

Lecture 2

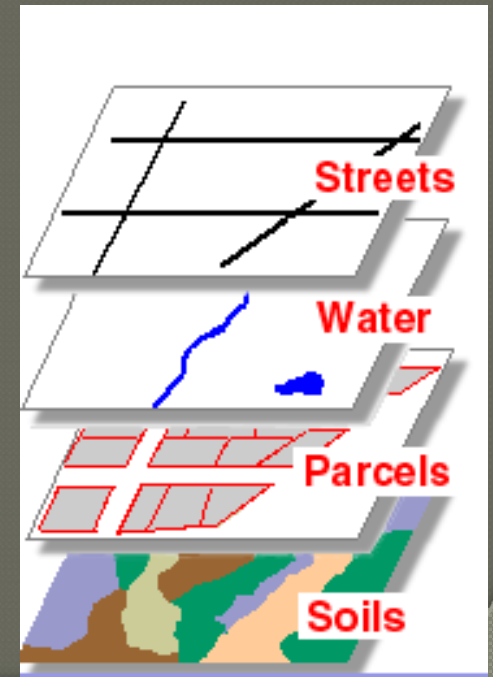
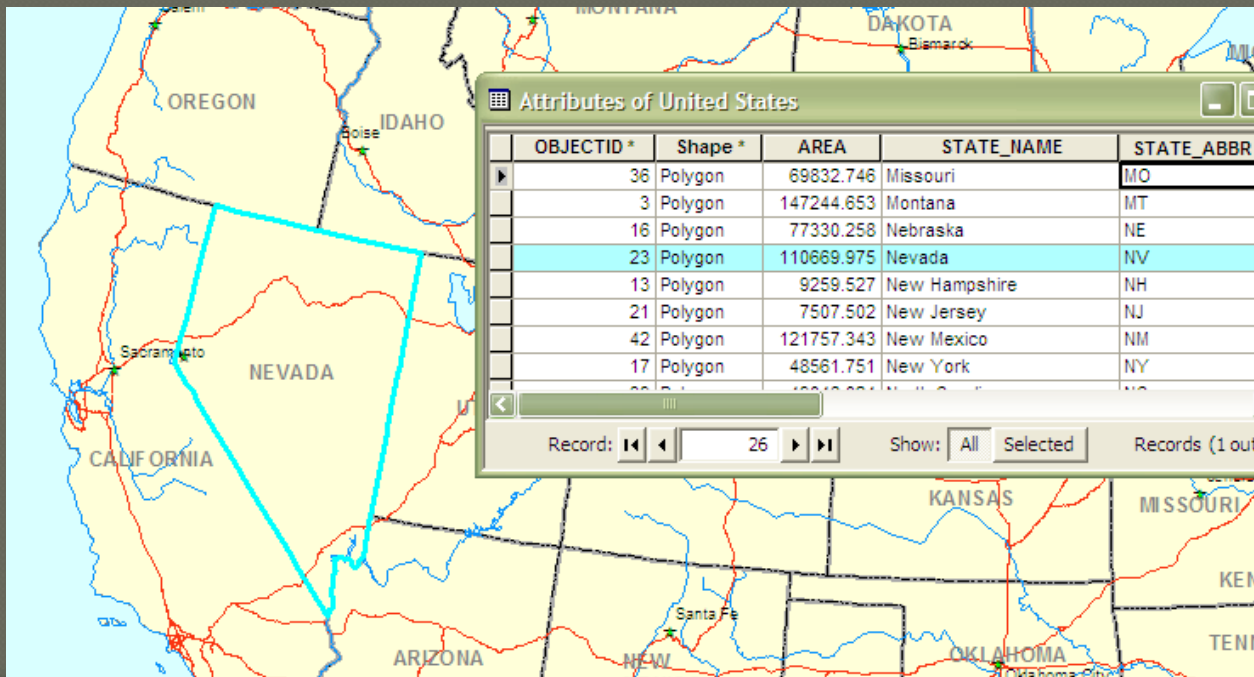
A Review: Geographic Information Systems & ArcGIS Basics

Outline

- GIS Overview
- Types of Maps
- Symbolization & Classification
- Map Elements
- GIS Data Models
- Coordinate Systems and Projections
- Scale
- Geodatabases
- Data Preparation & Analysis
- ESRI's ArcGIS: A Review

GIS Review

- What is a GIS?
- What is special about GIS?
- Applications of GIS



Types of Maps

- The form of your data dictates the form (type) of the map.
 - General Reference Maps
 - Graduated Symbol Maps (Proportional Symbol Maps)
 - Choropleth Maps
 - Isopleth Maps
 - Area Qualitative Maps
 - Dot Density Maps



Symbolization

Visual resources cartographers can use to symbolize information on a map.

3 Types of Symbols:

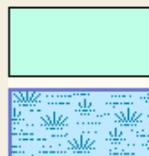
Point



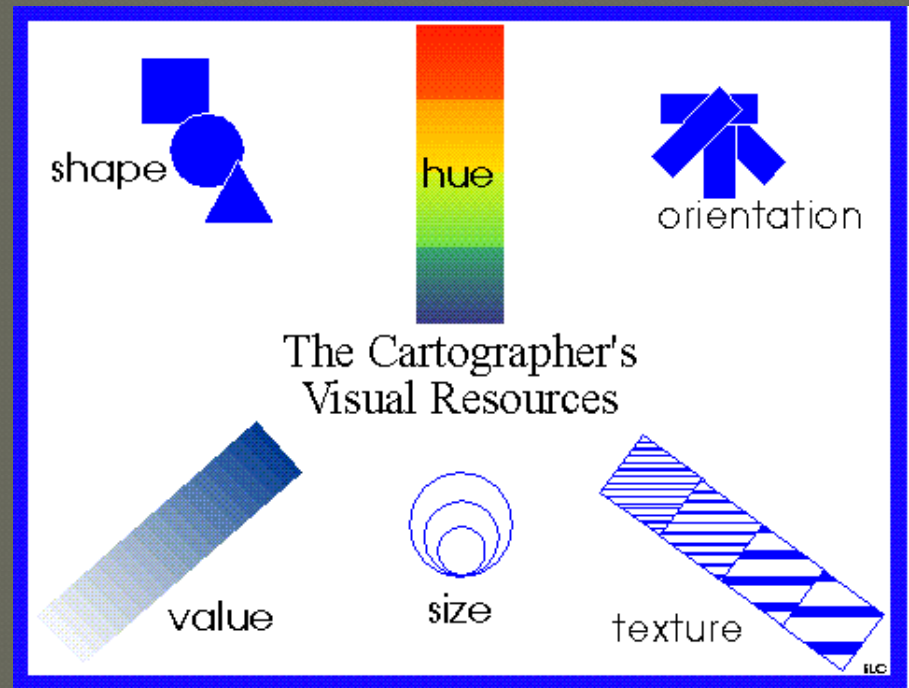
Line



Polygon

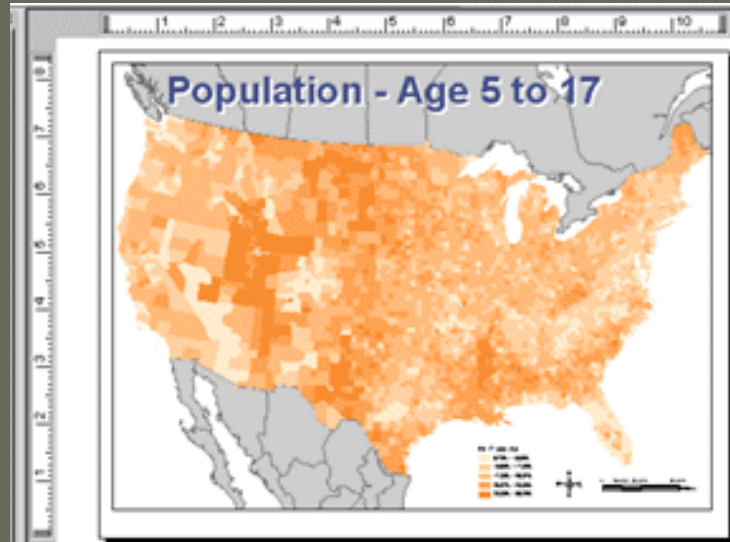


Options for Symbolization:

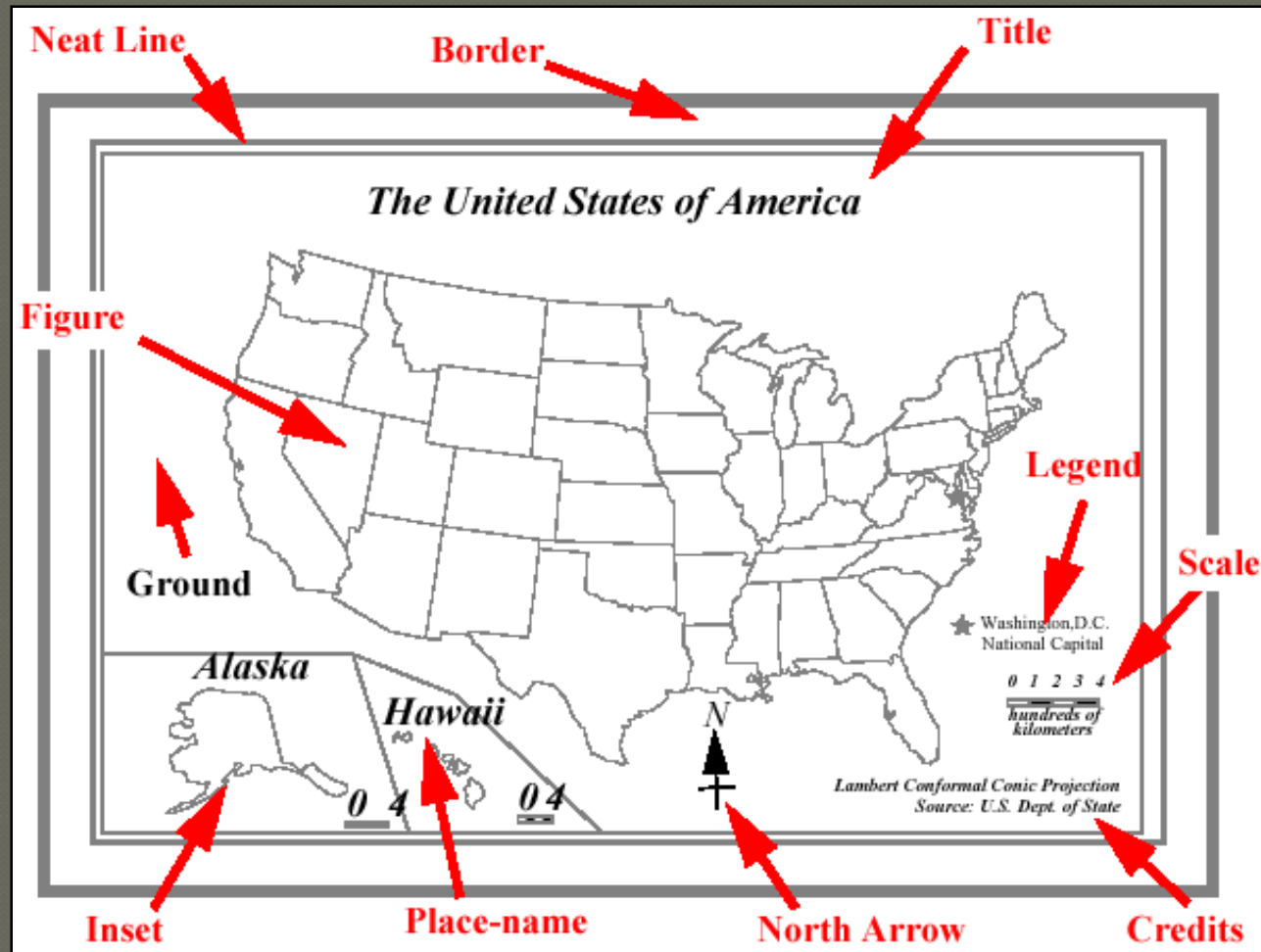


Classifying Features

- Groups attributes into classes to help discern patterns.
- Make choices about not only how many different classes that the data should be categorized into, but what the value ranges of those classes should be. A slight adjustment of the "breaks" in the value ranges of ordered data, for example, might alter the map significantly and reveal trends that were not detected previously (or are not in fact there).
- You can define your own classes OR Use one of the standard methods:
 - Natural Breaks
 - Equal Interval
 - Quantile



Map Elements

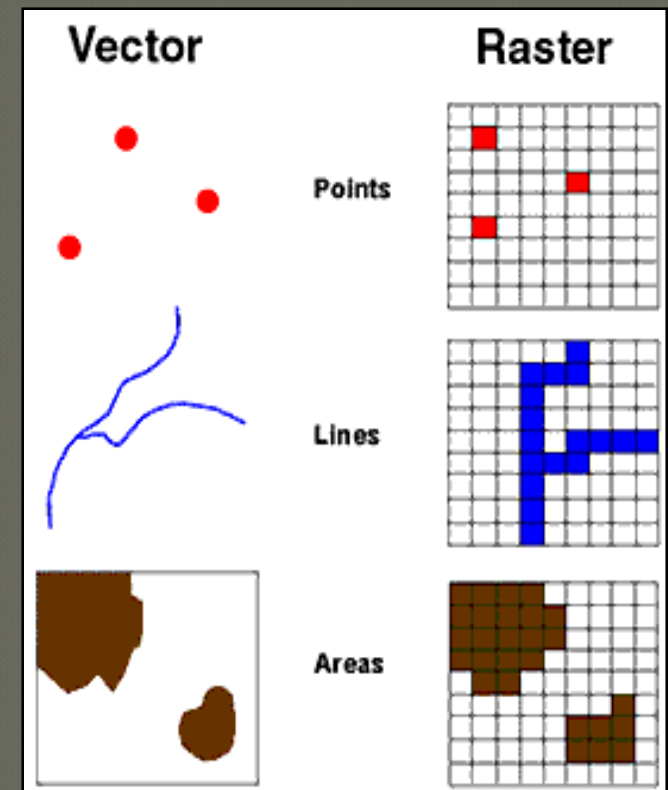
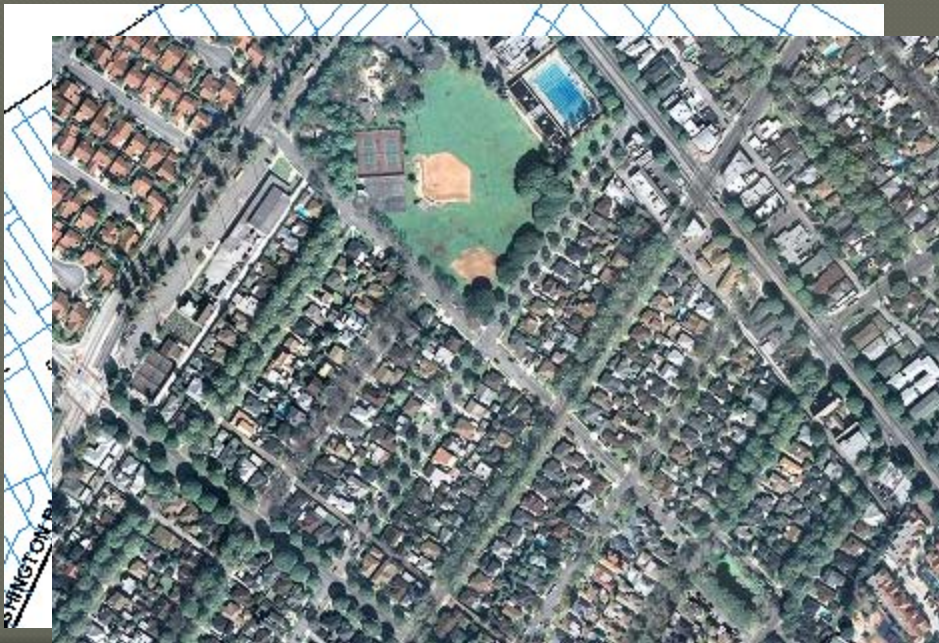


GIS Data Models

Common Spatial Data Models

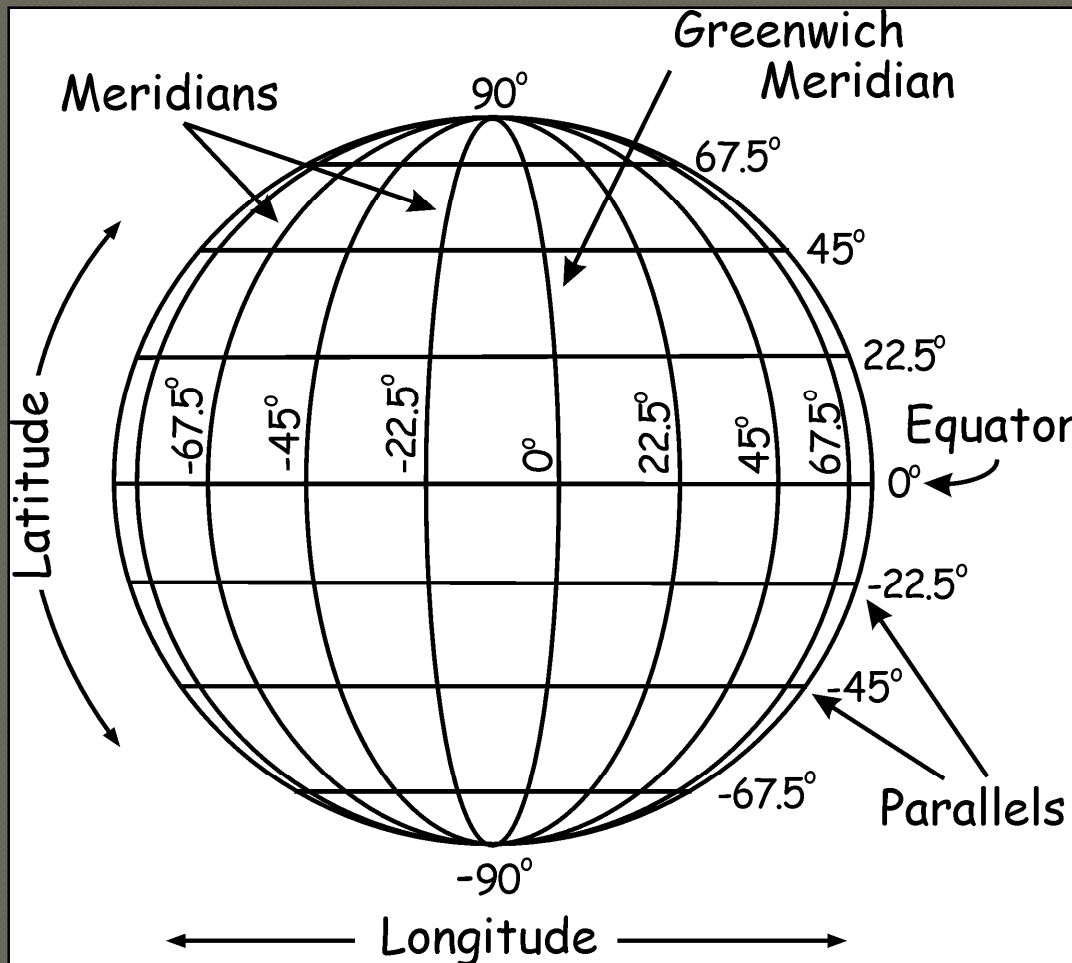
- Vector
- Raster
- TIN

Vector vs. Raster?



Geographic Coordinate Systems

(Spherical Coordinate Systems)



- While **latitude** and **longitude** can locate exact positions on the surface of the earth, they are not uniform units of measure.
- Only along the *equator* does the distance represented by one degree of longitude approximate the distance represented by one degree of latitude.

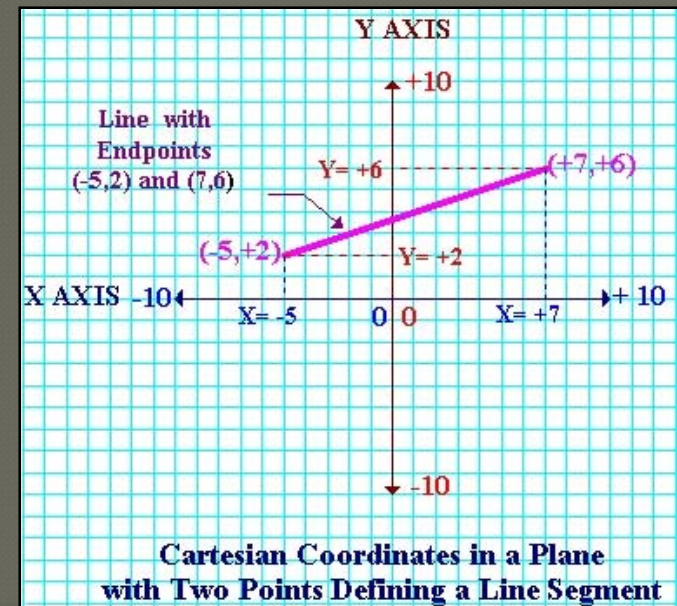
Cartesian Coordinate Systems

(Projected Coordinate Systems)

- What are they for?

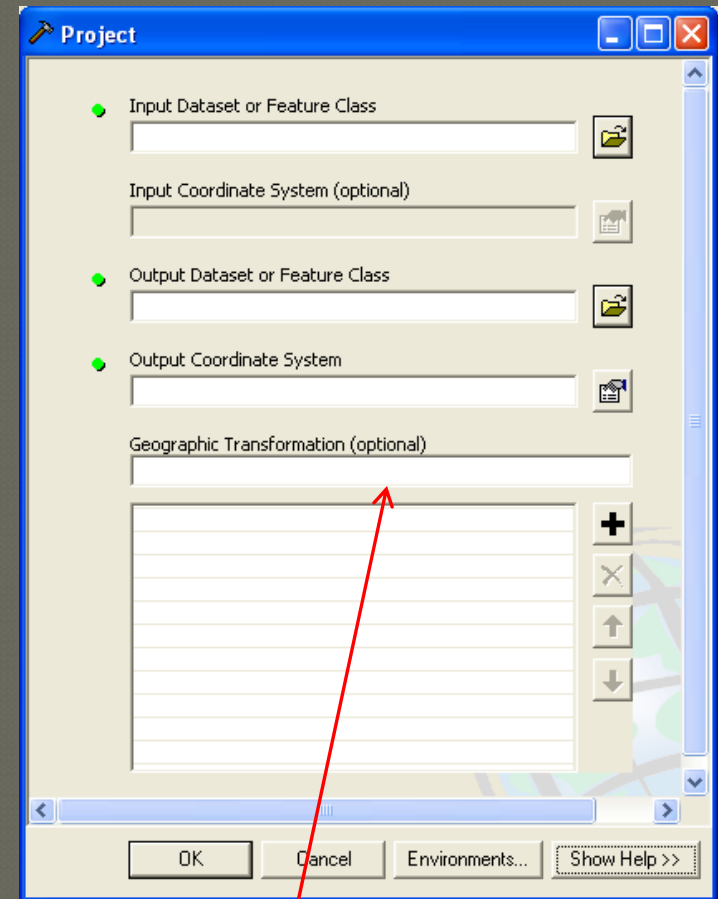
- Where are you right now?
- How far are you from some other location?
- Coordinate systems provide a quantitative framework for identifying your location on the earth.

■ To overcome measurement difficulties, data is often transformed from three-dimensional geographic coordinates to two-dimensional projected coordinates.



ArcGIS and Coordinate Systems

- On-the-fly Projections
- Permanent Layer Projections
- Assigning projections and re-projecting data:
 - ArcToolbox → Data Management Tools → Projections and Transformations
- How to view projection information of a *layer*:
 - ArcCatalog → Metadata → “Spatial” tab.
 - ArcMap → Layer Properties → “Source” tab.
- View projection information of a *data frame*:
 - View → Data Frame Properties

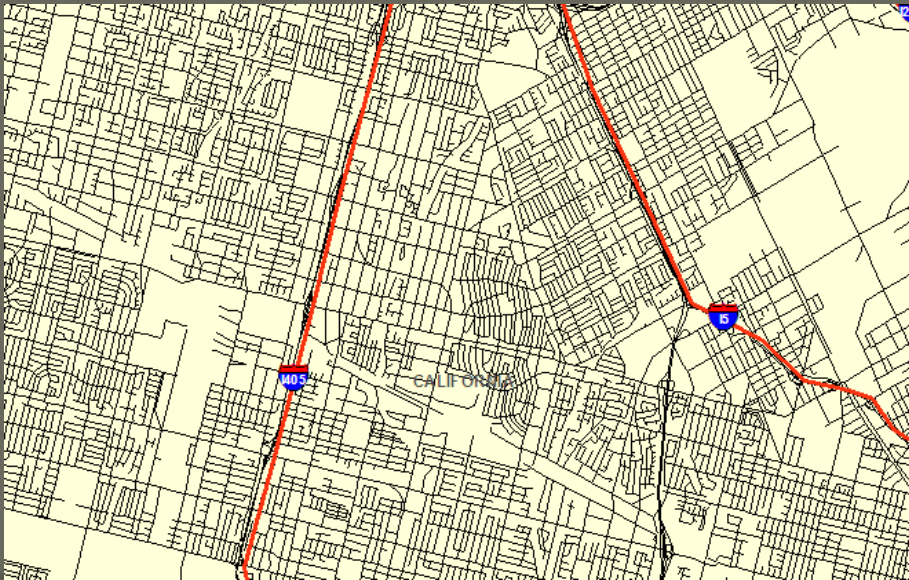


Geographic Transformation = Datum Shift

Understanding Scale

- Scale is the relationship between the size of features on a map and the size of the corresponding objects in the real world.
- Scale is commonly represented as a ration or representative fraction.
Ex. 1:10,000
- This means 1 unit on a map is equal to 10,000 units on the earth's surface.

Large-Scale Map: Generally covers a small area in *more* detail.



Small-Scale Map: Generally covers a large area in *less* detail.



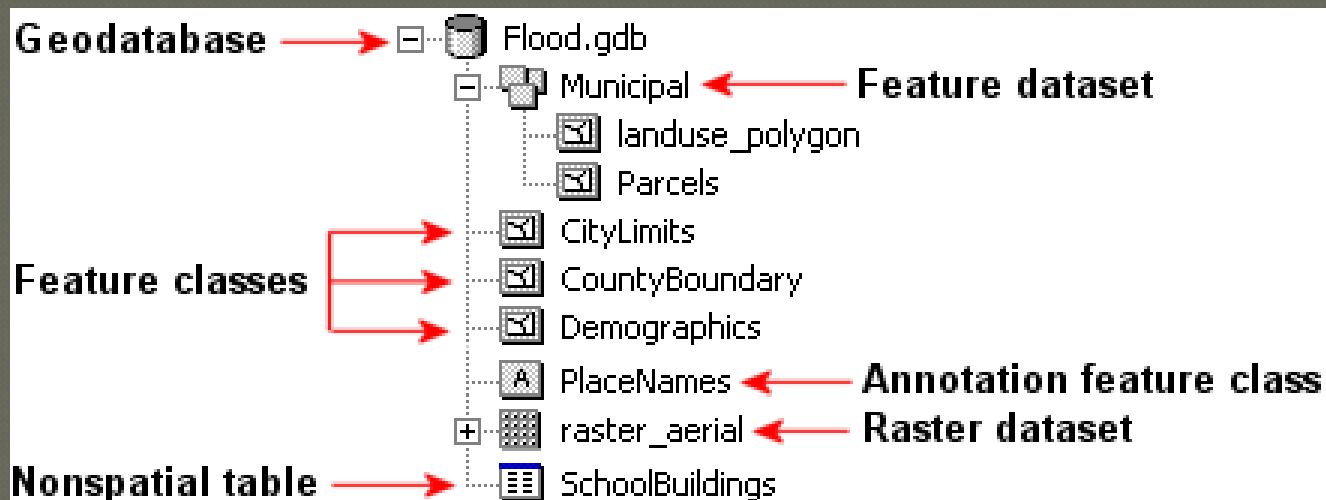
Geodatabases and Data Organization

Geodatabase Types:

- Personal
- File
- SDE

Geodatabases can consist of:

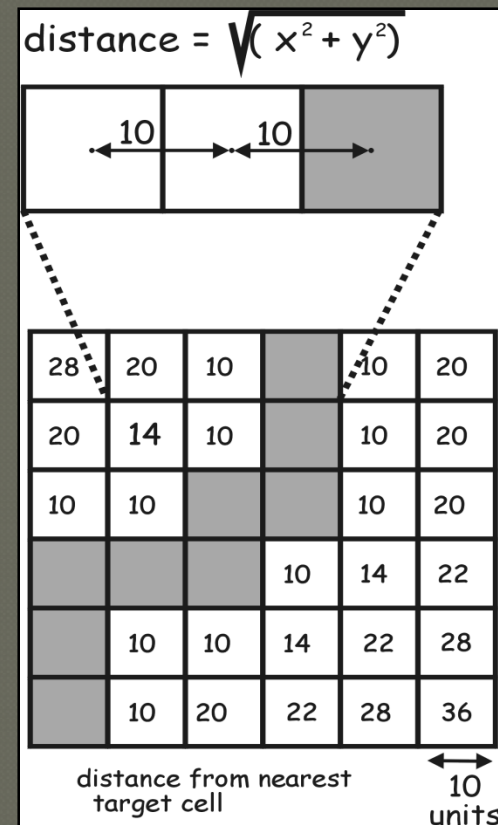
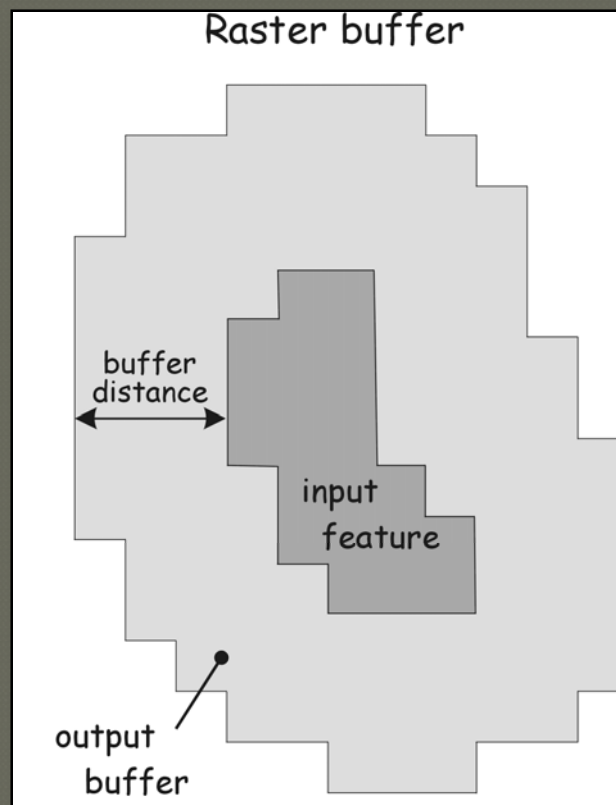
- Feature Datasets
- Feature Classes
- Annotation Feature Classes
- Raster Datasets
- Nonspatial Tables



Spatial Analysis

Buffer Operations

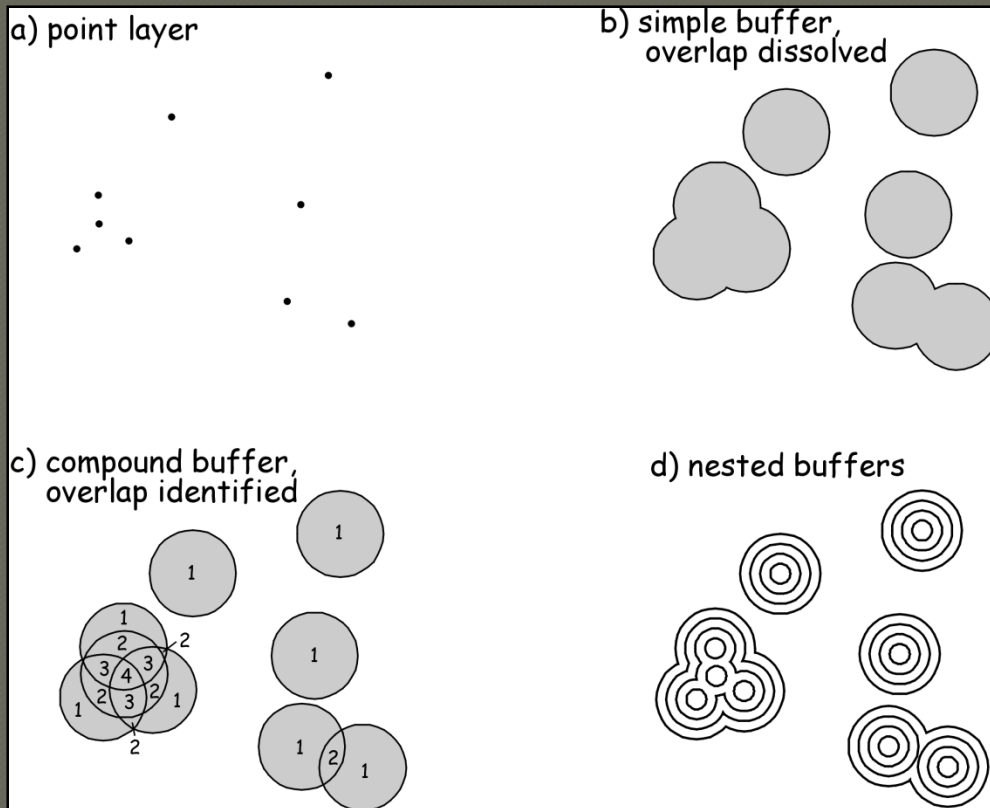
Buffer: A buffer is a region that is less than or equal to a specified distance from one or more features.



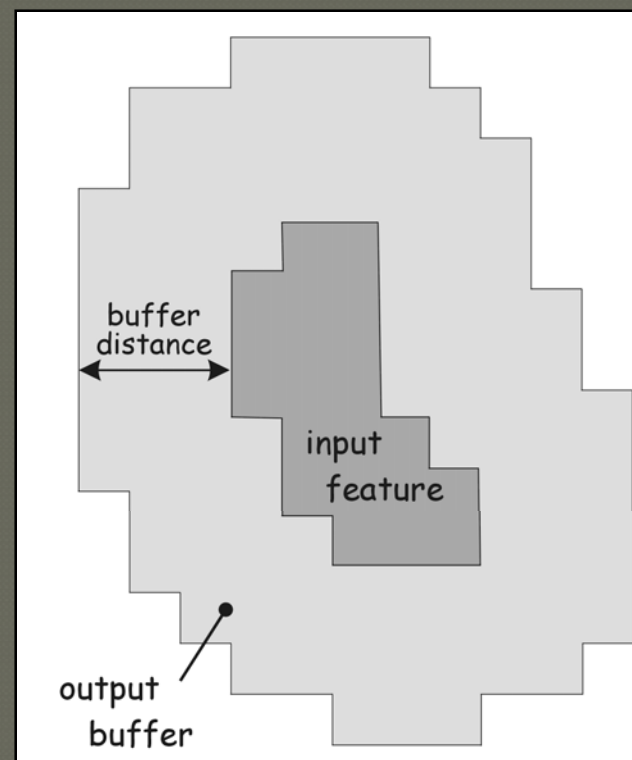
Spatial Analysis: Buffer Operations

Buffer: A buffer is a region that is less than or equal to a specified distance from one or more features.

Vector Buffer



Raster Buffer

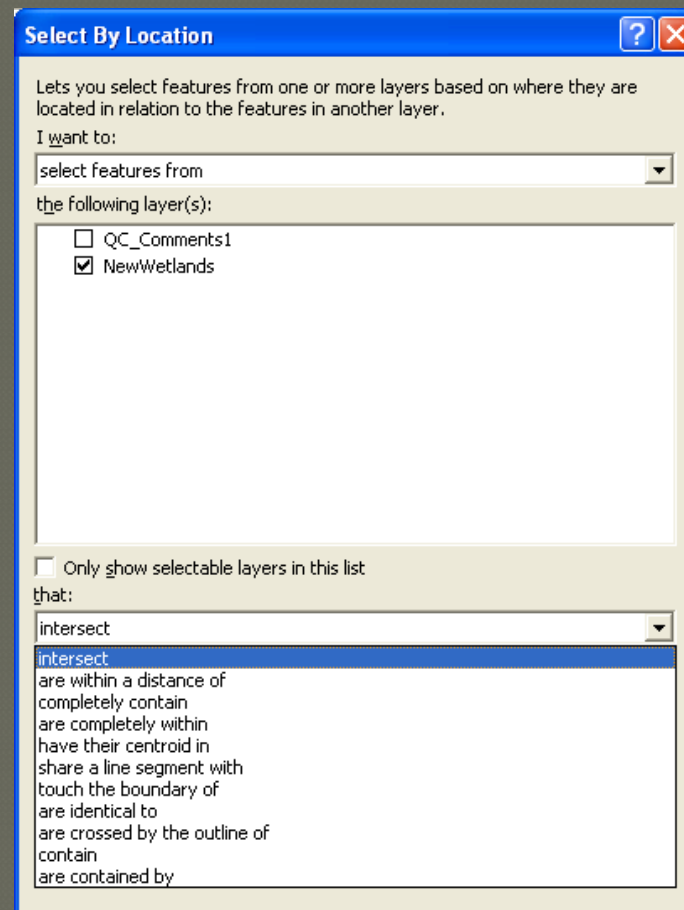


Spatial Analysis

Spatial Selection/Proximity Functions

Select By Location Options in ArcMap:

To Access:
Click Selection and click
Select By Location.

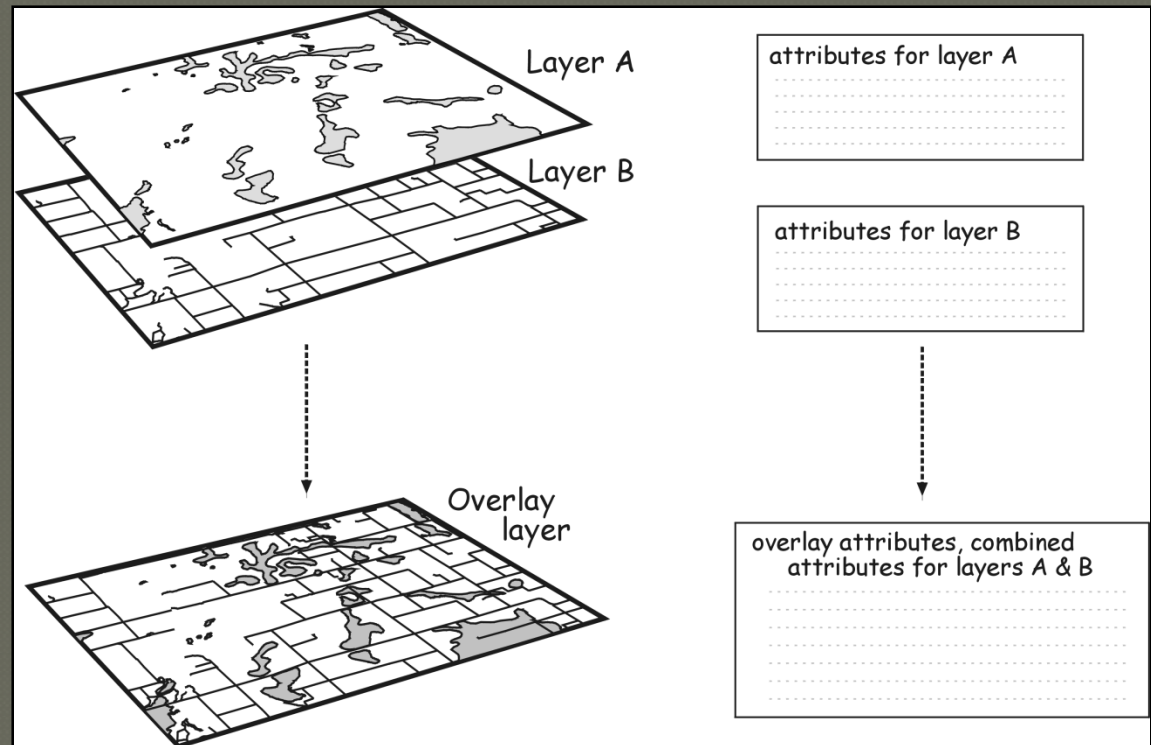
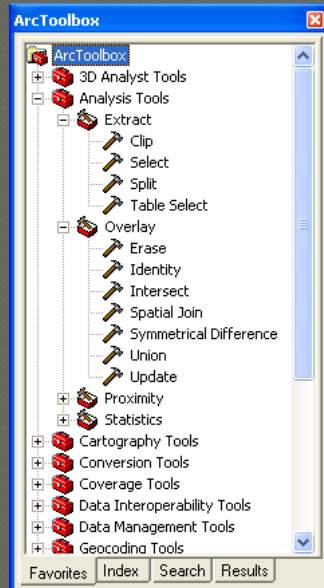


Preparing Data for Analysis

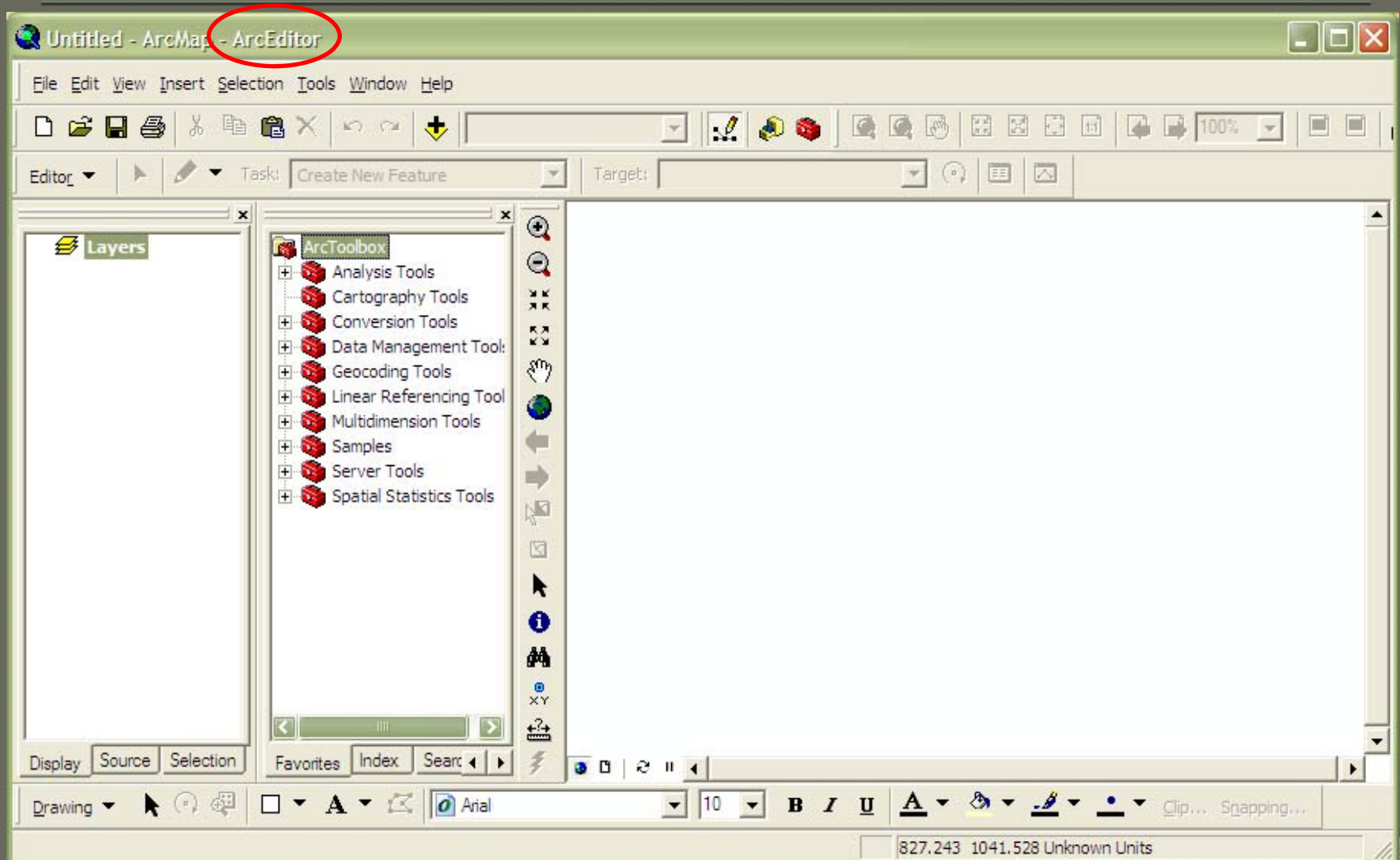
Overlay Operations

Overlay: Combines spatial and attribute data from two or more spatial data layers. i.e. Union, Intersect, Clip, etc...

ArcToolbox Path:
Analysis Toolbox →
Extract & Overlay
Toolsets

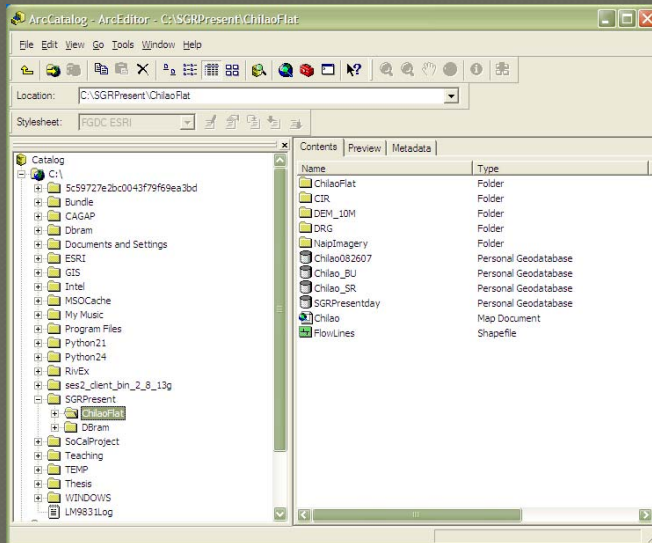


ArcGIS Desktop



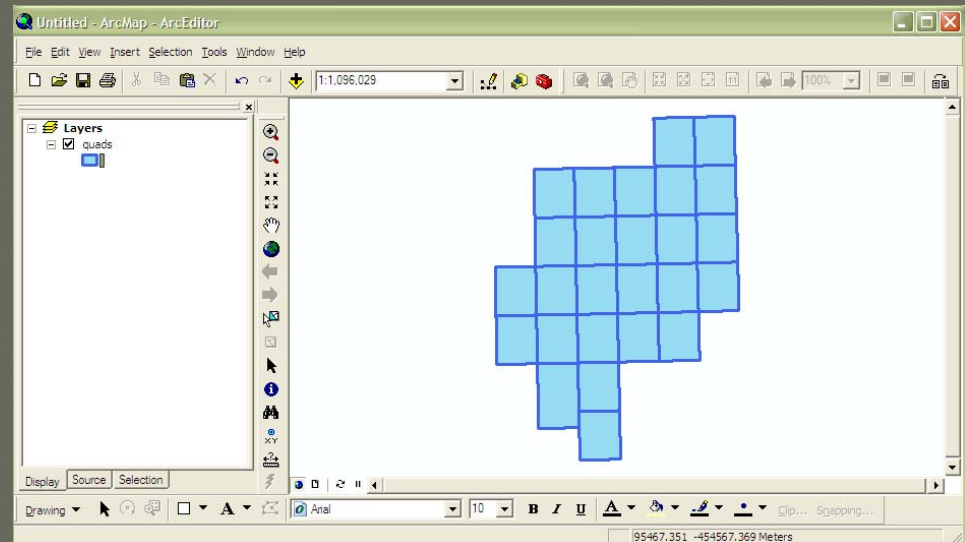
ArcMap and ArcCatalog

Each ArcGIS Desktop product includes two applications:
ArcMap & ArcCatalog



- **ArcCatalog** – The ArcGIS application used for browsing, managing and documenting geographic data.

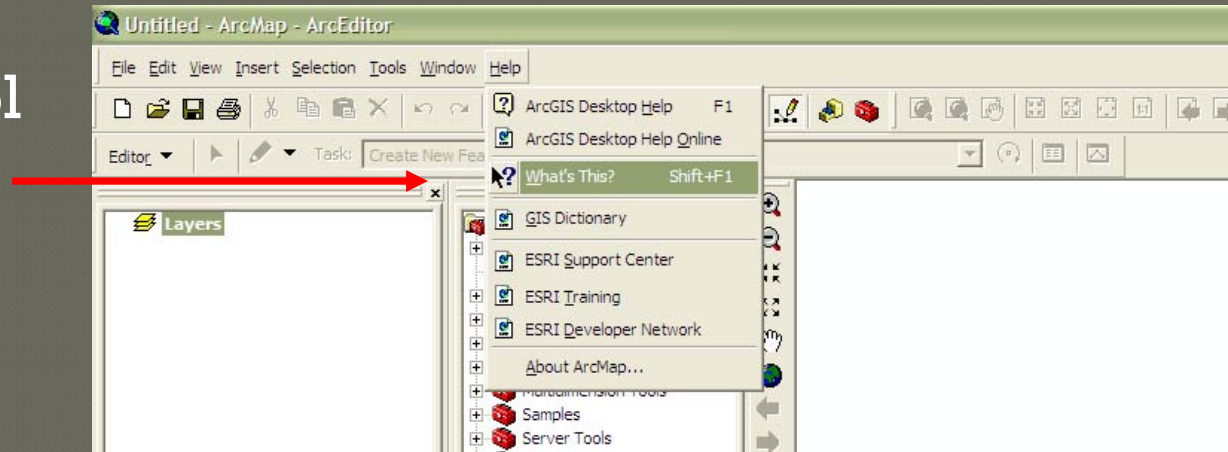
- **ArcMap** – The ArcGIS application used to view, analyze, and edit geographic data as well as create professional-quality maps, graphs, and reports.



Obtaining HELP

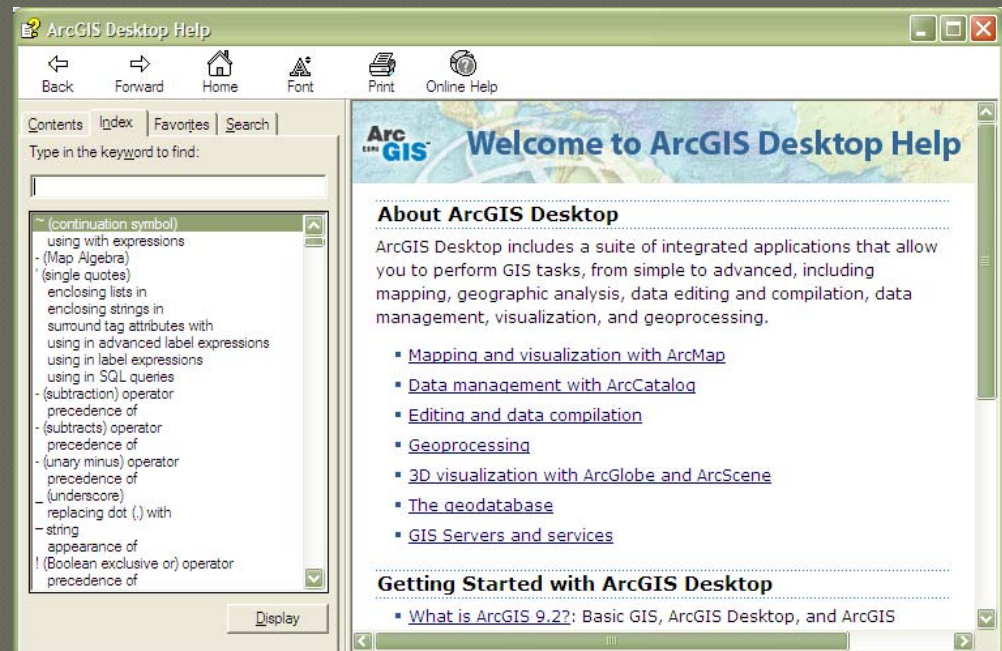
- *What's This?* Tool

- Shift+F1



- ArcGIS Desktop Help

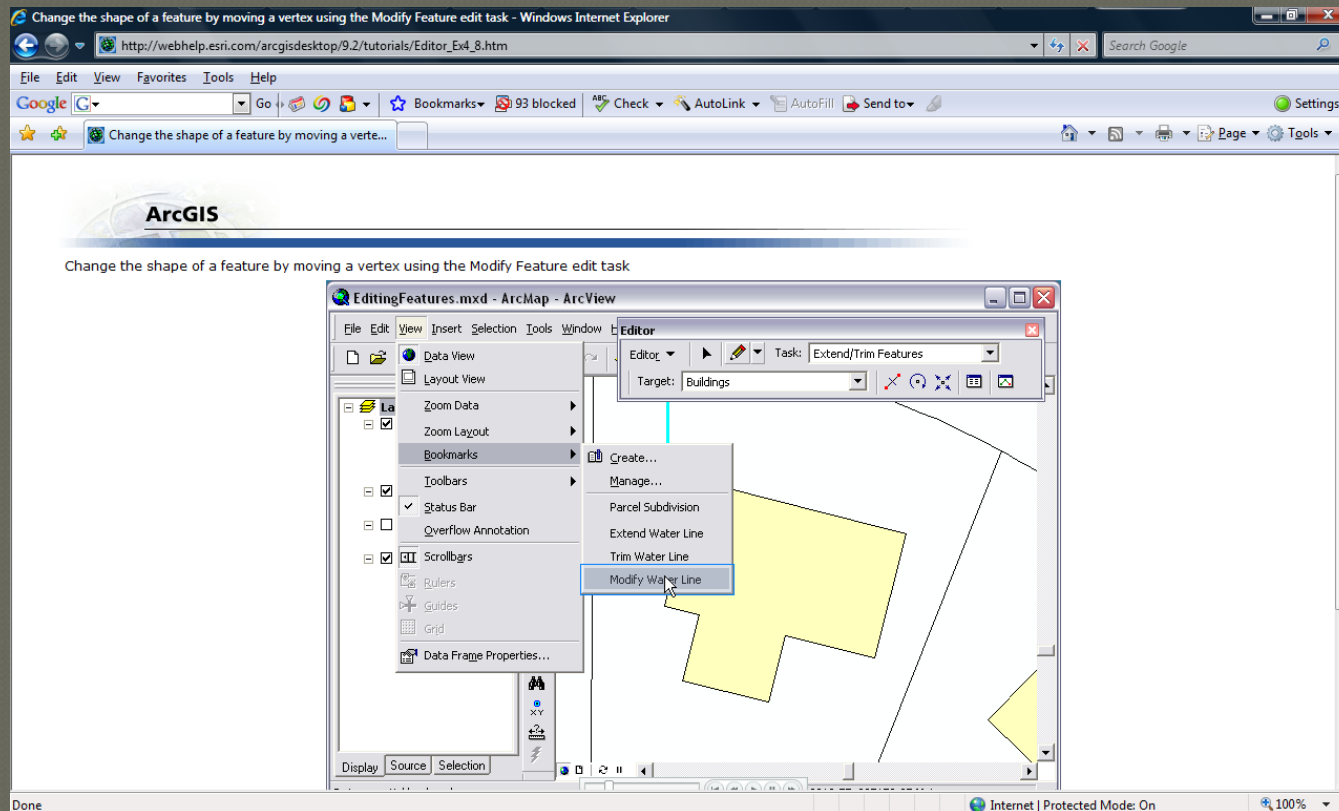
- F1 Key



- ESRI online support:
<http://support.esri.com/>

ESRI Tutorials

- View animated tutorials or review PDF's.
- Go to: <http://webhelp.esri.com/arcgisdesktop/9.2/tutorials/tutorials.htm>



Page and Print Setup

- When designing a layout, always decide on and set the page size **FIRST!**
- Go to File....Page and Print Setup.

STANDARD PAGE SIZES

Name	Dimensions (inches)
A-size (Letter):	8.5 x 11
Legal:	8.5 x 14
B-Size (Tabloid):	11 x 17
C-size:	17 x 22
D-size	22 x 34
E-size:	34 x 44

Page and Print Setup

Printer Setup

Name: Microsoft Office Document Image Writer Properties...

Status: Ready

Type: Microsoft Office Document Image Writer Driver

Where: Microsoft Document Imaging Writer Port:

Comments:

Paper

Size: Custom Size

Source: Default tray

Orientation: ☐ Portrait ☒ Landscape

☐ Printer Paper

☐ Printer Margins

☐ Map Page (Page Layout)

☒ Sample Map Elements

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

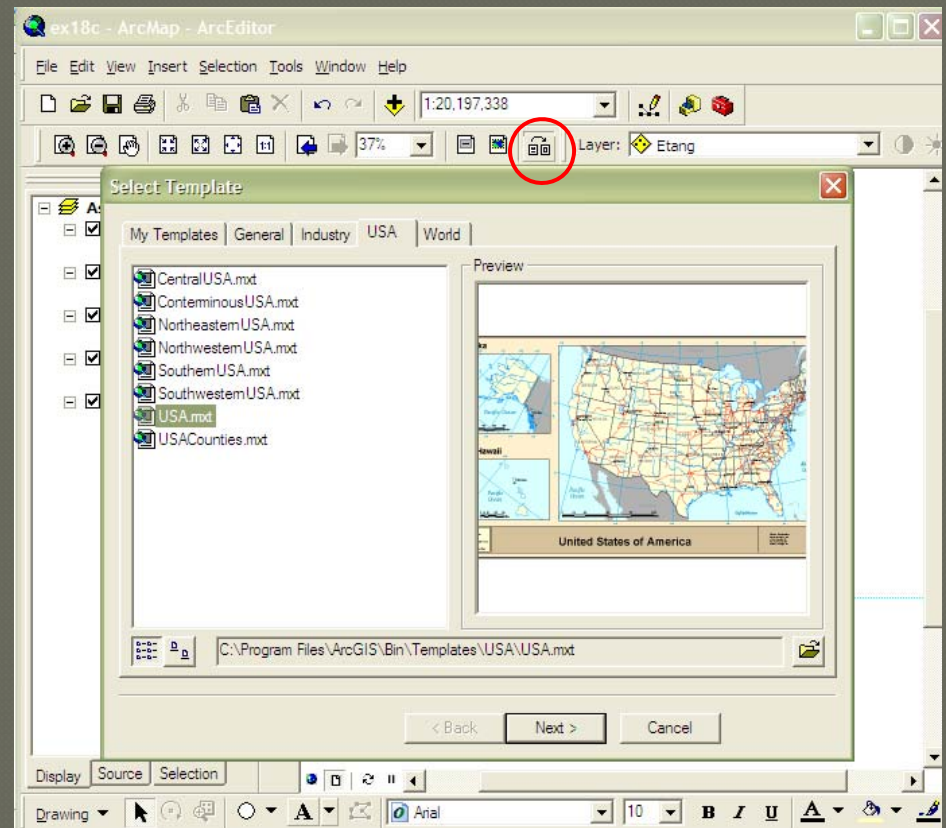
Orientation: ☐ Portrait ☒ Landscape

☒ Show Printer Margins on Layout ☒ Scale Map Elements proportionally to changes in Page Size

OK Cancel

Templates

- Create your own template OR
- Use existing map templates
 - Select template when opening ArcMap OR
 - Go to “Change Layout” button and select template.
- .mxt extension



Adding Textual Information

3 Primary Methods:

- Dynamic Labels
- Annotation
- Map Text (Graphics)

Attribute Tables

- A specific type or category of information associated with a geographic feature is called an *attribute*.
- Attributes are stored in the 'attribute table' associated with the layer.

Each attribute is a
column or field.

Attributes of United States

	OBJECTID *	Shape *	AREA	STATE_NAME	STATE_ABBR	POP1990	POP2000	POP90_SQMI
	36	Polygon	69832.746	Missouri	MO	5117073	5502243	73
	3	Polygon	147244.653	Montana	MT	799065	885795	5
	16	Polygon	77330.258	Nebraska	NE	1578385	1672199	20
	23	Polygon	110669.975	Nevada	NV	1201833	1879204	11
	13	Polygon	9259.527	New Hampshire	NH	1109252	1215100	120
	21	Polygon	7507.502	New Jersey	NJ	7730188	8192366	1030
	42	Polygon	121757.343	New Mexico	NM	1515069	1750921	12
	17	Polygon	48561.751	New York	NY	17990455	18223519	370
	39	Polygon	49048.024	North Carolina	NC	6628637	7762819	135
	5	Polygon	70812.056	North Dakota	ND	638800	631032	9
	26	Polygon	41193.957	Ohio	OH	10847115	11281851	263
	38	Polygon	70003.325	Oklahoma	OK	3145585	3383158	45

Record: 26 Show: All Selected Records (1 out of 51 Selected) Options

Each feature is
a record (row).

ModelBuilder

- A model is a collection of geoprocessing operations that automatically execute in sequence when the model is run to produce a final output dataset.

