

Welcome!

- **Introduction**
 - Instructor: Greg Carlino
- **Attendee Introductions**
 - Your Name
 - Department/Group

Class Outline

Sections

- **Section 1- Cartography Basics**
- **Section 2- Map Elements & Layout View**
- **Section 3- Creating Custom Symbology & Labels**
- **Section 4- Graphics & Annotation**
- **Section 5- Data Frame Layout Properties**
- **Section 6- Map Production**
- **Section 7- Color**

Section 1

Cartography Basics

Map Types and Themes

Physical Features



Arbitrary Features

- **Physical Geography**

- Environment
- Streets
- Utilities
- Asset management

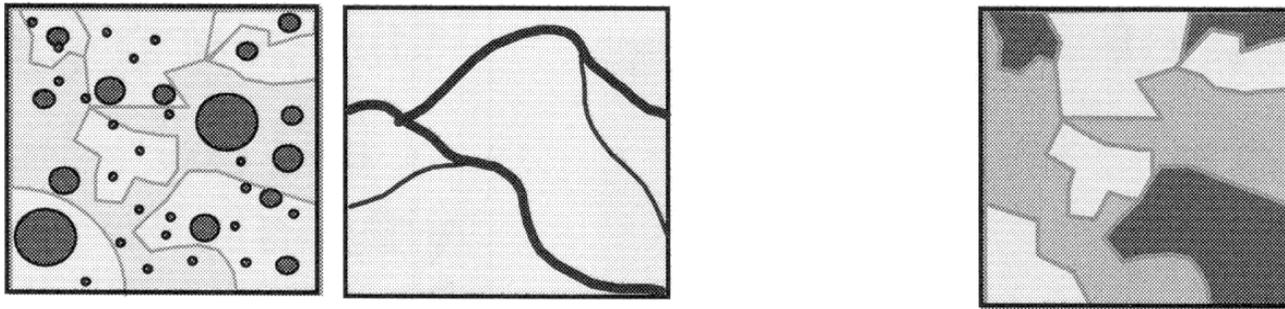
- **Human Geography**

- Rooted in Sociology
- Greater focus on arbitrary features
- Population, Socioeconomic, Sales, Public Safety

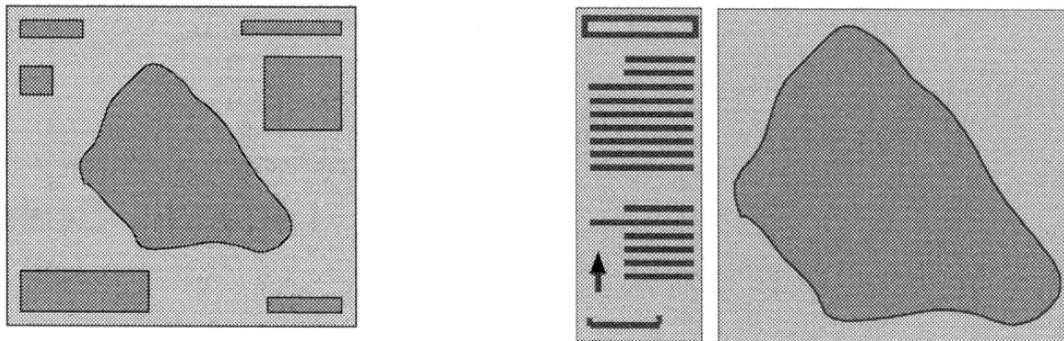
Issues in Cartographic Design

- Colors, shade patterns and text
 - 1) Legibility of features and text

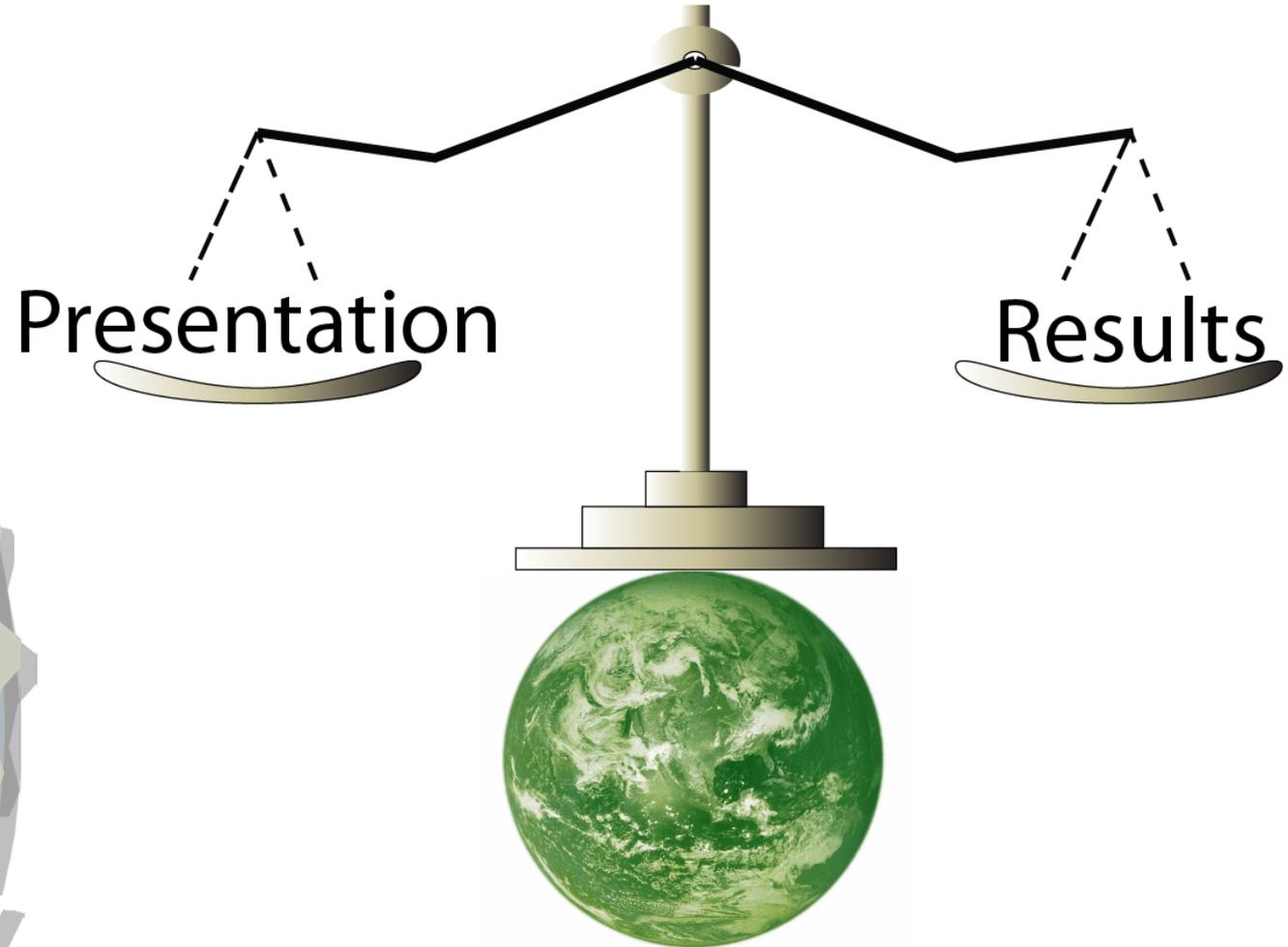
2) Visual contrast and hierarchy



3) Visual balance

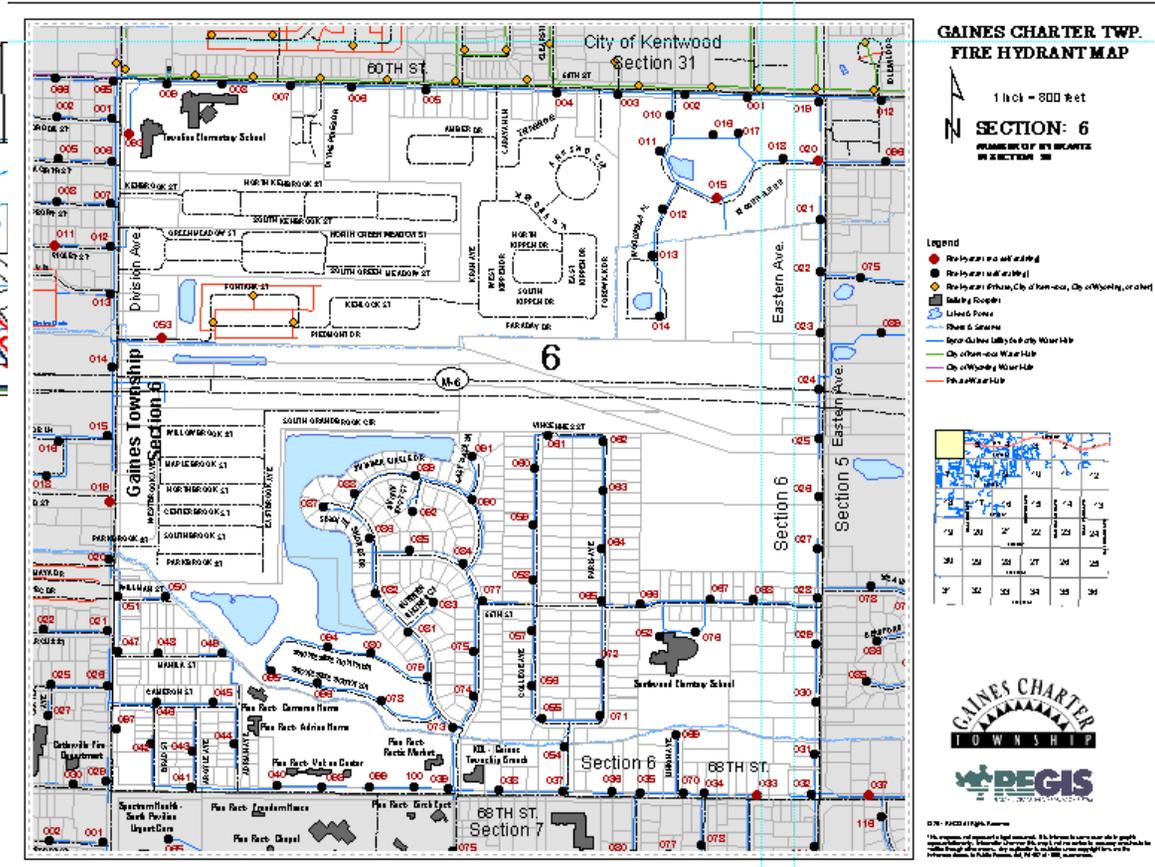
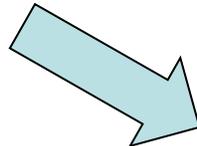
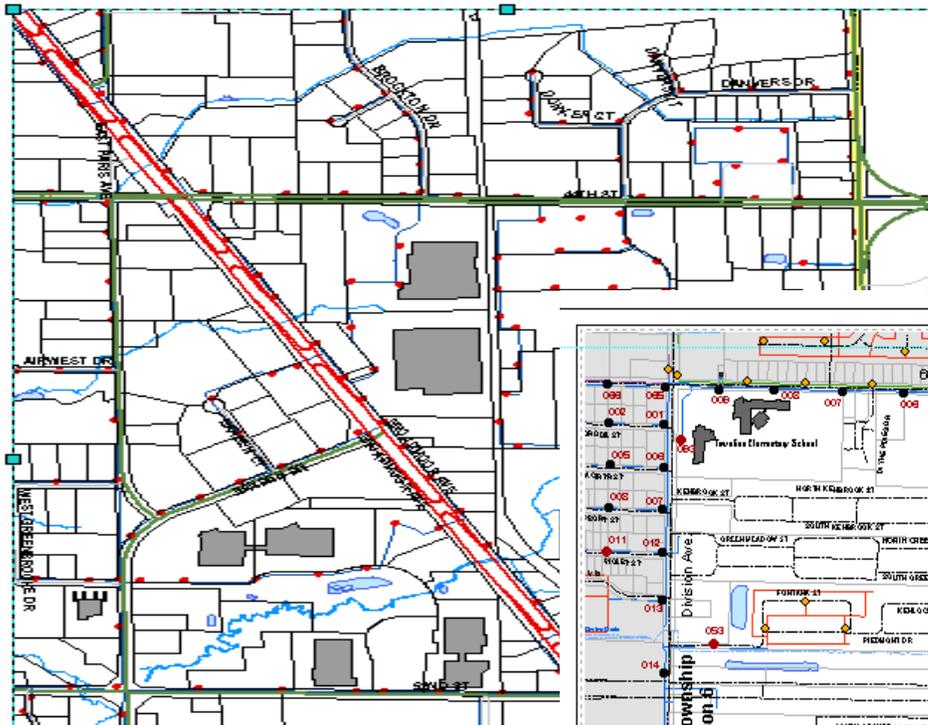


Balancing Time, Information & Aesthetics

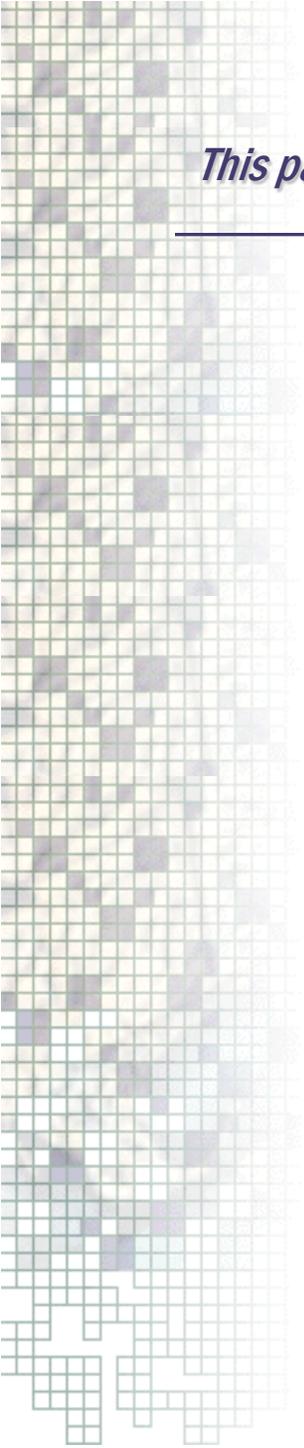


The map's purpose and audience dictates the detail

From Data to Finished Map product



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Section 2

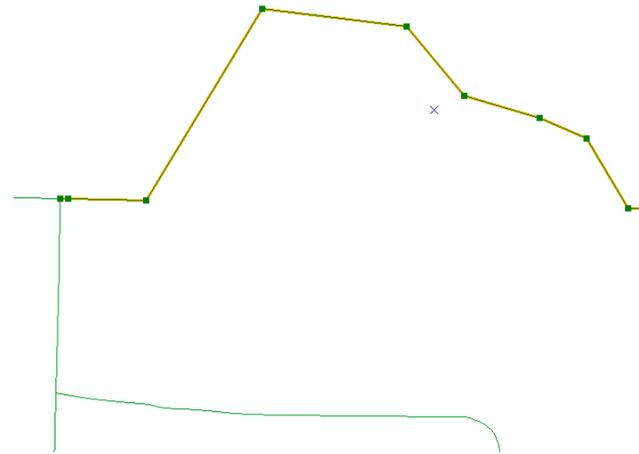
Map Elements & Layout View

Feature Data

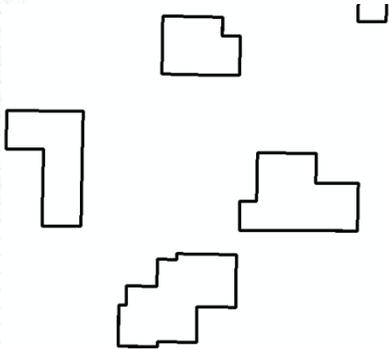
Point



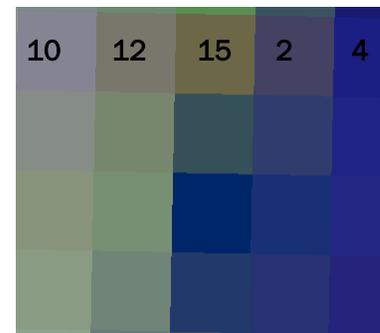
Line



Area



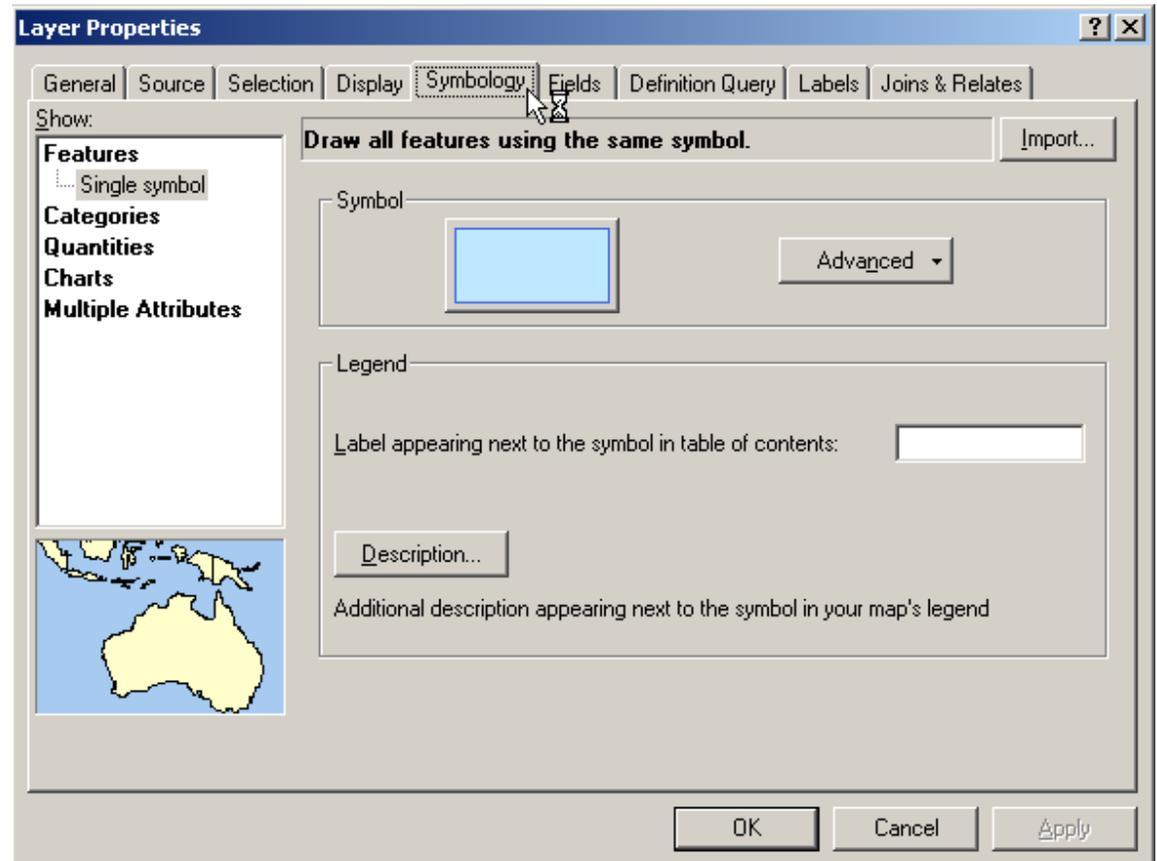
Raster



Feature Symbolology

- Markers/Symbols

- Representation

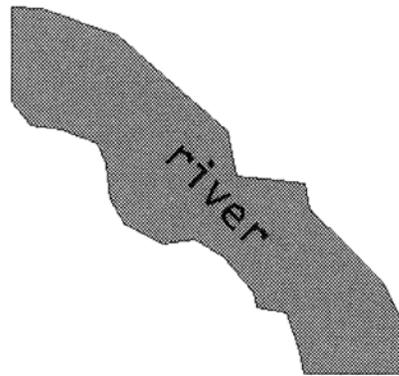


Changing the Symbology Setting in Layer Properties

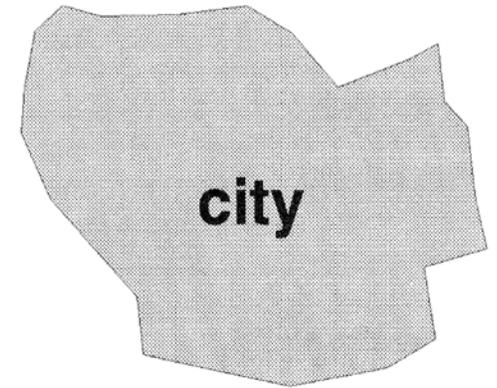
Map scale

- Map scale determines the size and shape of features

- Large scale



1:500



1:24000

- Small scale



1:24000



city

1:250000

Scale Ratio and Scale Bar

1:20,500



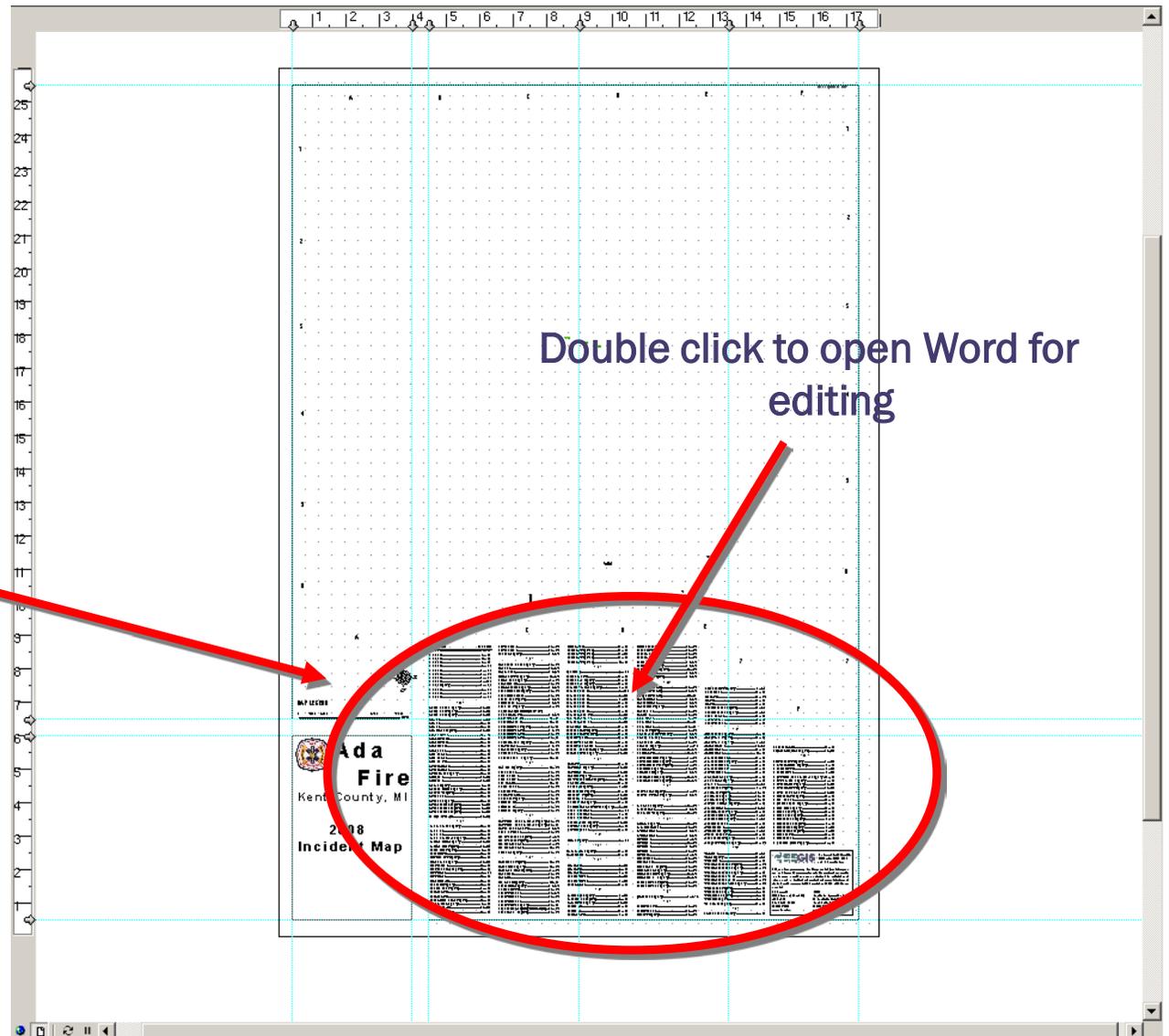
1 Inch Equals 16 Miles

Objects

- Adding Object files to layout

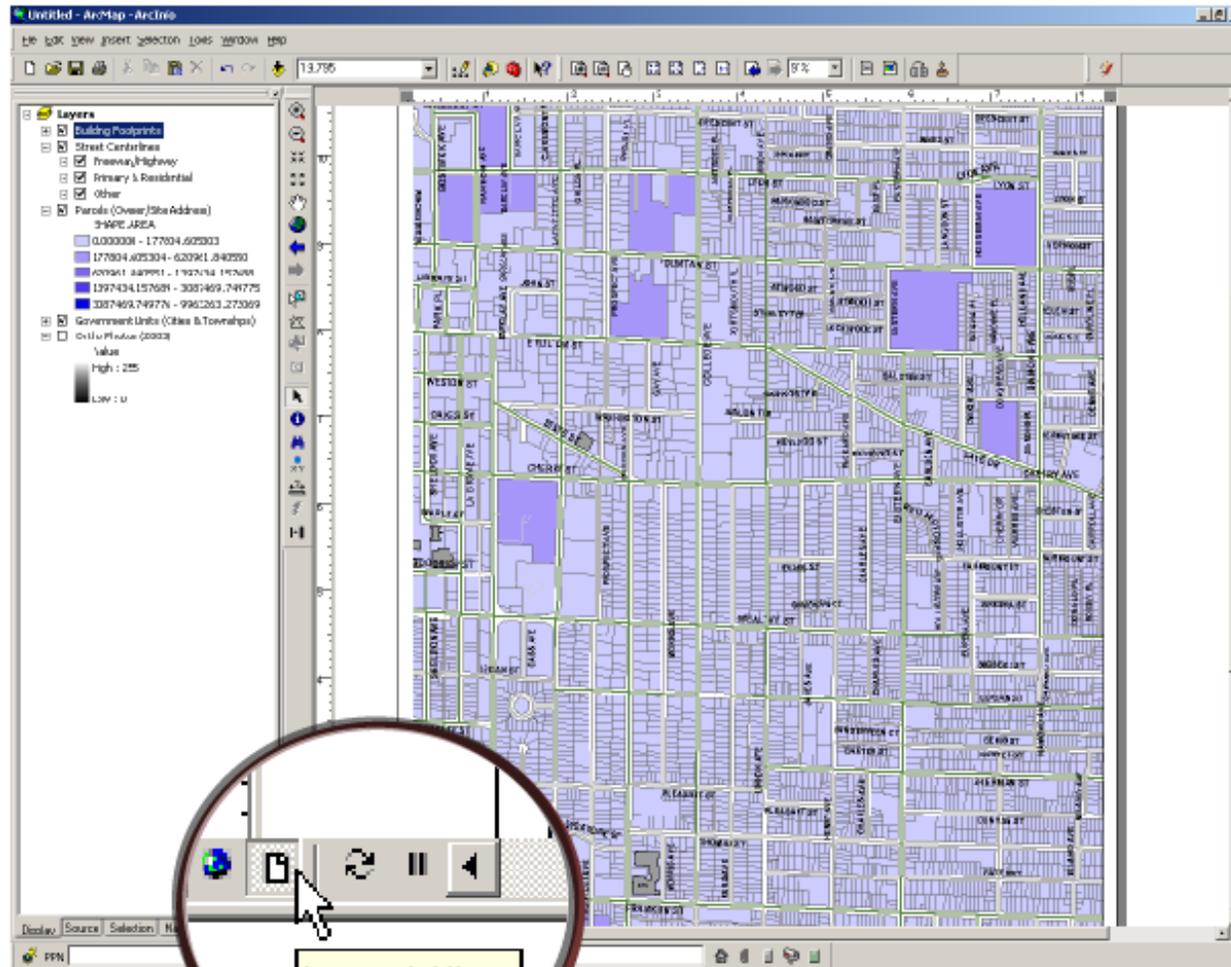


Linked Word Document



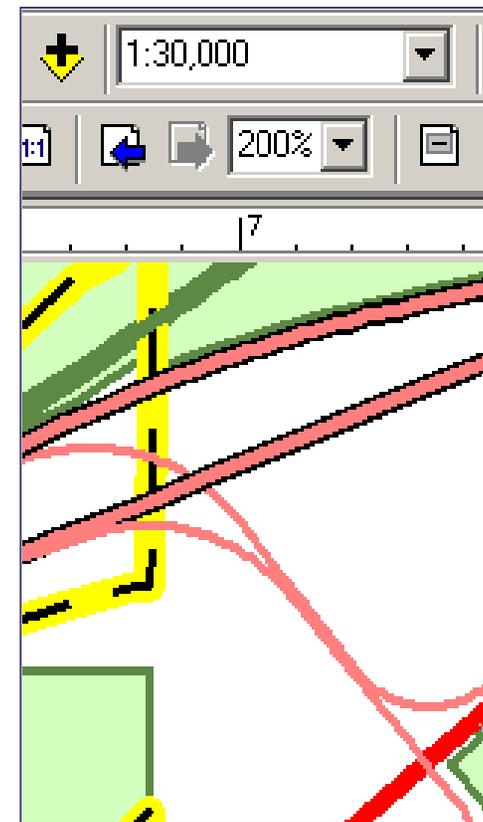
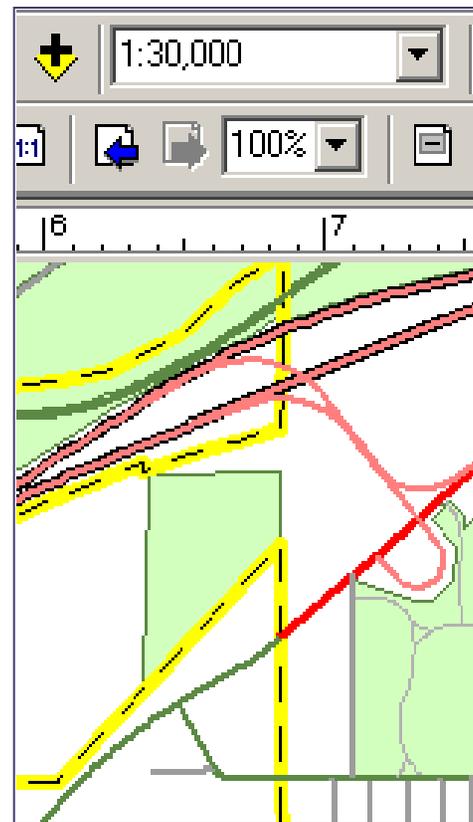
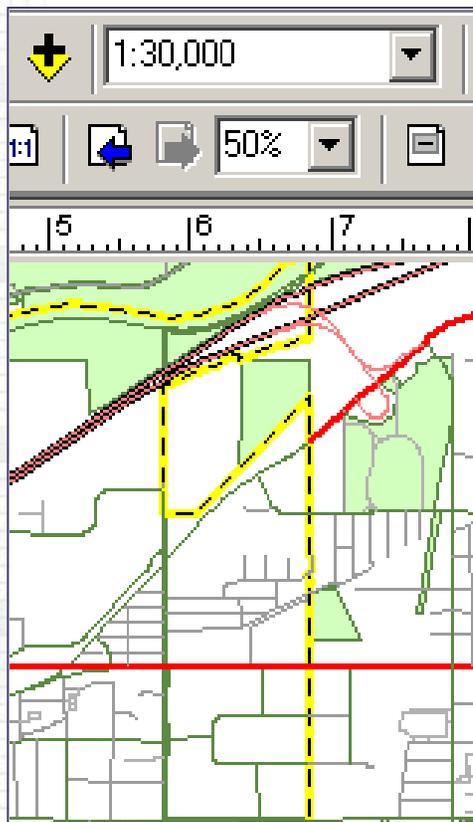
Double click to open Word for editing

Layout View



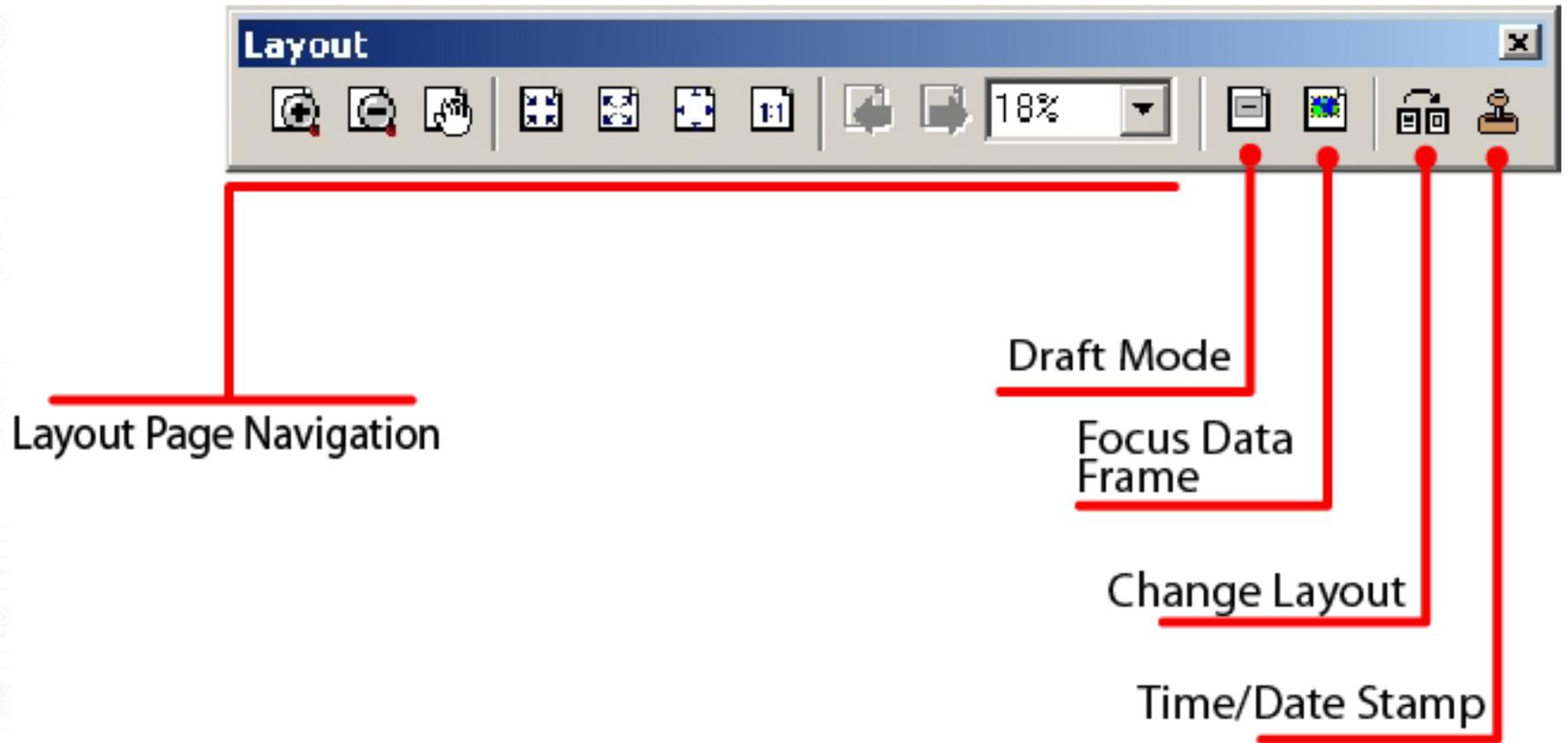
Layout Toolbar

- Zoom and pan the layout page



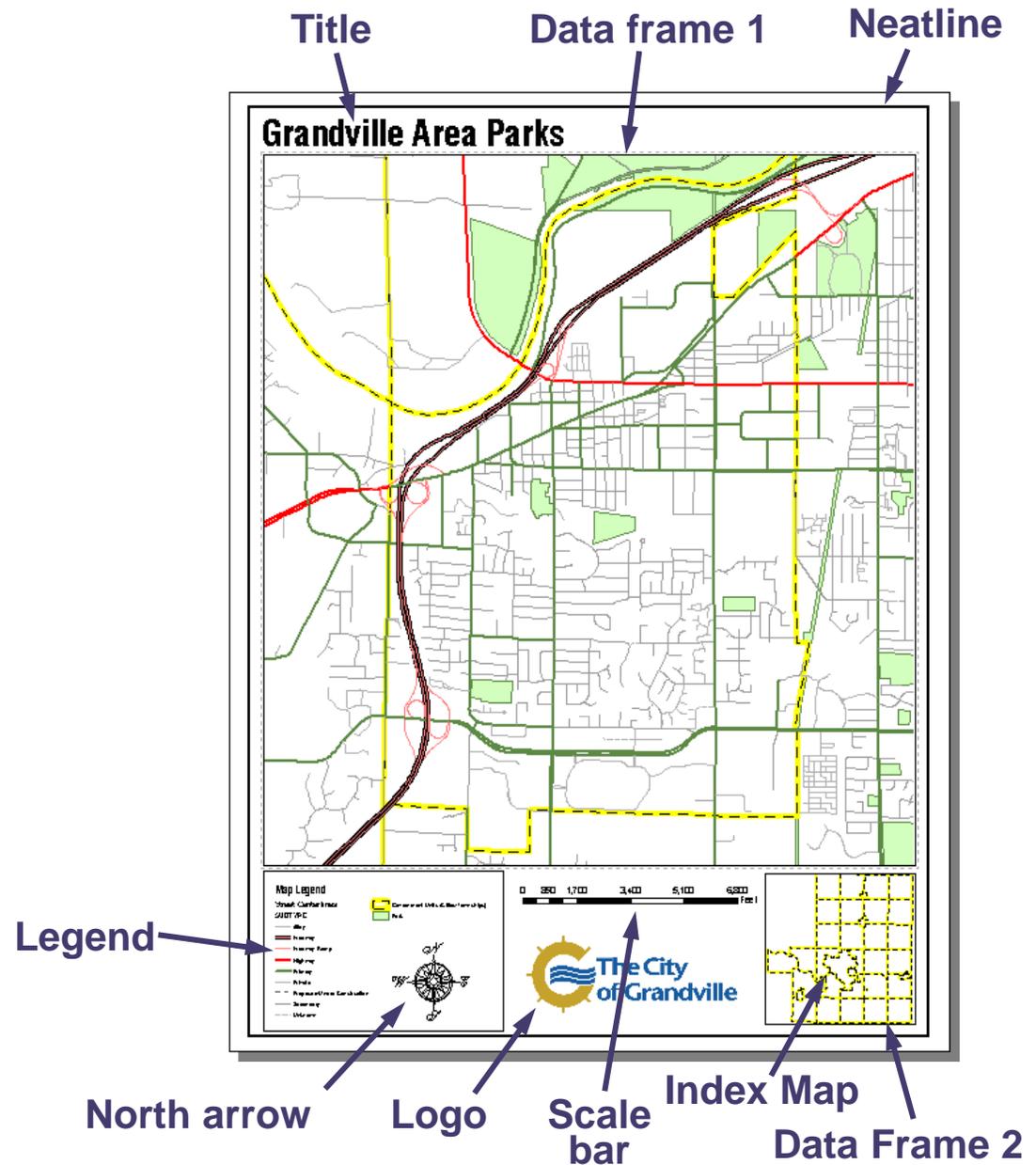
- Additional layout settings from Tools > Options

Other Toolbar Buttons



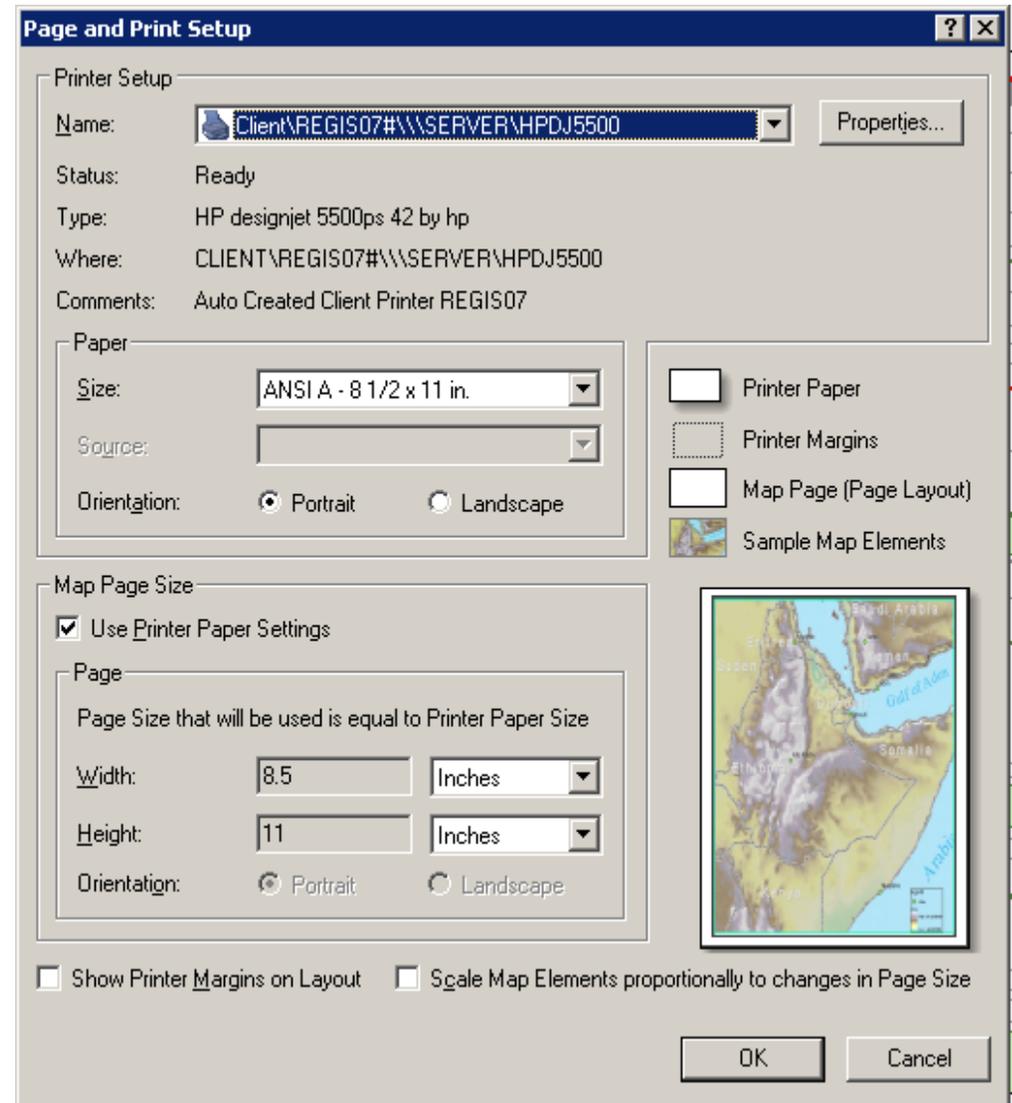
Map Layout in ArcMap

- 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

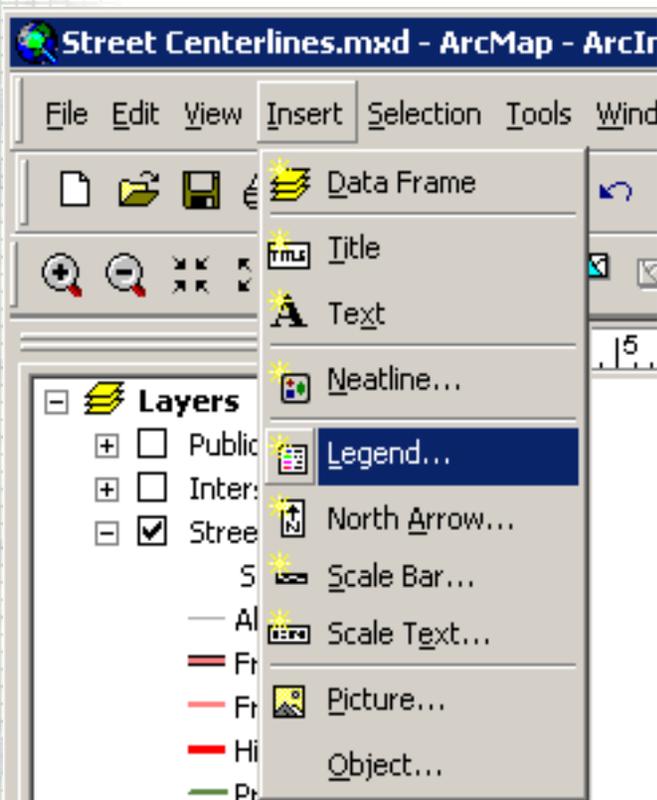


Setting up the page

- 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?

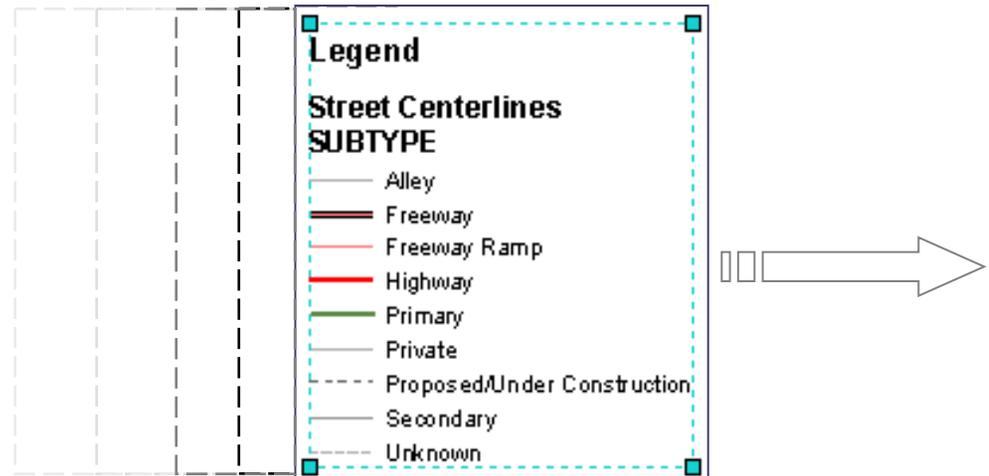


Inserting map elements

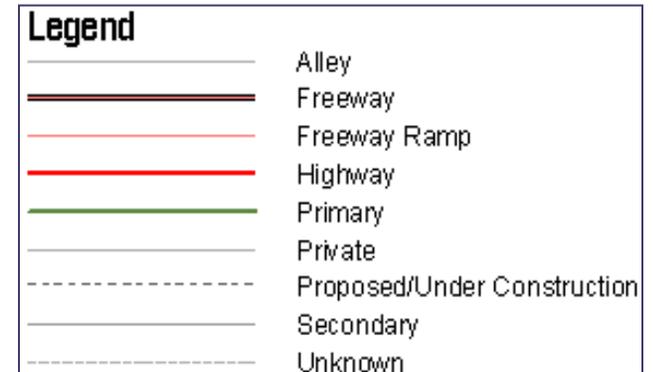


1 Choose Element

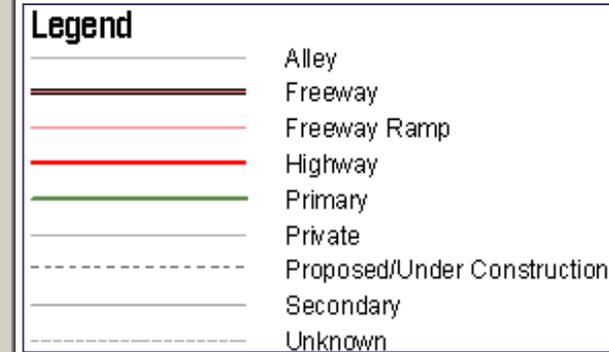
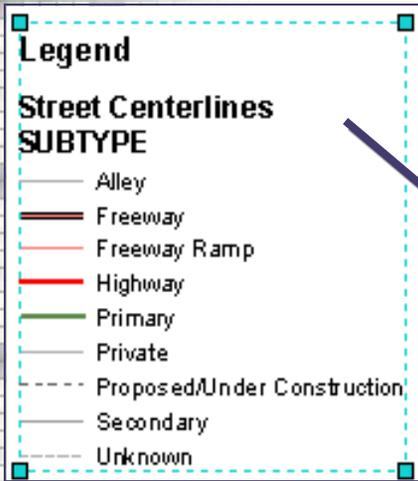
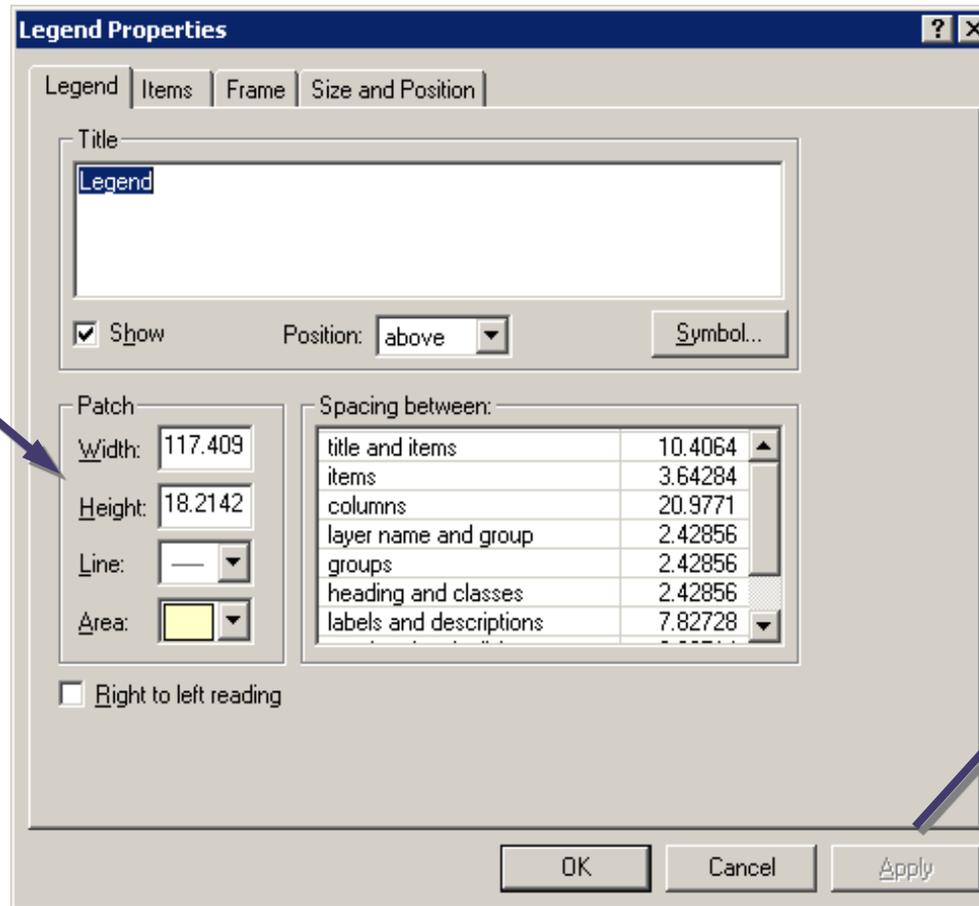
2 Click and Drag to Layout position



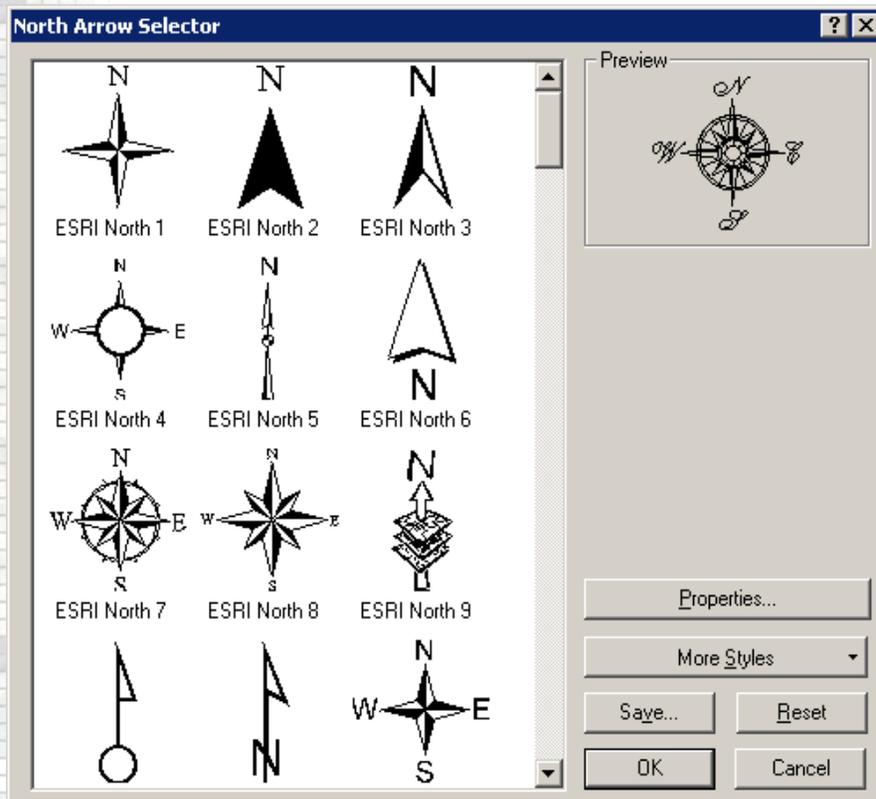
3 Modify to clean up (if necessary)



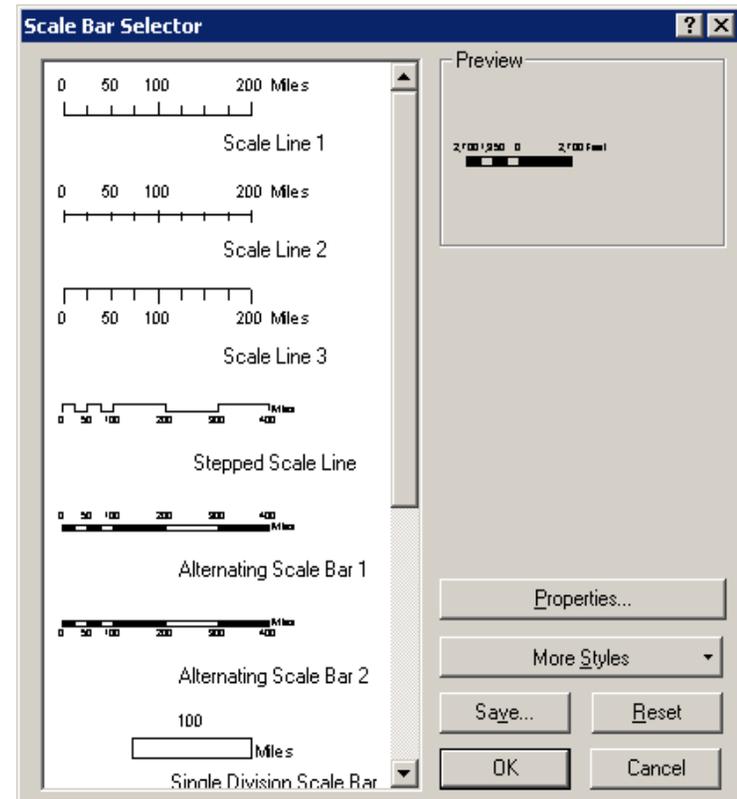
An example of the Legend Properties dialog



Adding a North Arrow and Scale



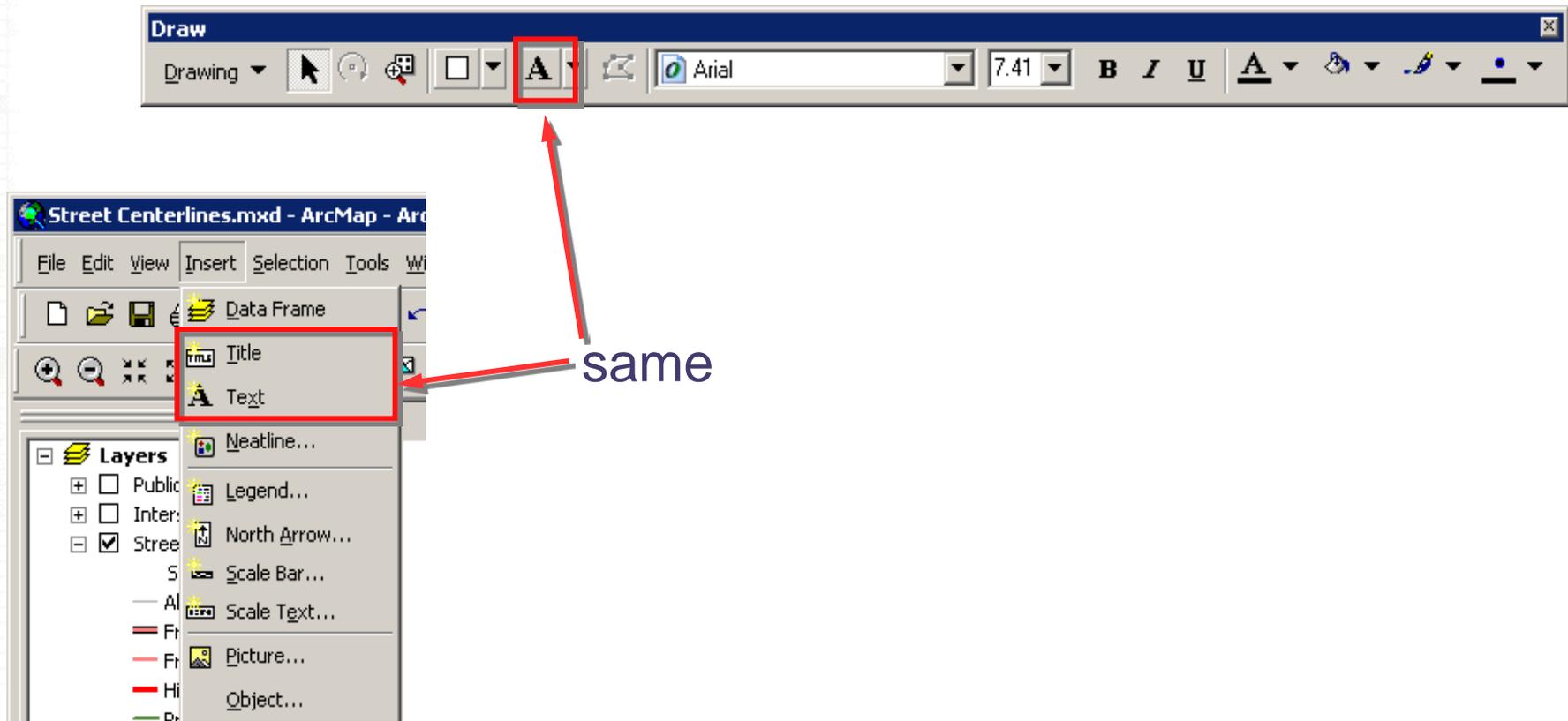
- Change angle, size and color



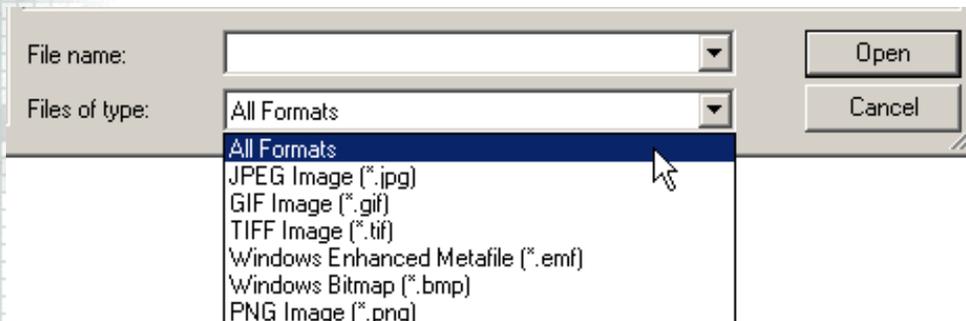
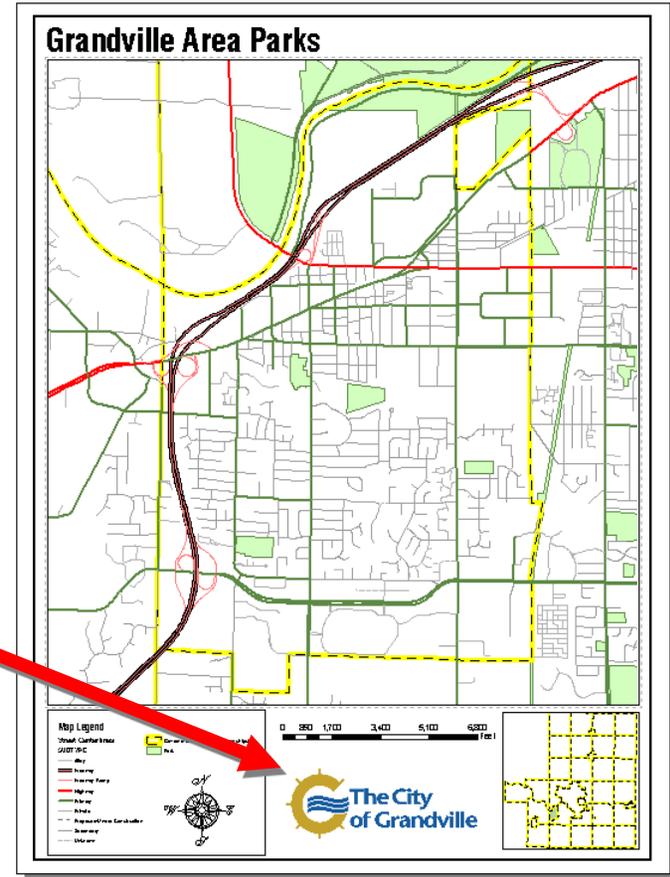
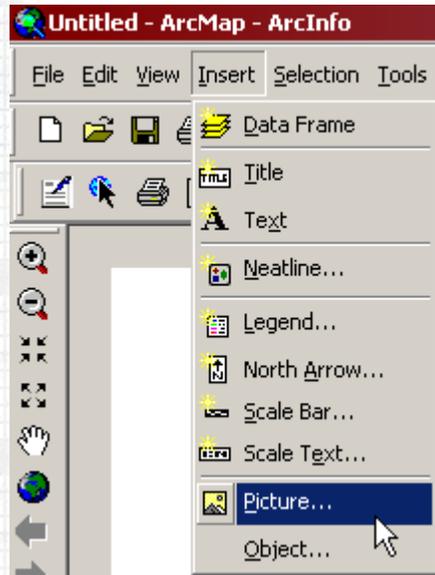
- Choose type, unit increments, color and font

Inserting textual information

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



Inserting Images



Layout Grid, Guides and Element Snapping

Options [?] [X]

Tables | Raster | CAD | Table Of Contents
General | Data View | Layout View | Geoprocessing

Choose how you work with your map when you are in Layout view.

Appearance

- Stretch contents when window is resized
- Show scroll bars
- Show horizontal guides
- Show vertical guides
- Show dashed line around active data frame

Rulers

- Show
- Units: Inches
- Smallest Division: 0.1 in

Grid

- Show
- Horizontal Spacing: 0.25 in
- Vertical Spacing: 0.25 in

The grid will not be shown if the spacing is too fine for the zoom level.

Snap elements to:

- Guides
- Grid
- Rulers
- Margins

Snap Tolerance: 0.2 in

OK Cancel Apply

Adjustable guides are created by clicking on rulers

Grid is shown with dots

Ada Fire
Kent County, MI
2008 Incident Map

Section 2 Exercises

- Exercise 2.1 – Map Layout Setup
- Exercise 2.2 – Inserting and Organizing Map Elements
- Exercise 2.3 - Creating an Index Map
- Exercise 2.4 – Inserting Linked Objects

Section 3

Creating Custom Symbology & Labels

Symbology Settings

Double Click

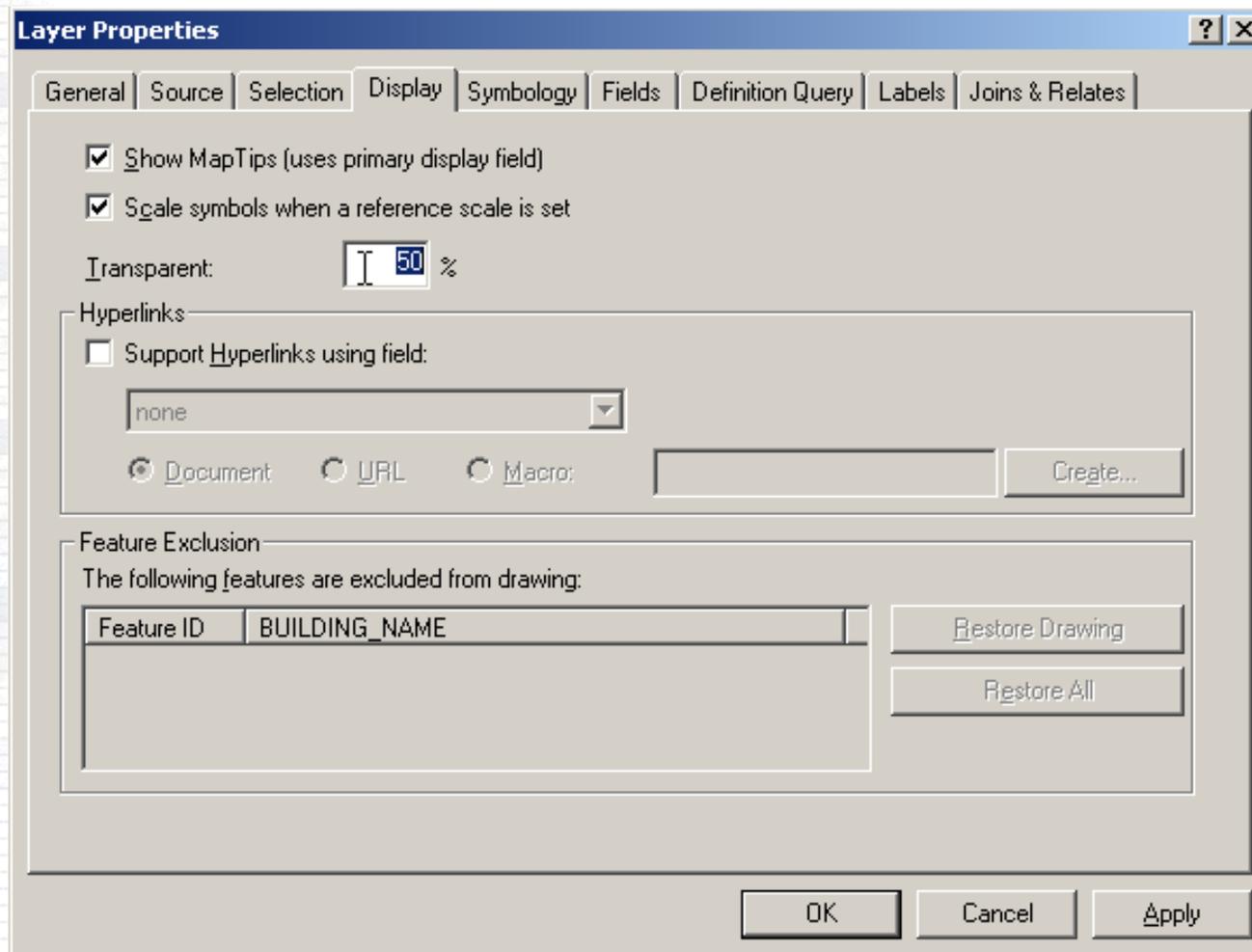
Double Click

Right Click on Symbol for Quick Color Change

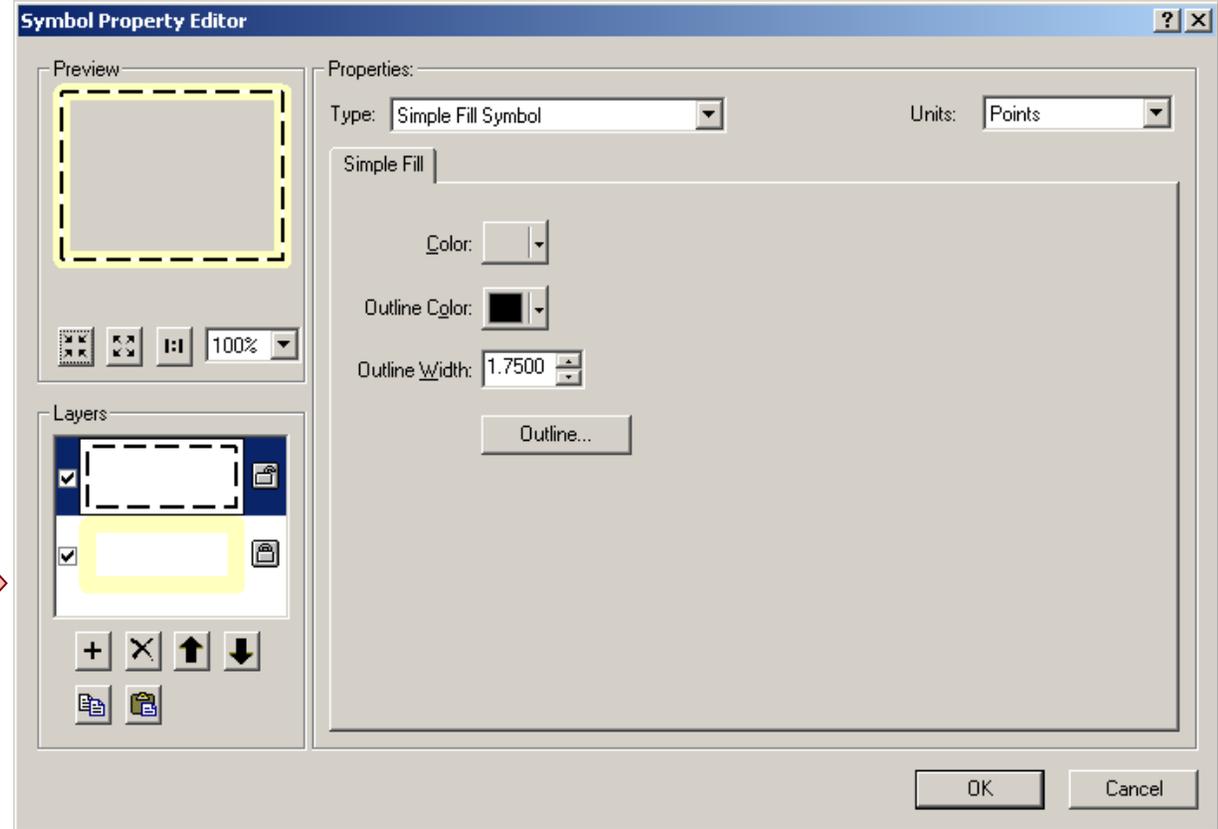
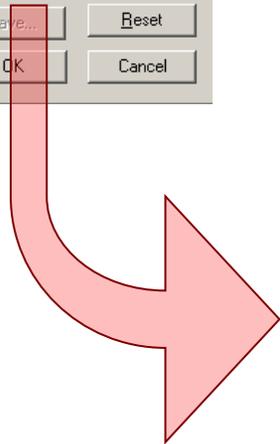
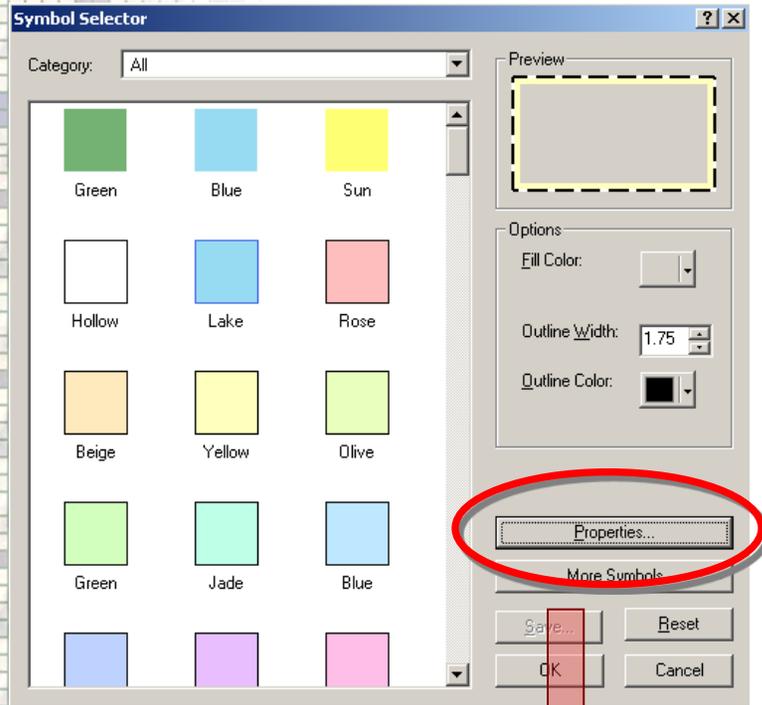
The image shows a composite screenshot of GIS software. On the left, a 'Layers' panel lists 'Major Buildings', 'Municipal Boundaries', and 'Railroads'. A red arrow points from 'Major Buildings' to the 'Layer Properties' dialog box. The 'Layer Properties' dialog has tabs for 'General', 'Source', 'Selection', 'Display', 'Symbology', 'Fields', 'Definition Query', 'Labels', and 'Joins & Relates'. The 'Symbology' tab is active, showing 'Draw all features using the same symbol.' and a preview of a solid olive green rectangle. A second red arrow points from the 'Layer Properties' dialog to the 'Symbol Selector' dialog box. The 'Symbol Selector' dialog has a 'Category' dropdown set to 'All' and a grid of color swatches. The 'Preview' section shows the selected olive green color. The 'Options' section includes 'Fill Color' (set to olive green), 'Outline Width' (0.25), and 'Outline Color'. Buttons for 'Properties...', 'More Symbols', 'Save...', 'Reset', 'OK', and 'Cancel' are visible at the bottom.

Symbology Settings

- Transparency

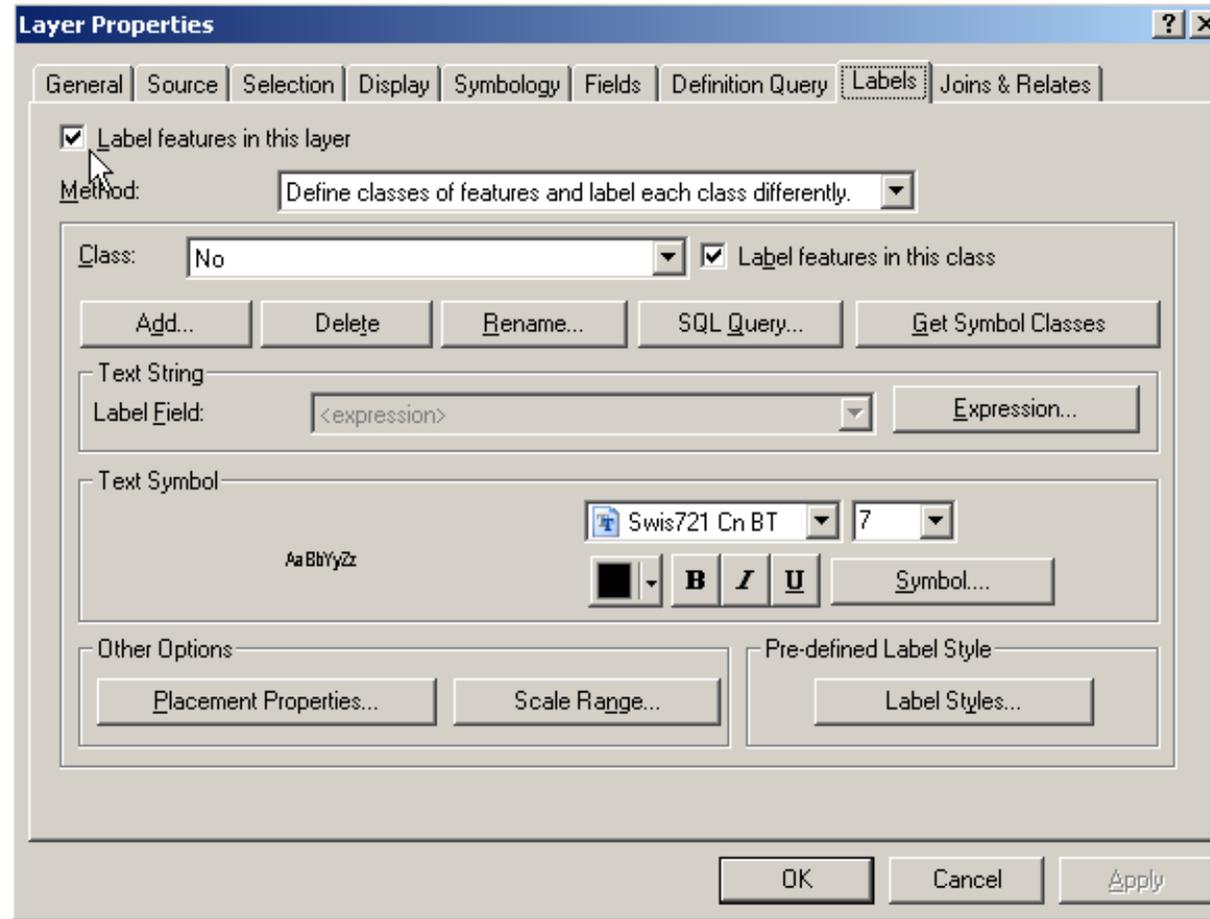


Symbol Layering



Auto Labeling Engine

- Font/Color
- Type Effects
- Placement Properties
- Scale Range

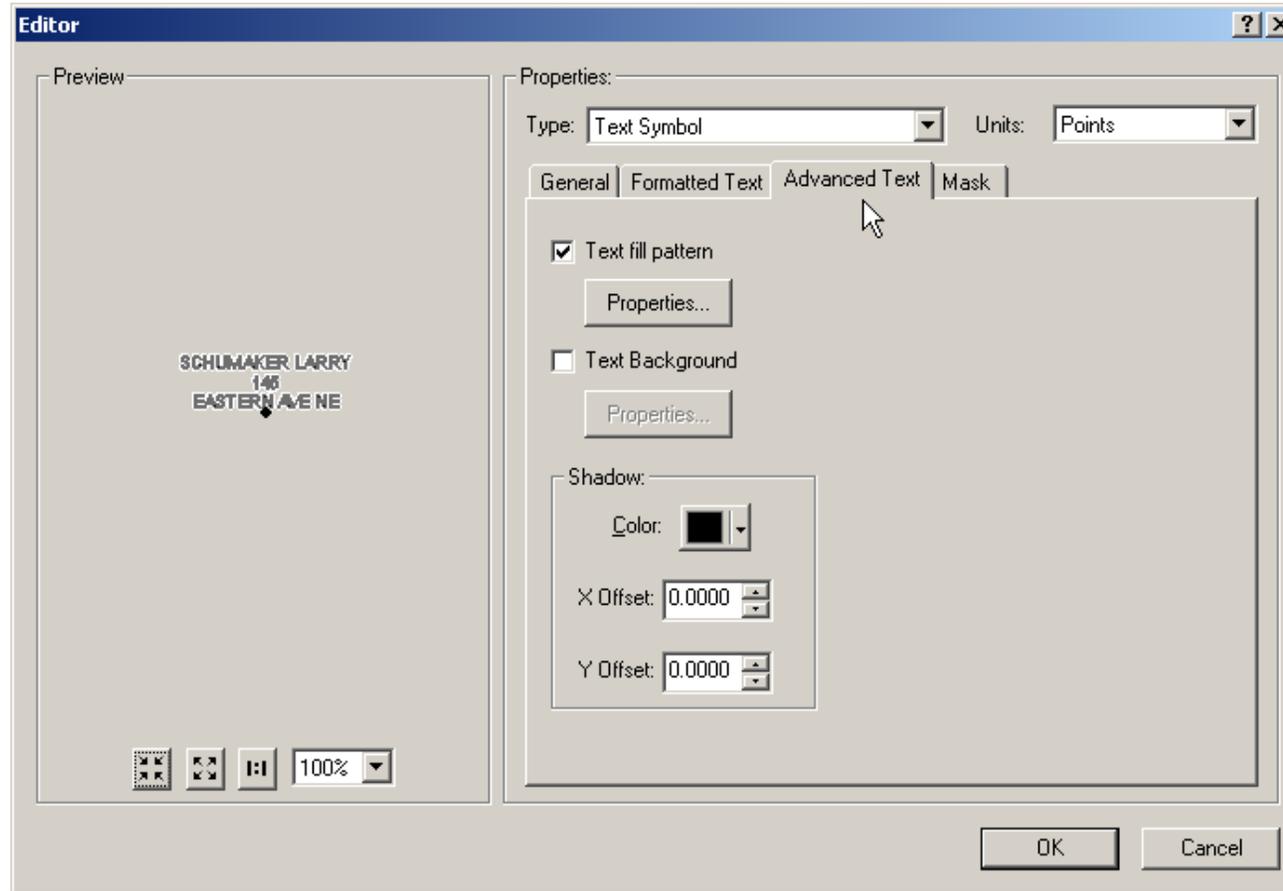


Advanced label settings



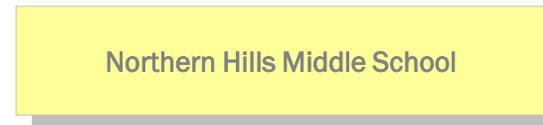
Label Symbol Editor

- Position & Character Spacing
- Text Fill
- Text Background
- Text Mask (Halo)



Common Labeling Techniques

- **Curved Line & Water Serif Font**
- **Visual Hierarchy in Size and Spacing**
- **Text Backgrounds and Masking**



Section 3 Exercises

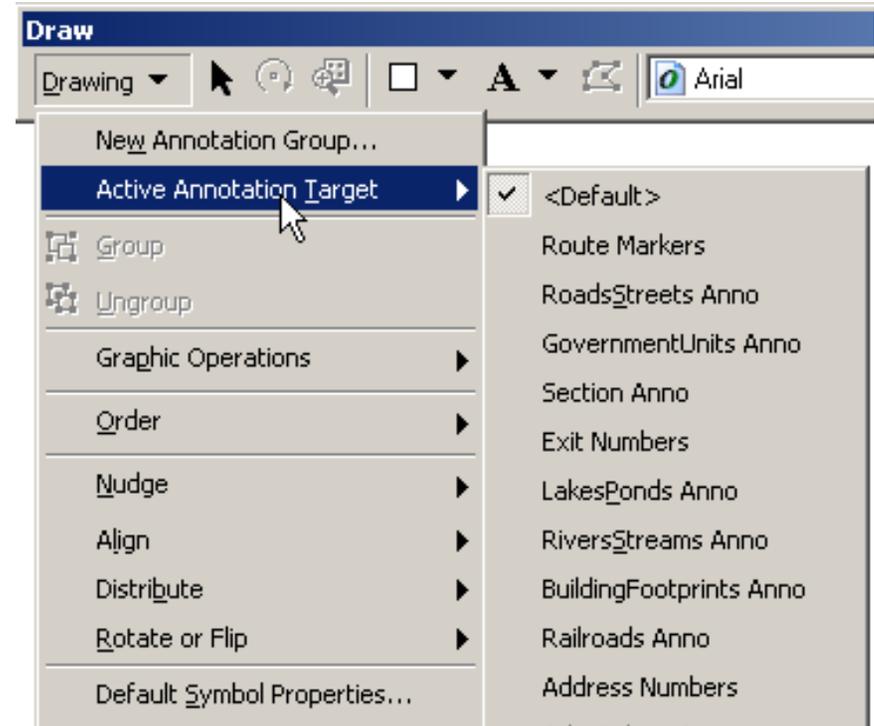
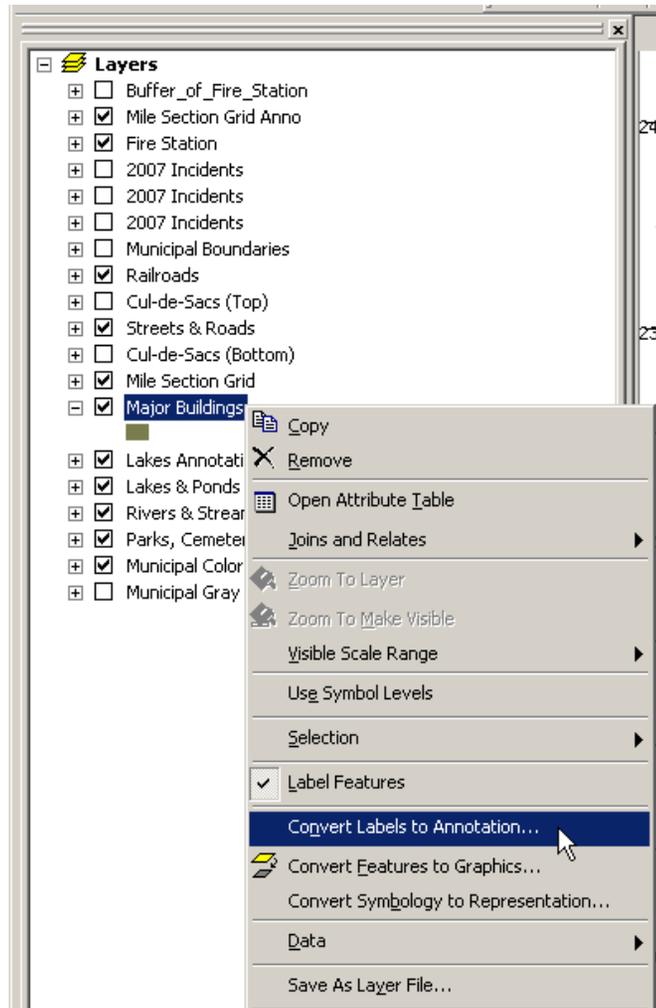
- Exercise 3-1 Changing Symbology Settings
- Exercise 3-2 Working with Labels

Section 4

Graphics & Annotation

Annotation In the Map

- Converting Labels to Annotation In the Map



Annotation In a Database

- Converting Labels to Annotation In a Database

The screenshot displays two dialog boxes in ArcGIS. The 'Convert Labels to Annotation' dialog box is in the foreground, with the following settings:

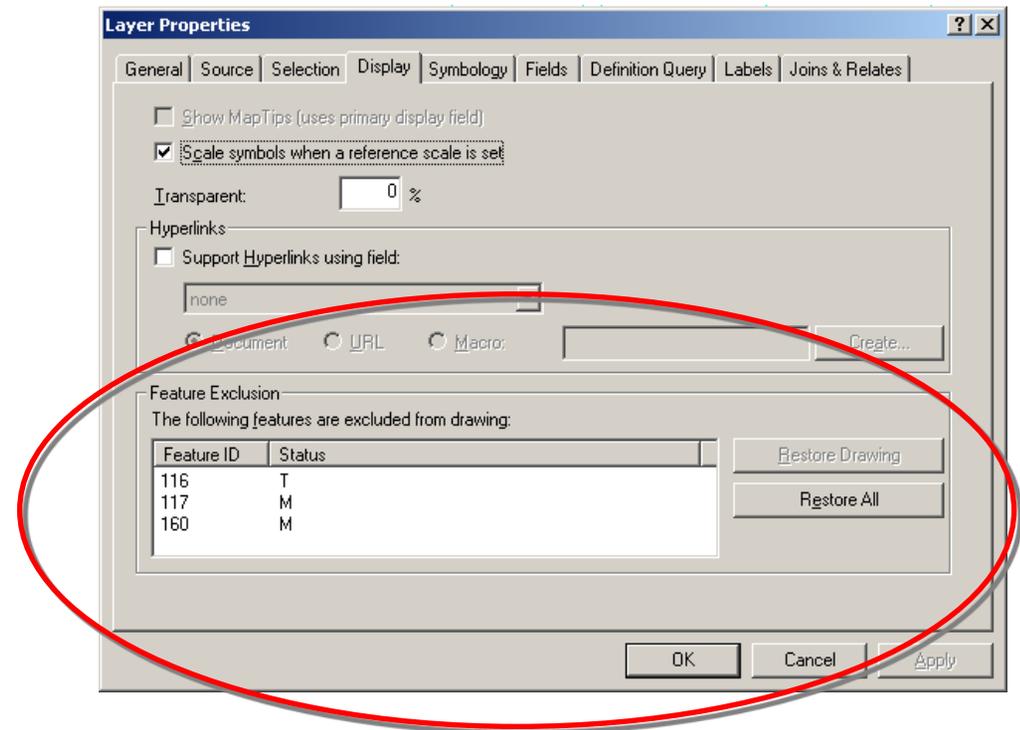
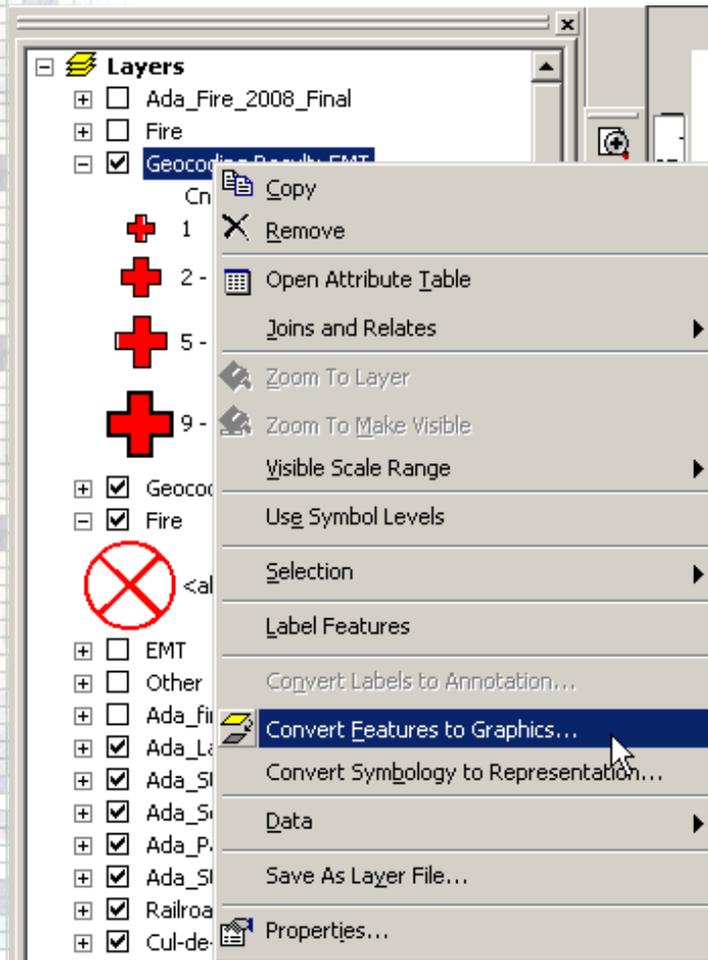
- Store Annotation: In a database, In the map
- Reference Scale: 1:297,296
- Create Annotation For: All features, Features in current extent, Selected features
- Feature Layer: Freeway/Highway
- Feature Linked:
- Append:
- Annotation Feature Class: Freeway_HighwayAnno
- Destination: \\TRANSPORTATION.Transportation_Network\Freeway_HighwayAnno
- Convert unplaced labels to unplaced annotation

The 'Create Annotation Feature Class' dialog box is also visible, showing the following settings:

- Look in: moorej
- Name: Freeway_HighwayAnno
- Save as type: Feature classes

The background map shows a road network with red dashed lines representing annotations.

Convert Symbology to Graphics



Return converted features to map

Graphics as Annotation Groups

- Map Graphics can be stored and managed as a Group.

The screenshot displays a GIS software interface. On the left, a context menu is open, showing options such as 'New Annotation Group...', 'Active Annotation Target', 'Group', 'Ungroup', 'Graphic Operations', 'Order', 'Nudge', 'Align', 'Distribute', 'Rotate or Flip', and 'Default Symbol Properties...'. The 'Graphic Drawings' option is selected, and a tooltip 'Graphic Drawings' is visible. Below the menu, a text field contains 'Parcel_Address'. At the bottom, a toolbar shows 'Drawing' mode, a mouse cursor, and the font 'Arial'.

On the right, the 'Data Frame Properties' dialog box is open, showing the 'Annotation Groups' tab. The dialog has tabs for 'General', 'Data Frame', 'Coordinate System', 'Illumination', 'Grids', and 'Map Cache'. The 'Annotation Groups' tab contains a table with the following data:

Group Name	Associated Layer	Reference Scale
<input checked="" type="checkbox"/> <Default>	<n/a>	<None>
<input checked="" type="checkbox"/> Graphic Drawings	<None>	<None>

Buttons on the right side of the dialog include 'Select All', 'Clear All', 'New Group...', 'Remove Group', and 'Properties...'. At the bottom of the dialog, it says 'Draw annotation using this coordinate system:'.

Converting Elements to Graphics

MAP LEGEND

Roads & Streets

- Freeway
- Freeway Ramp
- Highway
- Primary
- Secondary
- Proposed/U.C.
- Private

Boundary
s
s, Etc.

A screenshot of a context menu with the following options: Zoom Whole Page, Zoom to Selected Elements, Cut (Ctrl+X), Copy (Ctrl+C), Delete, **Convert To Graphics** (highlighted), Group, Ungroup, and Graphic Operations.

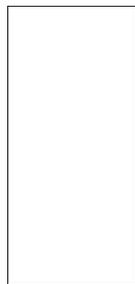
MAP LEGEND

Roads & Streets

- Freeway
- Freeway Ramp
- Highway
- Primary
- Secondary
- Proposed
- Private

Roads
on Lines
Municipal Boundary
Buildings
& Ponds
& Streams
, Cemeteries, Etc.

A screenshot of a context menu with the following options: Zoom Whole Page, Zoom to Selected Elements, Cut (Ctrl+X), Copy (Ctrl+C), Delete, Convert To Graphics, **Ungroup** (highlighted), Group, Graphic Operations, Order, and Nudge.



Layer graphics for extra
Drop Shadow effects

Railroads

Section Lines

Municipal Boundary

Managing Multiple Graphics



GROUPING

ORDER

ALIGNMENT

SIZE

ROTATE

Primary Element with Blue Selection Color

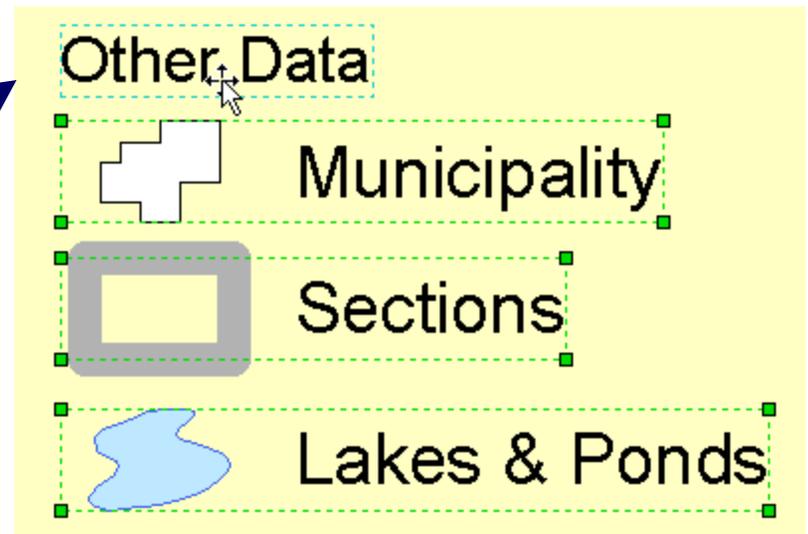


Image Graphics or “Pictures”

Original Size



Scaled Down



1
Miles

File Grid, 1" = 0.22 Miles



Image Types (files extensions)

Raster

.bmp, .jpeg, .tiff, .gif,
.png

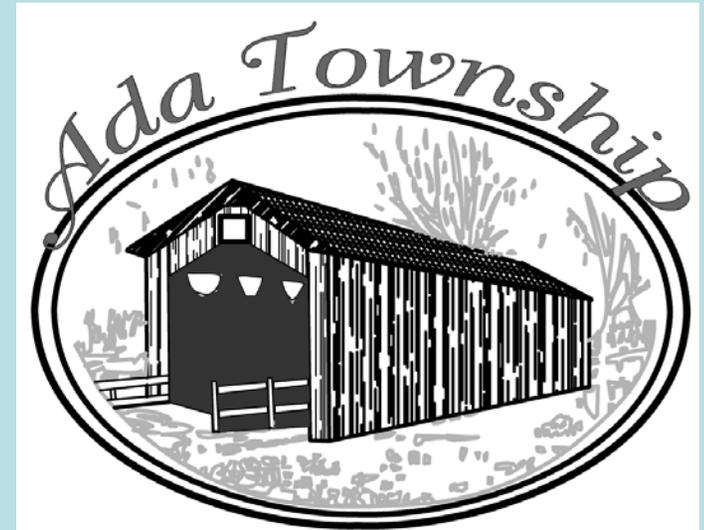
Raster & Vector

.wmf, .emf

(Quality is less effected with
resizing)

.bmp

.jpeg



Transparency Support

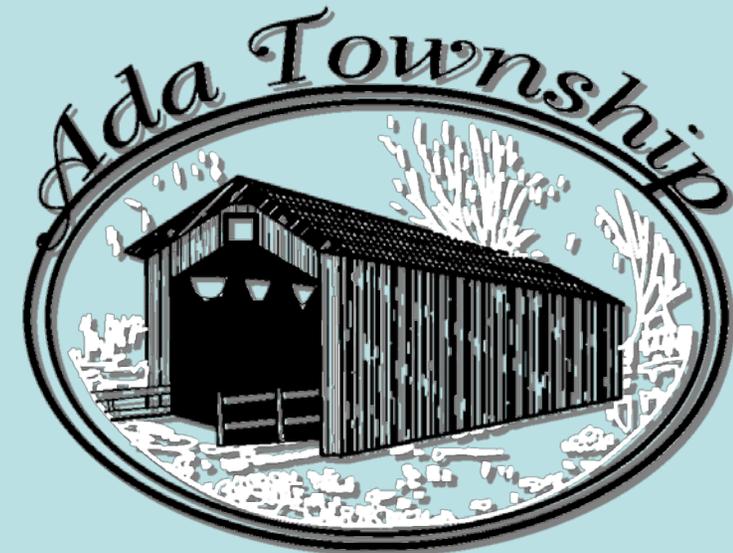
.gif

.png

.tif

.emf

.wmf



Section 4 Exercises

- Exercise 4-1 Annotation in the Map
- Exercise 4-2 Annotation in a database
- Exercise 4-3 Converting Symbols to Graphics

Section 5

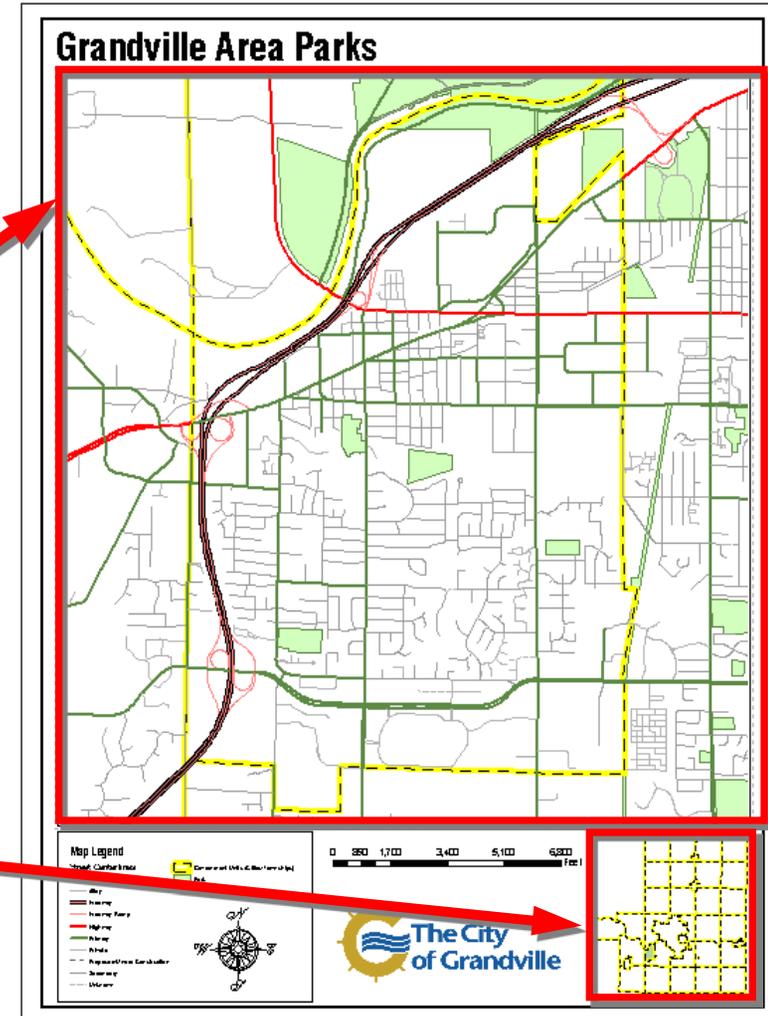
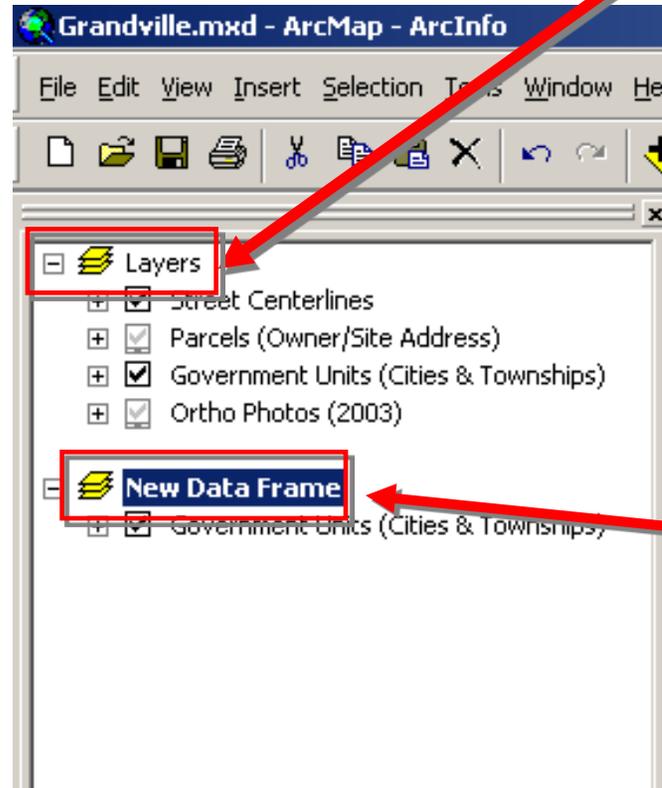
Data Frame Layout Properties

Data Frame Management

Adding Data Frames

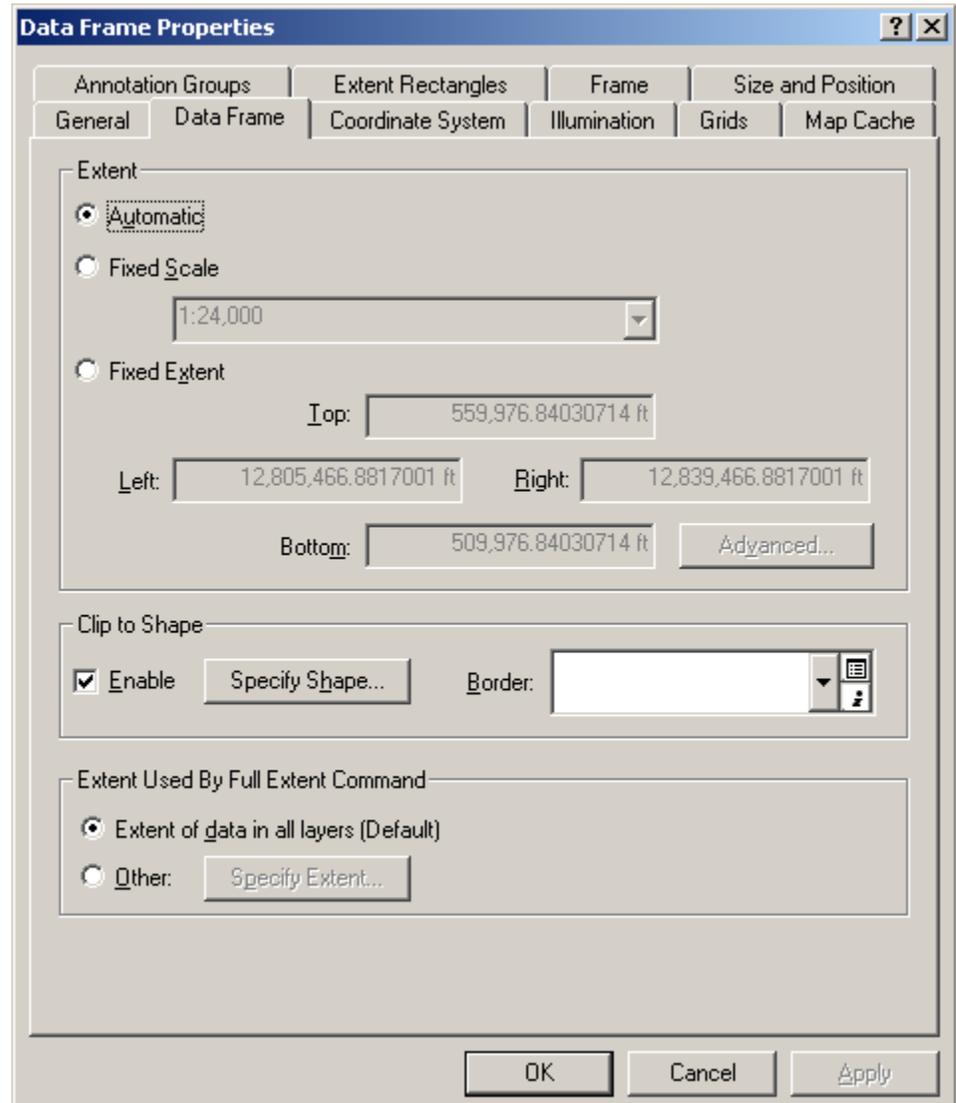


Data frames



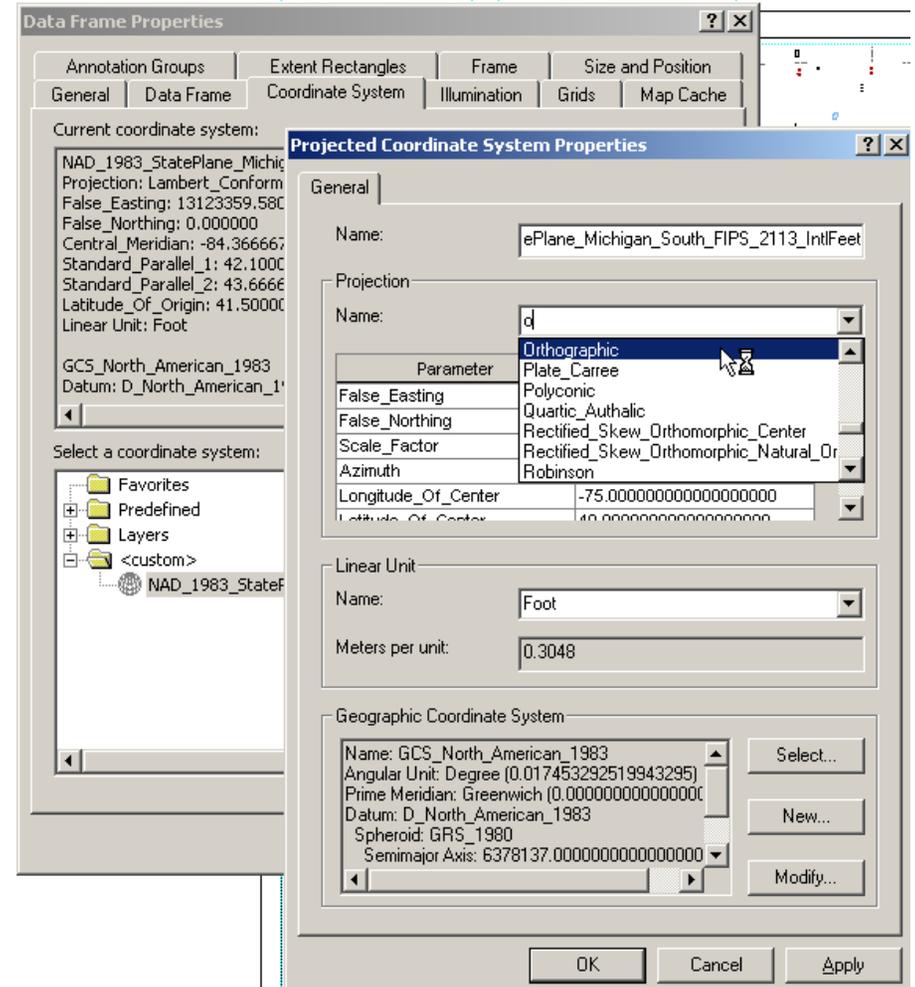
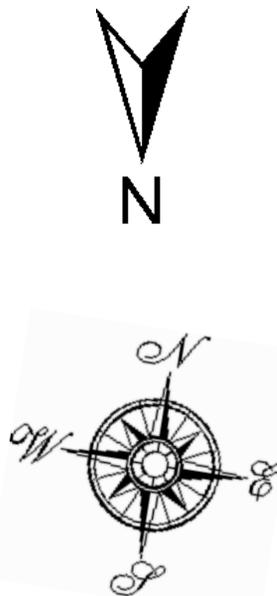
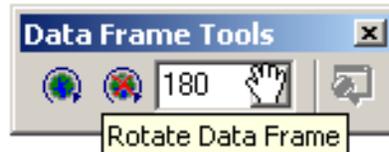
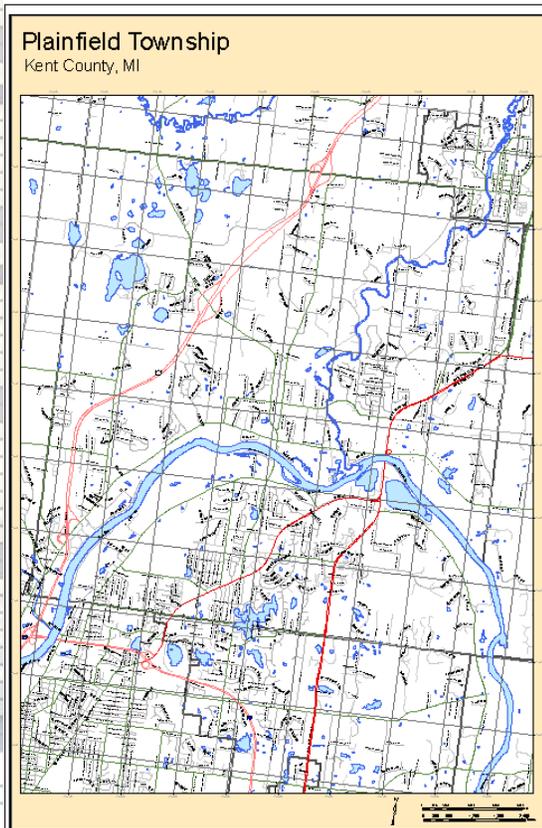
Data Frame Management

- Data Frame Tab



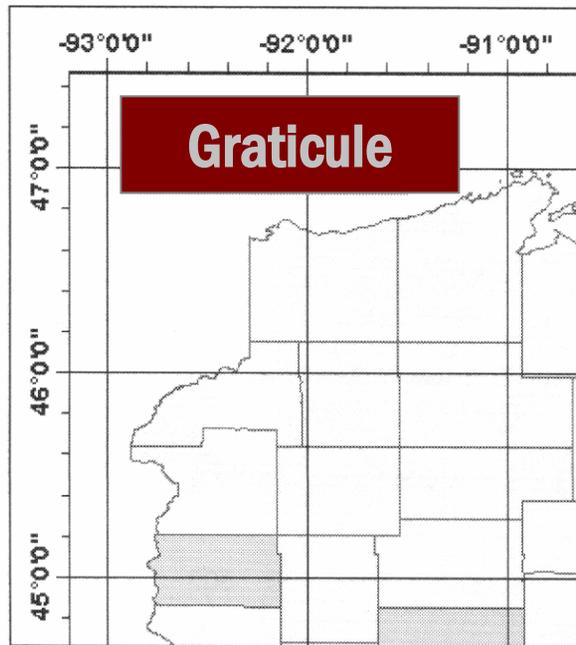
Data Frame Management

- Projection/Coordinate
- Rotate Data Frame

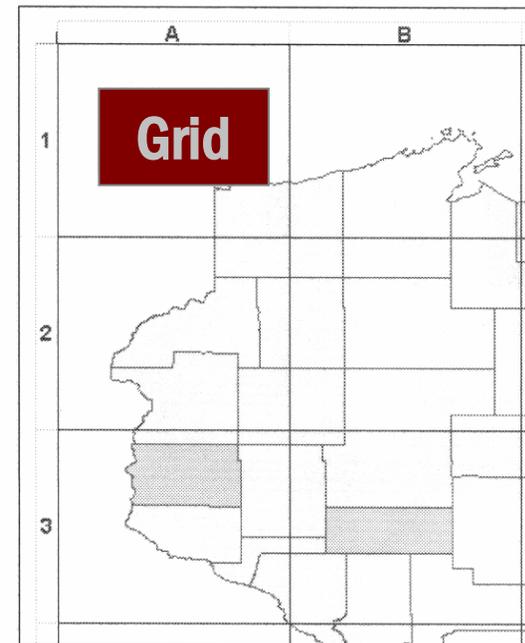


Data Frame Management

- Grids and Graticules



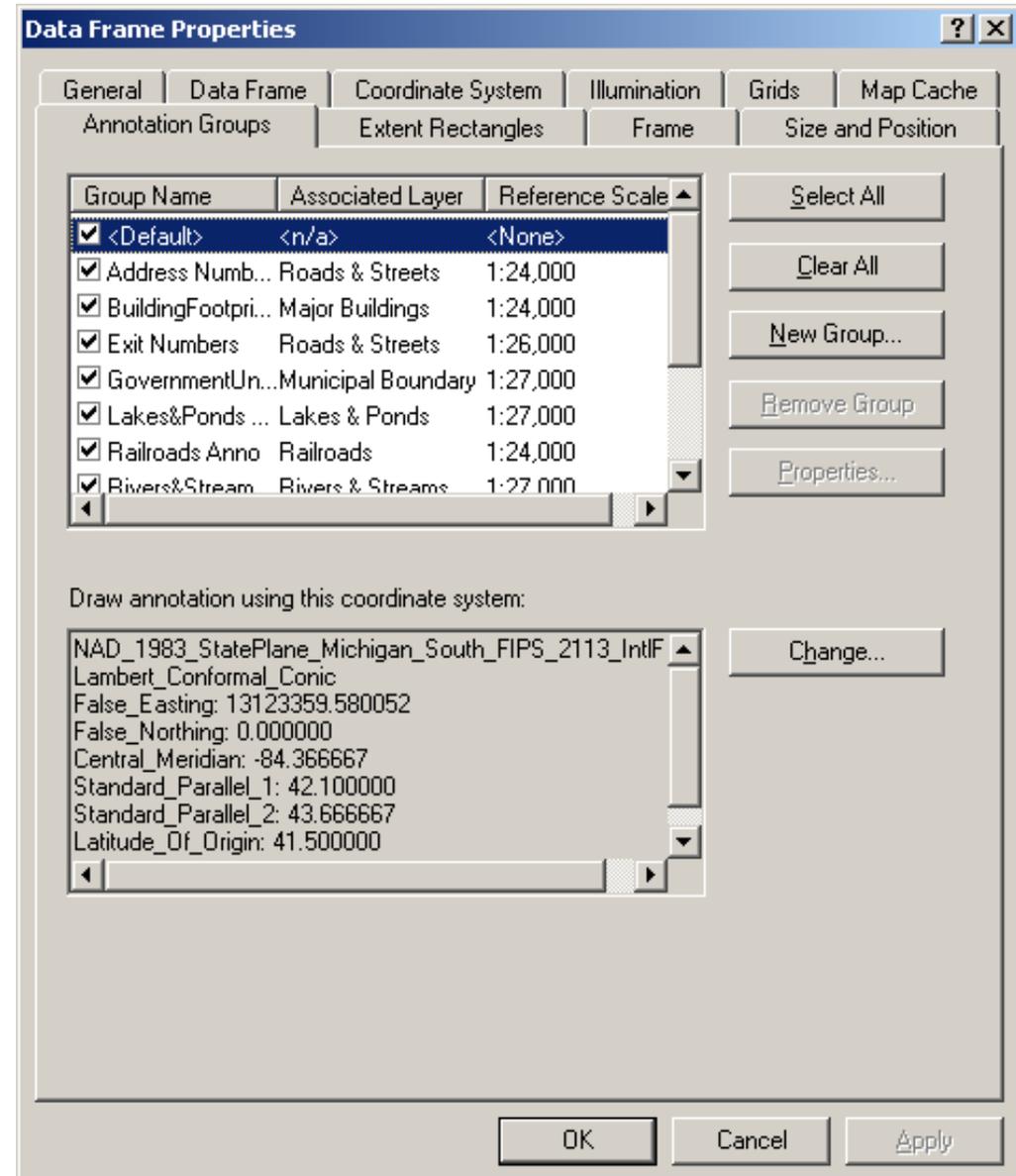
Latitude/Longitude, feet, meters, etc.



ABC/123, others

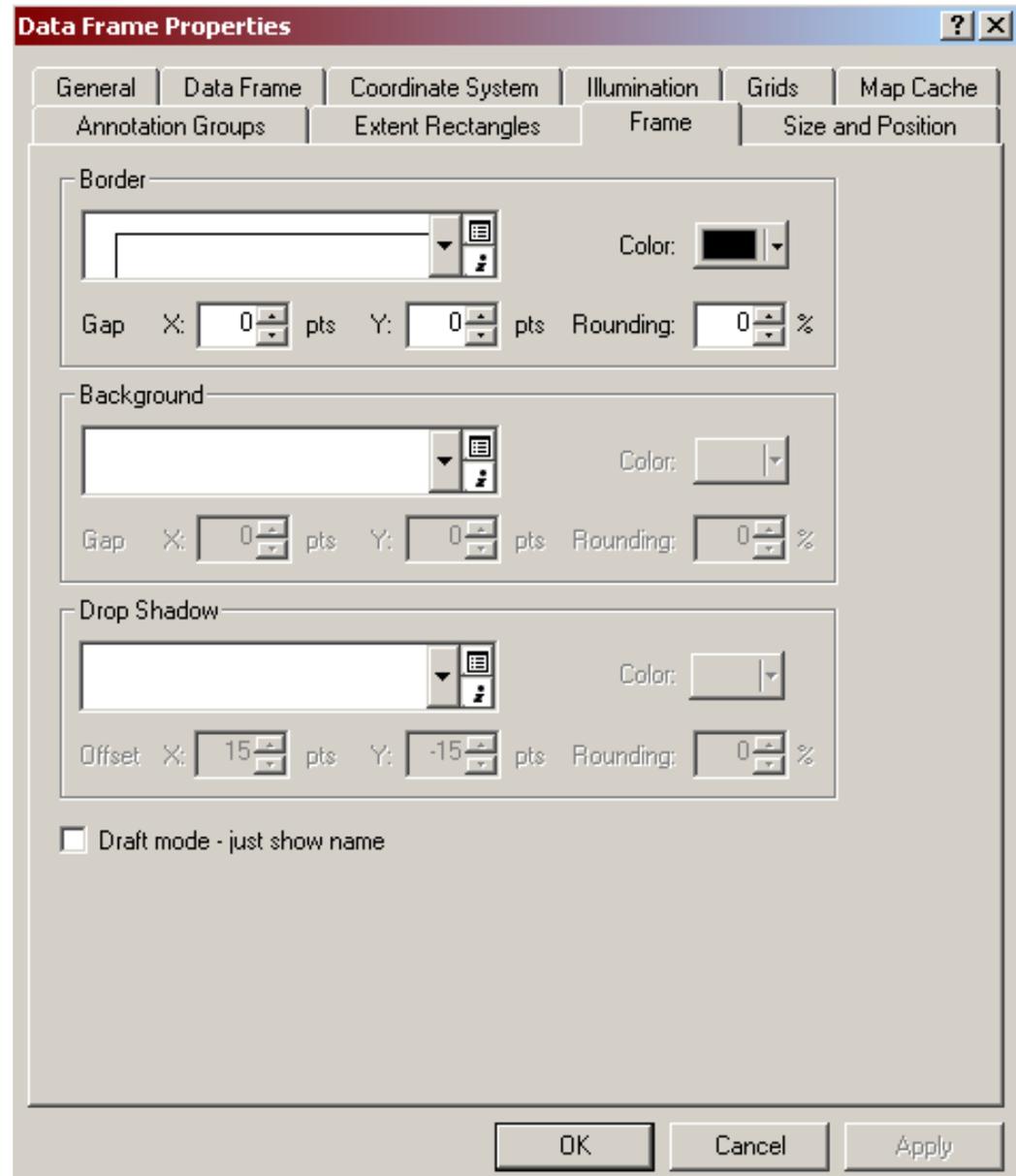
Data Frame Management

- Annotation Groups



Data Frame Management

- Frame



Section 5 Exercises

- Exercise 5-1 Data Frame Management

Section 6

Map Production

Printing and Plotting Maps

Print

Printer Name: Client\REGIS07#\SERVER\HPDJ5500
Status: Ready
Type: HP designjet 5500ps 42 by hp
Where: CLIENT\REGIS07#\SERVER\HPDJ5500
Comments: Auto Created Client Printer REGIS07

Printer Engine: Windows Printer
Output Image Quality (Resample Ratio): Normal
Ratio: 1 : 1
Number of Copies: 1
 Print to File

File menu options: New..., Open..., Save, Save As..., Add Data..., Add Data from I..., Page and Print S..., Print Preview..., **Print...**, Map Properties..., Import from ArcView project..., Export Map..., Exit (Alt+F4)

Choose a printer engine
ArcPress
PostScript
Windows

Page and Print Setup

Printer Setup Name: Client\REGIS07#\SERVER\HPDJ5500
Status: Ready
Type: HP designjet 5500ps 42 by hp
Where: CLIENT\REGIS07#\SERVER\HPDJ5500
Comments: Auto Created Client Printer REGIS07

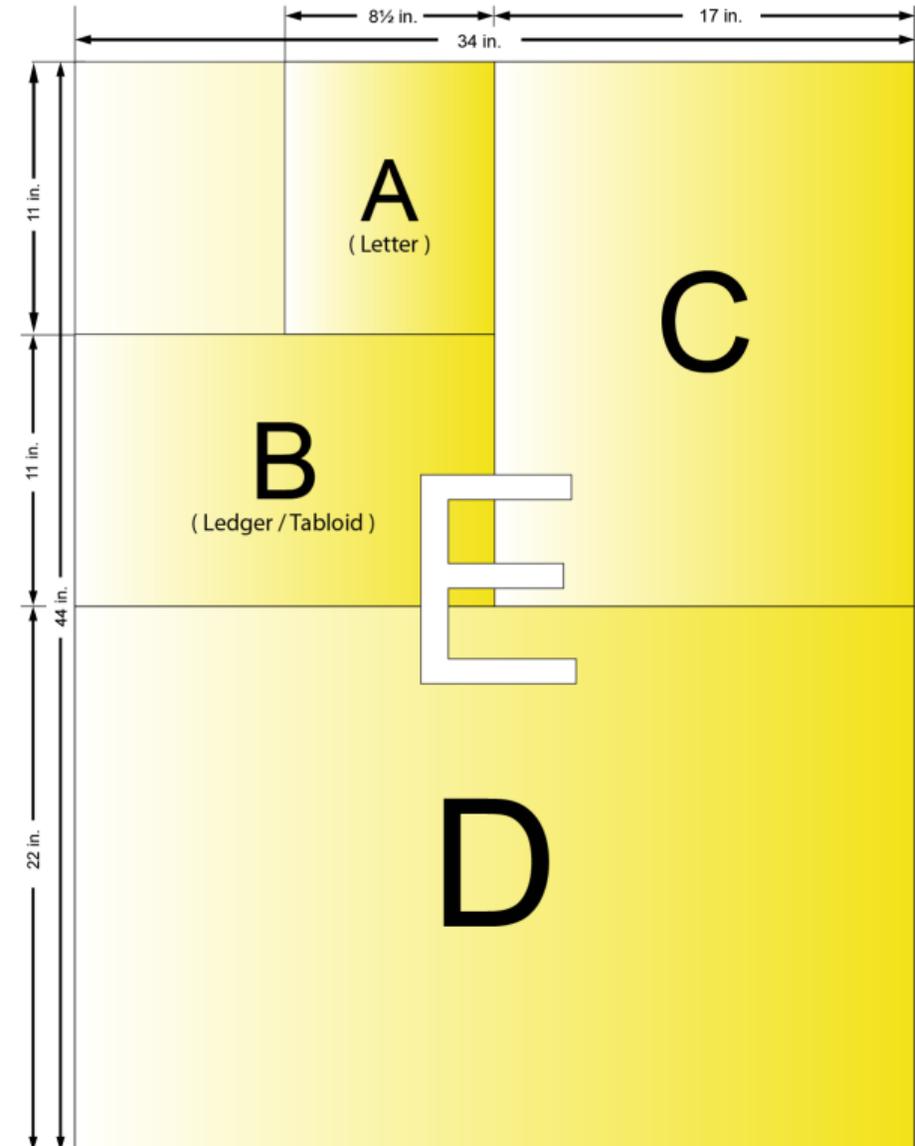
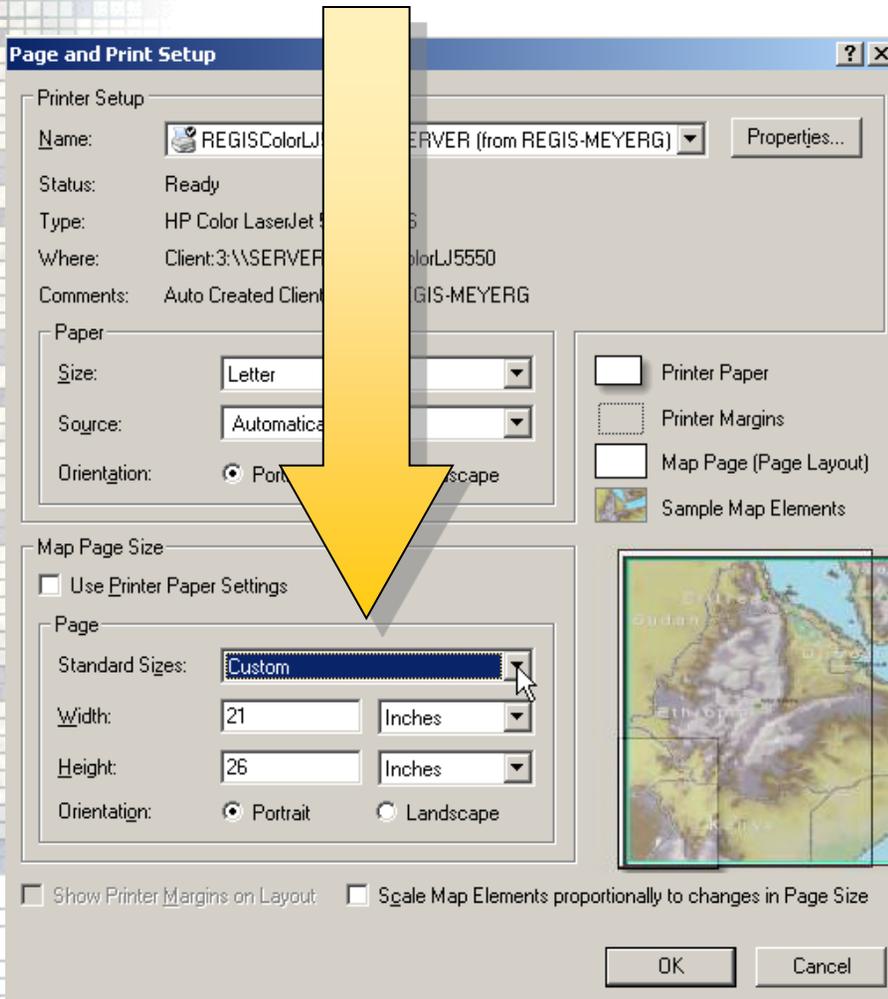
Paper Size: ANSI A - 8 1/2 x 11 in.
Orientation: Portrait Landscape

Map Page Size Use Printer Paper Settings
Page Size that will be used is equal to Printer Paper Size
Width: 8.5 Inches
Height: 11 Inches
Orientation: Portrait Landscape

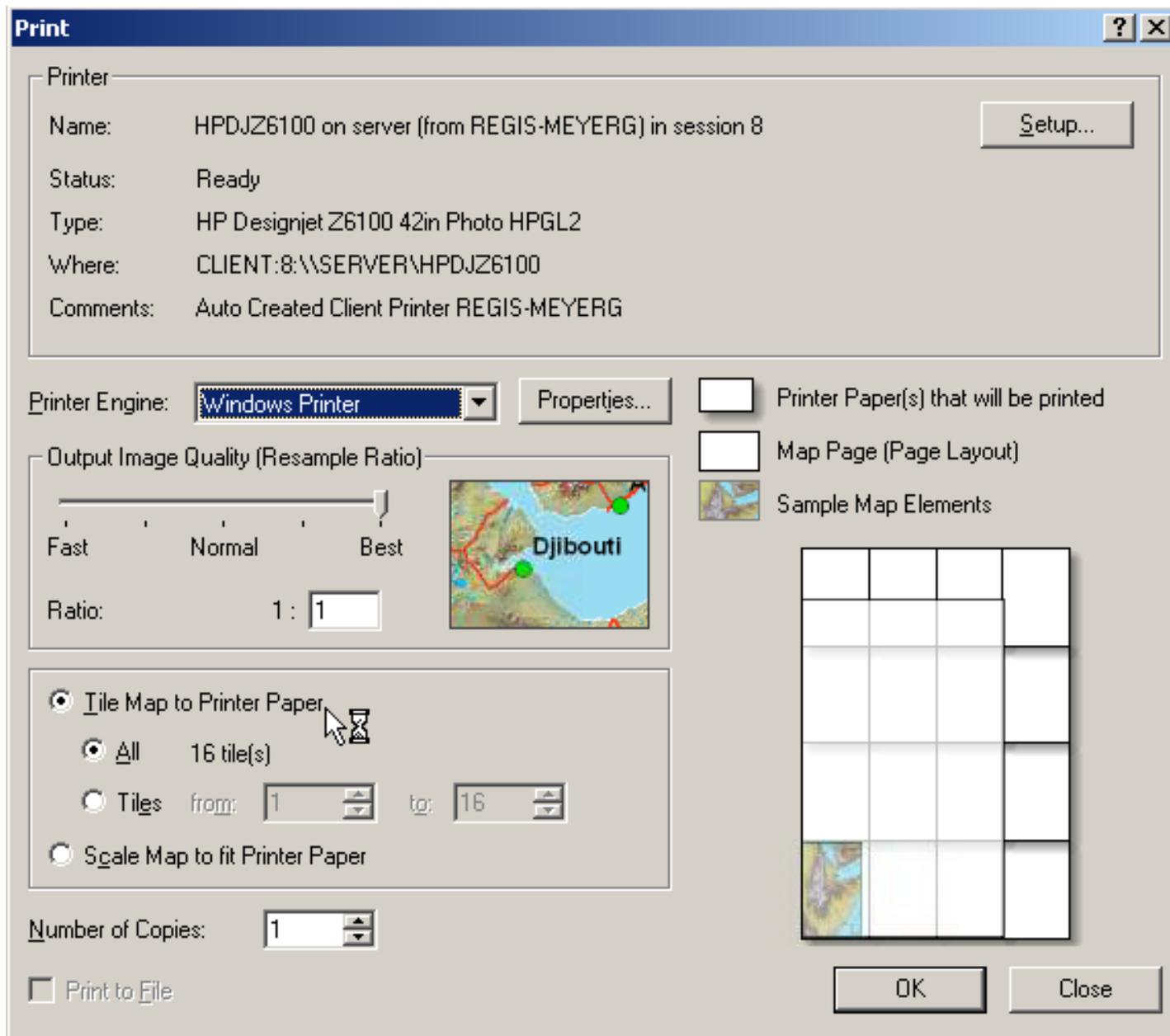
Windows
printer engine

Common Paper Sizes

- Using Standard Sizes Option

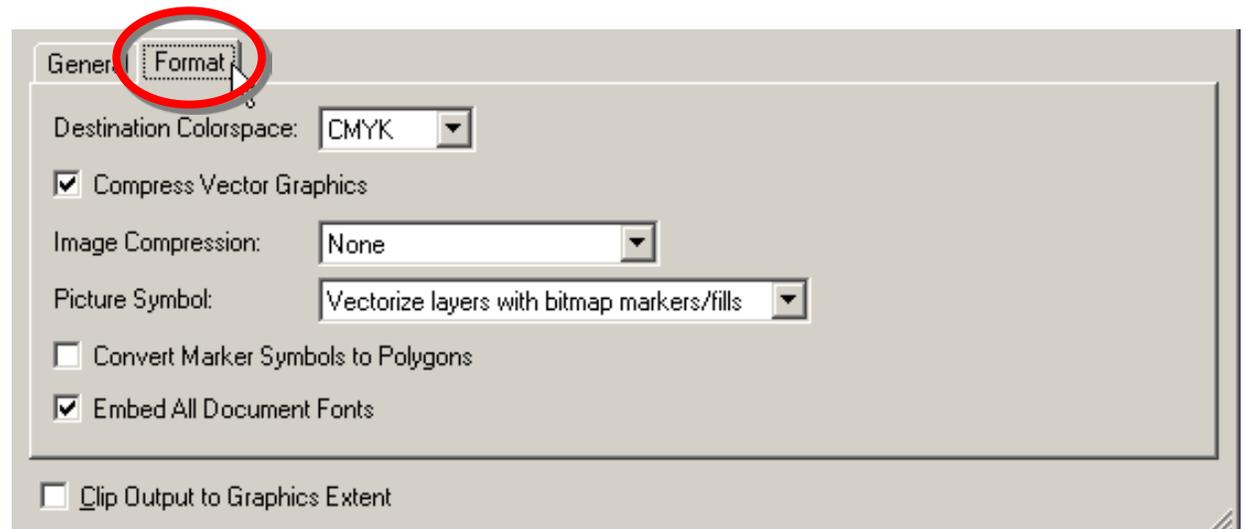
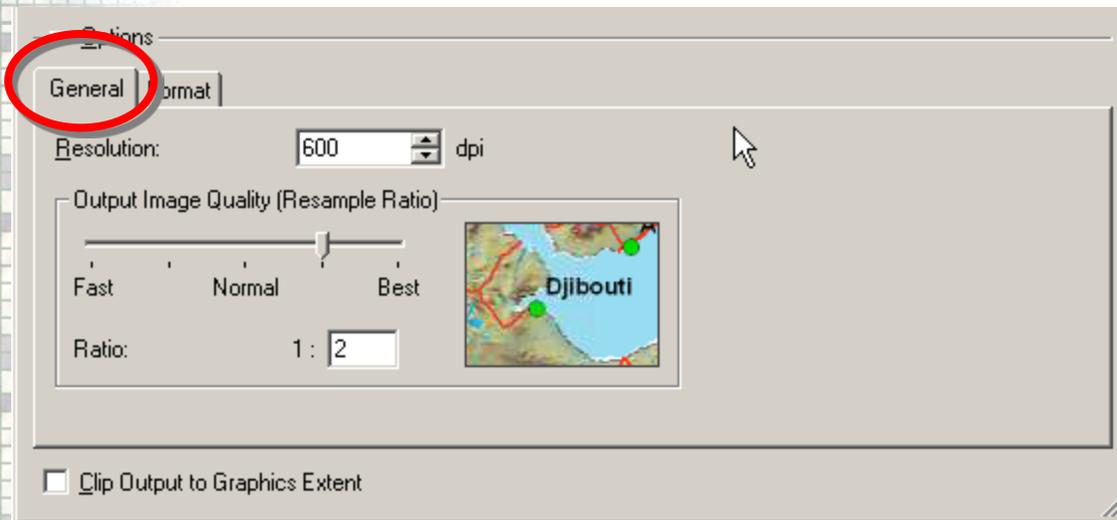


Tile Maps to Printer

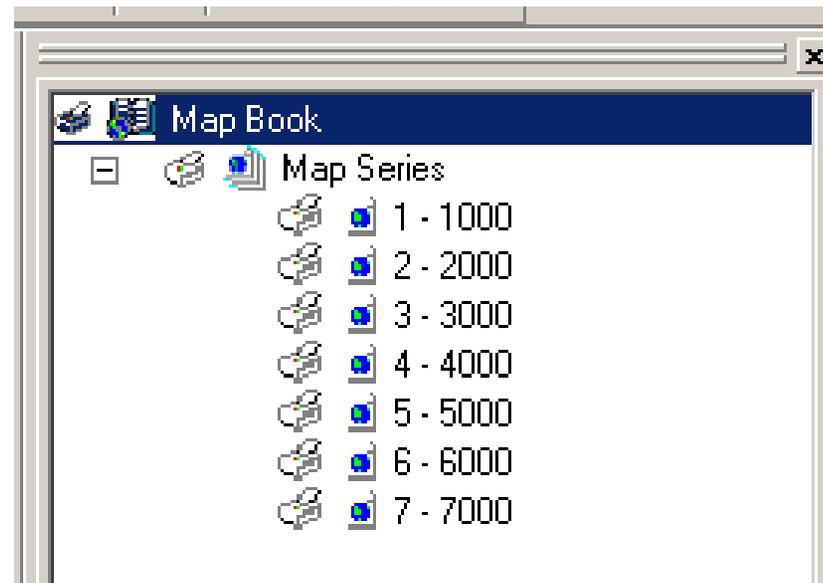
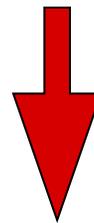
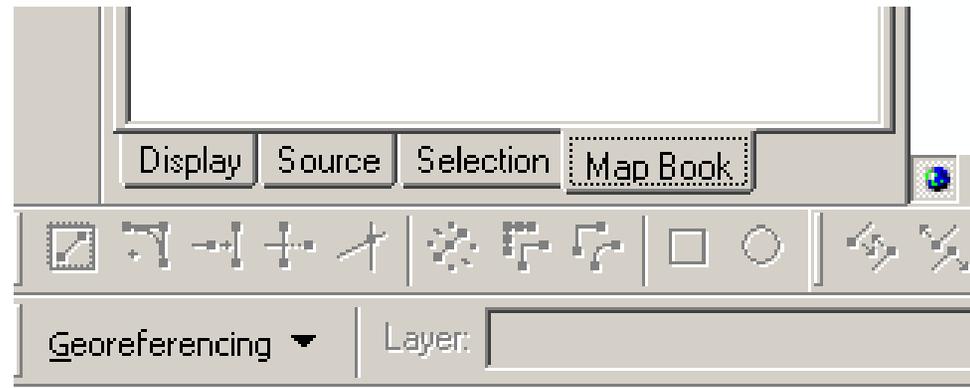


Exporting maps as digital files

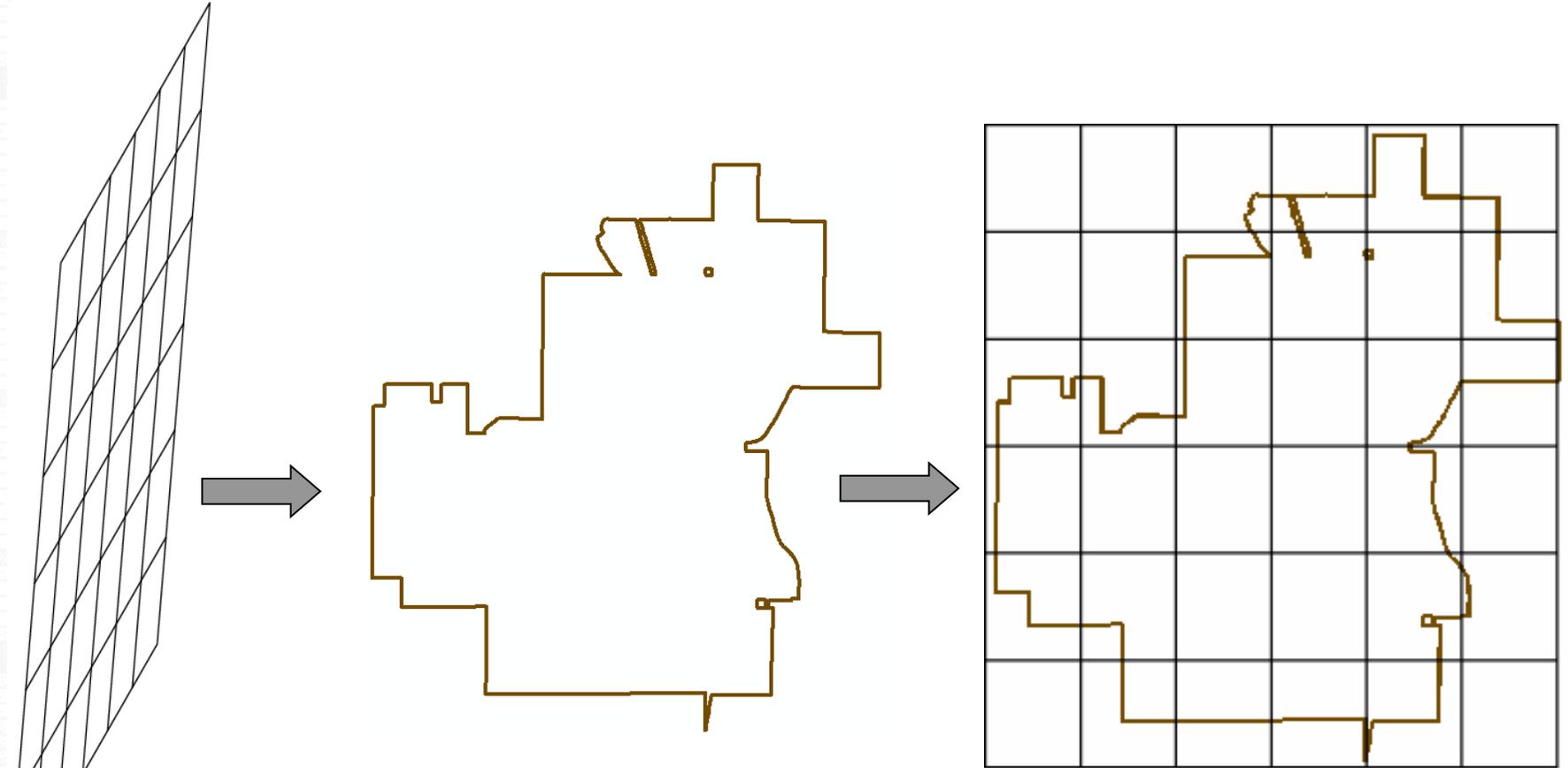
- Export a print of entire map layout: *File>Export Map*



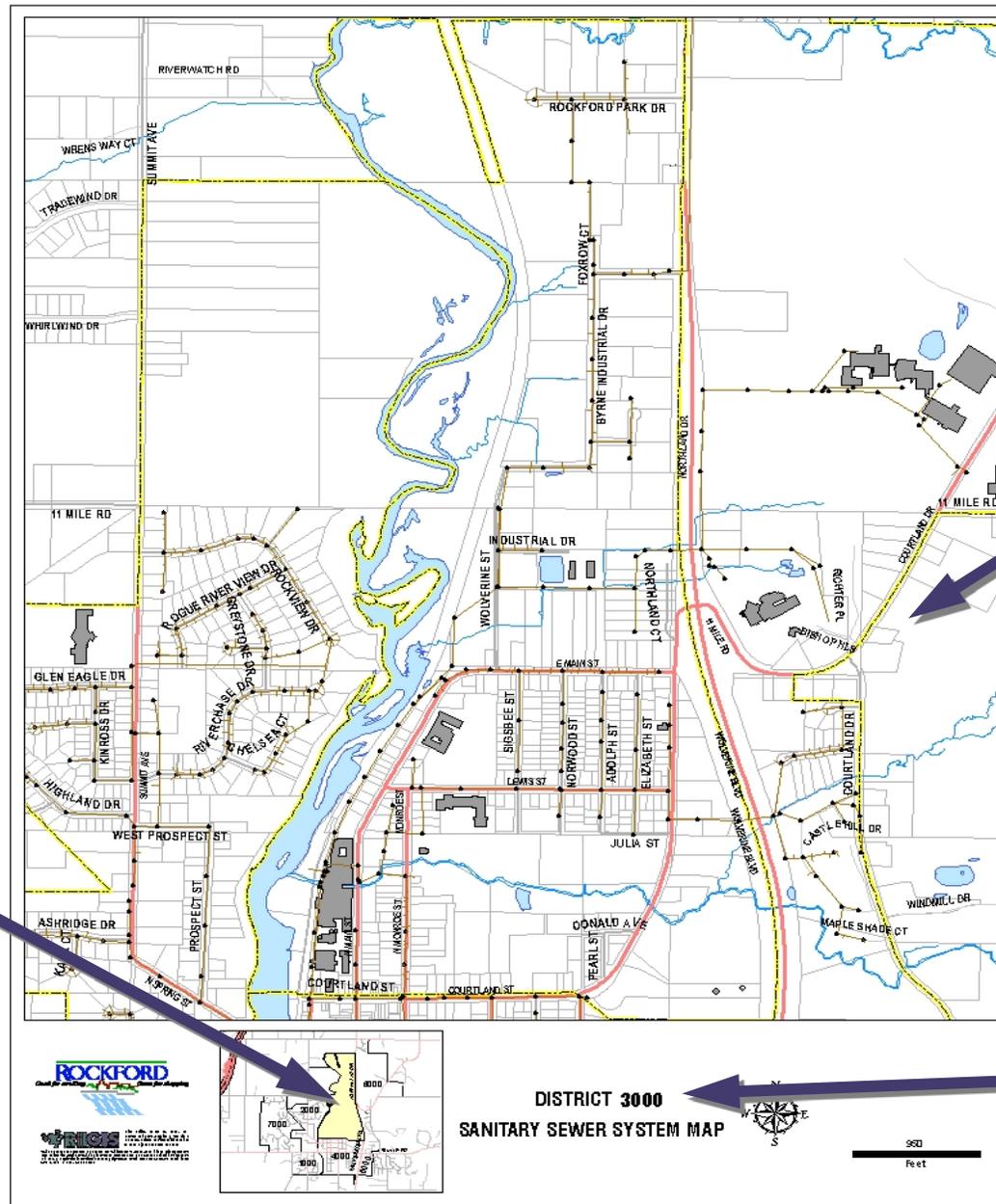
Map Book Creation



Map Book Index Grid



Map Book Creation



Large Scale Snapshot

Index Map

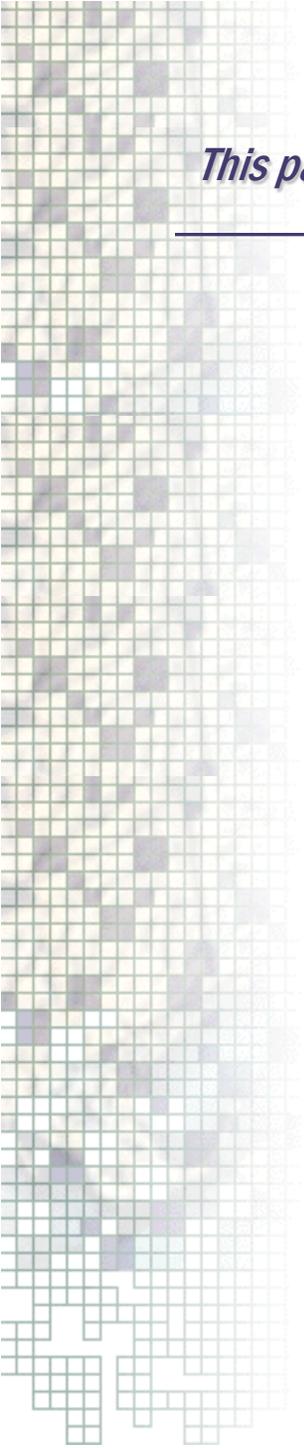
Page/Index ID

DISTRICT 3000
SANITARY SEWER SYSTEM MAP

Section 6 Exercises

- Exercise 6-1 The Map Book Tool

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Section 7

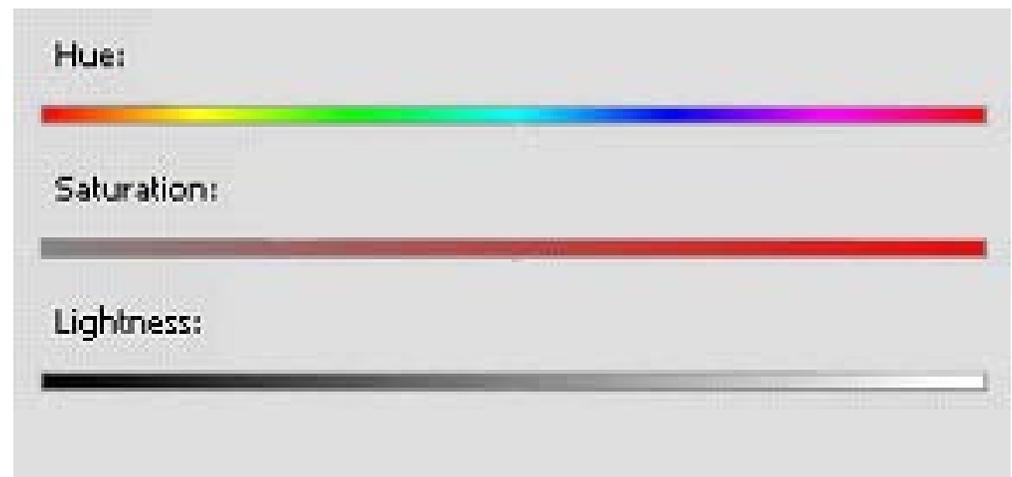
Color Cartography

Cartography and Color Theory

- There is no absolute measure of color.
- Using color in mapping instantly creates a value of subjectivity.
 - Can be the most difficult aspect of cartography
- A map with good use of contrast (or value of lightness) is most important in cartography

Color Characteristics

- Hue (Color)
- Saturation (Chroma, Intensity, Purity)
- Contrast (Value or Lightness)



Color Spectrum

12 Total Colors

- 3 Pure Colors
 - Yellow
 - Red
 - Blue
- 9 Secondary Colors
- Most maps do not use “pure” color values.
Grays or “neutral” color values are used for realism.
- Most objects in reality are perceived as neutral colors.



Logical Color Association

- **Blue: Water**
- **Red with warm and Blue with cold temperature**
- **Yellow and tans for dry and little vegetation**
- **Brown for land surfaces (contours or uplands)**
- **Green for lush/thick vegetation**

Color Theory – Subjectivity/Mood

1. Reddish Browns (most calming)

2. Warm – Aggressive

Exposure to bright **reds** has been observed to increase one's adrenaline.

1. Cool – Controlled

Blue has been proven to be the most preferred color overall.

Color Theory – Subjectivity/Mood

Yellow: Cheerfulness, dishonesty, youth, light, hate, cowardice...etc.

Red: Action, life, blood, fire, heat, passion, danger, power, loyalty, bravery, anger, excitement...etc.

Blue: Coldness, serenity, depression, melancholy, truth, purity, formality, depth, restraint

Orange: Harvest, fall, middle life, tastiness, abundance, fire, attention, action.

Reddish Browns (ochre, earth colors): Warmth, cheer, deep worth, friendly, cozy.

Green: Immaturity, youth, spring, nature, envy, greed, jealousy, cheapness.

Purple (violet): Dignity, royalty, sorrow, despair, richness.

White: Cleanliness, faith, purity, sickness.

Black: Mystery, strength, mourning, heaviness.

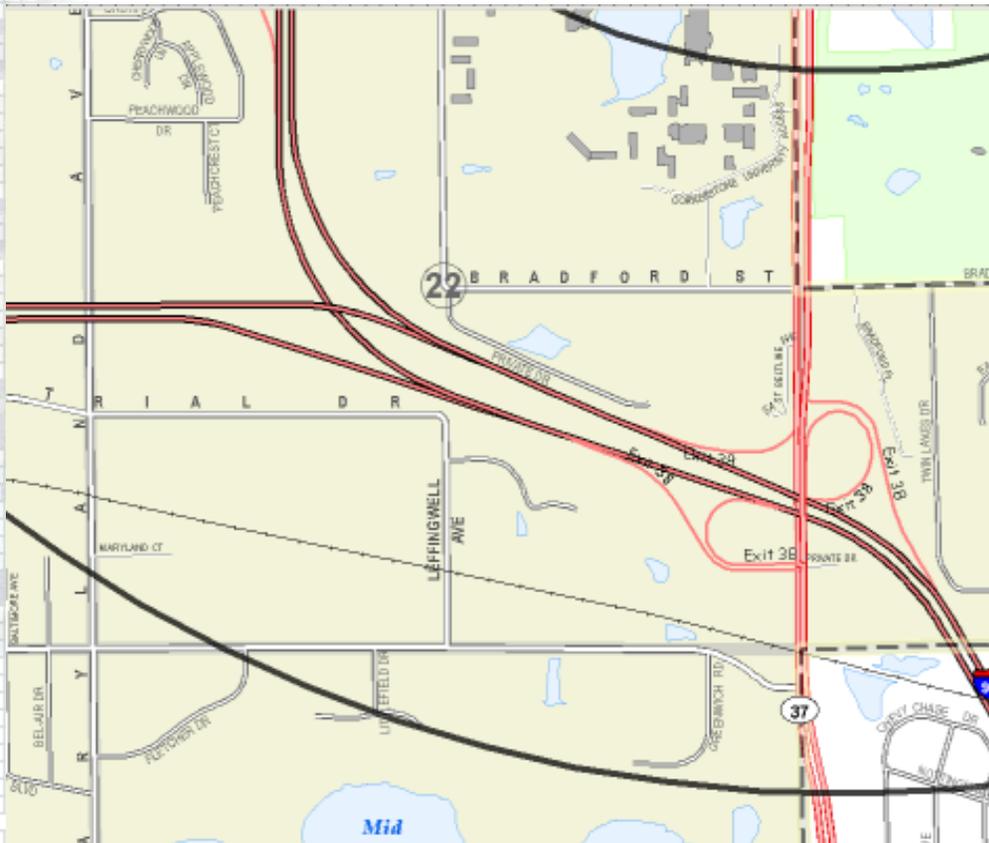
Grays: Quiet & reserved, controlled emotions, can be used to create a sophisticated atmosphere.

Color Methods – Warm Color Symbolology

- Warm colors advance while cool colors recede



Feature & Background Relationship



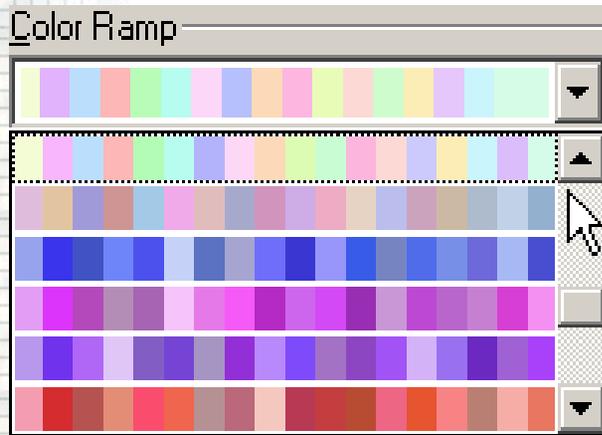
Controlling Color Dominance

Order of Color Dominance & Relative Values

Yellow	9
Orange	8
Red	6
Green	6
Blue	4
Violet	3

Grouping & Harmony

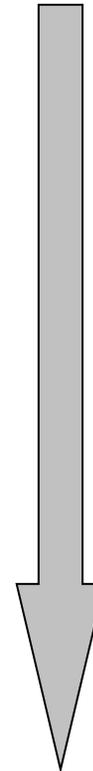
Color scheme selection in ArcMap



Label Color

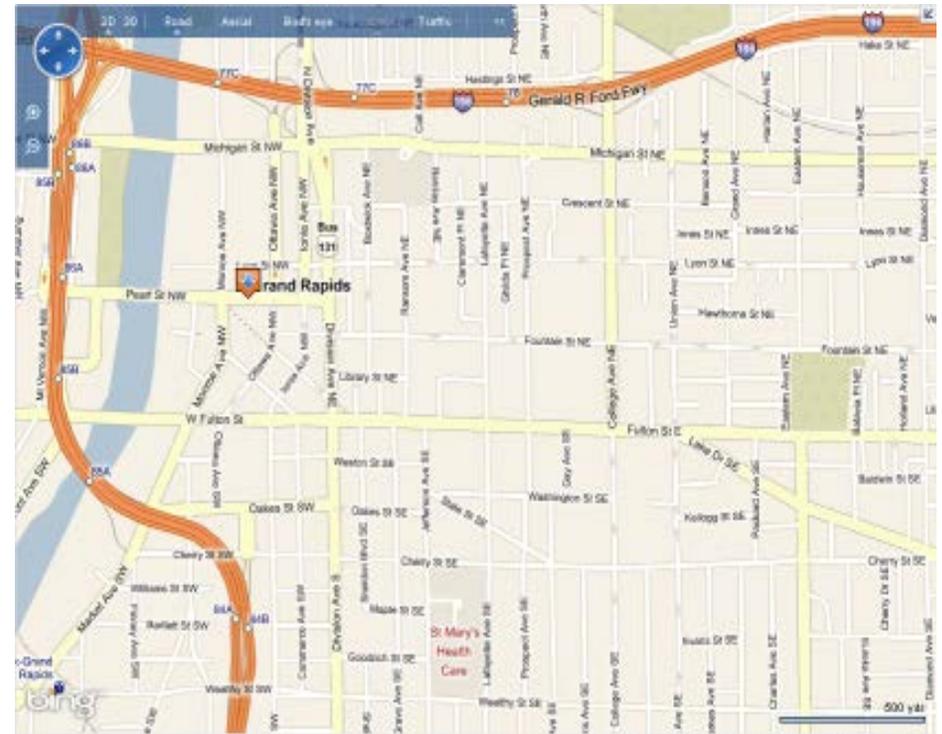
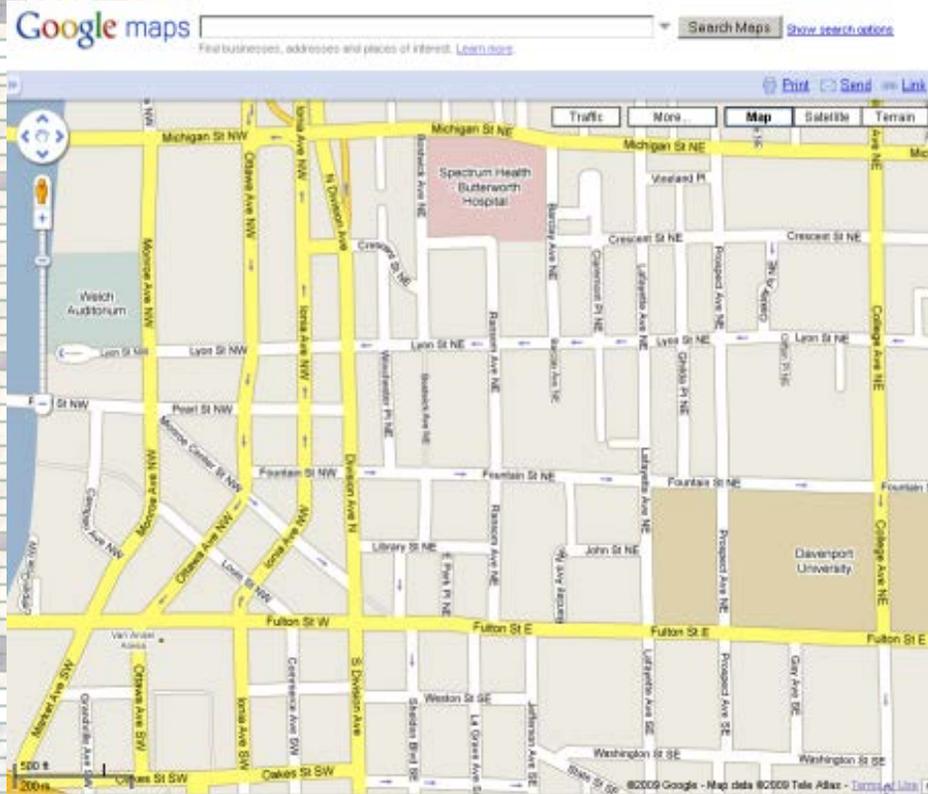
1. Black on Yellow
2. Green on White
3. Blue on White
4. White on Blue
- 5. Black on White**
6. Yellow on Black
7. White on Red
8. White on Orange
9. White on Black
10. Red on Yellow
11. Green on Red
12. Red on Green

Most Legible



Least Legible

Popular Black on Yellow Text Examples



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Summary of Color & Contrast Rules

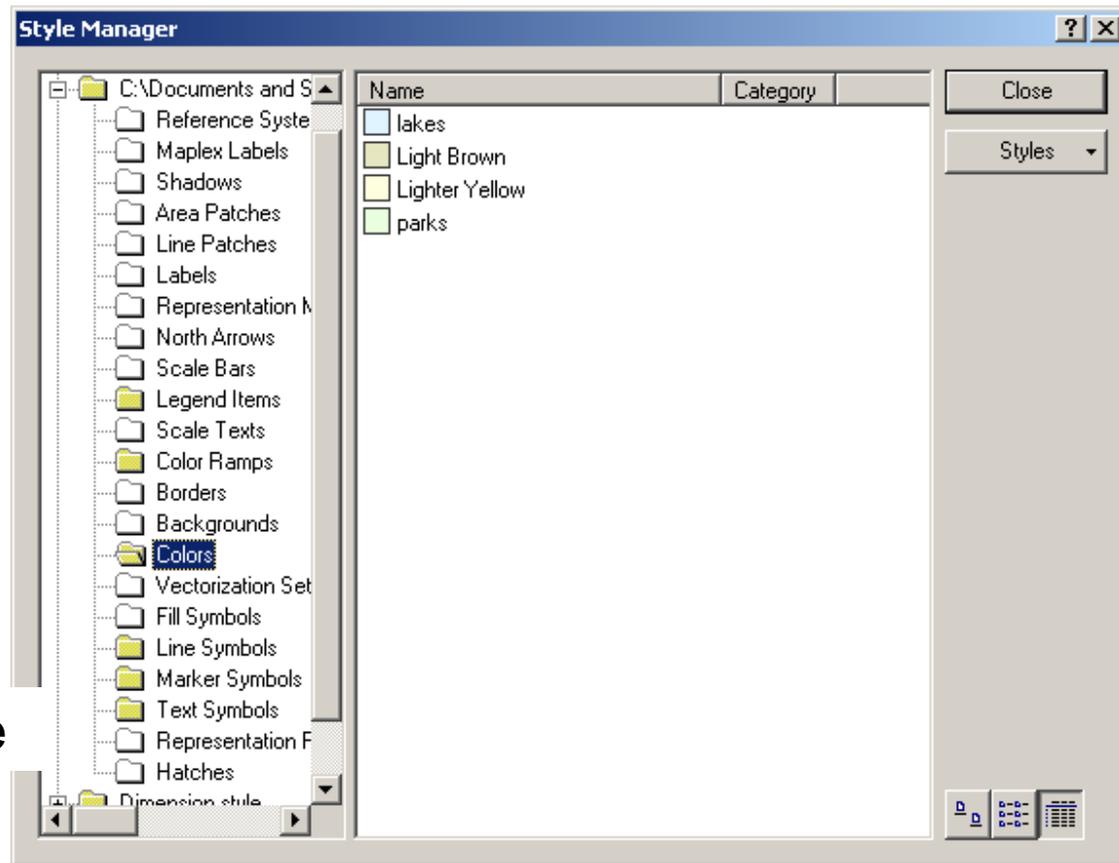
1. Avoid pure hues – add grays and contrast.
2. Careful use of pure black. Most effective for very fine lines or labeling
3. Maintain visual hierarchies with saturation and contrast.
4. Do not pick colors simply on difference. Saturated versions of the same color help avoid accidental highlighting of features.
5. Stick with logical color conventions to avoid confusion.
6. Avoid using more than 5 lightness (contrast) values.
7. Avoid bright colors with white backgrounds to avoid uncomfortable color afterimages – especially for electronic map viewing

Saving Colors

- Saving Palette Colors in Style Manager



Personal Palette



Color Models in Display and Print

Displays

- RGB (Red, Green, Blue)
 - Computer monitors standard

Print

- CMYK (Cyan, Magenta, Yellow, Key (Black))
 - More color combinations

ICC Profiles (International Color Consortium) are used to standardize color classifications between digital imaging systems (from the computer monitor to the printer)

They will never match perfectly.

Section 7 Exercises

- Exercise 7-1 Color Matching Elements

Exercise 2.1 – Map Layout Setup

In this exercise, you will learn how to:

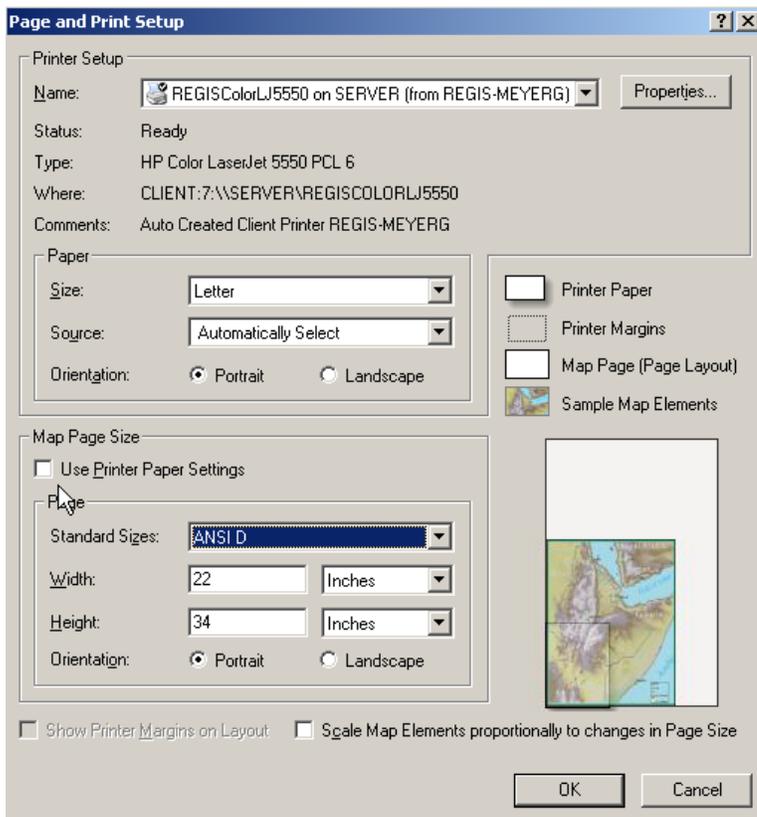
- ◆ Prepare page and print setup options in REGIS system.
- ◆ Setup map layout for cartographic design.

Setup

Open the .mxd project located at I:/Cartography Training/cartography.mxd. Make sure the Draw and Graphics toolbars are enabled in your map. Add them by going to *View>Toolbars*.

Page and Print Options

1. Switch to the Layout View by clicking on the page icon in the lower left corner of your map, shown at right.
2. Go to *File>Page and Print Setup*.



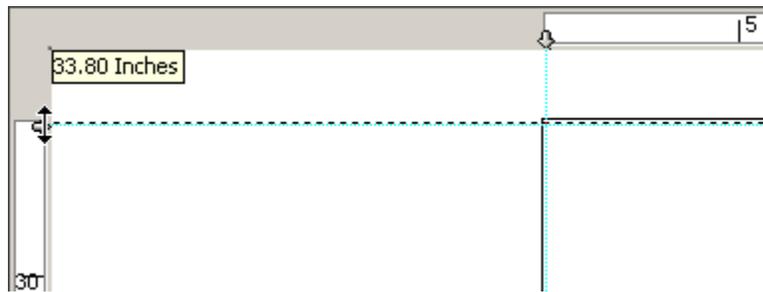
Uncheck the box for **Use Printer Paper Settings** in the Map Page Size section of the dialogue box and select an appropriate paper size from the **Standard Sizes** drop-down or type **18x24** as the custom size for Width and Height.

You will see the page size change in the lower right corner.

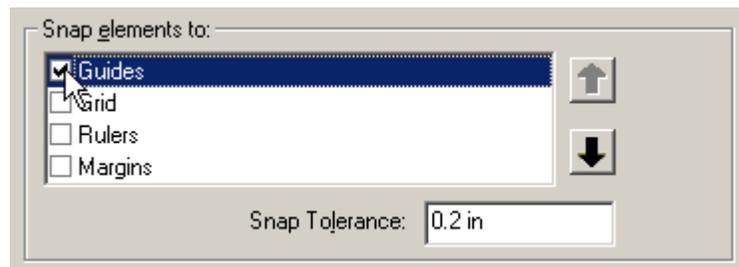
Note: This is the recommended method for maintaining paper size in your layout while working within the REGIS Citrix-based system. This is to avoid plotter paper sizes changing.

3. **Click OK**, and observe the map layout. You should see the data frame displayed and the larger layout page.
4. Before resizing the data frame, create guides for all four corners by clicking on the side and top rulers until you have two for the top ruler and two for the bottom.

- Click and drag the guide arrows in the ruler and adjust them until they are exactly **.20 Inches** from the edge of the page. You should see a measurement value pop-up, as shown below.



- Once your guides are positioned, go to **Customize > ArcMap Options > Layout tab** and check the box to enable snapping of map elements to your new guides. **Click OK.**



- Select and drag the corners of your data frame to fit along the edge of your guides. They should easily snap to position.

You can zoom into your page to get a closer look of the fit by using the layout navigation tools  found on the **Layout** toolbar.

****Navigating around the layout page will not change the scale and extent of your data.**

End of Exercise 2.1

Exercise 2.2 – Inserting and Organizing Map Elements

In this exercise, you will learn how to:

- ◆ Insert basic map layout elements
- ◆ Using the Order and Group functions for managing graphic elements

Setup

Utilize the Layout Setup created in Exercise 2.1

Inserting and Managing Elements

1. Go to the full extent of the Layout by clicking on the **Zoom Whole Page**  shortcut found on the Layout toolbar.
2. In the main menu, go to *Insert>Title* and type your title in the text box.

**Text size of title box is sized automatically based on the extent of your layout page.

3. Using the **Draw** toolbar, click on the **New Rectangle** tool  and draw a box around your title.
4. This box should display atop the text. Correct this by adjusting the graphical order of your rectangle by using the graphic order shortcuts  found on your **Graphics** toolbar or by right-clicking on the text box and hover over Order.

With the rectangle still selected, click the **Send Backward** button  to position text above the rectangle.

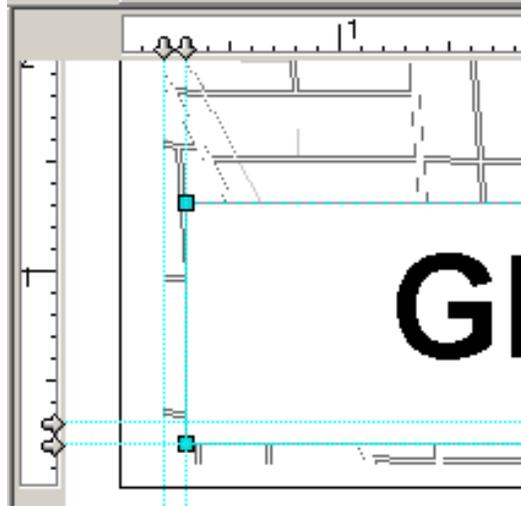
5. Adjust the color and font of each element through the **properties** options in the element's **right-click** menu or by selecting the element and using the **Draw** toolbar.



6. Once the title text and rectangle are formatted, create a **Group** by selecting both elements and choosing the **Group** option by **Right-Clicking** on the selected elements or by clicking on the  shortcut located on the **Graphics Toolbar**.

7. Notice how the group has a single selection box. This will allow for easier positioning.

Grab the new group and position it in the top or lower left corner so it snaps against the layout guides created in Exercise 2.1.

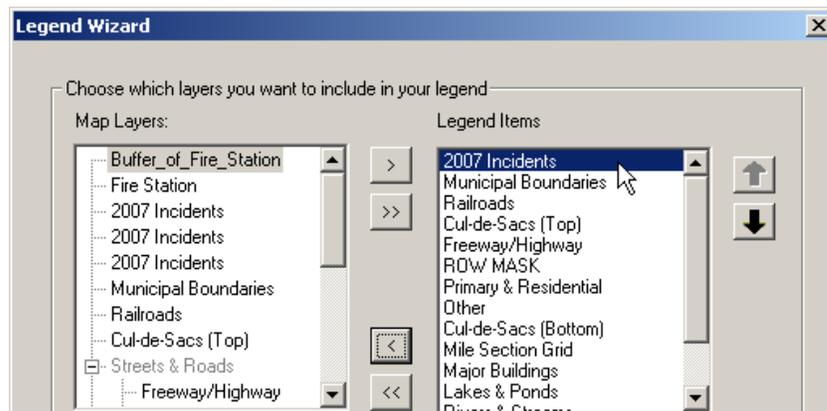


Additional guides can be added to accurately space the text box from the edge of the map data, as shown above.

Inserting and Managing a Static Legend

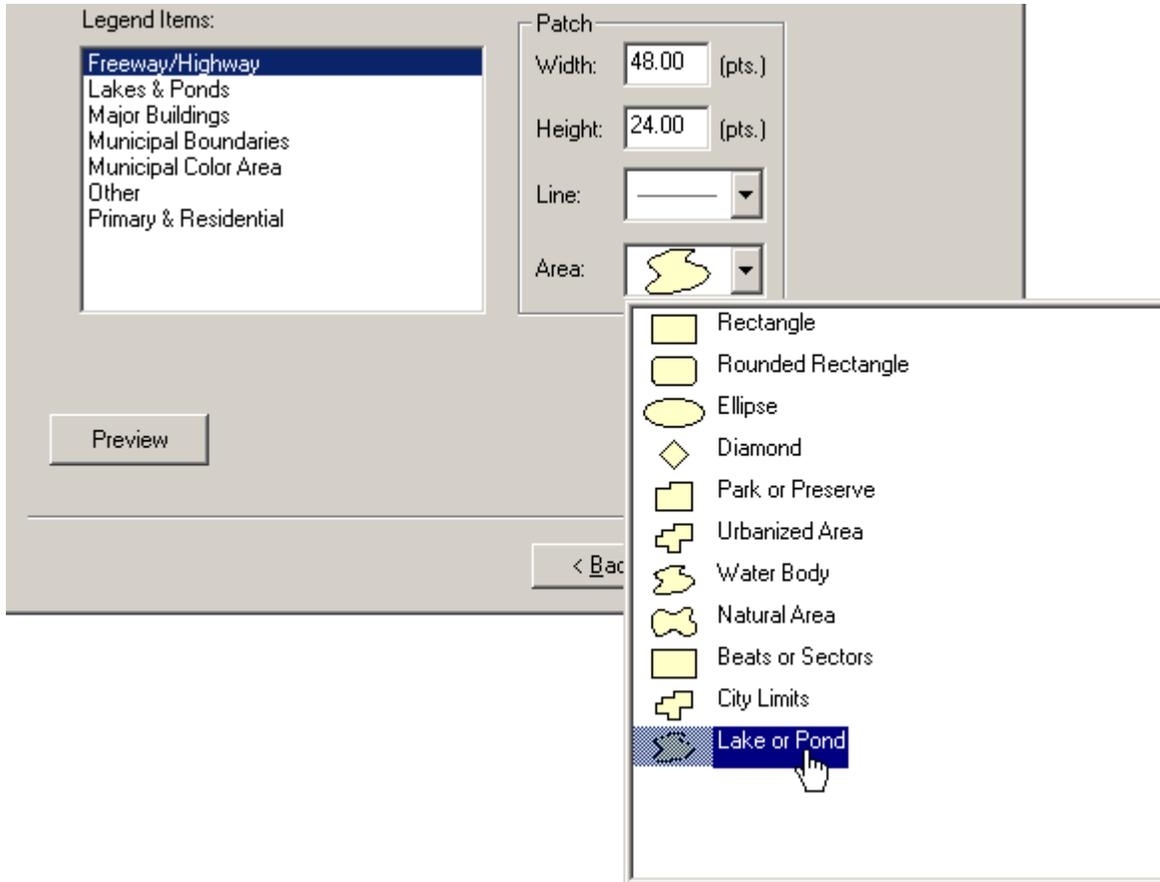
Legends can be managed within a map layout as a dynamic element that updates as the layers are modified or as a static graphical element. The latter can provide the cartographer with greater flexibility in design.

1. Start the Legend Wizard by going to **Insert>Legend** in the main menu in Layout View.
2. By default the wizard will include all active layers within your data frame by placing them in the right window named **Legend Items**.

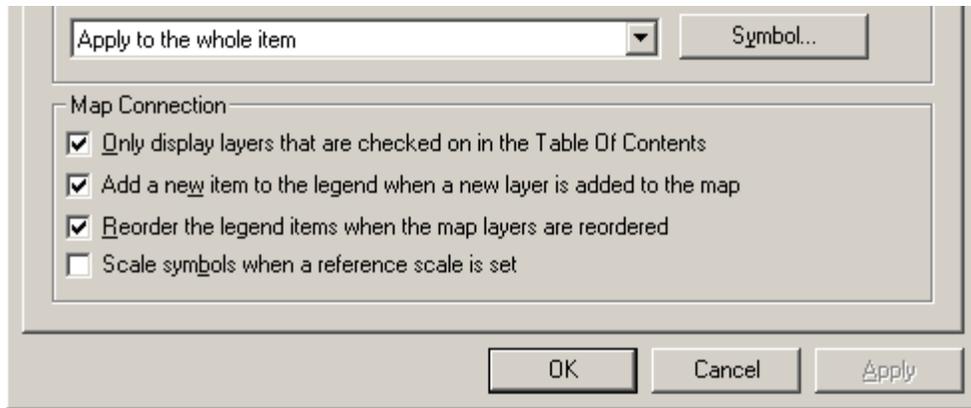


Use the Arrow keys to manage which layers will be included. Single arrows  will move a selected layer while the double arrow  moves all layers.

3. Now use the UP/DOWN arrow keys to the right to order your legend layers.
4. Follow through the wizard to customize your legend. Attributes such as legend title and borders can be easily edited later.



5. Legend items can be further customized by selected the layer and adjusting Width, Height and unique Line or Area presentation, as shown above.
6. You can click the **Preview** button anytime during the wizard configuration or click **Finish** when you reach the last step in the Wizard.
7. You can **Double-Click** the legend or go to **Properties** in the **Right-Click** menu to make any further modifications/fixes.

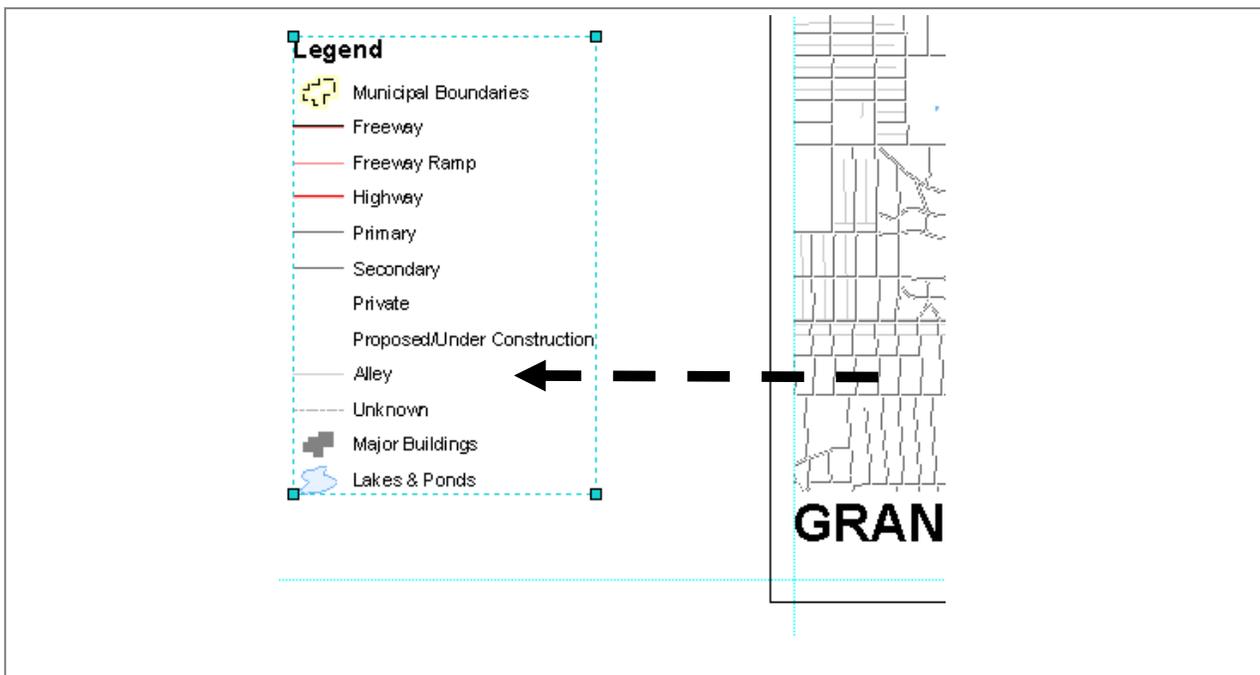


- When you go back to the legend properties you can configure the dynamic options in the **Map Connection** section of the **Items** tab, shown above.

Maintaining a live legend is useful when a map will be modified and printed in the future.

Converting Legend to Graphics

- Move your legend to a blank part outside of your page layout, as shown below.

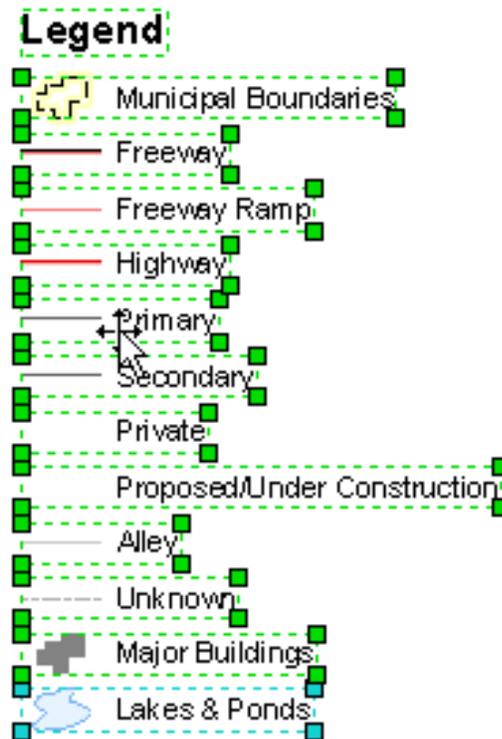


Any blank space outside of your page layout can be used to place items used for later or graphics that need organizing.

2. Right-Click on your legend and choose **Convert to Graphics**.
Your Legend is now independent from any changes to your Table of Contents.
3. Right-Click on your legend a second time and choose **Ungroup**.
4. You can now size and group your elements as needed. Use the **Order** and **Group** operations discussed earlier to create a unique legend.
5. Utilize the Draw toolbar to draw shapes that can function as boundaries for your legend items.

Leave the legend you create in the white space outside of the layout view as you will use this in the next exercise

Ungrouped Legend Items



End of Exercise 2.2

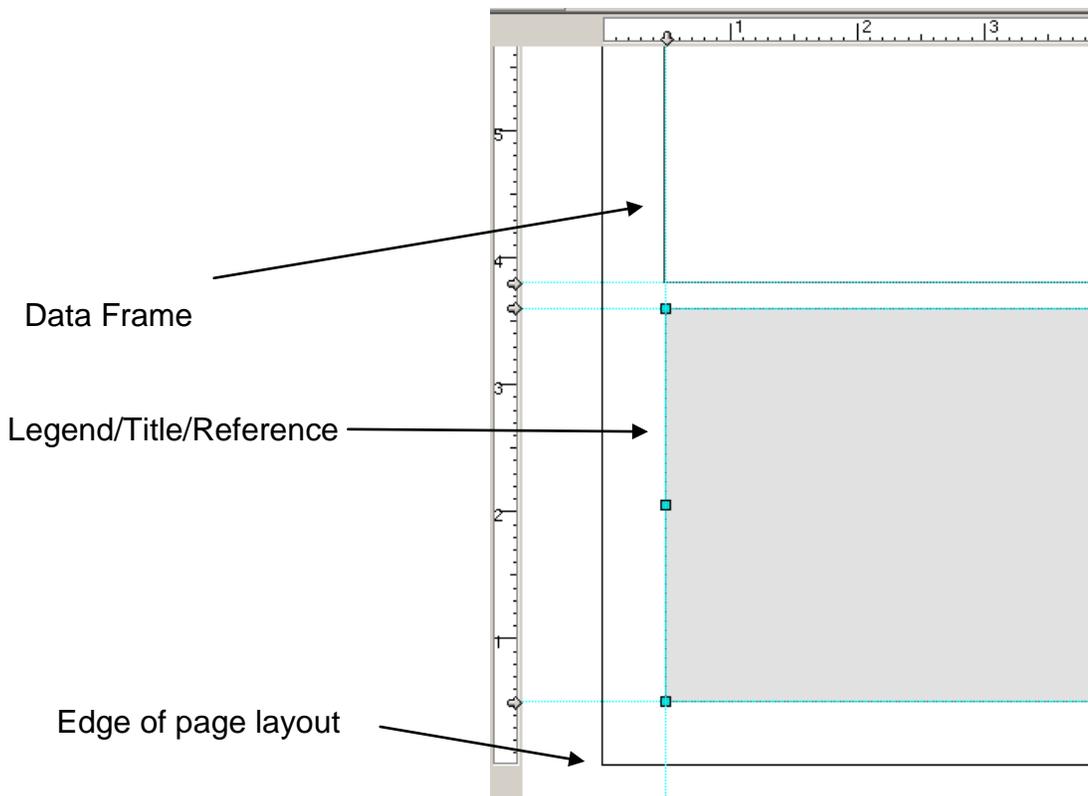
Exercise 2.3 – Creating an Index/Overview Map

In this exercise, you will learn how to:

- ◆ Create a custom element frame.
- ◆ Insert an additional Data Frame as an index map.

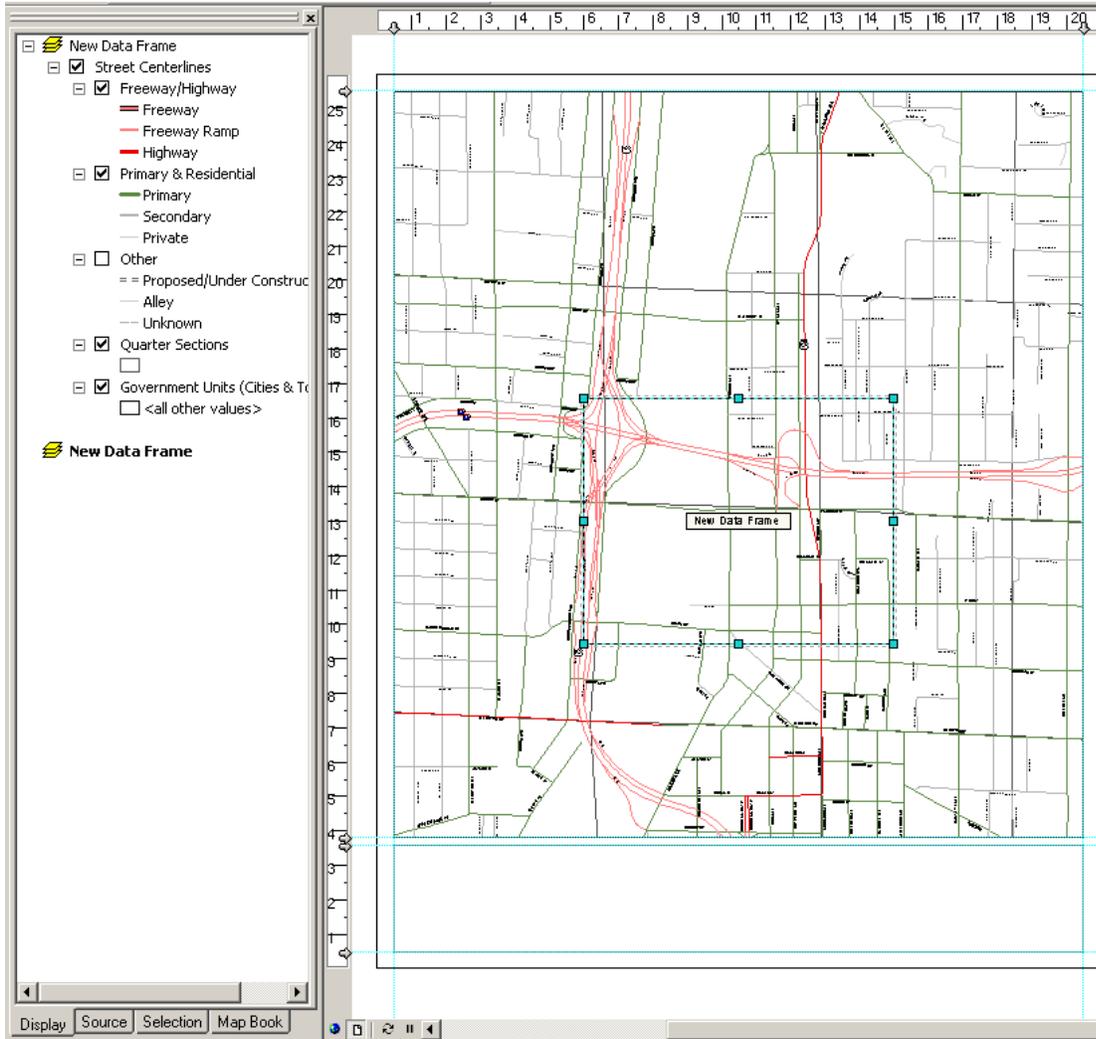
Creating Reference Area with Index Map

1. Enable the layout **Draft Mode** by enabling the button  located on the Layout Toolbar. This will ensure faster navigation through your layout.
2. Resize your data frame to allow room for a large reference/legend area at the bottom of the page. Insert and snap to guides as needed.
3. Using the rectangle tool  from the **Draw** toolbar, create a box under your map, fitting it within the page, as shown below. Move the legend you created in the Exercise 2.2 into this area



4. Choose *Insert*> *Data Frame* in the main menu.

You should see a new Data Frame in the Table of Contents and in the center of your layout.



5. Reposition the new empty Data Frame to fit within your new title box.
6. In the Table of Contents, **drag and drop** the Government Units layer from your main Data Frame to your new one below it. It will automatically create a copy of this layer to your new Data Frame.

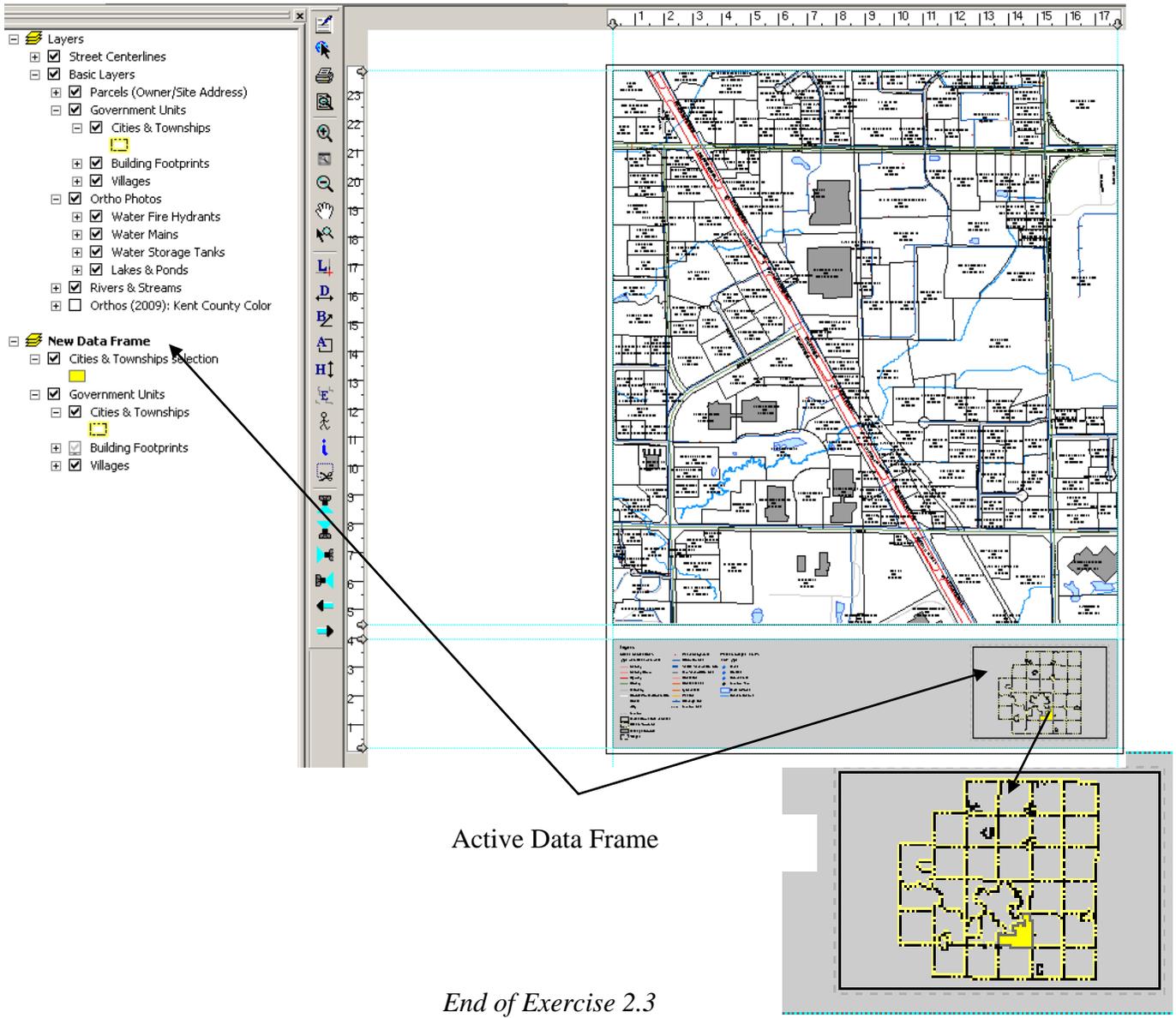
**Note: if you do not have this layer in your original data frame you can add it from the  Theme Manager>Basic Layers folder.

- Using the **Select Features** tool , highlight the City of Kentwood in the index map. When the index map is highlighted the text of the data frame heading in the Table of Contents is bold. This indicates the data frame as active. *(Right click on Cities & Townships and click Selection < Create layer from selected features to isolate the City of Kentwood boundary)*

You can **right-click** on the heading and choose activate to also achieve this.

You can zoom into your layout page for easier selection or go to the data view of that activated data frame to create the selection set.

Your Map should look something like the example below



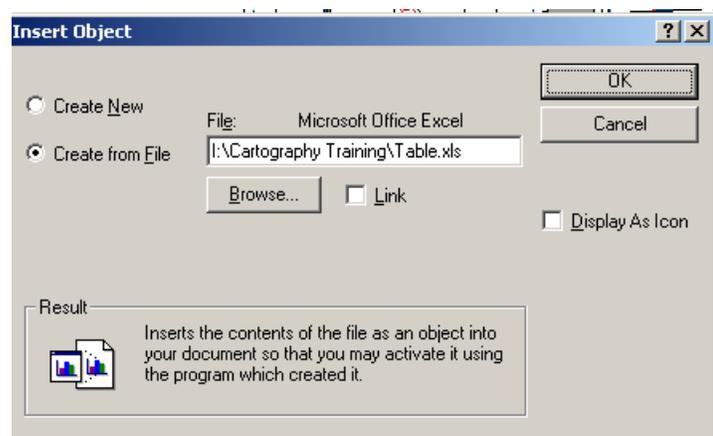
Exercise 2.4 – Inserting Linked Objects

In this exercise, you will learn how to:

- ◆ Insert an Excel spreadsheet as a linked object.

Inserting Object

1. Select **Object** under the *Insert Menu* to bring up the Insert Object dialogue box.
2. Choose **Create from File** and check the **Link** box.
3. Click the **Browse** button and find the Excel Spreadsheet titled Table.xls, located at *I:\Cartography Training\Table.xls*.
4. **Click OK**



5. Move and organize the Excel table to fit below the map.
6. Double-click the data to launch Microsoft Excel for editing.
7. Change *Pipe ID* to *Pipe Number* in the spreadsheet and push enter on your keyboard. The new addition should take immediate affect.

The screenshot shows a Microsoft Excel window titled "Worksheet in cartography.mxd". The active cell is E10. The data table is as follows:

	A	B	C	D	E	F	G	H
1		Pipe ID	Pipe Diameter	Total Length	Last Inspected			
2	Kentwood	260810109033	8	970	1/1/2011			
3	Grand Rapids	260810109032	6	764	2/2/2011			
4		260810109042	12	878	1/1/2011			
5		260810109031	24	665	2/2/2011			
6		260810109041	26	1,118	2/2/2011			
7								
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9								
10								
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12								
13								
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22								
23								

The map interface below the Excel window shows a legend with various symbols and colors, a main map area, and a small inset map in the bottom right corner. The legend includes categories like "Water", "Roads", and "Buildings".

8. You can click save on Excel to save your changes.

End of Exercise 2.4

Exercise 3.1 – Changing Symbology Settings

In this exercise, you will learn how to:

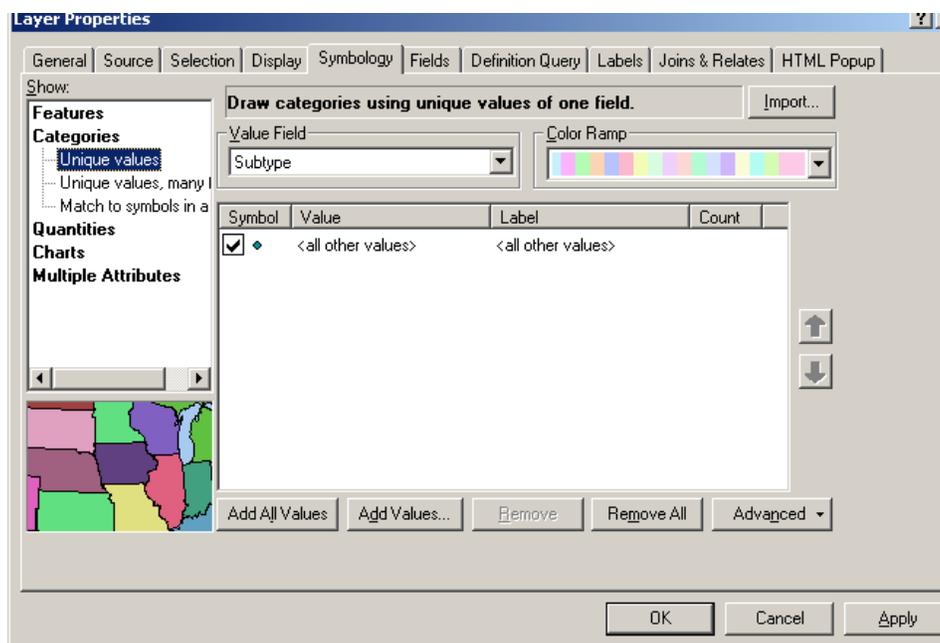
- ◆ Change Symbology Settings

Setup

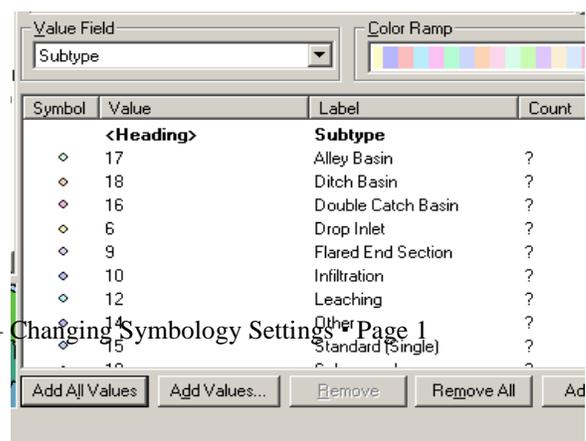
If the project is not open already open the mxd. Project located at I:/Cartography Training/cartography.mxd.

Change Symbology Settings

1. Right click on the Storm Inlet layer and click Properties.
2. Click the Symbology tab.
3. Click the Categories option.



4. In the Value Field drop down menu pick *Subtype*.



5. Click **Add All Values**.

6. Double click on the **Standard (Single)** symbol to open the **Symbol Selector**.

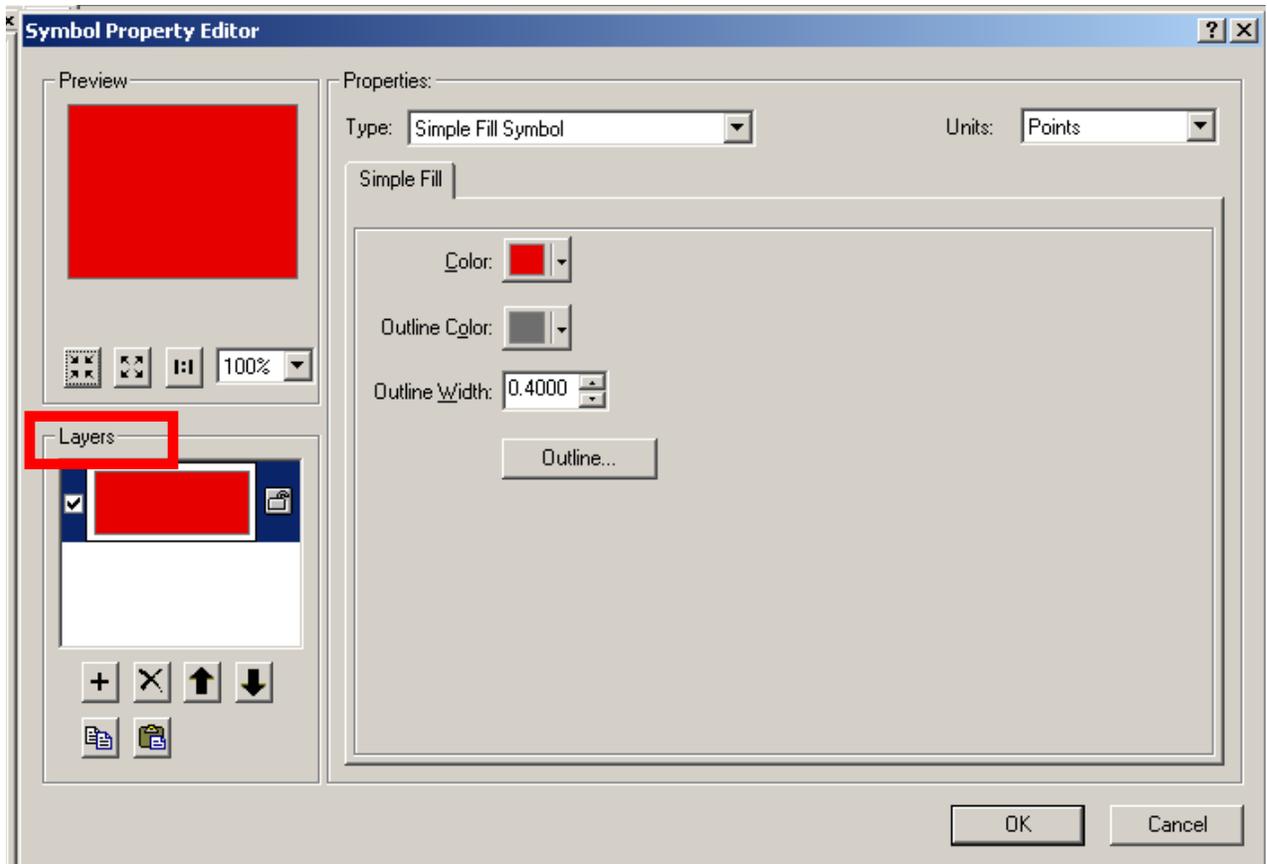


Pick a symbol of your choice to represent this feature. Try clicking on More Symbols to explore adding new symbol sets to pick from.

For extra practice try changing the Water Fire Hydrants Symbology layer.

Symbol Layering

1. Locate the **Existing Land Use 2003** layer and turn the layer on.
2. Double click on **Retail, Services – Other** to open the symbol selector.



3. Click **Properties** to Open the **Symbol Property Editor**.
4. Under **Layers** click the **+** symbol to add a new layer to the symbology editor.
5. Under the **Simple Fill Tab** change the fill color to No Fill.

Make the outline color “green” and the Outline Width **3**.

6. Click the **+** symbol to add a third layer to the symbology editor window.
7. Under **Type** pick **Line Fill Symbol** and change the Color to “black”.
8. Click OK.

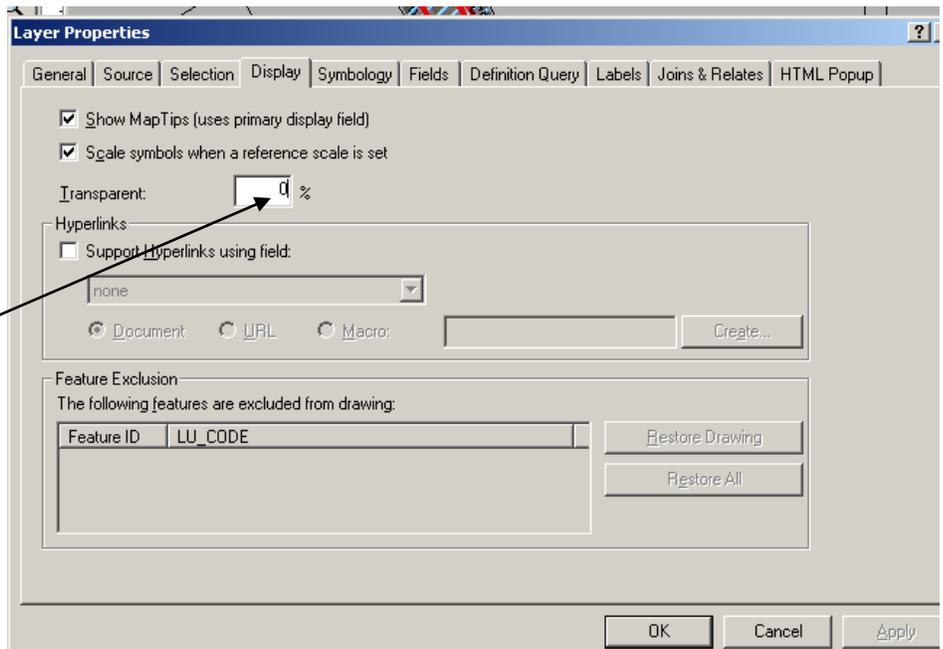
Observe the map and you will see each polygon with the **Retail, Services – Other** changed to this new layered Symbology.

Experiment with other symbols and layers.

Applying Transparency

1. Turn on the 2009 aerial photo.
2. Right click on the Existing Land Use 2003 layer.
3. Select the Display tab.
4. Change Transparent to 50%.
5. Click OK.

You are now able to see the aerial photo under the Land Use Layer.



End of Exercise 3.1

Exercise 3.2 – Working with Labels

In this exercise, you will learn how to:

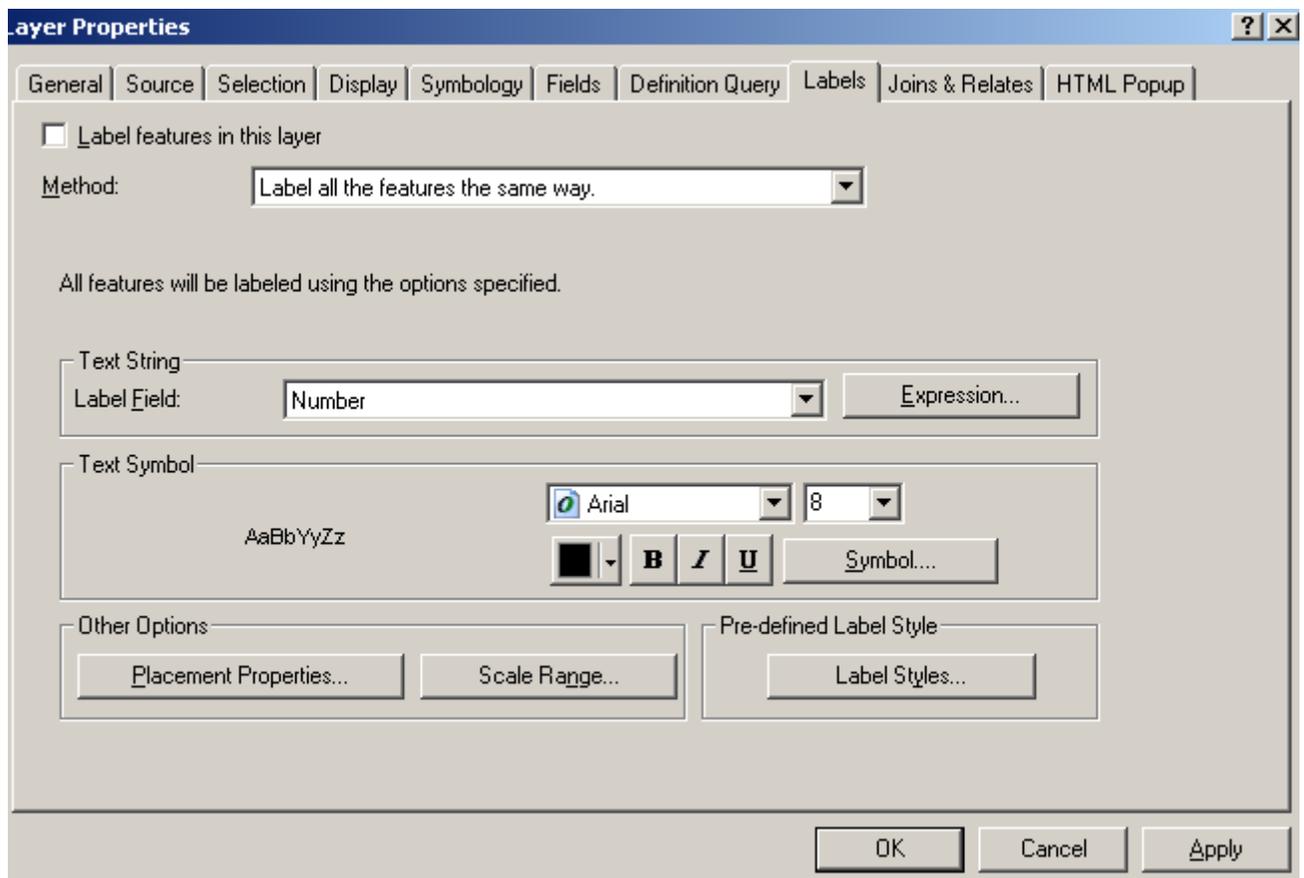
- ◆ Use the Auto Label Engine
- ◆ Use the Label Symbol Editor

Setup

If the project is not open already open the mxd. Project located at I:/Cartography Training/cartography.mxd.

Using the Auto Label Engine

1. Right Click on the **Water Fire Hydrants** Layer and click **Properties**.
2. Click the **Labels** Tab.



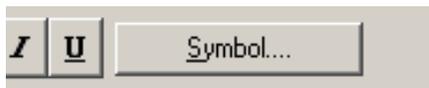
3. In the Label Field drop down menu pick “*Number*” to label the map with the hydrant number.
4. Under **Text Symbol** change the font size to **10** and change the font color to “*red*”.



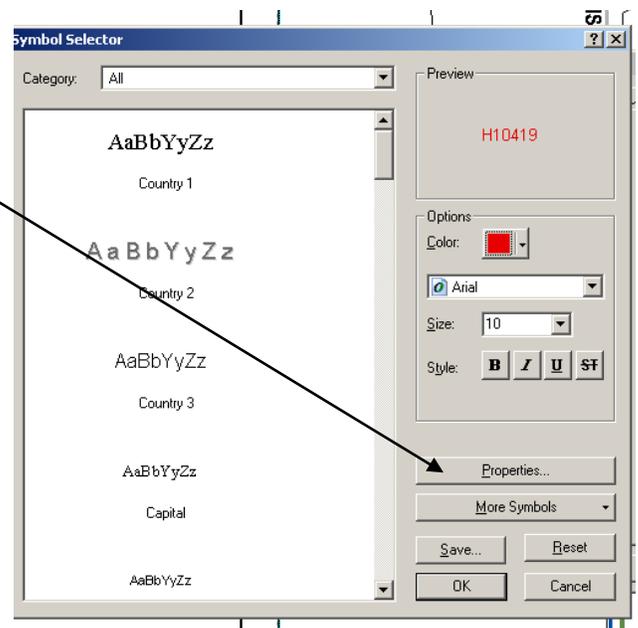
5. Click Ok.
6. Right click on the Water Fire Hydrant layer once again to turn on the labels and you will notice the hydrant labels appear in the map.

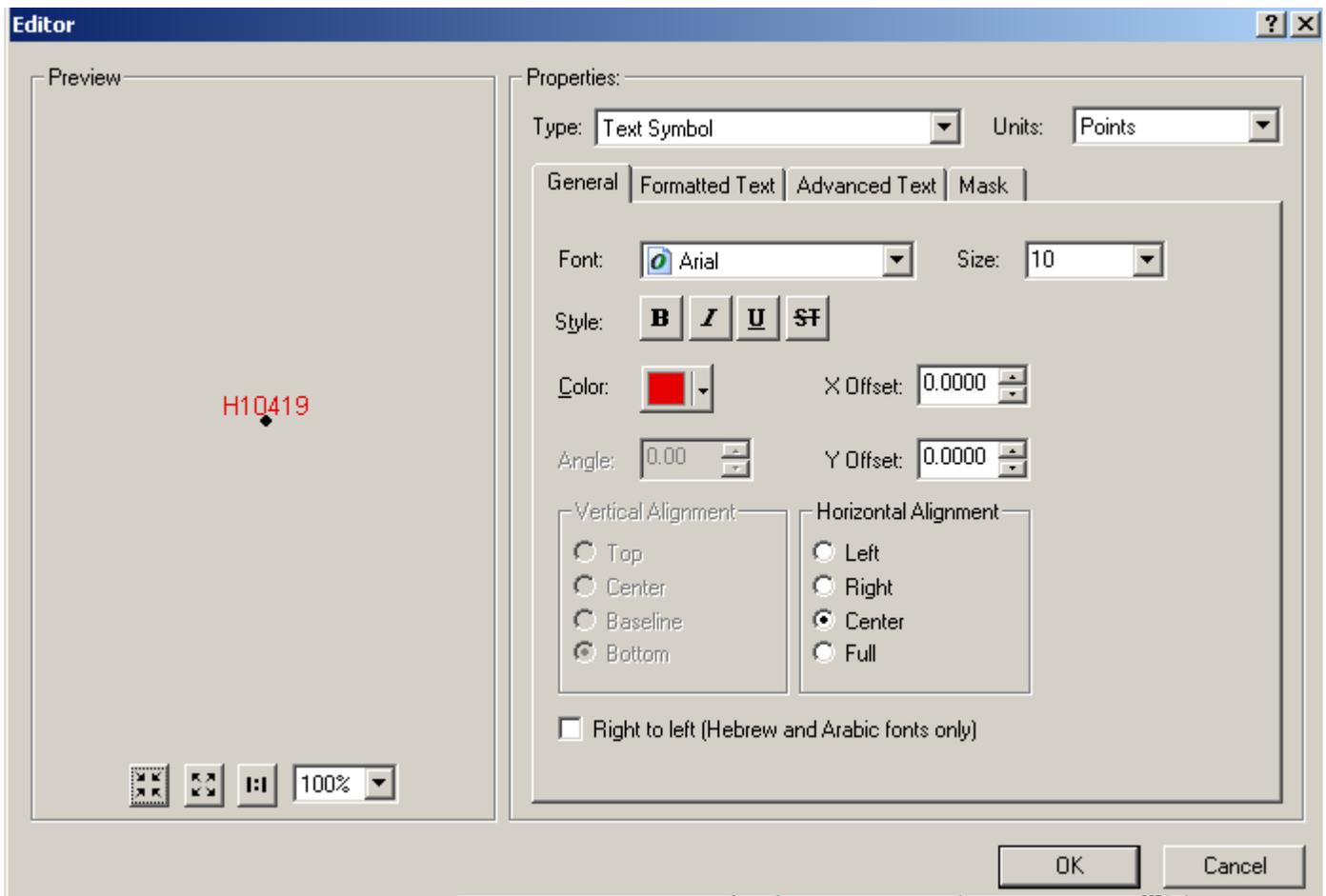
Using the Label Symbol Editor

1. Right Click on the **Water Fire Hydrants Layer** and click **Properties**.
2. Click the **Labels** Tab.
3. Click **Symbol** under **Text Symbol**.



4. Click **Properties**.
5. Click the **Mask** tab once the symbol **Editor** window opens (see graphic on page 3).



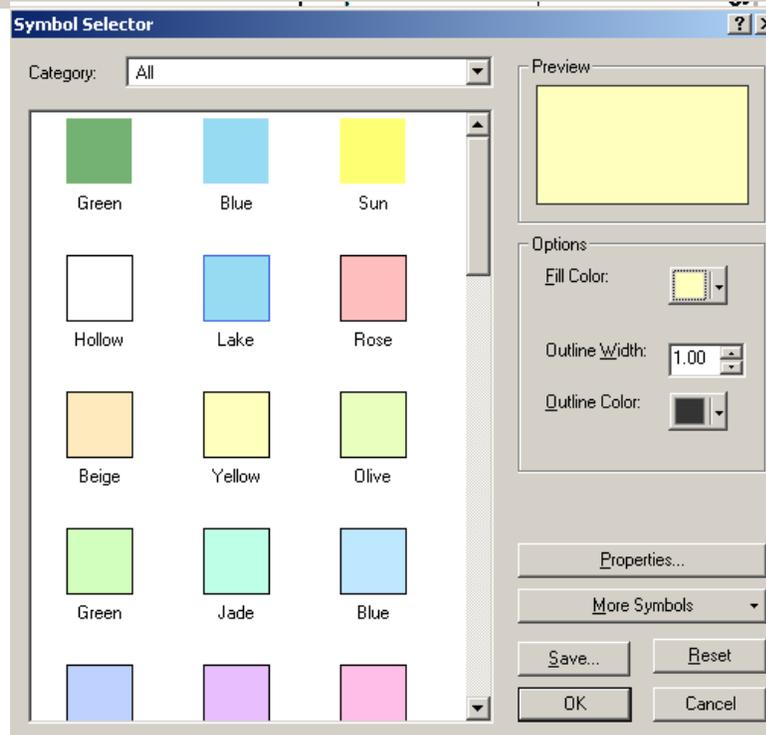


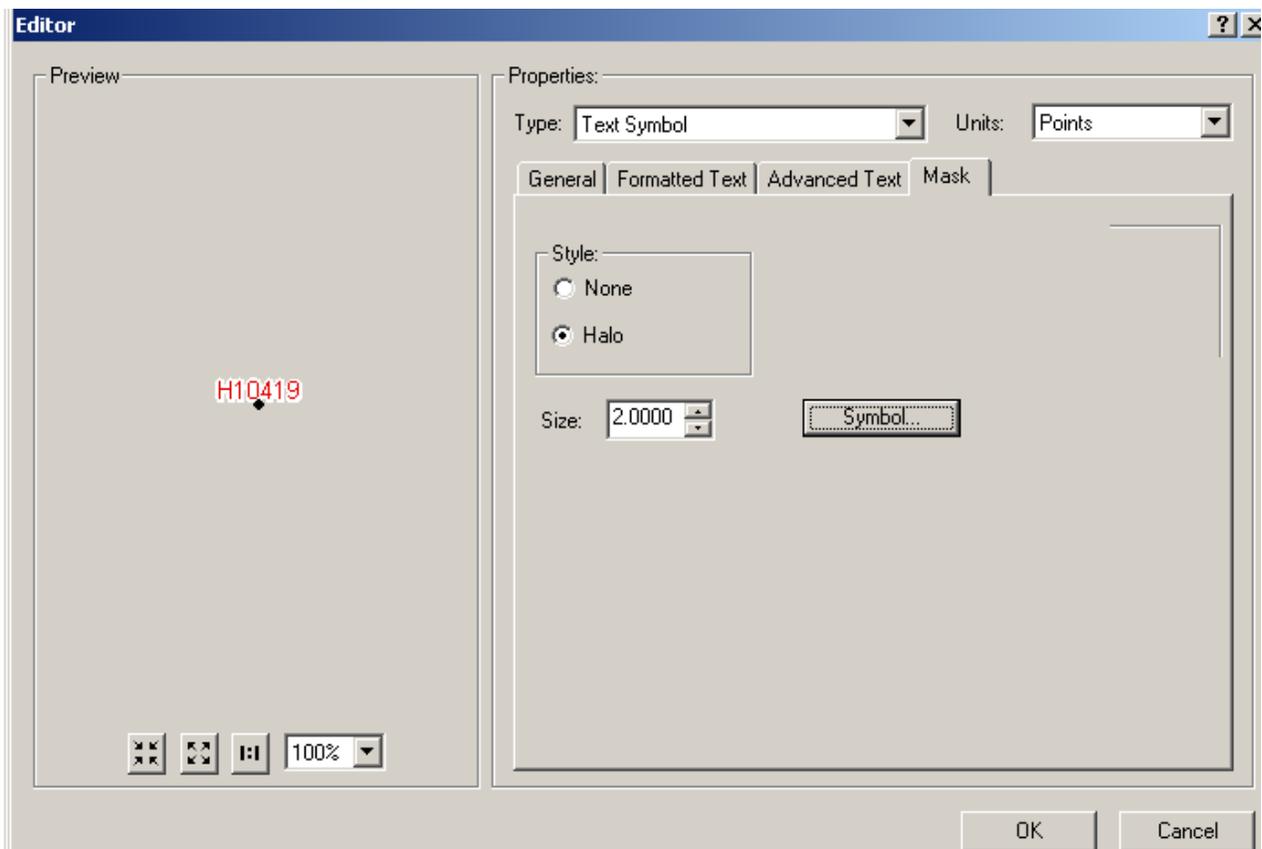
6. Activate the Halo option by clicking the option next to **Halo** (see graphic on page 4).

7. Next click **Symbol**.

Change the fill color to 30% grey.

Change the Outline color to *black*, Outline width 1.

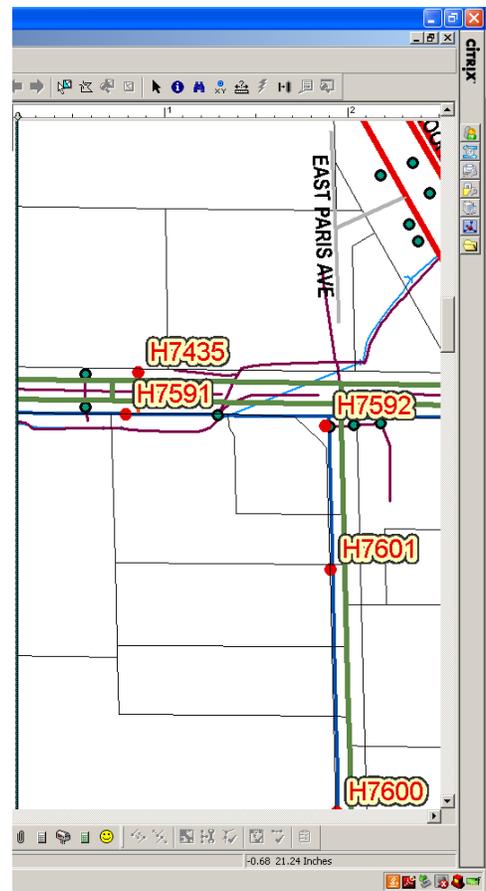




8. Click OK on all open windows and observe the hydrant labels in the map.

Keep this project open to use in the next exercise.

End of Exercise 3.2



Exercise 4.1 – Annotation in the Map

In this exercise, you will learn how to:

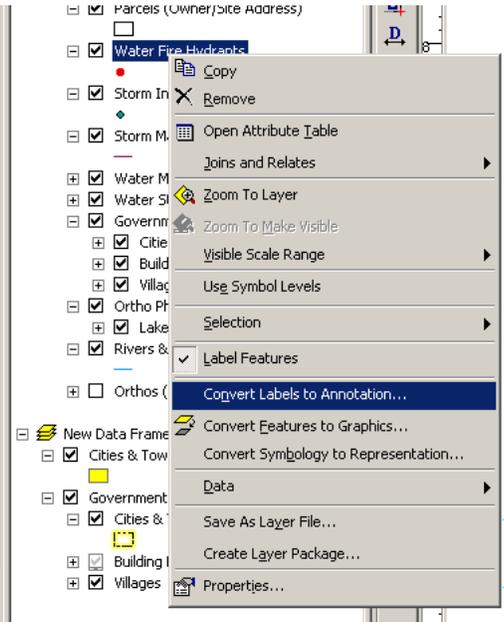
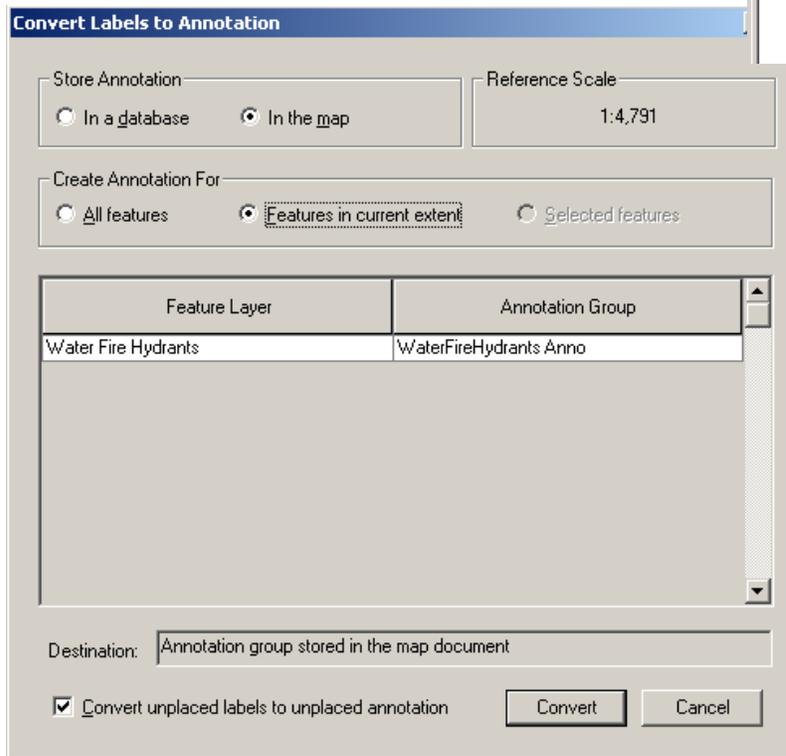
- ◆ Convert labels to Annotation in a Map document
- ◆ Manage Annotation layers

Setup

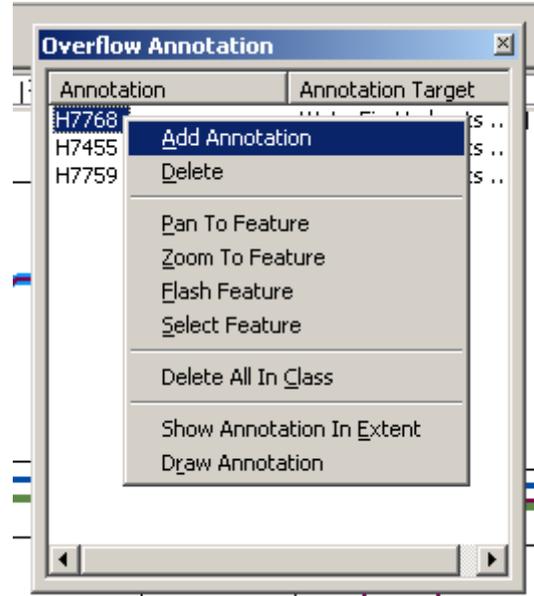
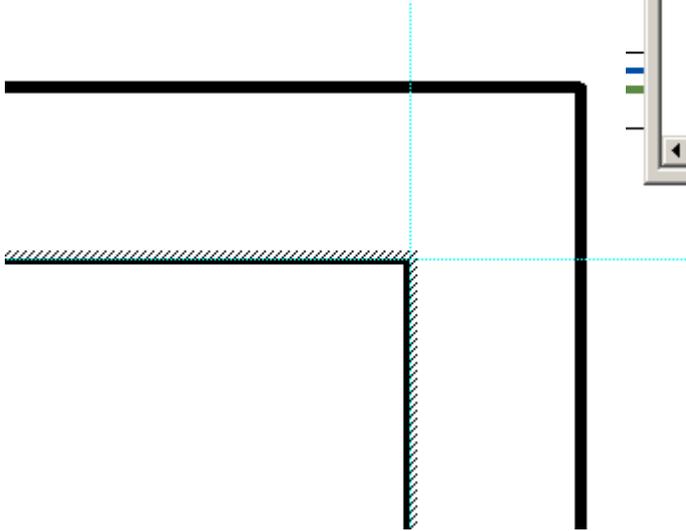
You should still have the cartography.mxd open with the fire hydrant labels showing you created in exercise 3-2.

Convert Symbology to Graphics

1. Right click on the Water Fire Hydrants layer.
2. Fill the Convert Labels to Annotation window out as shown in the graphic below.
3. Click **Convert**.



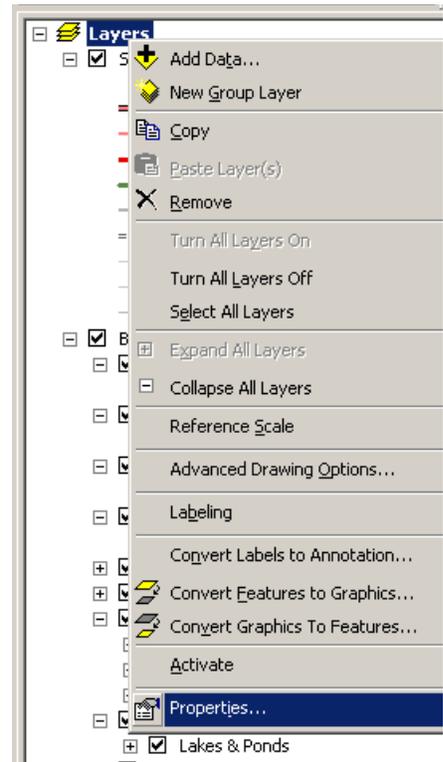
- You will notice an **Overflow Annotation** window will open up. Right click on each label and click **Add Annotation** to be sure the label is placed in your map.
- Double click in the data frame to be sure you are in the data view. When in the data view you will see a hatch line around your map outline (see graphic below).



- Once you verify you are in the data view you now can use the Select Elements tool to move the fire hydrant annotation labels around the map and change the settings.

Experiment with a few of the labels and use the full control to move them around the map and change the font type etc.

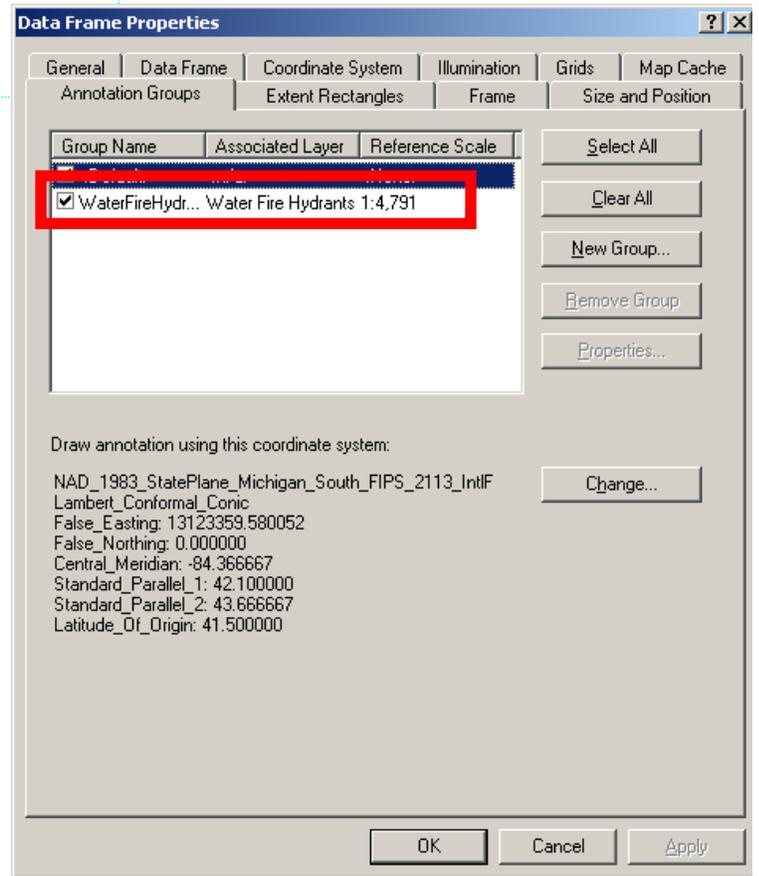
- Next right click on the data frame and click Properties.
- Click the Annotation Groups tab (see graphic on page 3).
- You will notice the layer you converted to annotation has been added as an annotation group (WaterFireHydrantsAnno).



10. Uncheck the layer to turn off the annotation group in the map.

11. Click Apply and you will notice the layer turn off in the map.

Turn the layer back on and click OK to close the Data Frame Properties window.



End of Exercise 4.1

Exercise 4.2 – Annotation in a Database

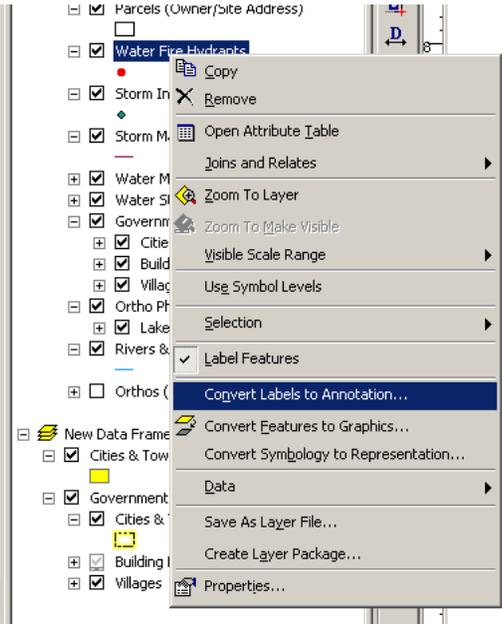
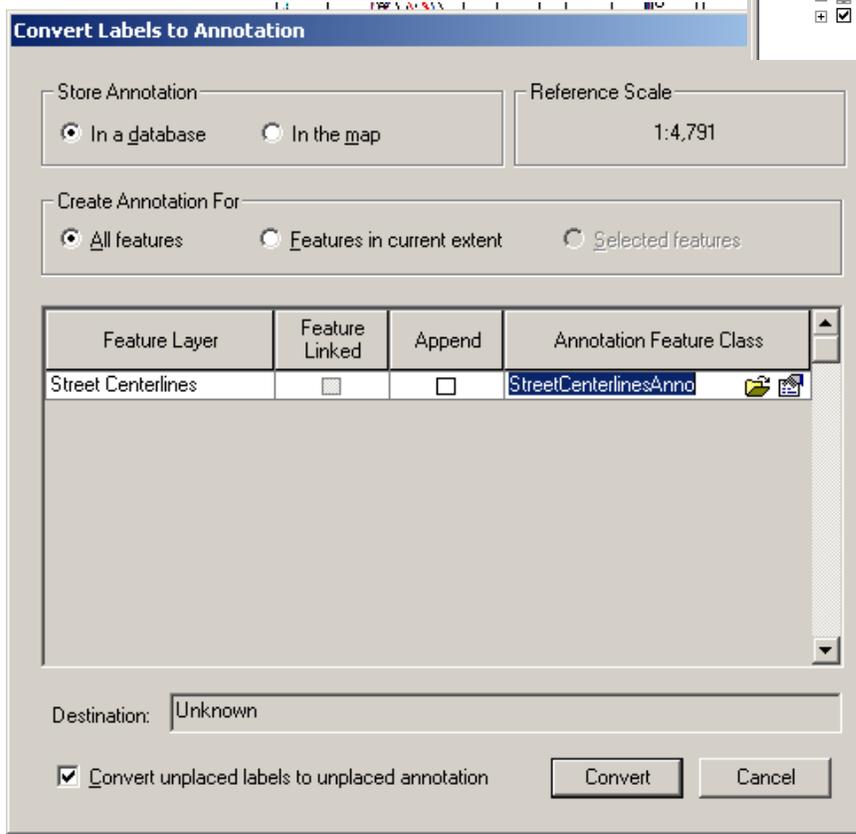
In this exercise, you will learn how to:

- ◆ Convert Labels to Annotation in a Database

Setup

Open the project cartography.mxd.

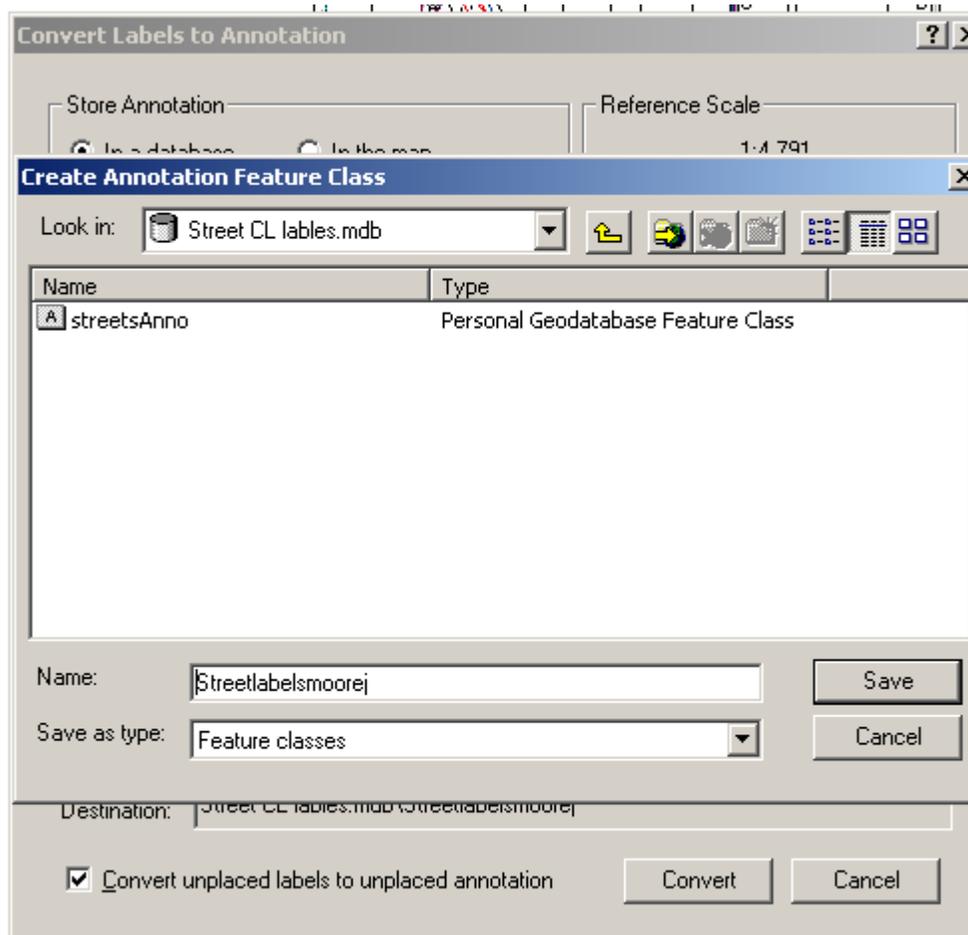
1. Right click on the **Street Centerlines** layer.
2. Click **Convert Labels to Annotation**.
3. In the **Convert Labels to Annotation** window fill the window out as shown below.



- Next click on the folder icon on under **Annotation Feature Class**.

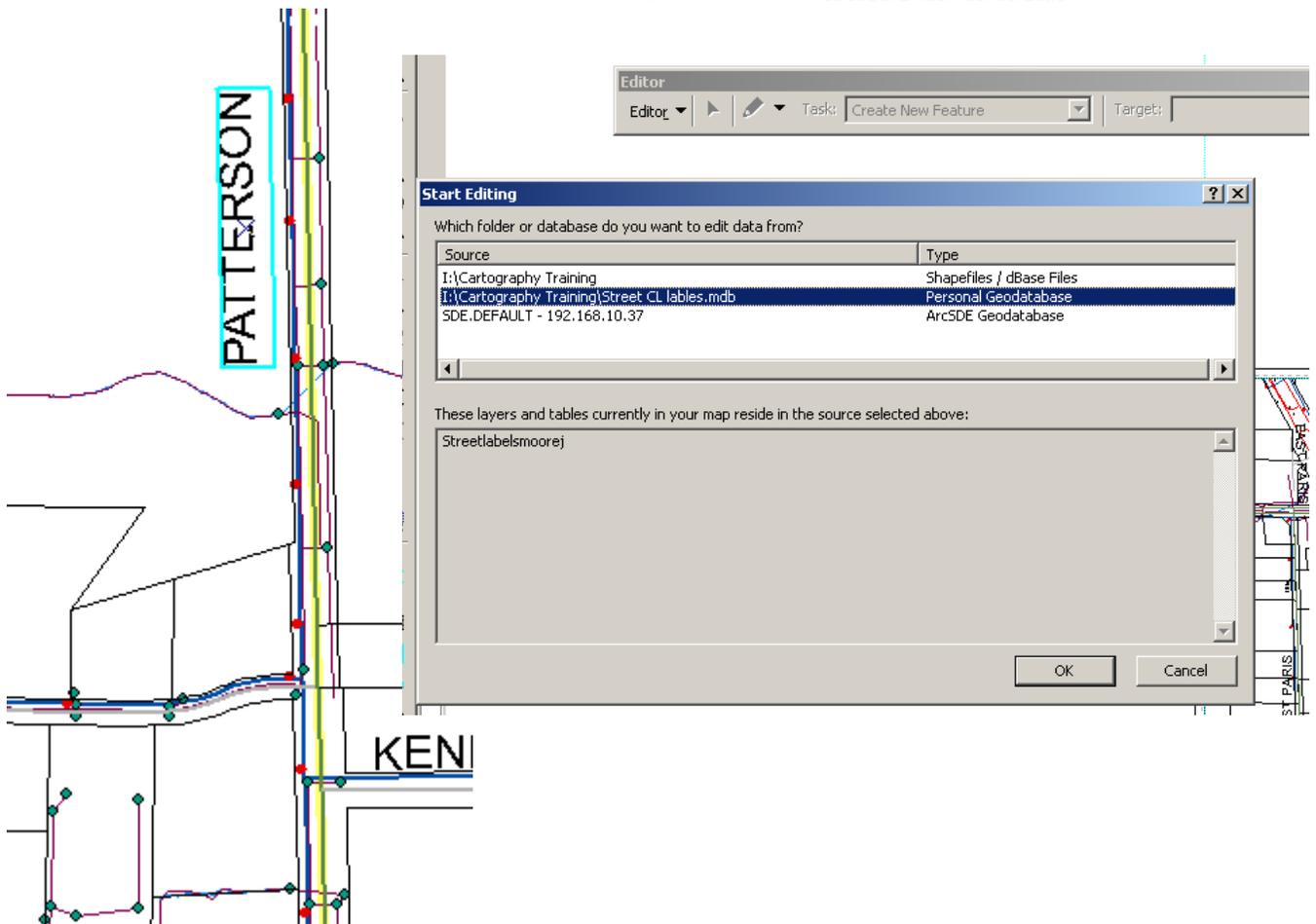
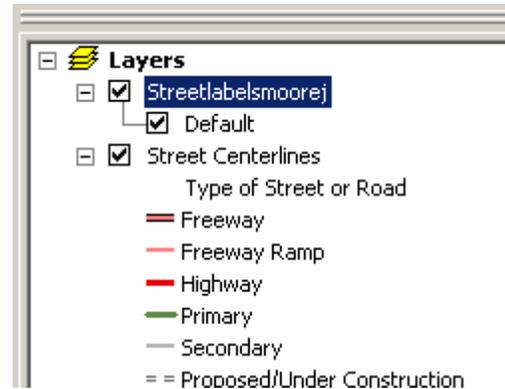


- Browse to *I:\Cartography Training\Street CL labels.mdb*.
- Double Click on **Street CL labels.mdb** and click Save.
- Name the new layer *StreetLabels_yourusername* (e.g. *StreetLabels_moorej*).
- Click **Convert**.



- You will notice a new layer has been added to the Table of Contents (see graphic on page 3).

10. Next, Right click **View > Toolbars** and add the **Editor Toolbar**.
11. Click **Start Editing**.
12. Start an edit session with the Personal Geodatabase located at I:\Cartography Training\Street CL labels.mdb.
13. Verify you are in the data view and use the edit tool to select a Street Label.



14. Experiment moving the label around the map and with other functions.
15. Next click on the **Attribute edit tool** along on the editor toolbar.



16. You will notice the Attributes Edit window open up. This is where you have full control over the properties of the annotation features. Experiment with different settings. Click Apply to preview.

End of Exercise 4.2

Exercise 4.3 – Converting Symbols to Graphics

In this exercise, you will learn how to:

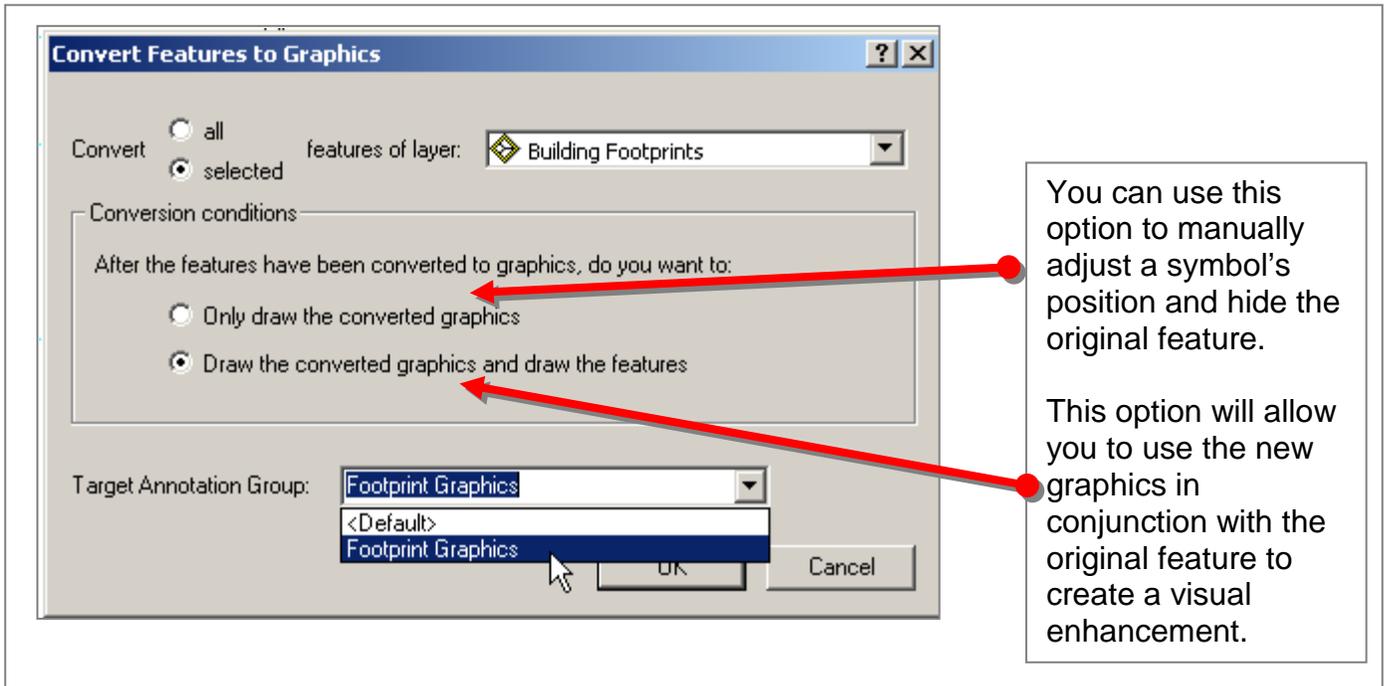
- ◆ Convert symbology to graphics
- ◆ Manually edit, enhance and organize graphical elements

Setup

Open or create a map layout that contains the REGIS Building Footprints layer.

Convert Symbology to Graphics

1. Go to the **Annotation Groups** tab in the **Data Frame Properties** (*View>Data Frame Properties*) and click **New Group**.
Type “Footprint Graphics” for the name of your new group and **click OK**.
2. While in your map layout, make the Building Footprints layer the only selectable layer by using the **Selection** tab and select all of the features that fit in your layout using the selection tool. 
3. In the **Display** tab of the Table of Contents, right-click on the Building Footprints layer in the Table of Contents and choose **Convert Features to Graphics...**
4. In the dialog box make sure you are converting only the **selected** features and choose **Draw the converted graphics and draw the features**.
5. Select the Target Annotation Group created in step 1 and **Click OK**.



6. Uncheck your Building Footprints layer in the Table of Contents. Observe how your new graphics are displayed independent of the layer.

You can control the visibility or delete the graphics group by going to the **Annotation Groups** tab in the **Data Frame Properties**. Other options commonly used for annotation (discussed in exercise 7.2) can be controlled within this dialogue box.

Editing Graphics Groups

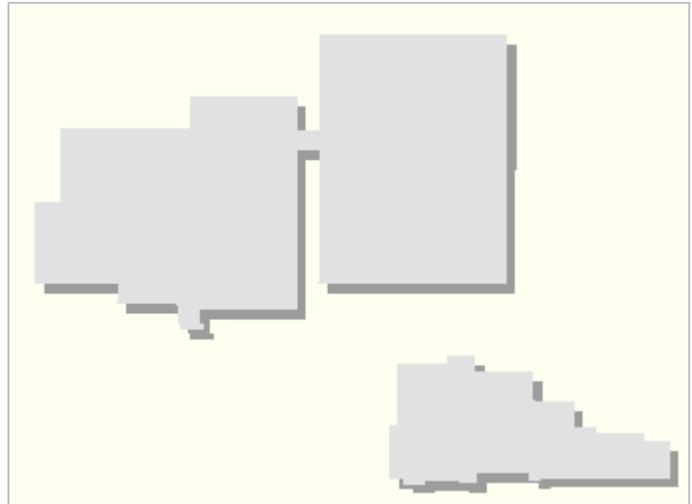
This section of the exercise will demonstrate how to use the new Building Footprints graphics to add a shadow for cartographic effect.

1. Double click on the Building Footprints layer symbol in the Table of Contents to quickly remove the **Outline Color**. Keep the dark gray fill color.

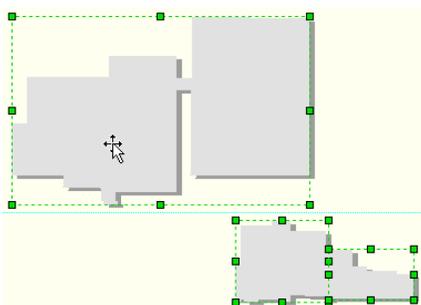
Building Footprints



2. Using the Select Elements tool  select one of the new building graphics until you see the blue selection boundary. Double clicking while in the layout view may be necessary.



3. With this graphical element selected, click on **Edit>Select all Elements** in the main menu. You should now see all the newly created graphics selected.
4. Use the **Draw** toolbar to quickly remove the outline color  and change the fill color  to a light gray.
5. To reposition the graphics so the original layer serves as the building shadow, carefully click and drag the graphics to offset them from the original layer. This is done by using the mouse move cursor  that appears when using the Select Elements tool. 

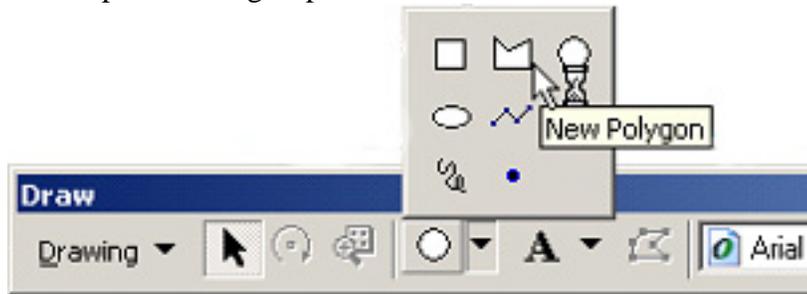


6. Adjust position and colors until the desired effect is reached.

Adding Graphics to Annotation Groups

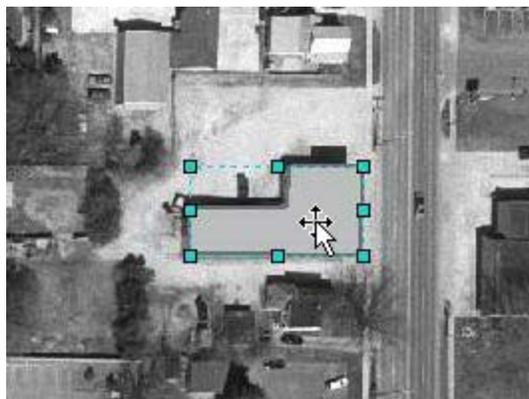
When adding additional graphics with the **Draw** toolbar, it is good practice to maintain those graphics within a manageable group. This final section will demonstrate how to add additional building footprints to the current footprints graphics group.

1. Click on the Draw toolbar options button **Drawing** and select the Footprints Graphics under **Active Annotation Target**. Now all graphics you create or insert will be part of this group.



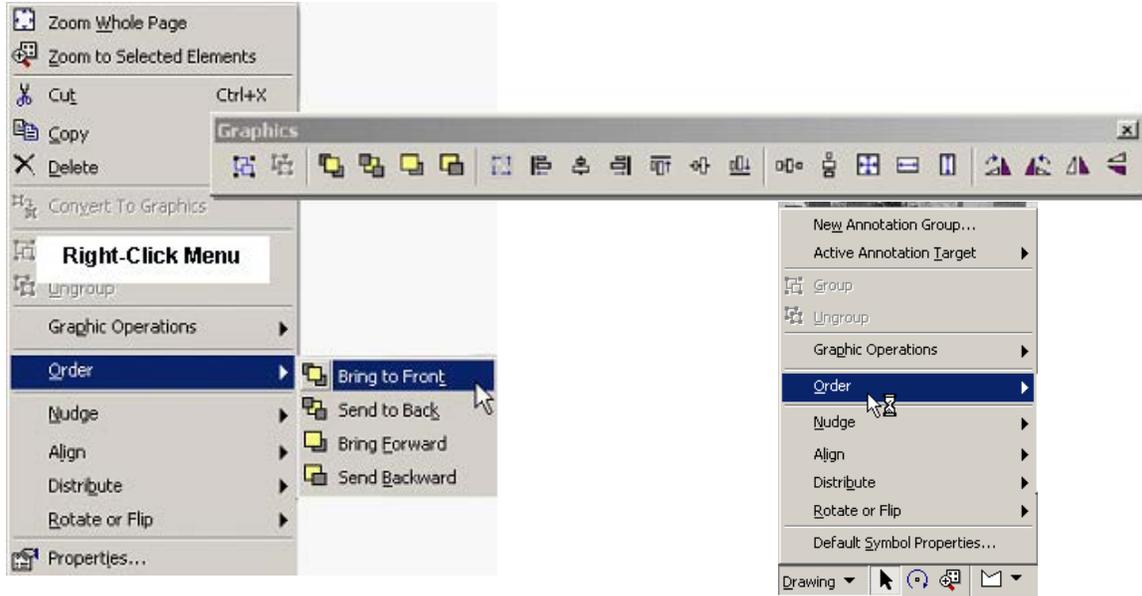
2. Using the Polygon Draw tool (shown above) and the REGIS Ortho Photos layer, draw a polygon along the rooftop of a building. Modify the colors to match other footprints.
3. Because there is no original footprint in the REGIS building footprints layer, you will have to manage two graphics for the building and the shadow. While selected, **right-click** on your new footprint and choose **copy** and then **paste**.

Note: All graphics that are copied/cut and pasted are placed within whichever is selected as the active annotation group.



- Carefully position and color the graphical layers to achieve the effect. Use the **Order** options to layer the bottom and top graphics appropriately.

These options can be found by **right-clicking** on the selected graphics, via the **Graphics Toolbar** or the **Draw** toolbar options menu.



- Once both graphics are positioned correctly, use the **Group** function to maintain their position. While both graphics are selected, right click and choose **Group**.

Group and **Ungroup** options can be found in the same menus as the **Order** operation in the previous step.

End of Exercise 4.3

Exercise 5.1 – Finalizing Data Frames

In this exercise, you will learn how to:

- ◆ Establishing a fixed scale for final map layout
- ◆ Clipping map layout to graphic polygon
- ◆ Using Data Frame “Frame” color properties

Setup

Any map setup for layout of an entire municipality.

Using Fixed Scale

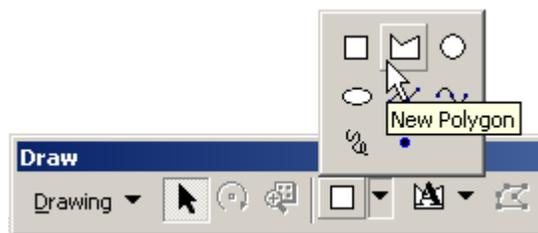
1. Using the *File>Page and Print Setup* and the navigation controls, establish a final paper size, scale and extent for your map layout.
2. Go to the Data Frame properties by **Double-Clicking** or **Right-Clicking** on the Data Frame name in the Table of Contents  or by going to *View>Data Frame Properties* in the main menu.
3. Choose the **Data Frame** tab and choose the **Fixed Scale** option and **Click OK**.
4. Notice your navigation controls are now gray and inactive.



This will help finalize your layout and avoid accidental shifts in your map.

Clipping Layout Area to Graphic

1. From the **Draw** toolbar, choose the **New Polygon** drawing tool, as shown below.



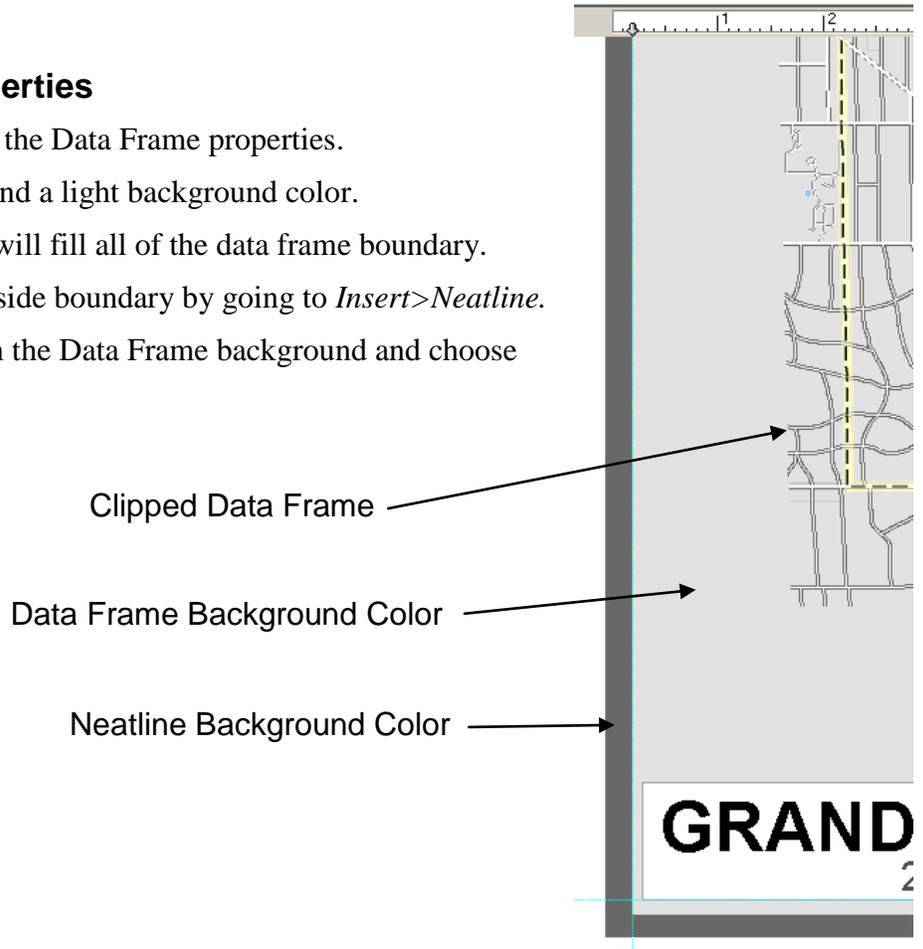
2. Before drawing, make sure the data frame is in focus, by clicking the **Focus Data Frame** button  on the Layout Toolbar. This will allow the graphic to appear in both the layout and data views and enable the option to clip visible area to the graphic.
3. Use the polygon drawing tool to create a **general border** around the government unit boundary. **The goal is to achieve** a layout that cuts off the map information slightly beyond government unit boundary.

4. With the polygon complete and still selected, go the **Data Frame** tab in the Data Frame Properties and check **Enable** in the **Clip to Shape** option and choose Specify **Shape**.
5. Choose **Outline of Selected Graphic(s)**.
6. **Click OK** to close the **Data Frame Properties**.
7. If your graphic is colored, use the **Draw** toolbar to quickly remove the fill color of your polygon to see your clipped area.
8. Go to the Data View and observe the same clipping function take effect. Your polygon shows up in both views due to the use of the **Focus Data Frame** function used in Step 2.

NOTE: The clipping boundary can be modified at any time by drawing another polygon or modifying the graphic with the Edit Vertices  tool (found in the Draw Toolbar). Once a new boundary is formed simply repeat steps 4 - 6.

Using Frame Color Properties

1. Go to the **Frame** tab in the Data Frame properties.
2. Choose a border style and a light background color.
3. **Click OK**. This color will fill all of the data frame boundary.
4. Insert an additional outside boundary by going to *Insert>Neatline*.
5. Pick a darker color than the Data Frame background and choose **Place inside margins**.
6. **Click OK**.



End of Exercise 5.1

Exercise 6.1 – Map Book Creation

In this exercise, you will learn how to:

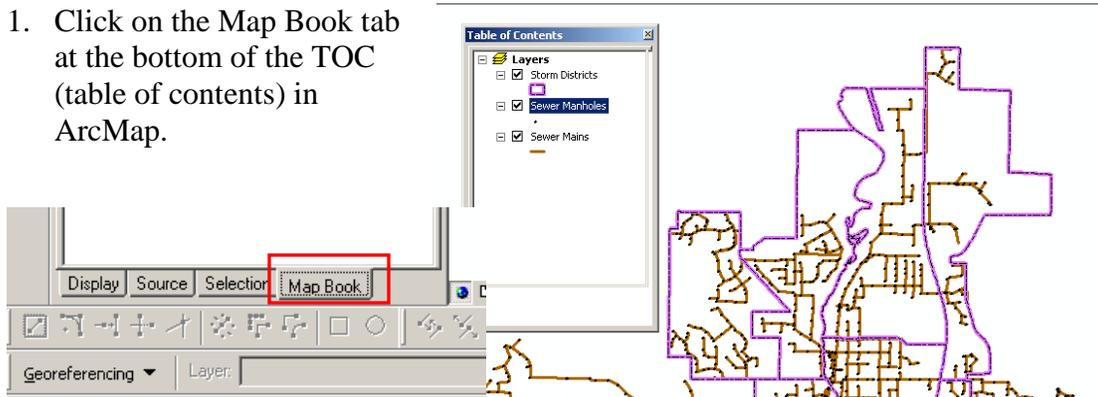
- ◆ Map Book Tool Setup

Setup

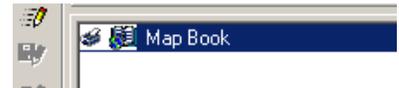
- ◆ Open the map project located at I:/Cartography Training/Map Book.mxd

Index Grid Setup

1. Click on the Map Book tab at the bottom of the TOC (table of contents) in ArcMap.



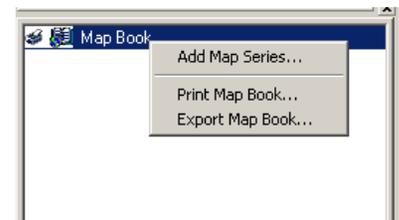
2. Right click on Map Book at the top of the TOC.
3. Click **Add Map Series**.
4. You will see the **Map Sheet Wizard** window appear (see graphic on next page). Fill the Map Sheet Wizard in as follows.



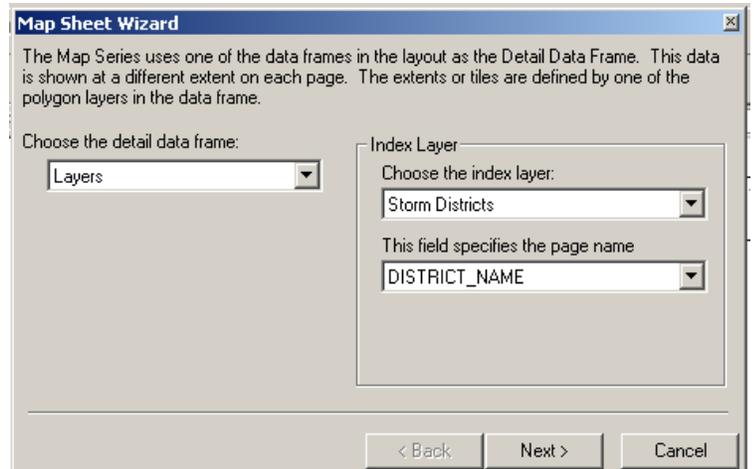
Choose the detail frame: Accept default

Index layer: Pick your index grid layer

This field specifies the page name: Pick the unique field that describes each of your grids (Note: this field must be unique).

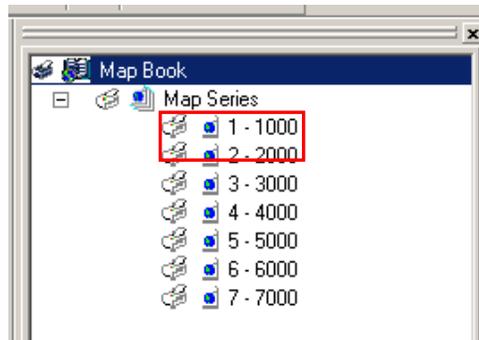


- When finished with the Map Sheet Wizard click Next and except the defaults on the windows that follow and click Finish on the final window.
- Once the Map Sheet Wizard window closes you will see your Map Series appear in the Map Book TOC. (Note: If any error messages appear please call the REGIS Help Desk)



View, Print and Export Pages

- To export an entire map series right click on Map Series and click on Print Series... or Export Series... (export options include: PDF, BMP, TIFF or JPEG)

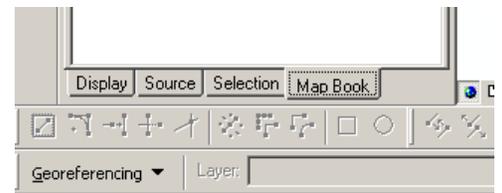


- View a single page by right clicking on the map page under Map Series and click view page.

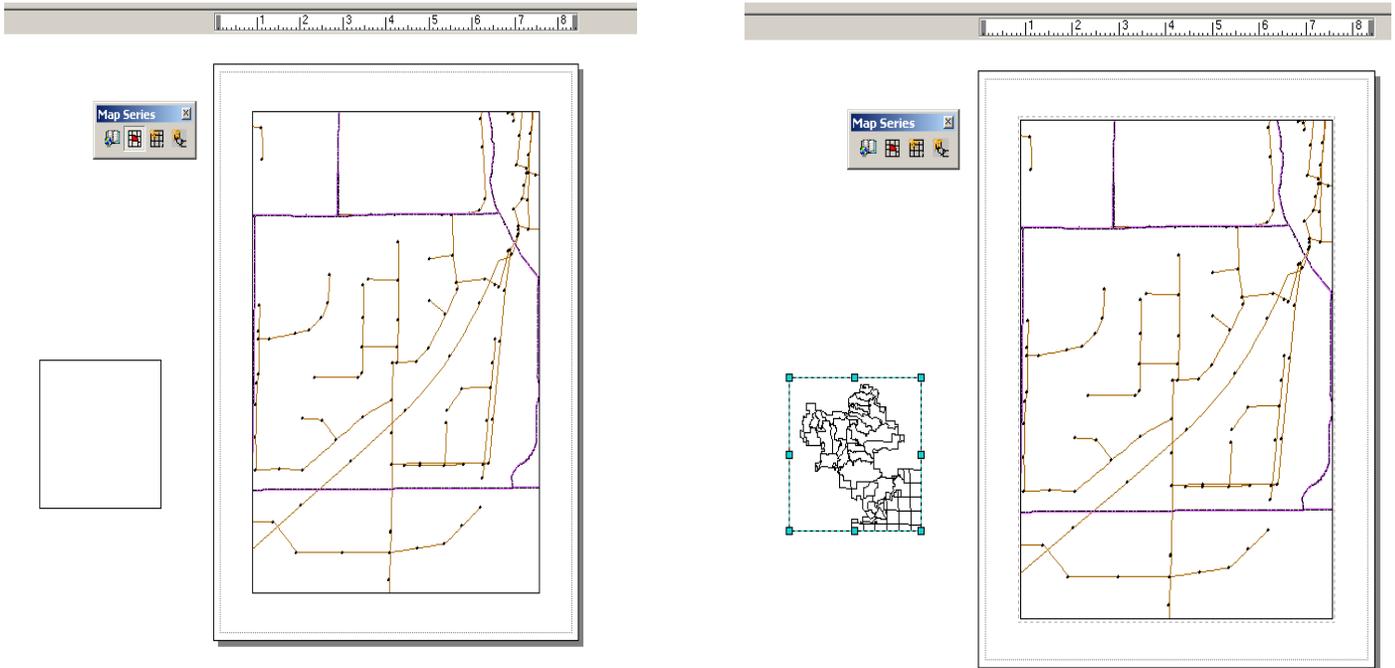
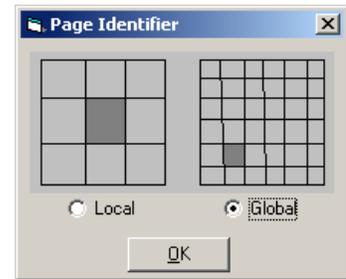
The layout view will automatically zoom to that particular page you selected.

How to Add an Identifier Frame and Index Field

- If you do not see the Map Series toolbar right click in the grey area and check Map Series.
- Click the display tab at the bottom of the TOC to switch back to the display view and be sure you are in layout view.

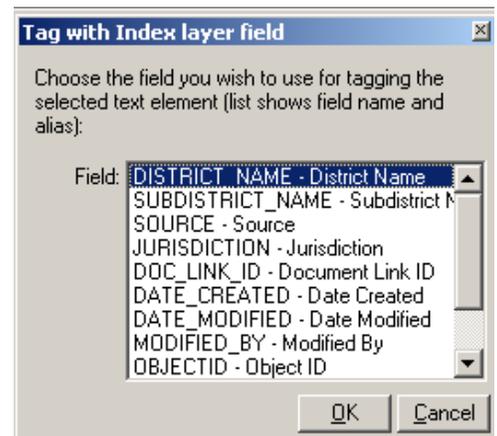


3. Click on the Add Identifier Frame button. 
4. Click and drag to add the new Identifier Frame, as seen below.

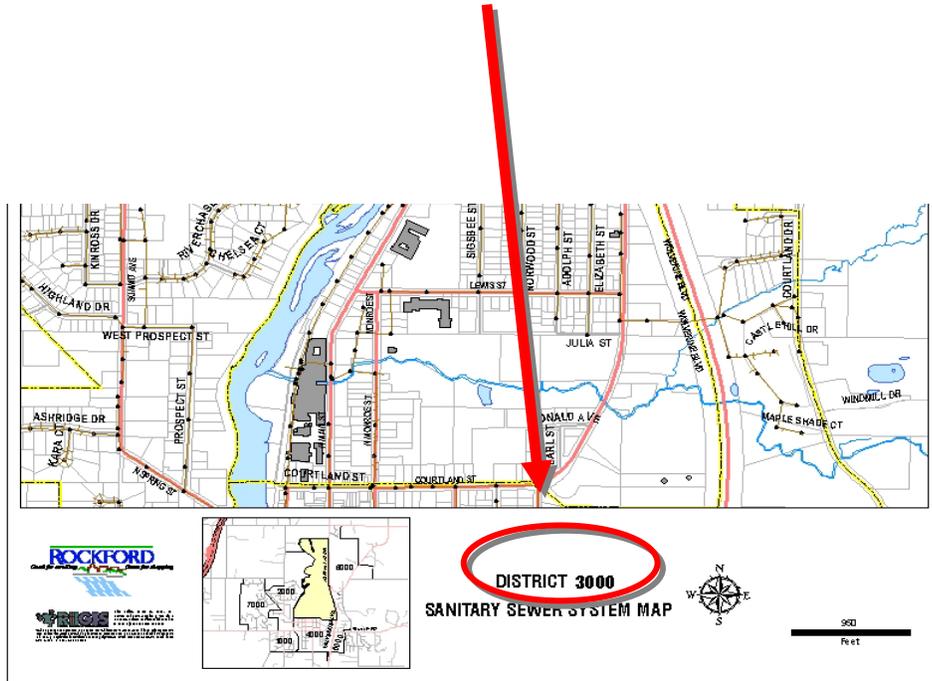


Add the Index Layer Field

1. To add an index layer field make sure you are in the Map Book view in the TOC by clicking on the Map Book tab and be sure you are in layout view.
2. Add text to your layout view.
3. Select the text you added and right click on **Map Series** and click on **Tag with Index Layer Field**.
4. In the **Tag with Index Layer Field** window pick the field you would like to label on your map pages.
5. Click OK



- The text you added will change to the name of the field you indexed. Right click on one of the map pages and click View Page. You will see the text update with the unique identifier. This will update each time to the view changes a page



End of Exercise 6.1

Exercise 7.1 – Color Matching Map Elements

In this exercise, you will learn how to:

- ◆ Color match elements using the eyedropper tool.

Setup

Open the map created in exercise 2.3 and configure both Data Frames for the City of East Grand Rapids, MI. Have the Draw toolbar enabled.

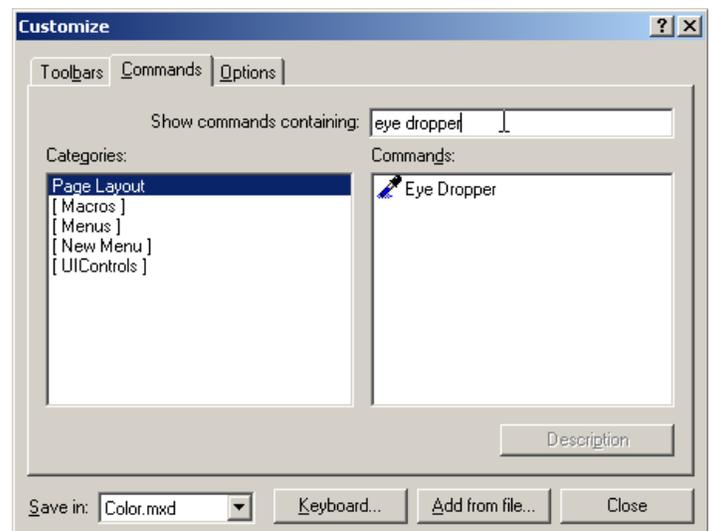
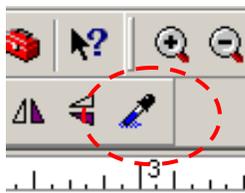
Using Eye Dropper Tool with Logo

1. Enable the layout **Draft Mode** by enabling the button  located on the Layout Toolbar. This will ensure faster navigation as you organize and edit your layout.
2. Insert the East Grand Rapids logo (logo_egrndrapids.jpg) by going to *Insert>Picture...* and navigating to the C:\REGIS Logo\logo_egrndrapids.jpg.
3. Reposition the Logo. You can resize it to a smaller size by selecting and dragging the corners. Stretching it to a larger size is not recommended.



City of
Kent Col

4. Customize your toolbar to add the Eye Dropper by either **Double-Clicking** on an empty space on your toolbar or by going to *View>Toolbars* and scrolling down the list until you see **Customize**.
5. In the **Commands** tab of the toolbar **Customize** window, type “eye dropper” in the search box called **Show commands containing:**
6. Find the Eye Dropper tool that appears in the **Commands** window and click and drag it into a toolbar



7. Use the Eye Dropper tool to record the color value of the logo's yellow background color.
8. You will see a color window come up providing the RGB values of your selected color. You can type in a unique name or keep the numbers and **Click OK** to store it in your personal palette.

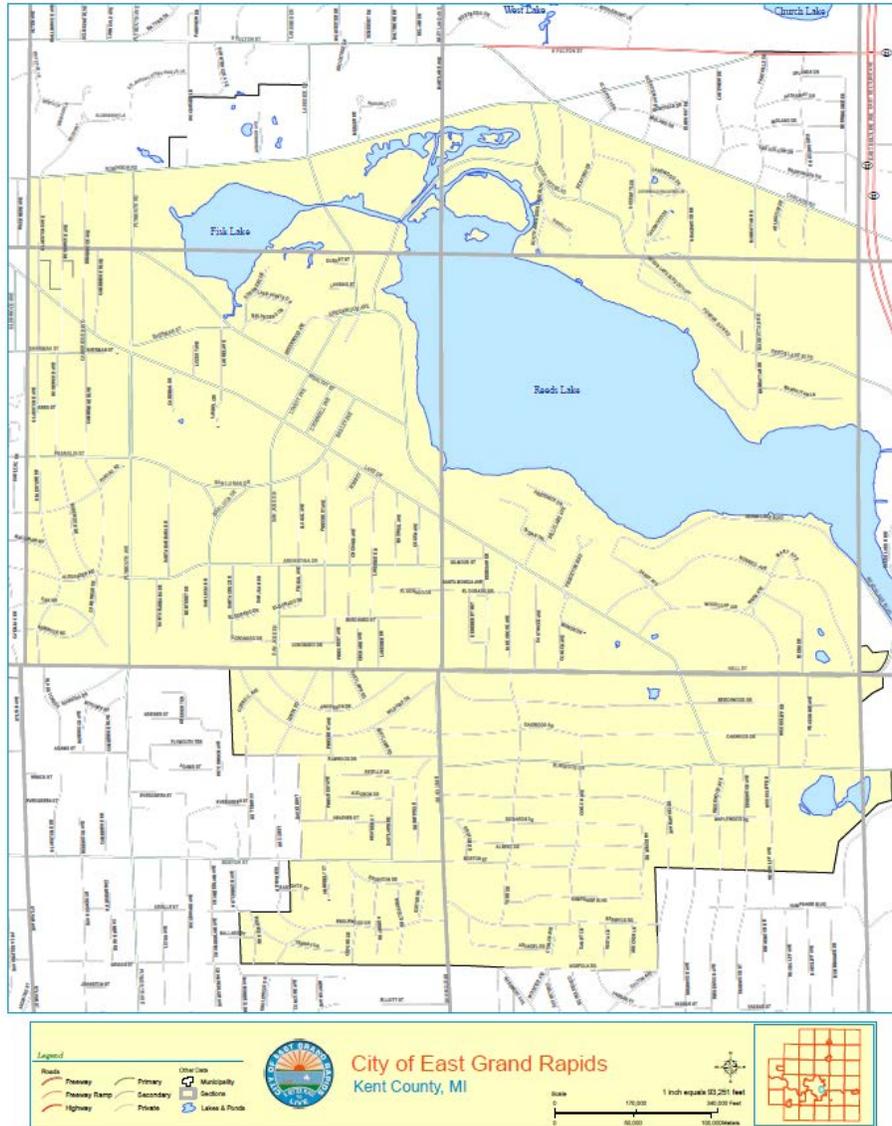


9. Select the graphical border surrounding your legend and title and open the color palette in the Color Fill  tool in the Draw toolbar.
10. Find your color in the palette, which is displayed outside of the default colors.

You will see the color name pop up when placing the mouse cursor above it, as shown at the left.

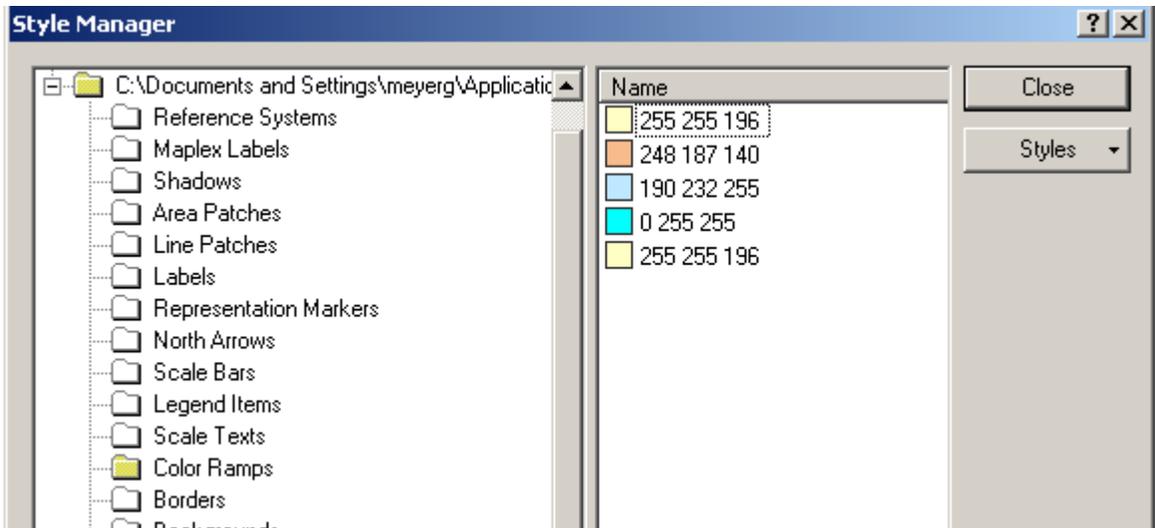
11. Choose your color to fill in your Legend border. This color should blend with the logo's background.
12. Use the Eye dropper to match other colors in the logo with other elements, such as the index map, title text and border lines.

Matching colors can also be used to highlight the municipality and match within your map, as shown in the example below.



Using the Style Manager

1. To view and manage your saved palette colors go to *Tools>Styles>Style Manager* to bring up the Style Manger configuration window.
2. Expand the folder titled *C:\Documents and Settings\ to access your personal style settings.*
3. Choose the Colors folder to view the saved colors stored in your personal color palette. The color along with the name should appear, as shown below. This is the color ID that will show in your palette.



4. You can right click to delete or rename the colors as you see fit. Colors will be stored in your REGIS user profile for future use.
5. Click Close to return to you map.
6. Finalize and save.

End of Exercise 7.1