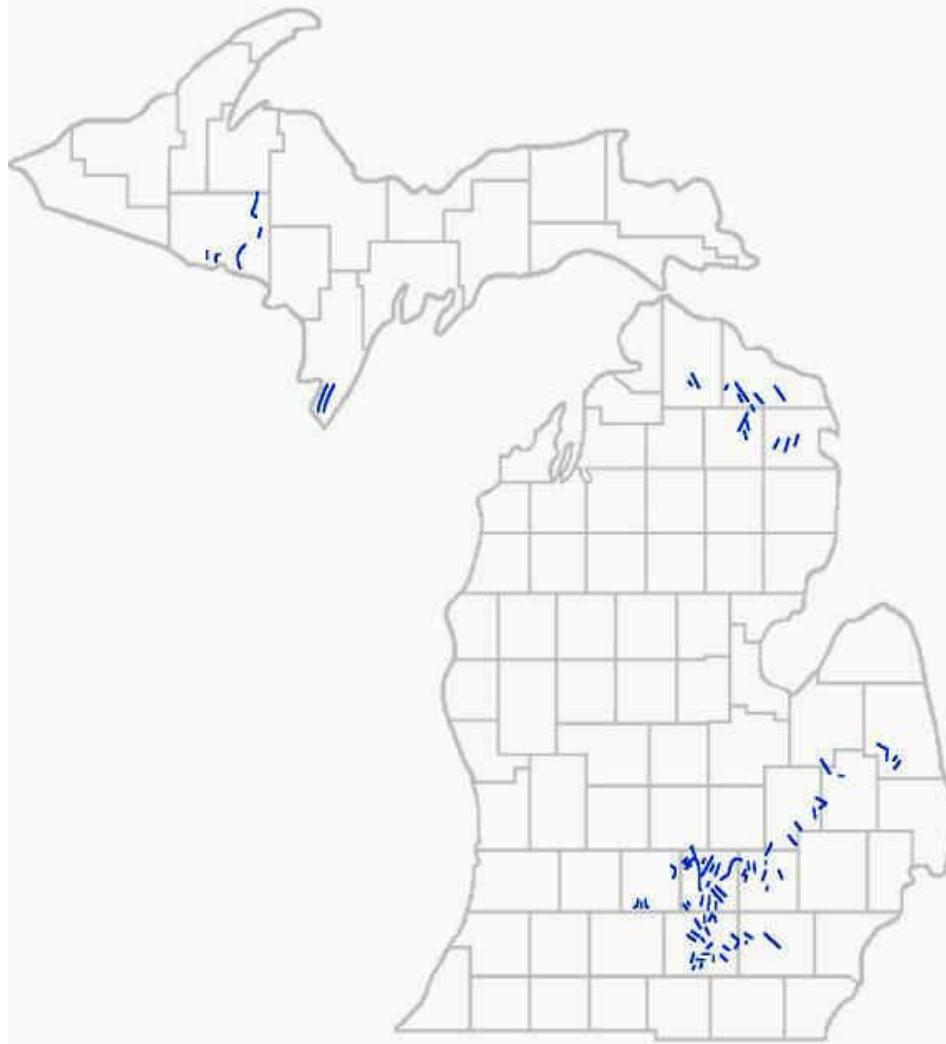


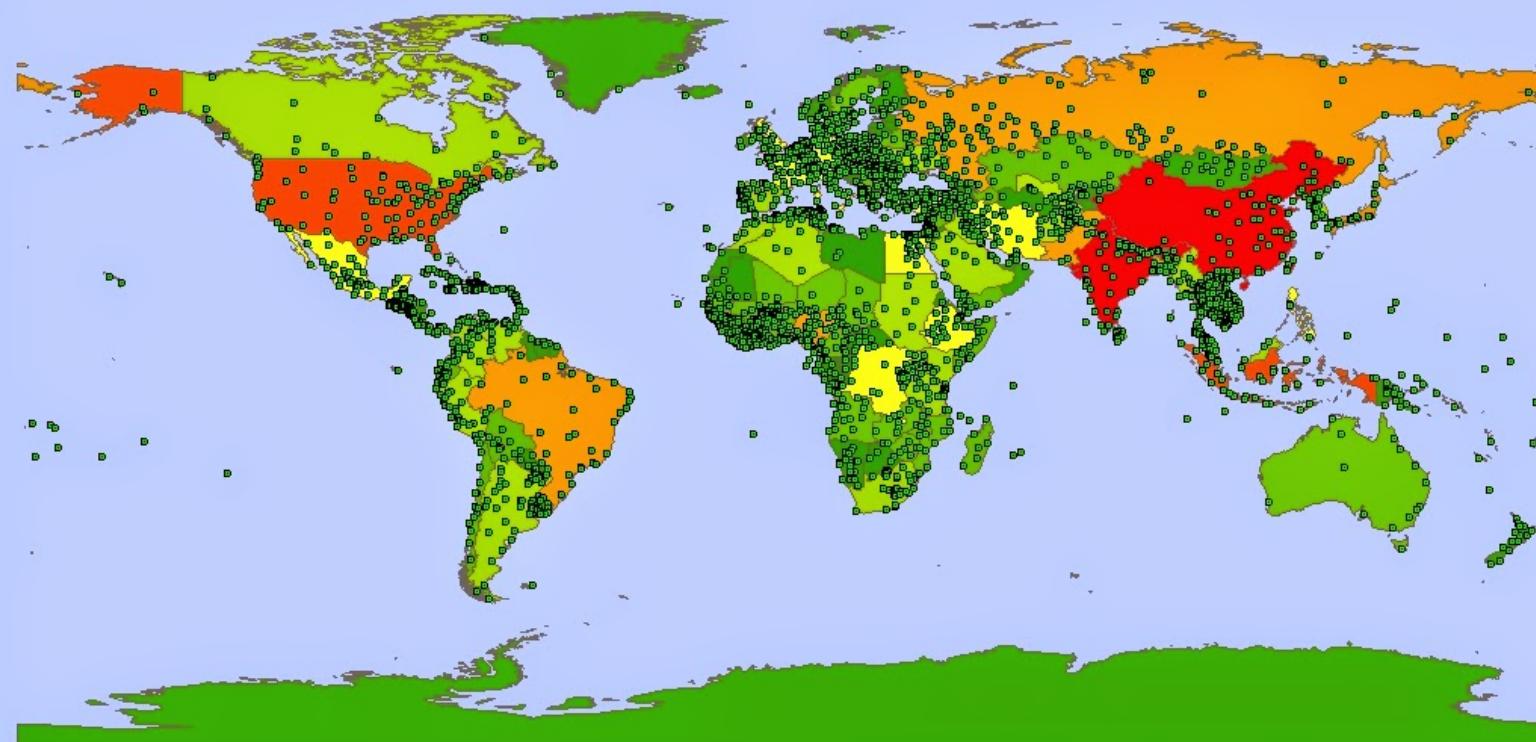
Today's Agenda

- Cartography and map design
- Course projects

Eskers In Michigan



World Countries by Population



Legend

• Cities

World Countries by Population

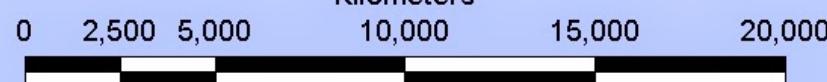
Pop. as of 2007

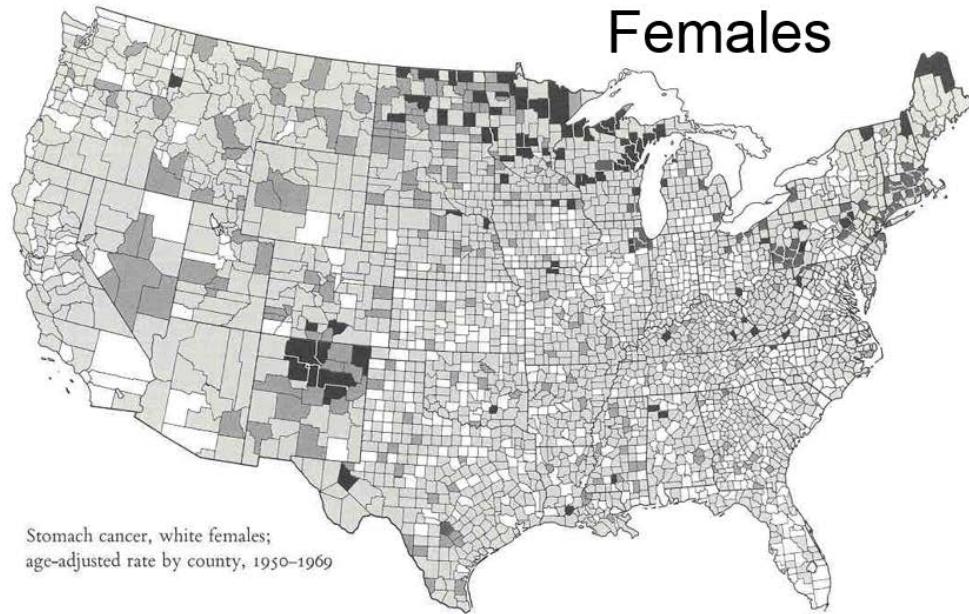
-100000 - 7320000
7320001 - 23300000
23300001 - 49000000
49000001 - 108700000
108700001 - 190000000
190000001 - 301140000
301140001 - 1330000000

Created By: [REDACTED]

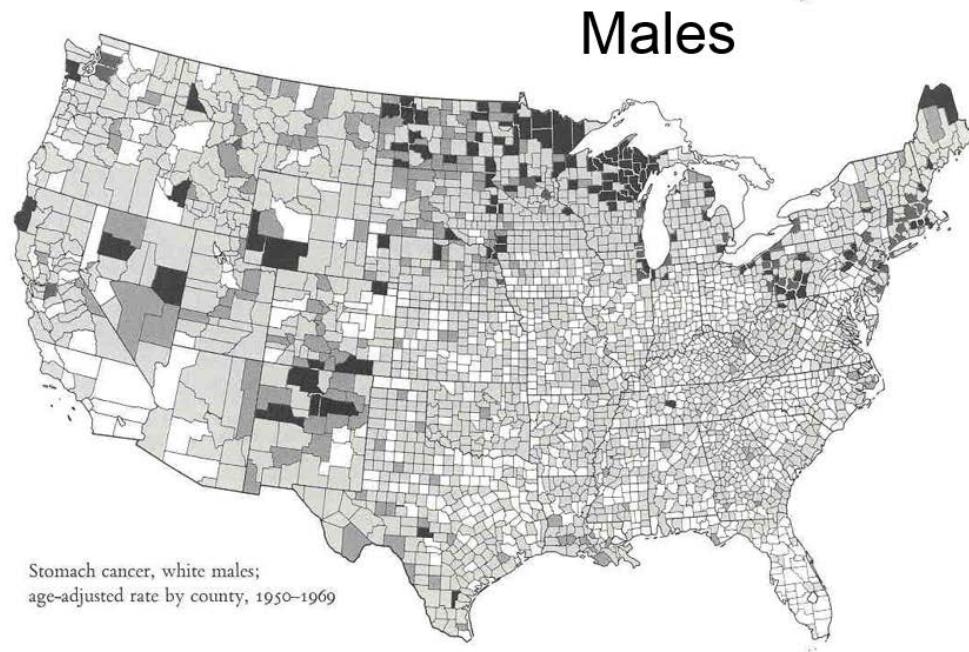
Data Source: USGS

Created 1/11/2015





- Highest decile
- Significantly higher
- Higher than average (NS)
- Not different from US average
- Lower than average



Adapted from *Atlas of Cancer Mortality for U.S. Counties: 1950-1969*,
TJ Mason et al, PHS, NIH, 1975

Audience

Who will be viewing the map?

What is their expected level of knowledge?

- About the subject matter
- About maps in general

Do they have special requirements?

- Color blindness, large print?

Medium

Paper map (300 DPI)

- Report? Wall map? Poster?

Electronic files (pdf, jpg, etc. – 96 DPI is typical)

- What format(s)? File sizes? Delivery method?
- Never send a Word document with a screenshot of map

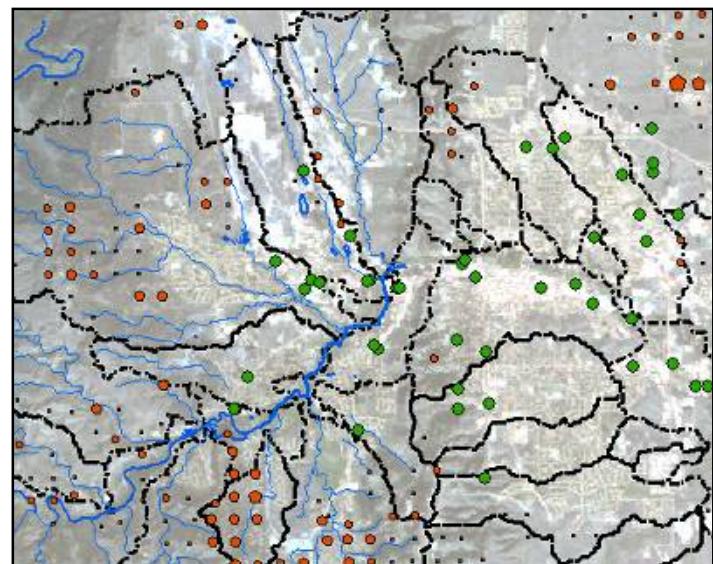
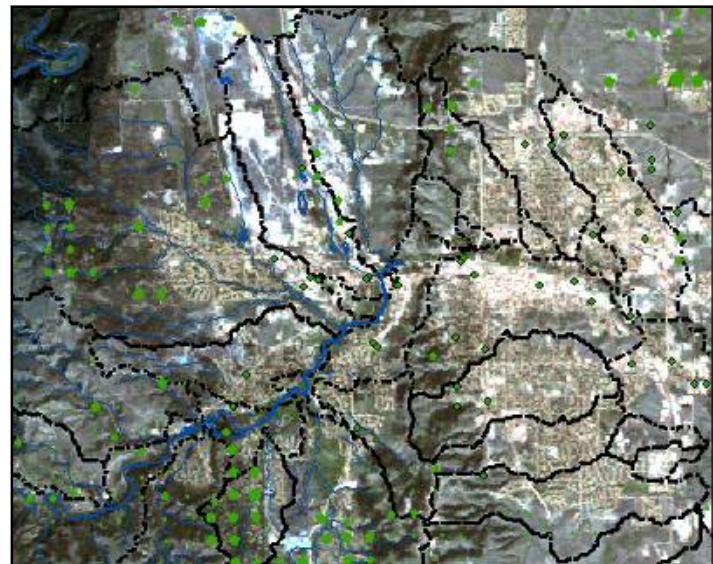
Projection screen

Mobile devices/tablets/smartphones

Selecting the data layers

A good map tells a story

- Who are the lead players?
- Which layers play a supporting role?
- Do some layers distract from the story? Or obscure it?



Should you omit some data?

Privacy issues

- Publishing parcel owner names

Sensitive information

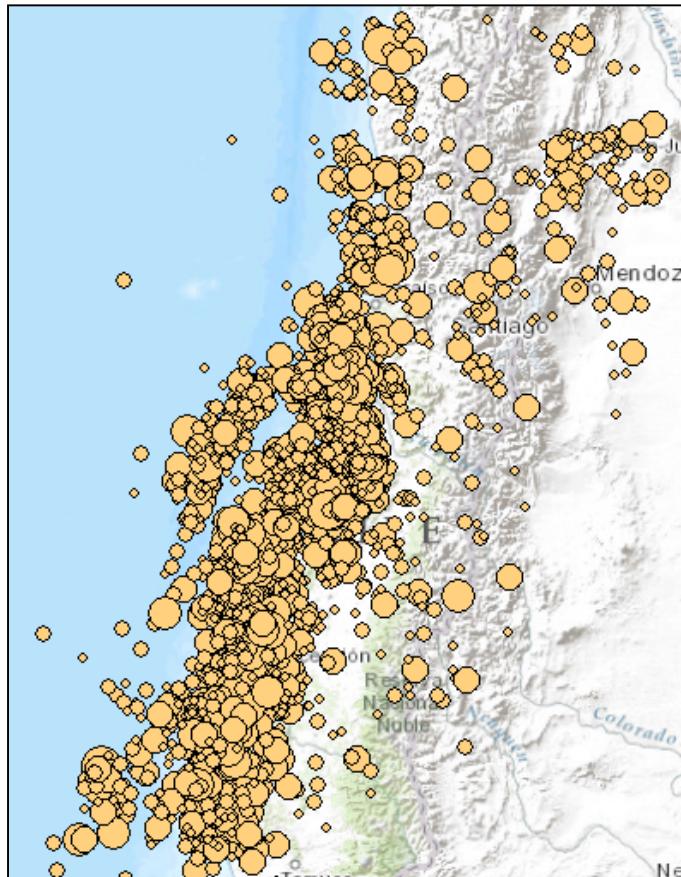
- Fossil or archeological sites (poaching issues)
- Pipelines or climate stations (vandalism concerns)

Unintended economic consequences

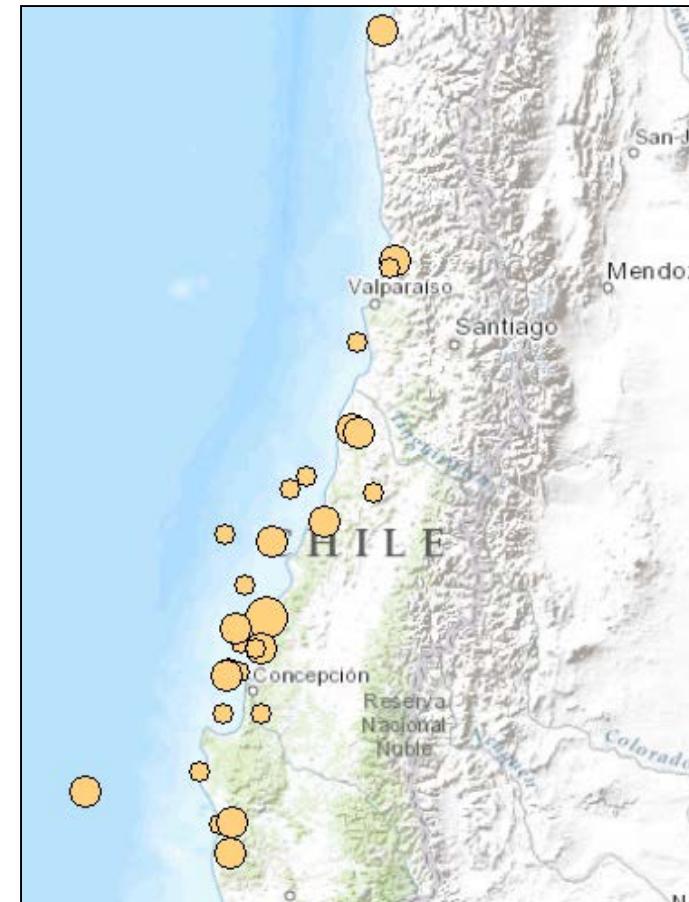
- Showing faults intersecting parcels
- Publishing water tests of private wells

Using a query

Show a
subset of
features



Quakes > 4.0

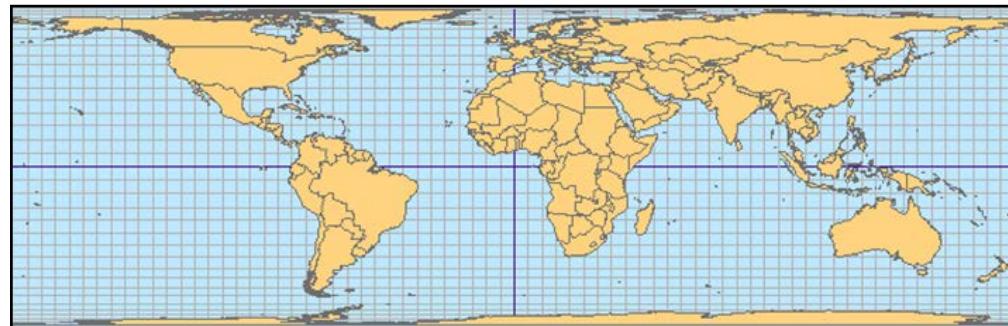
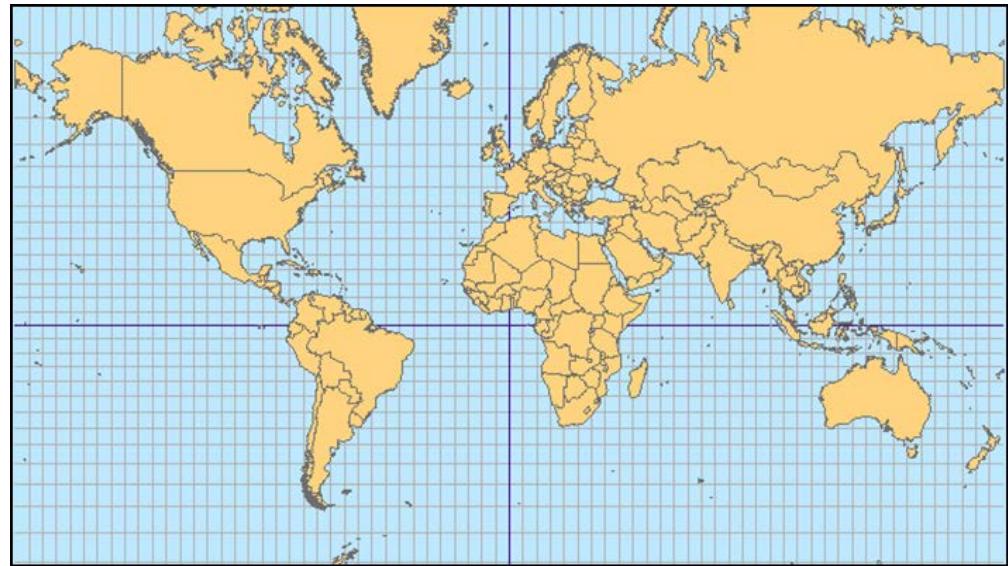


Quakes > 6.0

Unintended consequences

Projection choice
may affect the story

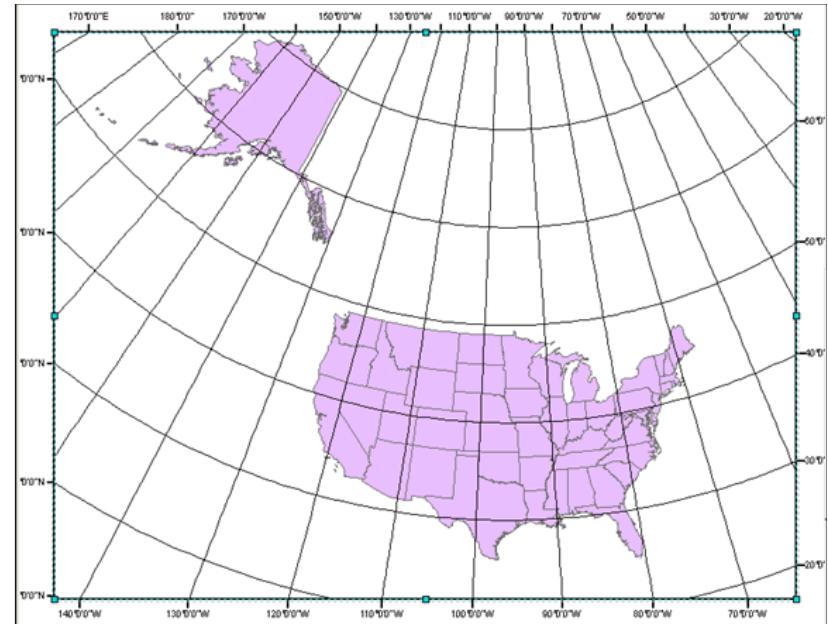
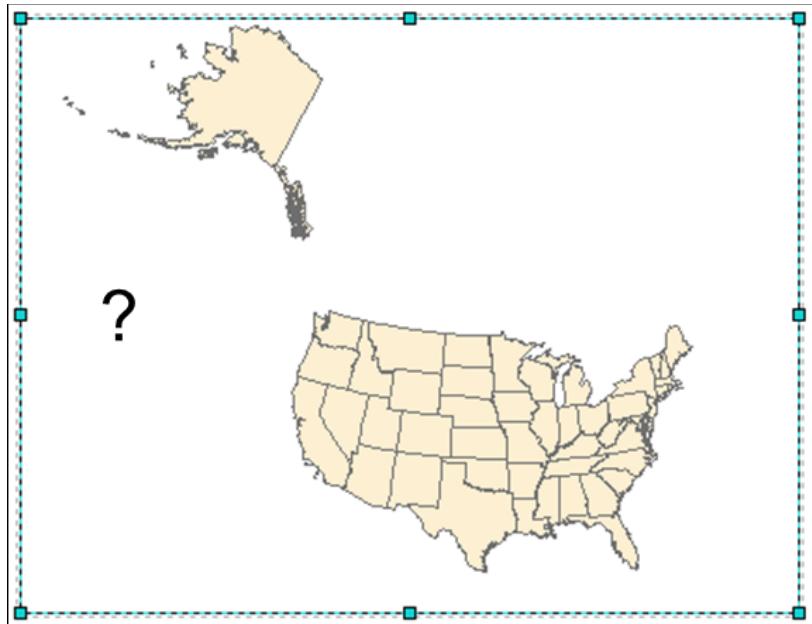
Mercator maps
make northern
hemisphere look
more important



Cartography and map design

Graticule grids

A north arrow is not appropriate for **some** projections because some projections distort direction. You should place graticule grids on a map **and** a north arrow when appropriate.



Maps that distort distance should not have scale bars.

Visual hierarchy

The order in which a reader perceives the different objects in a design

A good map establishes a clear pathway that highlights the important aspects

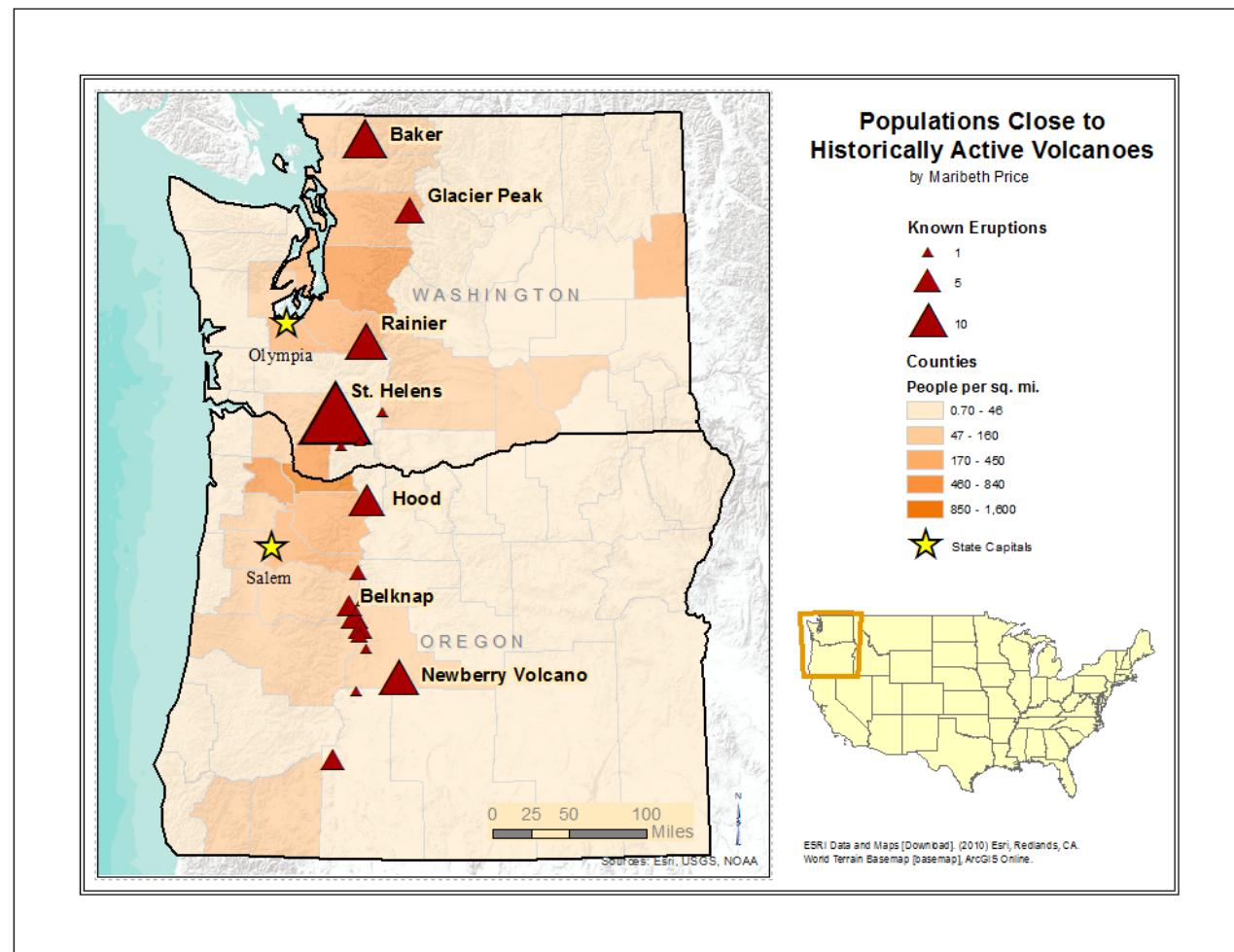
Visual hierarchy

What is the map about?

What did you notice first?

How did your eye move around the map?

How was the path achieved?

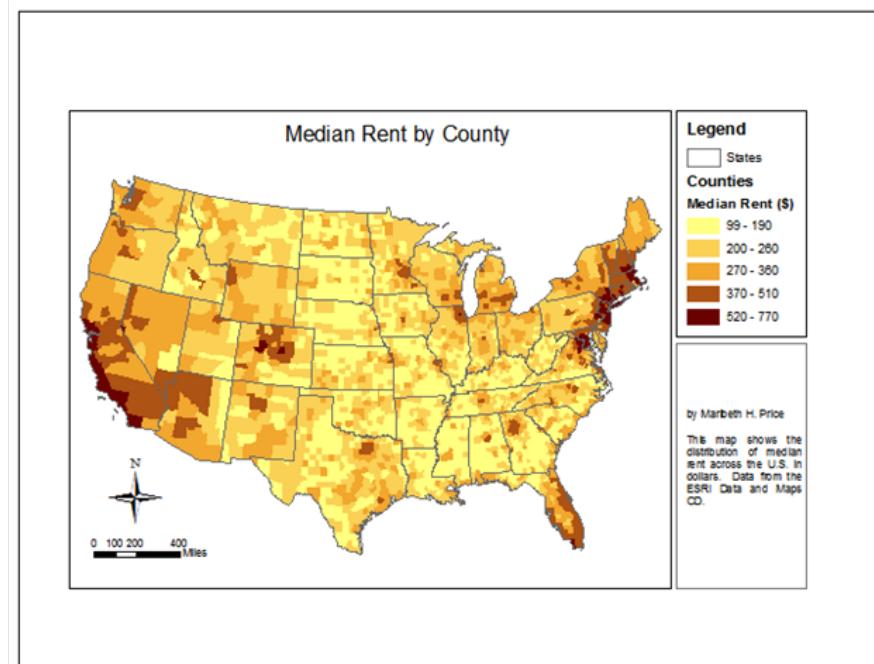
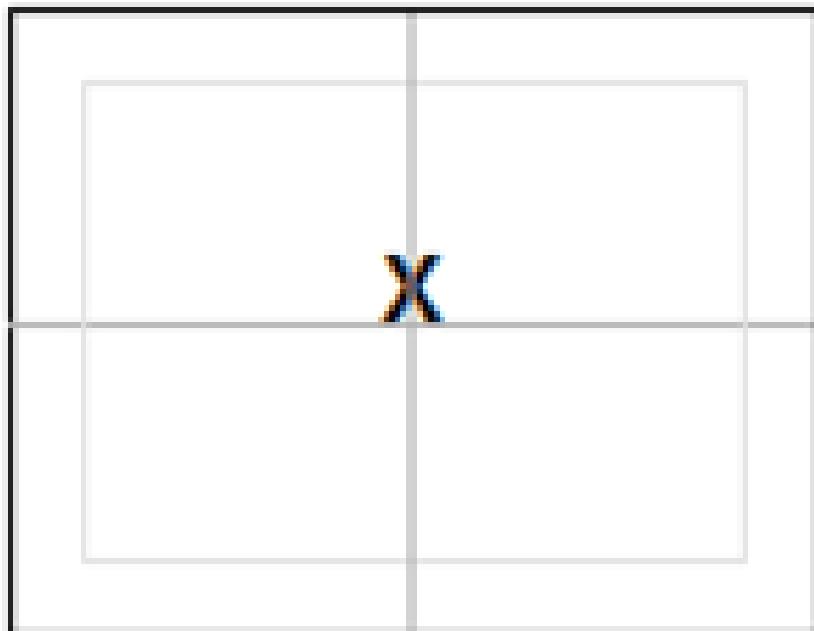


Establishing a visual hierarchy

- Visual center
- Rule of thirds
- Balance
- Alignment
- Negative space
- Neatlines
- Symbolization
- Color
- Contrast
- Size/thickness
- Foreground/background

Visual center

Visual center is higher than the geometric center

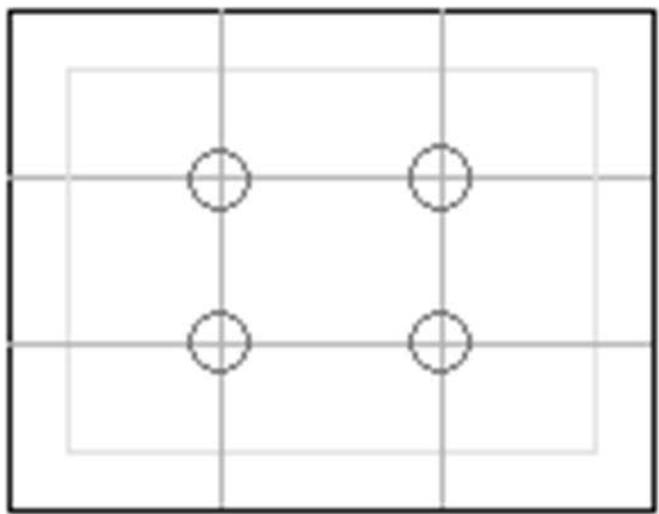


Map feels a little heavy, no?

Rule of thirds!

Composition rule for photographs

Place important items at intersections

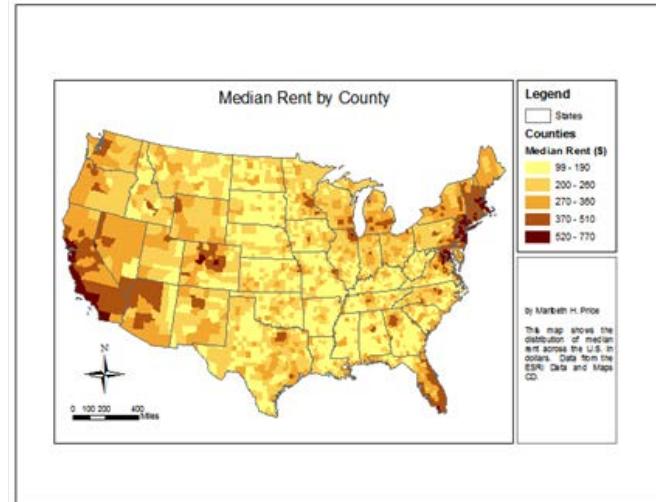
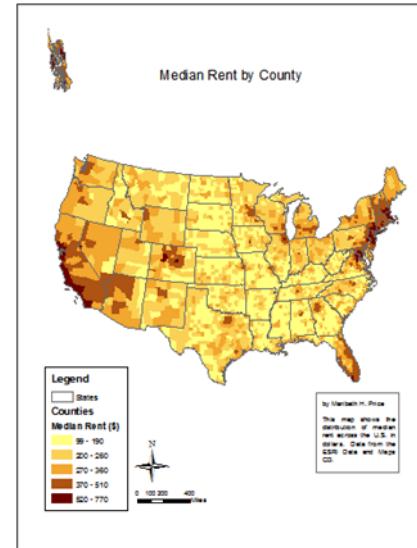


Negative space

Balance it evenly

Don't crowd elements

Don't leave big empty spaces



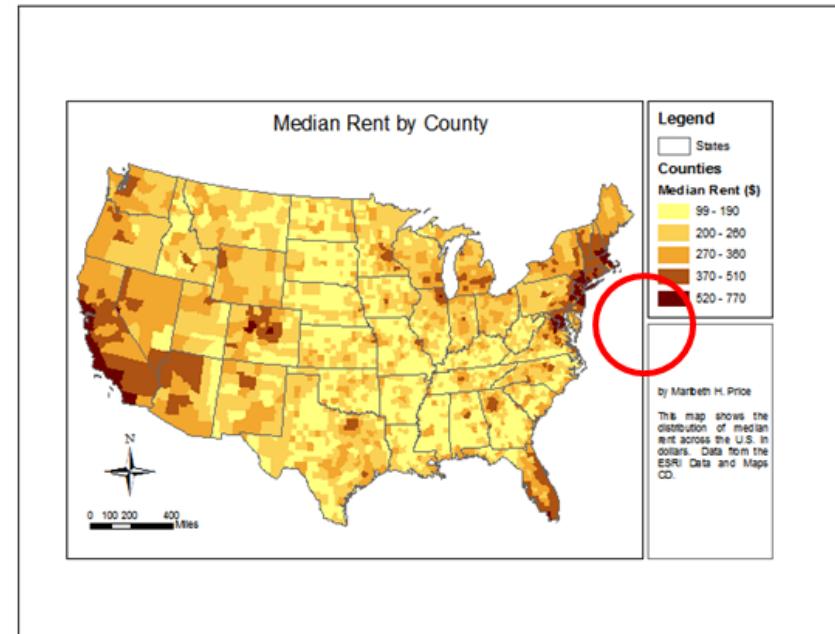
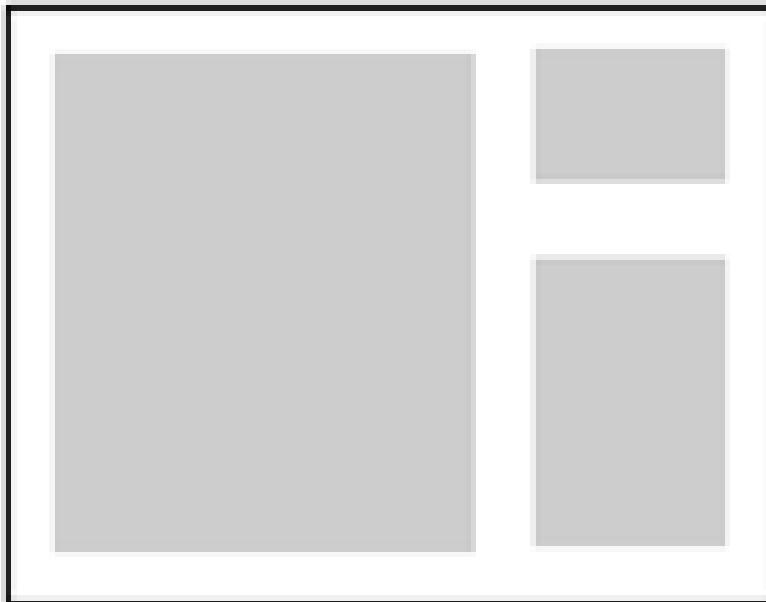
Balancing elements



Shuffle things around until there is good balance and use of negative space

Alignment

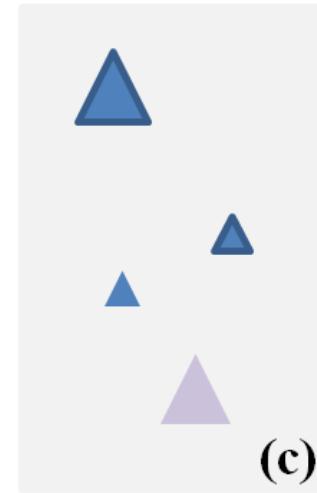
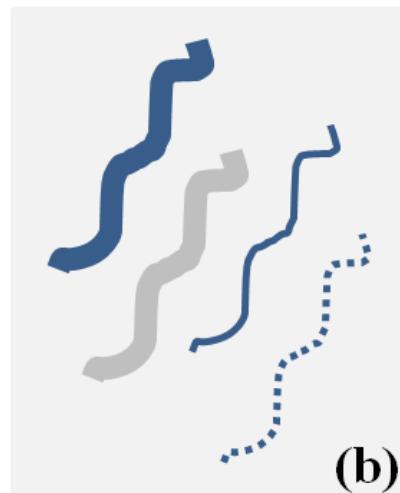
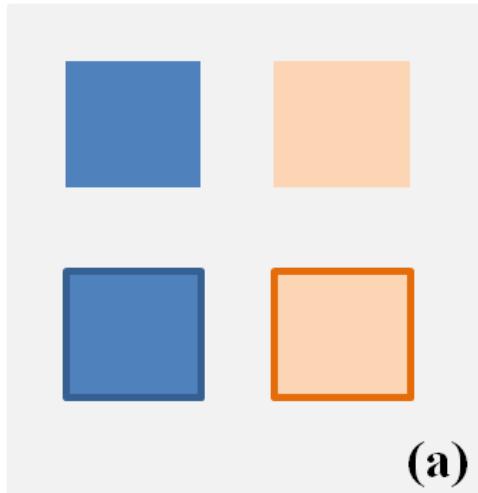
Use columns
Align edges



Symbolizing for hierarchy

What stands out?
How is it achieved?

- Color
- Contrast
- Foreground/background
- Size/thickness
- Symbol/font
- Spacing/grouping



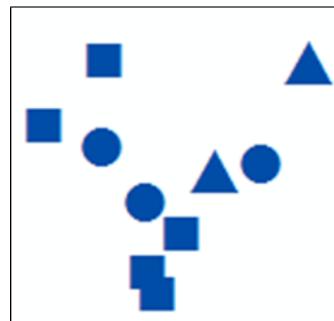
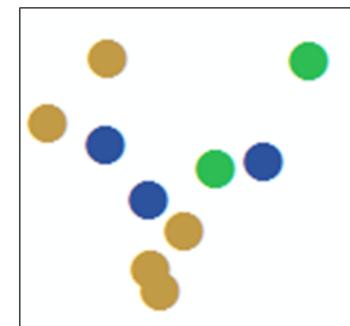
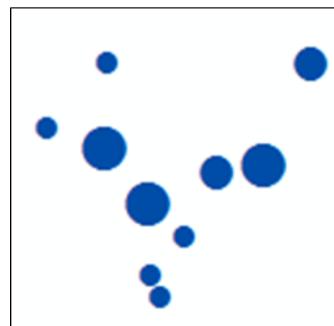
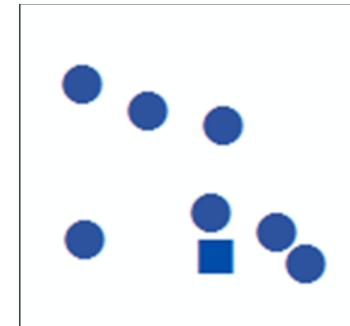
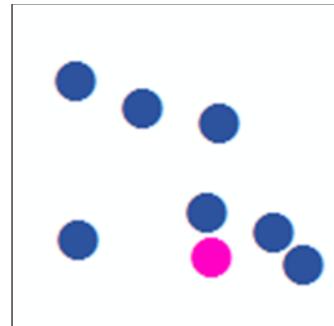
MAINE
Maine
Maine
Maine
Maine
Maine
Maine
Maine
Maine

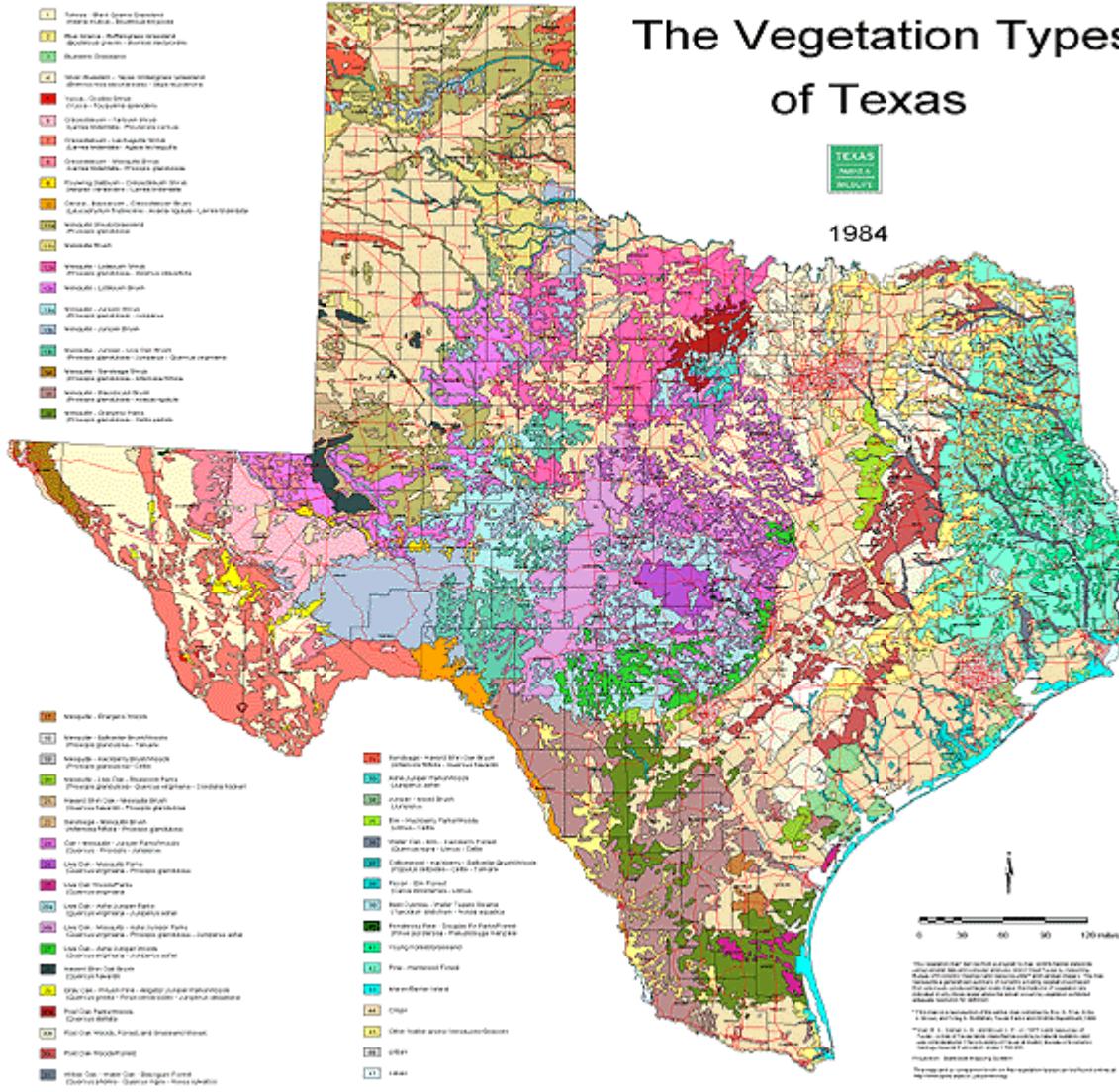
(d)

Symbols and patterns

The brain doesn't just observe, it tries to find patterns

- How do you make things stand out? Belong together?
- Show difference in quantity? Difference in category?





The Vegetation Types of Texas

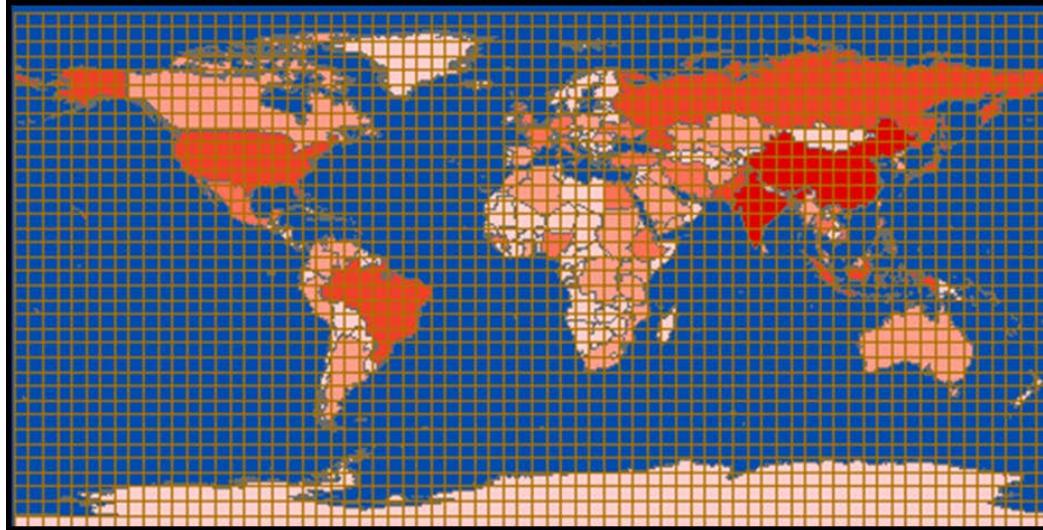
Alignment?

Negative space?

Visual hierarchy?

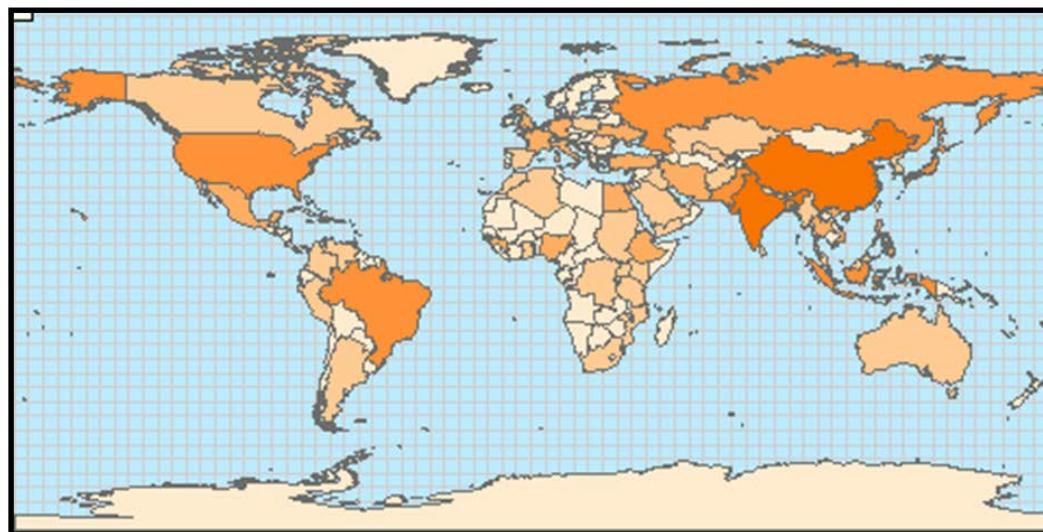
Balance?

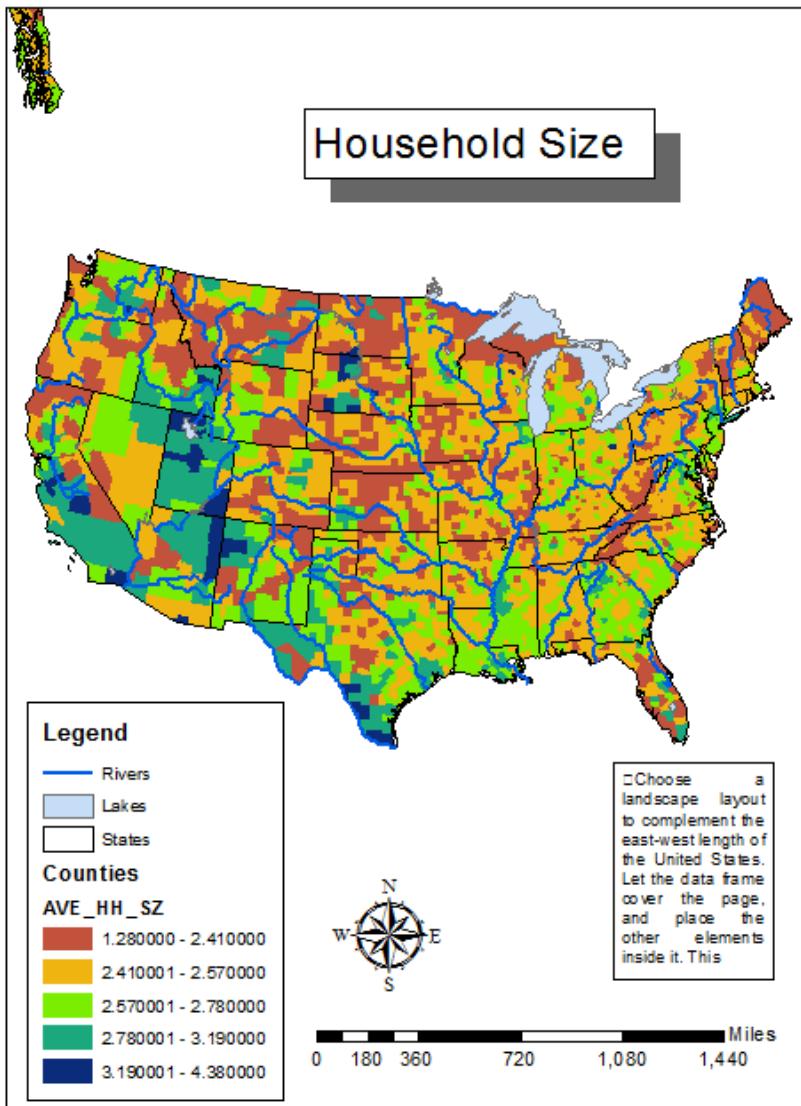
Visual Center?



Which map has a clear visual hierarchy?

How is it achieved?





Alignment?

Negative space?

Visual hierarchy?

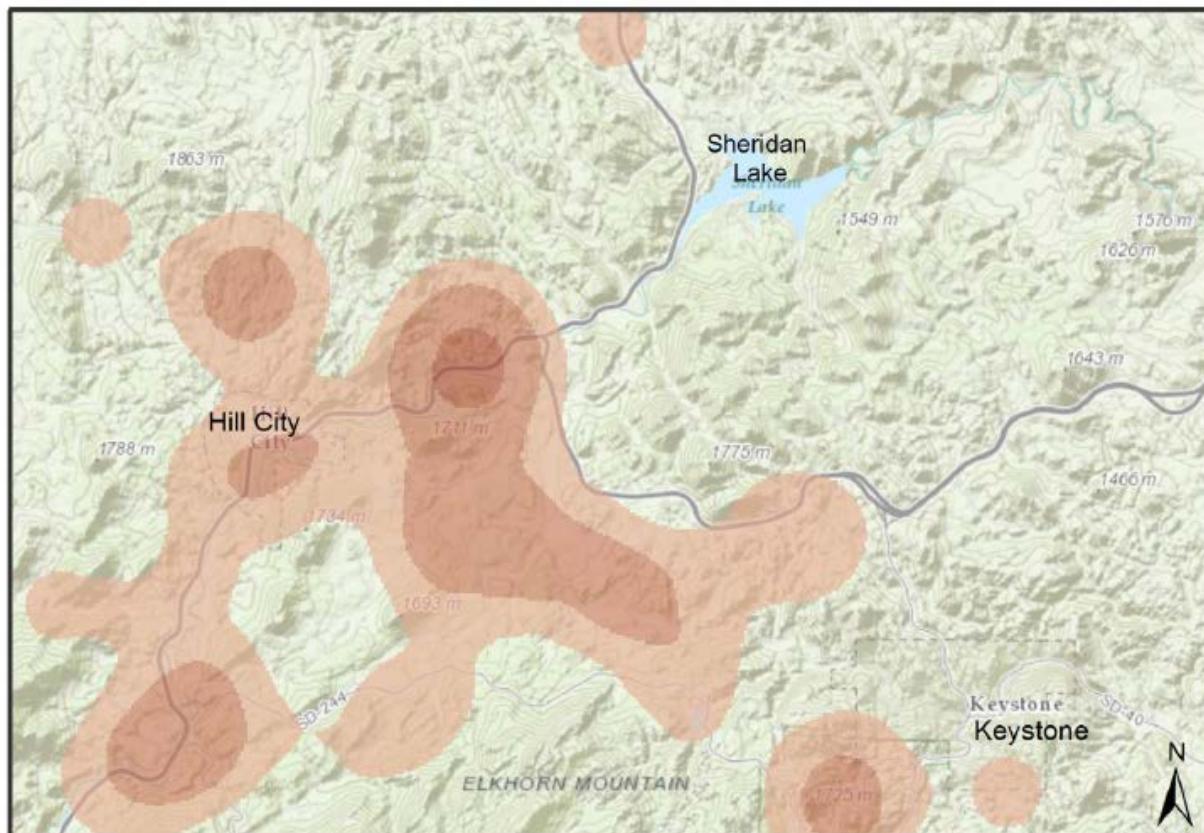
Balance?

Visual Center?

The three-second test

Look at the map on the next slide for 5-4 seconds

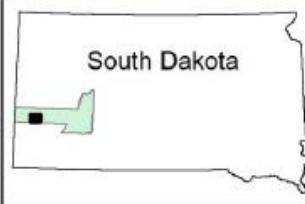
Arsenic Areas of Concern



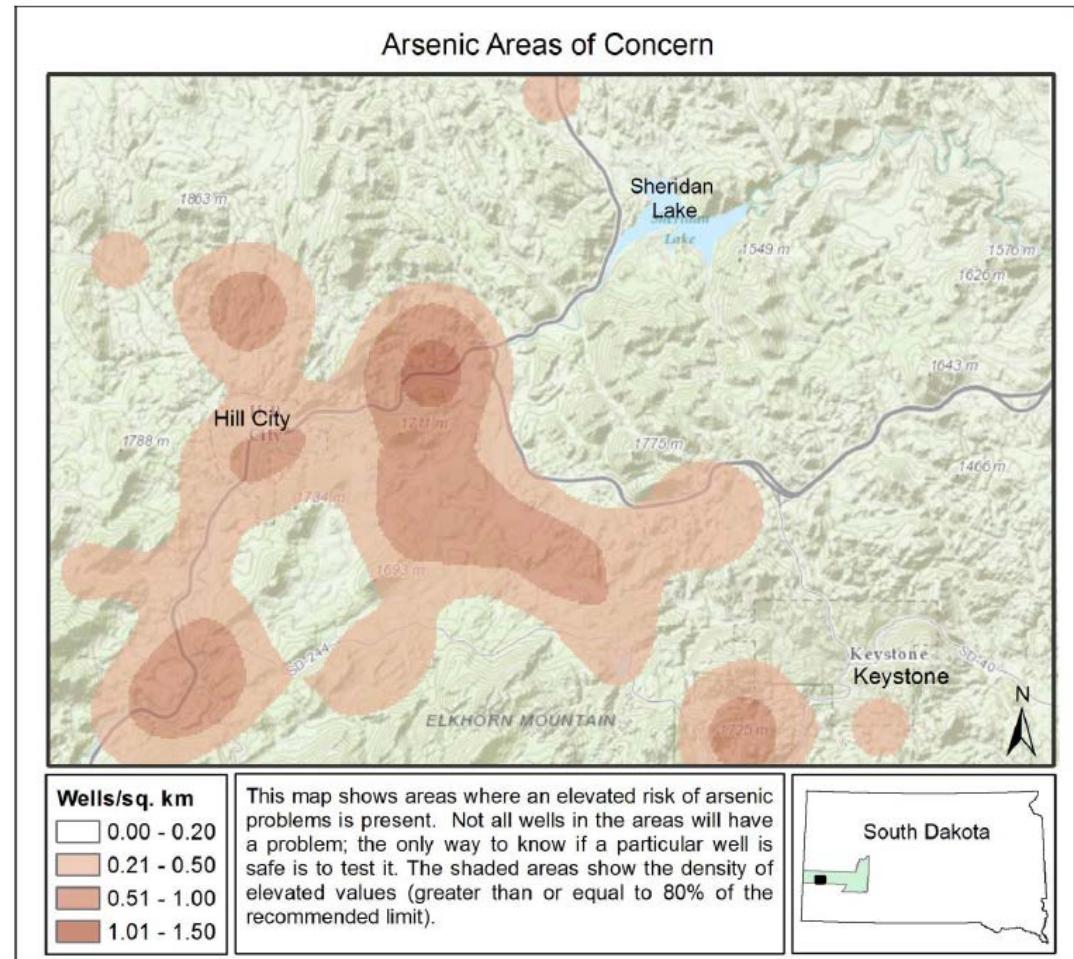
Wells/sq. km

0.00 - 0.20
0.21 - 0.50
0.51 - 1.00
1.01 - 1.50

This map shows areas where an elevated risk of arsenic problems is present. Not all wells in the areas will have a problem; the only way to know if a particular well is safe is to test it. The shaded areas show the density of elevated values (greater than or equal to 80% of the recommended limit).



- What did you notice first?
- Was your first impression positive or negative?



Longer review

- What is the map about?
- What is the main point?
- Is anything confusing or unclear?

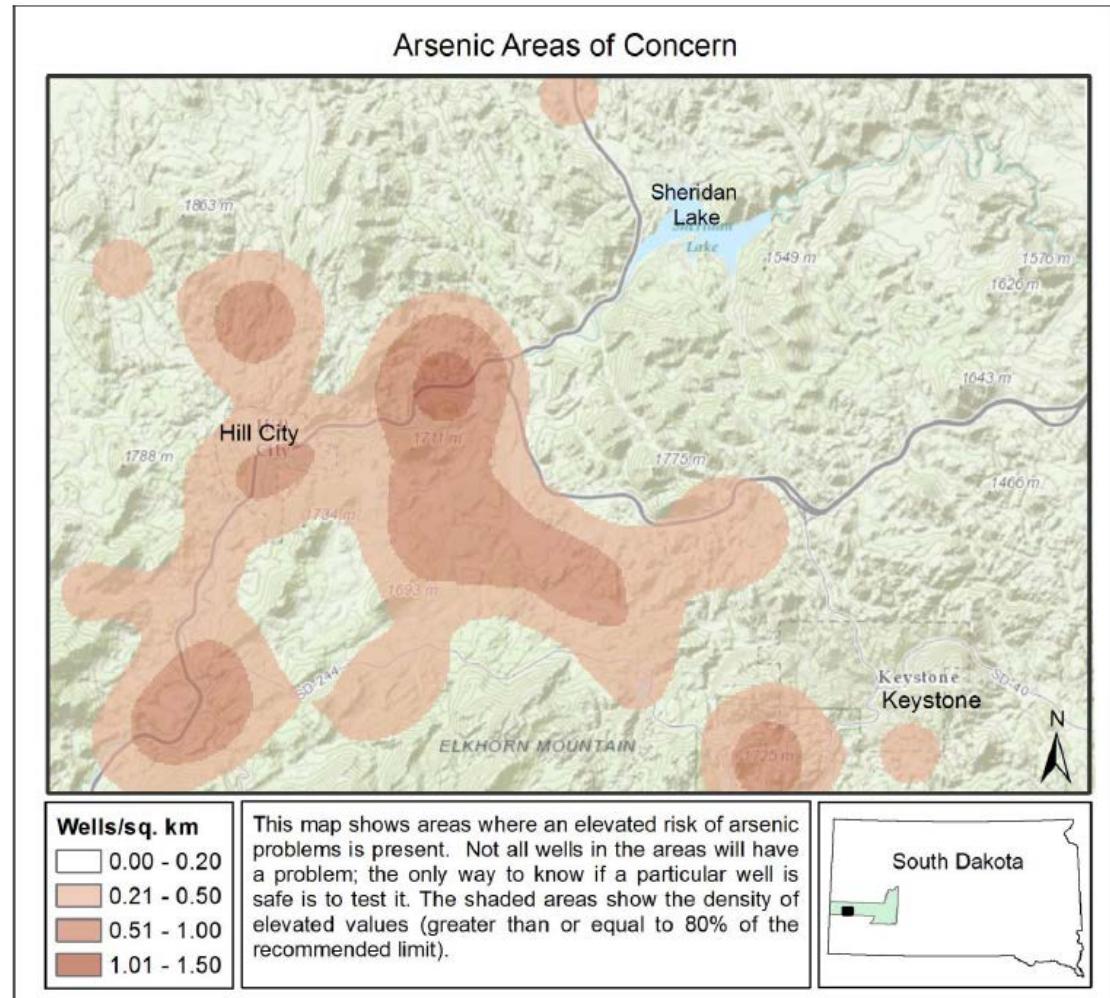
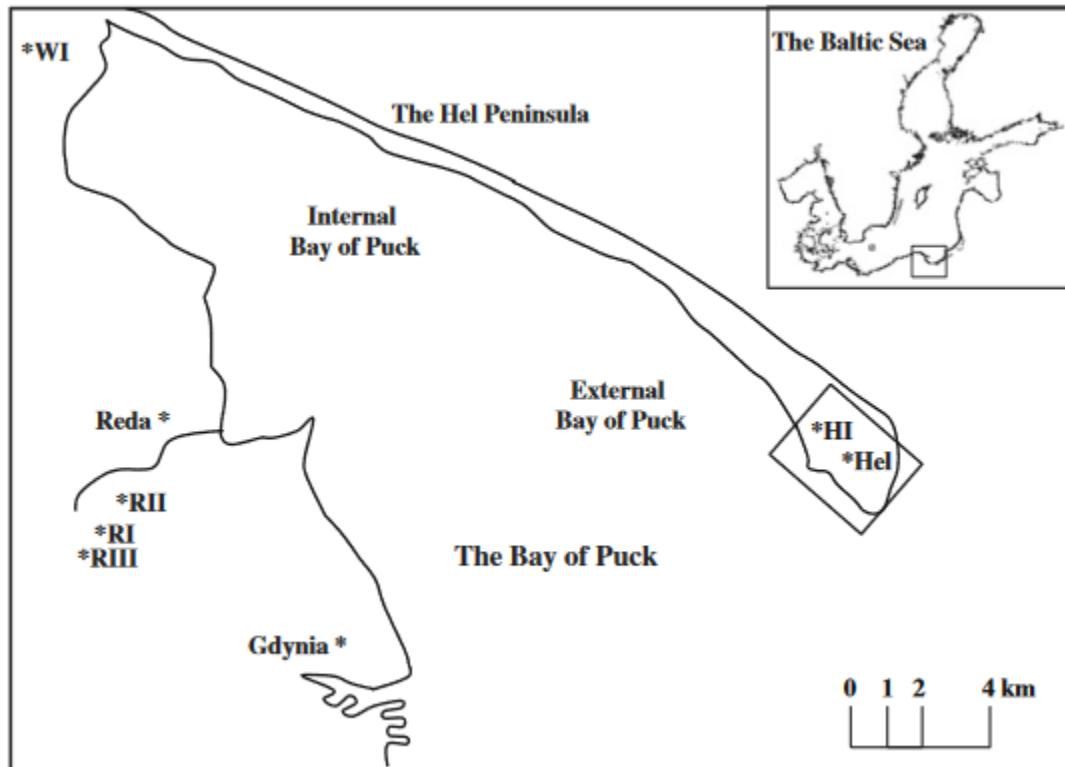
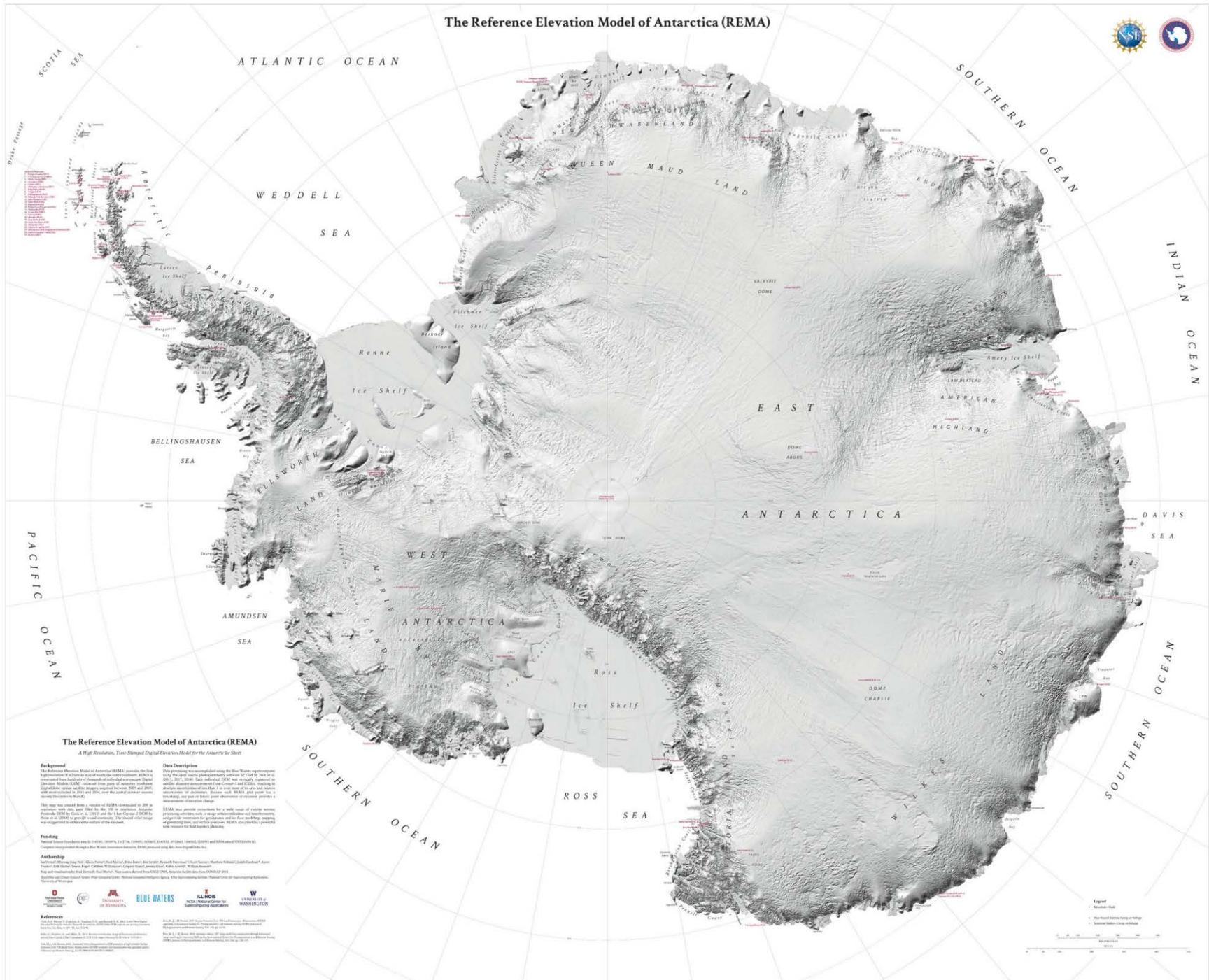


Fig. 1 Map of the Bay of Puck with the study area indicated as a square and sampled groundwater wells: H1 (Hel), W1 (Władysławowo), RI (Reda I), RII (Reda II), RIII (Reda III). RI is a Tertiary aquifer at 41 m depth RII is a Quaternary aquifer at 15.7 m depth, RIII is a Craterous aquifer at 178 m depth, H1 and W1 are Pleistocene aquifers at 170 m and 122.5 m depth respectively



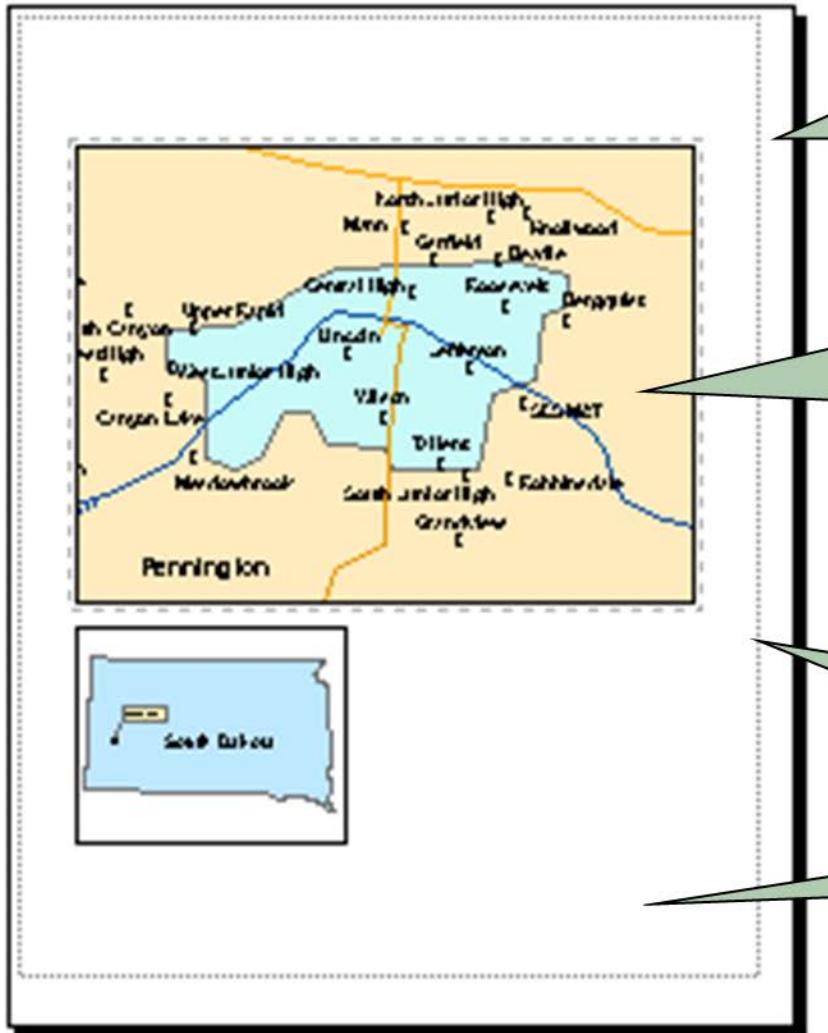
The Reference Elevation Model of Antarctica (REMA)





Landsat Image Mosaic of Antarctica (LIMA) Project

Visioning the map page



Paper size?
Landscape or Portrait?

Data frames
Size and position?
Map scale?

Margins

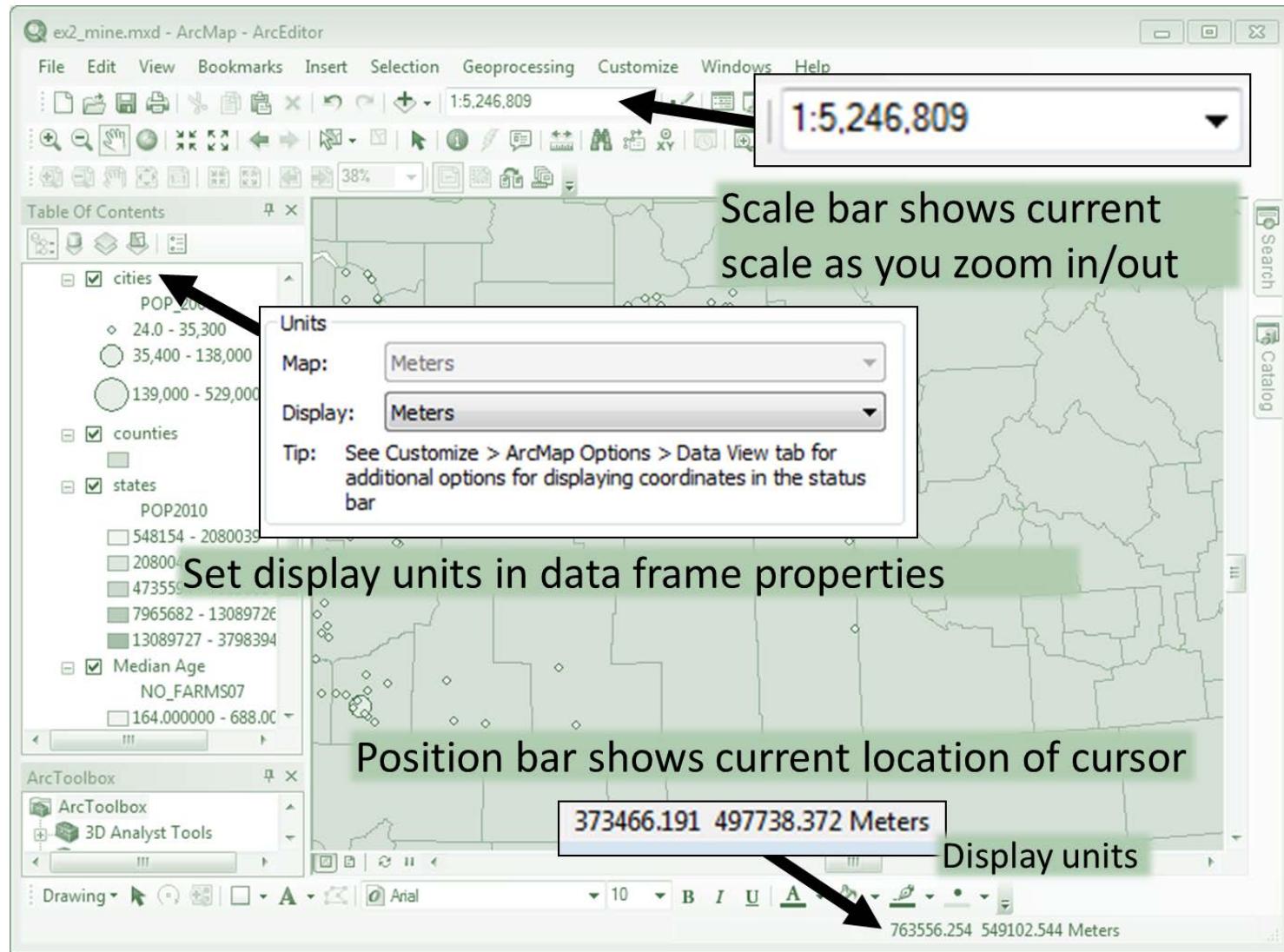
Grid for aligning features

Units terminology

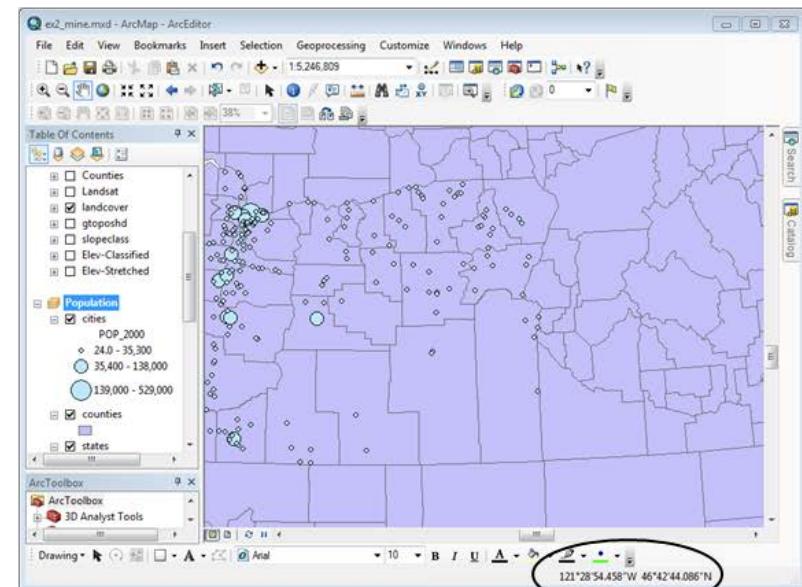
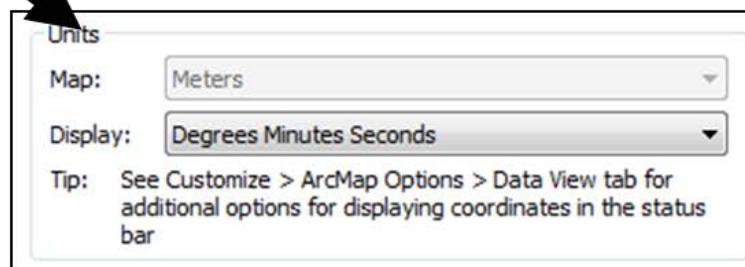
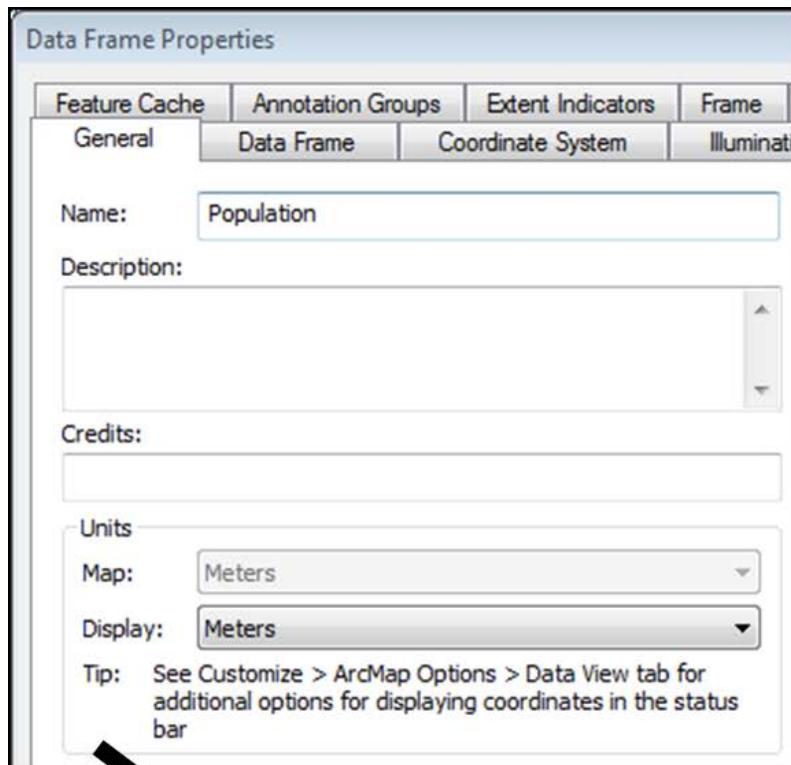
Map units are determined by the data frame coordinate system.

Display units can be set by the user, so that the coordinates may be viewed in any desired unit, such as miles.

Page units show the location on the map page layout, usually in inches or cm.



Setting the display units



373466.191 497738.372 Meters

122°52'24.786"W 46°34'49.117"N

Dynamic labels

Layer Properties

General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates Time HTML Popup

Label features in this layer

Method: Label all the features the same way.

All features will be labeled using the options specified.

Text String

Label Field: AREA_ACRES Expression...

Text Symbol

Arial 8 AaBbYyZz B I U Symbol...

Other Options

Placement Properties... Scale Range... Pre-defined Label Style Label Styles...

Scale Range

You can specify the range of scales at which labels will be shown.

Use the same scale range as the feature layer.

Don't show labels when zoomed:

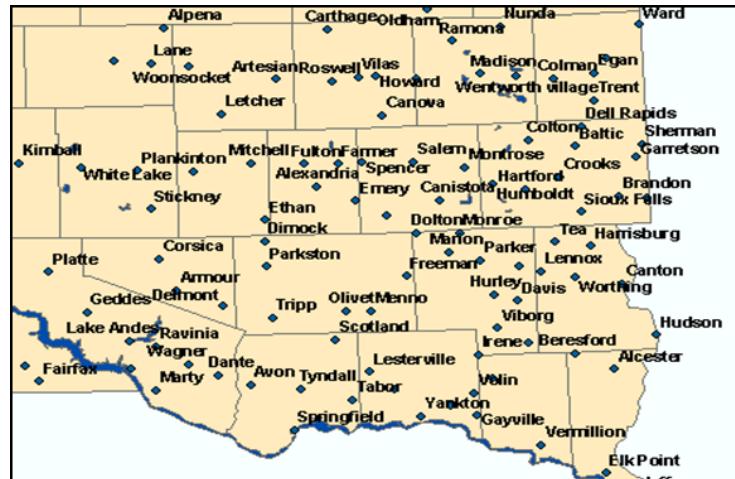
Out beyond: <None> (minimum scale)

In beyond: <None> (maximum scale)

OK Cancel Apply OK Cancel



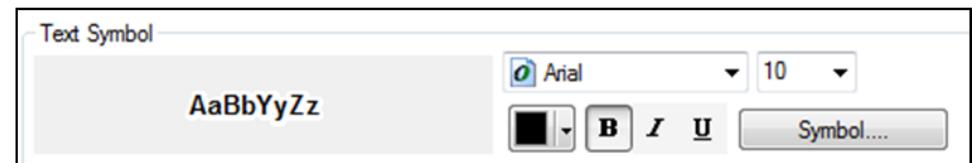
Default label scaling



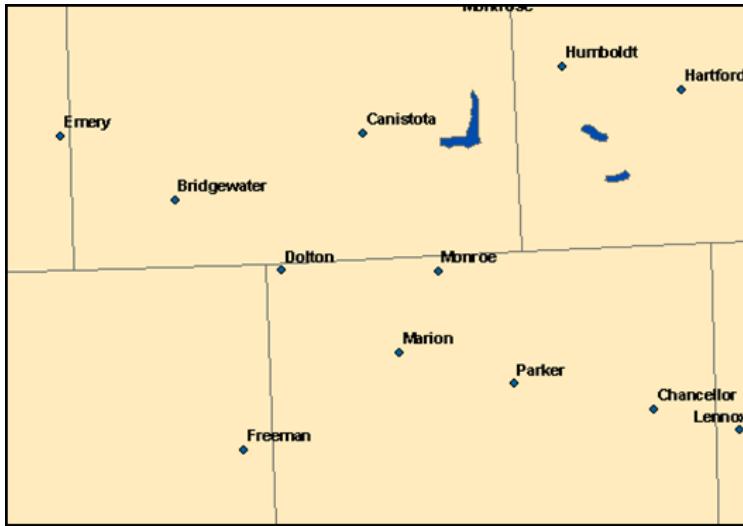
Sizes of labels and symbols are specified when they are created.

By default, they remain the same size as the user zooms in and out.

If specified as 10 pt. labels, they are always 10 pt. labels.

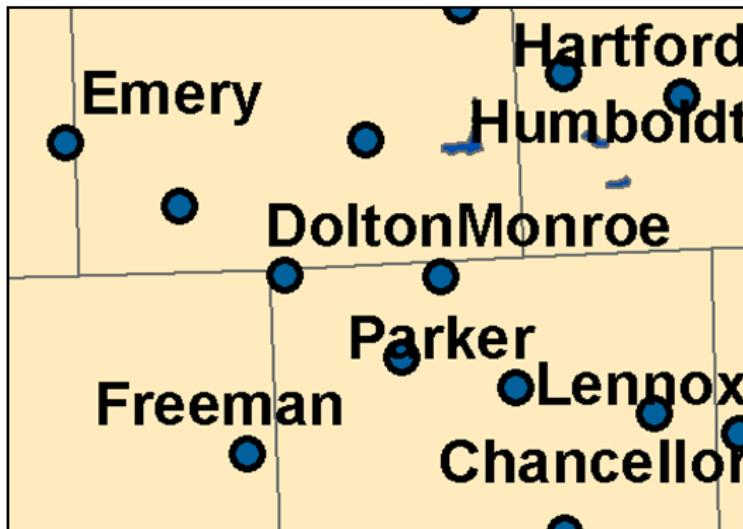


The reference scale



Alternately, symbols and text can change size when the user zooms in or out.

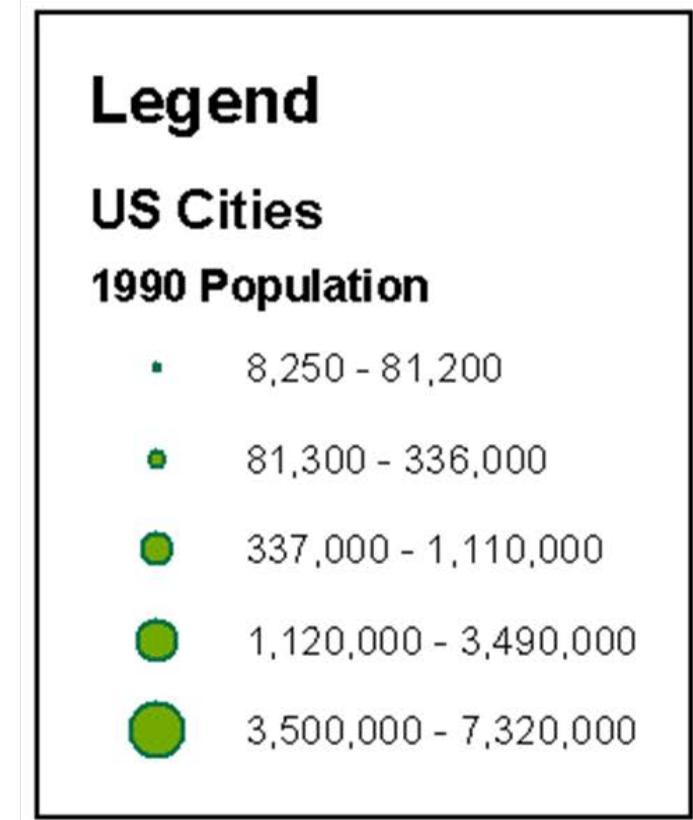
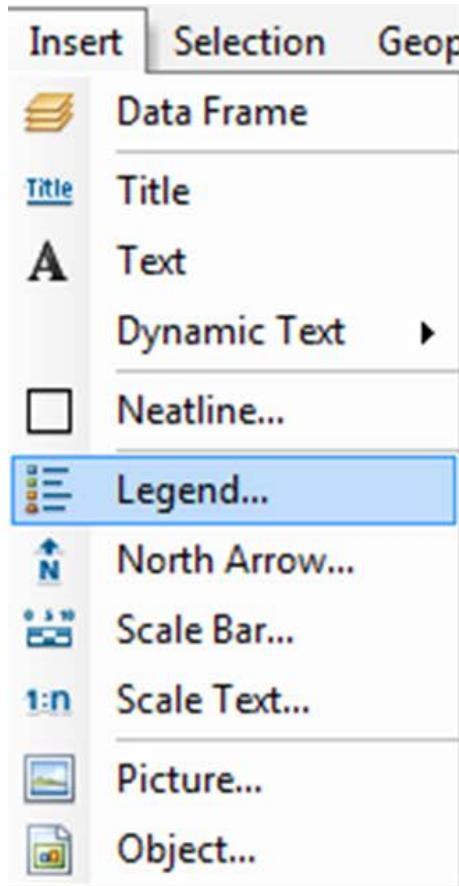
The **reference scale** is the scale at which symbols will appear at their assigned size.



If a reference scale is set, then symbols and text change size when the map scale changes. They only appear at their assigned size if the map scale once again matches the reference scale.

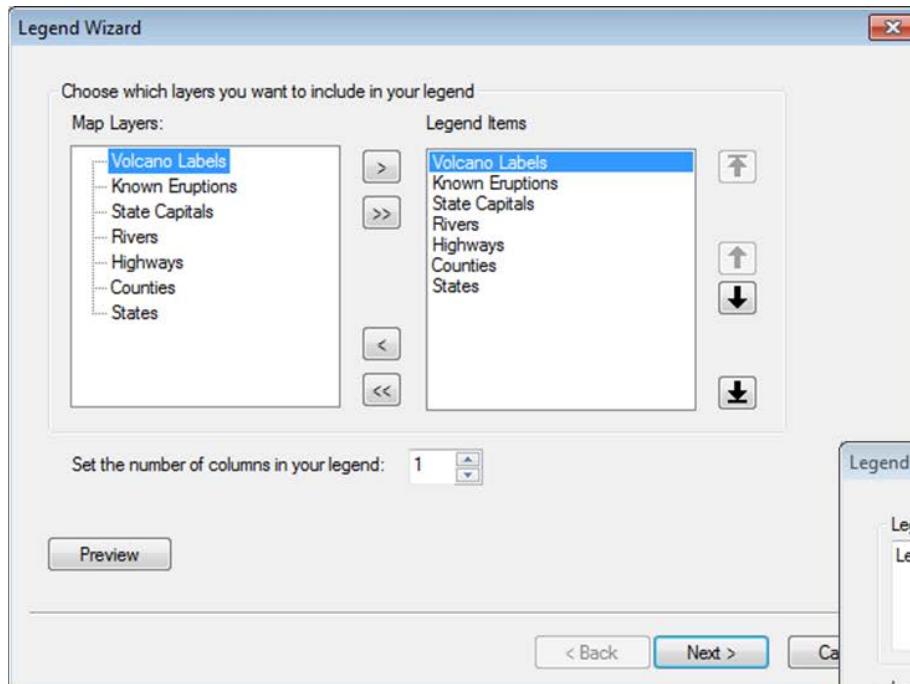
Adding map elements

Adding a legend

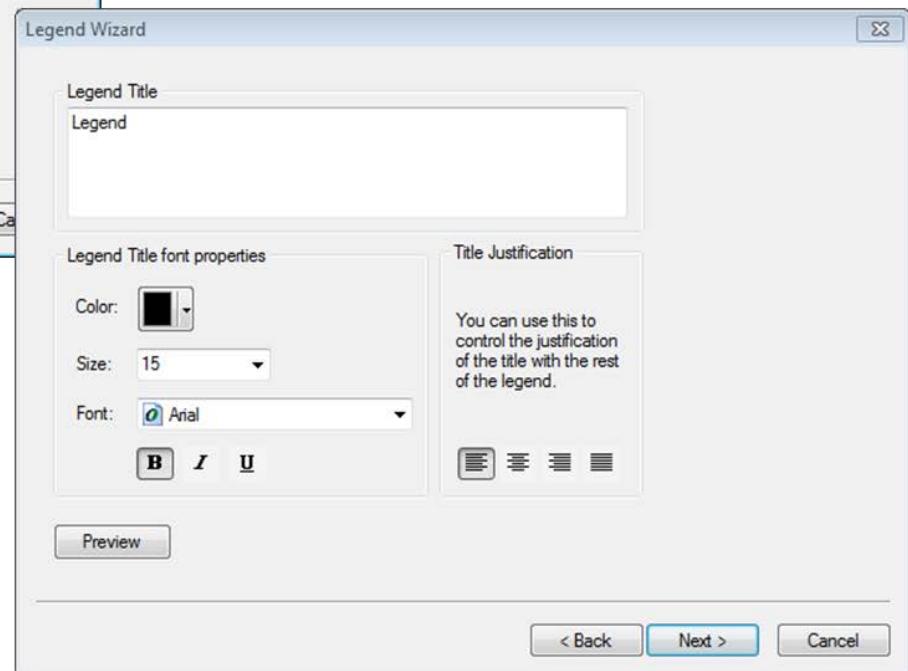


Opens the Legend Wizard

The Legend Wizard

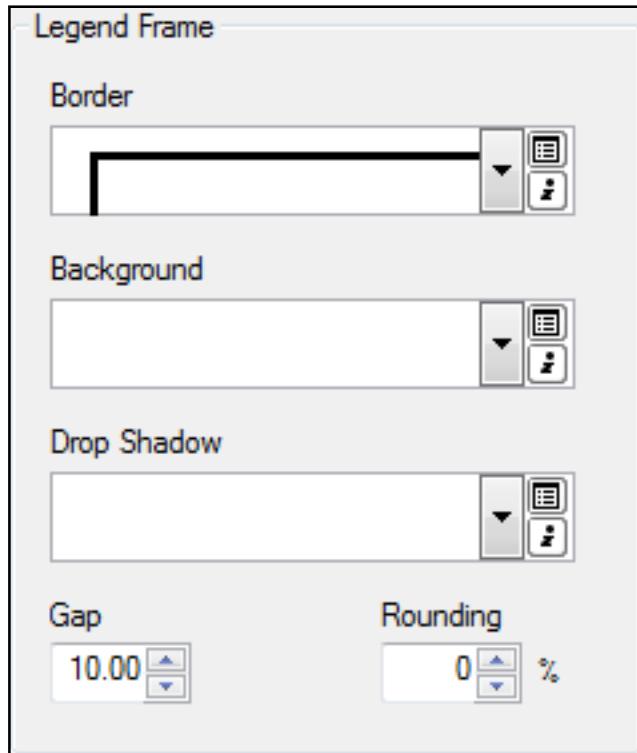


Choose layers to include



Set title and font

Legend Wizard



Add frame border and shading

This screenshot shows the 'Patch' settings for legend items. A note says: 'You can change the size and shape of the symbol patch used to represent line and polygon features in your legend.' Below it, 'Major Roads' and 'US States' are selected in the 'Legend Items' list. On the right, 'Width' is set to 30.00 pts., 'Height' to 15.00 pts., and 'Line' is a thin black line. The 'Area' dropdown is set to 'Rectangle'. A preview window shows a yellow rectangle. A list of patch types includes: Rectangle, Rounded Rectangle, Ellipse, Diamond, Park or Preserve, Urbanized Area, Water Body, Natural Area, and <custom>. The '<custom>' option is highlighted.

Set patch size and type

Legend Wizard

Legend Wizard

Set the spacing between the parts of your legend.

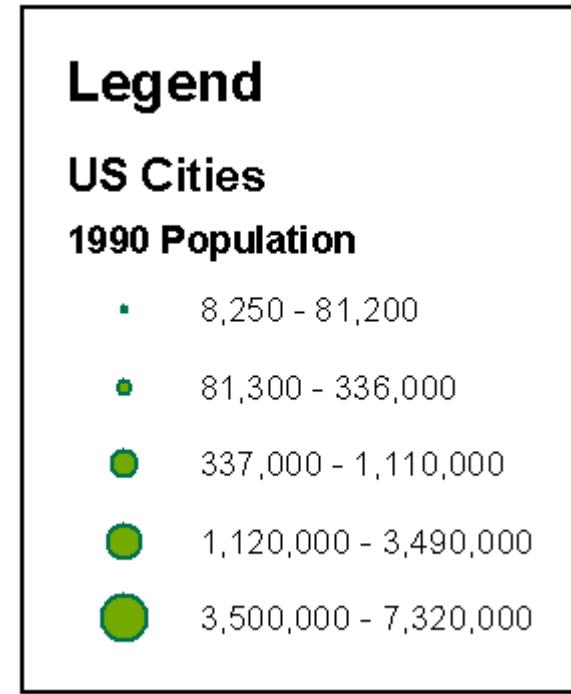
Spacing between:

Title and Legend Items:	8.57 (pts.)	
Legend Items:	5.36 (pts.)	
Columns:	5.36 (pts.)	
Headings and Classes:	5.36 (pts.)	
Labels and Descriptions:	5.36 (pts.)	
Patches (vertically):	5.36 (pts.)	
Patches and Labels:	5.36 (pts.)	

Title
Layer 1 Layer 7 Group 1
Group 2 Class 1 Description 1

Preview

Set spacing between elements
(usually leave defaults)



Finished

Right-click legend
to open properties
and modify it.

Legend Styles

Legend

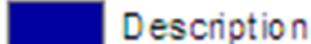


Label

Horizontal Single Symbol
Label Only

Legend

Layer Name



Horizontal Single Symbol
Layer Name and Description

Legend

Layer Name

Heading



Horizontal with Layer Name,
Heading and Label

Legend



Cenozoic



Upper Mesozoic



Lower Mesozoic



Upper Paleozoic



Madison Limestone



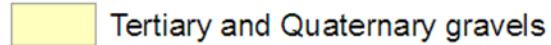
Lower Paleozoic



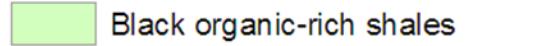
Precambrian

Legend

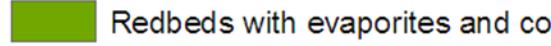
Geology



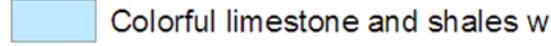
Tertiary and Quaternary gravels



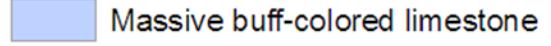
Black organic-rich shales



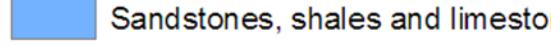
Redbeds with evaporites and co



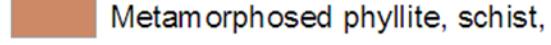
Colorful limestone and shales wi



Massive buff-colored limestone



Sandstones, shales and limeston

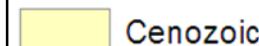


Metamorphosed phyllite, schist,

Legend

Geology

Rock Unit



Cenozoic



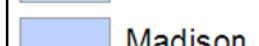
Upper Mesozoic



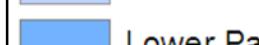
Lower Mesozoic



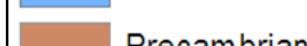
Upper Paleozoic



Madison Limestone

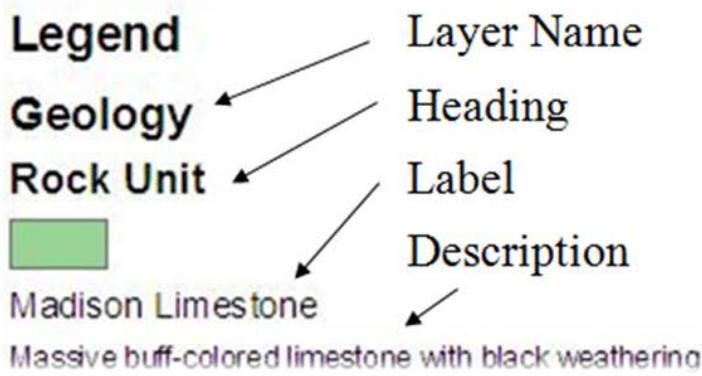
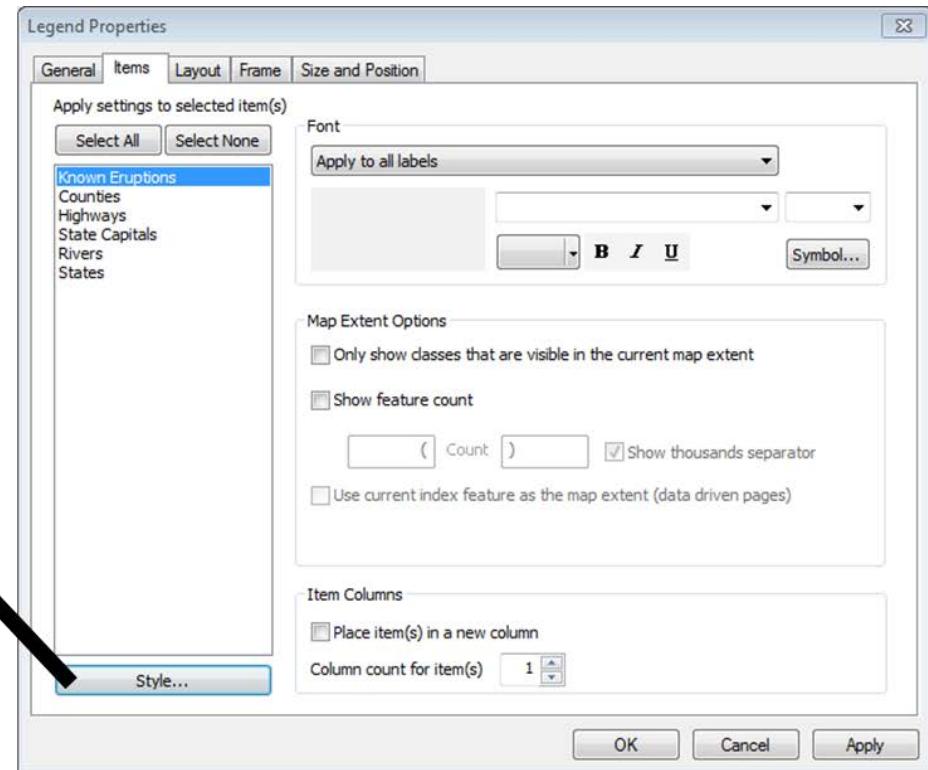
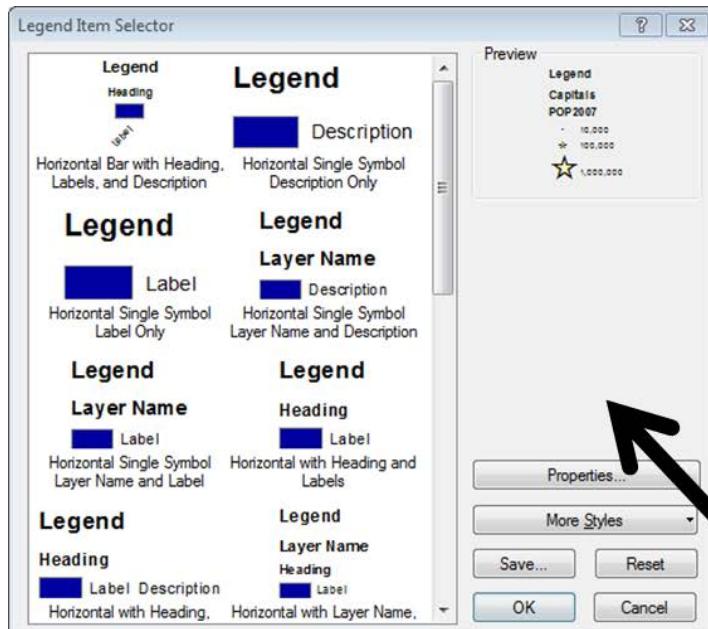


Lower Paleozoic



Precambrian

Changing the legend style



Legend terms

Managing legend styles

In the Table of Contents

<input type="checkbox"/>	<input checked="" type="checkbox"/>	Geology
		Rock Unit
		 Madison Limestone
		 Lower Paleozoic
		 Precambrian

Legend	
Geology	Layer Name
Rock Unit	Heading
 Madison Limestone	Label
Massive buff-colored limestone with black weathering	Description
 Lower Paleozoic	
Sandstone, siltstone, shale, and limestone	
 Precambrian	
Metapelites and quartzites, metagranite, and pegmatite	

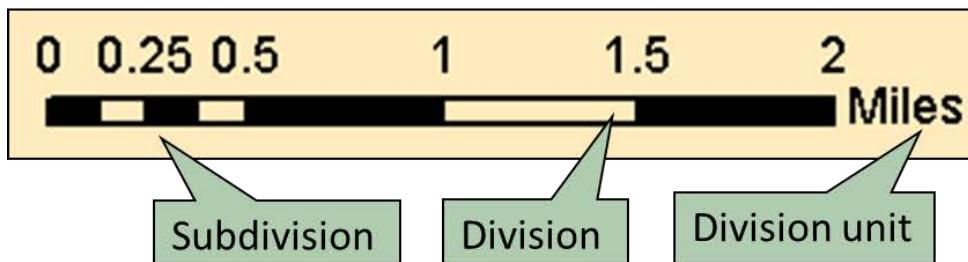
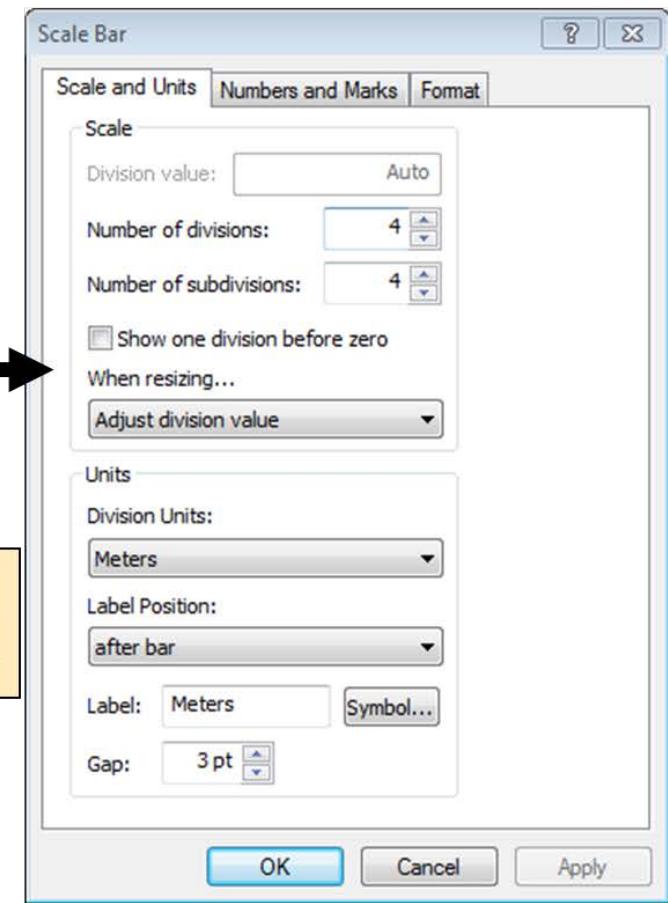
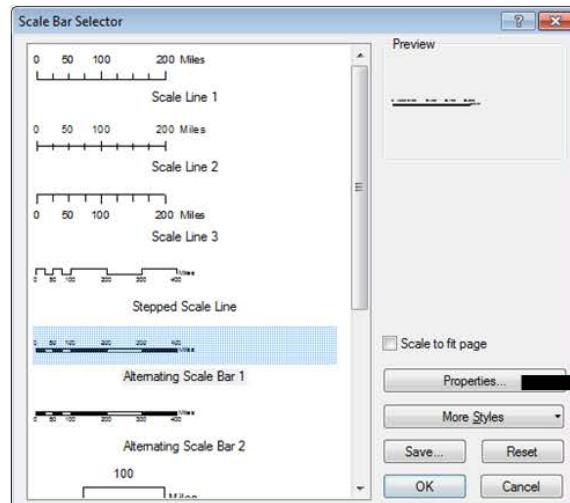
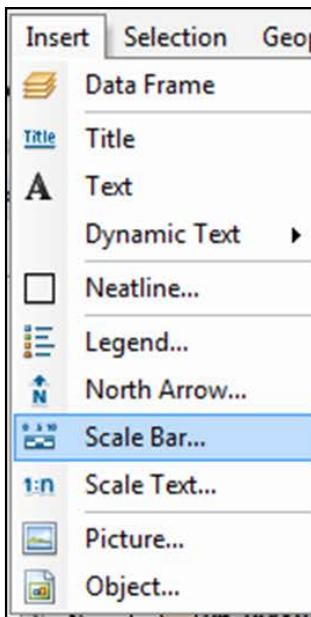
In the Symbology properties

Symbol	Value	Label	Count
<input type="checkbox"/>	<all other values>	<all other values>	
	<Heading>	Rock Unit	
	Madison Limestone	Madison Limestone	
	Lower Paleozoic	Lower P	
	Precambrian	Precambrian	

- Apply Color Scheme
- Edit Description...
- Move to Heading

Where to make text changes that appear in the legend.

Adding a scale bar



Scale bar size is determined by division settings and the map scale



If the scale changes, so must the scale bar.

Options when resizing scale bar

When resizing...

Adjust division value

Adjust width

Adjust division value

Adjust number of divisions

Adjust divisions and division values



Scale

Division value: Auto

Number of divisions:

Number of subdivisions:

Show one division before zero
When resizing...

Adjust division value

Scale

Division value:

Number of divisions:

Number of subdivisions:

Show one division before zero
When resizing...

Adjust width

Scale

Division value:

Number of divisions:

Number of subdivisions:

Show one division before zero
When resizing...

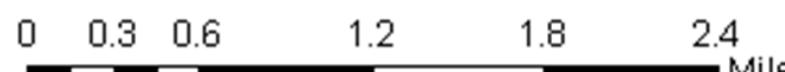
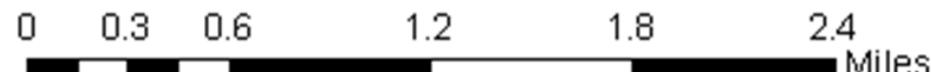
Adjust number of divisions

Adjust division value

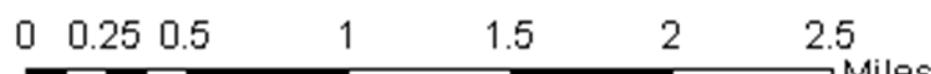
Zoom out



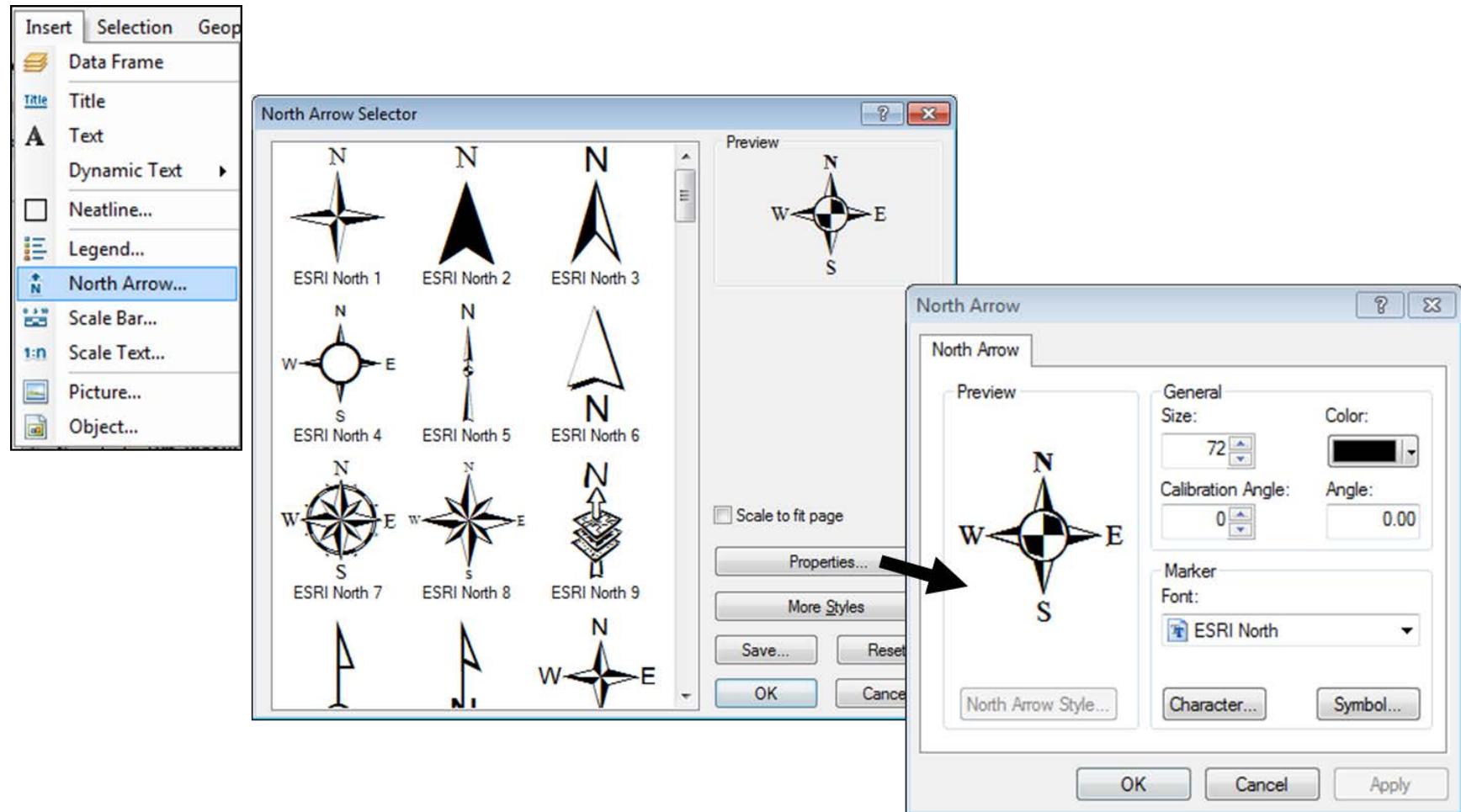
Adjust width



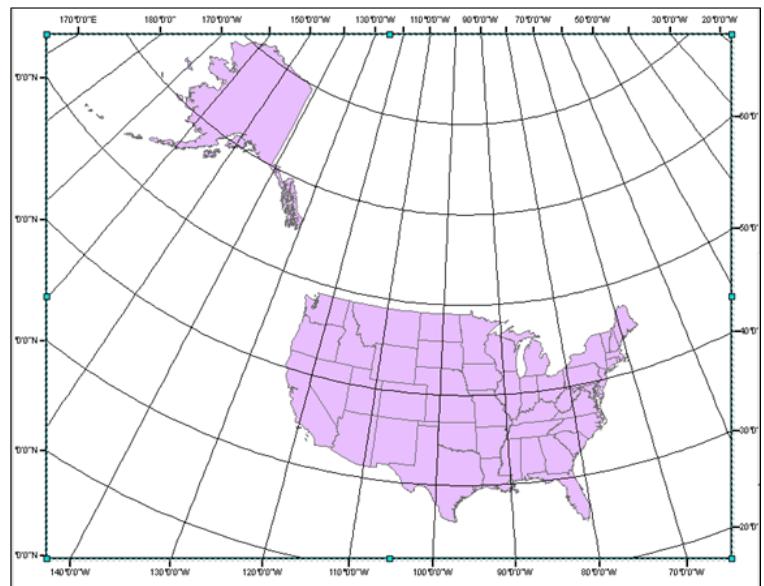
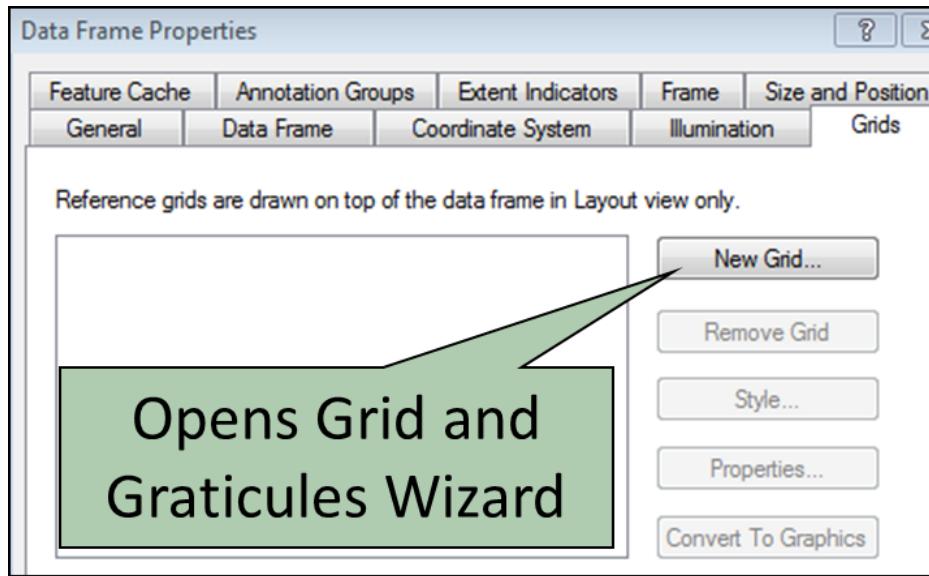
Adjust number of divisions



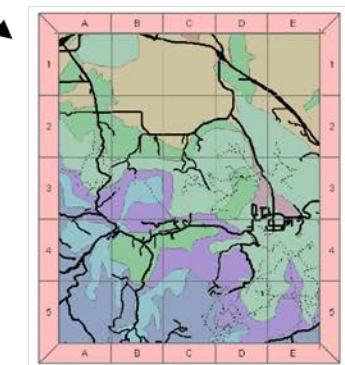
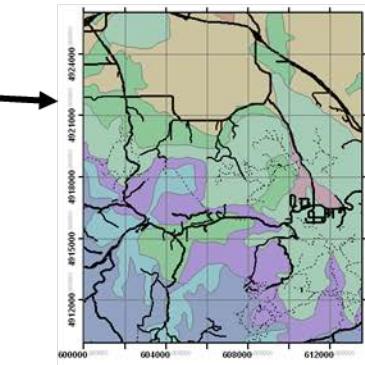
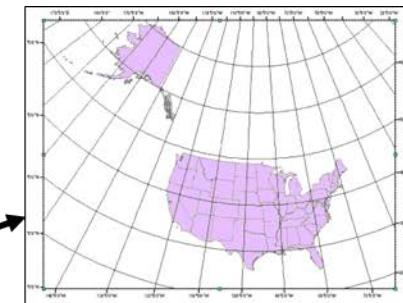
Adding north arrow



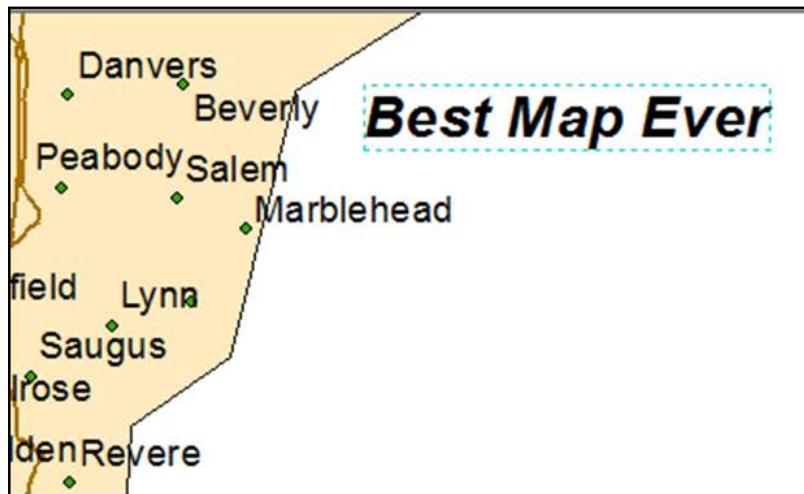
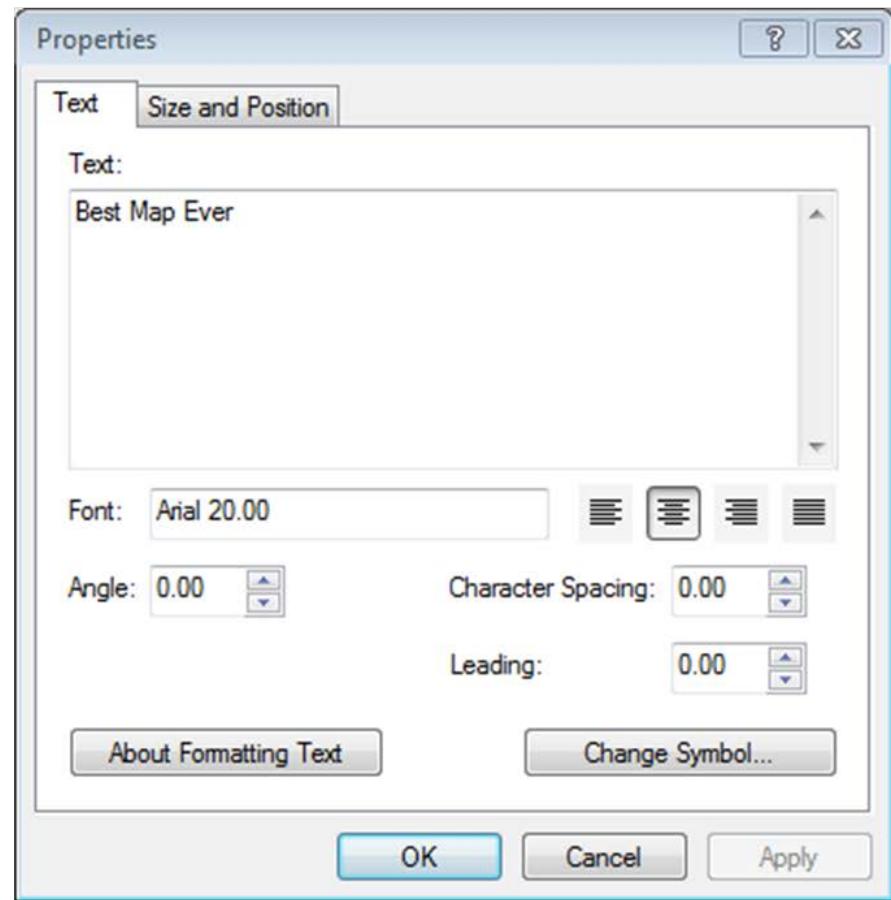
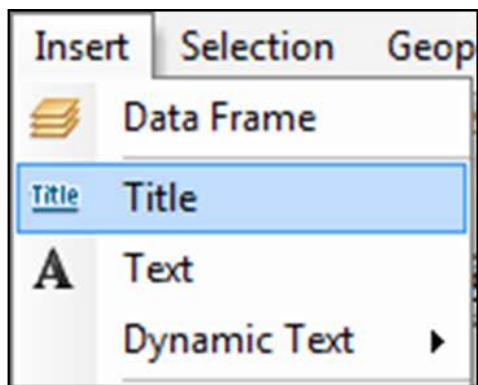
Creating Grids and Graticules



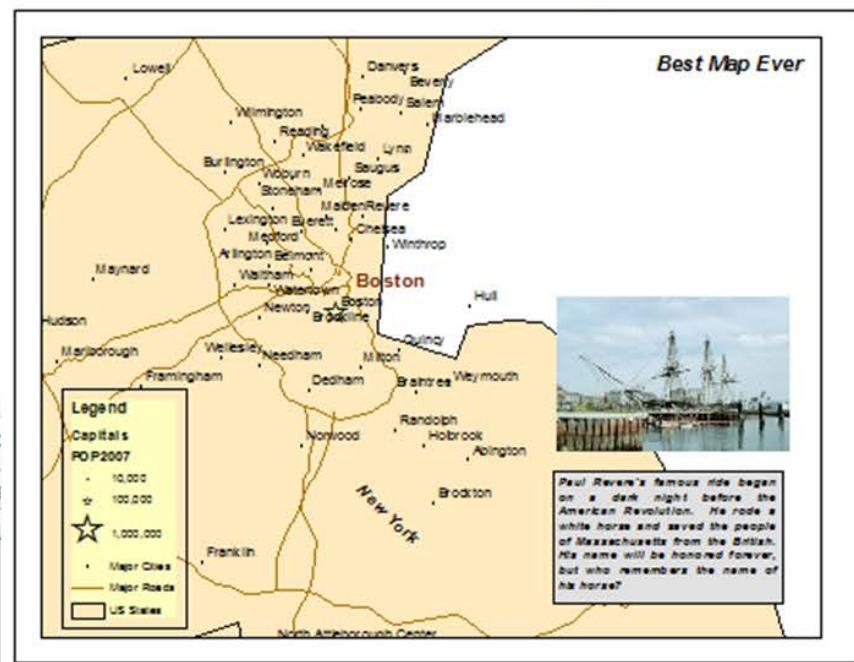
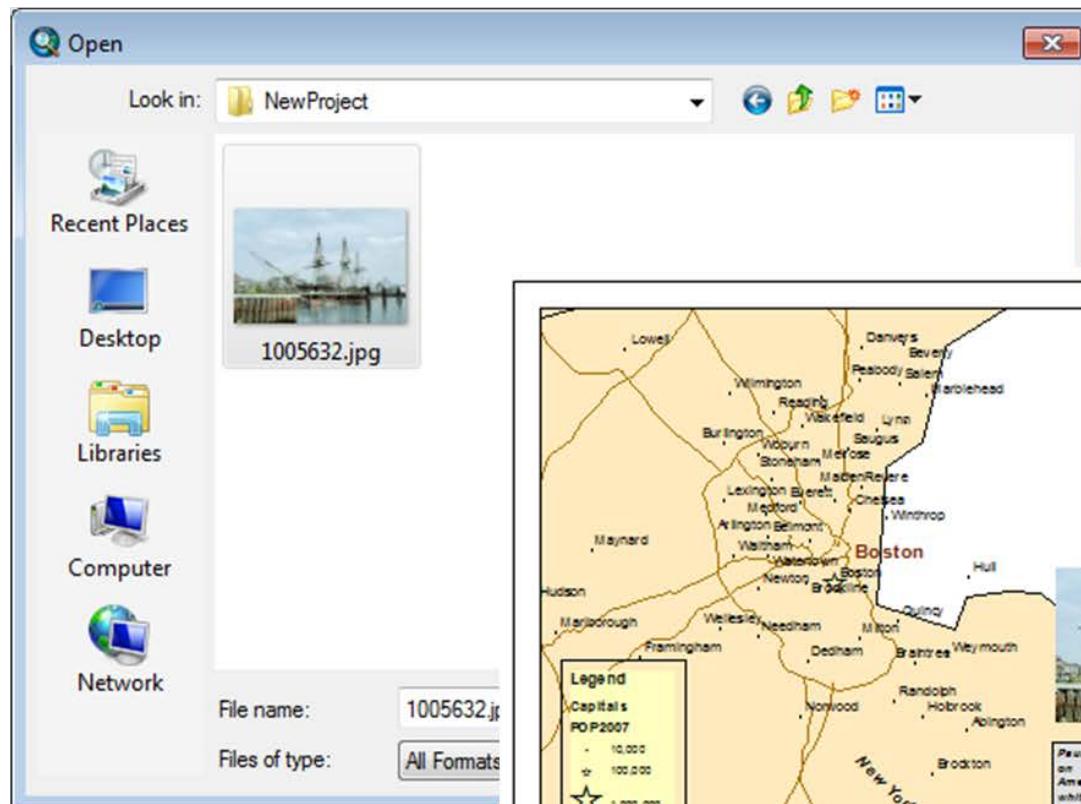
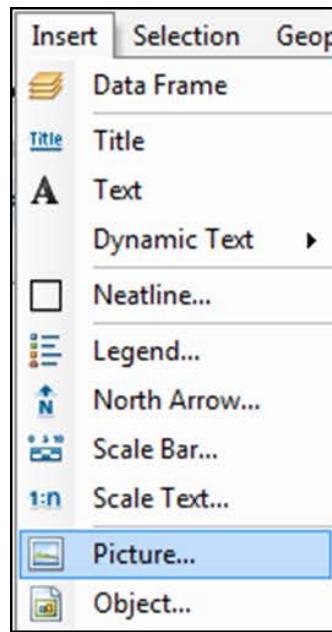
Grids and Graticules Wizard



Text and titles



Pictures



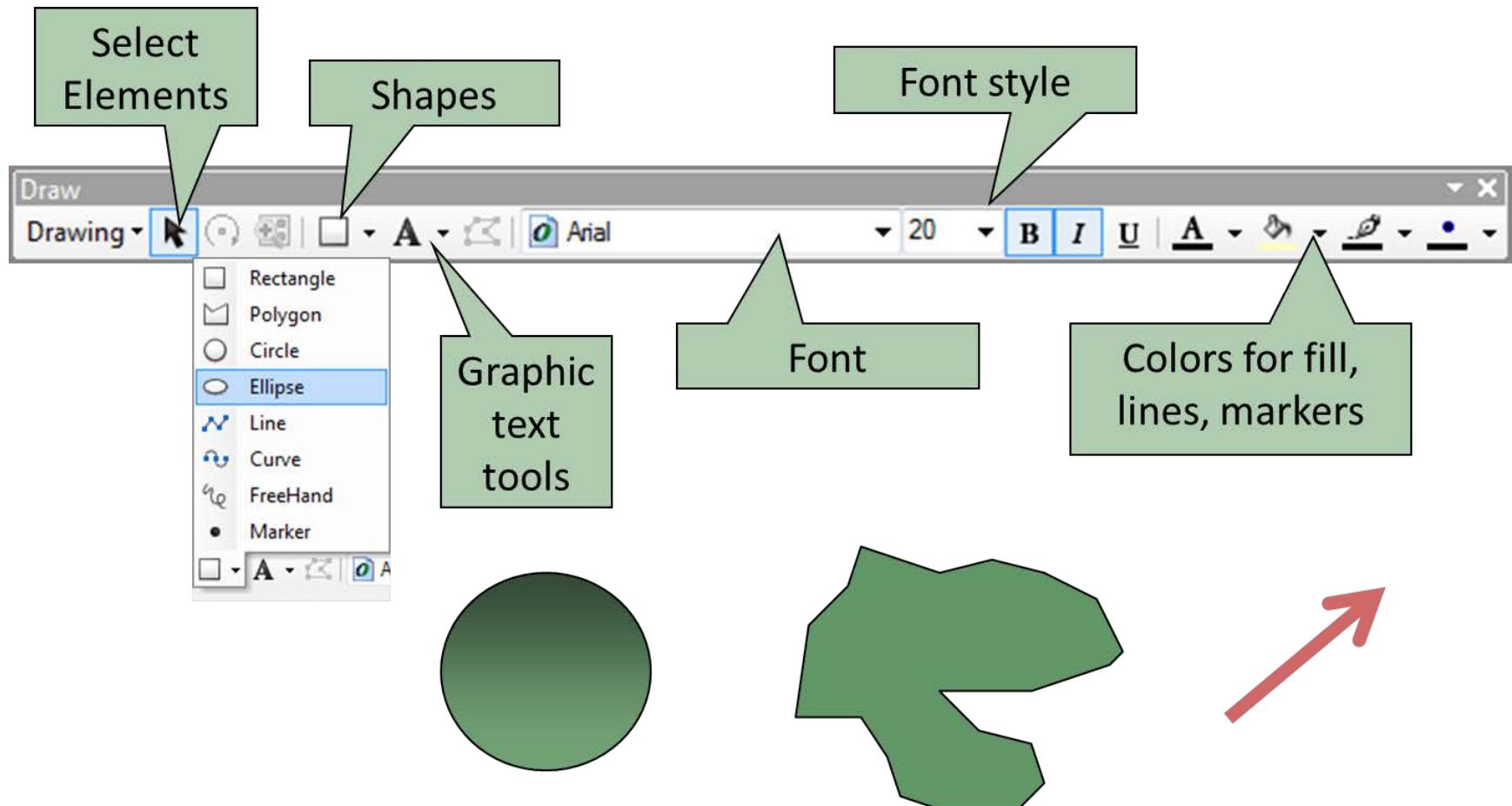
Neatlines

The screenshot illustrates the process of adding a neatline to a map. On the left, a software interface shows the 'Insert' menu open, with 'Neatline...' selected. A 'Neatline' dialog box is displayed in the center, containing settings for placement, border, background, and drop shadow. The 'Placement' section includes options like 'Place around selected element(s)', 'Place around all elements' (which is selected), and 'Place inside margins'. The 'Border' section shows a preview of a black border. The 'Background' section shows a preview of a light blue background. The 'Drop Shadow' section is empty. Below these sections are 'Gap:' and 'Rounding:' inputs, set to 10.0 pts and 0%, respectively. At the bottom are 'Advanced...', 'OK', and 'Cancel' buttons. To the right, a map of New England is shown with a neatline applied. The map includes state boundaries, county names, and a legend for population density. An inset image of a historical ship is present, and a text box contains the following text:

Paul Revere's famous ride began on a dark night before the American Revolution. He rode a white horse and saved the people of Boston from British soldiers. His name will be honored forever, but who remembers the name of his horse?

Graphics

The Draw toolbar



Assessment of all assignments moving forward will take into account map layout, design, and cartographic principles