



Cartographic Data Capture

Concepts, and Hardware,

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Objectives

- ◆ Provide an overview of the basic tasks of data capture:
 - ◆ conversion of graphic information that appears as points, lines, and areas on maps...
 - ◆ into digital form to be stored and manipulated within the computer.

Overview

- ◆ Review of data needed to make a map
- ◆ Steps in data collection process
- ◆ Two fundamental approaches: raster & vector
- ◆ Vector mode data capture
- ◆ Raster mode data capture

Information needed to make a map

- ◆ **Base map** for extracting cartographic data:
 - ◆ Projection information
 - ◆ Location of control points
 - ◆ Location of all cartographic features to capture [points, lines, areas]
- ◆ **Attribute data** values for:
 - ◆ Points
 - ◆ Lines
 - ◆ Areas
 - ◆ Labels

Steps in procedure for automated capture of base map

- ◆ **Acquisition** of stable, geo-referenced base map materials drawn at a scale appropriate to the mapping project
- ◆ **Initial data capture:** a device is needed that enables conversion of the graphic image on the map into digital form [hardware dependent and intensive]
- ◆ **Editing** of captured data for generalization, simplification, and error correction
- ◆ **Manipulation and transformation** of the captured, corrected data

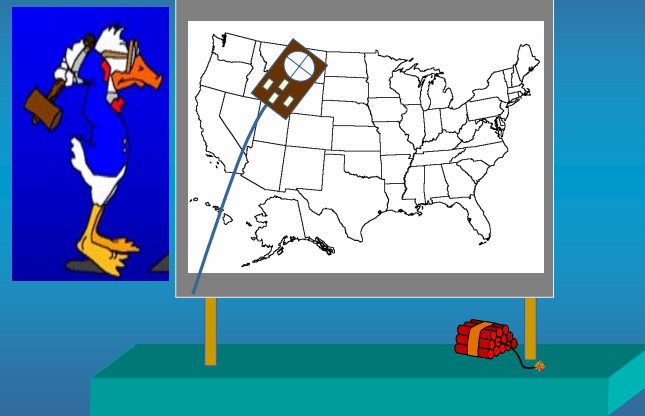
Two fundamental approaches automated map compilation

- ◆ **Vector:** basic element from which all cartographic elements are formed is the X,Y coordinate pair.
- ◆ **Raster:** basic element from which all cartographic structures are formed is the picture element or pixel.

Vector Mode Approaches

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Digitizer



Hardware for Vector Mode

- ◆ Ruler
- ◆ Semi-automatic digitizing tablet & tablet technology:
 - ◆ Rail and beam
 - ◆ Tablet underlain with fine mesh of wires.
 - ◆ Sonic
- ◆ Automatic line following



Modes of Digitizer Operation

- ◆ Point
- ◆ Continuous interval
 - ◆ Stream
 - ◆ Switched stream
- ◆ Continuous incremental
 - ◆ Stream
 - ◆ Switched stream



Vector Mode Capture

- ◆ Advantages
 - ◆ Devices inexpensive
 - ◆ Need store only small part of image area
 - ◆ High resolution
- ◆ Disadvantage
 - ◆ Not good for highly complex images-photos.



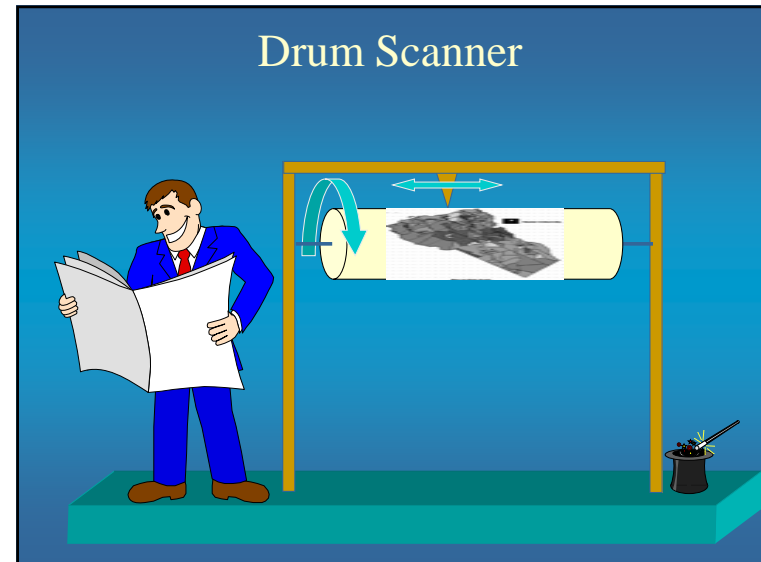
Raster Mode Hardware

- ◆ Scanners
 - ◆ Drum
 - ◆ Flat bed

The diagram illustrates the classification of raster mode hardware. It features three images: a drum scanner (top left), a flat-bed scanner (top right, labeled 'Flat-bed scanner'), and a desktop scanner (bottom right). Yellow arrows point from the 'Scanners' list to each of these three images, indicating that both drum and flat-bed technologies are used in various scanner models.

Raster Mode Capture

- ◆ Advantages
 - ◆ Highly automated
 - ◆ Fast
- ◆ Disadvantages
 - ◆ Costly devices
 - ◆ Large data storage requirements, but
 - ◆ can convert to vector mode
 - ◆ Next release of Arc Info will include Arc Scan at no extra cost.



Linear Photo Sensor Array



Error Detection in Digitizing

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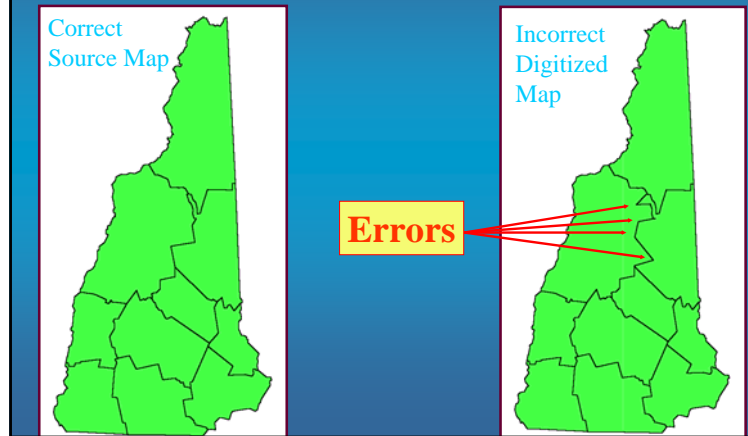
Overview

- ◆ Review of typical error types.
- ◆ Error detection techniques.

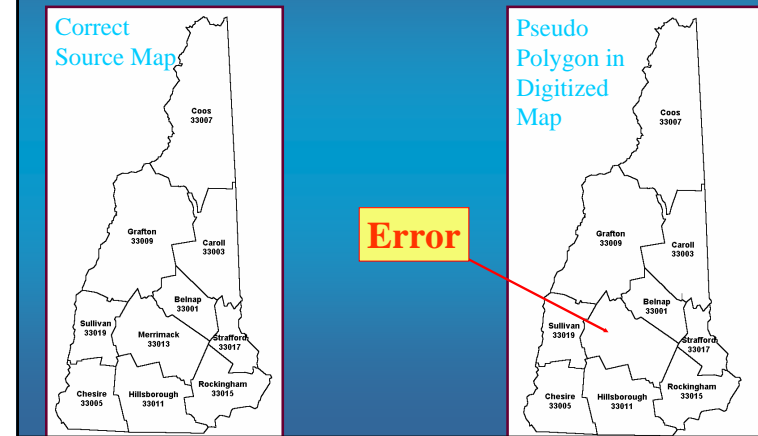
Common error types

- ◆ Error in line shape.
- ◆ Pseudo polygons.
- ◆ Mislabeled polygons.
- ◆ Gaps and slivers.

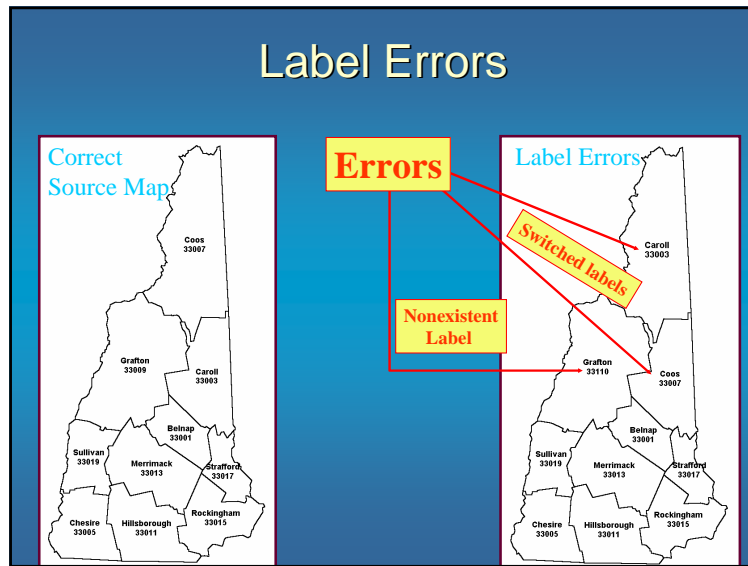
Error in line shape



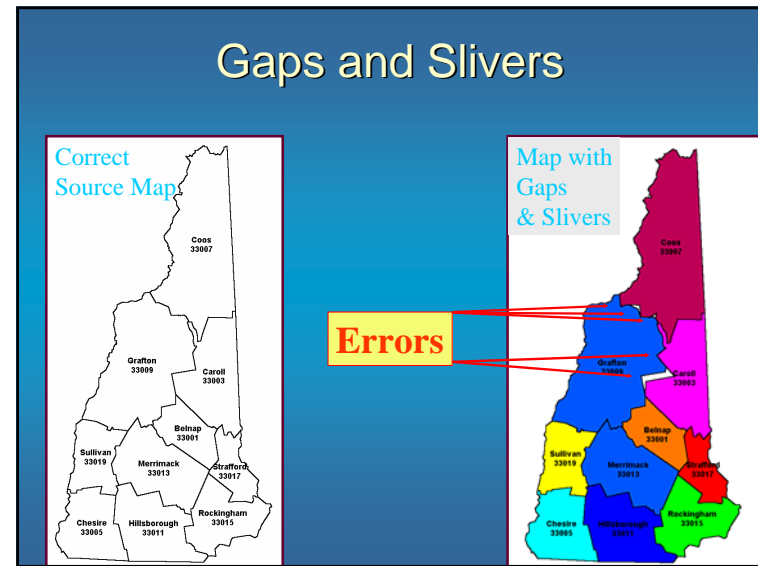
Pseudo Polygons



Label Errors



Gaps and Slivers



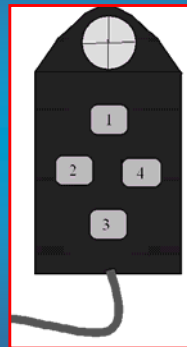
Error Detection Techniques

Error Detection Techniques

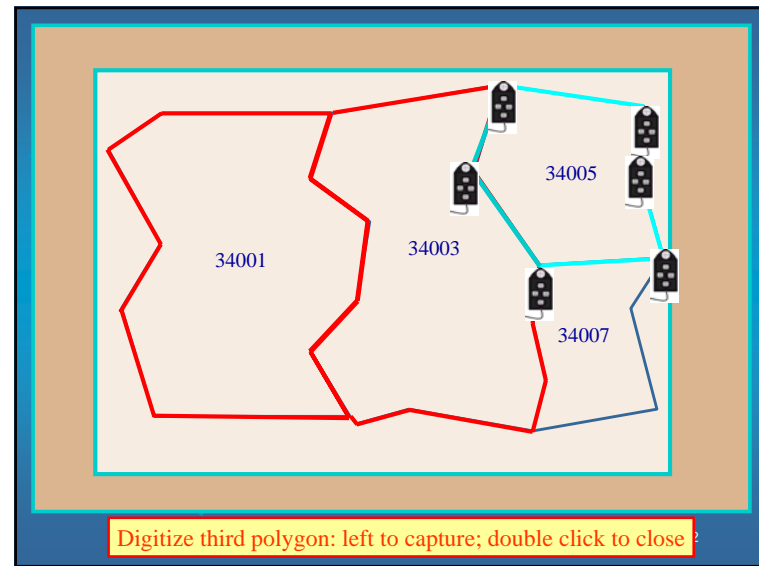
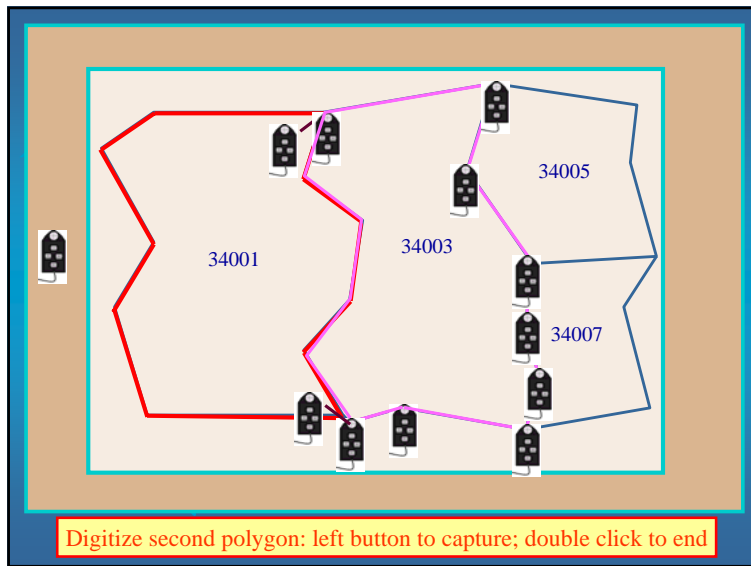
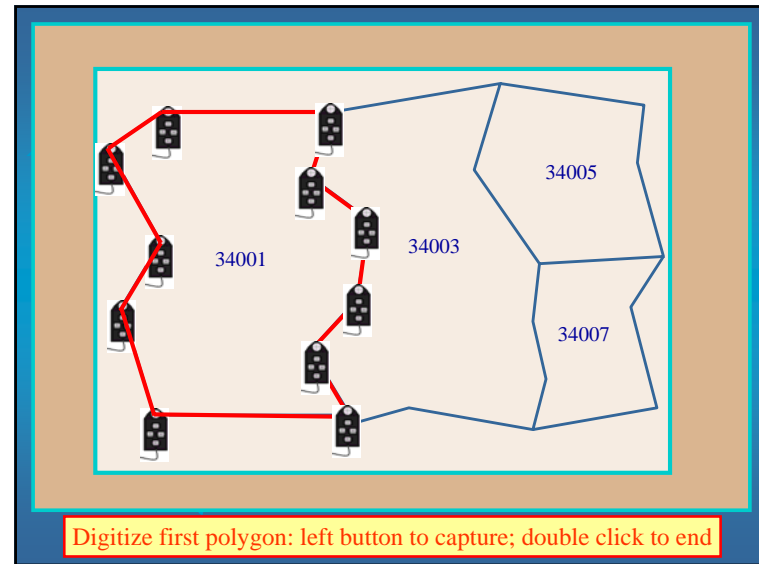
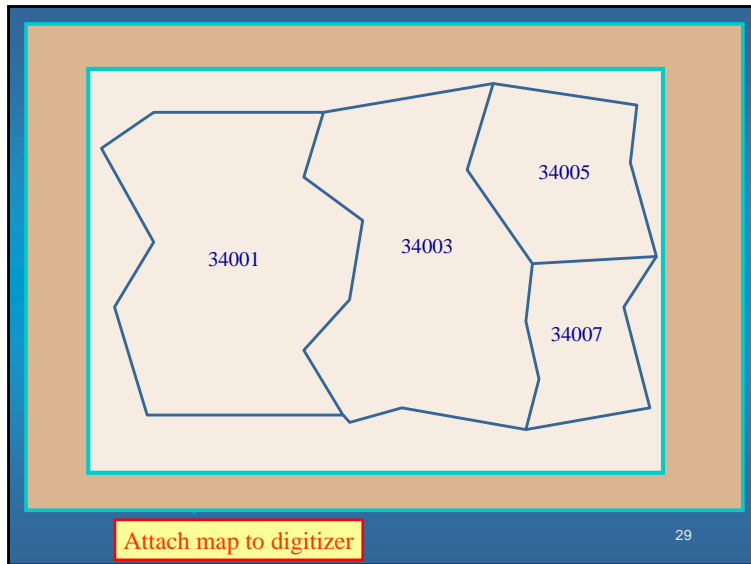
- ◆ Plot map using fine line and compare to source.
- ◆ Display labels and plot to check for pseudo polygons.
- ◆ Display labels and plot to check for incorrect labels.
- ◆ In short...plot the map with a thin line weight and with labels displayed.

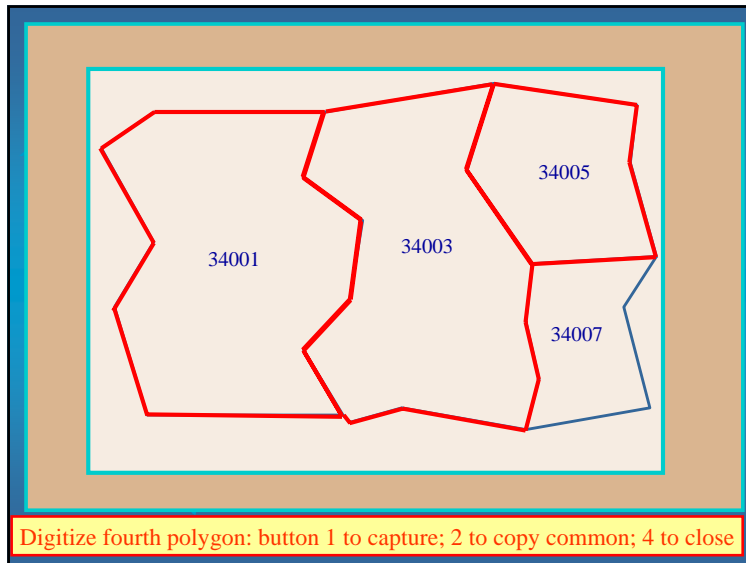
Digitizing features:

- ◆ Button 1: capture points



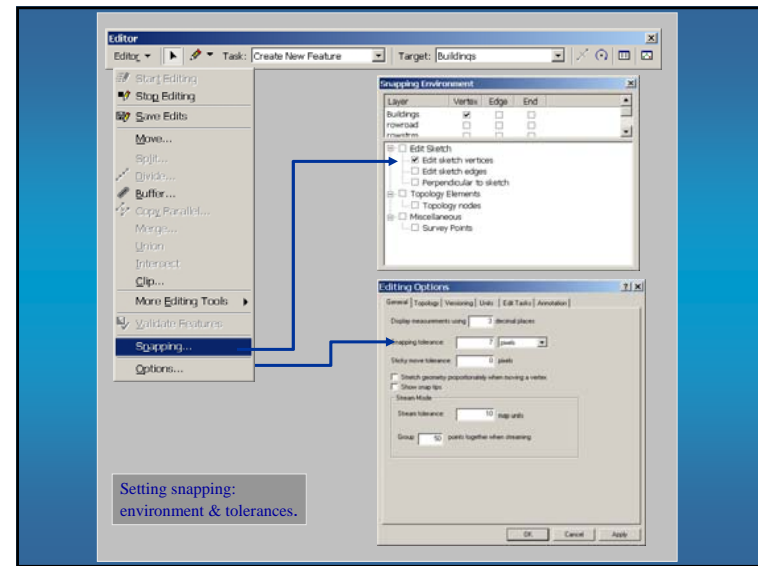
Simulation of process



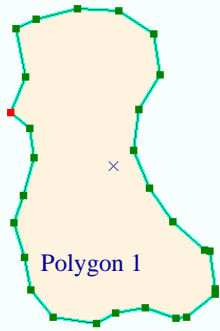


Overview

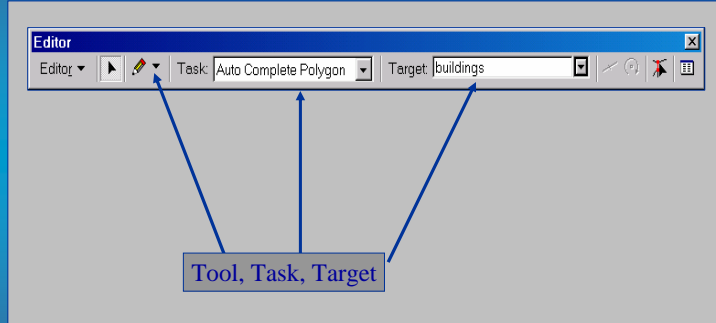
- ◆ Create new layers in Arc Catalog
- ◆ Run Arc Map and open the Editor Toolbar
 - ◆ Load new layers
 - ◆ Set Snapping
 - ◆ Start editing
 - ◆ Digitize
 - ◆ Correct
 - ◆ Save
- ◆ Add attributes



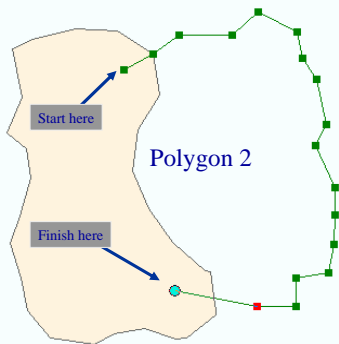
Digitize a Polygon



Digitize a Common Border Polygon



Avoiding Gaps and Slivers



Avoided Gaps and Slivers

Polygons with common border
and no gaps or slivers

Polygon 1 is the existing feature. Polygon 2 is a new feature that shares a common border with polygon 1. To avoid gaps and slivers, select the autocomplete task and begin digitizing either within polygon 1 or at the location of a common vertex. Finish digitizing by double clicking within polygon 1. The program automatically stores the common vertices in polygon 2 so as to avoid gaps and slivers.

Polygons with common border and no gaps or slivers

Delete a Vertex

headdigmap.mxd - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

Undo Add Vertex Ctrl+Z

Redo Ctrl+Y

Cut Ctrl+X

Click Edit and then select Undo Add Vertex

Modify a Feature

Editor

Task: Modify Feature Target: buildings

Tool, Task, Target

Modify a Feature: Delete

Insert Vertex

Delete Vertex

Move...

Move To...

Flip

Trim...

Delete Sketch Ctrl+Delete

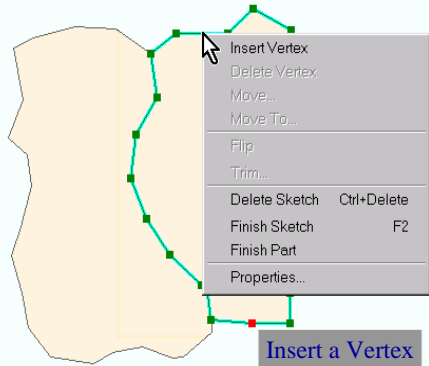
Finish Sketch F2

Finish Part

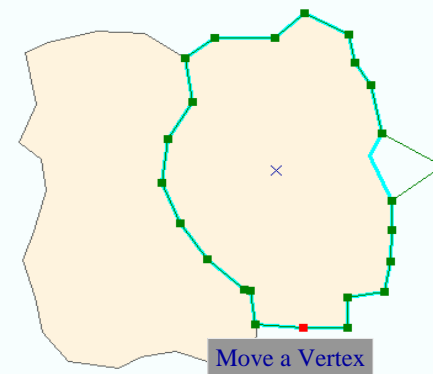
Properties...

Delete a Vertex

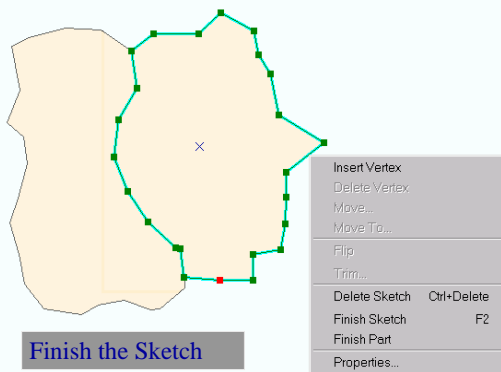
Modify a Feature: Insert Vertex



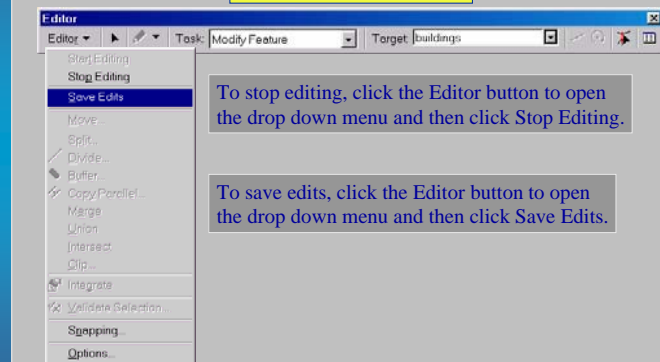
Modify a Feature: Move Vertex

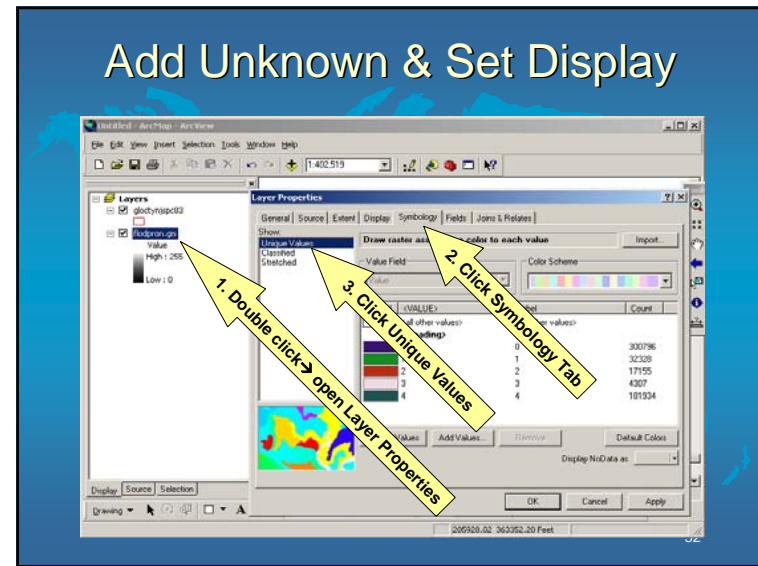
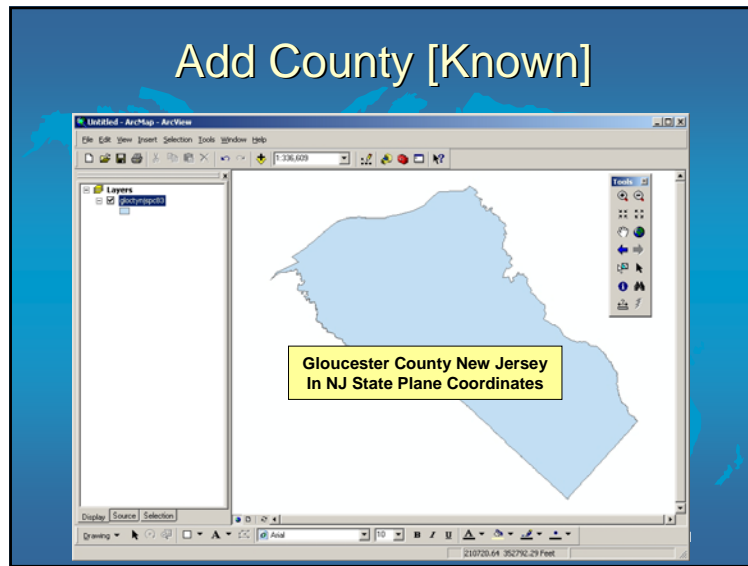
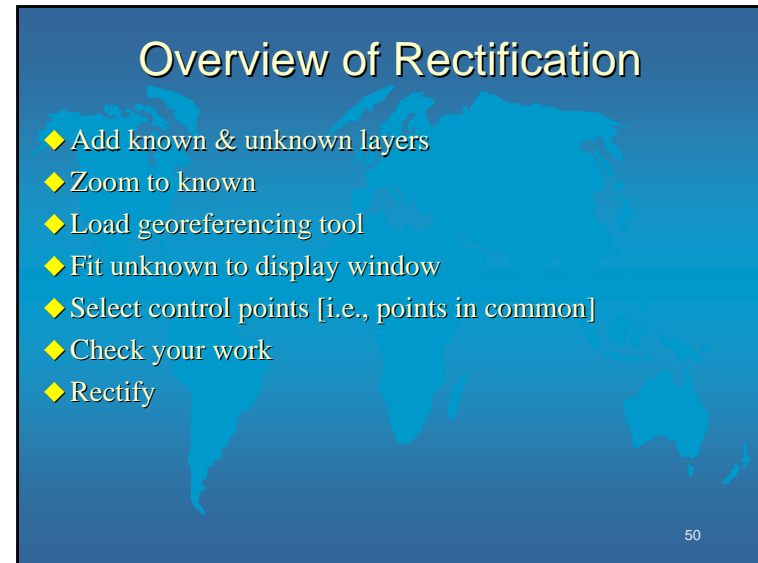
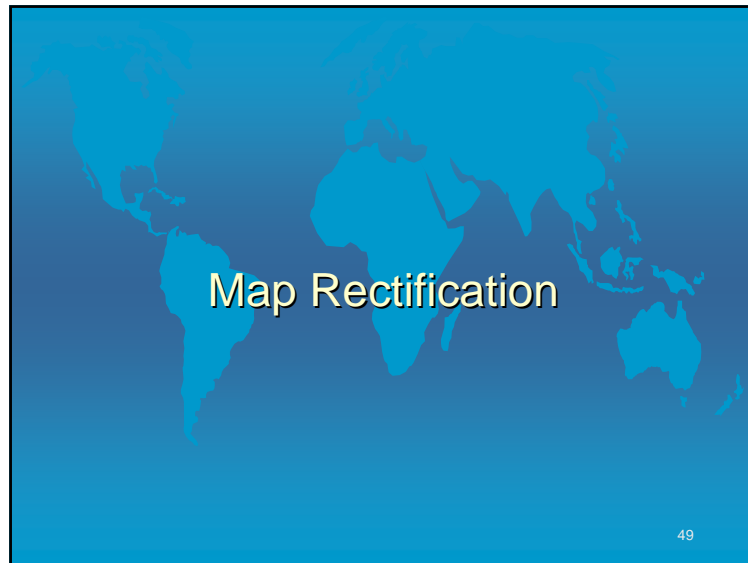


Modify a Feature: Finish Sketch

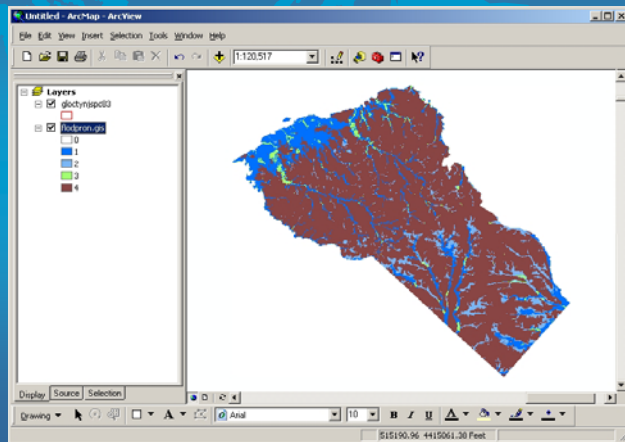


Stop and Save

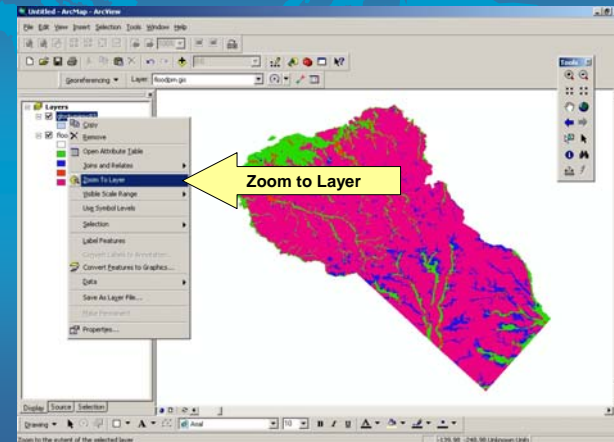




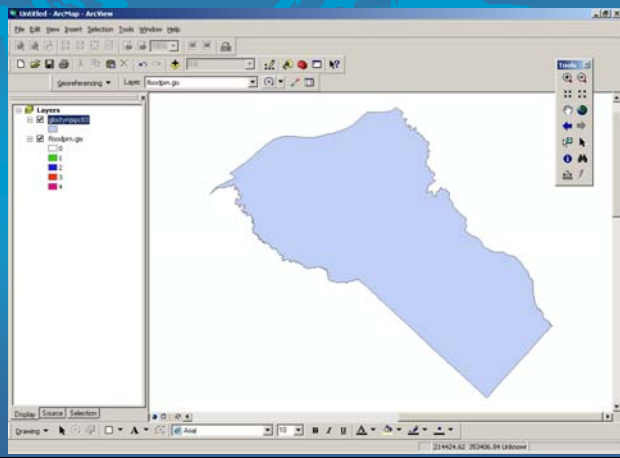
Erdas GIS Layer [Unknown]



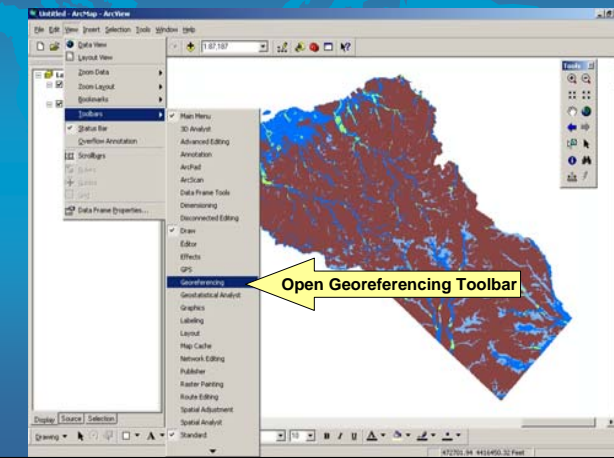
Zoom to Known Layer



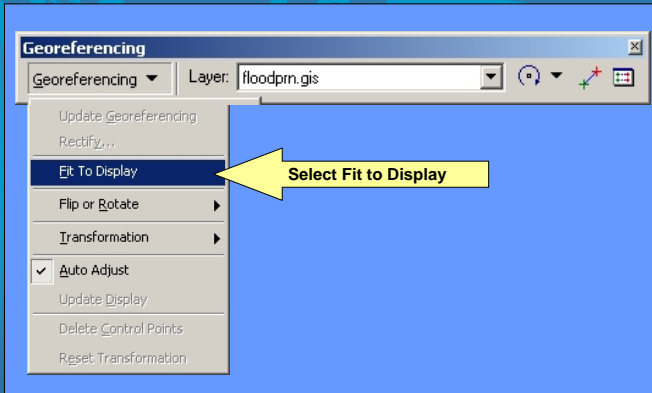
Zoomed to Known Layer



Open Georeferencing Tools

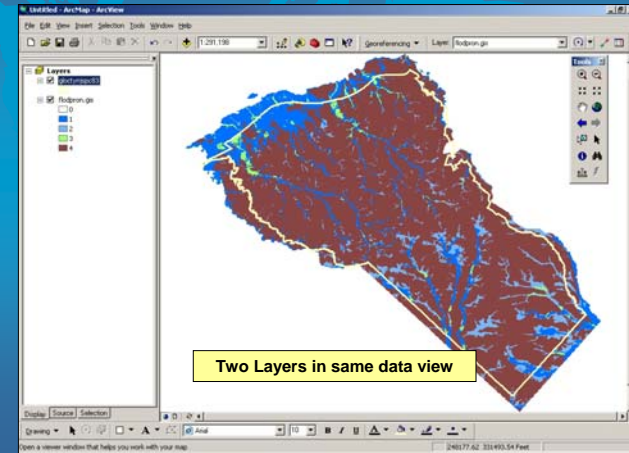


Fit to Display

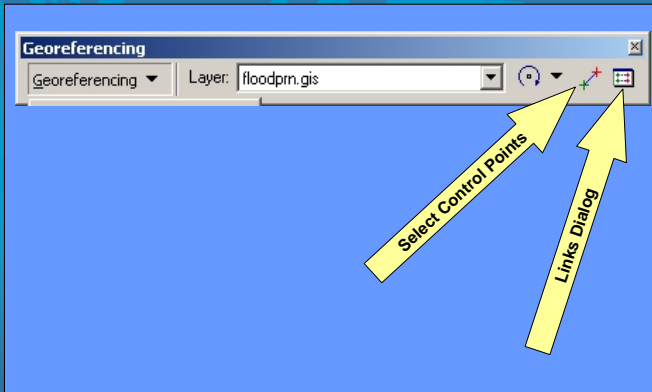


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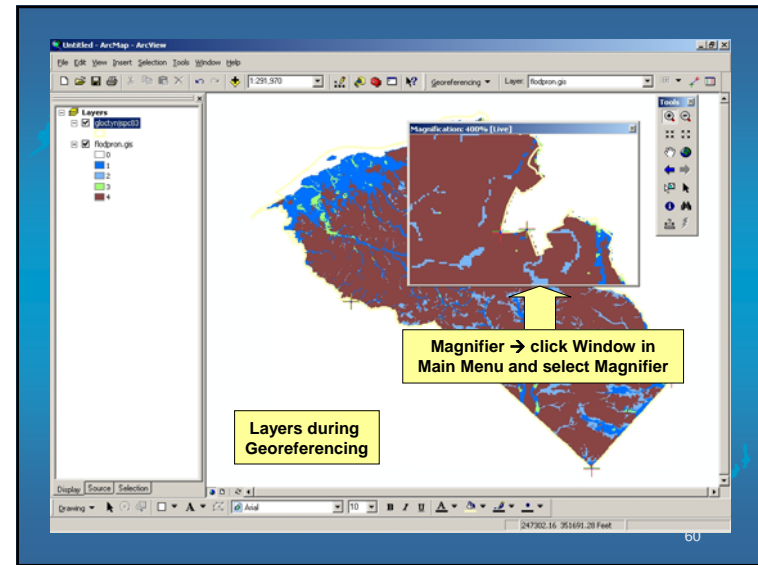
Two Layers Fit in Same Window



Tying Unknown to Known Points

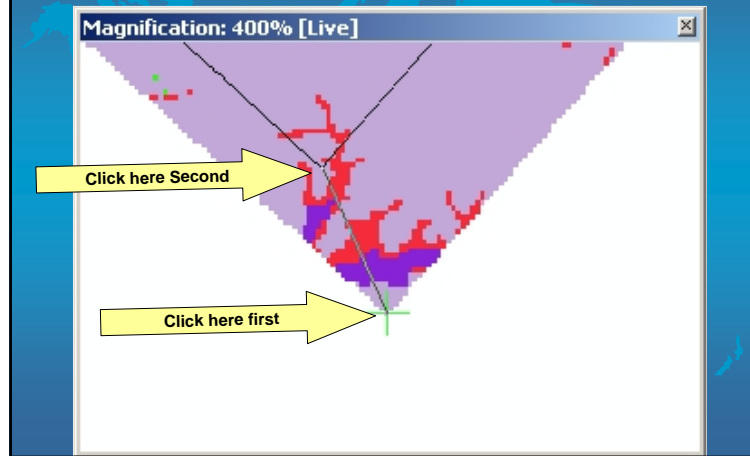


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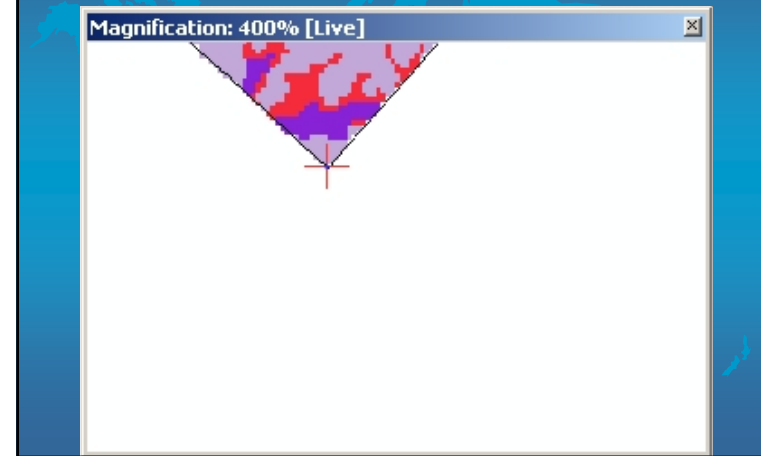


60

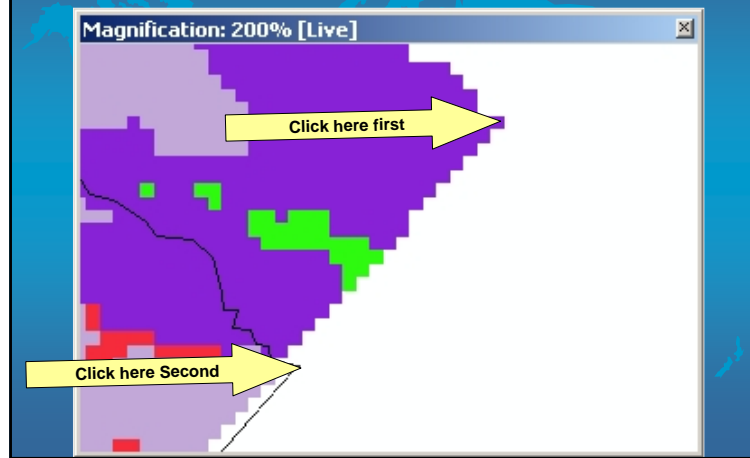
Tying Unknown to Known Points



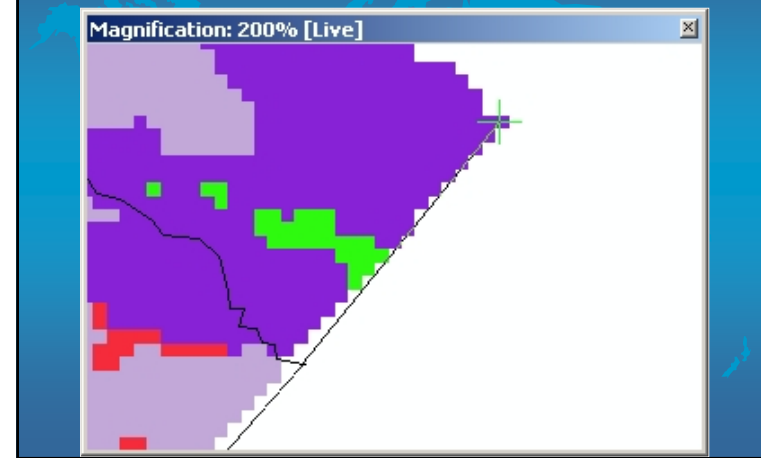
Unknown & Known Snapped



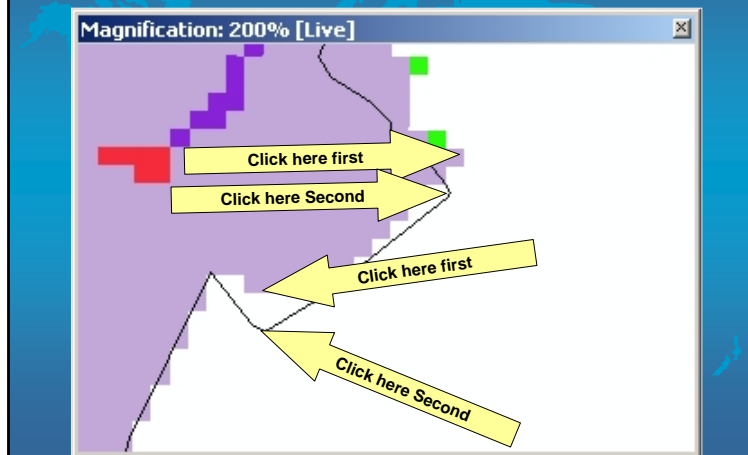
Tying Unknown to Known Points



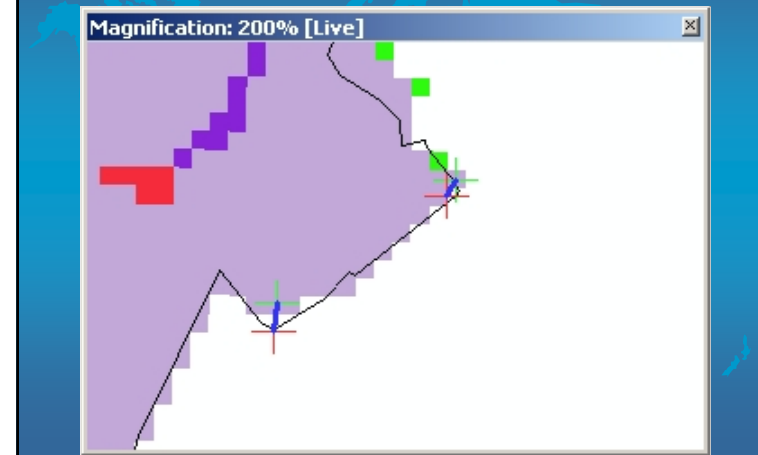
Unknown & Known Snapped



Tying Unknown to Known Points



Unknown & Known Snapped



Check to See Fit Quality

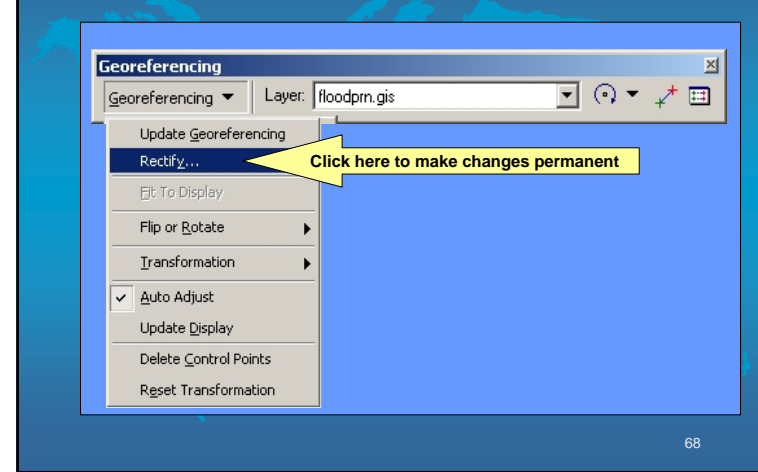
Link Table

Link	X Source	Y Source	X Map	Y Map	Residual
1	501235.111012	4373729.891652	355189.326765	248658.530041	0.87668
2	465810.533985	4400777.119864	239508.639088	338259.460792	1.77035
3	493727.886687	4404736.016596	331086.795636	350198.059485	73.03167
4	493145.527261	4404325.842331	329223.713114	348742.526218	75.67870

Auto Adjust Transformation: 1st Order Polynomial (Affine) Total RMS Error: 52.59466

Load... Save... OK

Keep Your Work



Specify Resampling Method & Save

Save As [?] [X]

Cell Size:

Resample Type:

Output Raster: [Folder Icon]

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