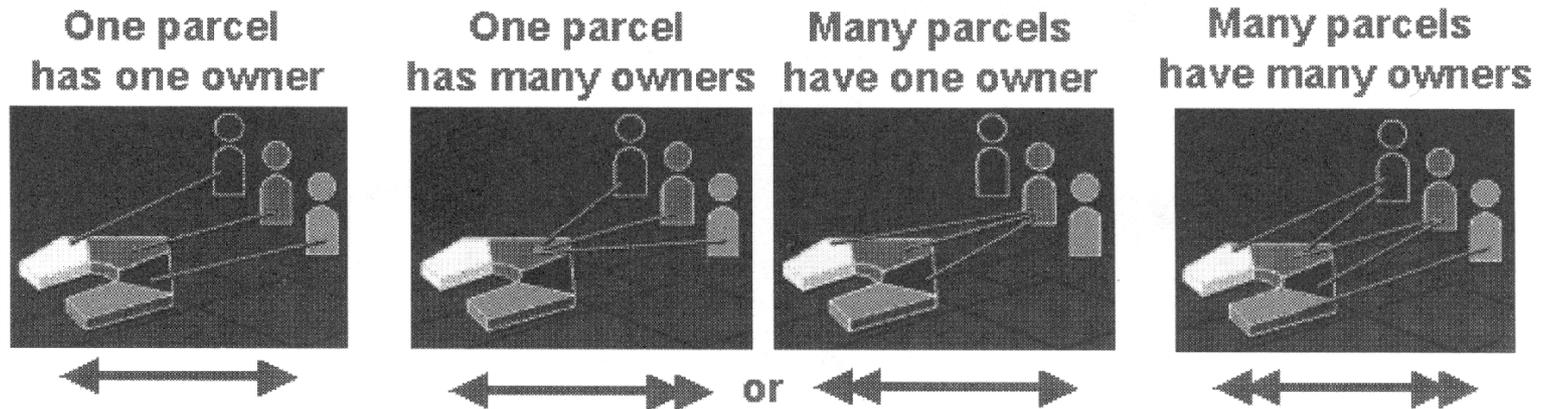
FID	Shape	AREA	PERIMETER	ZONE#	ZONE-ID	ZONE_CODE
29	Polygon	139761.1	3436.182685761	29	31	RES
30	Polygon	19311.13	1227.994790069	30	25	AIR
31	Polygon	1394.393	269.1558402356	31	35	IND
32	Polygon	10618.05	433.2512163686	32	33	RES
33	Polygon	9529.783	418.2222455404	33	34	RES
34	Polygon	16141.88	812.9035032412	34	38	000
35	Polygon	44579.73	879.9199925836	35	36	IND
36	Polygon	74082.59	1254.269129168	36	37	SDP
37	Polygon	11033.96	439.7286407905	37	38	RES

Additional attribute table

Rowid	ZONE_CODE	DESCRIPTION
1	000	NODATA
2	AGR	Agricultural
3	AIR	Airport
4	COM	Commercial
5	FLD	Flooded
6	IND	Industrial
7	INS	Institutional
8	OS	Open Space
9	RES	Residential

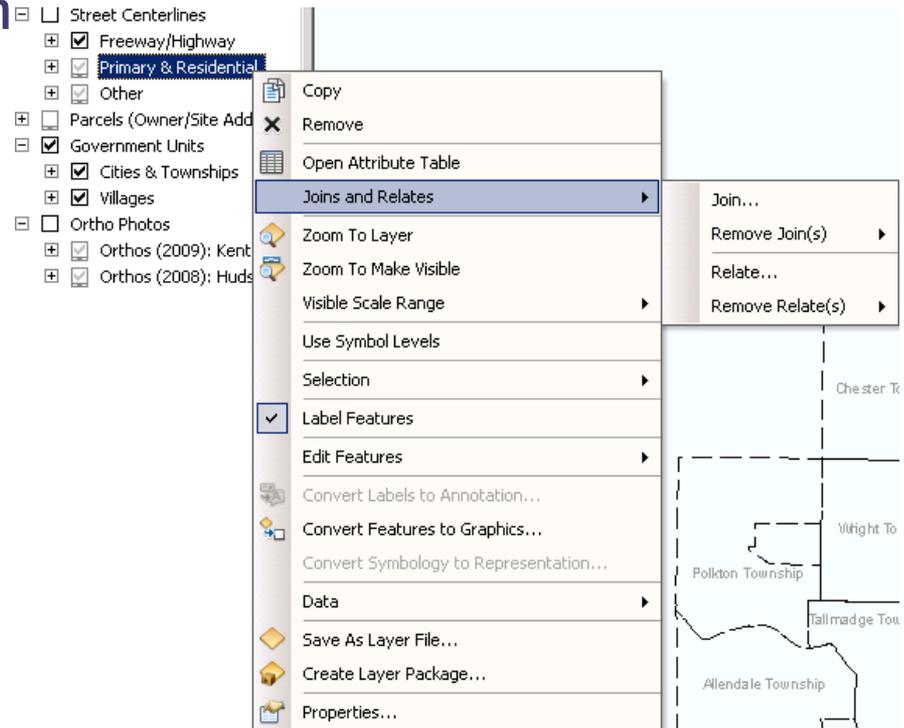
# Table relationships

- How many “A” objects are related to “B” objects?
- Types of cardinality
  - One to one, one to many or many to one, and many to many
- Must know cardinality before connecting tables



# Joins and relates

- Two methods to associate tables in ArcMap
- Join appends the attributes from one onto the other based on a common field
- Relates define a relationship between two tables



# Connecting tables with joins

- Physical connection between two tables
- Appends the attributes of two tables
- Assumes one-to-one or one-to-many cardinality

Soil

Attributes of soil		
OBJECTID*	Shape*	SOIL_CODE
1	Polygon	41
2	Polygon	26
3		
4		
5		
6		
7		

Soil\_desc

Attributes of soil_desc		
OBJECTID*	SOIL_CODE	SOIL_DESC
1	41	Quary-Gravel pit
2	26	Psamments and Fluvents (freq-flooded)

Soil

Attributes of soil					
OBJECTID	Shape	soil.SOIL_CODE	soil_desc.SOIL_CODE	soil_desc.SOIL_DESC	
1	Polygon	41	41	Quary-Gravel pit	
2	Polygon	26	26	Psamments and Fluvents (freq-flooded)	
3	Polygon	26	26	Psamments and Fluvents (freq-flooded)	
4	Polygon	26	26	Psamments and Fluvents (freq-flooded)	
5	Polygon	34	34	Soboba stony loamy sand	
6	Polygon	50	50	Water	

# Connecting tables with relates

- Define relationship between two tables
- Tables remain independent
- Additional cardinality choices
  - One to many, many to many

The image shows a sequence of steps in ArcGIS. On the left, a table with columns 'KEYFIELD' and 'OBJECTID' is visible. Below it, a context menu is open, with 'Related Tables' highlighted. An arrow points from this menu to the right, where a new window titled 'Attributes of Blk\_Dmg' is displayed. This window shows a table with columns 'OBJECTID\*', 'STATEFP', 'CNTY', and 'TRAC'. The 'Related Tables' menu also includes options like 'Find & Replace...', 'Select By Attributes...', 'Select All', 'Clear Selection', 'Switch Selection', 'Add Field...', and 'Create Graph'.

KEYFIELD	OBJECTID
0073	1151
0073	1171
0073	1171
007602	620

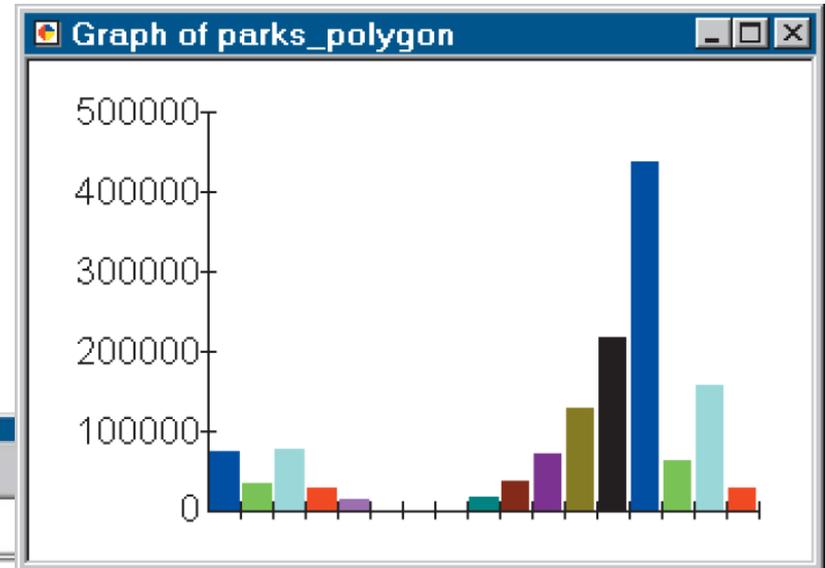
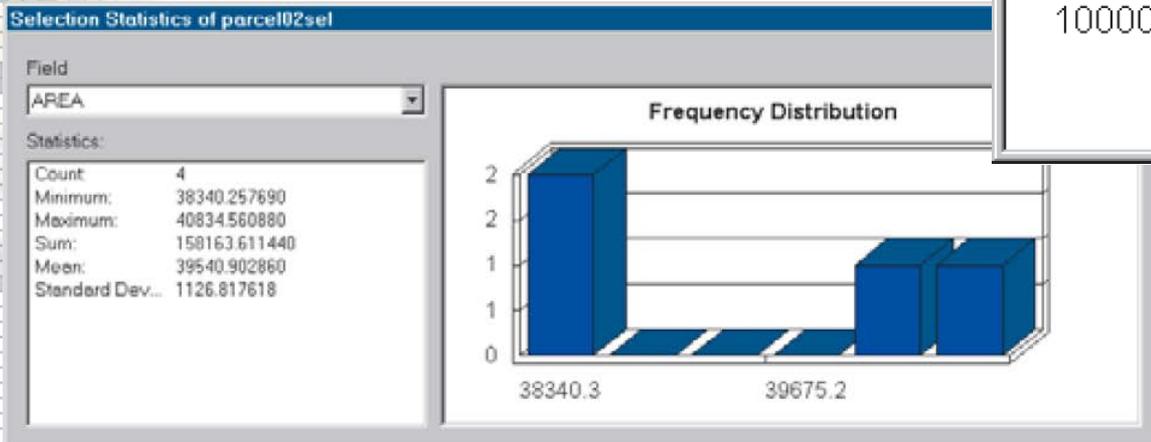
KEYFIELD	OBJECTID	
06.071.0073	.101	1 F
06.071.0073	.111	2 F
06.071.		
06.071.		
06.071.		
06.071.		

OBJECTID*	STATEFP	CNTY	TRAC
12	06	071	0086
13	06	071	0073
14	06	071	0078
15	06	071	0078
16	06	071	0078
17	06	071	0078

Open related table

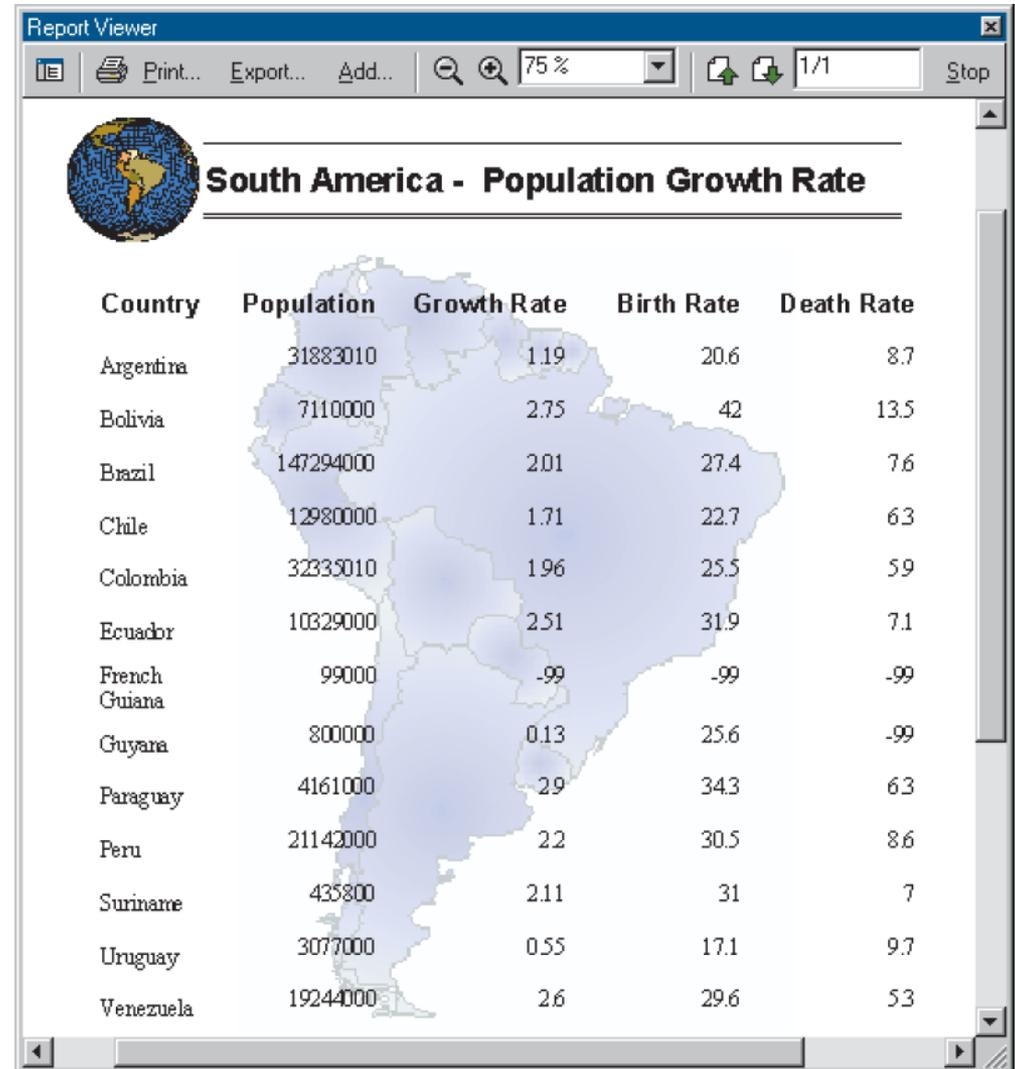
# Graphs

- Summarize tabular information
- A variety of graph formats
- Set display properties
- Add to a map



# Reports

- Organize and display tabular data
- Group and format data
- Save and export
- Three reporting tools
  - Report Writer
  - Crystal Reports
  - REGIS Mailing Labels



Report Viewer

Print... Export... Add... 75% 1/1 Stop

### South America - Population Growth Rate

Country	Population	Growth Rate	Birth Rate	Death Rate
Argentina	31883010	1.19	20.6	8.7
Bolivia	7110000	2.75	42	13.5
Brazil	147294000	2.01	27.4	7.6
Chile	12980000	1.71	22.7	6.3
Colombia	32339010	1.96	25.5	5.9
Ecuador	10329000	2.51	31.9	7.1
French Guiana	99000	-99	-99	-99
Guyana	800000	0.13	25.6	-99
Paraguay	4161000	2.9	34.3	6.3
Peru	21142000	2.2	30.5	8.6
Suriname	435800	2.11	31	7
Uruguay	3077000	0.55	17.1	9.7
Venezuela	19244000	2.6	29.6	5.3

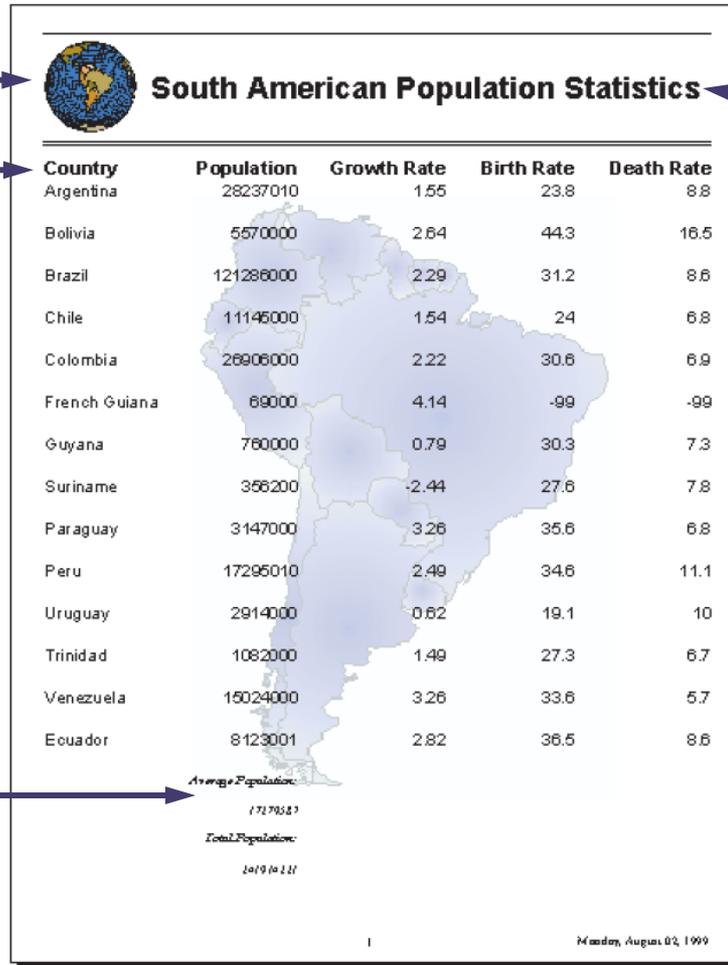
# The ArcMap Report Writer

- Quick, easy, professional report creation

Add an image

Choose fields

Calculate summary statistics



Add borders

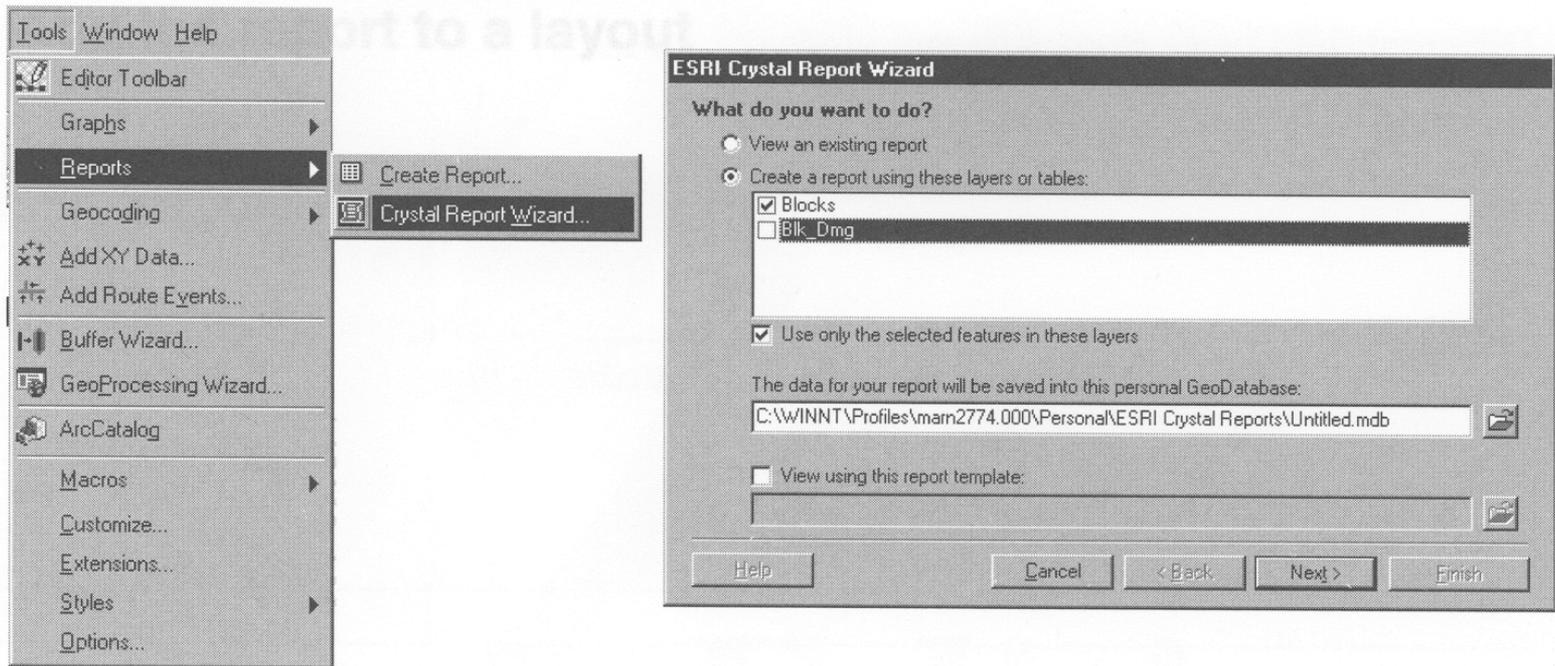
Title

Display records

Date and page numbers

# Crystal Reports

- A more powerful reporting tool
- Export to Crystal Reports format
- Wizard aids in report creation



# Section 9 Exercises

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**9.1 – Introduction to Tables**

**9.2 – Using Tables**

**9.3 – Using Field Properties and MapTips**

**9.4 – Using Relates**

**9.5 – Creating and Using Joins**

**9.6 – Creating Graphs**

**9.7 – Creating Reports**

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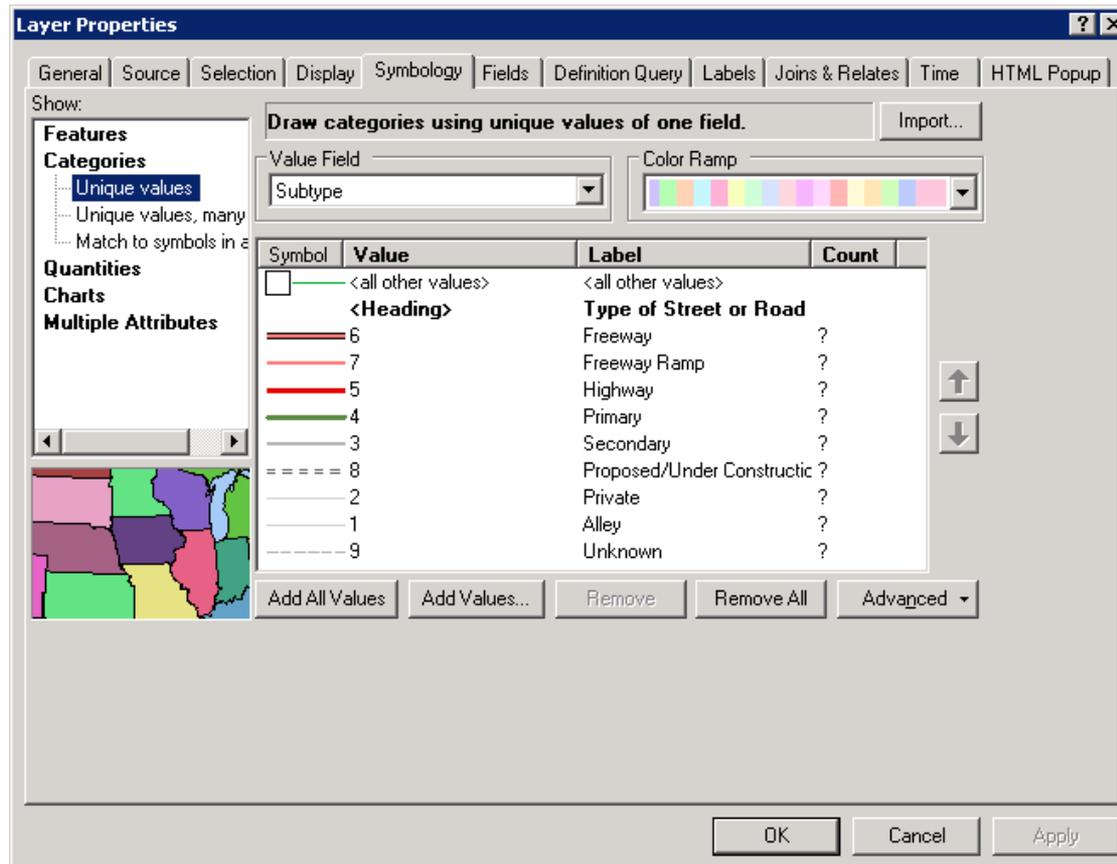
# SECTION 10

---

# SYMBOLIZING & DISPLAYING DATA

# Layer symbology in ArcMap

- Same symbol for all features
- Based on attribute values



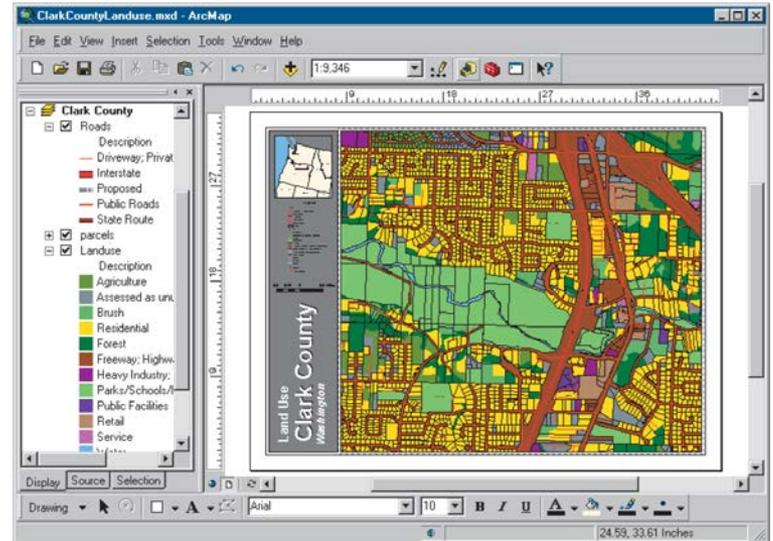
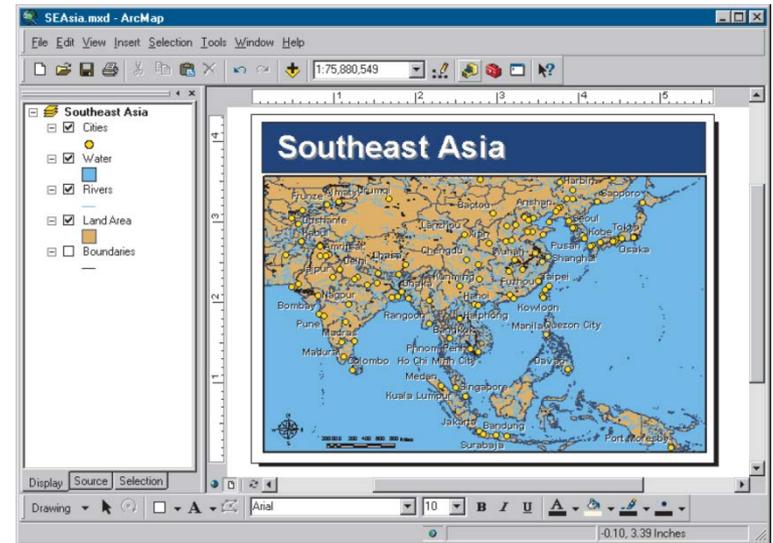
# Displaying qualitative values

- Features

- Features
  - Single symbol
- Categories
- Quantities
- Charts
- Multiple Attributes

- Categories

- Features
- Categories
  - Unique values
  - Unique values, many I
  - Match to symbols in a
- Quantities
- Charts
- Multiple Attributes



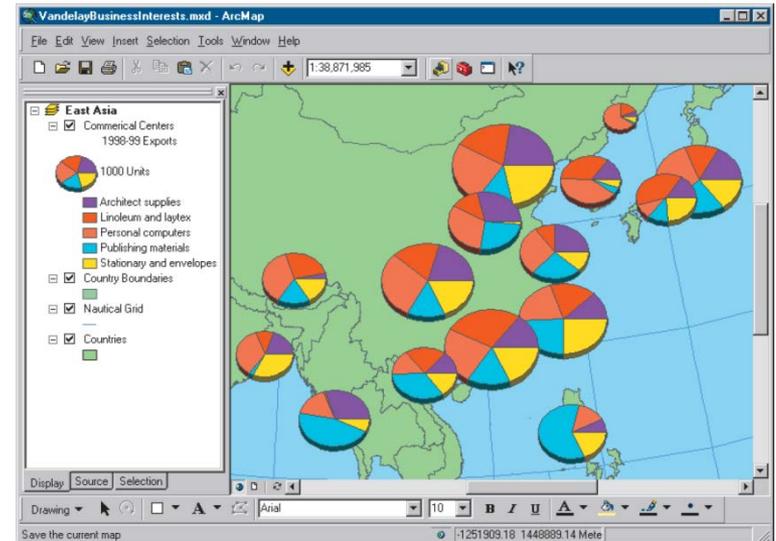
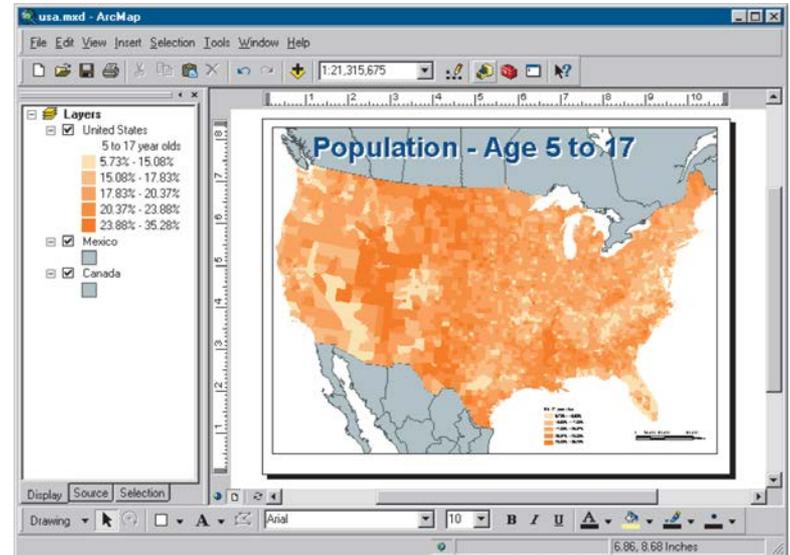
# Displaying quantitative values

- Quantities

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

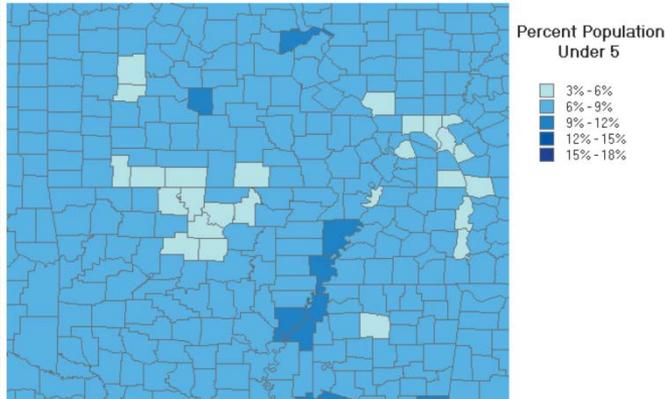
- Charts

- Features
- Categories
- Quantities
- Charts
  - Pie**
  - Bar/Column
  - Stacked
- Multiple Attributes

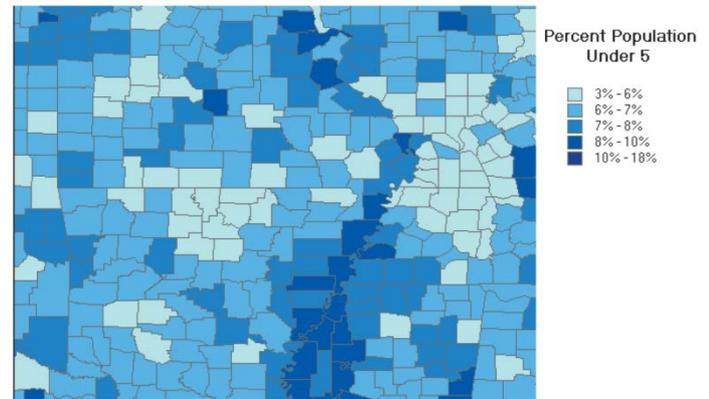


# Classifying quantitative values

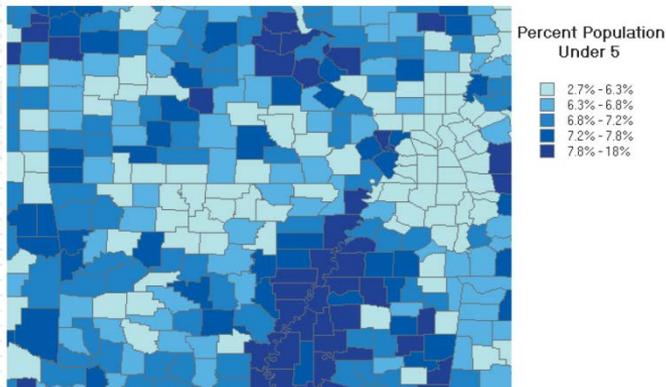
- Can modify classes



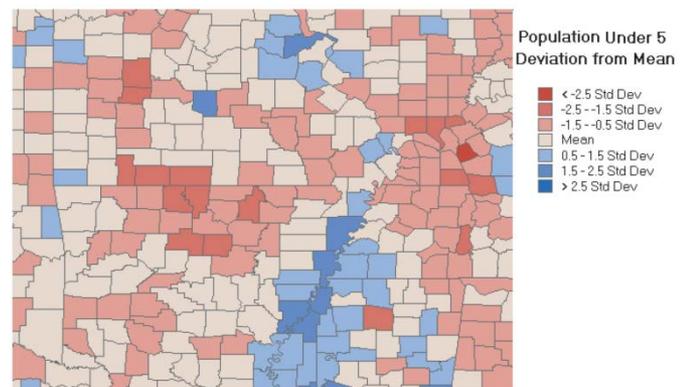
Equal Interval



Natural Breaks



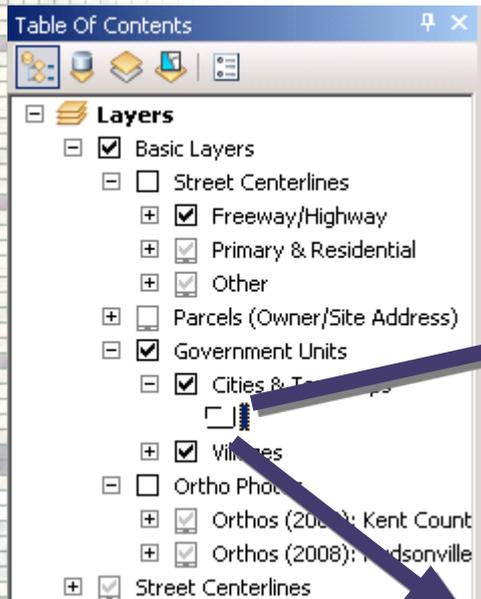
Quantile



Standard Deviation

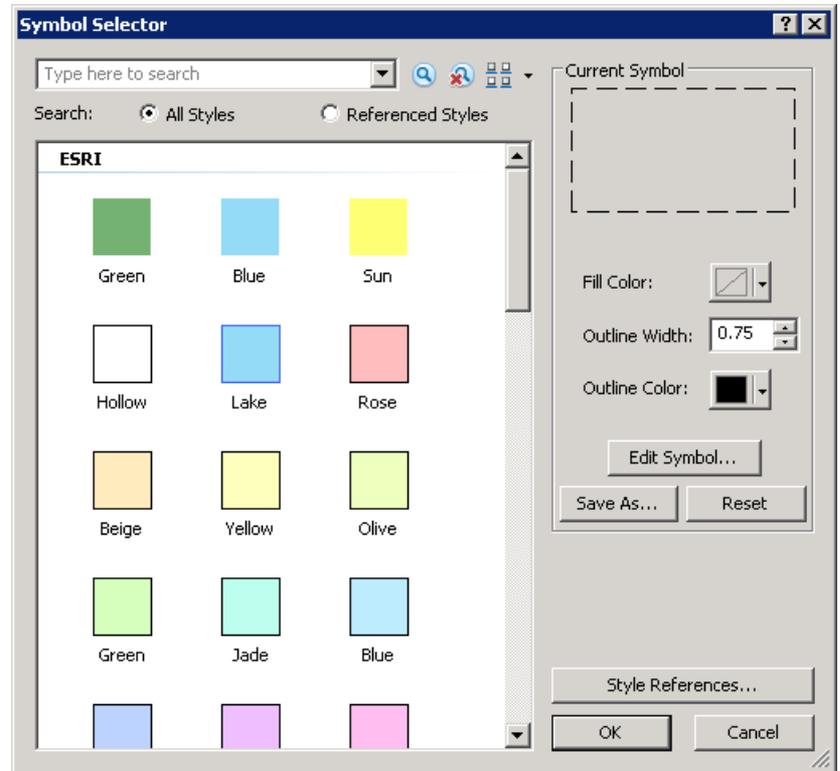
# Changing the symbol properties

- Symbology tab or Table of Contents



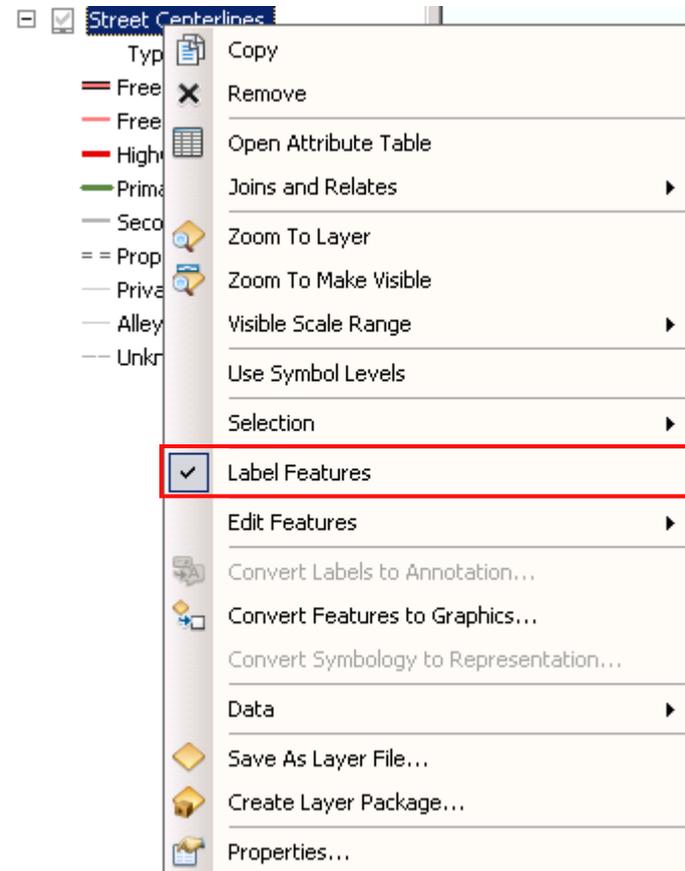
Left-click

Right-click



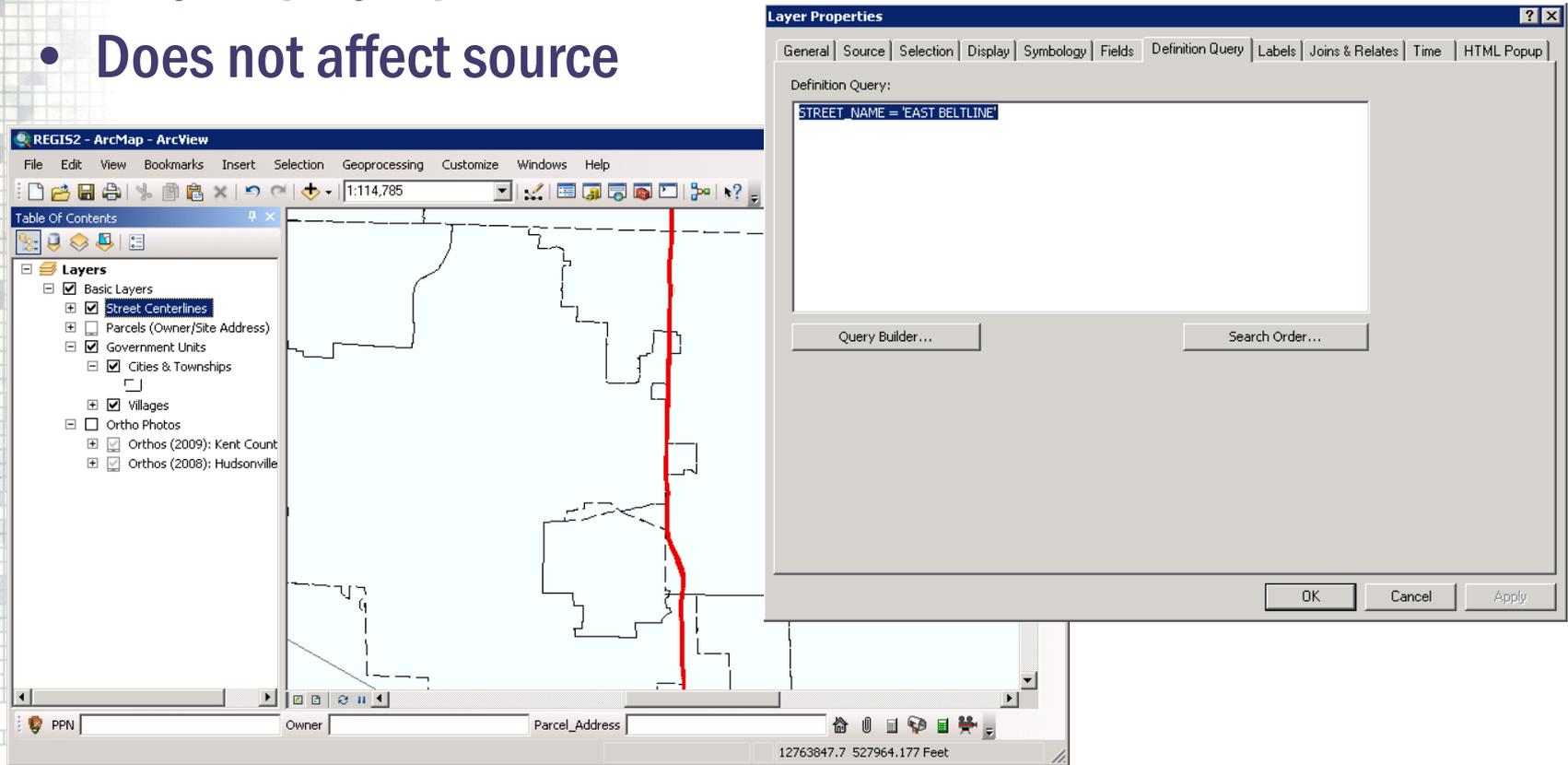
# Labeling features

- Label features dynamically using attribute values
- Layer properties control appearance and position
- Convert labels to annotation features



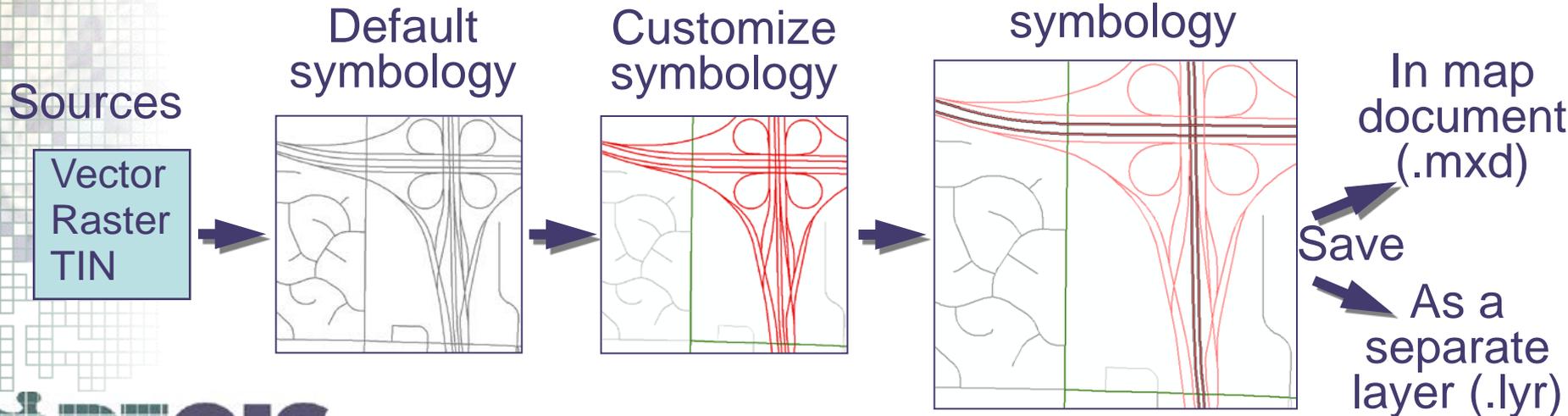
# Creating a definition query (“filter”)

- Build a query based on attributes
- Only displays queried features
- Does not affect source



# Saving a layer file

- Save symbology for use in other map documents
- Layer files
  - .lyr extension
  - Save the display for a layer without saving an entire map document
  - Load into another map document
  - Preview in ArcCatalog



# Section 10 Exercises

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**10.1 – Introduction to Layer Symbology**

**10.2 – Advanced Layer Symbology**

**10.3 – Labeling Features**

**10.4 – Creating a Definition Query**

**10.5 – Creating a Layer File**

# SECTION 11

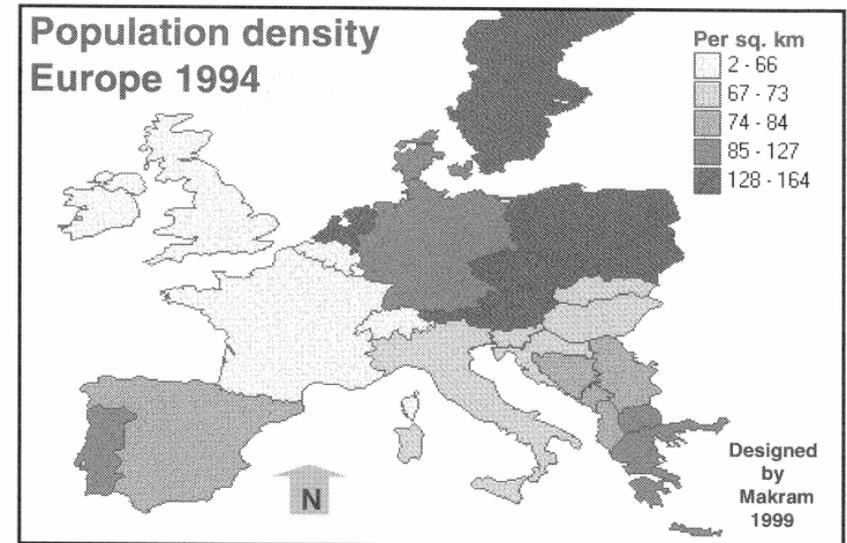
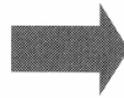
---

# CARTOGRAPHIC DESIGN

# Section 11 Overview

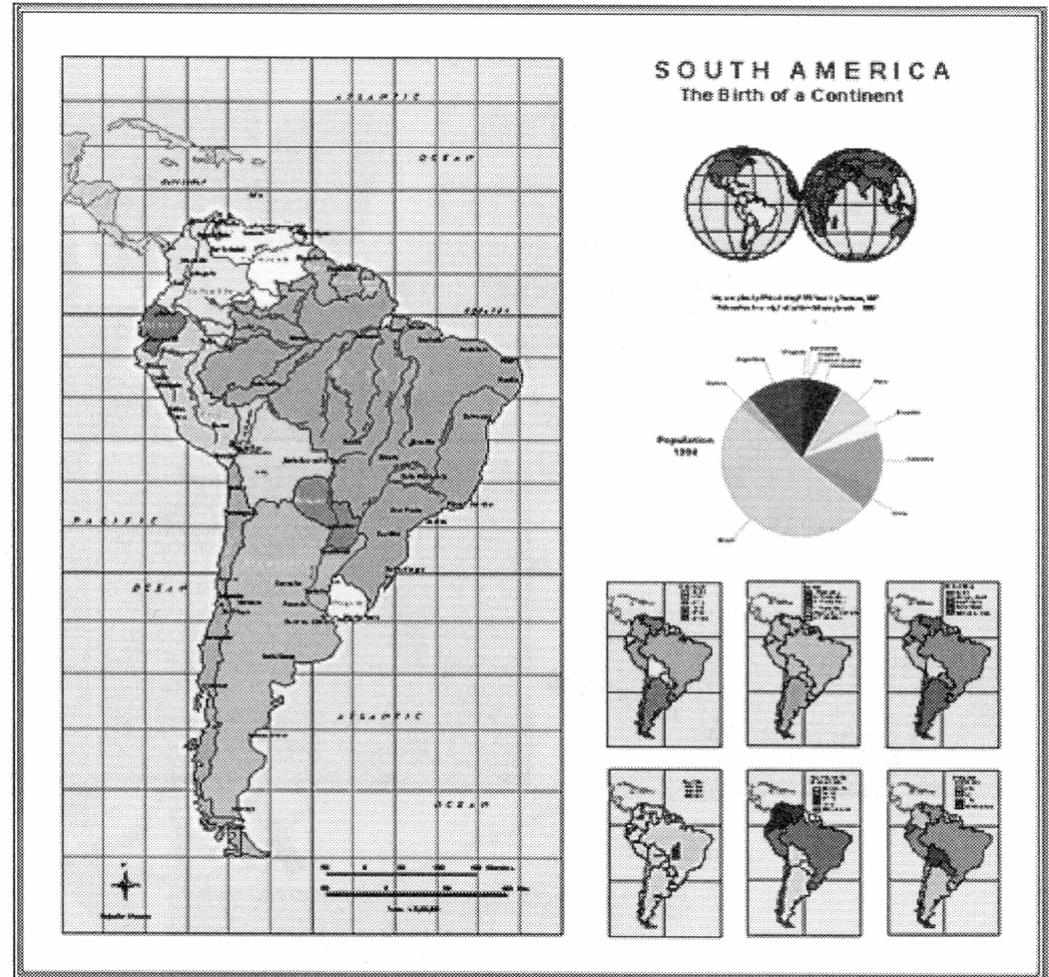
- Basic cartographic concepts
- Creating maps in ArcMap
- Printing and plotting maps

Output  
from  
query/analysis

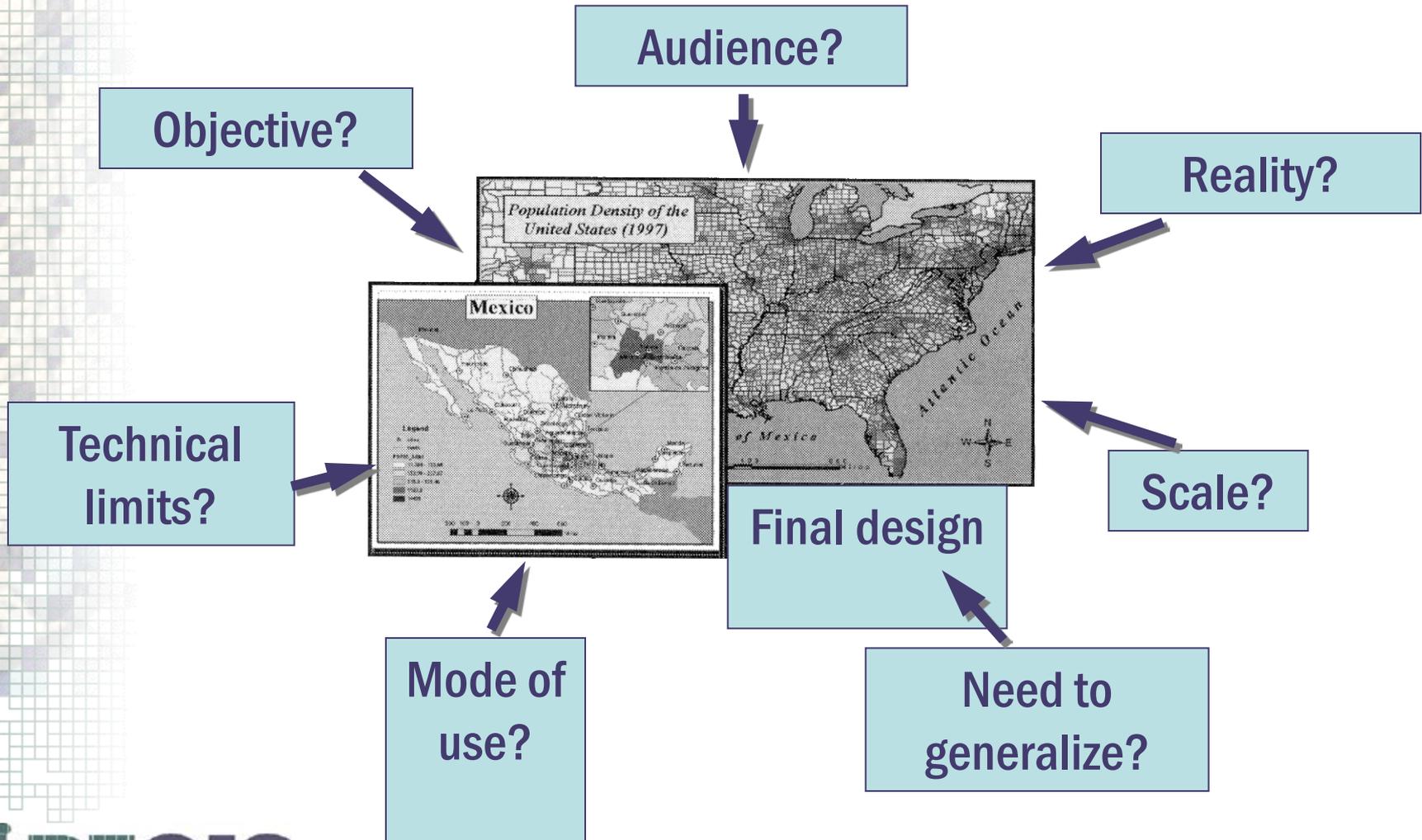


# Map and design objectives

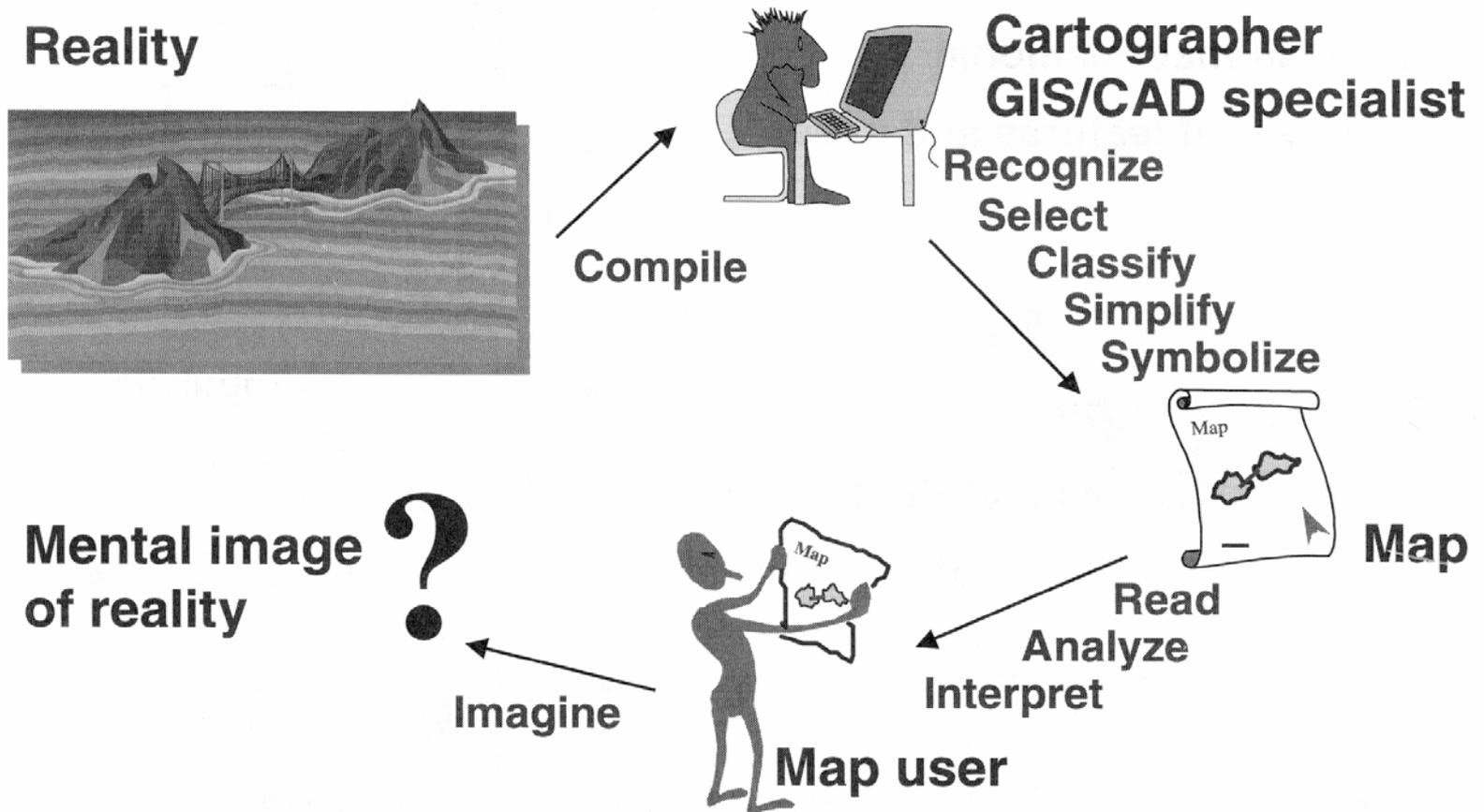
- **Map objectives**
  - Share information
  - Highlight relationships
  - Illustrate analysis results
- **Design objectives**
  - Manipulate the graphic characteristics
  - Fulfill the intended purpose



# Factors controlling cartographic design

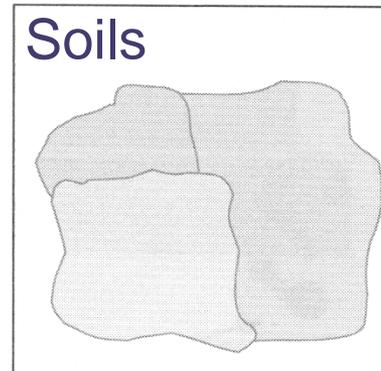
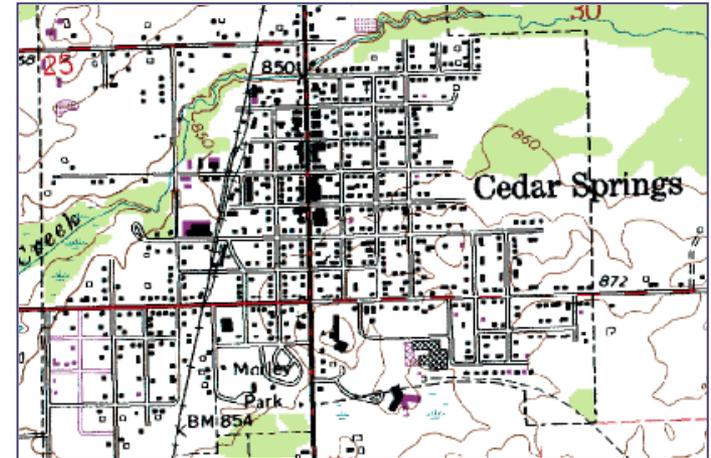


# Communication in maps

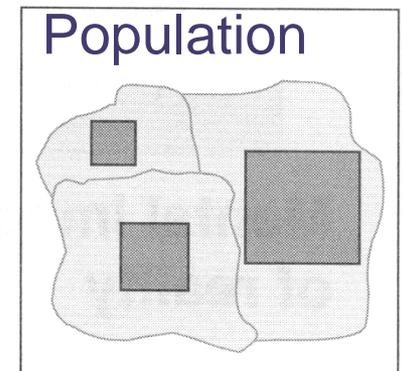


# Types of maps

- **General maps**
  - Locational/Positional
  - Variety of features and uses
- **Thematic maps**
  - Distribution of an attribute
  - Single attribute or relationship
- **Different objectives, different cartographic designs**



Qualitative



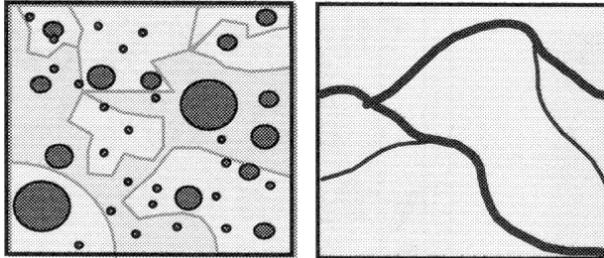
Quantitative

# Issues in cartographic design

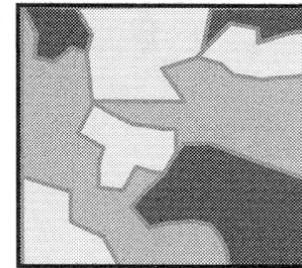
---

- **Colors, shade patterns and text**
  - Perception of colors and symbols
  - Legibility of features and text
  - Visual contrast and hierarchy

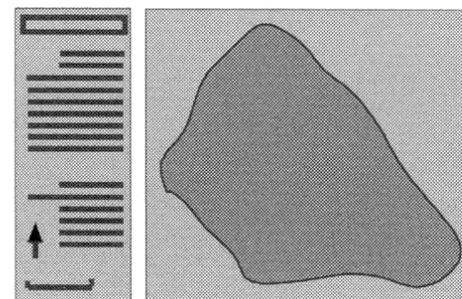
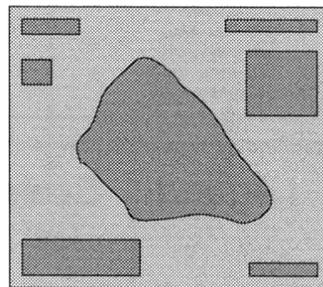
Size



Value

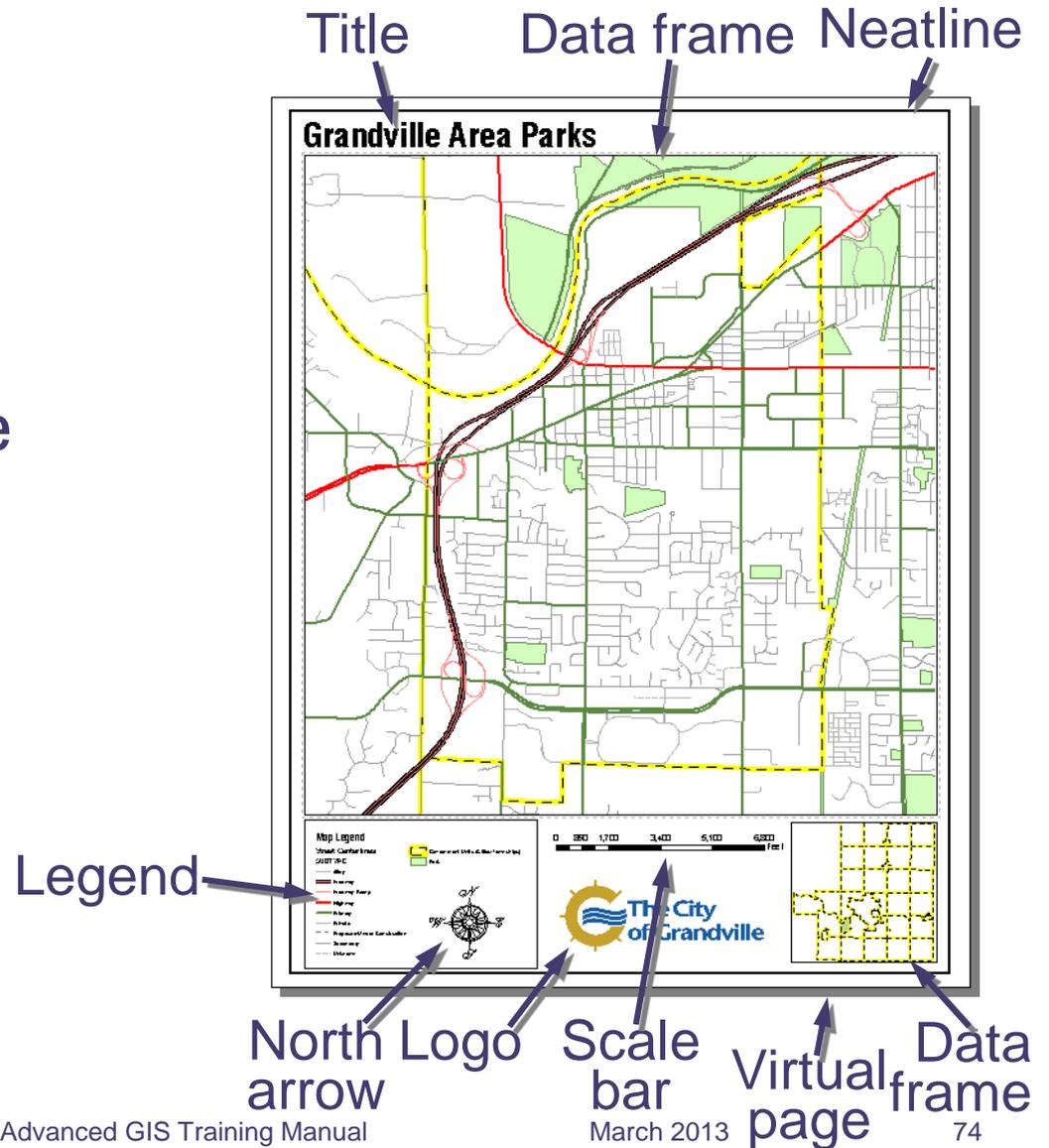


- **Visual balance**



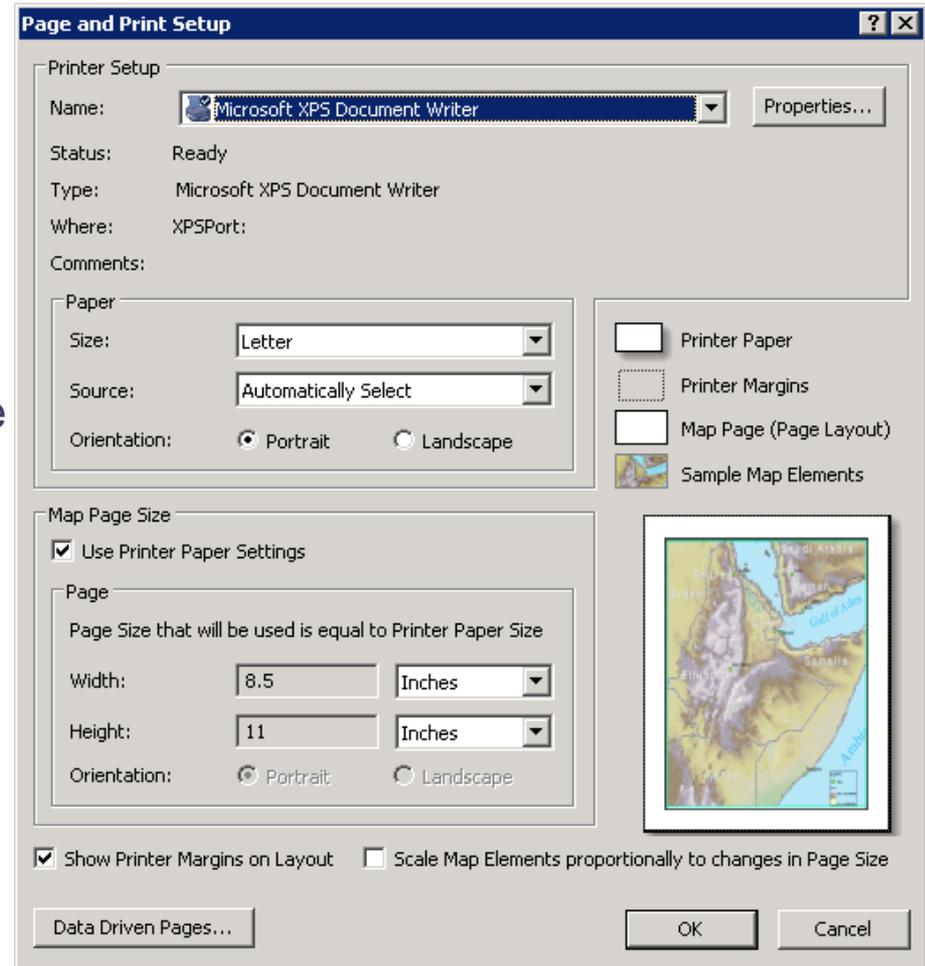
# Creating maps in ArcMap

- Design in Layout view
- Data frames organize layers
- Map elements are added to a virtual page
- Maps stored as .mxd files
  - Data location
  - Layer properties

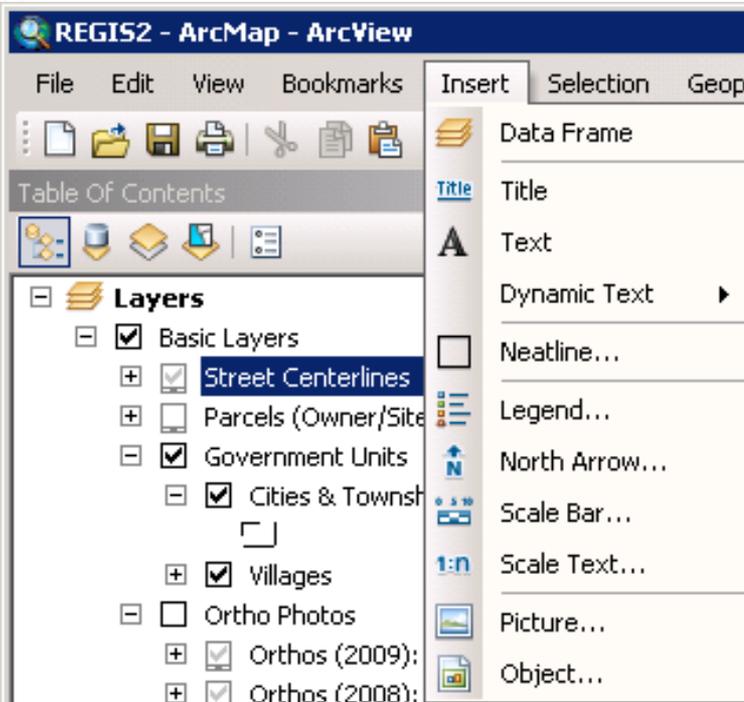


# Setting up the page

- Remember the purpose
  - Will the map be viewed up close or at a distance
  - What is the best page size?
  - Landscape or portrait?
  - What printer will I be using and what are my printer size limitations?

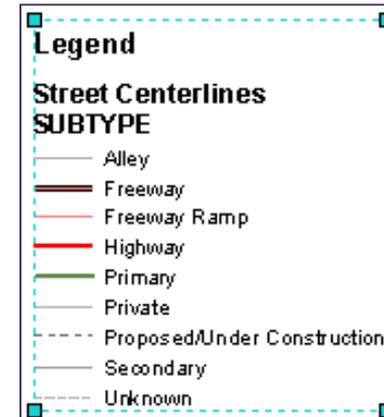


# Inserting map elements



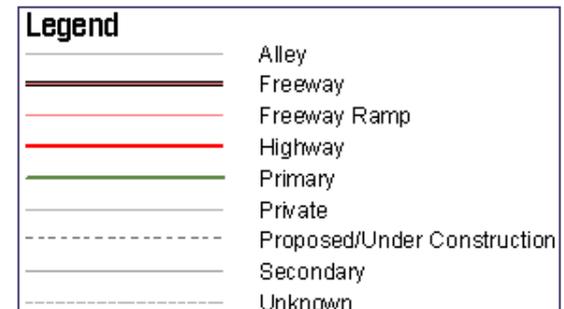
1 Choose type

2 Legend appears

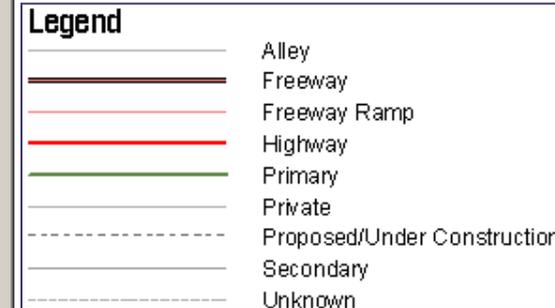
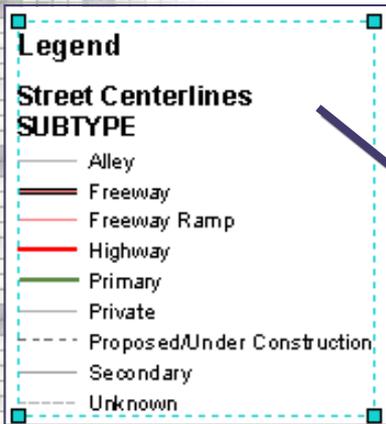
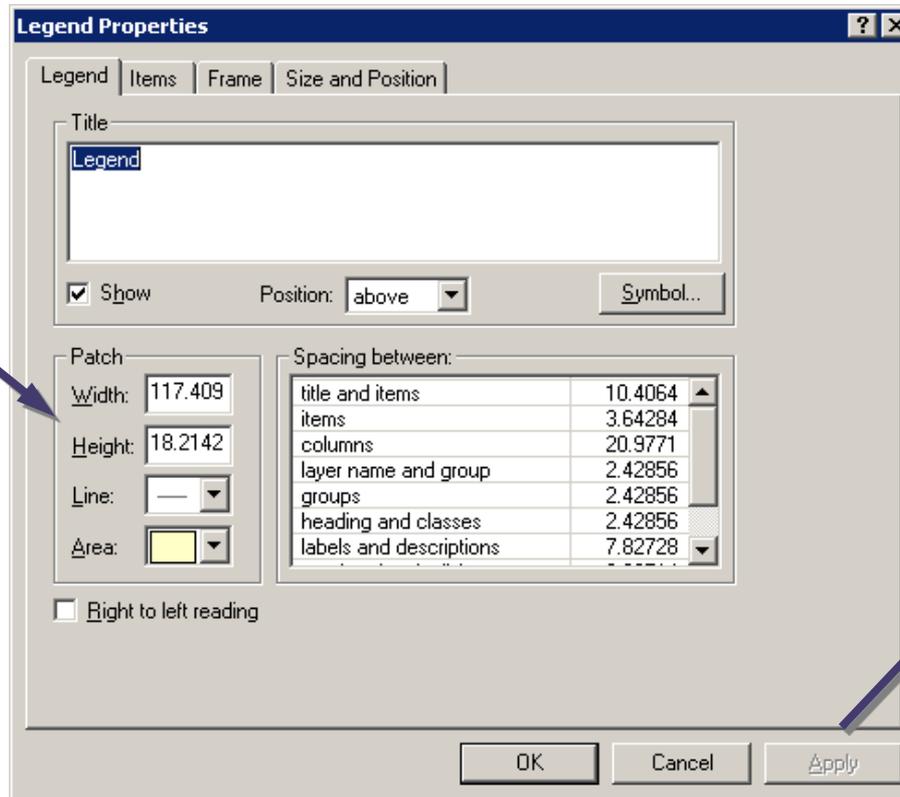


3 Drag

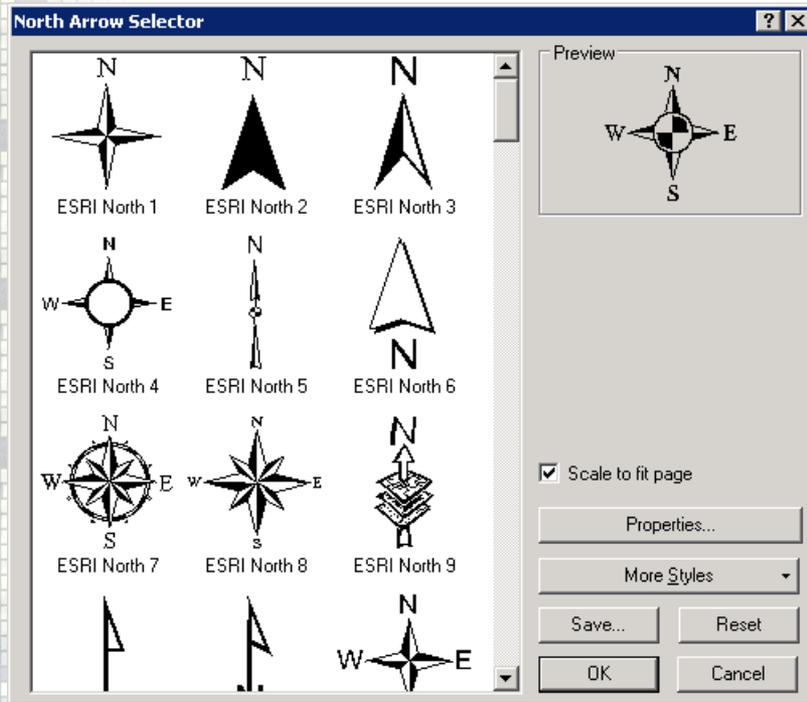
4 Modify



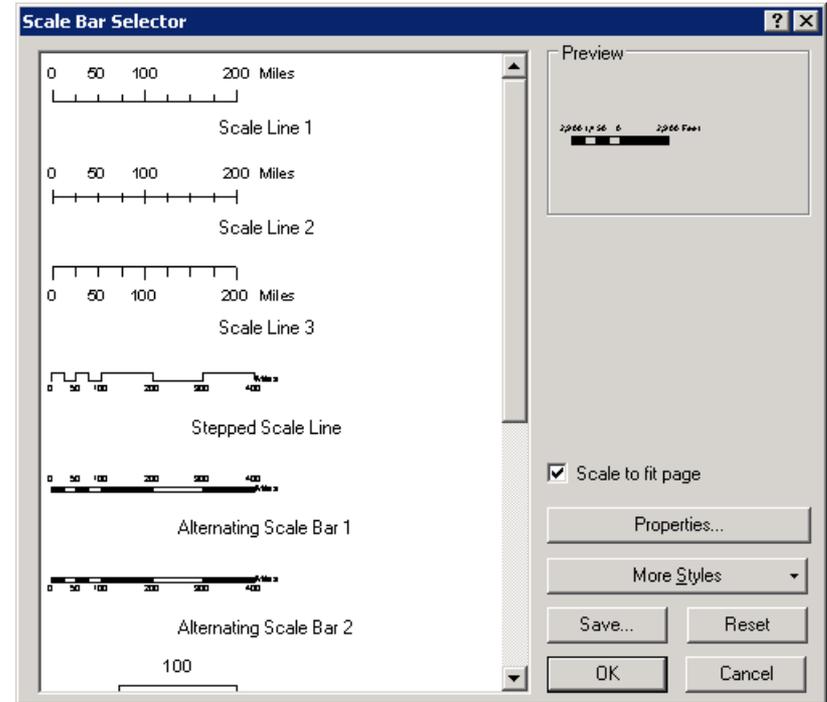
# An example of the Legend Properties dialog



# Adding a north arrow and a scale



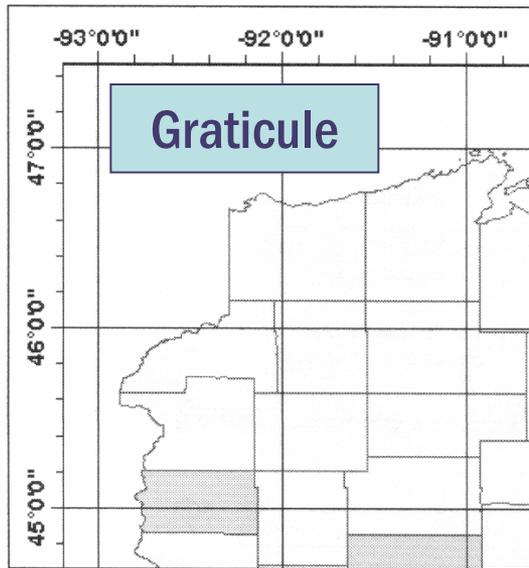
- Change angle, size and color



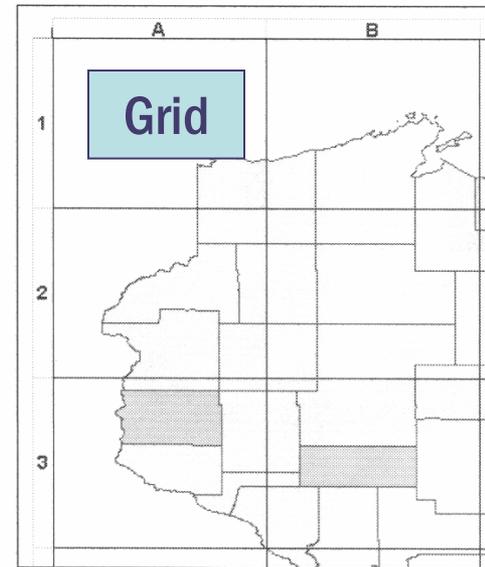
- Choose type, unit increments, color and font

# Incorporating a reference system

- Display reference positions on maps
- Available reference systems



Latitude/Longitude, feet, meters, etc.

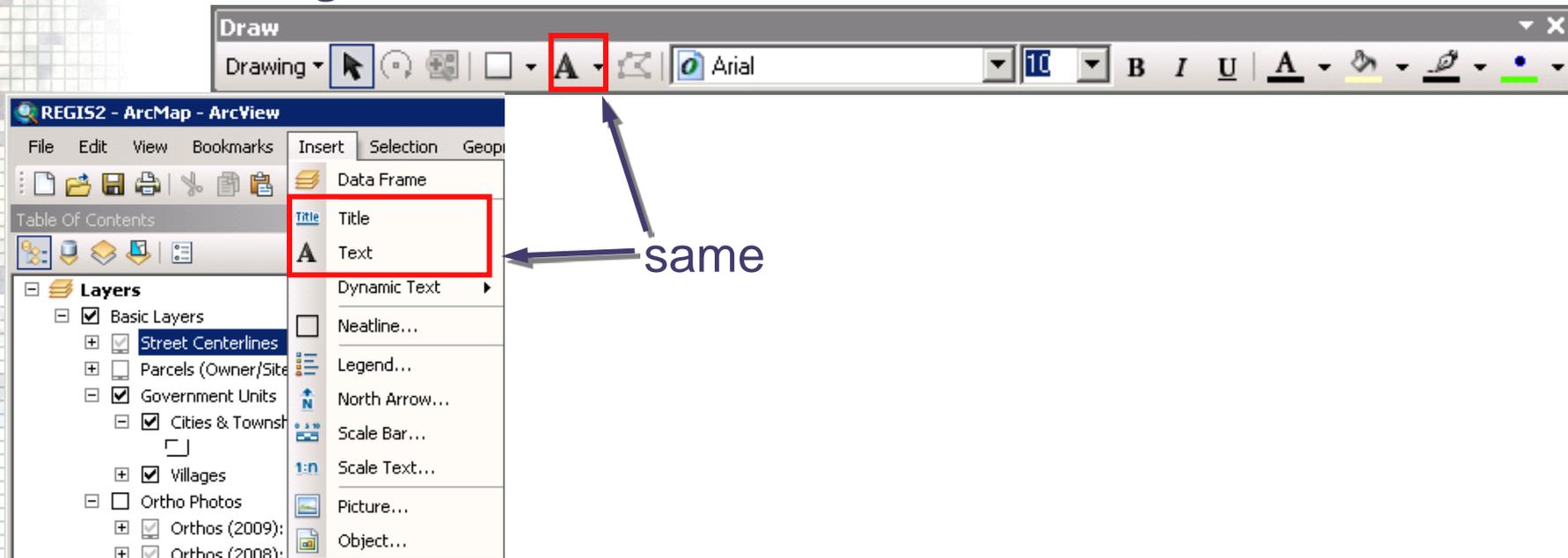


ABC/123, others

- Different graticule or grid types on the same map

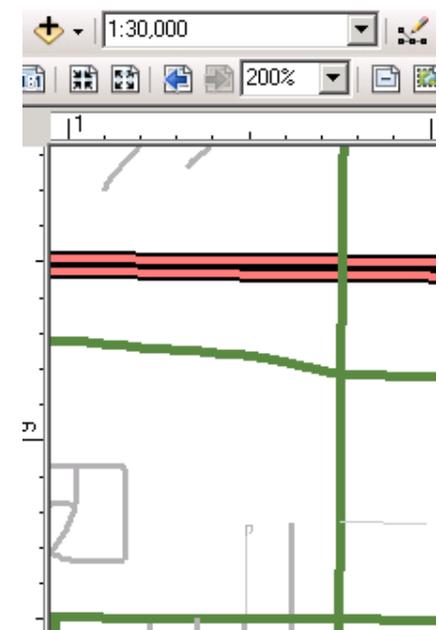
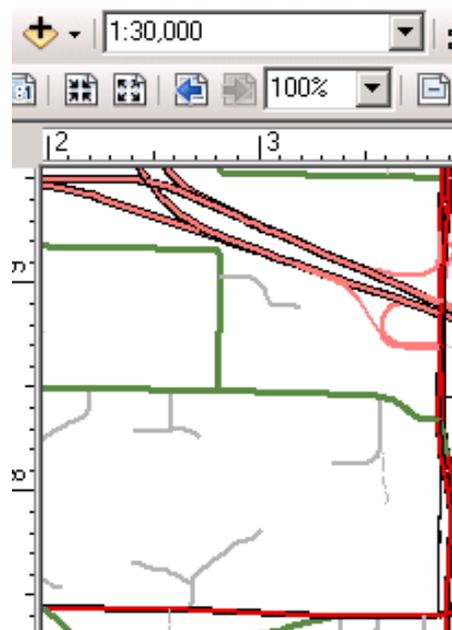
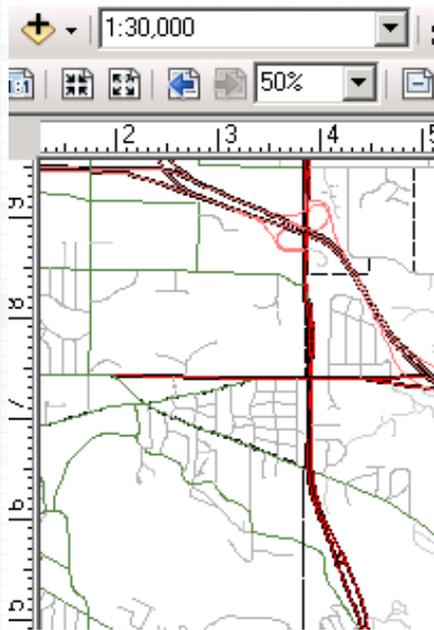
# Inserting textual information

- Title and author
- Data source, date, projection
- Date of map
- Disclosures and acknowledgements



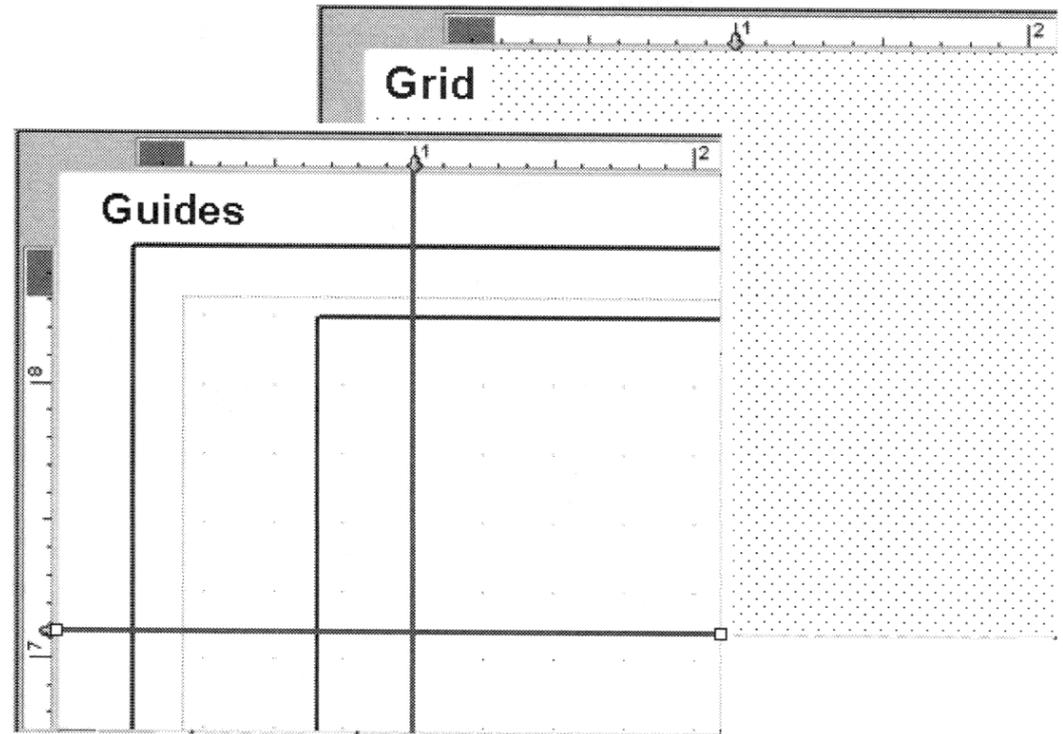
# Layout tools

- Zoom and pan the layout page
- Additional layout settings from Tools > Options



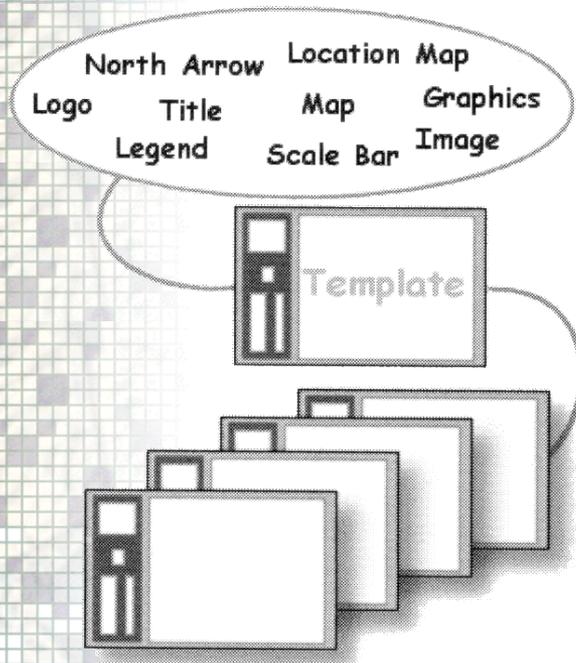
# Grids and rulers

- Determine the size of map elements
- Use guides to arrange elements
- Use grids to position elements at specific points
- Use snapping for precision and efficiency



# Creating and using map templates

- Gives all maps in a series the same look



- ArcMap templates
- Create your own

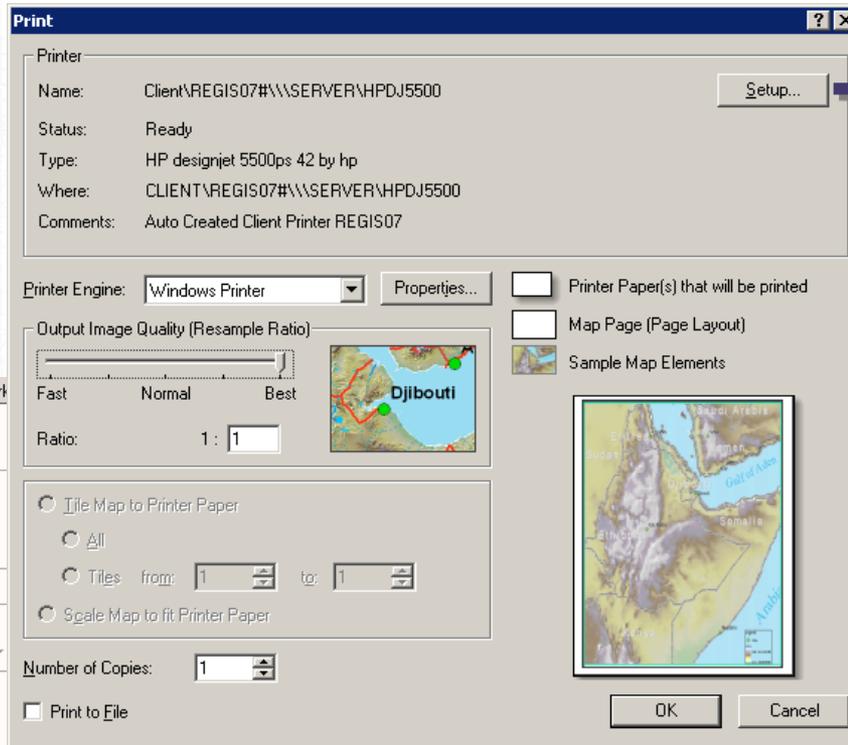
- Australia.mxt
- CentralAmericaCaribbean
- Europe.mxt
- NorthAmerica.mxt
- SouthAmerica.mxt

Choose a standard template

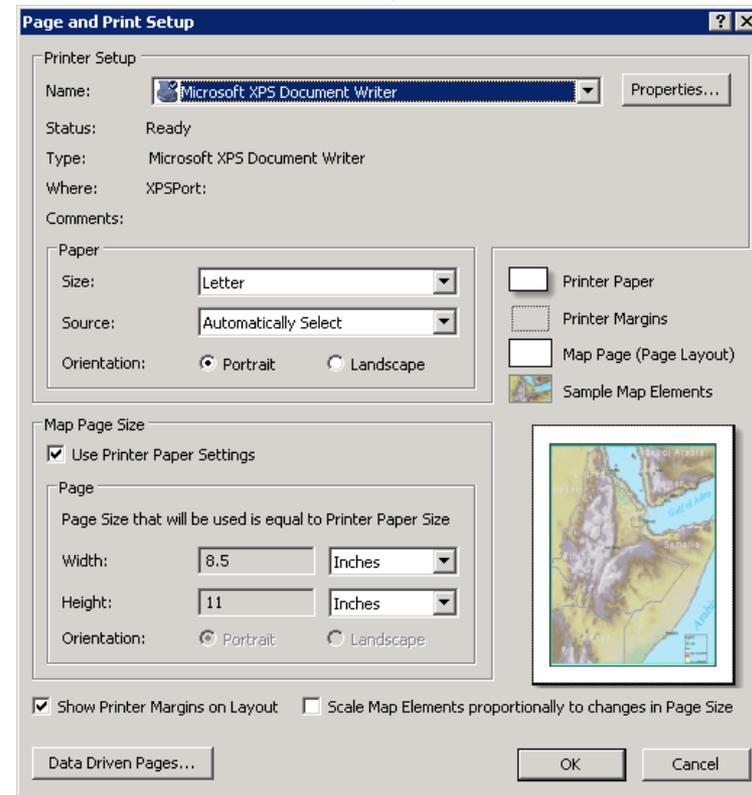
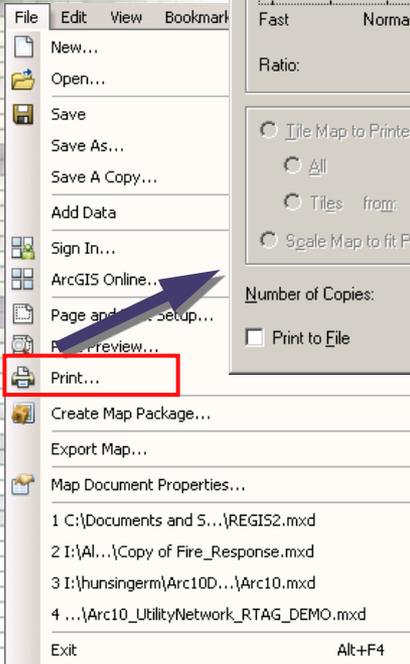
- Australia.mxt
- CentralAmericaCaribbean
- Europe.mxt
- NorthAmerica.mxt
- SouthAmerica.mxt



# Printing and plotting maps



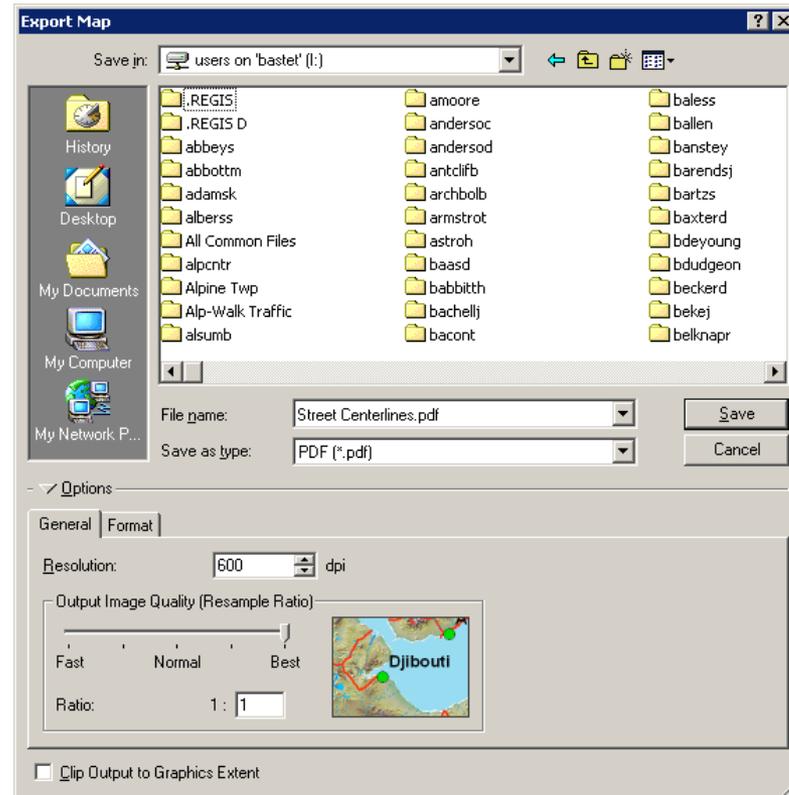
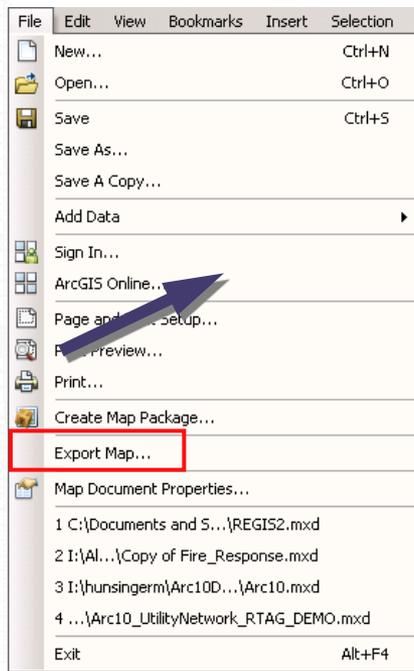
Choose a printer engine  
ArcPress  
PostScript  
Windows



Windows  
printer engine

# Exporting maps as digital files

- Export from Layout view, not Data view!
- Exports all elements from layout, not just map
- Export to raster (.gif, .jpeg, .tiff) or PDF formats



# Section 11 Exercises

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**11.1 – Layout View Overview**

**11.2 – Adding Reference Systems**

**11.3 – Aligning Elements in Layout View**

**11.4 – Using the Draw Toolbar**

## Exercise 7.1 – Using Arc Catalog

### In this exercise, you will learn how to:

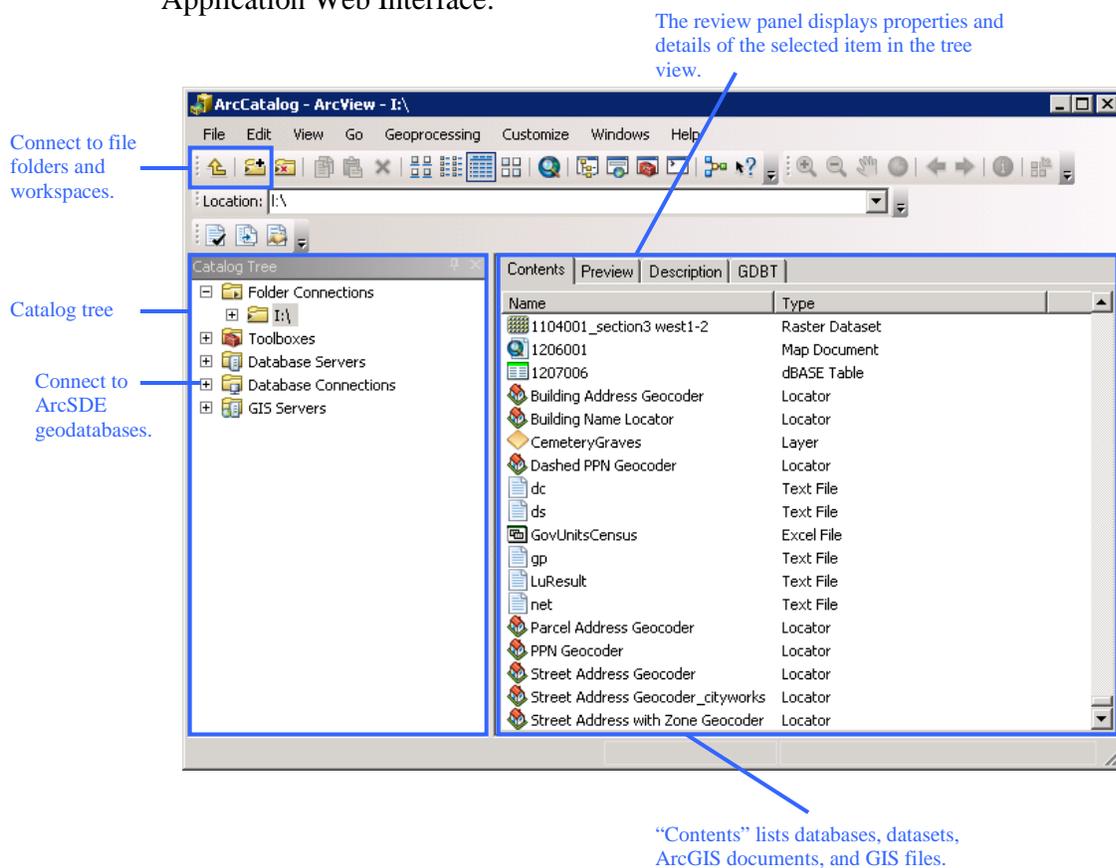
- ◆ Open ArcCatalog and understand the interface
- ◆ Connect to a folder to create a directory shortcut
- ◆ Preview GIS datasets
- ◆ Add data to ArcMap from ArcCatalog

### Setup

Log in to the REGIS Application Web Interface and Launch ArcView 10.

### Using ArcCatalog Tutorial

1. ArcCatalog can be opened from within ArcMap. Select the Catalog button  on the Standard toolbar. ArcCatalog can also be launched directly from the REGIS Application Web Interface.



2. ArcCatalog has its own table of contents on the left side that is called the **Catalog Tree**. Each drive is displayed with a folder icon  I:\ that can be expanded to view the subdirectories.

- ArcCatalog also allows for the creation of folder shortcuts to save from having to drill-down through multiple directories to get a specific location. Press the **Connect to Folder** button  found on the Standard toolbar.

- In the Connect to Folder window, navigate to

Users\$ on 'na1' (I:) (*referred to as the REGIS I:drive*) and find your user folder

---

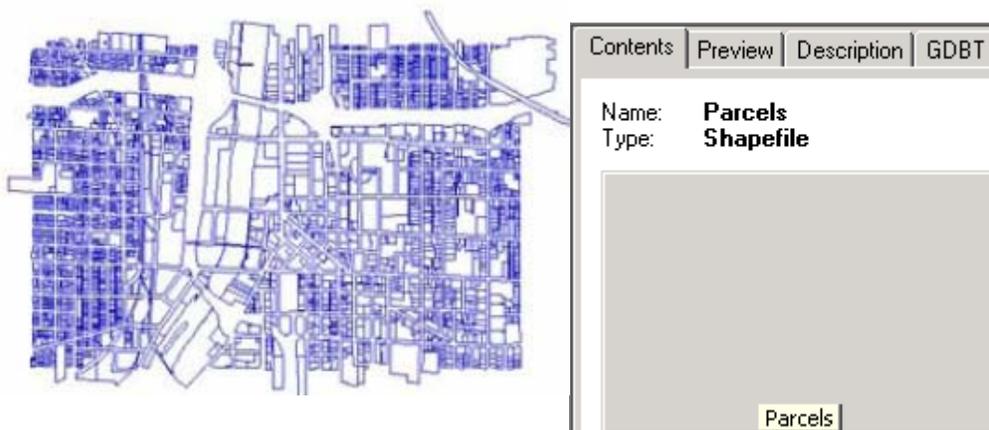
And press **OK**. The folder will now appear as another option in the Catalog Tree.

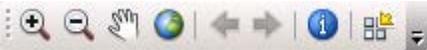
- The folder shortcut can be renamed to something more appropriate by *right-clicking* on the name and choosing **Rename**.
- Make a shortcut connection to your designated community REGIS I:drive folder.
- In the main area (also called the review panel) of ArcCatalog, make sure the **Contents** tab is selected. Notice that only GIS-related files appear in the list.

Name	Type
 Water	File Geodatabase
 GovernmentalUnits	Map Document
 GovUnitsCensus	Excel File
 Parcels	Shapefile
 Training	Raster Dataset

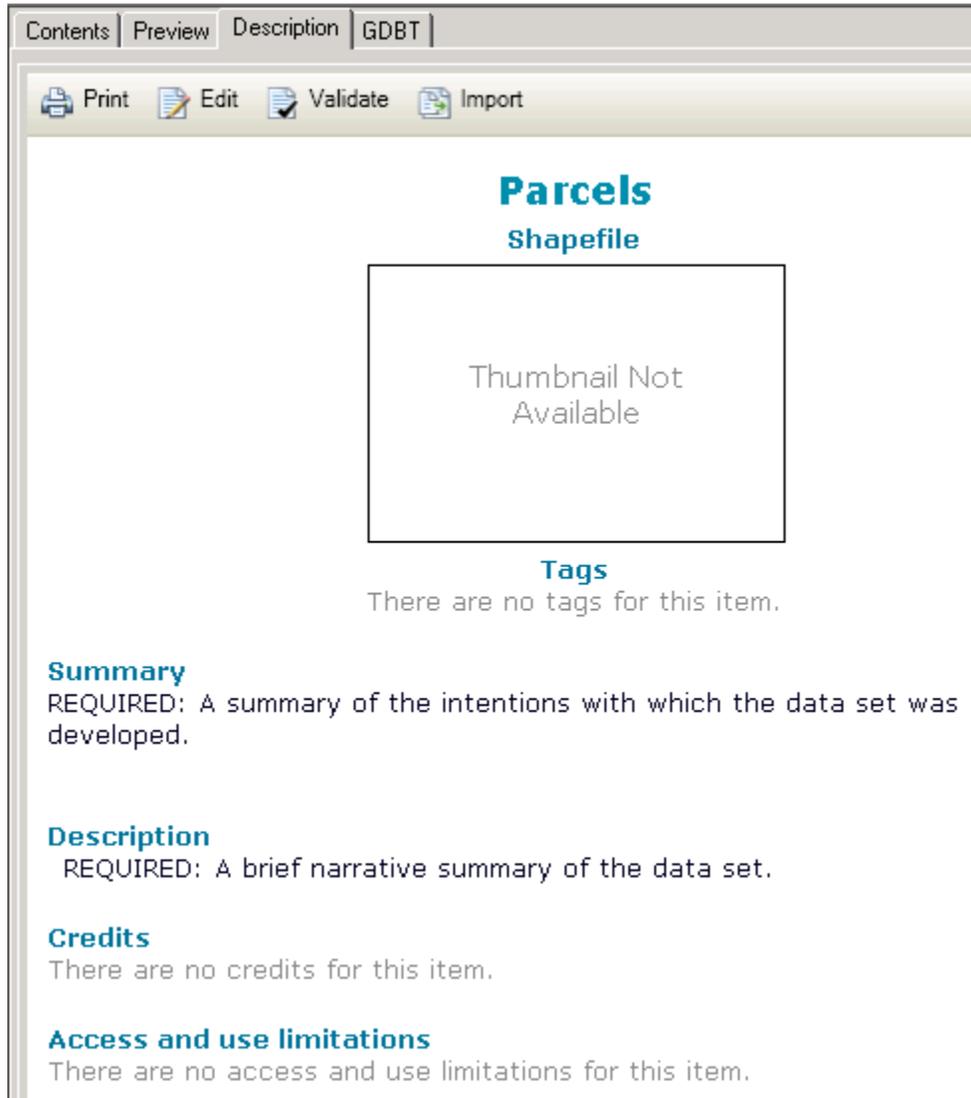


- Locate a shapefile and left click on the layer to highlight it. If you cannot locate a shapefile ask the instructor and he or she can guide you to a file to view
- Click on the Preview tab



- Use ArcCatalog's Geography toolbar  to zoom in and out, pan, return to full extent, and identify features in the Preview window.

11. Next choose a vector dataset and select the **Description** tab.



12. If there is metadata for the layer, it will be listed here. For many datasets this tab will not contain any information since metadata must be entered by the data creator and this is often an overlooked step in GIS.

13. ArcCatalog also shows ArcMap project files in the **Contents** tab. They can be renamed by *right-clicking* or opened by *double left-clicking* on the name.

 GovernmentalUnits

Map Document

14. ArcCatalog can also view Microsoft Excel files. GIS data types (e.g. Coverages, Shapefiles, Personal Geodatabases, Rasters, etc.) and tables (e.g. Excel files, DBFs, Access tables) can be added to ArcMap directly from ArcCatalog. First make sure your ArcCatalog window is small enough to see ArcMap's window behind it. Then select a GIS dataset in ArcCatalog. *Left-click and hold* on the dataset's name and drag it over to ArcMap's map area or Table of Contents and release the mouse button. It may take several seconds to load but the layer will eventually appear in ArcMap.

## Additional Information

See the **Workspace and dataset management with ArcCatalog** section of the ArcGIS Desktop Help Manual.



*End of Exercise 7.1*

## Exercise 8.1 – Select Features Interactively

---

### In this exercise, you will learn how to:

- ◆ Set the selectable layer(s)
- ◆ Select features in the map
- ◆ Add and remove features from a selection

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

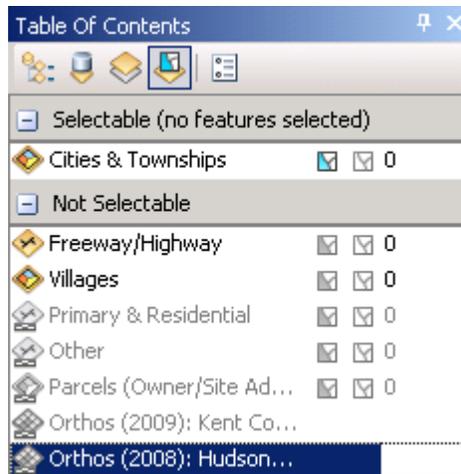
### Select Features Interactively Tutorial

1. An interactive selection begins by choosing which layer or layers the selection will be made from. In this exercise, you will be defining the Cities & Township layer in the Governmental Units group as the only selectable layer. There are multiple ways to define a selectable layer.

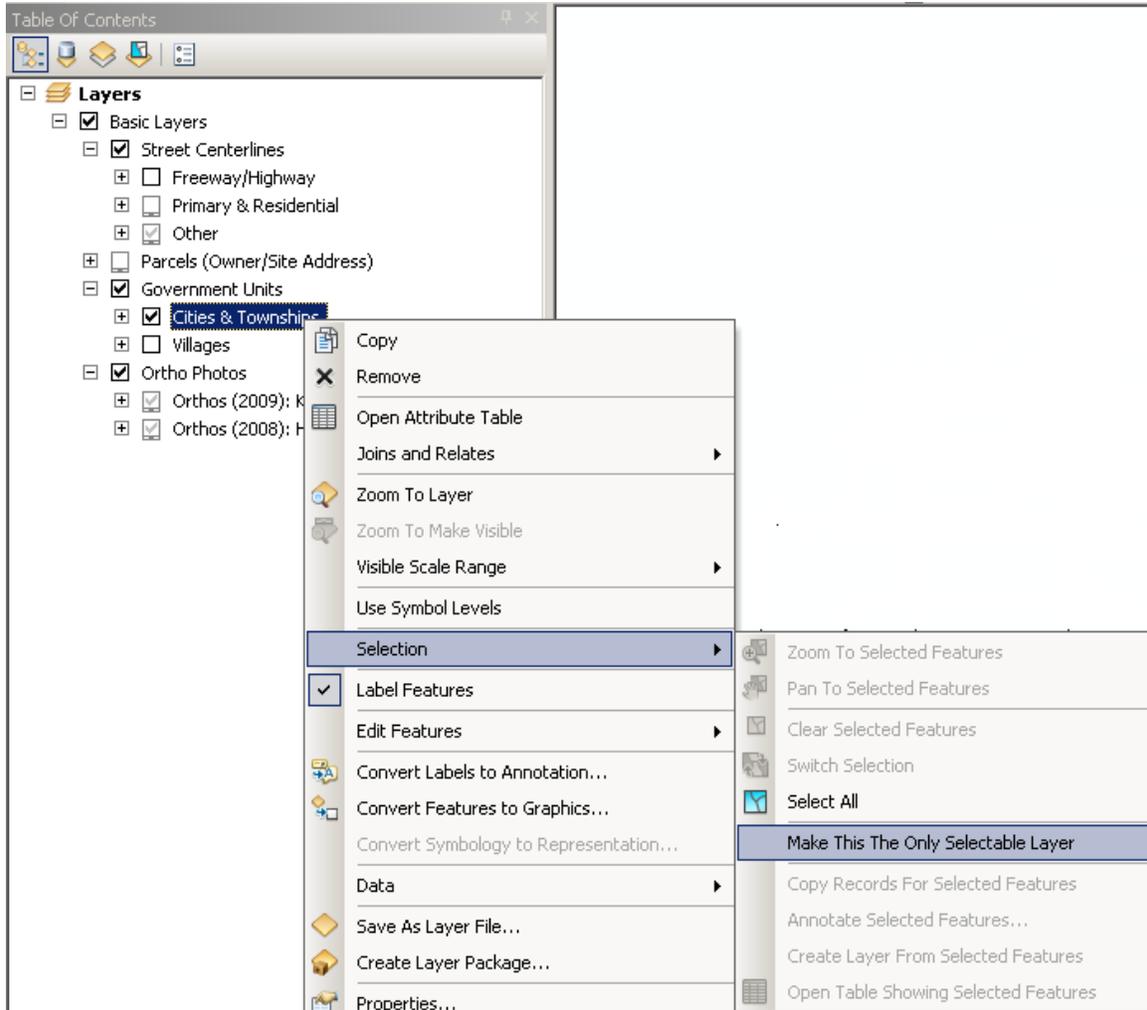
**Option 1:** At the top of the Table of Contents click on the List by Selection button



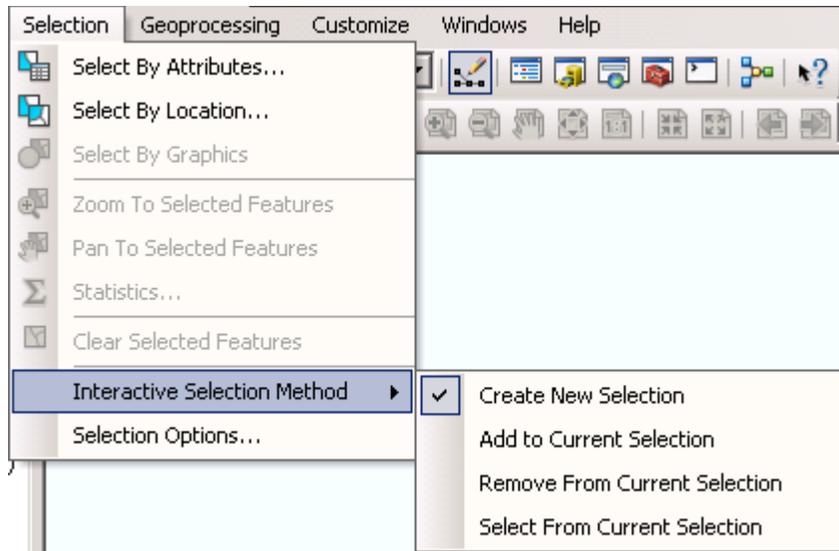
Left click the left polygon to change the selectability of the layer. Make the Cities & Townships layer the only selectable layer.



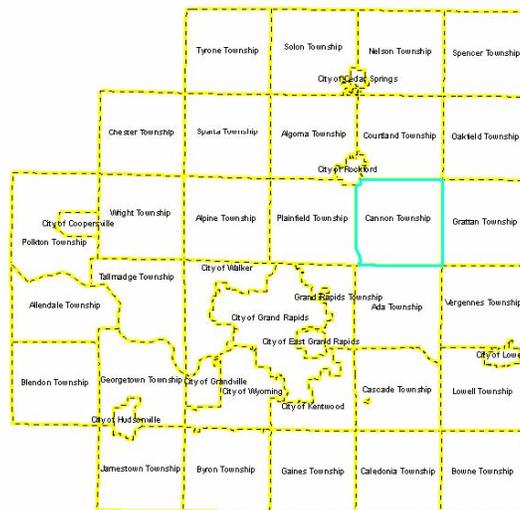
**Option 2:** Click on the **List By Drawing Order** icon  at the top of the Table of Contents. *Right-click* on the **Cities & Townships** (in Government Units) layer name, choose Selection and select the **Make This The Only Selectable Layer** option.



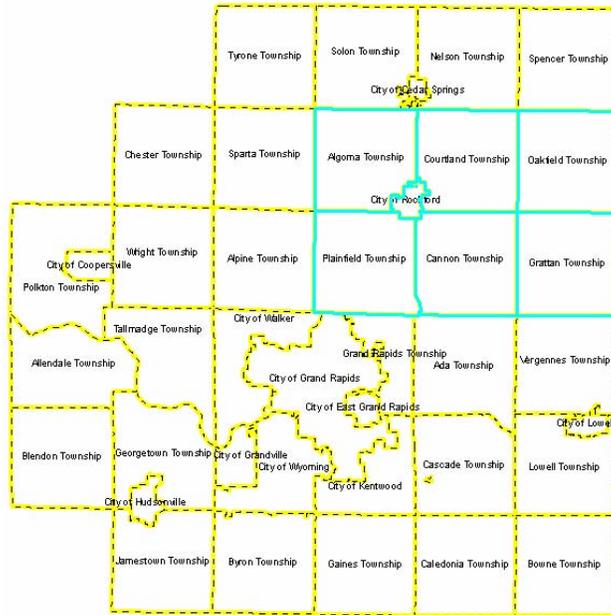
2. Go to the **Selection** menu, choose the **Interactive Selection Method** and select the **Create New Selection** option.



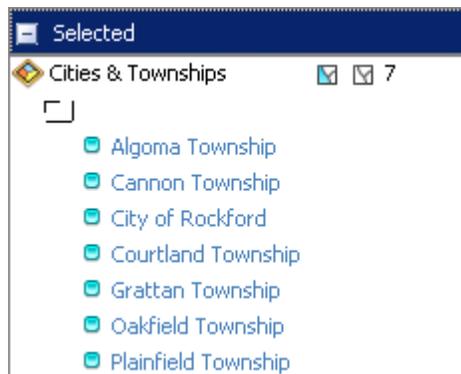
3. Select the **Select Features** tool  on the Tools toolbar. Return to the map and *left-click* inside of a government unit to select it. It is highlighted with a thicker turquoise border.



4. Press the **Clear Selected Features** button  to clear the selection.
5. With the **Select Features** tool  still active, *left-click and hold* to draw a box on the map. Be sure the box extends across multiple government units. Release the mouse button and every government unit that is touched by the box is selected.



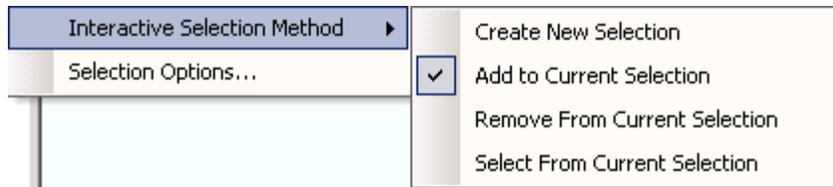
- To verify how many features have been selected, switch to the **List by Selection** tab. The Government Units layer is displayed along with the number of polygons selected in parentheses. The selected elements in the Cities & Townships layer are displayed below the layer. To easily unselect an element, left click on the circle  next to the element.



- There are two options for adding to the selection.

**Option A:** Hold down the **SHIFT** key and *left-click* inside another government unit that is not selected.

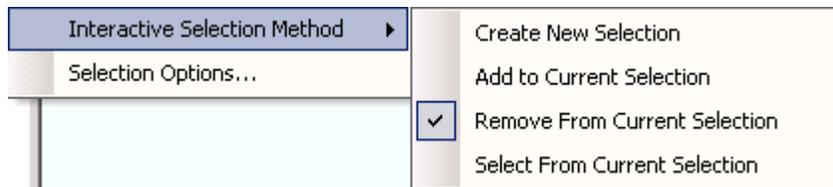
**Option B:** Return to the **Interactive Selection Method** options in the **Selection** menu and choose **Add to Current Selection**. *Left-click* on the map to remove individual government units.



8. There are three options for removing selected features.

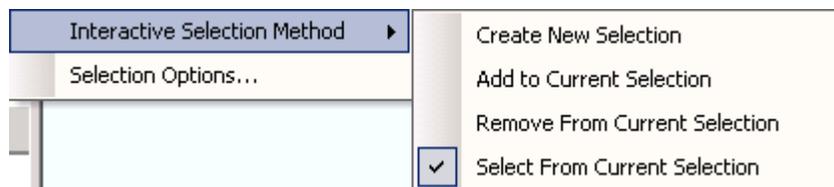
**Option A:** Hold down the **SHIFT** key and *left-click* inside a government unit that is already selected. It will be unselected while leaving everything else still selected.

**Option B:** Return to the **Interactive Selection Method** options in the Selection menu and choose **Remove From Current Selection**. *Left-click* on the map to remove individual government units from the selection.



**Option C:** Left click on the blue circle  in the List by Selection tab in the Table of Contents.

9. The final interactive selection method is **Select From Current Selection**. *Left-click and hold* to draw a box on the map that intersects some of the currently selected features. Instead of selecting every feature that intersects the box, only those features that were previously selected are selected.



## Additional Information

See the **Selecting features interactively** section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [-]  Navigating and interacting with maps
    - [+]  Navigating maps and layout pages
    - [-]  Interacting with maps
      -  About interacting with maps
      -  Identifying features
      -  Displaying MapTips
      -  Adding hyperlinks to features
      -  Measuring distances and areas
      -  Finding features and locations
      -  Exporting features
    - [-]  Selecting features and graphics
      -  Selecting graphics
      -  **Selecting features interactively**
      -  Using Select By Attributes
      -  Using Select By Location
      -  Using Select By Graphics
      -  Using selection layers
      -  Setting the selection color
      -  Displaying information about selected features

*End of Exercise 8.1*

## Exercise 8.2 – Select By Attributes

In this exercise, you will learn how to:

- ◆ Select features based on attribute values
- ◆ Create, save, and load query expressions

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Select by Attributes Tutorial

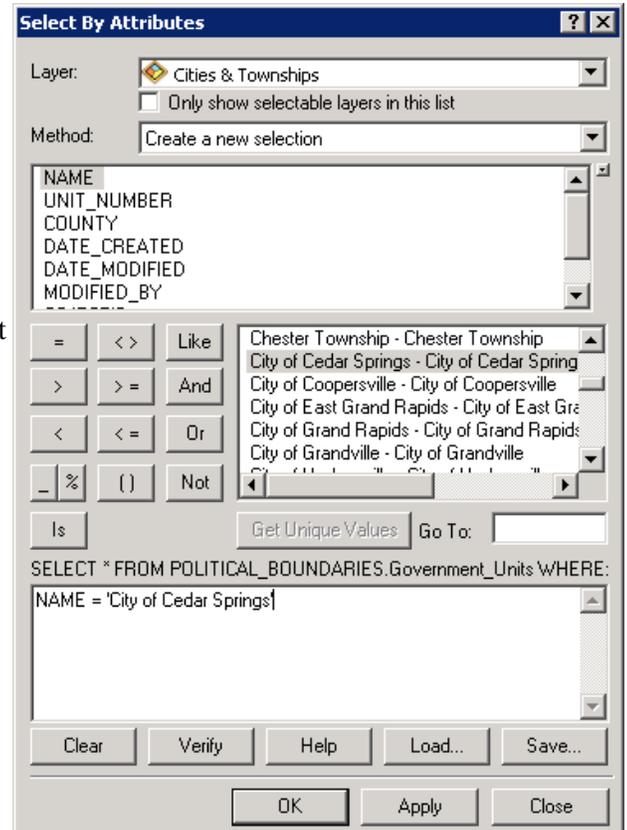
1. Go to the **Selection** menu and choose **Select By Attributes**.



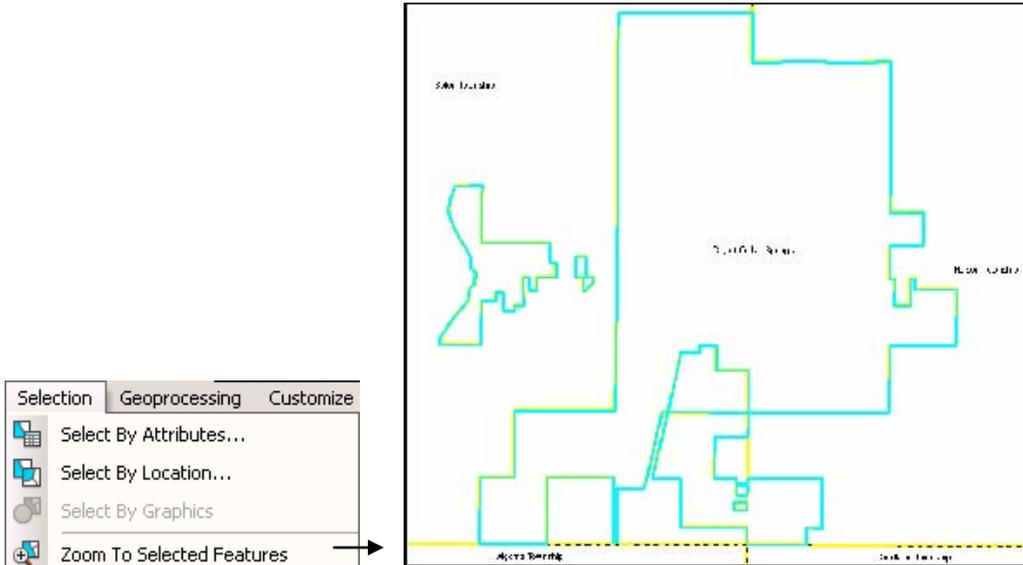
2. The **Select By Attributes** window will appear. Complete the following setup steps to perform an attribute selection.

- a. Choose **Cities & Townships** (in Government Units) in the Layer drop-down box.
- b. Notice the method drop-down box defaults to **Create a New Selection**.
- c. *Double left-click* on the **[NAME]** attribute to add it to the query window at the bottom.
- d. *Left-click* on the **equals**  button.
- e. *Left-click* on the **Get Unique Values** button to show a complete list of government unit names.
- f. *Double left-click* on the **City of Cedar Springs** entry to complete the query expression:

NAME = 'City of Cedar Springs'



- Press **OK** to perform the selection. All four polygons that represent the City of Cedar Springs are selected in the map. Go to the **Selection** menu and choose **Zoom To Selected Features** or left click the Zoom to Selected Features button .



- Press the **Clear Selected Features** button . Use the **Go Back To Previous Extent** button  to return to the full extent of the Government Units layer.
- Return to the **Select By Attributes** window and create the following expressions using the **Cities & Townships** (in Government Units) layer. In some cases, it may be faster to simply type in the expression in the text box. Use the **verify** button to determine if you have entered a valid query. Press **Apply** after each one and observe the resulting selection on the map.

Query Expression	Selection Result	#
COUNTY = 'Ottawa County'	Selects all government units in Ottawa County.	10
COUNTY = 'Ottawa County' OR COUNTY = 'Kent County'	Selects all government units in either Ottawa or Kent counties.	51
NAME LIKE '%City%'	Selects every government unit that has "City" in its name.	15
NAME LIKE '%City%' AND COUNTY = 'Ottawa County'	Selects every City in Ottawa County.	2
NAME <= 'C'	Selects government units where the name begins with A, B, or C.	8

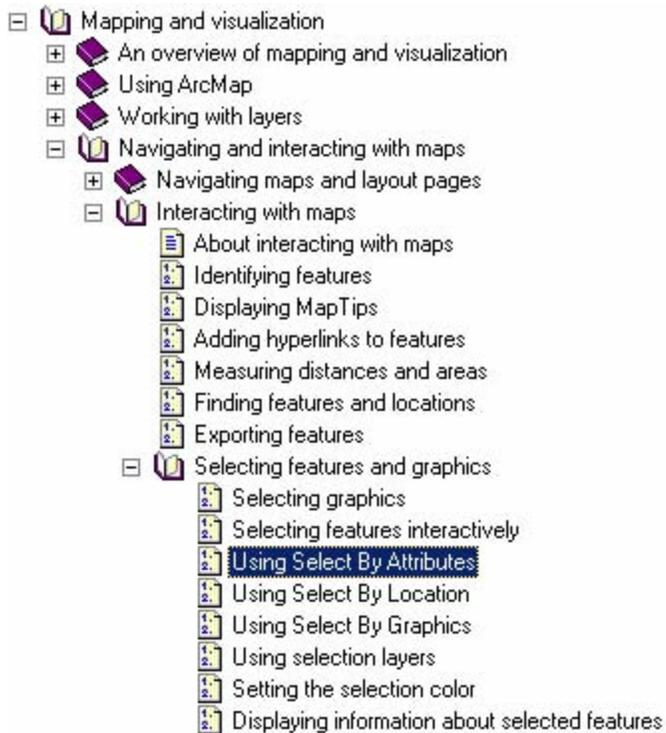
6. After entering one of the above expressions, press the **Save** button to bring up a **Save As** box. Enter an appropriate name for the query expression and press **Save**. This will save the query to a file that can be loaded at a later date in any ArcMap project by pressing the **Load** button.



7. Press the **Help** button at the bottom of the **Select By Attributes** window. It displays an in-depth description of how to build your own custom query.

## Additional Information

See the [Using Select By Attributes](#) section of the ArcGIS Desktop Help manual.



*End of Exercise 8.2*

## Exercise 8.3 – Select By Location

---

### In this exercise, you will learn how to:

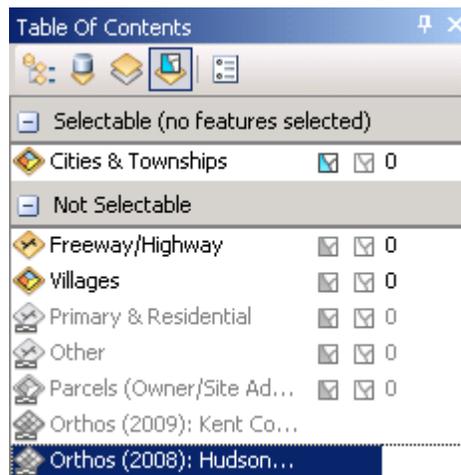
- ◆ Select features based on their spatial location
- ◆ Select features that are near other selected features

### Setup

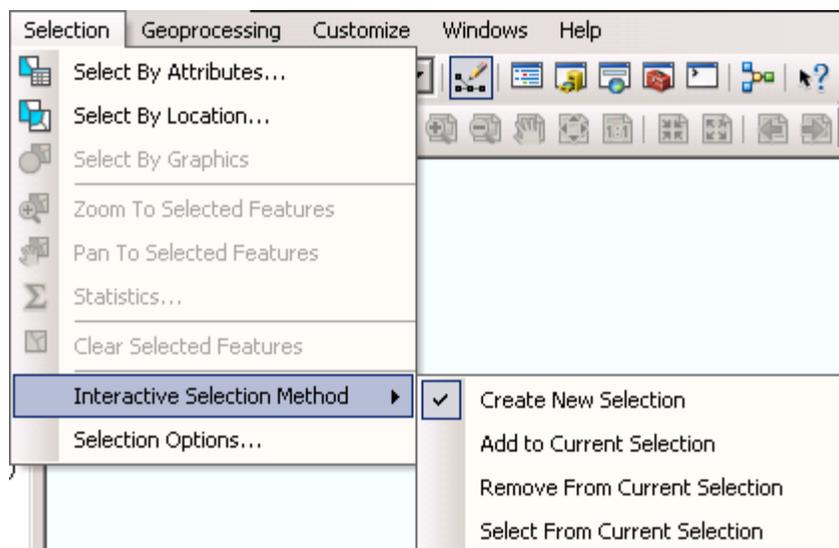
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Select by Location Tutorial

1. Begin by making the **Cities & Townships** layer the only selectable layer. Use any of the methods discussed in exercise 8.2 to achieve this.



2. Make sure your **Interactive Selection Method** is set to **Create New Selection**.



3. Use the **Select Features** tool  on the Tools toolbar to select a government Unit.

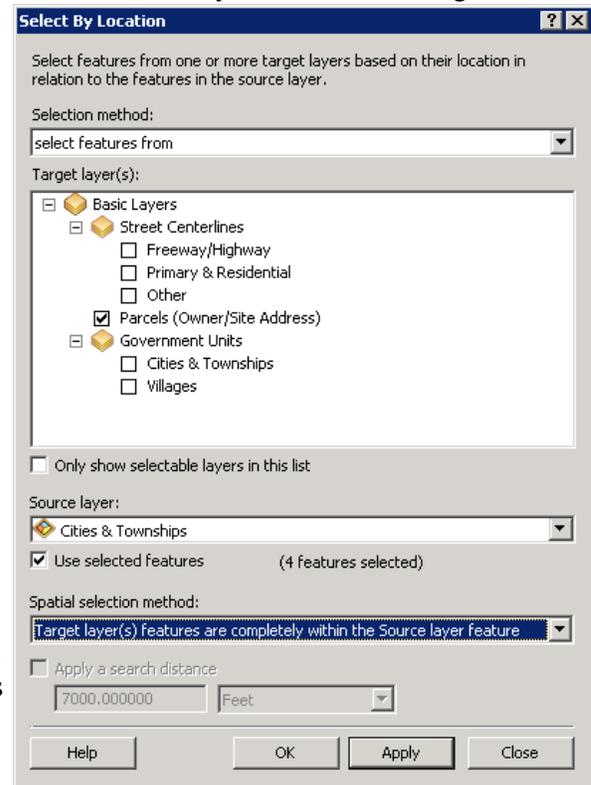


4. In the **Selection** menu, choose **Select by Location**.

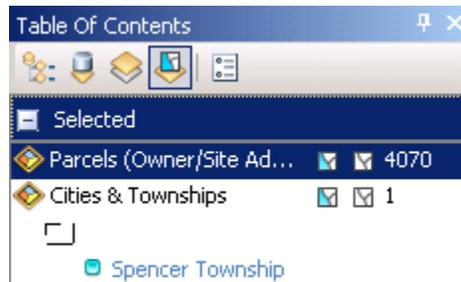


5. The **Select By Location** window appears. In this selection, you will be selecting all parcels that are inside the selected government unit. Complete the following steps to perform the selection.

- In the first box, choose **Select features from**.
- Place a checkbox by only the **Parcels** layer in the layers list.
- Choose **Target layer(s) features are completely within** in the **Spatial selection method** box.
- In the **features in this layer** box, choose **Cities & Townships**.
- Ensure that the **Use selected features** checkbox is checked and that it indicates only one feature is selected.



- Verify your selection by reading through the steps again in order... *“I want to select features from the Parcels layer that are completely within the selected feature in the Government Units layer.”*
- Press **OK** and the selection is performed. Switch to the **Selection** tab in the Table of Contents to see how many parcels were selected.



- The parcels layer may have a scale restriction enabled (as indicated by gray lettering  Parcels (Owner/Site Address)   0 ) so you may have to zoom in close enough to see the selection.

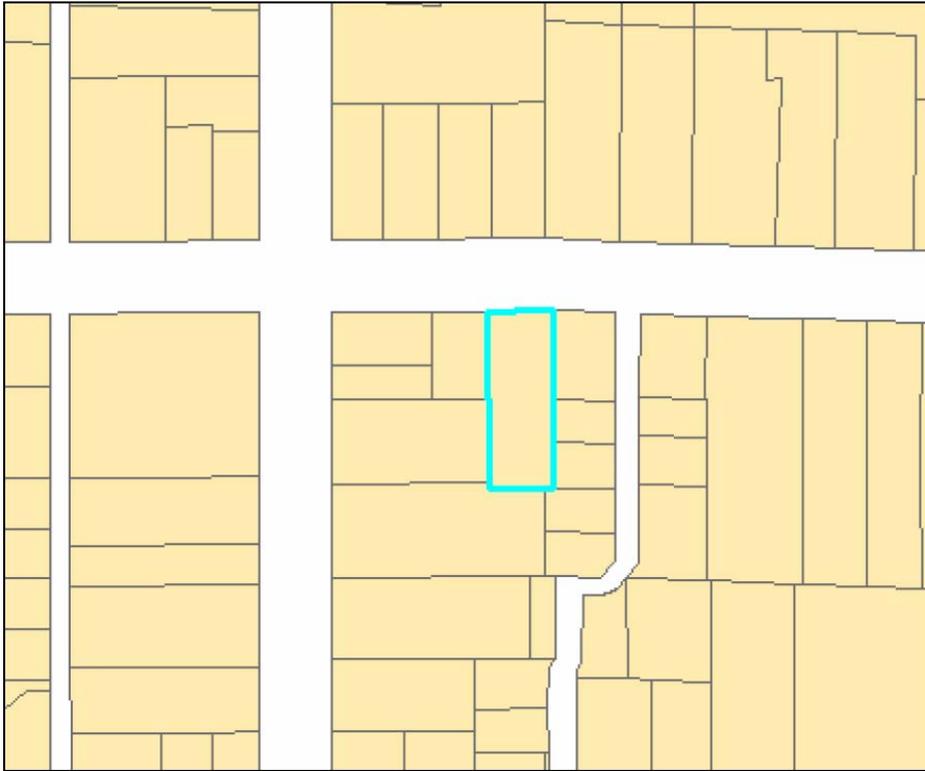


- Press the **Clear Selected Features** button .

- You will now perform another type of select by location. In this example, you will find all parcels within 300 feet of a selected parcel. First set the **Parcels** layer as the only selectable layer.

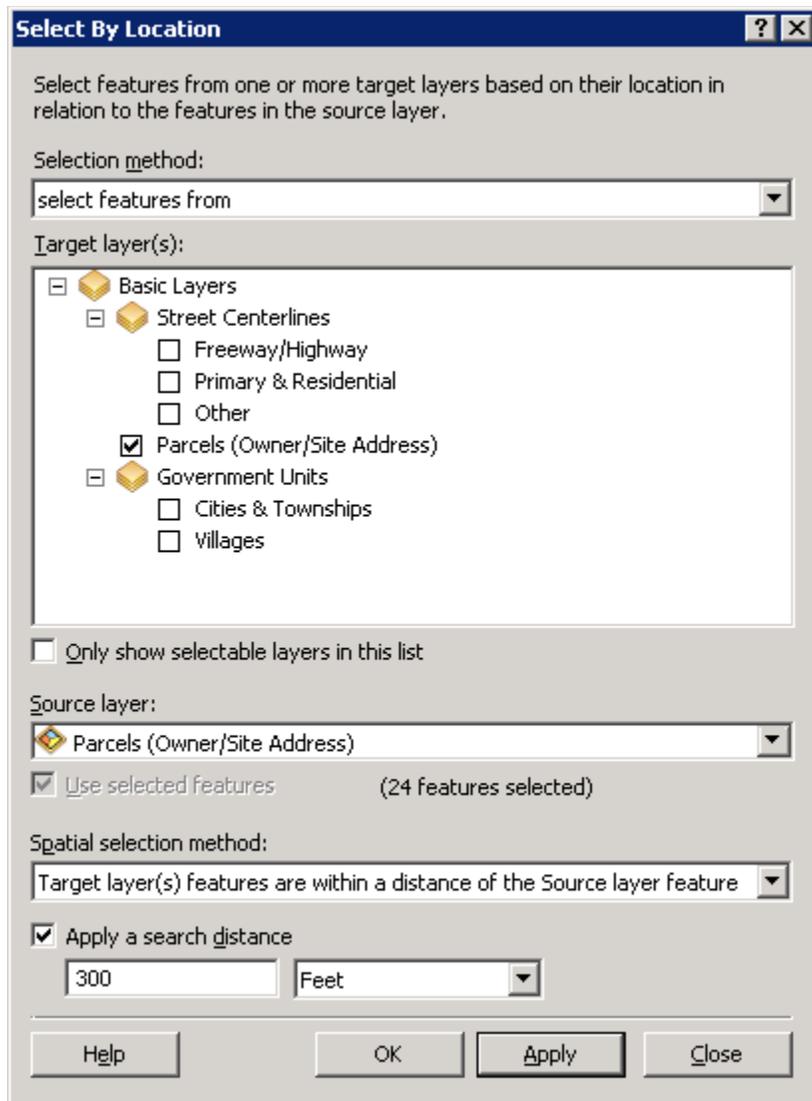


11. Use the **Select Features** tool  to select a parcel on the map.



12. Go to the **Selection** menu and choose **Select By Location**. Enter the appropriate information to match the screenshot on the following page.

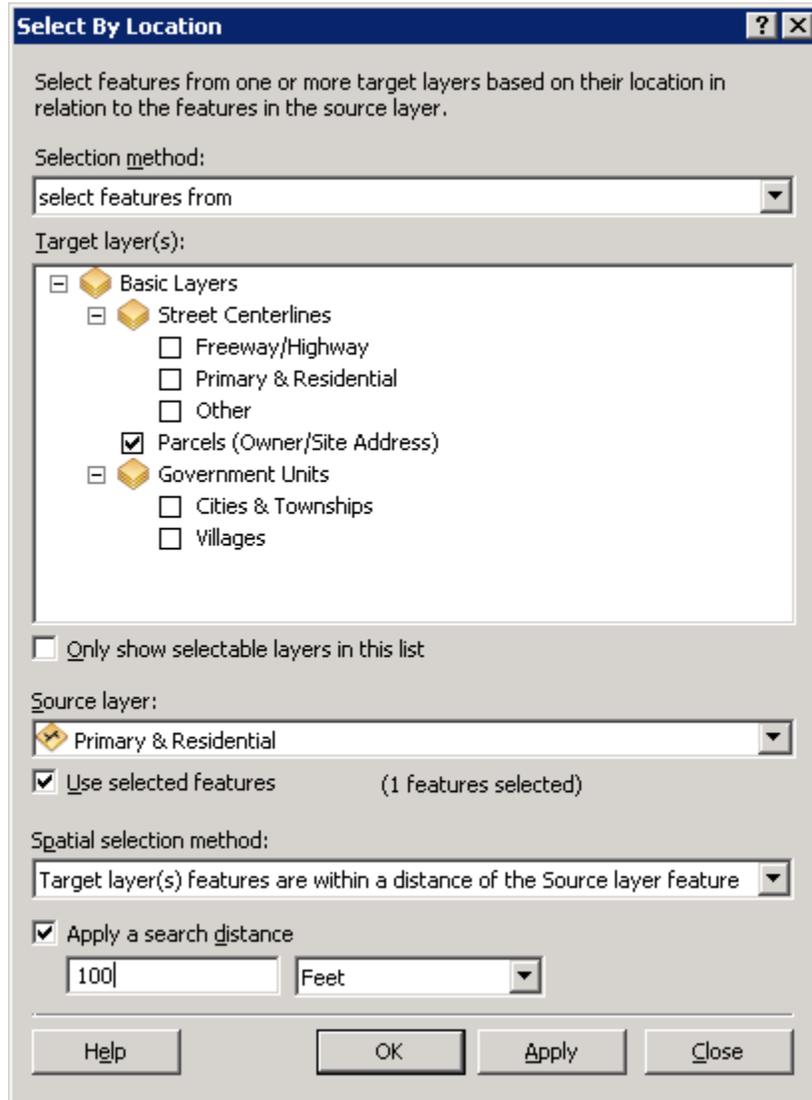




13. When finished, read over the selection again... *“I want to select features from the Parcels layer that are within a distance of 300 feet to the selected parcel.”* Press **OK** to view the result.



14. Repeat the select by location but this time begin by selecting a street segment. Find all parcels that are within 100 feet of the centerline.



## Additional Information

See the [Using Select By Location](#) section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
- [-]  Navigating and interacting with maps
  - [+]  Navigating maps and layout pages
  - [-]  Interacting with maps
    -  About interacting with maps
    -  Identifying features
    -  Displaying MapTips
    -  Adding hyperlinks to features
    -  Measuring distances and areas
    -  Finding features and locations
    -  Exporting features
  - [-]  Selecting features and graphics
    -  Selecting graphics
    -  Selecting features interactively
    -  Using Select By Attributes
    -  **Using Select By Location**
    -  Using Select By Graphics
    -  Using selection layers
    -  Setting the selection color
    -  Displaying information about selected features

*End of Exercise 8.3*

## Exercise 8.4 – Select By Graphics

---

### In this exercise, you will learn how to:

- ◆ Use the Draw toolbar to create a new polygon graphic
- ◆ Change the display properties of a graphic
- ◆ Use a graphic to select features

### Setup

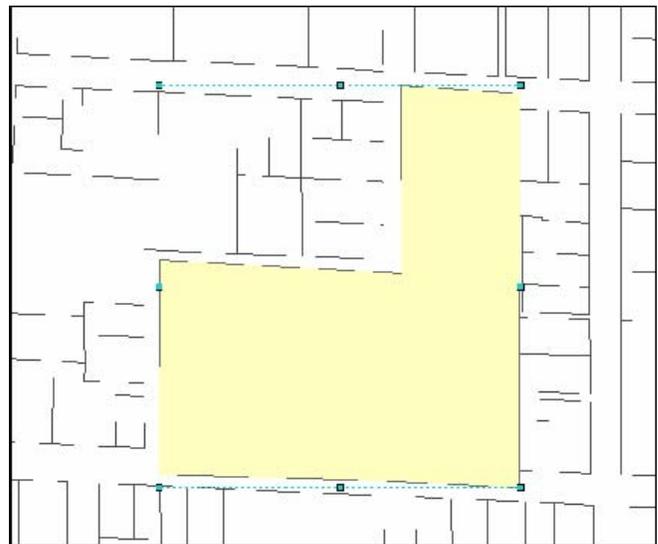
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

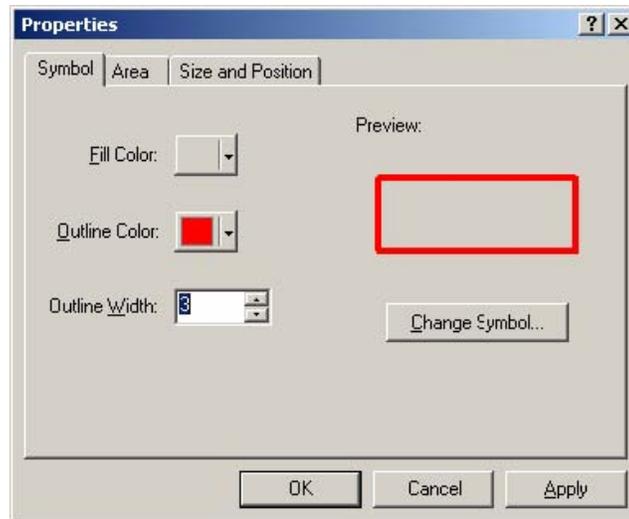
### Select by Graphics Tutorial

1. Turn on the Draw toolbar by going to the **View** menu, choosing **Toolbars** and select **Draw**.



2. Select the black down-triangle next to the New Rectangle button  and choose the **New Polygon** icon .
3. Return to the map and zoom in on a smaller area of parcels. Draw a shape on the map by *left-clicking* on the screen to create polygon vertices (remember that vertices are points that allow for polygon boundaries to change direction or shape). *Double left-click* on the last vertex of the shape to finish the drawing. This creates a graphic on top of the map data.
4. Using the Select Elements tool  on the Draw toolbar, *right-click* on top of the newly created graphic and select **Properties**. Select the **Symbol** tab and change the Fill Color to **No Color**, the Outline Color to **Red**, and the Outline Width to **3**.

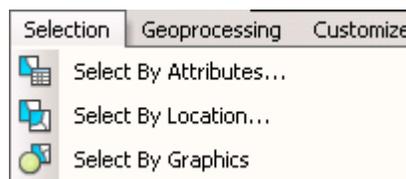




5. Press **OK** and return to the map. Before performing the select by graphic function, you first must set the Parcels layer as the only selectable layer. Go to the **List by Selection** tab.



6. First, make sure the graphic is still selected (notice the dotted rectangle surrounding the graphic), then go to the **Selection** menu and choose the **Select by Graphics** option. If this option is grayed out, use the Select Elements tool  to select the graphic and try again.



7. The select by graphics command will select all parcels that are intersected by the graphic you created.



## Additional Information

See the [Working with graphics](#) section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [-]  Adding graphics and text to maps
    - [-]  **Working with graphics**
      -  An overview of working with graphics
      -  Drawing points, lines, and circles
      -  Moving, rotating, and ordering graphics
      -  Aligning, distributing, and grouping graphics
      -  Joining graphics

See the [Using Select By Graphics](#) section of the ArcGIS Desktop Help man

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [-]  Navigating and interacting with maps
    - [+]  Navigating maps and layout pages
    - [-]  Interacting with maps
      -  About interacting with maps
      -  Identifying features
      -  Displaying MapTips
      -  Adding hyperlinks to features
      -  Measuring distances and areas
      -  Finding features and locations
      -  Exporting features
    - [-]  Selecting features and graphics
      -  Selecting graphics
      -  Selecting features interactively
      -  Using Select By Attributes
      -  Using Select By Location
      -  **Using Select By Graphics**
      -  Using selection layers
      -  Setting the selection color
      -  Displaying information about selected features

## Exercise 8.5 – Using Selections

In this exercise, you will learn how to:

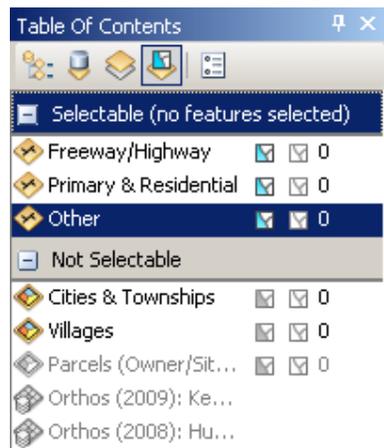
- ◆ Calculate summary statistics on a selection
- ◆ Create a new layer from selected features

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Using Selections Tutorial

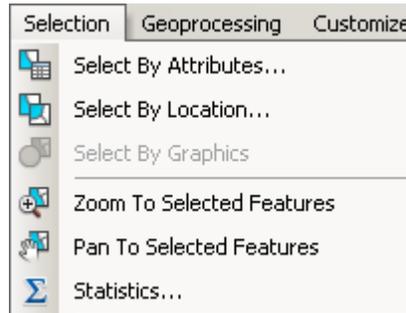
1. Set the **Street Centerlines** grouped layer as the only selectable layers by going to the **List by Selection** in the Table of Contents.



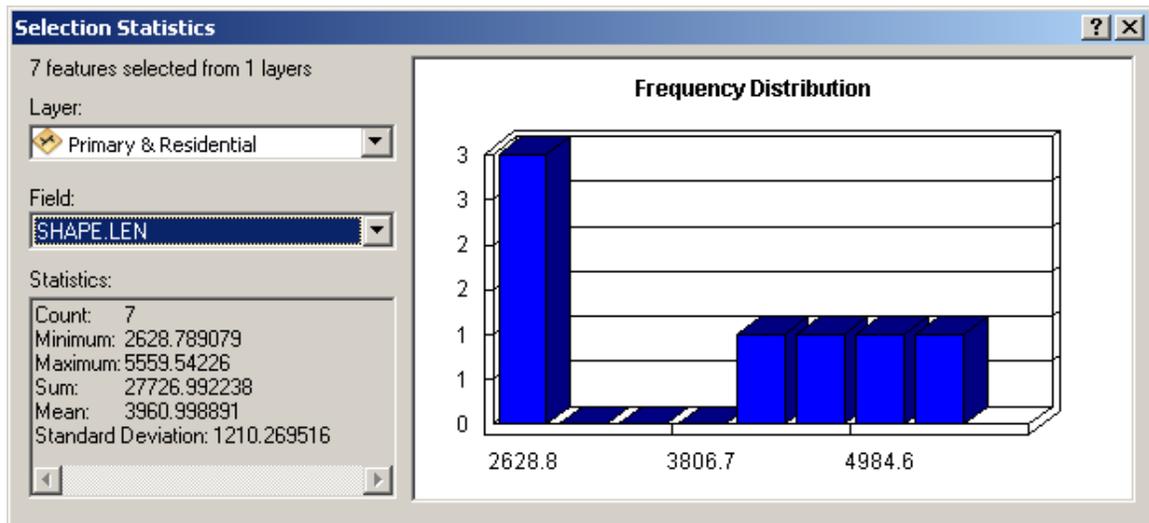
2. Use the **Select Features** tool  to select several street segments on the map.



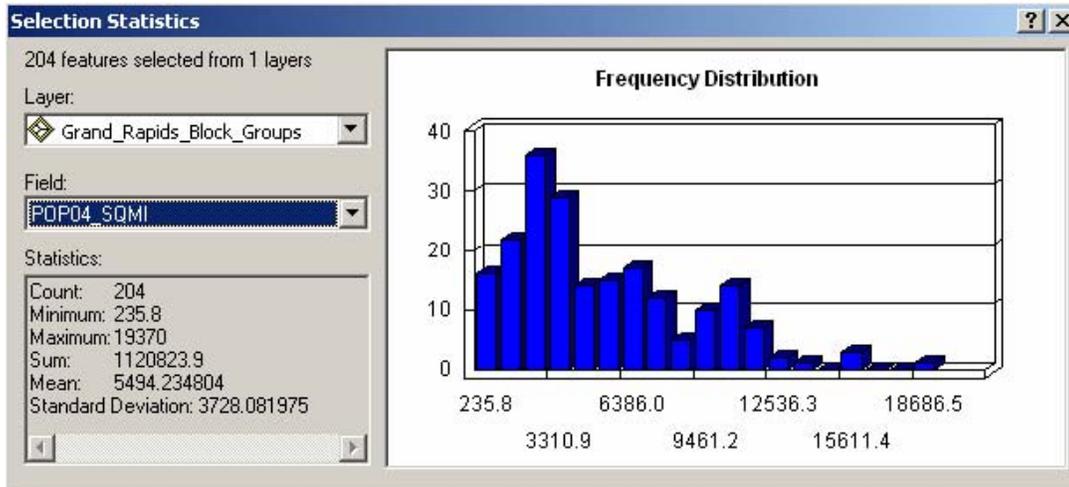
3. Go to the **Selection** menu and choose **Statistics**.



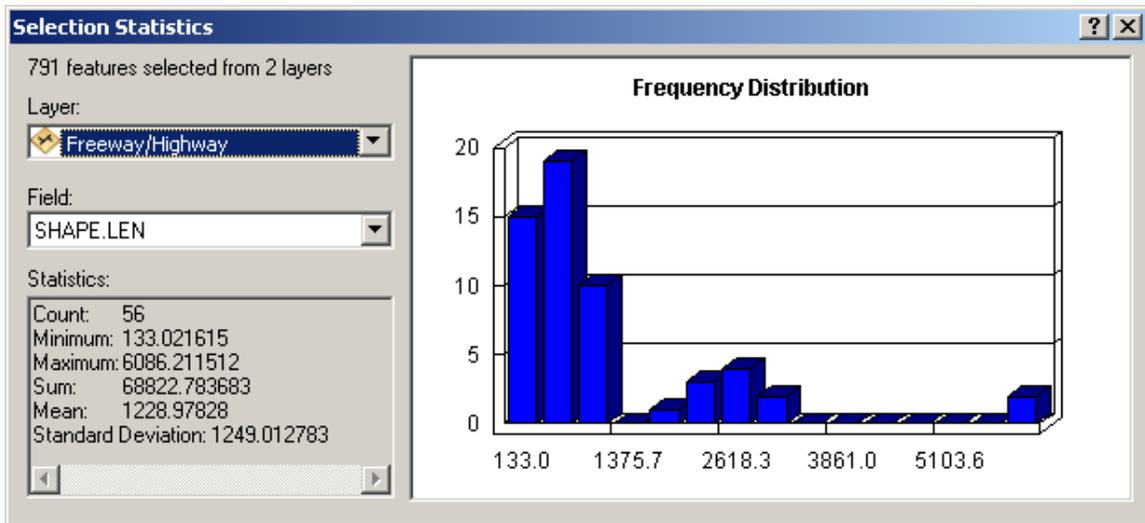
4. The **Selection Statistics** window appears to provide additional information about the selected features. Make sure the Layer drop-down box shows a **Street Centerlines** layer. In the field drop-down box, select the **SHAPE.LEN** field. It is important to understand that only numerical fields are available for selection statistics.



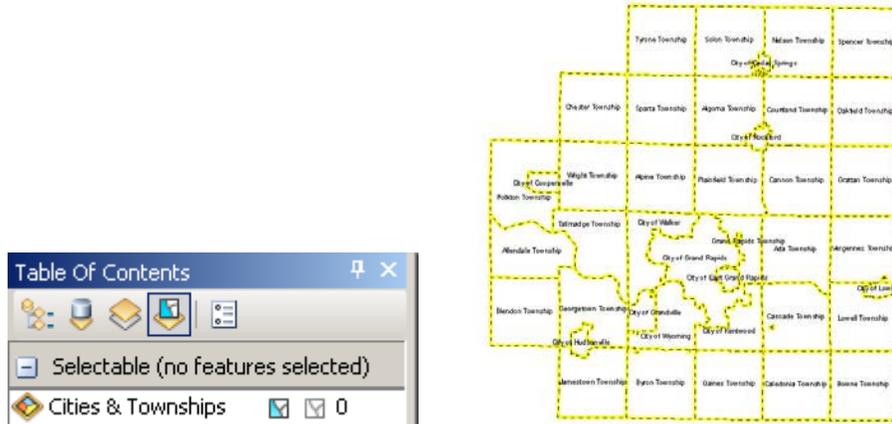
5. The **Statistics** box contains information on how many segments are selected, the shortest and longest segments (in feet), the total length, and the average length. A **Frequency Distribution** bar graph is created also in the window showing the distribution of street centerline lengths. This is more useful for datasets that contain information such as population. Below is an example from a Census dataset showing a frequency distribution of population per square mile.



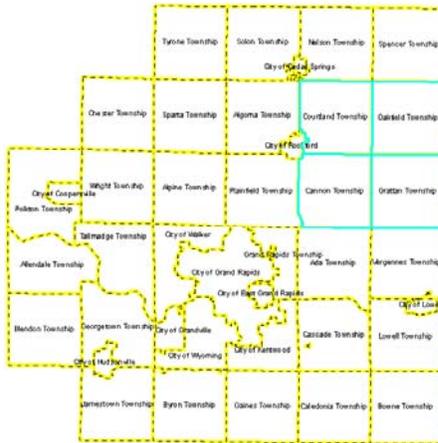
- Leave the Selection Statistics window open, return to the map and select a large number of street centerline using the **Select Features** tool . As soon as the selection is performed, notice how the Selection Statistics window is automatically updated with the new selection statistics.



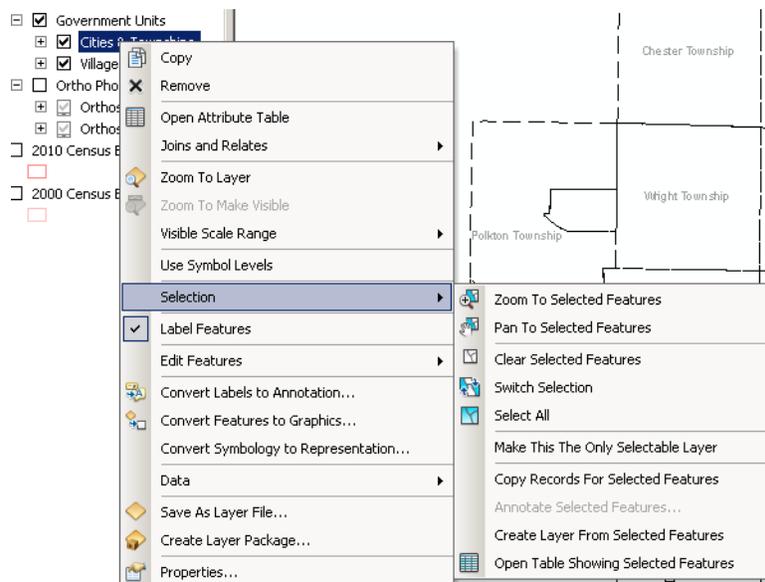
- Another way to use a selection is to create a new layer from the selected features. To begin, set the **Cities & Townships** layer (in Government Units) as the only selectable layer and zoom to the entire extent of the layer.



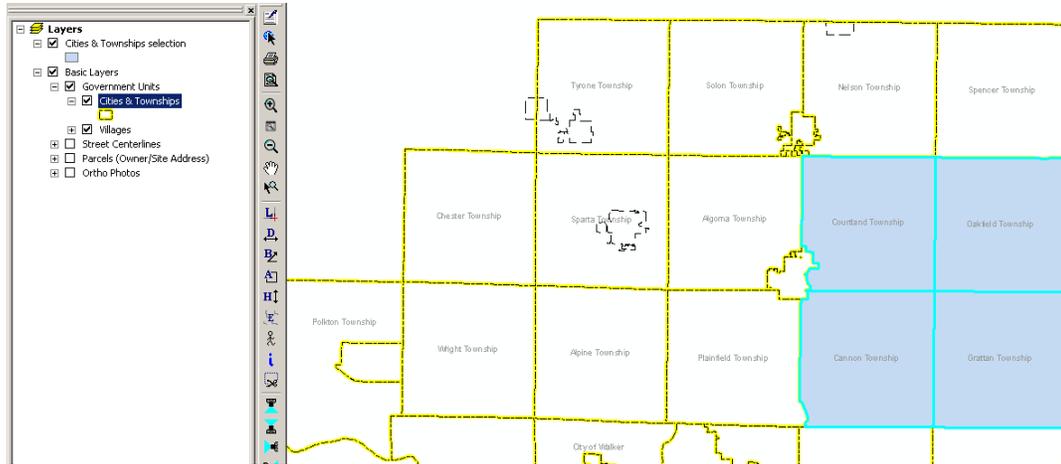
8. Use the **Select Features** tool  to select several government units.



9. In the Table of Contents, *right-click* on the **Cities & Townships** layer name, choose **Selection** and select **Create Layer From Selected Features**.

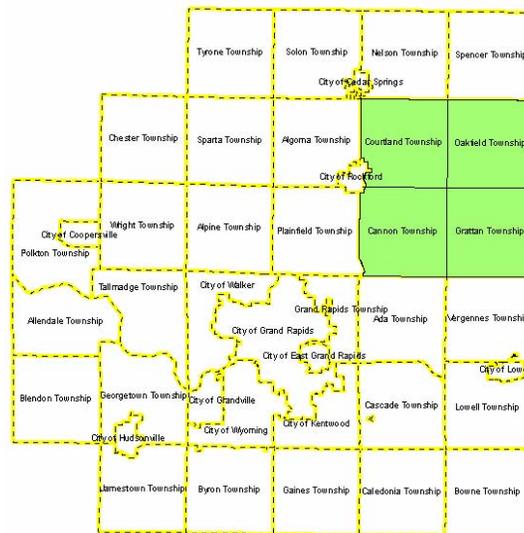


10. A new layer will be added to the Table of Contents that contains only the government units that were selected. This Layer is a temporary layer that only exists in your ArcMap project and does not alter the REGIS GIS data.



11. Press the **Clear Selected Features** button  to remove the selection on the original Government Units layer.

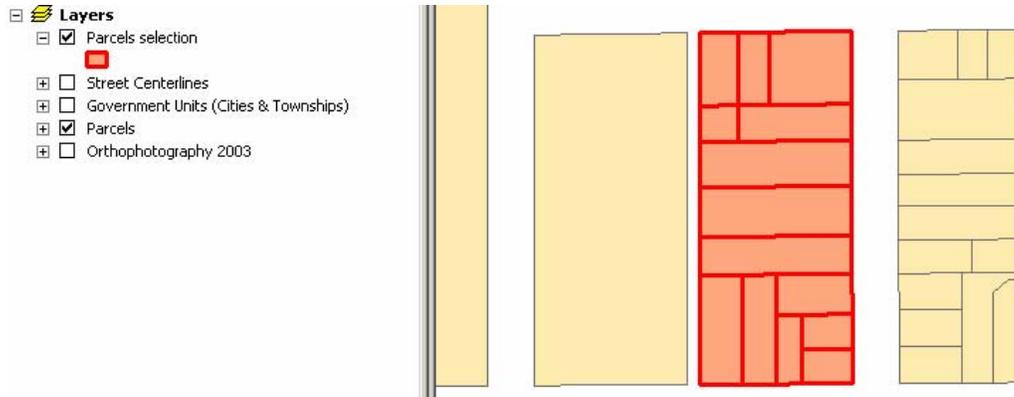
12. The symbology of the new layer can be changed by *left-clicking* on the symbol below the layer name in the Table of Contents.



13. The layer can be removed from the project by *right-clicking* on the layer name in the Table of Contents and selecting **Remove**.

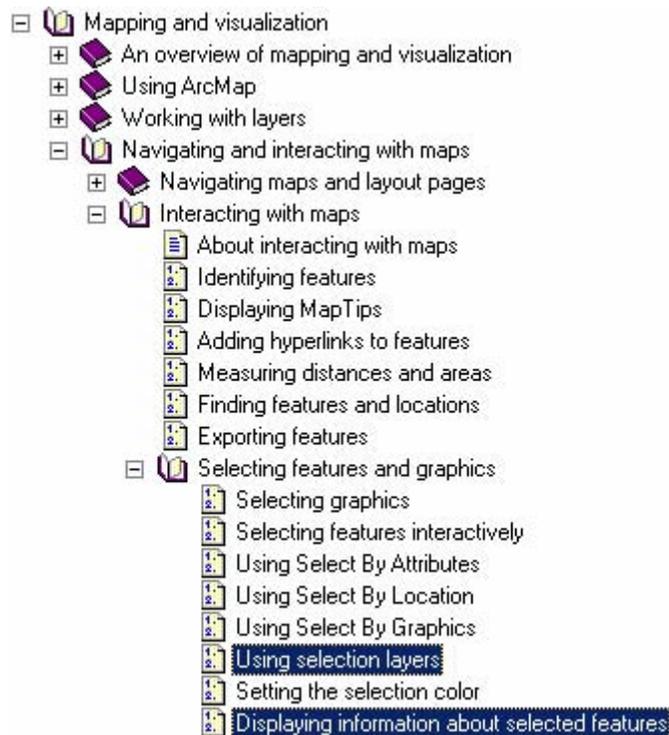


14. The concept of creating a new layer from selected features is useful when producing maps highlighting certain features. For example, select a group of parcels and then choose **Create Layer From Selected Features**.



### Additional Information

See the [Using selection layers](#) and [Displaying information about selected features](#) sections of the ArcGIS Desktop Help manual.



*End of Exercise 8.5*

## Exercise 9.1 – Introduction to Tables

In this exercise, you will learn how to:

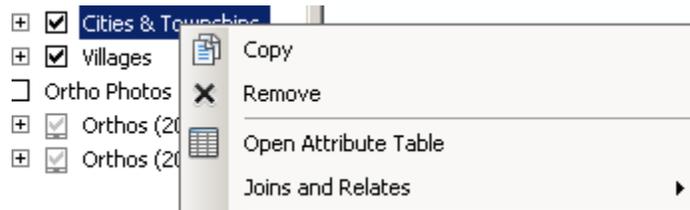
- ◆ Open and navigate attribute tables
- ◆ Select records in an attribute table

### Setup

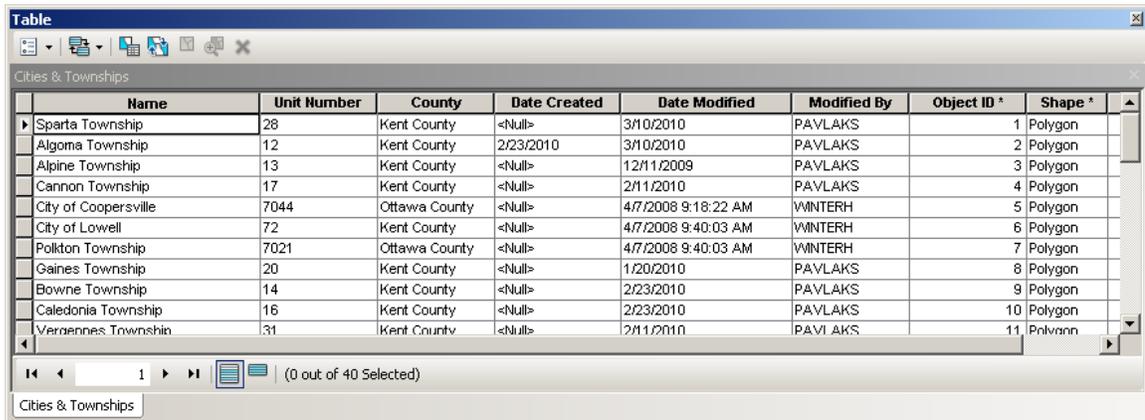
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Introduction to Tables Tutorial

1. *Right-click* on the **Cities & Townships** layer name in the Table of Contents and choose **Open Attribute Table**.



2. The attribute table for the Government Units layer appears in a new window. Along the top are field names such as Name, Unit Number, County, etc. Each record in the table is displayed horizontally below the field names.

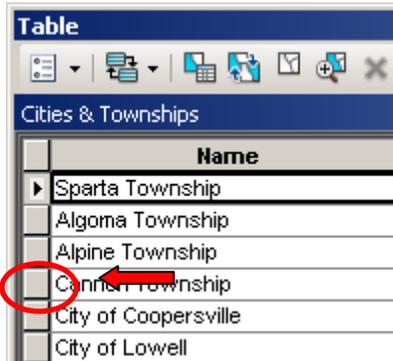


The image shows a screenshot of the 'Table' window in ArcView 10. The window title is 'Table' and the subtitle is 'Cities & Townships'. The table displays the following data:

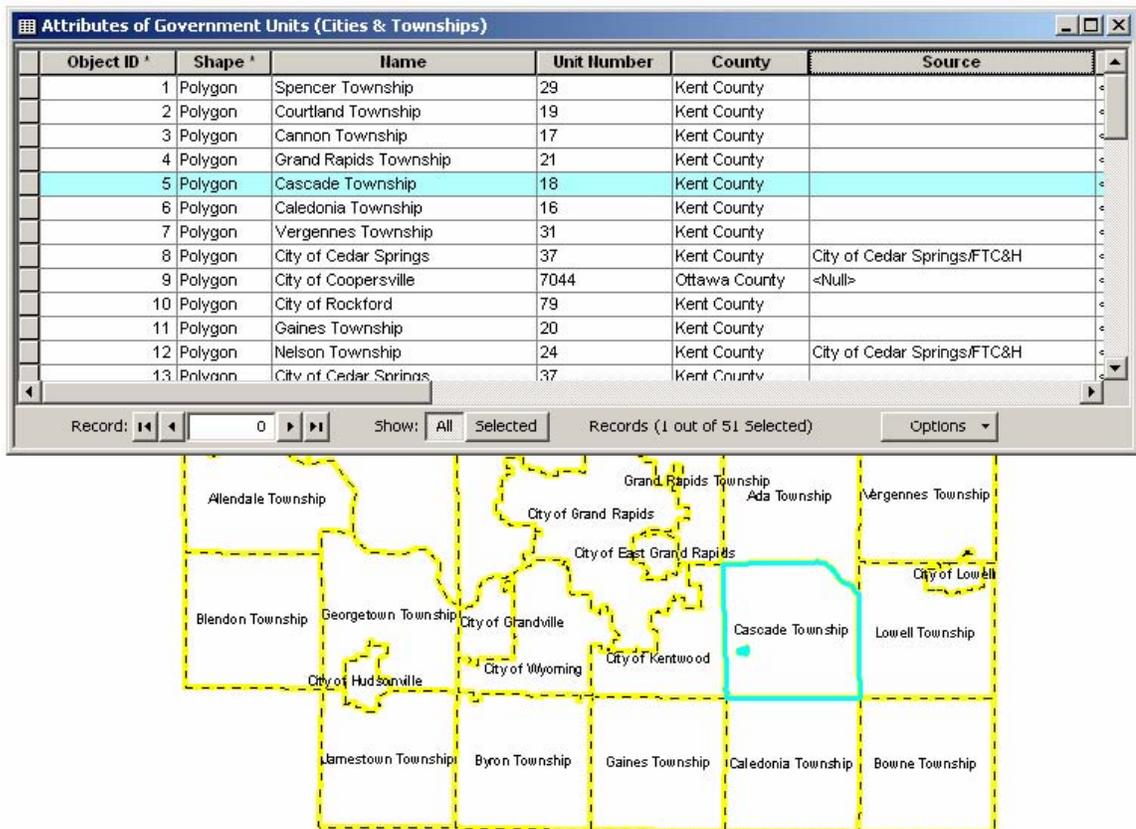
Name	Unit Number	County	Date Created	Date Modified	Modified By	Object ID *	Shape *
Sparta Township	28	Kent County	<Null>	3/10/2010	PAVLAKS	1	Polygon
Algoma Township	12	Kent County	2/23/2010	3/10/2010	PAVLAKS	2	Polygon
Alpine Township	13	Kent County	<Null>	12/11/2009	PAVLAKS	3	Polygon
Cannon Township	17	Kent County	<Null>	2/11/2010	PAVLAKS	4	Polygon
City of Coopersville	7044	Ottawa County	<Null>	4/7/2008 9:18:22 AM	WINTERH	5	Polygon
City of Lowell	72	Kent County	<Null>	4/7/2008 9:40:03 AM	WINTERH	6	Polygon
Polkton Township	7021	Ottawa County	<Null>	4/7/2008 9:40:03 AM	WINTERH	7	Polygon
Gaines Township	20	Kent County	<Null>	1/20/2010	PAVLAKS	8	Polygon
Bowne Township	14	Kent County	<Null>	2/23/2010	PAVLAKS	9	Polygon
Caledonia Township	16	Kent County	<Null>	2/23/2010	PAVLAKS	10	Polygon
Verennes Township	31	Kent County	<Null>	2/11/2010	PAVLAKS	11	Polygon

The table is displayed in a window with a toolbar at the top and a status bar at the bottom. The status bar shows '(0 out of 40 Selected)' and the layer name 'Cities & Townships'.

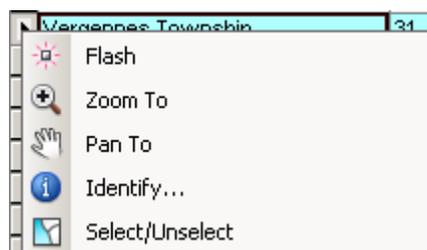
- To understand the one-to-one relationship between a record in the attribute table and a GIS feature, *left-click* on the gray box at the left-edge of one of the records.



- The entire row will be highlighted indicating that the record has been selected. Notice that the corresponding government unit is selected on the map.



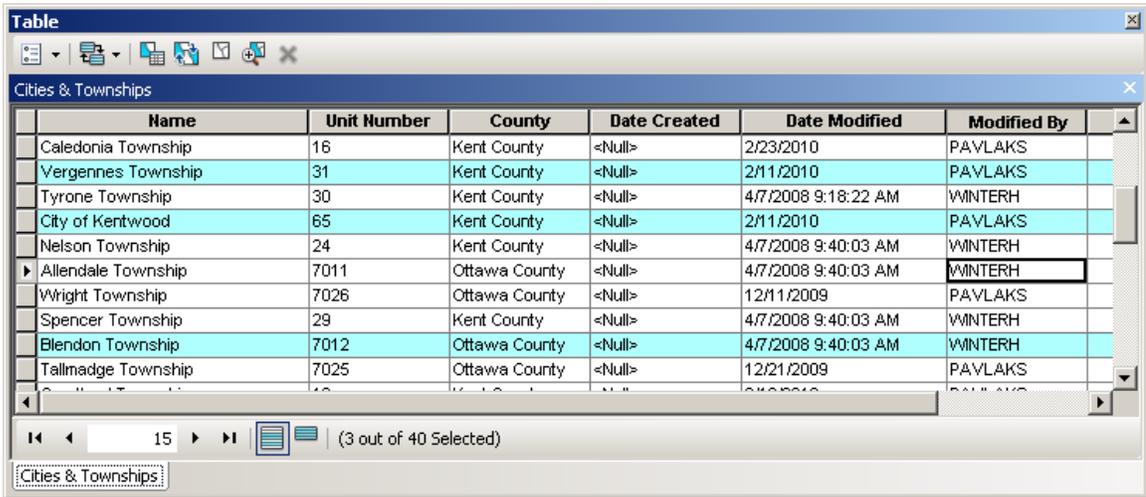
- Right-click* on the gray box again and select **Zoom To** to zoom the map to that government unit.



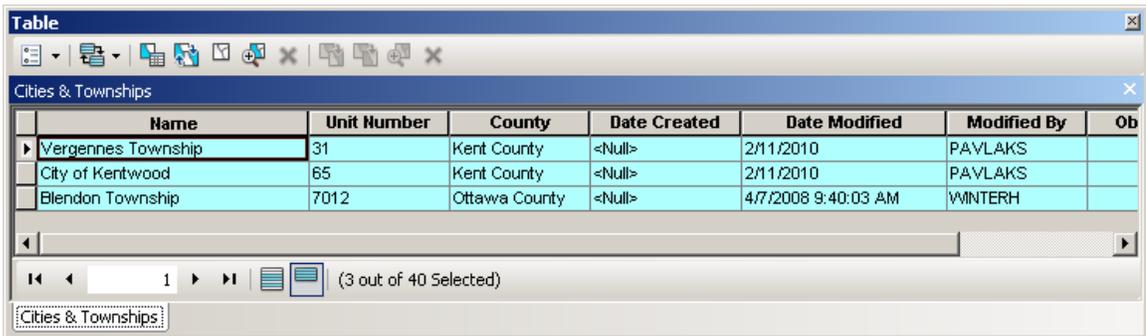
- At the bottom of the attribute table, the number of selected records is displayed along with the total number of records.



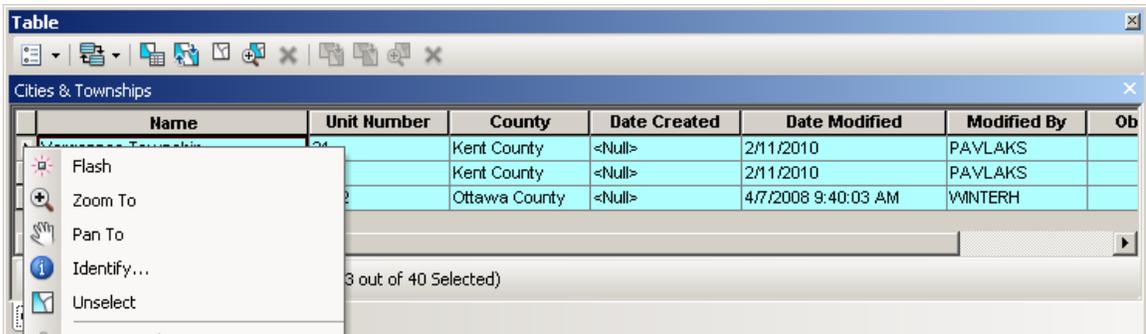
- To add to your selection, hold down the **CTRL** key and select additional records by *left-clicking* on the gray box at the left edge.



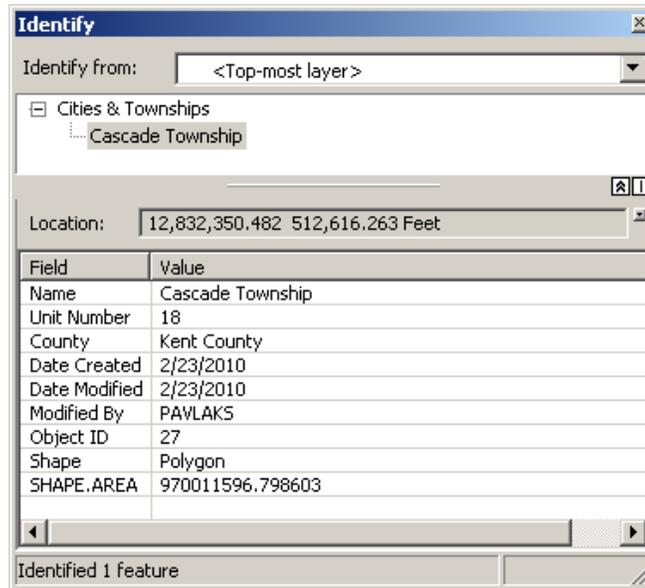
- At the bottom of the window, choose the blue row button  to switch the attribute table to show just the selected features.



- Right-click* on a record's left edge again and select **Identify**.



10. The Identify window appears showing the field names and values for the government unit. Notice that the Identify window is simply another way of viewing a record from the layer's attribute table.



## Additional Information

See the [Adding and viewing tables in ArcMap](#) section of the ArcGIS Desktop Help manual.

- [-] Data support in ArcGIS
  - [+] An overview of data support in ArcGIS
  - [+] Data formats supported in ArcGIS
  - [+] CAD data
  - [+] Coverages
  - [+] NetCDF: multidimensional, time series data
  - [+] Raster data
  - [+] Shapefiles
  - [-] Tables and attribute information
    - [+] Understanding tables and attribute information
    - [+] Creating tables and managing attribute information
    - [-] Displaying tables and attribute information
      - [+] Previewing a table in ArcCatalog
      - [+] Adding and viewing tables in ArcMap
      - [+] Setting field properties, aliases, and table display options
      - [+] Navigating to and finding records in a table
      - [+] Sorting records in a table
      - [+] Selecting records in a table
      - [+] Summarizing data in a table
      - [+] Printing a table
      - [+] Adding a table to a layout
      - [+] Viewing statistics for a table
      - [+] Creating a graph from a table
      - [+] Creating a report from a table

End of Exercise 9.1

## Exercise 9.2 – Using Tables

In this exercise, you will learn how to:

- ◆ Sort, resize, hide, and freeze fields in an attribute table
- ◆ Print and export all or portions of an attribute table

### Setup

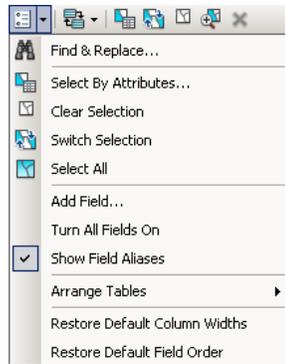
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Using Tables Tutorial

1. Right-click on **Freeway/Highway** layer in the **Street Centerlines** group and select **Open Attribute Table**.

Prefix Direction	Street Name	Street Suffix	Suffix Direction	Alternate Prefix Direction	Alternate St
<Null>	EAGLECREST	DR	NE		
<Null>	ADARIDGE	DR	SE		
<Null>	AIRPORT ACCESS	<Null>	<Null>		
<Null>	CARLTON	AVE	NE		
<Null>	ASHVILLE	DR	NE		
<Null>	ROGER	DR	<Null>	<Null>	<Null>
<Null>	EGAN	AVE	SE		
<Null>	4 MILE	RD	NW		
<Null>	BUTTERCUP	RUN	NE		
<Null>	ROGUE RIVER	RD	NE		
<Null>	HEISS	ST	NE		
<Null>	OAK HOLLOW	RD	NW		
<Null>	NORMAN	DR	SE		

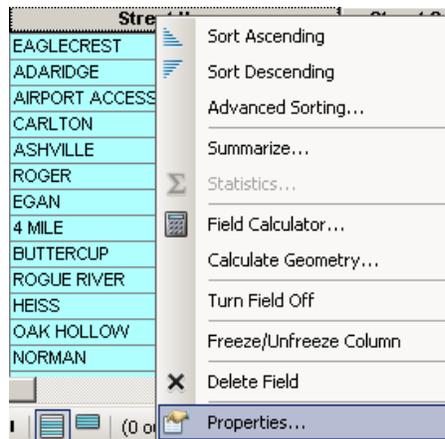
2. Field widths can be adjusted by moving the mouse cursor to the divider between field names. **Street Suffix**  **Suffix Direction** When the mouse cursor changes to the double-arrow icon ( $\leftrightarrow$ ), left-click and hold and resize the column.
3. Resized columns remain in the attribute table even if you close and reopen it. Use the **Table Options** button at the top left of the window to select **Restore Default Column Widths** to return every column to its original width.



4. Individual fields can be highlighted by *left-clicking* on the field name.

Prefix Direction	Street Name	Street Suffix	Suffix Direction	Alternate Prefix Direction	Alternate St
<Null>	EAGLECREST	DR	NE		
<Null>	ADARIDGE	DR	SE		
<Null>	AIRPORT ACCESS	<Null>	<Null>		
<Null>	CARLTON	AVE	NE		
<Null>	ASHVILLE	DR	NE		
<Null>	ROGER	DR	<Null>	<Null>	<Null>
<Null>	EGAN	AVE	SE		
<Null>	4 MILE	RD	NW		
<Null>	BUTTERCUP	RUN	NE		
<Null>	ROGUE RIVER	RD	NE		
<Null>	HEISS	ST	NE		
<Null>	OAK HOLLOW	RD	NW		
<Null>	NORMAN	DR	SE		

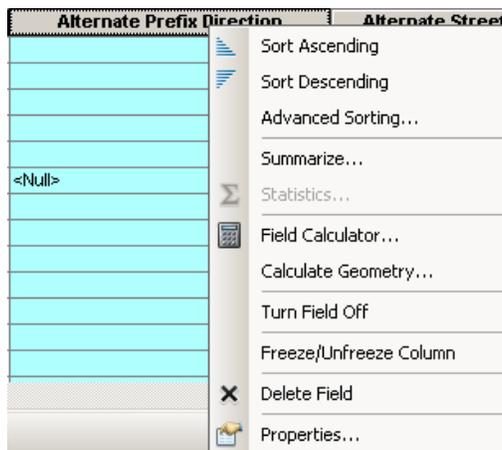
5. *Right-click* on the **Street Name** field and select **Sort Ascending**. All the records in the attribute table are sorted alphabetically by street name.



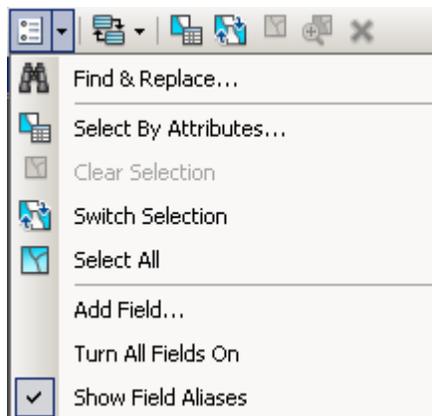
6. *Right-click* again on **Street Name** and select **Freeze/Unfreeze column**. The Street Name field immediately jumps to the far left side of the attribute table and is now locked in place. Scroll right using the bottom scrollbar and notice how the field remains visible while all other fields move.

Street Name	SHAPE.LEN	F_ZLEV	T_ZLEV	KCRC Category	Snow Route Number	CLASSNUMBER	ONEWAY	NOTES
EAGLECREST	619.300718	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
ADARIDGE	443.926451	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
AIRPORT ACCESS	519.806065	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
CARLTON	1493.296834	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
ASHVILLE	421.495779	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
ROGER	524.81105	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
EGAN	3490.831908	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
4 MILE	623.3115	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
BUTTERCUP	128.813504	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
ROGUE RIVER	694.864771	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
HEISS	3253.353783	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
OAK HOLLOW	719.796091	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
NORMAN	532.857473	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>

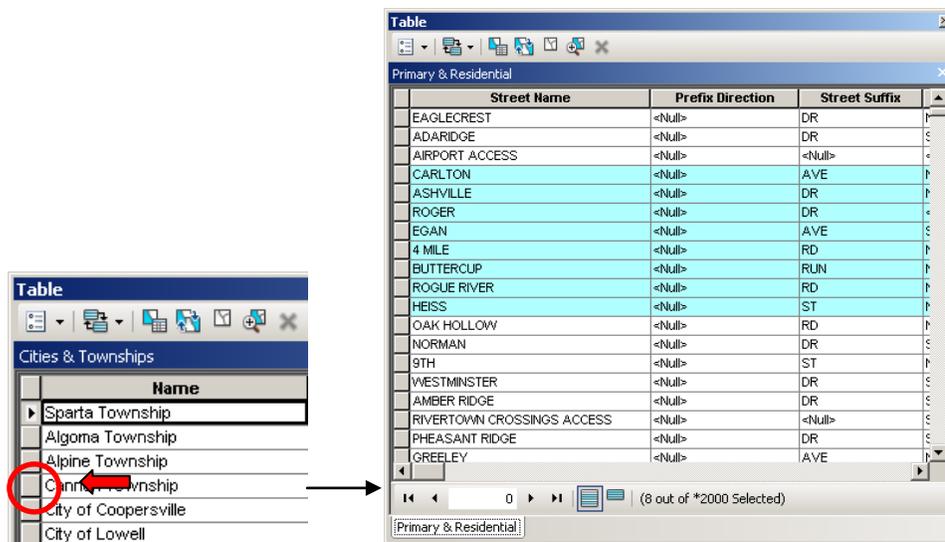
7. Select **Freeze/Unfreeze column** again to remove the locked field.
8. Individual fields can be turned off. Find the **Alternate Prefix Direction** field and *right-click* on the field name. Choose **Turn Field Off** to not show it in the attribute table.



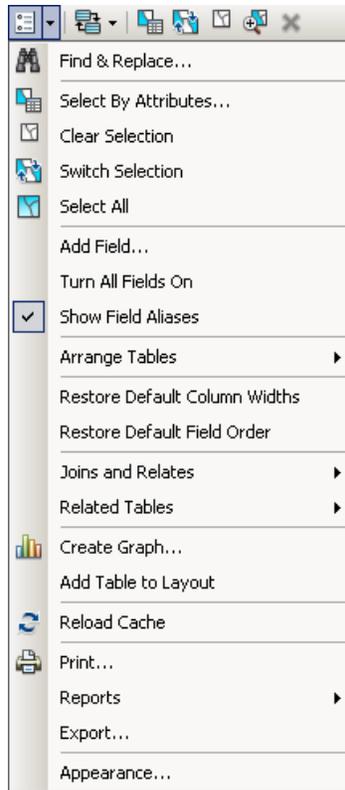
9. Turn all hidden fields back on by going to the **Options** menu and choosing **Turn All Fields On**.



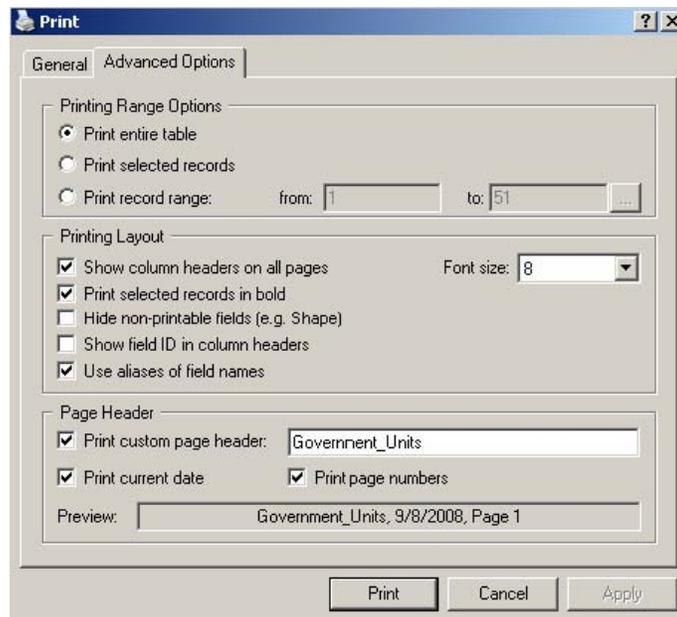
- Open the attribute table of the **Cites & Townships** layer in the **Government Units** group and select a group of records. An easy method for selecting multiple records is to *left-click and hold* on the gray box at the left edge of a record and drag up or down.



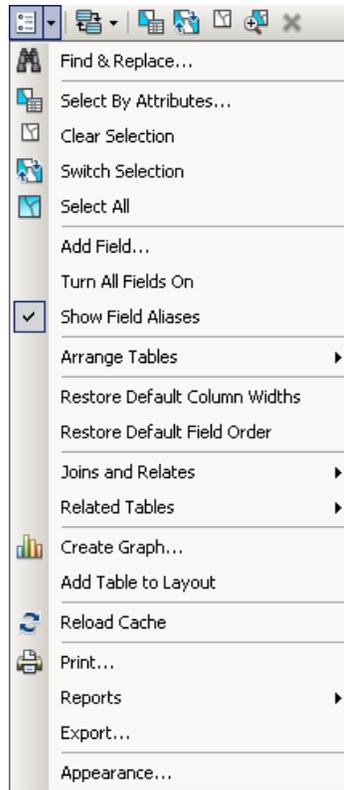
- Left click the Switch Selection button . All unselected records are selected while the original selection is cleared.
- An attribute table can be printed by opening the Options drop down menu  and choosing **Print**. It is good practice to first turn off all unnecessary fields and set the printers page orientation to landscape to avoid rows being printed across multiple pages.



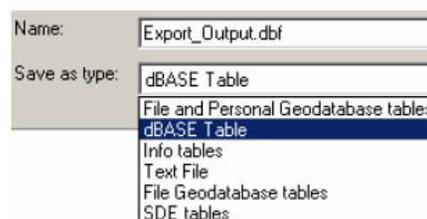
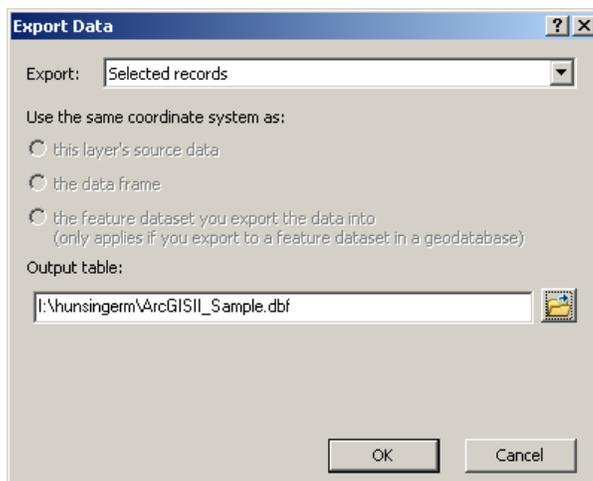
13. Use the **Advance Options** tab of the **Print** window to choose whether all records or just the selected records will be printed.



14. Attribute tables can also be exported to several file types, including Access tables, text files, and dBase (DBF). Press **Options** and select **Export**.



15. The **Export Data** window appears. The **Export** drop-down box allows you to choose whether to export all records or just the selected records. Use the folder icon to select an export location and file type. In most situations, set the **Save as type** as **dBASE table**.



16. The exported dBase file can now be opened in Excel and modified as needed. It is good practice to immediately save the file as an Excel worksheet (.xls) instead of trying to overwrite the dBASE.

F13		fx			
	A	B	C	D	
1	OBJECTID	NAME	UNIT_N	COUNTY	SOI
2	5	Cascade Township	18	Kent County	
3	8	City of Cedar Springs	37	Kent County	City
4	9	City of Coopersville	7044	Ottawa County	
5	13	City of Cedar Springs	37	Kent County	
6	15	City of Grandville	58	Kent County	
7	33	City of Hudsonville	7072	Ottawa County	
8	35	City of East Grand Rapids	44	Kent County	
9	37	Chester Township	7013	Ottawa County	
10	38	City of Cedar Springs	37	Kent County	
11	41	City of Grand Rapids	51	Kent County	

## Additional Information

See the [Displaying tables and attribute information](#) section of the ArcGIS Desktop Help manual.

- [-]  Data support in ArcGIS
  -  An overview of data support in ArcGIS
  -  Data formats supported in ArcGIS
  - [+]  CAD data
  - [+]  Coverages
  - [+]  NetCDF: multidimensional, time series data
  - [+]  Raster data
  - [+]  Shapefiles
  - [-]  Tables and attribute information
    - [+]  Understanding tables and attribute information
    - [+]  Creating tables and managing attribute information
    - [-]  **Displaying tables and attribute information**
      -  1.1.1 Previewing a table in ArcCatalog
      -  1.1.2 Adding and viewing tables in ArcMap
      -  1.1.3 Setting field properties, aliases, and table display options
      -  1.1.4 Navigating to and finding records in a table
      -  1.1.5 Sorting records in a table
      -  1.1.6 Selecting records in a table
      -  1.1.7 Summarizing data in a table
      -  1.1.8 Printing a table
      -  1.1.9 Adding a table to a layout
      -  1.1.10 Viewing statistics for a table
      -   Creating a graph from a table
      -   Creating a report from a table

*End of Exercise 9.2*

## Exercise 9.3 – Using Field Properties and MapTips

In this exercise, you will learn how to:

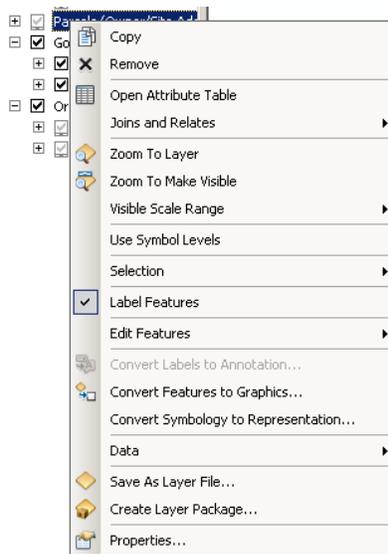
- ◆ Control field visibility in the Layer Properties window
- ◆ Setup and customize MapTips for a layer

### Setup

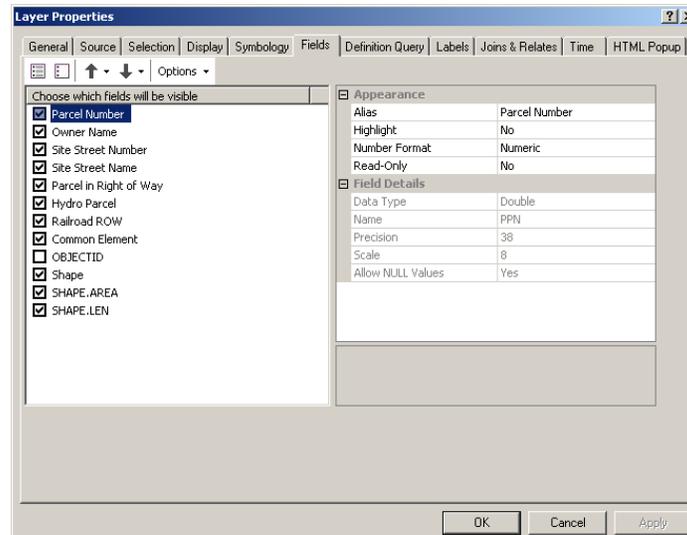
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Using Field Properties and MapTips Tutorial

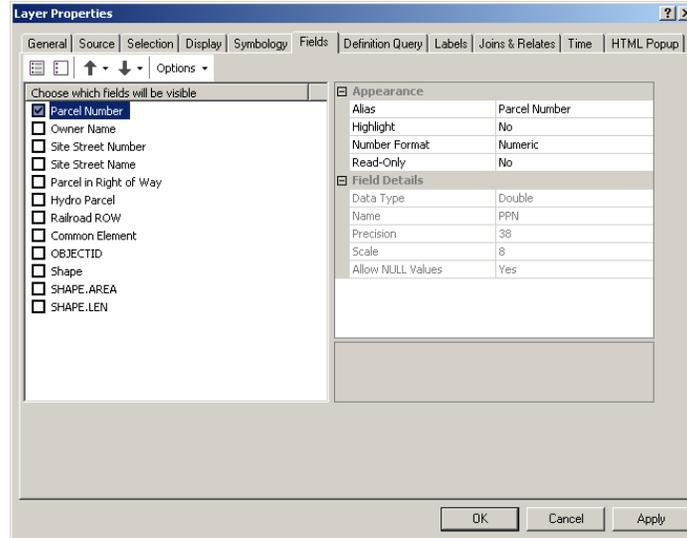
1. *Right-click* on the **Parcels** layer in the Table of Contents and select **Properties**.



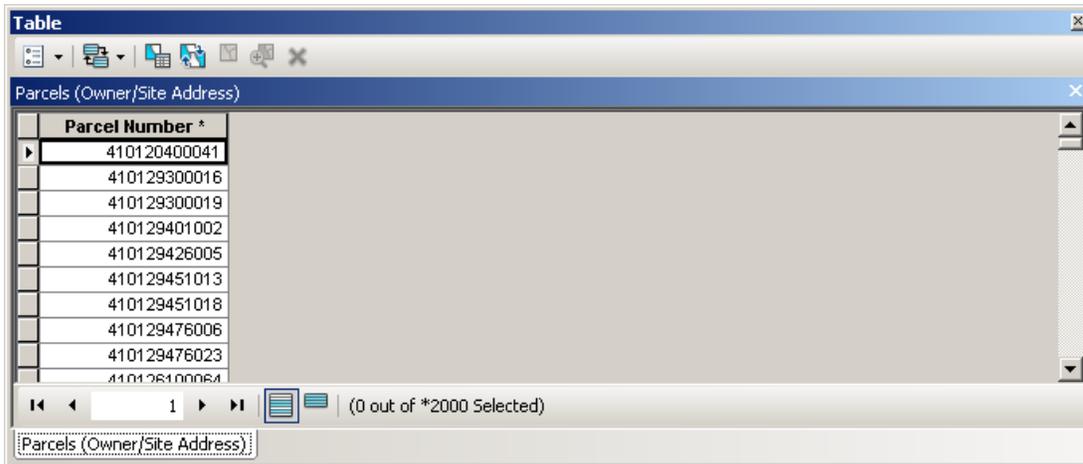
2. In the **Layer Properties** window, select the **Fields** tab.



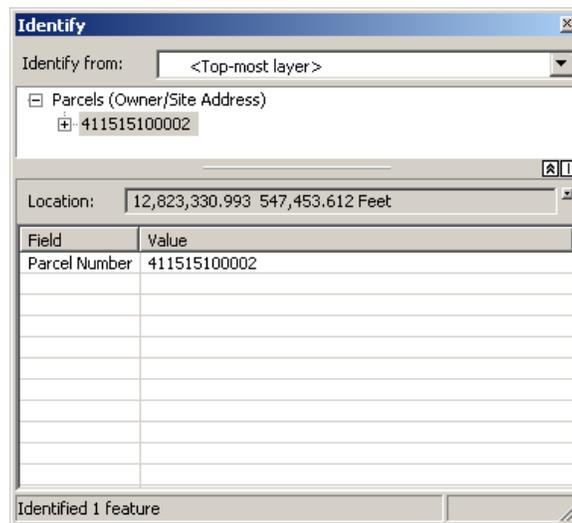
3. All of the parcel fields are listed along with their alias names, types, and lengths. The checkbox next to each field indicates that the field will be visible when the attribute table is opened. Select **Clear All** and then place a checkmark by only the **Parcel Number** field. Press **OK**.



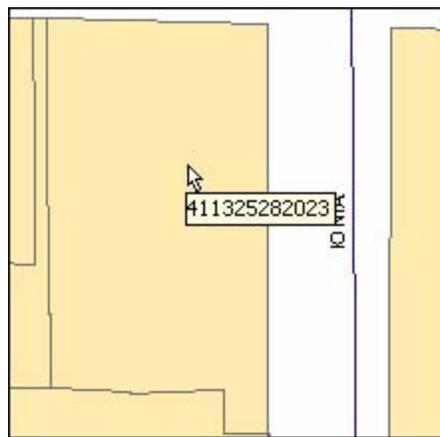
4. *Right-click* on the parcels layer again in the Table of Contents and select **Open Attribute Table**. Only the parcel Number field in now visible.



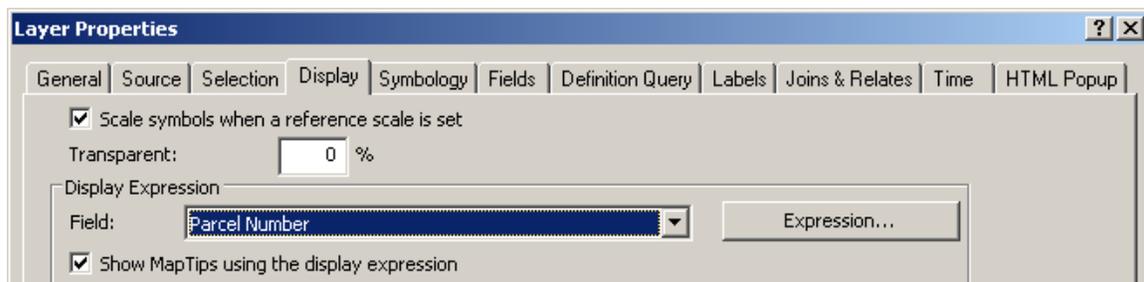
5. Use the **Identify Features** tool  to select a parcel in the map and notice that only the Parcel Number field is visible here also.



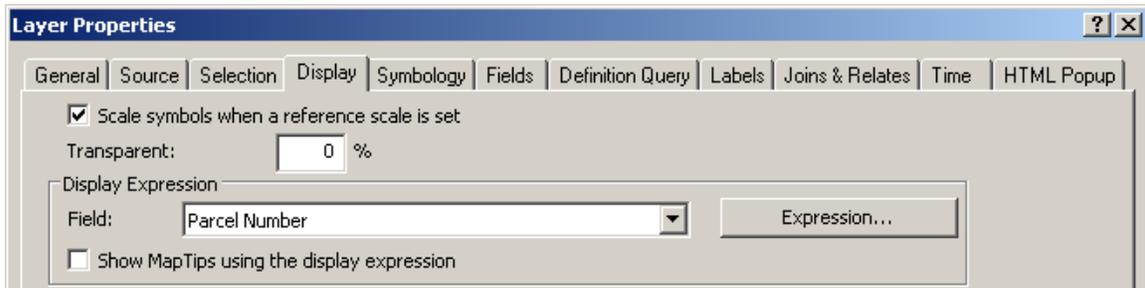
6. Move your mouse cursor over a parcel feature. After pausing, a box will appear next to your cursor displaying the parcel number. This is a **MapTip** that REGIS setup in the Parcels Layer Properties.



7. Return to the Parcels **Layer Properties** window and select the **Display** tab. The **PPN** field (i.e. Parcel Number) should be selected as the **Display Expression Field**. The Display Expression Field is the field that is displayed as the MapTip.



8. The first checkbox controls whether MapTips are turned on or off. Uncheck the **Show MapTips** box and press **OK**. Return to the map and pause your mouse cursor over a parcel. The MapTips will not appear.



## Additional Information

See the [Setting field properties, aliases, and table display options](#) section of the ArcGIS Desktop Help manual.

- [-]  Data support in ArcGIS
  -  An overview of data support in ArcGIS
  -  Data formats supported in ArcGIS
  - [+]  CAD data
  - [+]  Coverages
  - [+]  NetCDF: multidimensional, time series data
  - [+]  Raster data
  - [+]  Shapefiles
  - [-]  Tables and attribute information
    - [+]  Understanding tables and attribute information
    - [+]  Creating tables and managing attribute information
    - [-]  Displaying tables and attribute information
      -  Previewing a table in ArcCatalog
      -  Adding and viewing tables in ArcMap
      -  **Setting field properties, aliases, and table display options**
      -  Navigating to and finding records in a table
      -  Sorting records in a table
      -  Selecting records in a table
      -  Summarizing data in a table
      -  Printing a table
      -  Adding a table to a layout
      -  Viewing statistics for a table
      -  Creating a graph from a table
      -  Creating a report from a table

See the [Displaying MapTips](#) section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [-]  Navigating and interacting with maps
    - [+]  Navigating maps and layout pages
    - [-]  Interacting with maps
      -  About interacting with maps
      -  Identifying features
      -  **Displaying MapTips**
      -  Adding hyperlinks to features
      -  Measuring distances and areas
      -  Finding features and locations
      -  Exporting features

*End of Exercise 9.3*

## Exercise 9.4 – Using Relates

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### In this exercise, you will learn how to:

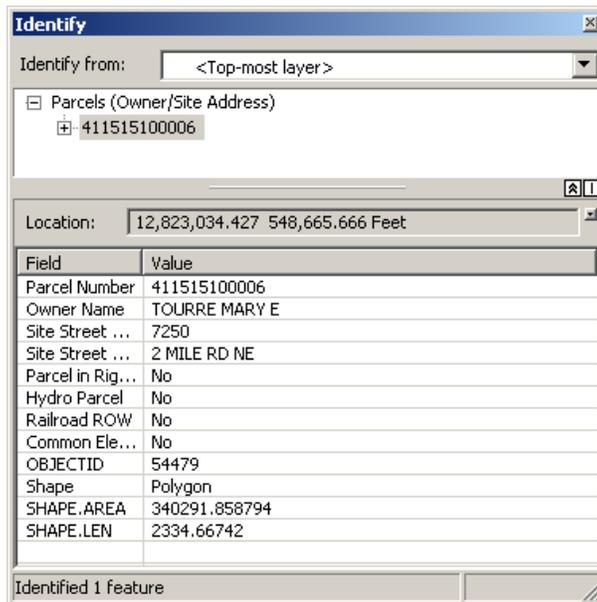
- ◆ Access related information of the parcels layer, including owner and address, legal description, and sales history.

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Introduction to Tables Tutorial

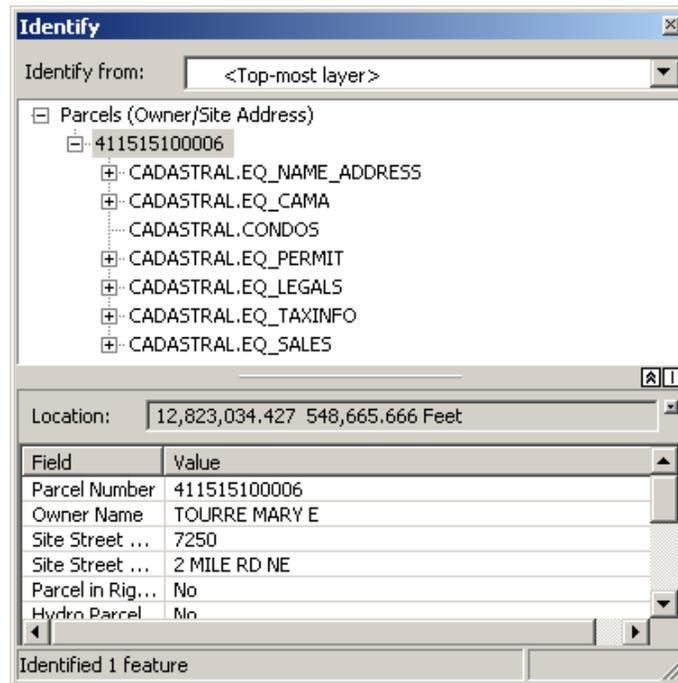
1. Use the **Identify Features** tool  to identify a parcel.



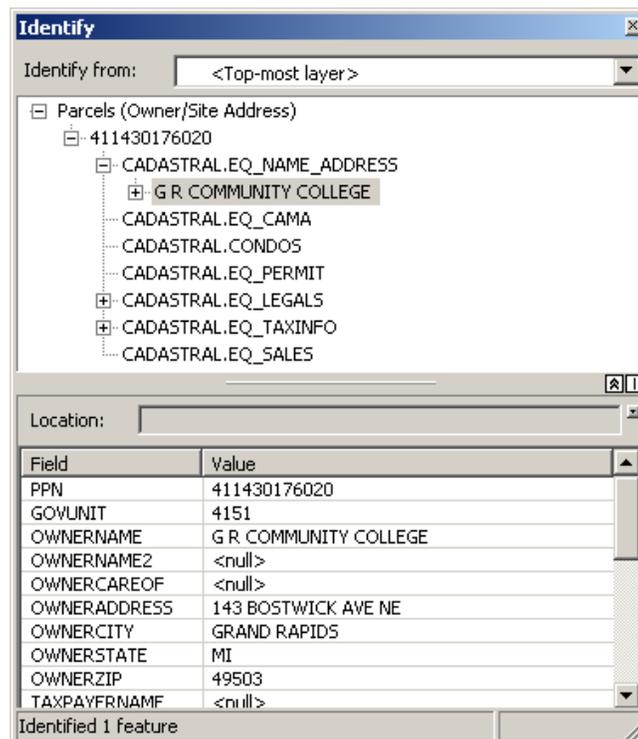
2. REGIS has setup predefined relates that can be accessed by *left-clicking* on the plus icon next to the identified parcel.



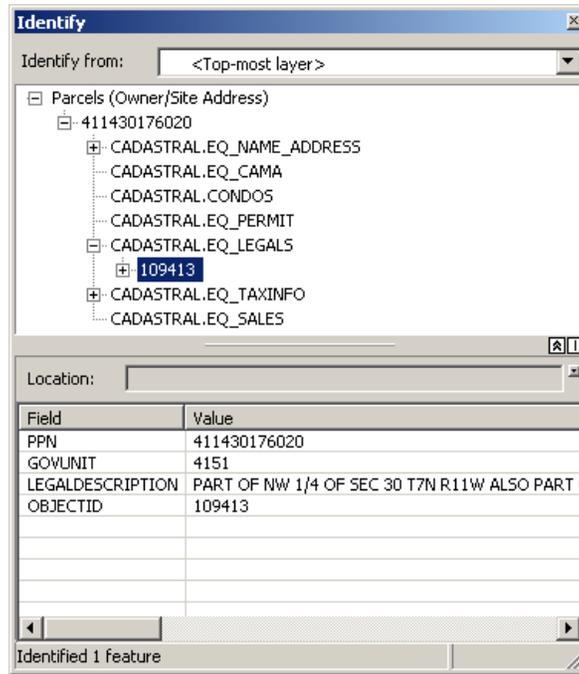
- The names of each related table will appear below. The related tables with a plus icon indicate that there are one or more records that relate to the identified parcel.



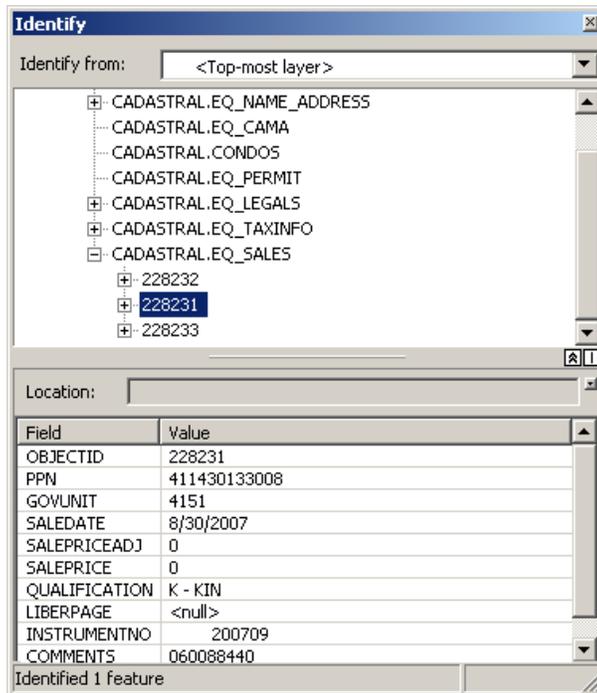
- For example, select the **CADASTRAL EQ NAME ADDRESS** plus icon to view the related record containing the address and owner information of the parcel. The field names and values of the related record appear in the right-side of the window.



- Identify another parcel and view the related record in the **CADASTRAL EQ LEGALS** table. Here you can view the legal description for the identified parcel.



- Identify other parcels to locate one that has a plus icon next to the **CADASTRAL EQ SALES** related table. Expanding that relate will show the sales history of the parcel. Since relates allow for a one-to-many relationship, there often will be multiple sales records for the parcel.



## Additional Information

See the [About joining and relating tables](#) section of the ArcGIS Desktop Help manual.

- [-]  Data support in ArcGIS
  -  An overview of data support in ArcGIS
  -  Data formats supported in ArcGIS
  - [+]  CAD data
  - [+]  Coverages
  - [+]  NetCDF: multidimensional, time series data
  - [+]  Raster data
  - [+]  Shapefiles
  - [-]  Tables and attribute information
    - [+]  Understanding tables and attribute information
    - [-]  Creating tables and managing attribute information
      -  Creating new tables
      -  About ObjectID fields
      -  1.2 Adding and deleting fields
      -  1.2 Editing values in a table
      -  1.2 Making field calculations
      -  1.2 Working with date fields
      -  1.2 Reloading the table cache
      -  1.2 Exporting records
      -  **1.2 About joining and relating tables**
      -  1.2 Joining tables
      -  1.2 Relating tables
      -  1.2 Joining the attributes of features by location
      -  Creating spatial data from tables
      -  1.2 Working with Microsoft Excel files in ArcGIS

*End of Exercise 9.4*

## Exercise 9.5 – Creating and Using Joins

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### In this exercise, you will learn how to:

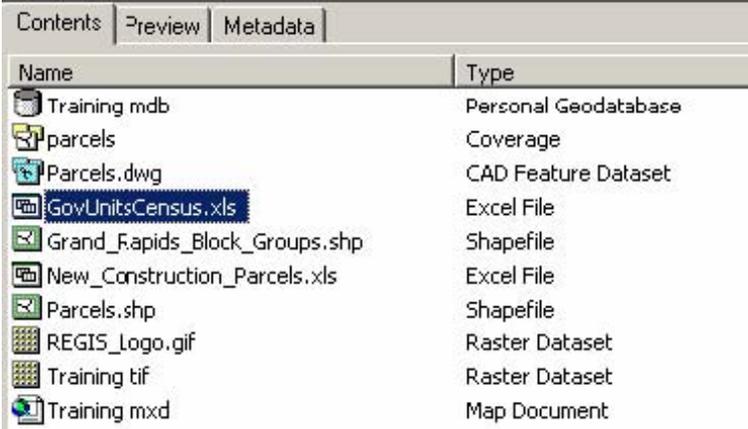
- ◆ Use ArcCatalog to preview an Excel spreadsheet
- ◆ Create a join between a GIS layer and an Excel spreadsheet

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

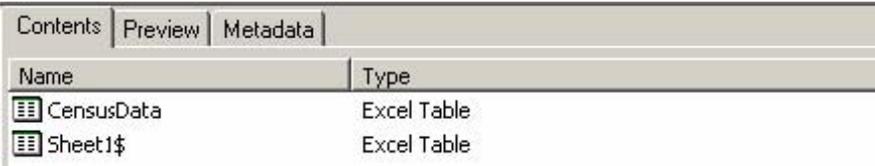
### Creating and Using Joins Tutorial

1. Select the **ArcCatalog**  button on the Standard toolbar. Navigate to the REGIS I: Drive directory and locate the Excel spreadsheet named **GovUnitsCensus.xls**.



Name	Type
Training.mdb	Personal Geodatabase
parcels	Coverage
Parcels.dwg	CAD Feature Dataset
<b>GovUnitsCensus.xls</b>	Excel File
Grand_Fapids_Block_Groups.shp	Shapefile
New_Construction_Parcels.xls	Excel File
Parcels.shp	Shapefile
REGIS_Logo.gif	Raster Dataset
Training.tif	Raster Dataset
Training.mxd	Map Document

2. *Double left-click* on the name to view the contents of the spreadsheet. Two entries should appear. **Sheet1\$** is the entire Excel worksheet while **CensusData** is a named range setup in Excel to capture a specific set of rows and columns.

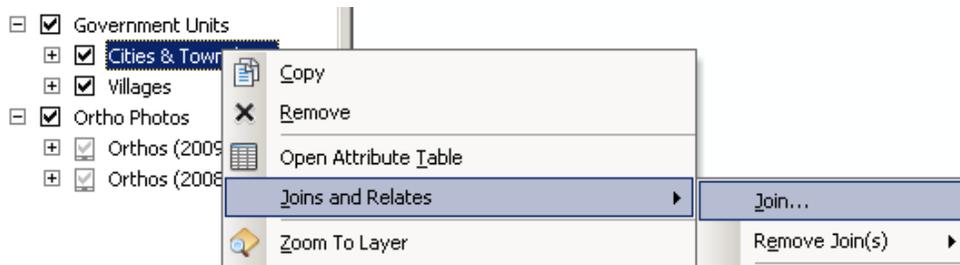


Name	Type
CensusData	Excel Table
Sheet1\$	Excel Table

3. Select **CensusData** and switch to the **Preview** tab. A table will be displayed showing Government units along with their REGIS unit number, population, and median household income from the 2000 Census. Notice there is only one record per township.

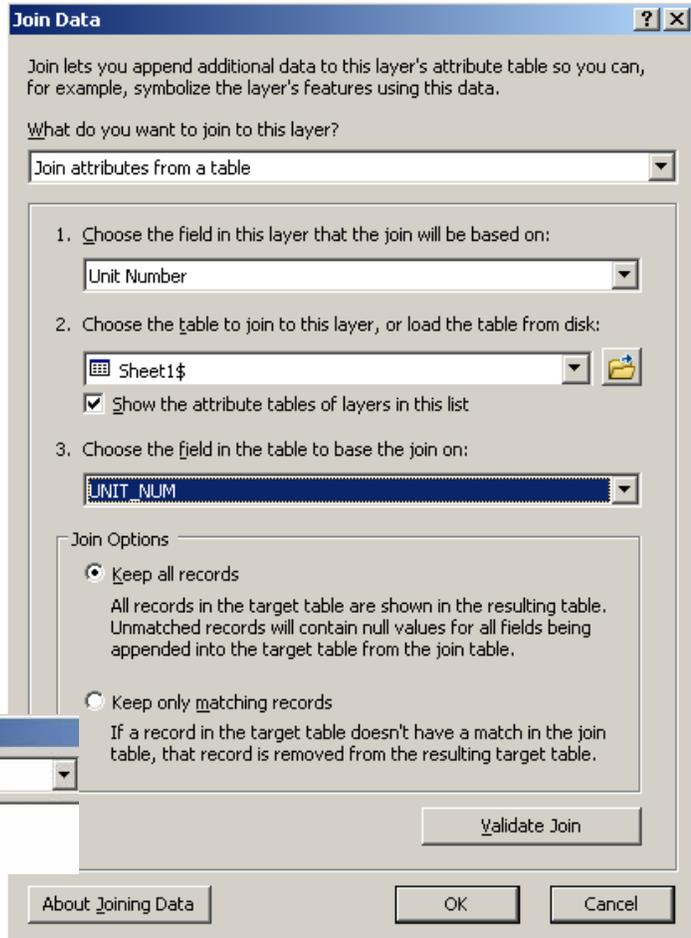
	NAME	UNIT_NUM	POPULATION	MED_INCOME
▶	Ada Township	11	9662	83357
	Algoma Township	12	9513	58285
	Allendale Township	7011	13042	48669
	Alpine Township	13	13976	42484
	Blendon Township	7012	5721	56094
	Bowre Township	14	2743	60909
	Byron Township	15	17553	49672
	Caledonia Township	16	8964	63032
	Cannon Township	17	12075	70925
	Cascade Township	18	15107	87290

4. In order to make a map of population or income, this Excel table must be joined to the Government Units layer in ArcMap (a join is used because there is a one-to-one relationship). Return to ArcMap and locate the Government Units layer in the Table of Contents. *Right-click* on the layer name and choose **Joins and Relates** and then select **Join**.



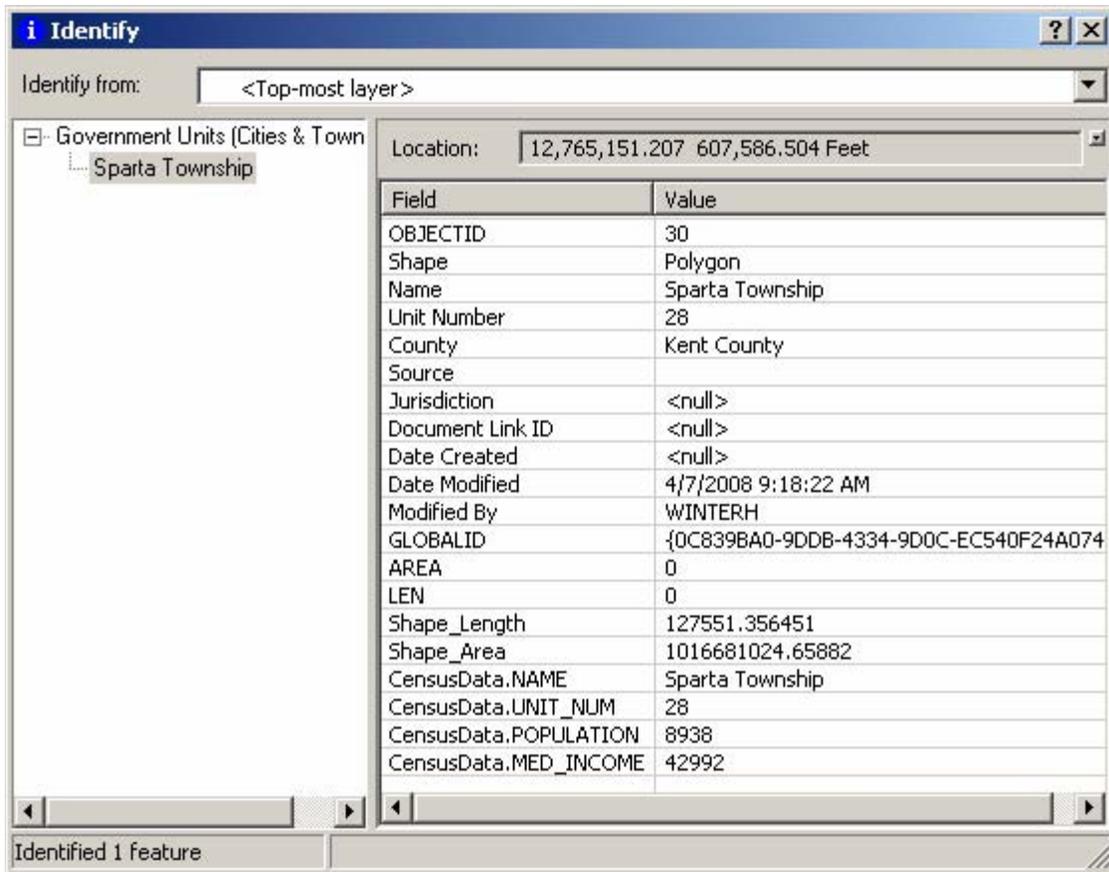
5. The Join Data window appears. Complete the following steps to setup a join between the Government Units layer and the Excel spreadsheet.

- a. Make sure the first drop-down box is set to **Join attributes from a table**.
- b. Under step 1, select **Unit Number** as the field that the join will be based upon.
- c. In step 2, use the folder icon  to navigate to the location of the **GovUnitsCensus.xls**, select the **CensusData** table and press **Add**.

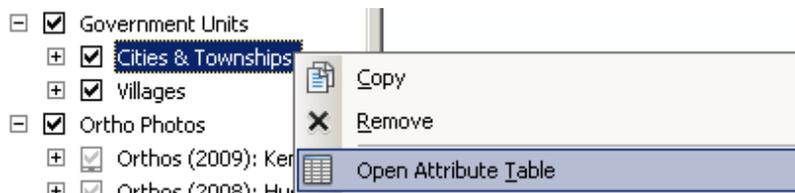


- d. In step 3, select **UNIT\_NUM** as the field in the table to base the join on. The NAME field could also be used but it is best to use the shorter field to avoid potential mismatches because of spelling errors.
- e. Press **OK** to close the window and create the join.

6. To ensure the join was successful, use the **Identify Features**  tool to select a Government Unit. At the bottom of the Field and Values window, there should be four additional fields all starting with the CensusData prefix. This indicates that the matching record from the Excel spreadsheet has been joined to the appropriate government unit.



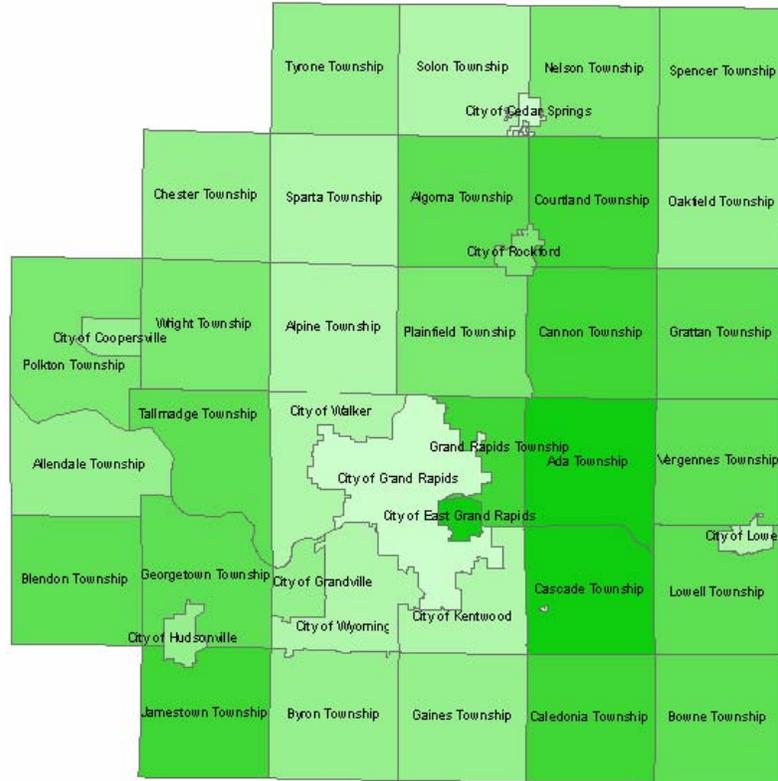
- The join also appears in the attribute table. *Right-click* on the **Cities & Townships** layer and select **Open Attribute Table**.



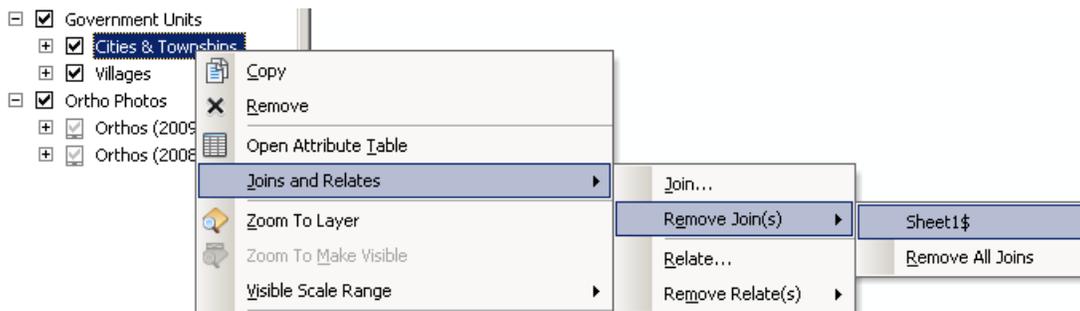
- Scroll to the right end of the attribute table and notice the fields appear here as well. ArcMap now considers them part of the regular attribute table so they can be used for sorting, freezing, turning on/off, selecting, etc.

Shape *	SHAPE_AREA	NAME	UNIT_NUM	POPULATION	MED_INCOME
Polygon	1016681024.66	Sparta Township	28	8938	42992
Polygon	22049.87225	Algoma Township	12	7596	58285
Polygon	1008935170.17	Alpine Township	13	14088	42484
Polygon	1029680764.23	Cannon Township	17	12086	70925
Polygon	131998964.25	City of Coopersville	7044	3910	48875
Polygon	85982651.3246	City of Lowell	72	3853	42326
Polygon	1109237088.93	Polkton Township	7021	2335	53929
Polygon	996928841.79	Gaines Township	20	20054	48482
Polygon	1003893220.98	Bowne Township	14	2755	60909
Polygon	995439360.998	Caledonia Township	16	8964	63032
Polygon	996928841.79	...	...	...	...

9. Joining fields can also be used for symbology. This will be discussed in section 10 but as an example, the Government Units layer could now be colored based on the median household income value (shown below) or population.



10. The join can be removed by *right-clicking* on the **Cities & Townships** layer and selecting **Joins and Relates**, then **Remove Join(s)** and select **Sheet1\$**.



## Additional Information

See the **Joining tables** section of the ArcGIS Desktop Help manual.

- [-]  Data support in ArcGIS
  -  An overview of data support in ArcGIS
  -  Data formats supported in ArcGIS
  - [+]  CAD data
  - [+]  Coverages
  - [+]  NetCDF: multidimensional, time series data
  - [+]  Raster data
  - [+]  Shapefiles
  - [-]  Tables and attribute information
    - [+]  Understanding tables and attribute information
    - [-]  Creating tables and managing attribute information
      -  Creating new tables
      -  About ObjectID fields
      -  <sup>4.2.1</sup> Adding and deleting fields
      -  <sup>4.2.2</sup> Editing values in a table
      -  <sup>4.2.3</sup> Making field calculations
      -  <sup>4.2.4</sup> Working with date fields
      -  <sup>4.2.5</sup> Reloading the table cache
      -  <sup>4.2.6</sup> Exporting records
      -   <sup>4.2.7</sup> **Joining tables**
      -  <sup>4.2.8</sup> Relating tables
      -  <sup>4.2.9</sup> Joining the attributes of features by location
      -   Creating spatial data from tables
      -  <sup>4.2.10</sup> Working with Microsoft Excel files in ArcGIS

*End of Exercise 9.5*

## Exercise 9.6 – Creating Graphs

In this exercise, you will learn how to:

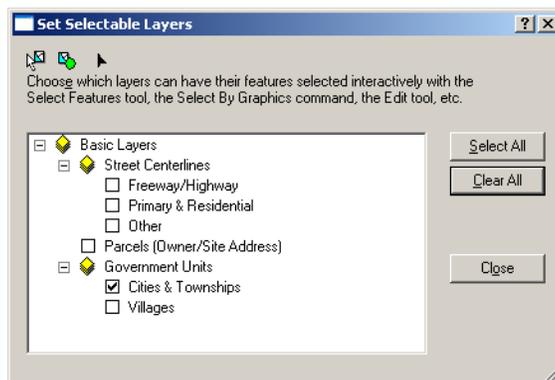
- ◆ Create a graph showing the population of government units

### Setup

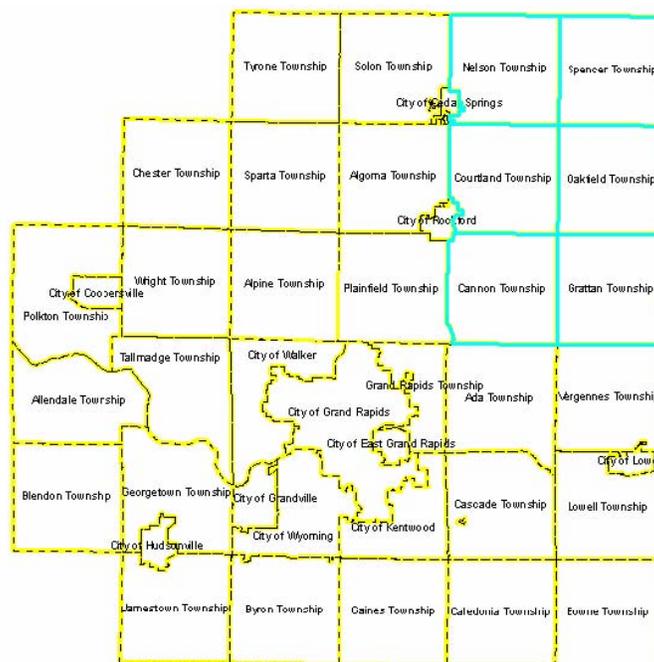
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Theme Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame. Use exercise 9.5 to create a join between the Cities & Townships layer and the Excel spreadsheet containing the sample census data.

### Introduction to Tables Tutorial

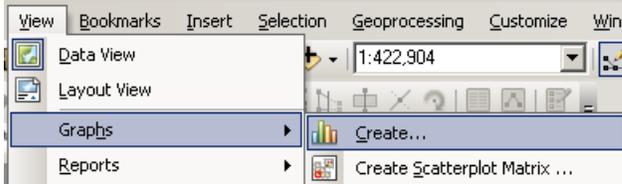
1. Set the Cities and Townships layer as the only selectable layer.



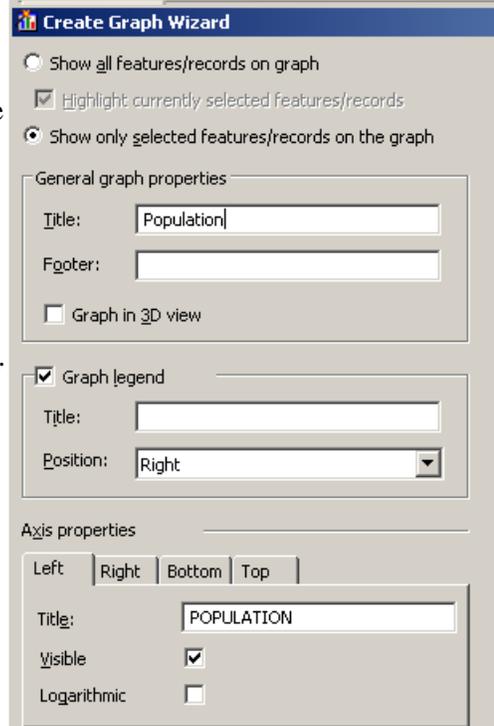
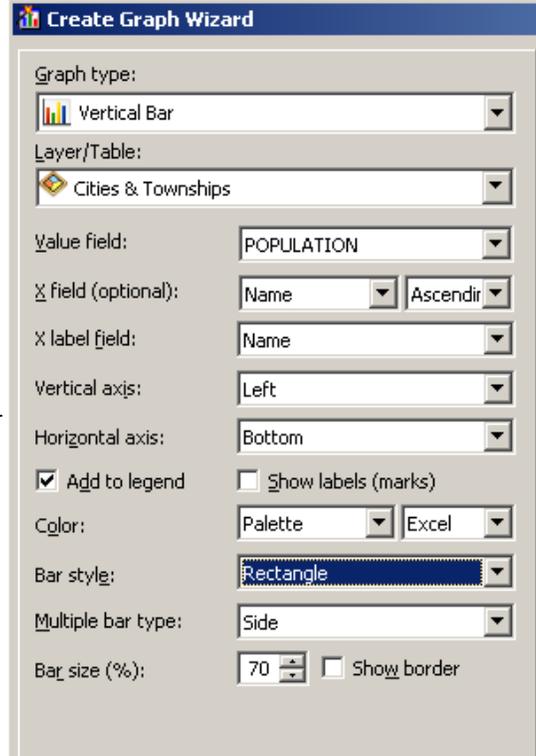
2. Use the Select Features tool  to select a small group of government units.

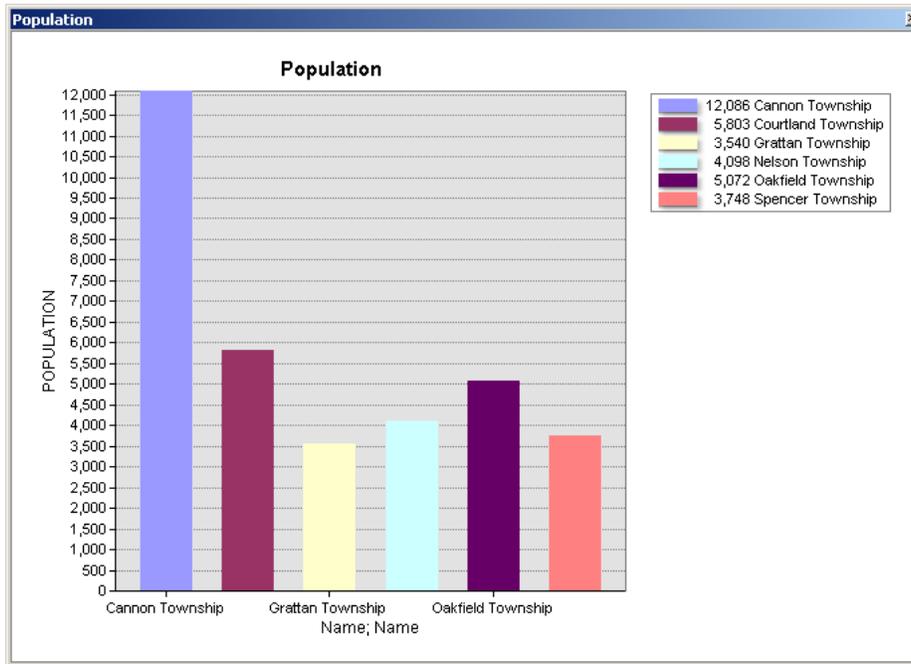


- Open the attribute table of the layer **Cities & Townships**. Select the **Table Options** button and click **Create Graph**.

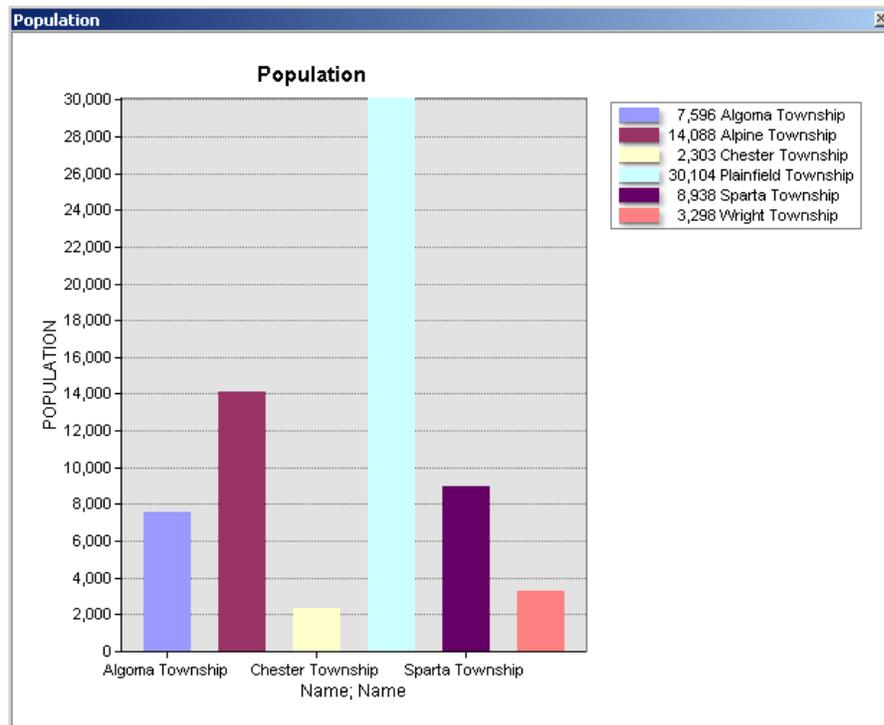


- The **Create Graph Wizard** appears. In order to create a population bar graph of the selected government units, complete the following steps.
  - Make sure the **Graph Type** is set to **Vertical Bar** and the **Layer/Table** drop-down box is set to **Government Units**.
  - Select **CensusData.Population** as the **Value** field.
  - In the **X field** drop-down box, select **Name** and choose **Ascending**.
  - In the **X label field** drop-down box, select **Name**.
  - In the **Color** drop-down box, select **Palette** and choose a color scheme in the adjacent box.
  - Press **Next** to go to the second setup screen.
  - Select the option named **Show only selected features/records on the graph**.
  - In the **General graph properties** box, change the **Title** value to something more appropriate like Population.
  - Move down to the **Axis Properties** tabs and change the **Left** axis title to just **Population**. Switch to the **Bottom** tab and uncheck the **Visible** checkbox.
  - Press **Finish** and the graph is displayed in its own window.

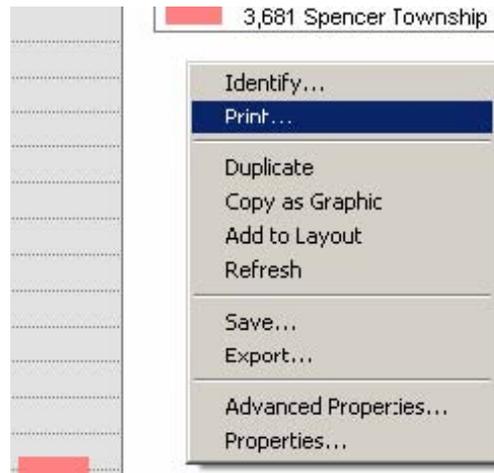




- The graph is not static. It is a live-link with the selected features in the map. Leaving the graph window open, return to the map and select a different set of government units. The graph will automatically update showing the populations of the new units selected.



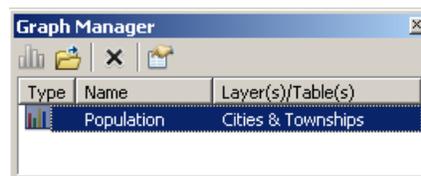
6. *Right-click* anywhere in the graph window to display more options, including the ability to **Print** to the graph.



7. Close the graph using the x icon in the upper-right corner of the window. To return to the graph, go back to the **View** menu, choose **Graphs** and select **Manage** options.



8. The Graph Manager window opens displaying a list of graphs created in the ArcMap project. *Double left-click* on a graph to re-open it or use the **Delete** button  to remove it.



## Additional Information

See the **Looking at data with graphs** section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [+]  Adding graphics and text to maps
  - [+]  Symbolizing data
  - [+]  Animation
  - [+]  Using cartographic representations
  - [+]  Page layout and map composition
  - [-]  Working with graphs and reports
    - [-]  **Looking at data with graphs**
      -  About looking at data with graphs
      -  Types of graphs
      -  Sources of information to graph
      -  Using Series with graphs
      -  **2.1** Creating a graph
      -  Setting the colors of a graph
      -  **2.1** Displaying a graph
      -  Graph options
      -  **2.1** Modifying a graph
      -  **2.1** Adding a function
      -  **2.1** Managing graphs
      -  **2.1** Saving and loading a graph
      -  **2.1** Exporting a graph
      -  **2.1** Interactive querying of graphs
      -  **2.1** Working with graphs in Layout
      -  **2.1** Using graph templates
      -  Further information about graph types
      -  **2.1** Using the Advanced properties
      -  **2.1** Creating pre-ArcGIS 9.2 style graphs

*End of Exercise 9.6*

## Exercise 9.7 – Creating Reports

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In this exercise, you will learn how to:

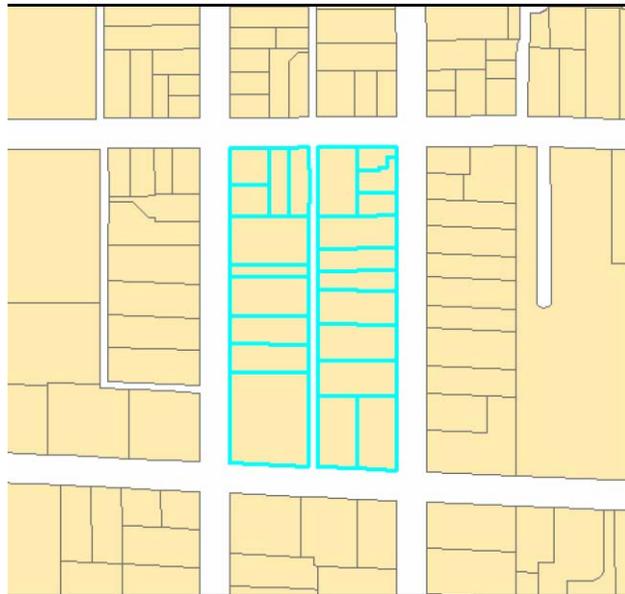
- ◆ Create a report for a group of selected parcels

### Setup

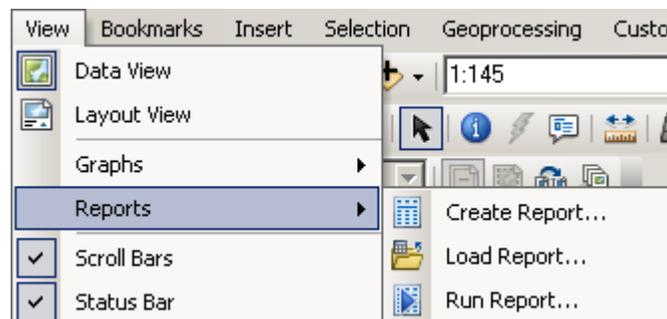
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the **Parcels with Name and Address** layer into the data frame.

### Creating Reports Tutorial

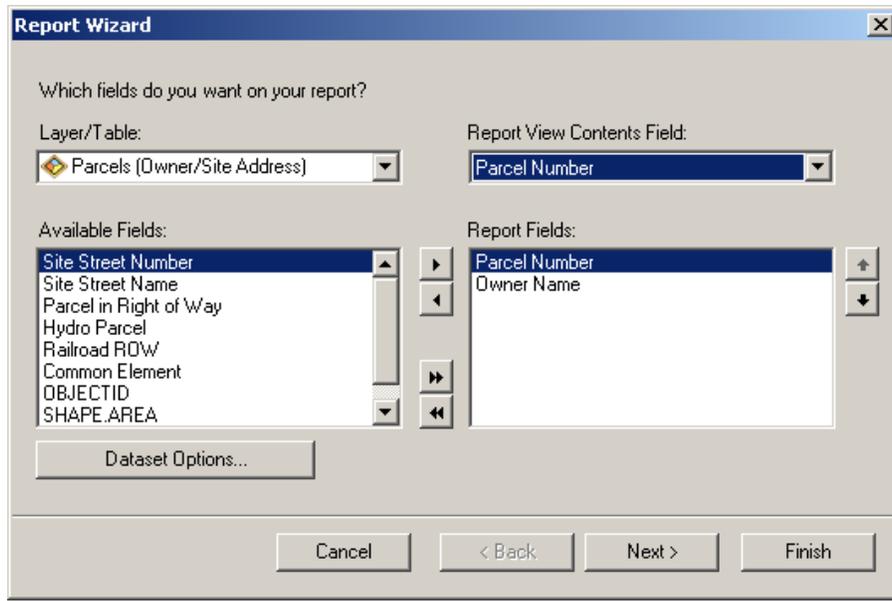
1. Use the **Select Features** tool  to select a small group of parcels.



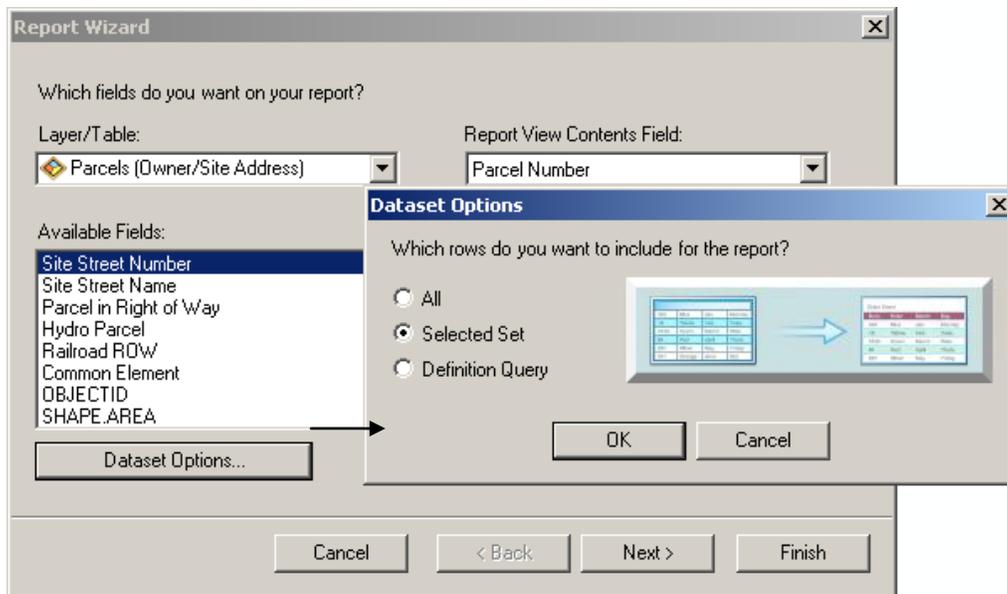
2. Go to the **View** menu, select **Reports** and select **Create Report**.



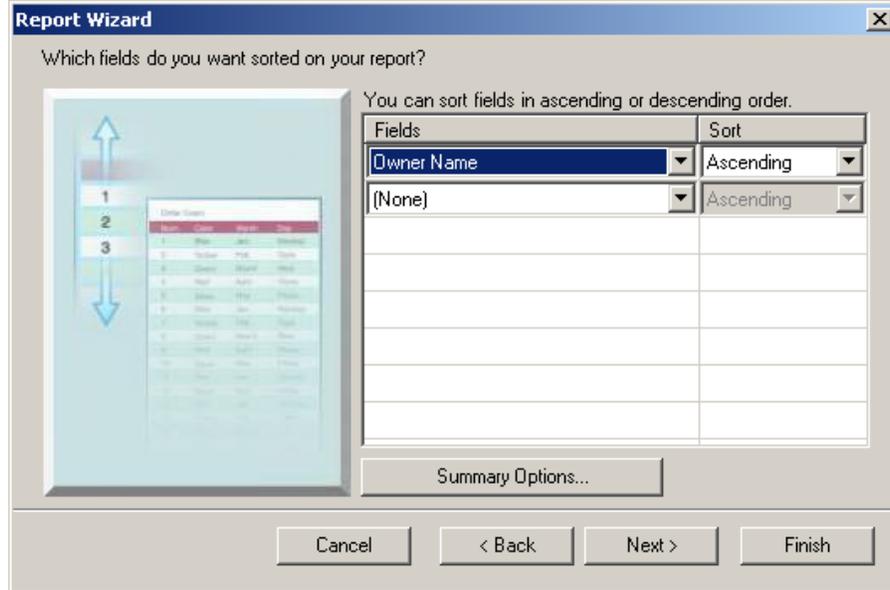
3. The Report Properties window appears with the **Fields** tab selected. In the **Available Fields** box, use the right arrow  to move the **Parcel Number** and **Owner Name** fields into the **Report Fields** list box.



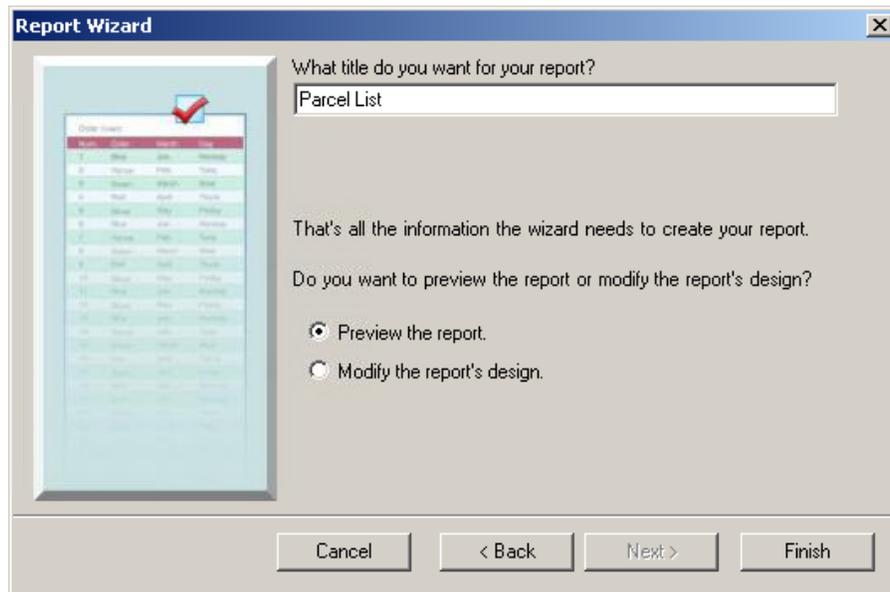
4. Left click Dataset Options and click the radio button next to Selected Set.



5. Left click Next twice and set the OWNERNAME field to sort Ascending.



6. Left click Next three times and Type in a title for the report and click Finish.

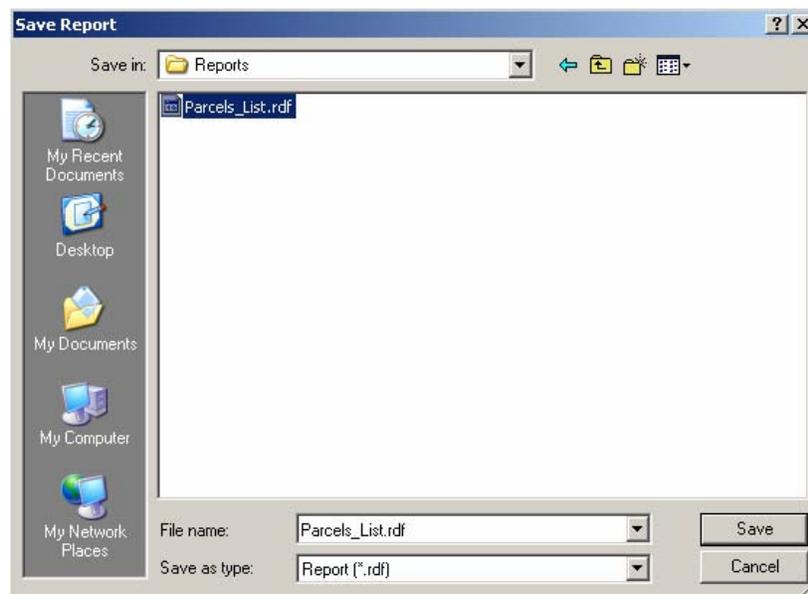


- Press the **Generate Report** button at the bottom of the window. The finished report will be displayed in a new window.

The screenshot shows a window titled "Report Viewer" with a menu bar (Print, Export, Add, Copy) and a search bar containing "1000". The main content is a table titled "Parcel List" with two columns: "Parcel Number" and "Owner Name".

Parcel Number	Owner Name
411430180008	BORDEAUX TE UR.SULA
411430180013	CANNON ENTERPRISES LLC
411430180009	HARRIS SCOTT A
411430179001	HERITAGE MANAGEMENT LLC
411430179010	HERITAGE MANAGEMENT LLC
411430179007	HONEYCUTT TE JAMES R
411430180006	JAHN PAUL
411430179011	KERKSTRA PAUL M
411430180005	KNAUF ANDREW T
411430180004	LAGRAND DAVID M
411430180011	LE THACH TRUNG & VUONG TRANG T
411430179012	LEIBER DENNIS B
411430179008	MAGLEY CHRIS
411430179002	MEIER JOAN ANN TRUST
411430180001	OUR HOPE ASSOC
411430180012	POT BELLY LLC
411430180003	ROGALEWSKI DENNIS R
411430180010	SCHULTZE JR. WALTER C
411430180007	SHELTER HILL LLC
411430179009	STRICKLAND DOUGLAS K
411430179006	WIERENGA KENNETH J
411430179005	WIERENGA KENNETH J TRUST

- Press the **Print** button at the top of the window to print the report.
- Press the **Export** button to save the report to a PDF.
- Close the report to return to the Report Properties window. Press the **Save** button and a **Save Report** window opens. The report can be saved to a file and loaded into another ArcMap project. Unlike a graph, a report is static and the saved report contains all the records involved. So it can be loaded into another ArcMap project that does not contain the Parcels with Names and Addresses layer.



- ArcMap's reporting capabilities are somewhat limited and can be frustrating to a new user. An alternative approach is to export the attribute table of a layer to a dBASE (DBF) file, open it and create your own report layout and formatting in Excel. See exercise 9.2 for instructions on how to export an attribute table.

## Additional Information

See the [Creating Reports](#) section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [+]  Adding graphics and text to maps
  - [+]  Symbolizing data
  - [+]  Animation
  - [+]  Using cartographic representations
  - [+]  Page layout and map composition
- [-]  Working with graphs and reports
  - [+]  Looking at data with graphs
  - [+]  [Pre-ArcGIS 9.2] Looking at data with graphs
  - [-]  **Creating reports**
    -  About reports
    -  <sup>1.2.1</sup> Creating a simple report
    -  <sup>1.2.2</sup> Setting the report type and size
    -  <sup>1.2.3</sup> Working with fields in reports
    -  <sup>1.2.4</sup> Organizing report data
    -  <sup>1.2.5</sup> Adding report elements
    -  <sup>1.2.6</sup> Controlling the presentation of a report
    -  <sup>1.2.7</sup> Saving and loading a report
    -  <sup>1.2.8</sup> Using Crystal Reports

*End of Exercise 9.7*

## Exercise 10.1 – Introduction to Layer Symbology

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In this exercise, you will learn how to:

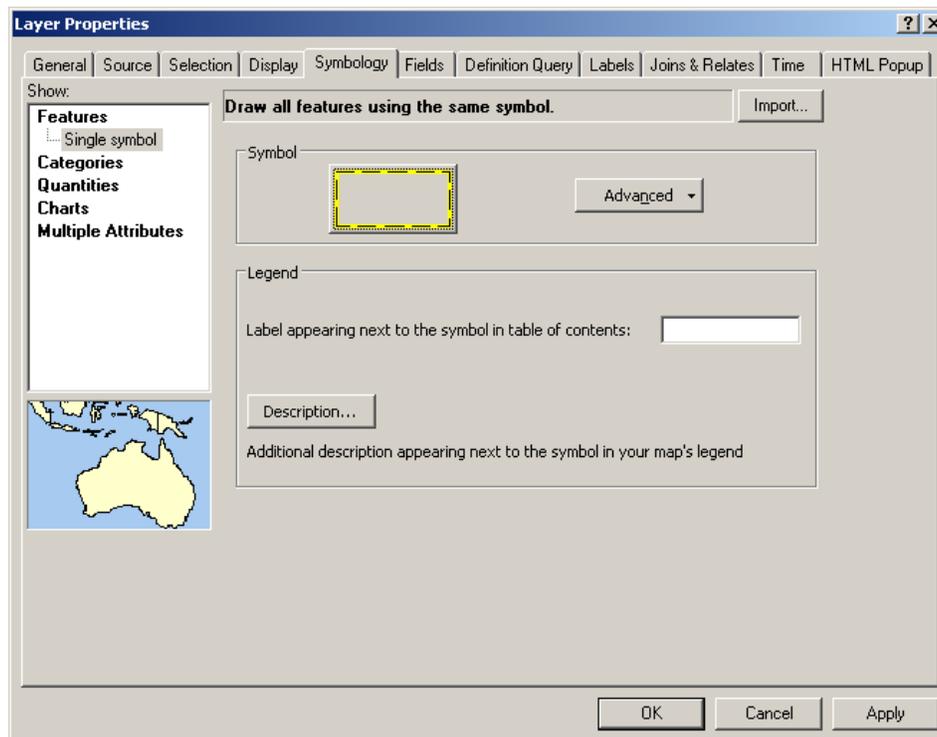
- ◆ Change a layer's symbology and transparency

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

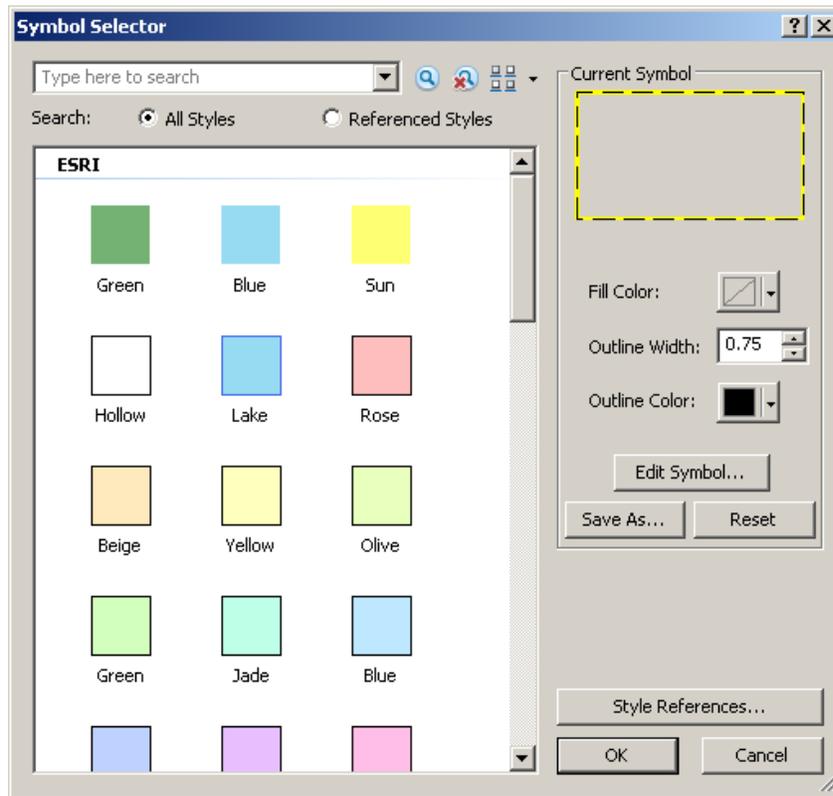
### Introduction to Layer Symbology Tutorial

1. *Right-click* on the **Cities & Townships** layer name in the Table of Contents and select **Properties**. Switch to the **Symbology** tab.

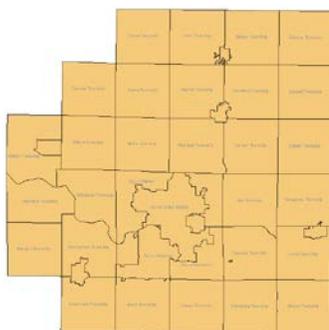
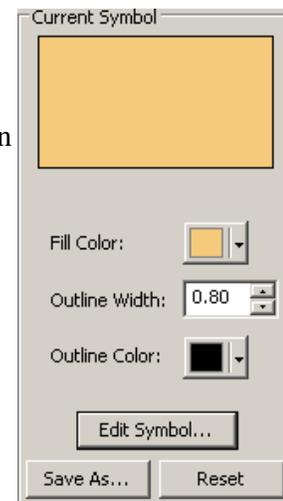


2. The layer is setup with the simplest form of symbology where every government unit has the same symbol. Notice that in the **Show** box this is referred to as **Single Symbol**.

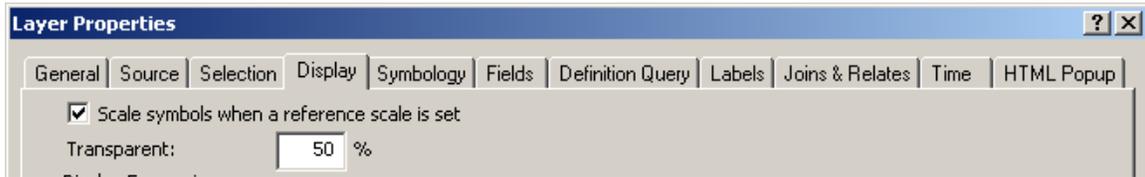
3. *Left-click* inside the symbol graphic in the main area to open the **Symbol Selector** window.



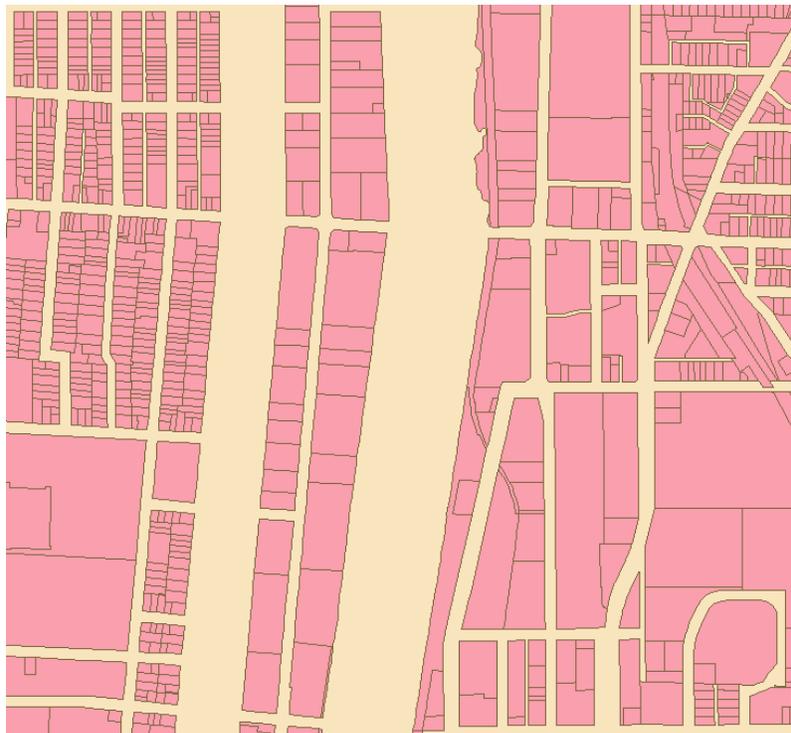
4. ArcMap comes with hundreds of predefined symbols to choose from. Select the symbol named **Medium Sand**.
5. You can also customize the symbol by using the **Options** box on the right side of the window. The fill color, outline, and width can be changed.
6. Press **OK** twice to return to the map with a new symbology for the Government Units.



7. In the Table of Contents, *left-clicking* in the symbol image provides a shortcut directly to the Symbol Selector window.
8. Return to the **Layer Properties** of the Government Units layer and select the **Display** tab. There is a **Transparent** text box that is initially set to 0%. Change the number to 50% and press **OK**.



9. With the Government Units now semi-transparent, it allows other layers underneath it to show through.



## Additional Information

See the [Drawing all features with a single symbol](#) and [Drawing a layer transparently](#) section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
- [-]  Adding graphics and text to maps
  - [+]  Working with graphics
  - [+]  Working with text
- [-]  Symbolizing data
  - [-]  Applying symbology
    -  [Drawing all features with a single symbol](#)
    -  Drawing features to show categories
    -  Ways to map quantitative data
    -  Setting a classification
    -  Standard classification schemes
    -  About symbolizing data to represent quantity
    -  Drawing features to show quantities
    -  Drawing features to show multiple attributes
    -  Importing the symbology of another layer
    -  Drawing TINs as surfaces
    -  [Drawing a layer transparently](#)
    -  Working with symbol levels
    -  Working with variable-depth masking
    -  Rotating point feature symbology

*End of Exercise 10.1*

## Exercise 10.2 – Advanced Layer Symbology

In this exercise, you will learn how to:

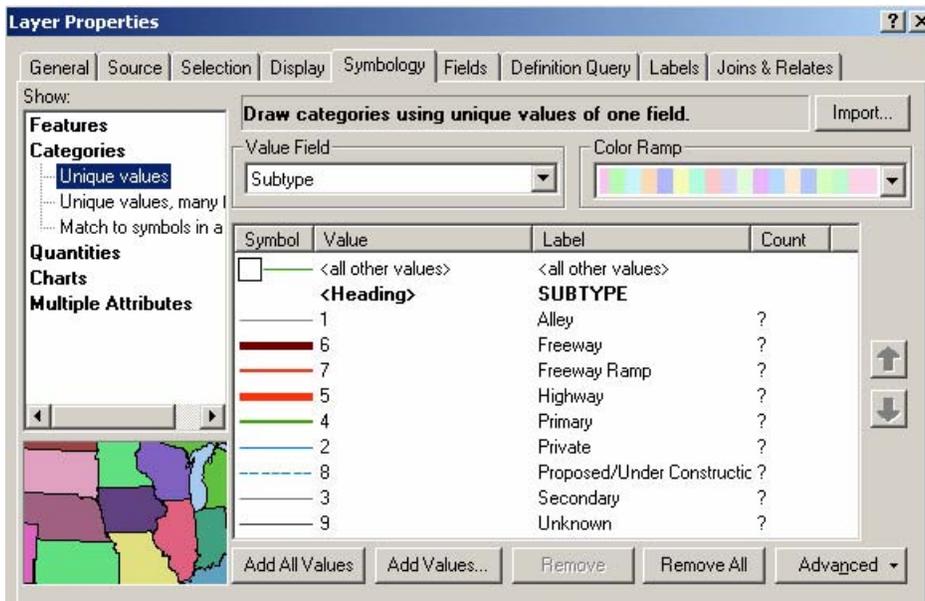
- ◆ Setup layer symbology based on unique attribute values or groups of values
- ◆ Setup layer symbology to display pie charts

### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Introduction to Layer Symbology Tutorial

1. Open the **Layer Properties** of the **Freeway/Highway** layer and switch to the **Symbology** tab. Instead of using the Single Symbol classification, notice that the **Show** box is set to **Unique values**.

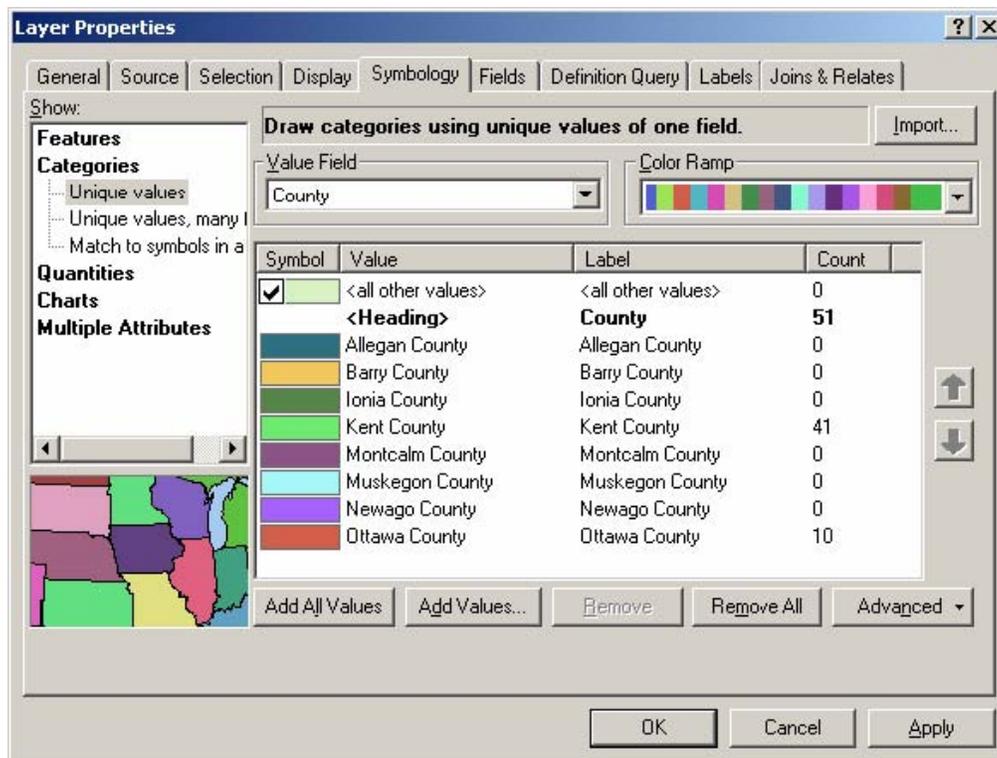


2. The streets are color-coded using the **Subtype** field (see the **Value Field** drop-down box). Each value has a separate symbol that can be changed individually by *left-clicking* on the symbol.

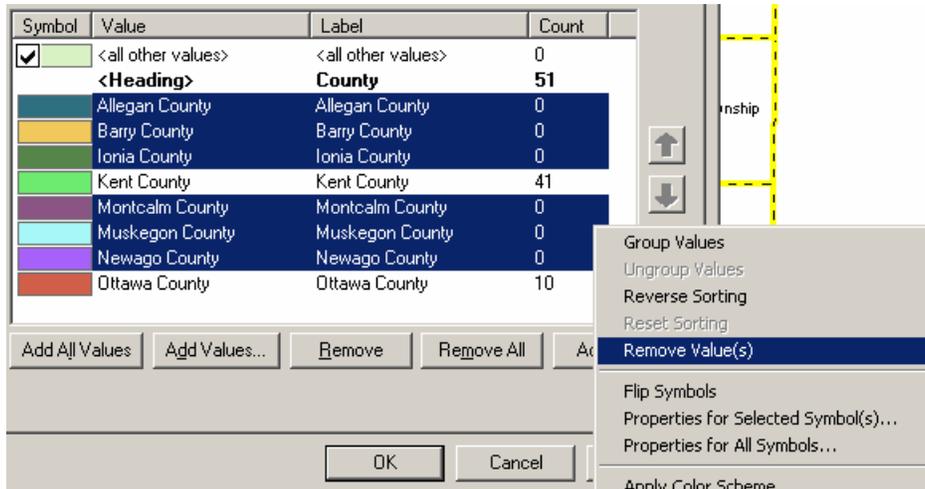
3. *Left-click* the **Count** column heading. The question marks will be replaced with the actual number of street centerline segments in each category.

Symbol	Value	Label	Count
	<all other values>	<all other values>	0
<b>&lt;Heading&gt; SUBTYPE</b>			
	1	Alley	68
	6	Freeway	33
	7	Freeway Ramp	38
	5	Highway	39
	4	Primary	401
	2	Private	19
	8	Proposed/Under Constructic	0
	3	Secondary	295
	9	Unknown	0

4. Close the Layer Properties window and return to the map. To create your own unique values symbology, open the **Layer Properties** for the **Government Units** layer.
5. In the **Symbology** tab, complete the following steps:
  - a. In the **Show** box, select the **Unique values** option under the Categories heading.
  - b. In the **Value Field** drop-down box, select **County**.
  - c. Press the **Add All Values** button at the bottom of the window. All of the possible counties in and around the REGIS area will be added as separate categories.
  - d. *Left-click* the **Count** column heading to see which categories actually have government units in the GIS data. Only Kent County and Ottawa County should have counts above 0.



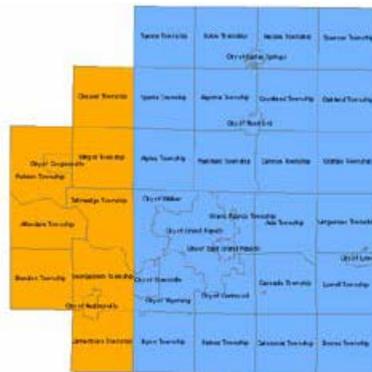
- Since most of the County categories are empty, they should be removed. Hold down the **CTRL** key and *left-click* on each row with a count of 0. Once they are all highlighted, *right-click* on the highlighted rows and choose **Remove Value(s)**.



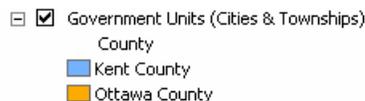
- The first row in the symbol list is always **<all other values>**. Since this count is also 0, go ahead and remove the checkmark next to the symbol.



- Change the symbol color of the remaining two categories and then press **OK**. The map will refresh with the government units now color-coded by county.

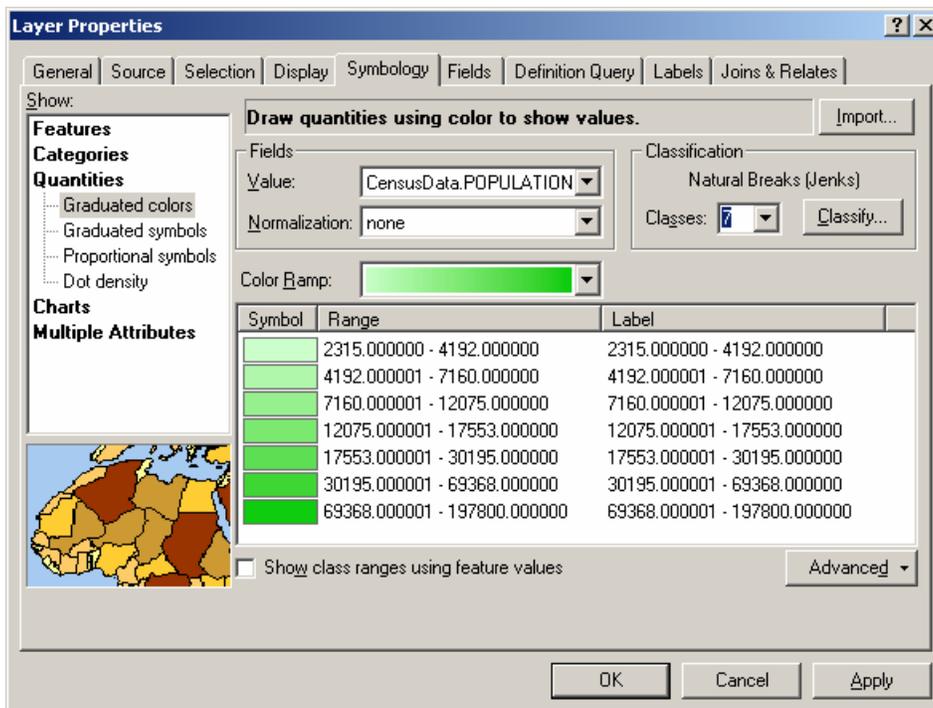


- The Table of Contents will also update with the new symbology.

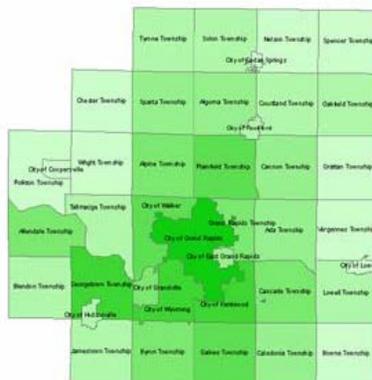


The rest of the exercise relies on a join that was setup in exercise 9.5. If the CensusData join is not present in the Government Units layer, return to exercise 9.5 to create the join.

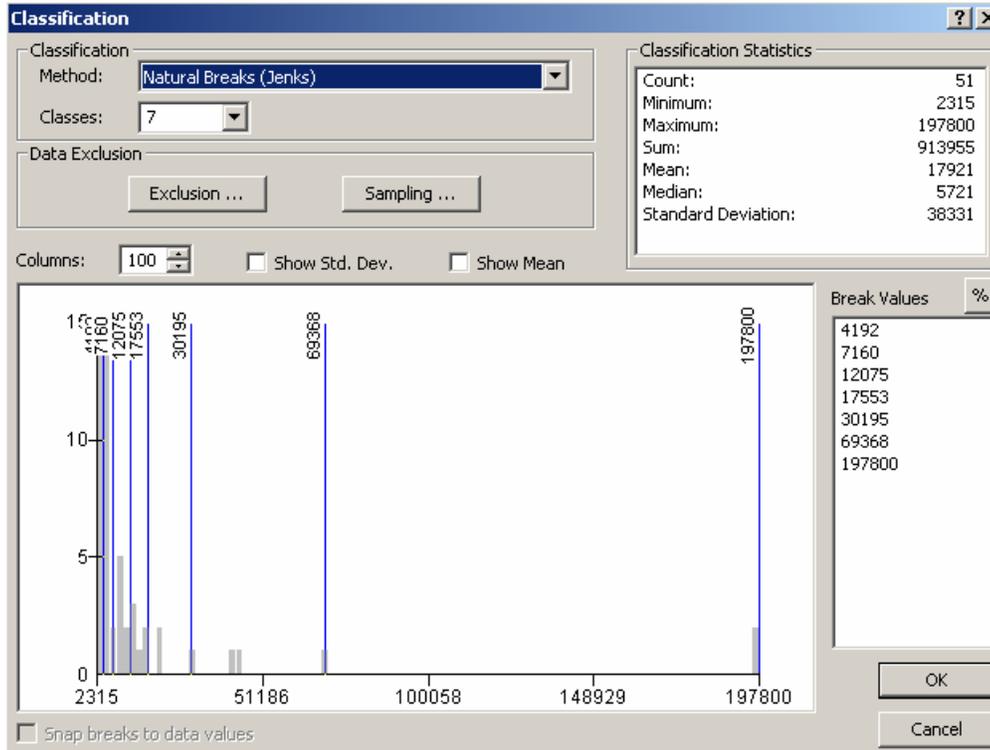
10. Return to the **Symbology** tab of the **Government Units** layer. You will now setup a graduated color symbology by completing the following steps:
  - a. In the **Show** box, select **Graduated colors** under the Quantities heading.
  - b. In the **Fields** box, set the **Value** to **CensusData.POPULATION**.
  - c. In the **Classification** box, note that classification type is **Natural Breaks**. Change the **Classes** drop-down box from 5 to **7**.
  - d. In the **Color Ramp** drop-down box, choose a color scheme that will display the population groups appropriately.



- e. Press **OK** to return to the map with the Government Units now color-coded by population.



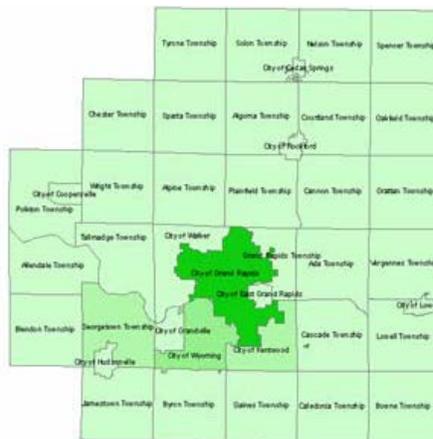
11. Return to the **Symbology** tab and select the **Classify** button.



12. Change the Classification Method to **Equal Interval**.

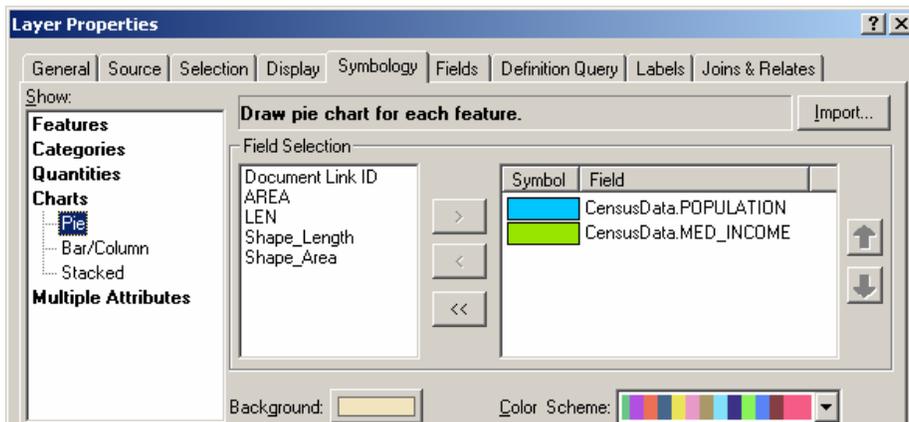


13. Press **OK** twice and notice how changing the classification method greatly affects how the population is represented on the map.

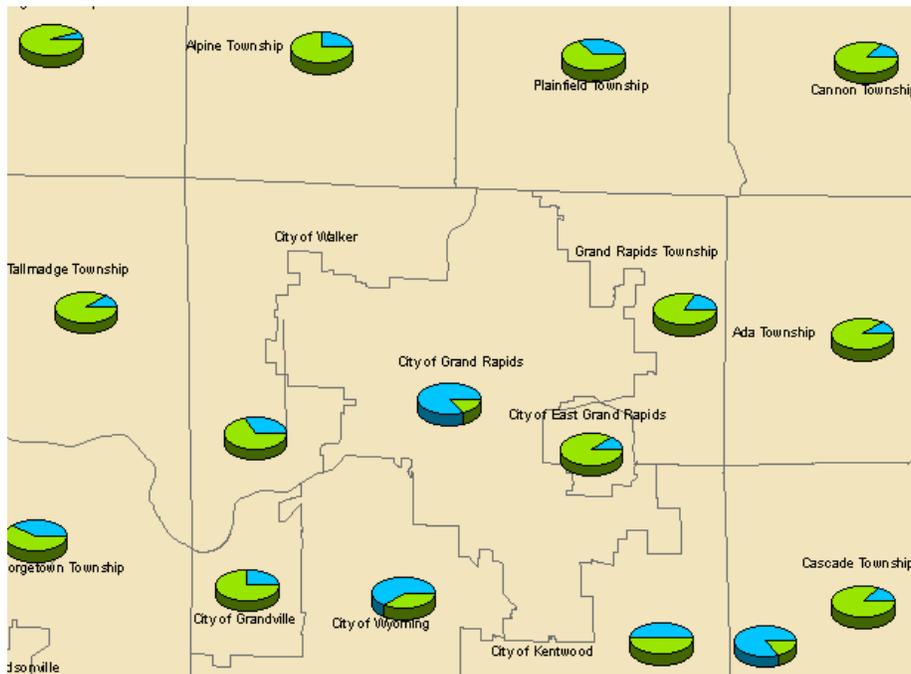


14. Return to the **Symbology** tab for the Government Units layer. You will now setup a pie chart symbology displaying both population and median income using the following steps:

- a. In the **Show** box, select the **Pie** option under the Charts heading.
- b. In the **Field Selection** box, move both the **POPULATION** and **MED INCOME** fields over into the symbol area.
- c. *Left-click* on the symbols to set appropriate colors.



- d. Press **OK** and each government unit is drawn on the map with a pie chart inside of it. Zoom in to eliminate the clutter and get a better view of the pie charts.\*



*\*This is just a demonstration on using pie charts. Population and median income don't have comparable values unless some form of standardization is performed first.*

## Additional Information

See the [Applying symbology](#) section of the ArcGIS Desktop Help manual.

- [-] Mapping and visualization
  - [+] An overview of mapping and visualization
  - [+] Using ArcMap
  - [+] Working with layers
  - [+] Navigating and interacting with maps
  - [+] Adding graphics and text to maps
  - [-] Symbolizing data
    - [-] **Applying symbology**
      - [+] Drawing all features with a single symbol
      - [+] Drawing features to show categories
      - [+] Ways to map quantitative data
      - [+] Setting a classification
      - [+] Standard classification schemes
      - [+] About symbolizing data to represent quantity
      - [+] Drawing features to show quantities
      - [+] Drawing features to show multiple attributes
      - [+] Importing the symbology of another layer
      - [+] Drawing TINs as surfaces
      - [+] Drawing a layer transparently
      - [+] Working with symbol levels
      - [+] Working with variable-depth masking
      - [+] Rotating point feature symbology

*End of Exercise 10.2*

## Exercise 10.3 – Labeling Features

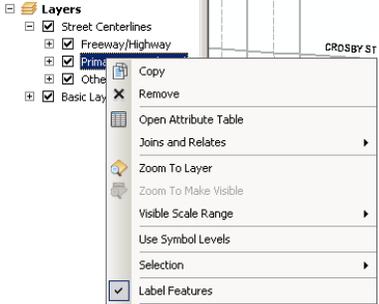
In this exercise, you will learn how to:

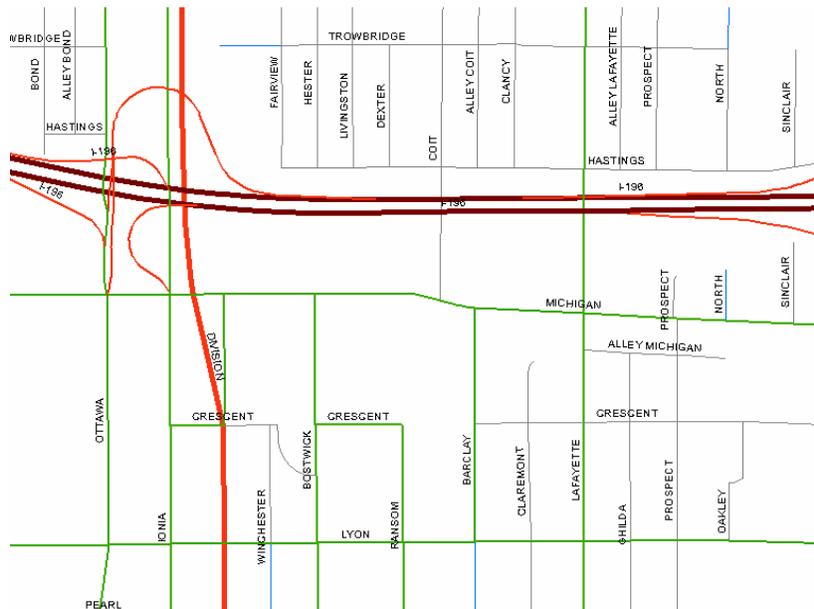
- ◆ Turn labels on or off
- ◆ Set which attributes are used for labeling
- ◆ Customize the label placement settings

### Setup

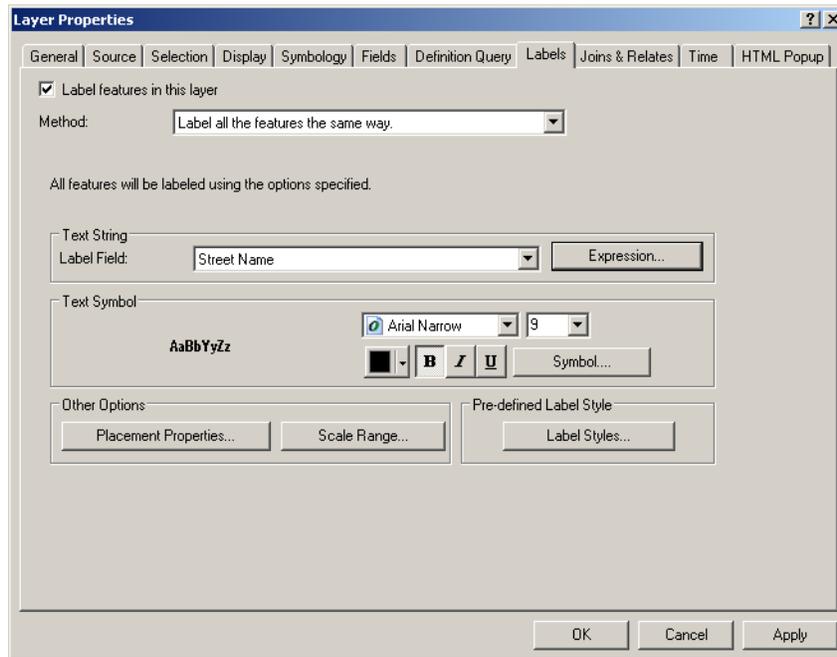
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Introduction to Layer Symbology Tutorial

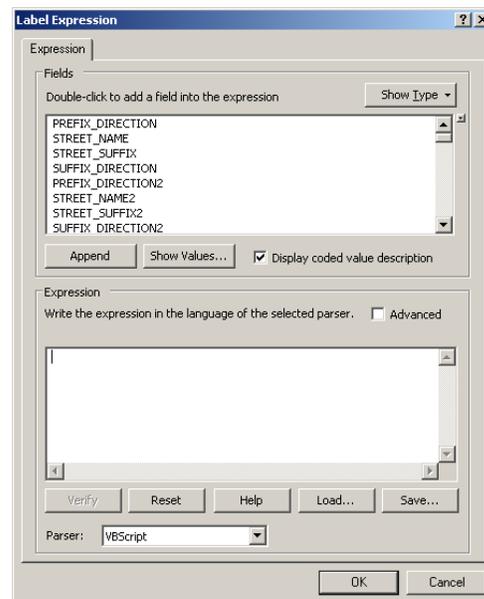
1. Labeling for any layer is easily controlled by *right-clicking* on a layer name in the Table of Contents. There is a **Label Features** that displays a checkbox when labeling is turned on. If it is missing, *left-click* on the Label Features text and the checkbox will be added and the map will redraw with labels.
2. Turn off all layers except for the street centerlines. Zoom in on the map to an area where a small portion of the street centerlines are visible. Make sure labeling is turned on for the street centerlines.



- Open the **Layer Properties** for the **Street Centerlines** and switch to the **Labels** tab.



- In the **Text Symbol** box, the font type, size, and color can be changed. Set the font size to **14**.
- In the **Text String** box, note that the **Street Name** field is used to display the labels on the map.
- The Street Name attribute does not contain the prefix (e.g. N, S, E, W) or the street type (e.g. RD, DR, PKWY, etc) but it may be useful to display these as well on the map. ArcMap allows for multi-field labels through the use of an expression. Select the **Expression** button in the Text String box.
- The **Label Expression** window appears. Put your mouse cursor in the Expression text box and manually delete the **[STREET\_NAME]** text so the entire box is blank.

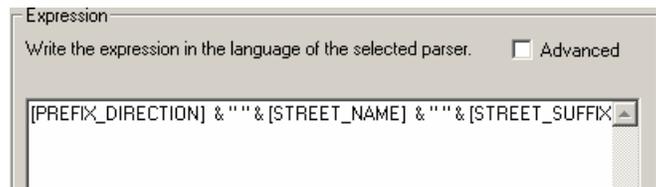


- In the top box that lists all the fields in the Street Centerlines layer, *double left-click* on the **Prefix Direction** field to add it to the expression. Then *single left-click* on the **Street Name** field to highlight it in the top box. Press the **Append** button. The expression should now look like this:

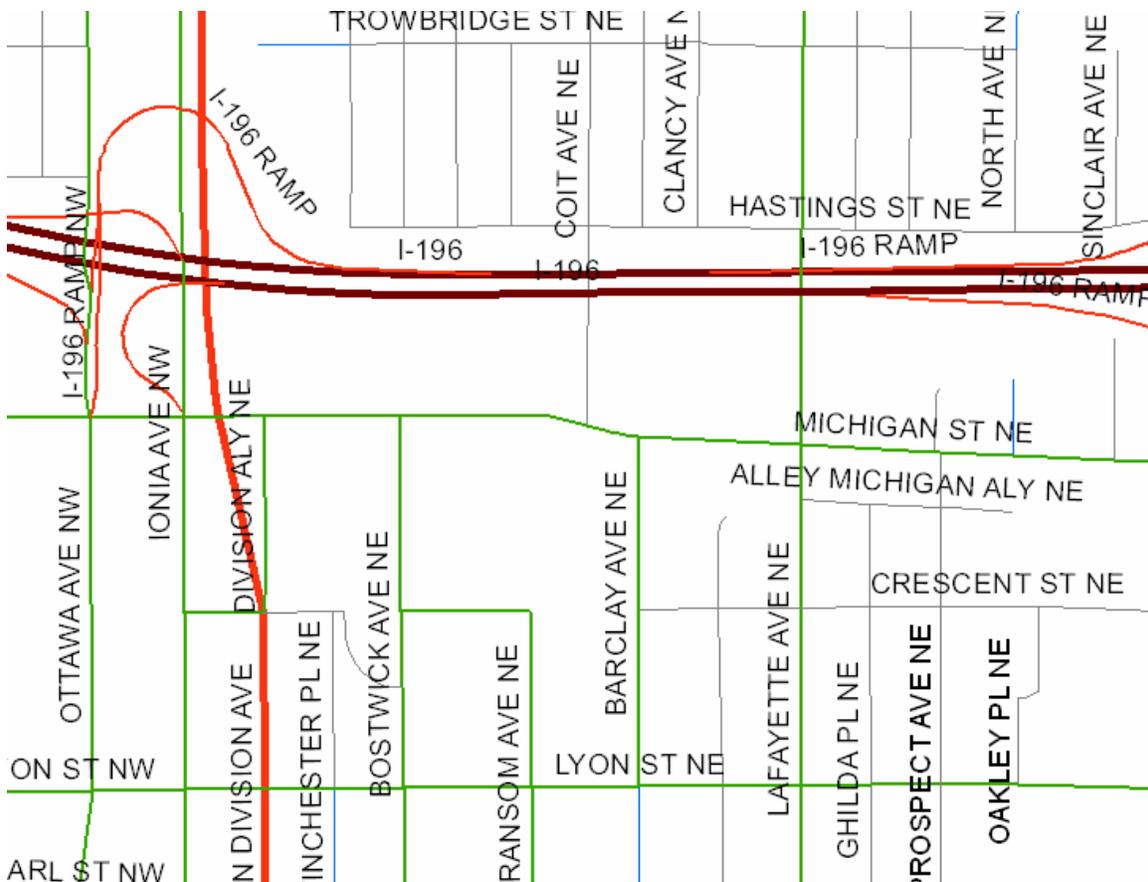
```
[PREFIX_DIRECTION] & " " & [STREET_NAME]
```

- Repeat the append process to add the **STREET SUFFIX** and **SUFFIX DIRECTION** fields to the expression so the final expression reads:

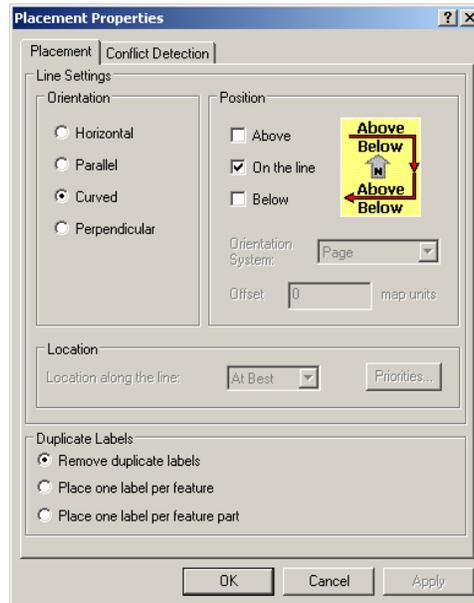
```
[PREFIX_DIRECTION] & " " & [STREET_NAME] & " " & [STREET_SUFFIX] & " " & [SUFFIX_DIRECTION]
```



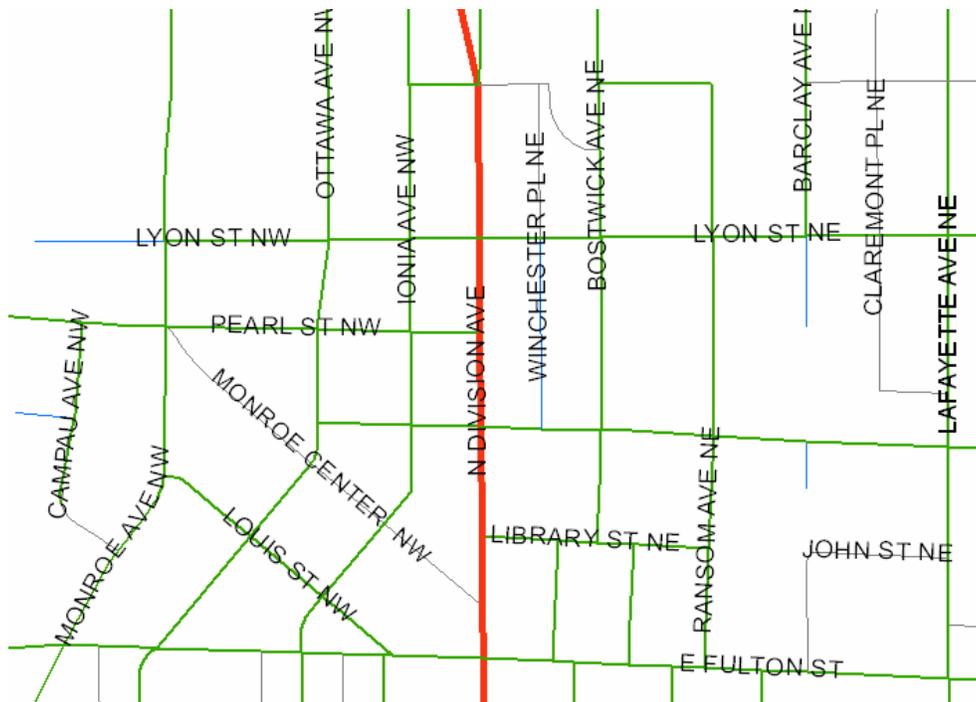
- Press **OK** twice and the labels on the map will change to include the full street name.



11. Return to the **Labels** tab for the Street Centerlines layer. Select the **Placement Properties** button inside the Other Options box. The placement Properties window appears with two tabs. Make sure the **Placement** tab is selected.
12. In the **Orientation** box, switch from Parallel to **Curved**. In the **Position** box, uncheck the **Above** option and place a checkmark in the **On the line** option.



13. Press **OK** twice and note how the labels have changed in the map. They should appear directly on top of the line and curved where needed.



### Additional Information

See the **Working with text** section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [-]  Adding graphics and text to maps
    - [+]  Working with graphics
    - [-]  **Working with text**
      -  An overview of working with text
      -  Common text related tasks
      -  Adding new text to a map
      -  Organizing annotation into groups
      -  About labeling
      -  Displaying labels
      -  General label settings
      -  Prioritizing and positioning labels
      -  Specifying the text of labels
      -  Setting scale ranges for label classes
      -  About building label expressions
      -  Using text formatting tags

*End of Exercise 10.3*

## Exercise 10.4 – Creating a Definition Query

---

In this exercise, you will learn how to:

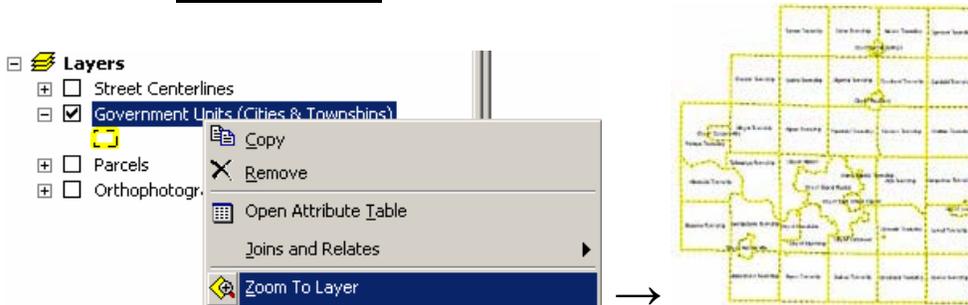
- ◆ Create a definition query to only display certain features in a layer

### Setup

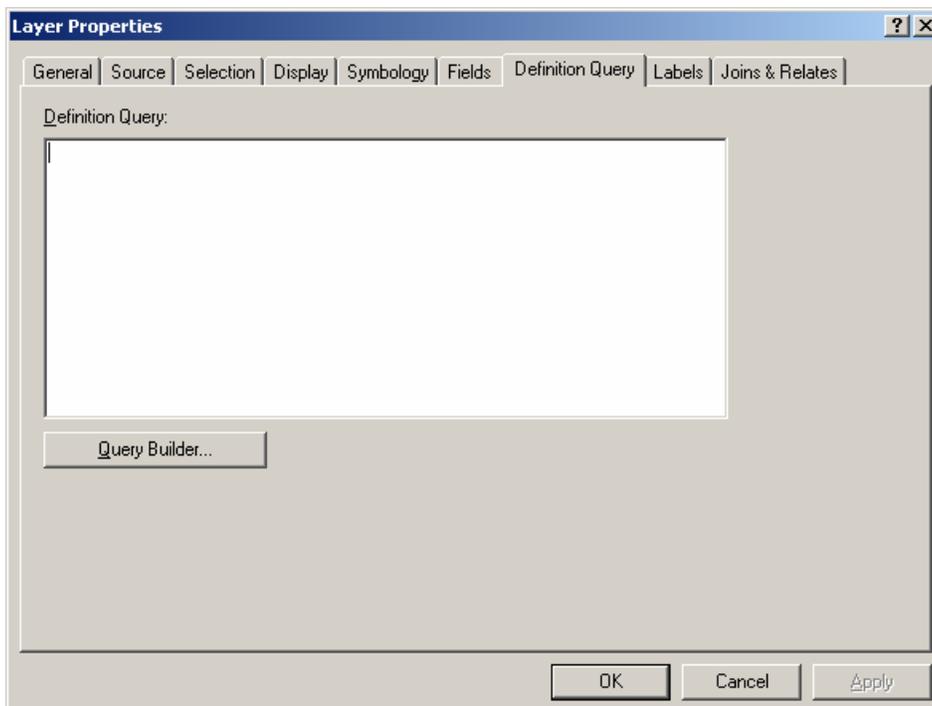
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

### Creating a Definition Query Tutorial

1. *Right-click* on the **Cities & Townships** layer name in the Table of Contents and select **Zoom To Layer**.



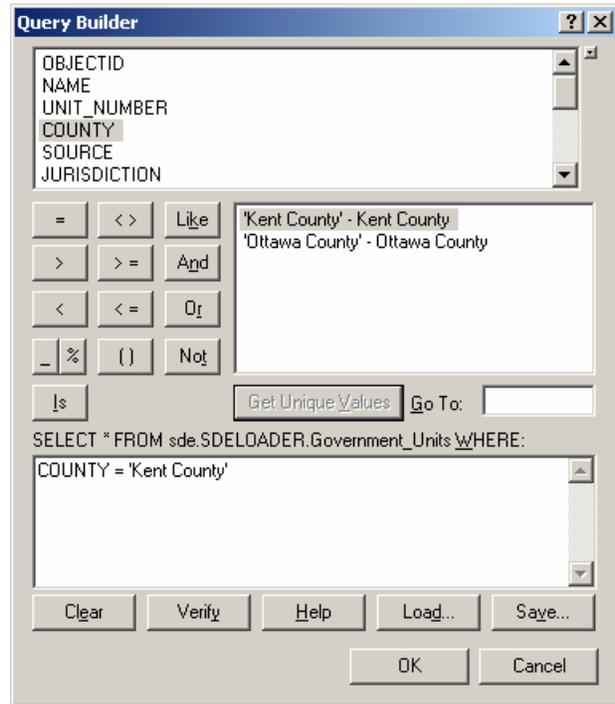
2. *Right-click* on the **Cities & Townships** layer again and select **Properties**. Switch to the **Definition Query** tab. The definition query box is empty indicating that the entire layer is being displayed.



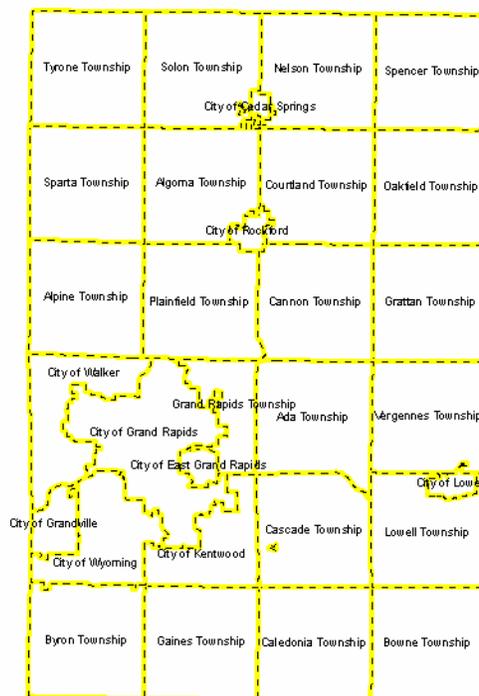
3. Select the **Query Builder** button to open it in a new window. In this exercise, you will create a definition query to show only those government units that appear in Kent County.

- a. *Double left-click* on the **County** field to add it to the expression box at the bottom.
- b. *Left-click* on the equals sign button.
- c. *Left-click* on **Get Unique Values**.
- d. *Double left-click* on **Kent County** to finish the expression:

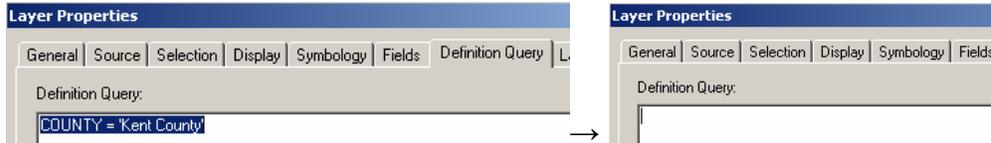
COUNTY = 'Kent County'



4. Press **OK** twice to return to the map. The map will refresh and only show government units in Kent County. Remember that a Definition Query does not alter the data in any way. ArcMap is simply using a filter to exclude Ottawa County government units in your project.



- To remove the definition query, return to the **Definition Query** tab. The query expression should automatically be highlighted. Press the **DELETE** key and the expression box is emptied. Press **OK** to return to the map and all the government units should now appear.



## Additional Information

See the [Displaying a subset of features in a layer](#) of the ArcGIS Desktop Help manual.

- Mapping and visualization
  - An overview of mapping and visualization
  - Using ArcMap
- Working with layers
  - Adding layers to a map
  - Adding x,y coordinate data as a layer
  - Changing a layer's drawing order
  - Changing a layer's text description
  - Setting layer properties
  - Managing group layers
  - Saving a layer to disk
  - Copying layers
  - Displaying layers at certain scales
  - Displaying a subset of features in a layer**
  - Repairing broken data links
  - Viewing a layer's metadata in ArcMap

*End of Exercise 10.4*

## Exercise 10.5 – Creating a Layer File

---

In this exercise, you will learn how to:

- ◆ Create a definition query to show only government units that are cities
- ◆ Save a layer file and add it back into an ArcMap project

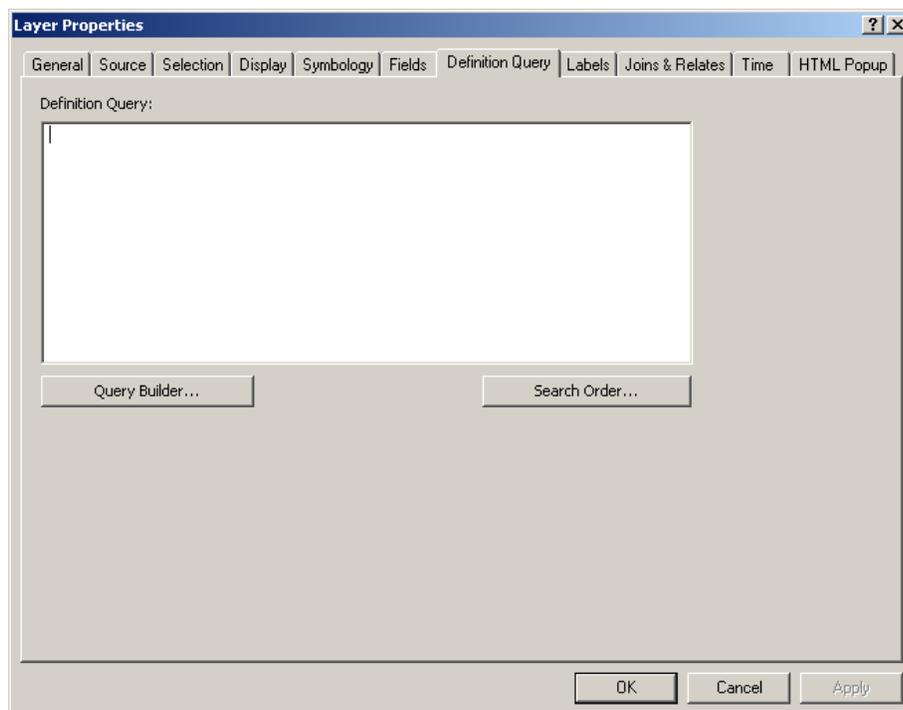
### Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

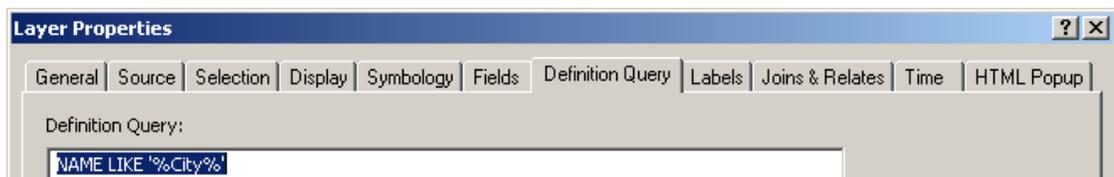
### Creating a Layer File Tutorial

*This exercise includes techniques from exercises 8.2 (Select By Attributes) and 10.4 (Creating a Definition Query). Please review those for more details.*

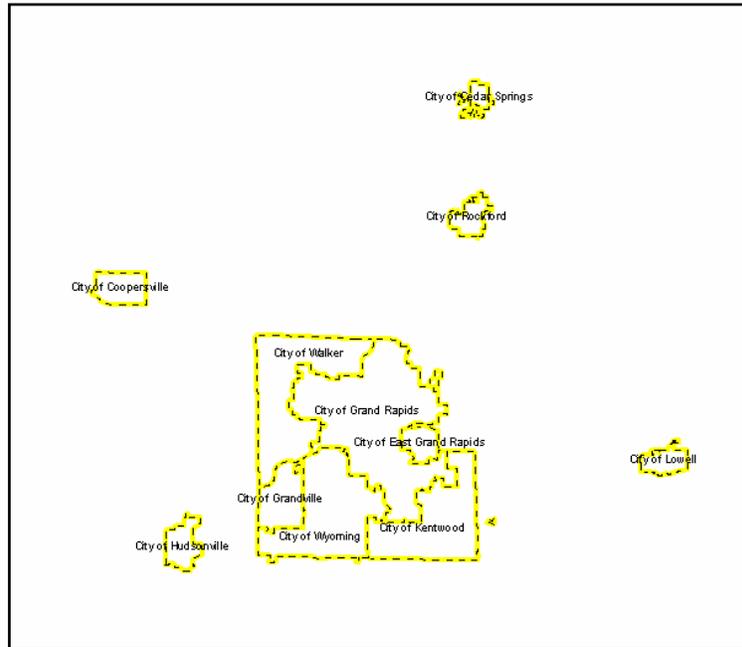
1. **Right-click** on the **Government Units** layer name in the Table of Contents, select **Properties** and switch to the **Definition Query** tab.



2. Select the **Query Builder** button and create the following query: **NAME LIKE '%City%'**.



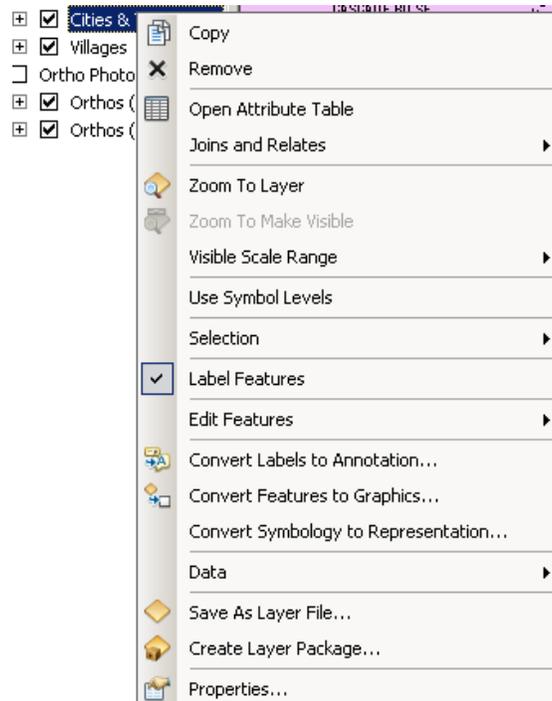
3. Press **OK** and the map will refresh showing only the government units that are cities.



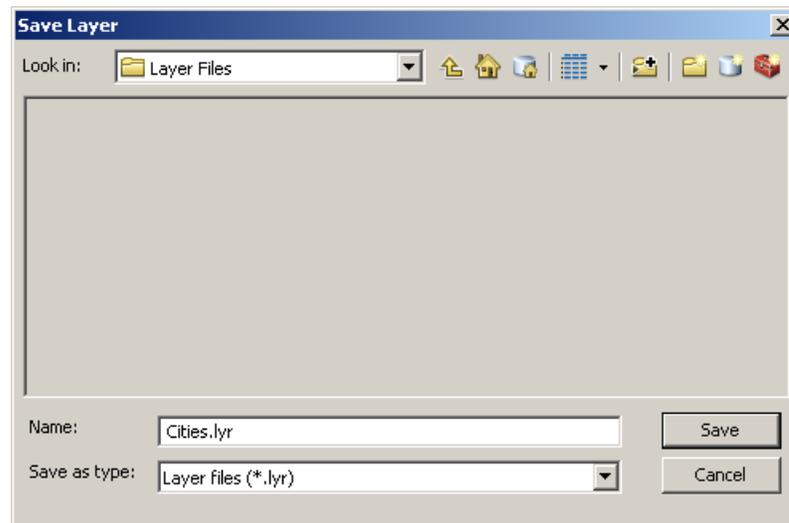
4. Rename the layer to Cities by highlighting it in the Table of Contents, pressing **F2** and entering a new name.



5. *Right-click* on the layer name and select **Save As Layer File**.



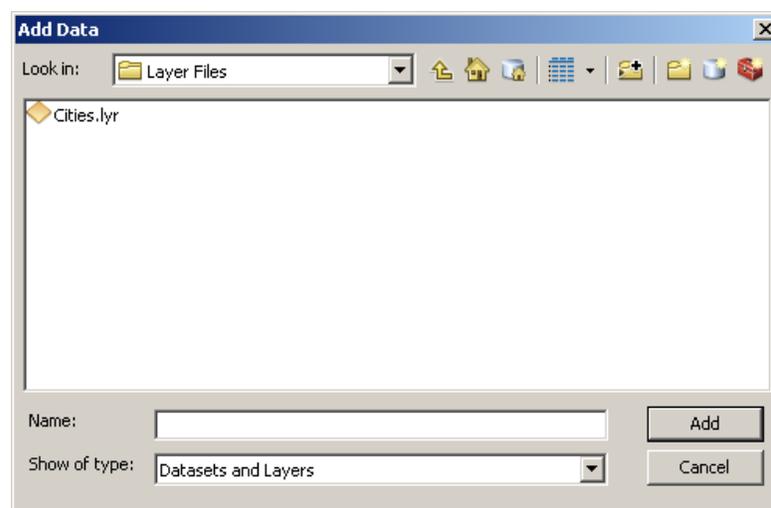
6. Navigate to your personal folder and save the file as Cities.lyr. Remember that a layer file does not contain any data. It only saves the layer properties (e.g. labeling, symbology, definition query, etc) of a dataset.



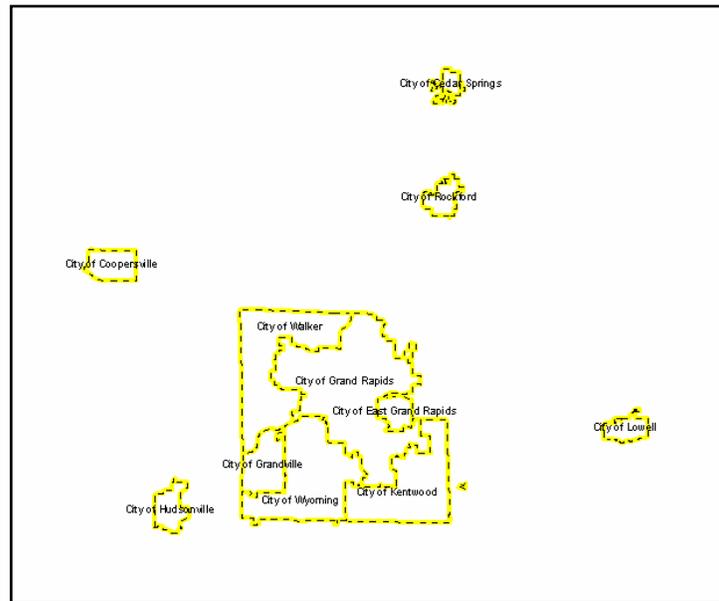
7. Press **Save** and a layer file is created that can be added to any ArcMap project.
8. To demonstrate adding a layer file, first remove the existing Cities layer. *Right-click* on the layer and select **Remove**.



9. Select the **Add Data** button  located on the Standard toolbar.
10. Navigate to the location of the layer you saved, highlight it and press **Add**.



11. The layer is added back into ArcMap with the definition query already setup to display only cities.



## Additional Information

See the [Saving a layer to disk](#) section of the ArcGIS Desktop Help manual.

- [-] Mapping and visualization
  - [+] An overview of mapping and visualization
  - [+] Using ArcMap
  - [-] Working with layers
    - [+] Adding layers to a map
    - [+] Adding x,y coordinate data as a layer
    - [+] Changing a layer's drawing order
    - [+] Changing a layer's text description
    - [+] Setting layer properties
    - [+] Managing group layers
    - [+] **Saving a layer to disk**
    - [+] Copying layers
    - [+] Displaying layers at certain scales
    - [+] Displaying a subset of features in a layer
    - [+] Repairing broken data links
    - [+] Viewing a layer's metadata in ArcMap

*End of Exercise 10.5*

# Exercise 11.1– Layout View Overview

---

In this exercise, you will review how to:

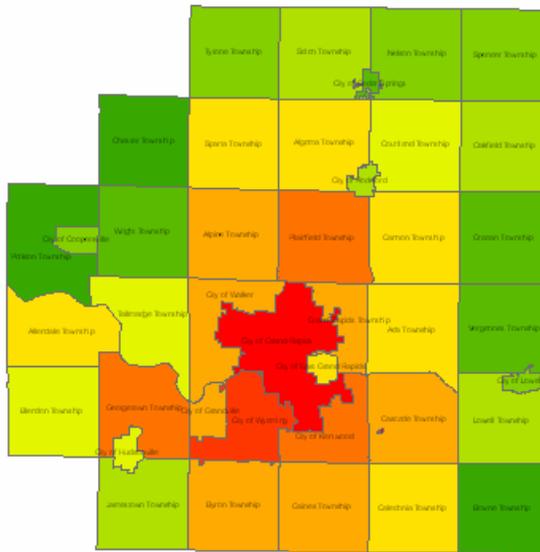
- ◆ Create a map in layout view
- ◆ Insert map elements including a title, text, north arrow, scale bar, and legend
- ◆ Print or export a map.

## Setup

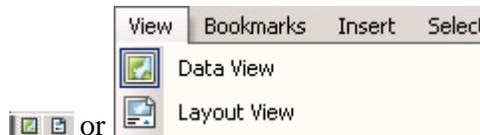
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame.

## Layout View Overview Tutorial

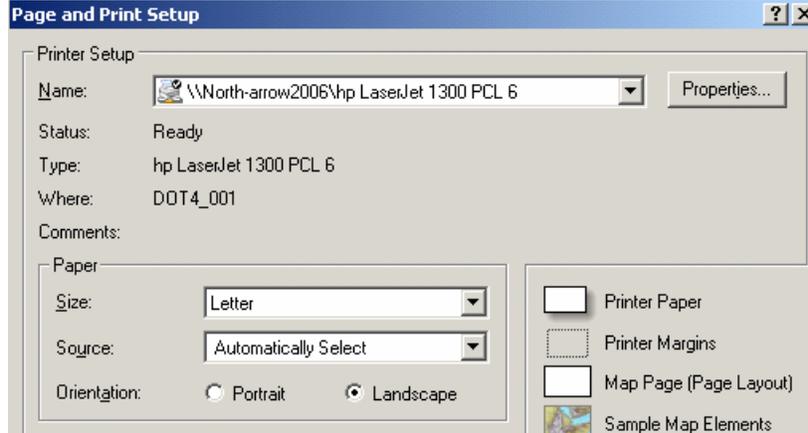
1. Determine the type of map you want to create and setup the appropriate symbology. Shown below are the REGIS Government Units color-coded by population.



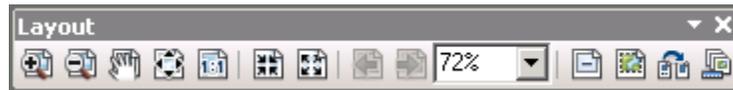
2. Remember that ArcMap has two views – **Data View** and **Layout View**. Use the icons in the lower-left corner of the map to switch between the views. Alternatively, go to the **View** menu and choose **Layout View**.



3. To change the page size or orientation, go to the **File** menu and choose **Page and Print Setup**.



4. Use the **Layout Toolbar** to navigate around the page.



5. Go to the **Insert** menu and select **Title** and type a title for the map.



6. Go to the **Insert** menu and choose **Text** to add more text boxes to the map.

Created By: North Arrow Technologies, Inc.  
Data Sources: REGIS & 2000 Census

7. Go to the **Insert** menu and choose **North Arrow**. Pick an arrow style and add it to the map.



8. Go to the **Insert** menu and choose **Scale Bar**. Pick a scale bar style and add it to the map.



9. To modify any element on the page, use the **Select Elements** tool  to highlight it and then modify its size. *Right-click* on an element and select **Properties** to change its style.

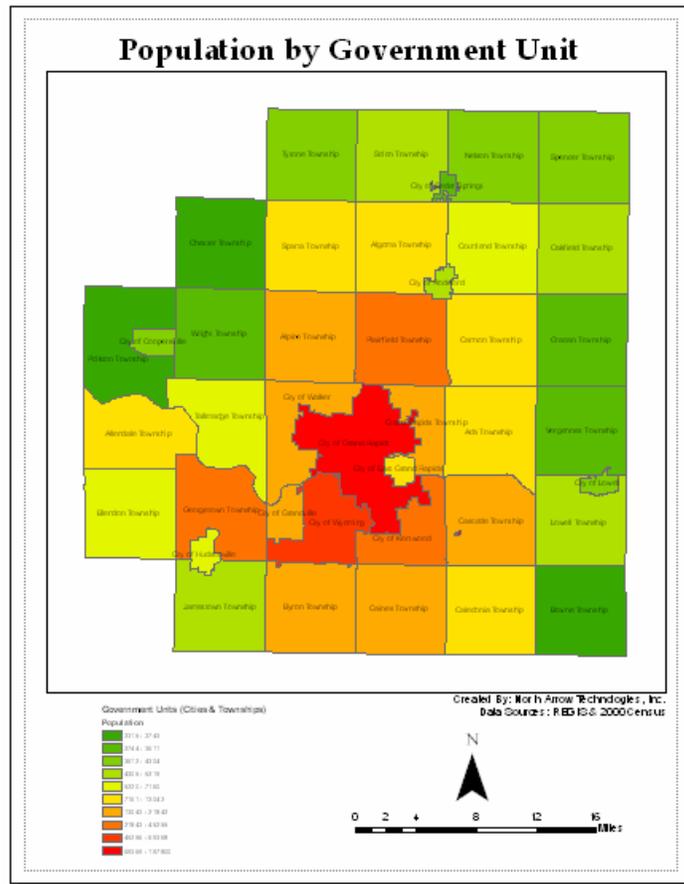


10. Go to the **Insert** menu and choose **Legend**. Complete the wizard to add a legend to the Layout View.

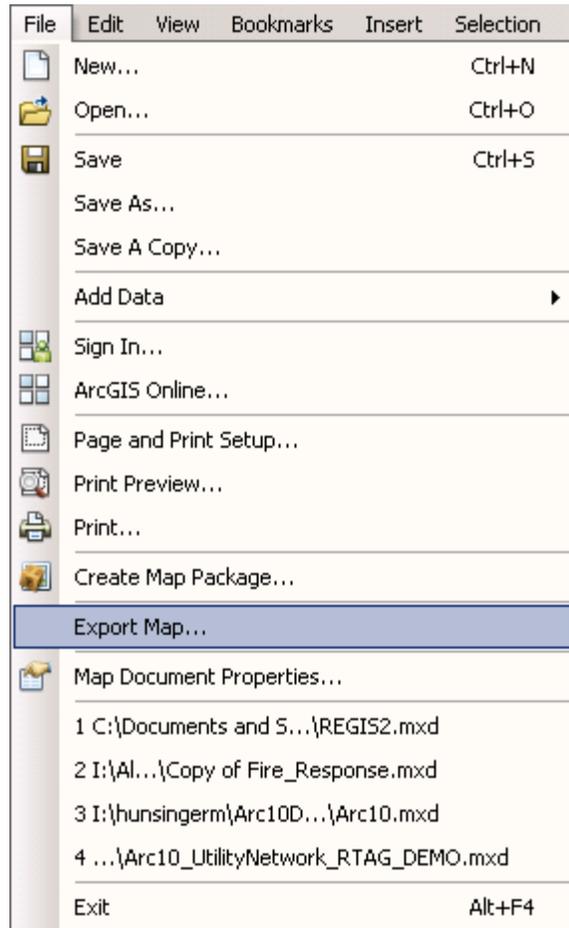
**Government Units (Cities & Townships)**



11. A completed map may look something like this.



12. The Layout view can be printed or exported to a file format such as PDF. Both options are found in the **File** menu.



## Additional Information

Review exercises in Section 4 of the ArcGIS I Training Class or read the **Page layout and map composition** section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [+]  Adding graphics and text to maps
  - [+]  Symbolizing data
  - [+]  Animation
  - [+]  Using cartographic representations
- [-]  **Page layout and map composition**
  - [+]  Getting started with laying out and printing maps
  - [+]  Map elements
  - [+]  Grids and graticules
  - [+]  Rulers and guides
  - [+]  Working with data frames in layout view
  - [+]  Creating interactive and paperless maps
  - [+]  Map output

*End of Exercise 11.1*

# Exercise 11.2– Adding Reference Systems

In this exercise, you will review how to:

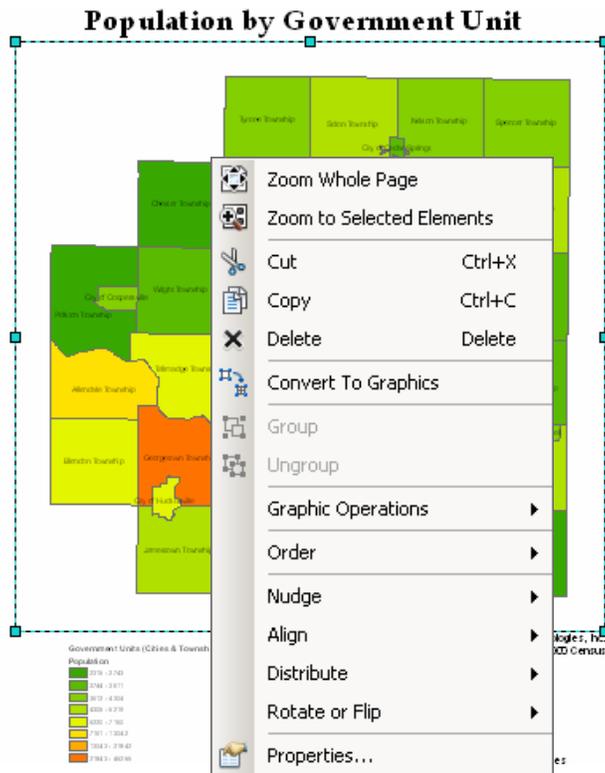
- ◆ Add latitude/longitude lines or a grid to a map in layout view

## Setup

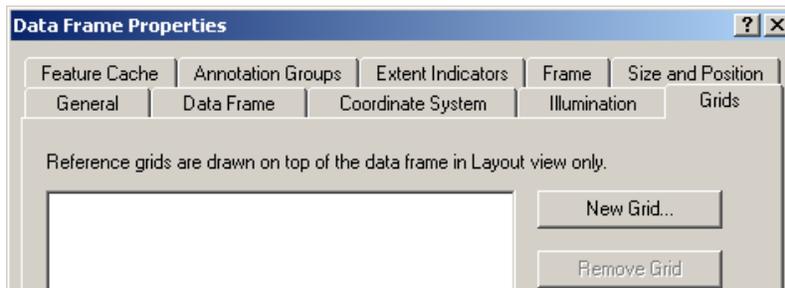
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame. Switch to the layout view.

## Layout View Overview Tutorial

1. Using the **Select Elements** tool , *right-click* on the map's data frame and choose **properties**.



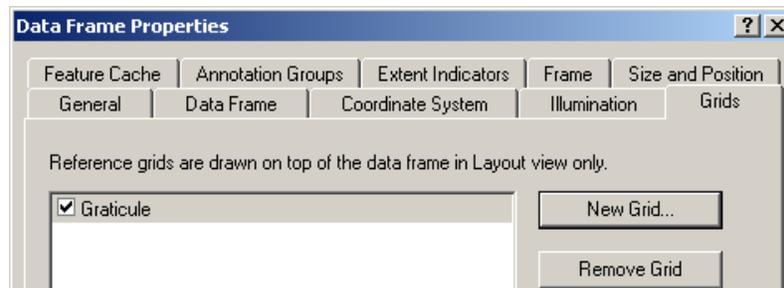
2. Switch to the **Grids** tab. It should be empty indicating that no reference systems have been added to the map. Select the **New Grid** button.



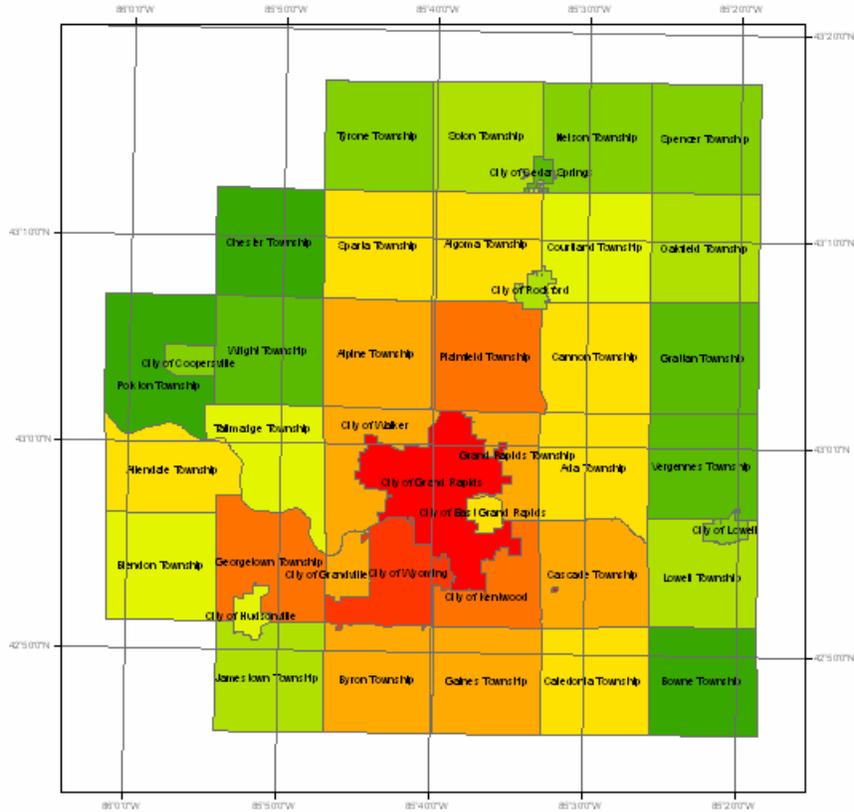
3. The **Grids and Graticules Wizard** appears. Select the **Graticule** option in the first box.



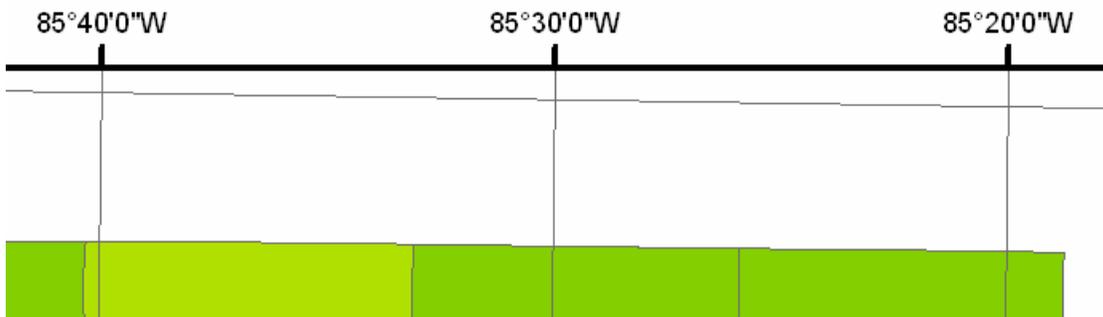
4. Press **Next** three more times to continue through the wizard. The default values are all acceptable but observe the various customization options that are available. Press **Finish** and the reference grid appears in the list named **Graticule**.



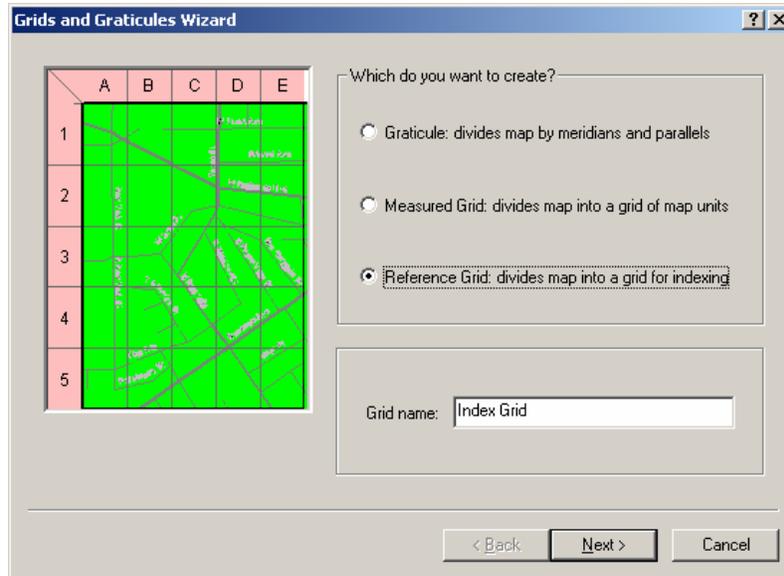
- Press **OK** and a latitude/longitude grid will be overlaid on the data frame. It may be necessary to reduce the size of the data frame if the latitude labels on the sides extend beyond the page margins.



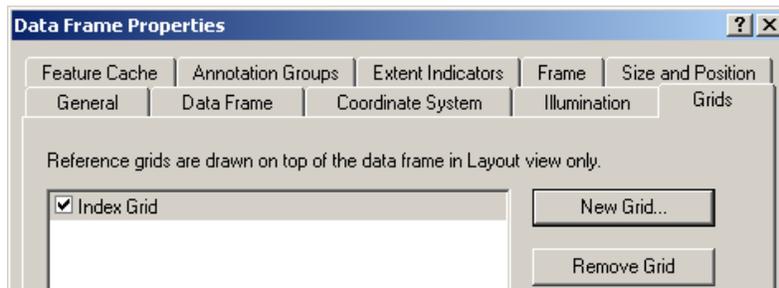
- Use the **Zoom In** tool  on the Layout Toolbar to zoom into the top edge of the data frame to clearly see the labels. In this example, lines of longitude are placed every 10 minutes (10').



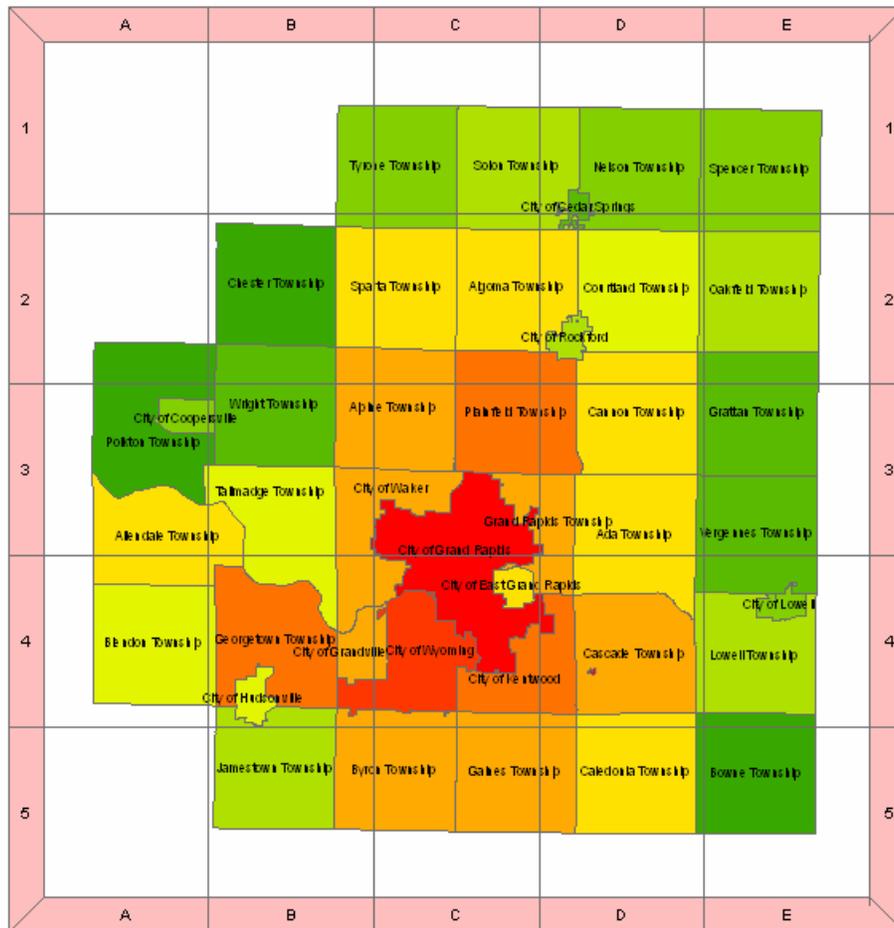
- Return to the **Data Frame Properties** and the **Grids** tab. Press the **Remove Grid** button to delete the reference system from the project.
- Press **New Grid** and this time select the **Reference Grid** option.



- Press **Next** three times to continue through the wizard. The default values are all acceptable but observe the various customization options that are available. Press **Finish** to add this grid to the list named **Index Grid**.



10. Press **OK** and a reference grid is drawn around the data frame.



## Additional Information

See the [Grids and graticules](#) section of the ArcGIS Desktop Help manual.

- ☐ Mapping and visualization
  - ☐ An overview of mapping and visualization
  - ☐ Using ArcMap
  - ☐ Working with layers
  - ☐ Navigating and interacting with maps
  - ☐ Adding graphics and text to maps
  - ☐ Symbolizing data
  - ☐ Animation
  - ☐ Using cartographic representations
- ☐ Page layout and map composition
  - ☐ Getting started with laying out and printing maps
  - ☐ Map elements
  - ☐ **Grids and graticules**
    - Adding grids and graticules (reference systems)
    - Disabling wizards in ArcMap
    - Adding MGRS and US National Grids

*End of Exercise 11.2*

## Exercise 11.3 – Aligning Elements in Layout View

---

In this exercise, you will learn how to:

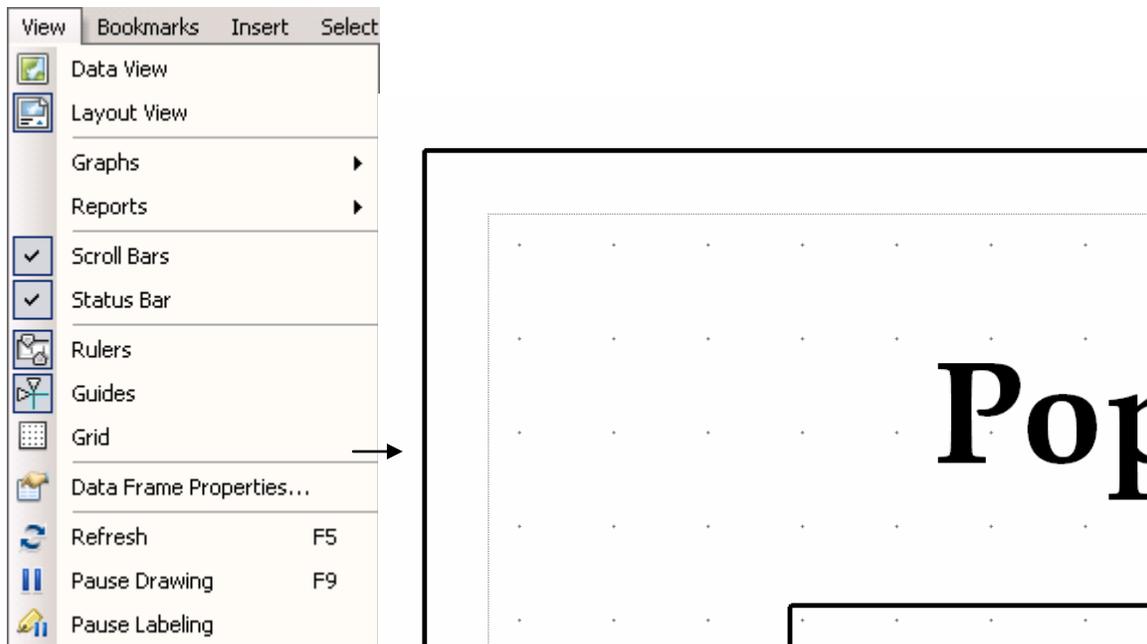
- ◆ Snap elements to grids
- ◆ Use guides to align elements
- ◆ Align elements to each other
- ◆ Group elements

### Setup

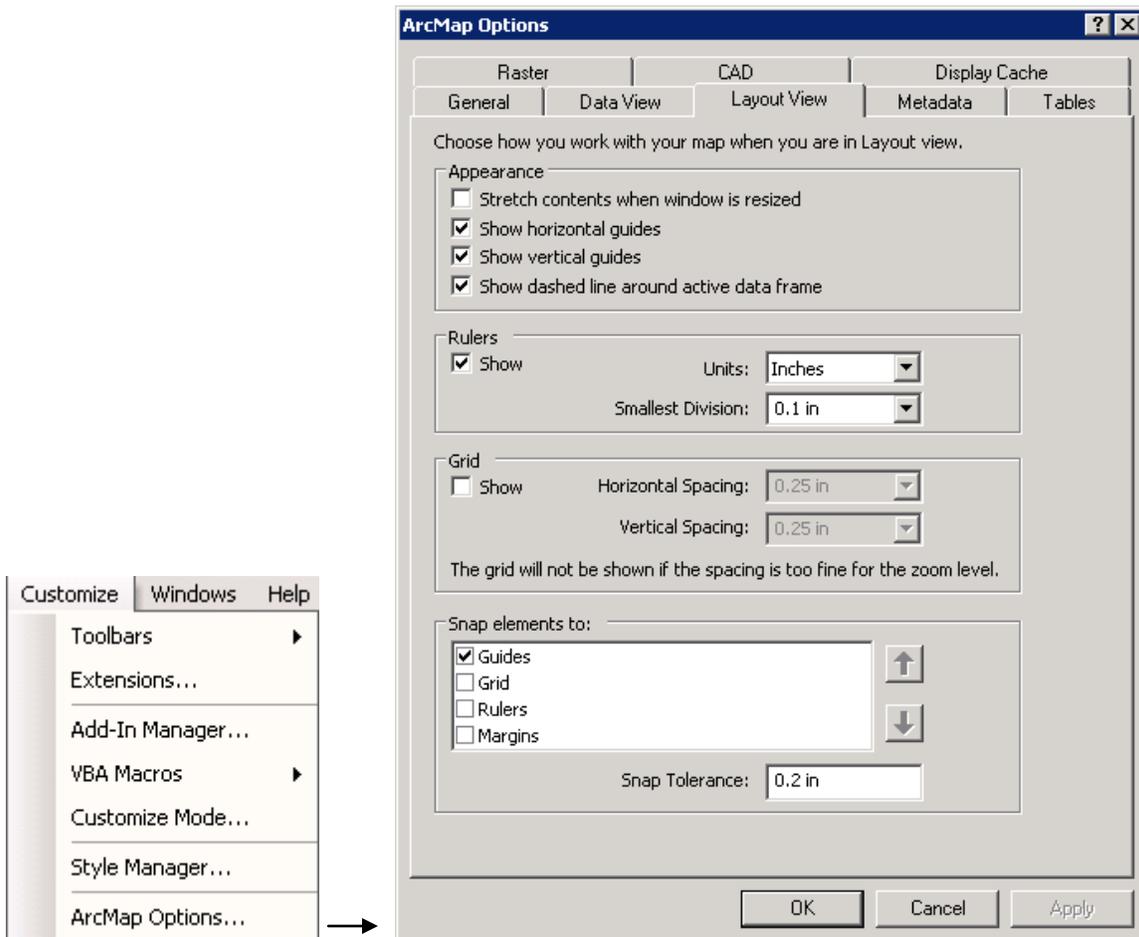
Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame. Switch to the layout view.

### Layout View Overview Tutorial

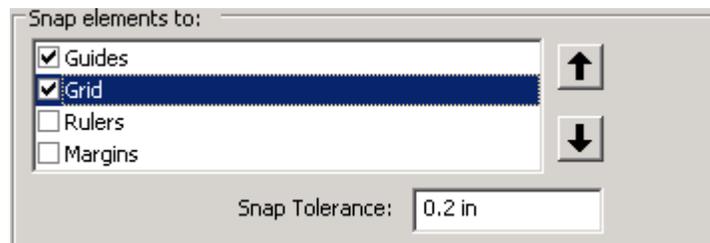
1. Go to the **View** menu and select **Grid**. A grid of dots will appear on the page to aid in aligning map elements.



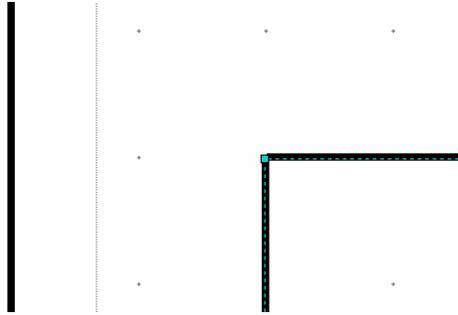
- Go to the **Customize** menu and select **ArcMap Options**. In the Options window that appears, switch to the **Layout View** tab.



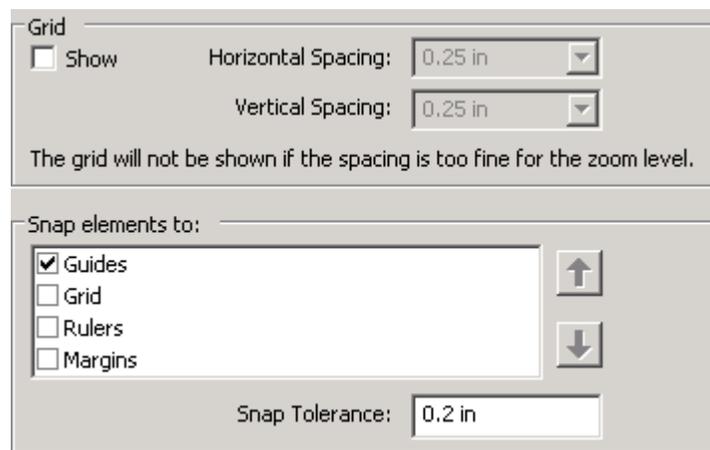
- In the **Snap elements to** box at the bottom, place a checkmark by **Grid**. Press **OK** to return to the layout view.



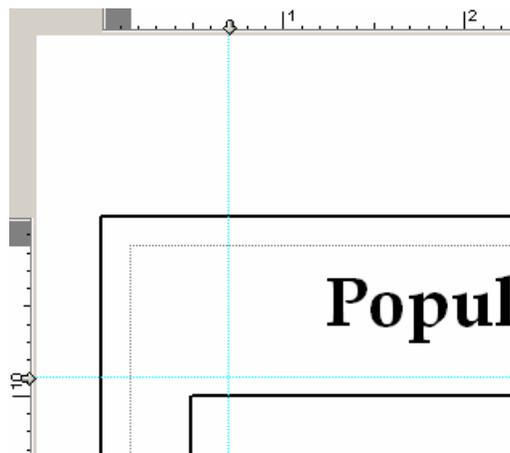
- Use the **Select Elements** tool  to select a map element and *left-click and hold* to move it around the page. Notice that with snapping to grid enabled, the element snaps easily to the dotted grid. Snapping to the grid also works when resizing elements.



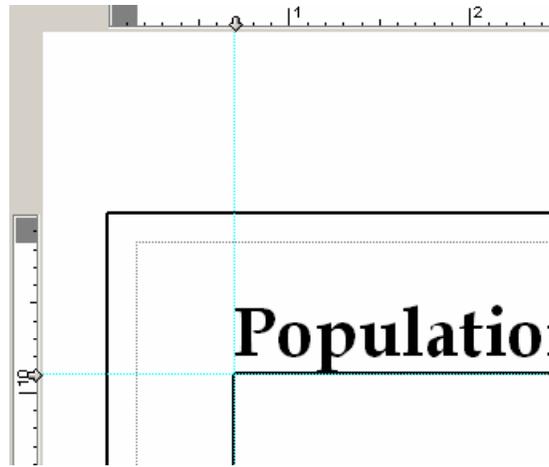
- Return to the **Options** menu and the **Layout View** tab. Uncheck **Show** in the Grid box to turn off the grid. Also uncheck **Grid** in the **Snap elements to** box.



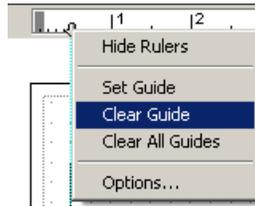
- Guides** are another method for aligning elements in the Layout View. Move your mouse cursor into the Ruler area at the top or left areas of the layout view and *left-click*. A small arrow will appear at the click point while a thin blue line will be drawn vertically or horizontally on the page.



- Again use the **Select Elements** tool  to move or resize elements to match the guide lines.



8. To remove a guide, *right-click* on the arrow and select **Clear Guide**.

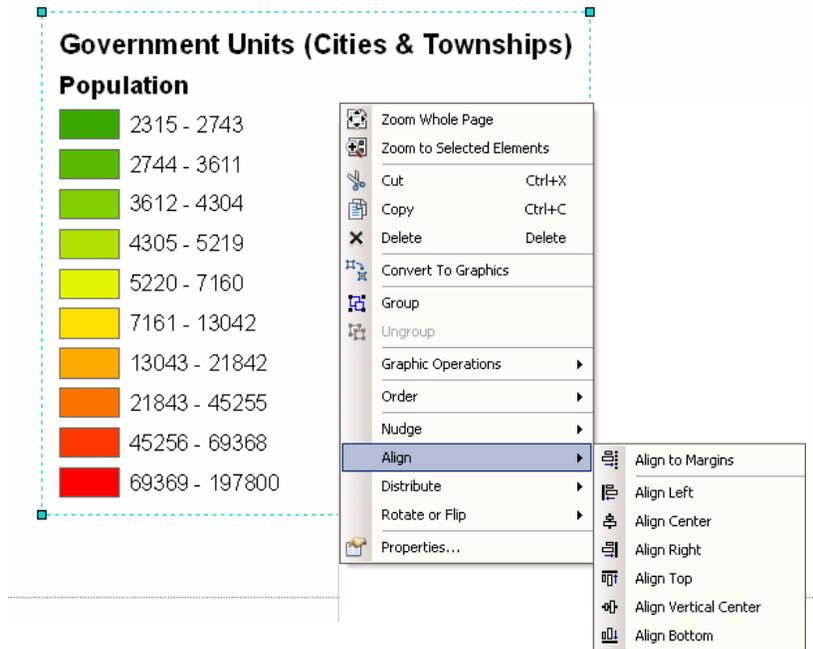


9. *Right-click* anywhere in the ruler and choose **Clear All Guides** to remove all guides.



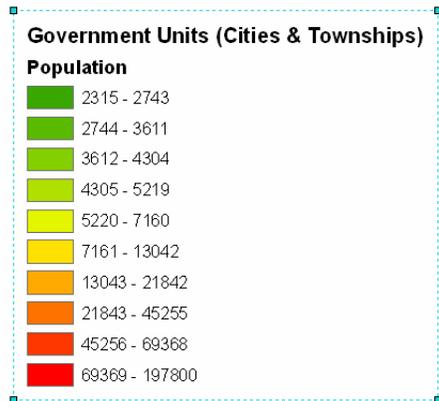
10. Map elements can be aligned to each other using the **Select Elements** tool . Select an element and then hold the **SHIFT** key to select more elements. *Right-click* on any of the elements and select **Align** and then choose the type of alignment. For example, select **Align Left**.

Created By: North Arrow Technologies, Inc.  
Data Sources: REGIS & 2000 Census

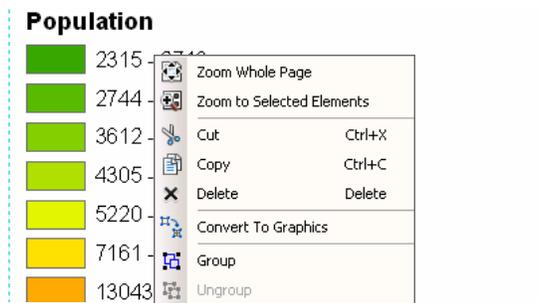


11. The map elements will align with each other.

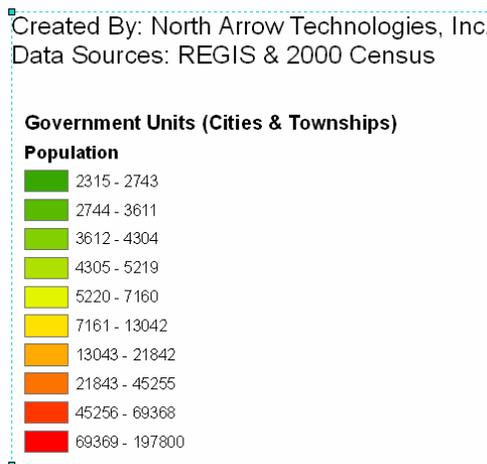
Created By: North Arrow Technologies, Inc.  
Data Sources: REGIS & 2000 Census



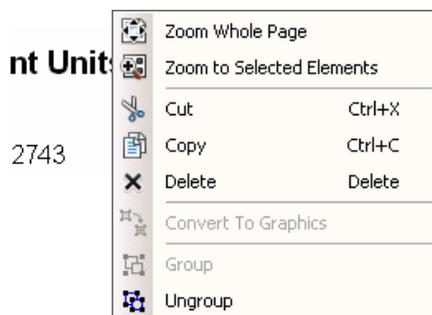
12. When multiple elements are selected, it is also possible to group them together for easier manipulation on the page. *Right-click* on the selected elements and choose **Group**.



13. The elements become a single element that can be moved, snapped, or aligned together.



14. Right-click on the grouped element and choose **Ungroup**.



## Additional Information

See the **Page layout and map composition** section of the ArcGIS Desktop Help manual.

- [-]  Mapping and visualization
  - [+]  An overview of mapping and visualization
  - [+]  Using ArcMap
  - [+]  Working with layers
  - [+]  Navigating and interacting with maps
  - [+]  Adding graphics and text to maps
  - [+]  Symbolizing data
  - [+]  Animation
  - [+]  Using cartographic representations
  - [-]  **Page layout and map composition**
    - [+]  Getting started with laying out and printing maps
    - [+]  Map elements
    - [+]  Grids and graticules
    - [+]  Rulers and guides
    - [+]  Working with data frames in layout view
    - [+]  Creating interactive and paperless maps
    - [+]  Map output

*End of Exercise 11.3*

# Exercise 11.4 – Using the Draw Toolbar

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In this exercise, you will learn how to:

- ◆ Use the Draw toolbar to add text and shapes to the Layout View

## Setup

Log in to the REGIS Application Web Interface and launch ArcView 10. Use the Layer Manager button on the REGIS toolbar to add the Basic Layers (Group Layer) to the data frame. Switch to the layout view.

## Using the Draw Toolbar Tutorial

1. Turn on the Draw toolbar by going to the View menu, choosing **Toolbars** and select **Draw**.

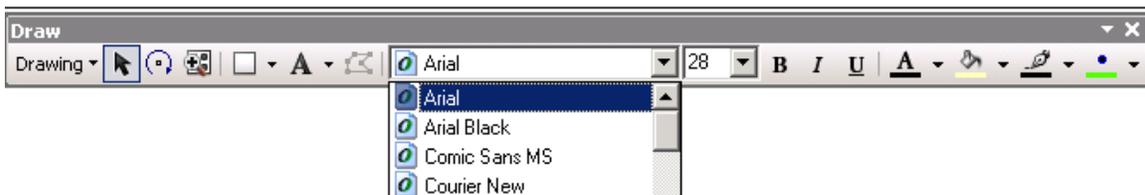


2. The Draw toolbar contains a variety of tools to assist in creating a page layout. It also contains the same **Select Elements** tool  that appears in the Tools toolbar.



3. Use the **Select Elements** tool  to highlight a text box. Return to the Draw toolbar and use the font controls to change the font type, size, style, and color.

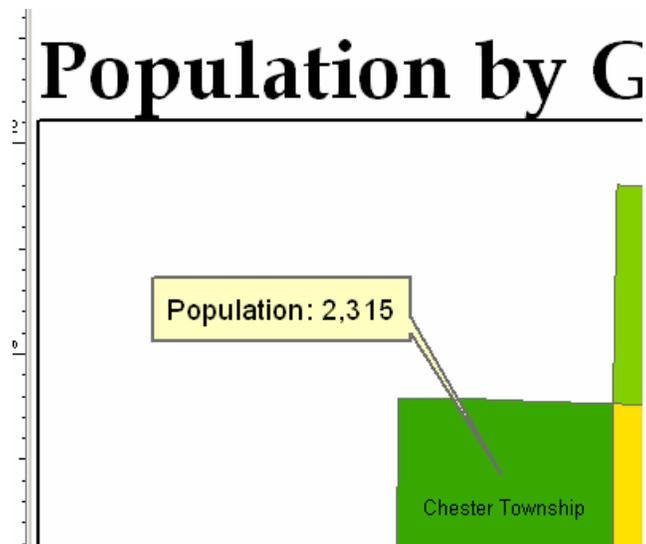
Population by Government Unit



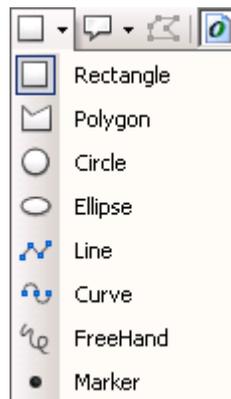
4. Select the New text drop-down box and pick the **A** icon to add regular text to the layout view. This is the same as going to the **Insert** menu and choosing **Text**.



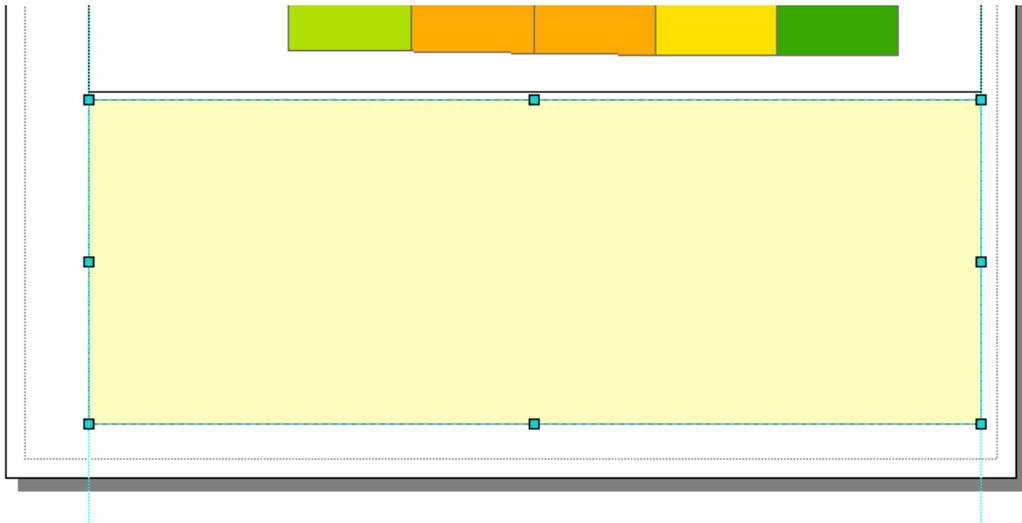
5. Select the **Callout** option  to add a text callout box to the page. Note that if you do place a text box on top of the data frame, it will not stay in the correct spot if the map extent is changed. When you do need the callout box to move with the map, switch back to data view and add graphics onto the map.



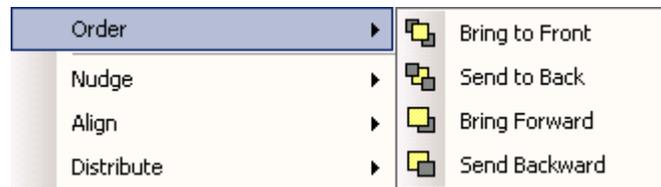
6. Select the new shape drop-down box and pick **New Rectangle**.



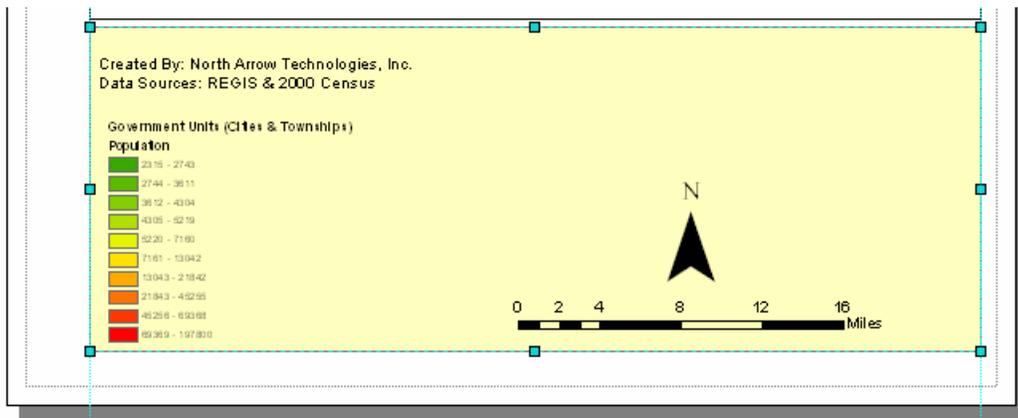
- On the page, *left-click* to draw a rectangle and *double left-click* to finish the shape. If needed, first create some guides to use in aligning the rectangle.



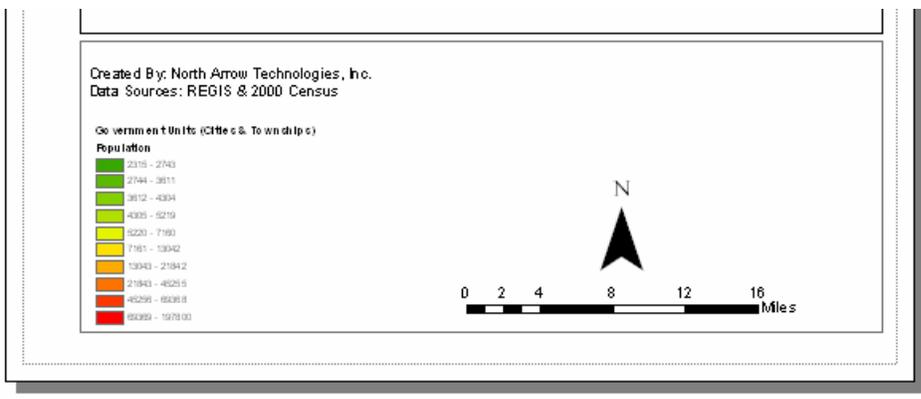
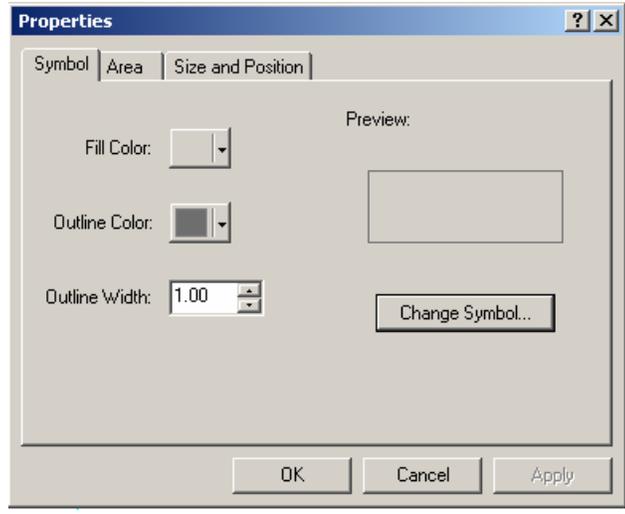
- A new shape will always appear on top of the other map elements. *Right-click* inside the rectangle. Select **Order** and then choose **Send to Back**.



- The shape is moved underneath the other elements.



- Right-click* on the shape again and select **Properties**. The Properties window appears where the fill and outline colors can be adjusted. Set the **Fill Color** to **No Color** and press OK.



## Additional Information

See the **Drawing points, lines, and circles** section of the ArcGIS Desktop Help manual.

- [-] Mapping and visualization
  - [+] An overview of mapping and visualization
  - [+] Using ArcMap
  - [+] Working with layers
  - [+] Navigating and interacting with maps
- [-] Adding graphics and text to maps
  - [-] Working with graphics
    - [+] An overview of working with graphics
    - [+] **Drawing points, lines, and circles**
    - [+] Moving, rotating, and ordering graphics
    - [+] Aligning, distributing, and grouping graphics
    - [+] Joining graphics

*End of Exercise 11.4*