Integrating CAD in ArcGIS

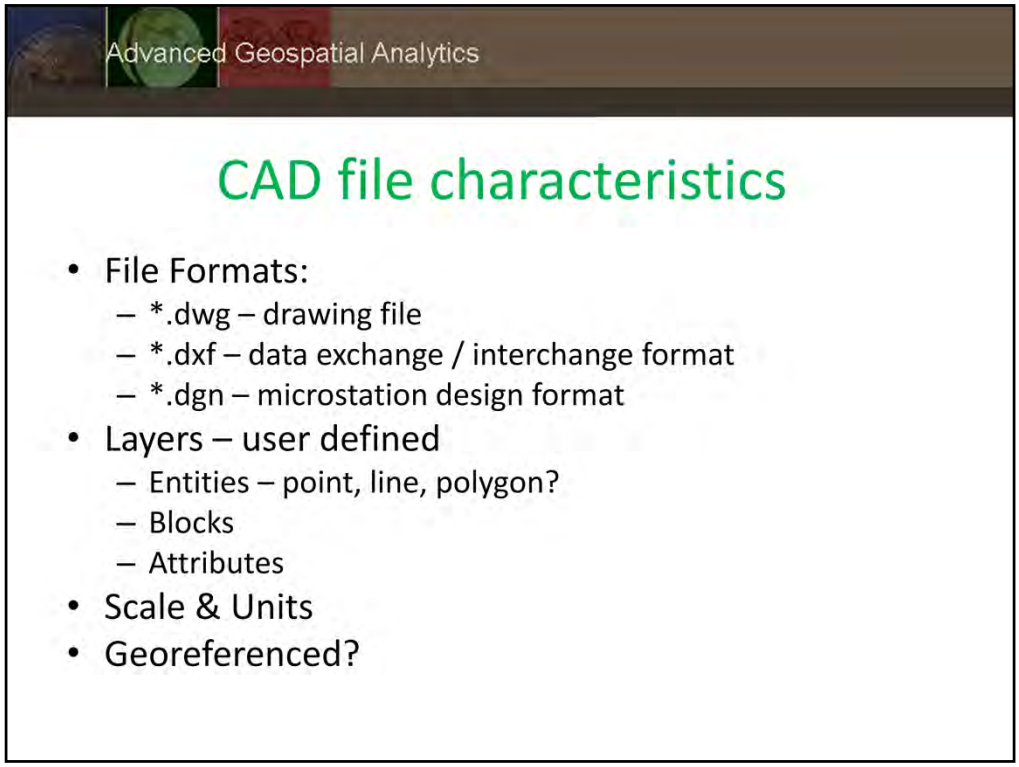
Topic Overview

What is CAD?

- Computer Aided Drafting / Design
- Autodesk AutoCAD software
  - AutoCAD
  - AutoCAD Map 3D
    - (GIS Capabilities, including import and display of shapefiles)
- Drawn at full size
  - Scaled for plotting
  - Model space vs. Paper Space

When we refer to CAD in this exercise, we are primarily talking about Autodesk software called AutoCAD. Note there is a version called AutoCAD Map 3D with GIS capabilities

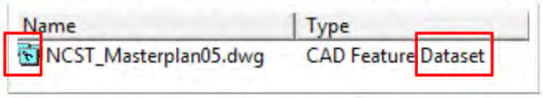
Note that when drafting in CAD, everything is drawn full size (1:1 scale). The drawing is scaled for printing.



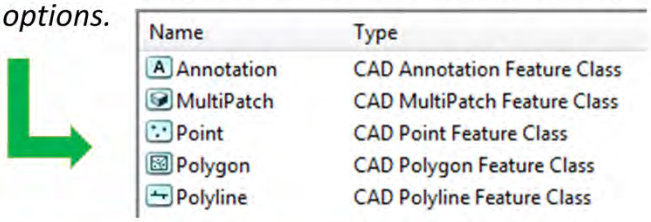
Units of measurement may differ depending on the CAD operator. We mentioned drawing are created at a 1:1 scale then rescales (feet to inches for example), but it is possible to bring a CAD file into ArcMap that uses inches as the map unit. It is important to find out about the file from the file creator / source of your data. The data we are using for the exercise in class uses feet for map units.

Adding CAD files to ArcMap

- Two methods to add data
  - CAD feature dataset – *manipulate display and geographic analysis*



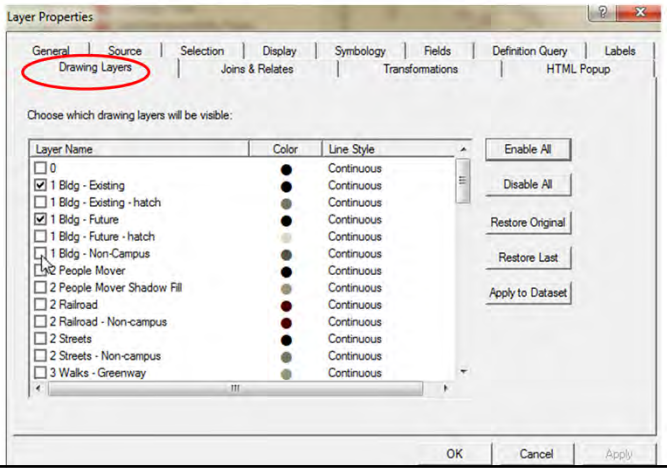
  - CAD drawing – *expand the feature dataset above to display feature class options.*



NOTE: all are shown, even if not present in the CAD file

Drawing Layers

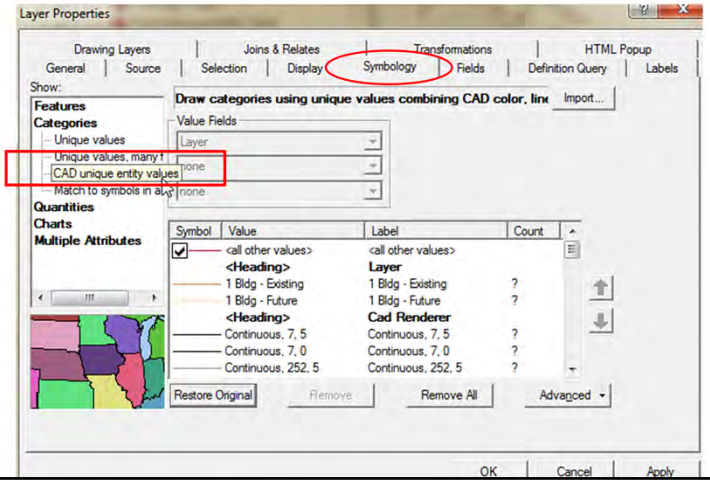
- Layer (ArcGIS) Properties dialog



Use the Layer Properties dialog to explore the CAD dataset. The Drawing Layers tab will display all of the CAD layers and allow you to filter which layers are displayed.

Symbology

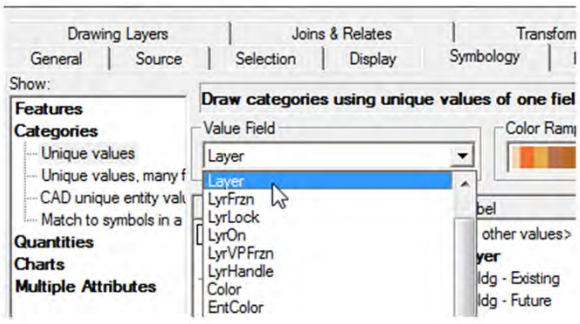
- Additional options for display



In the Layer Properties Dialog box, note the addition of CAD unique entity values under the categories option for Symbology.

Filter Layers

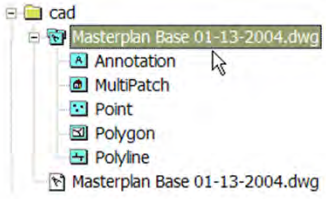
- Improve display by changing symbology



Change the categories for display to to unique values and use the value field “Layer” to display by layer names more familiar and to match the layers you selected earlier for display.

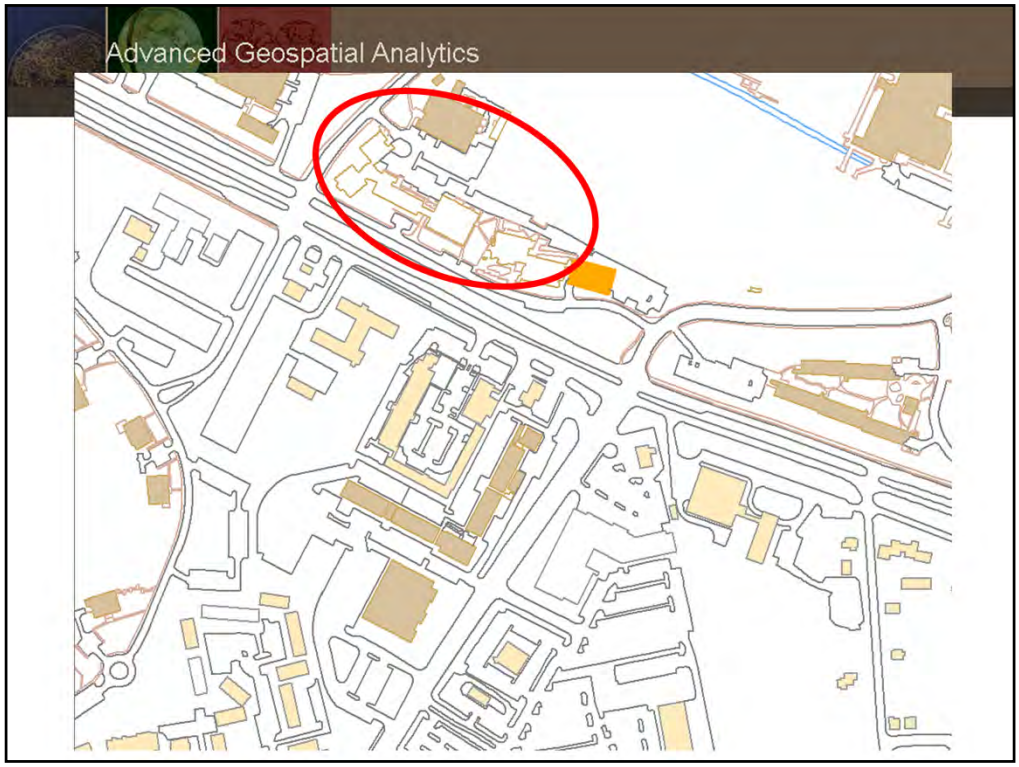
CAD Feature Dataset

- Separates entities
  - Annotation
  - MultiPatch
  - Point
  - Polygon
  - Polyline

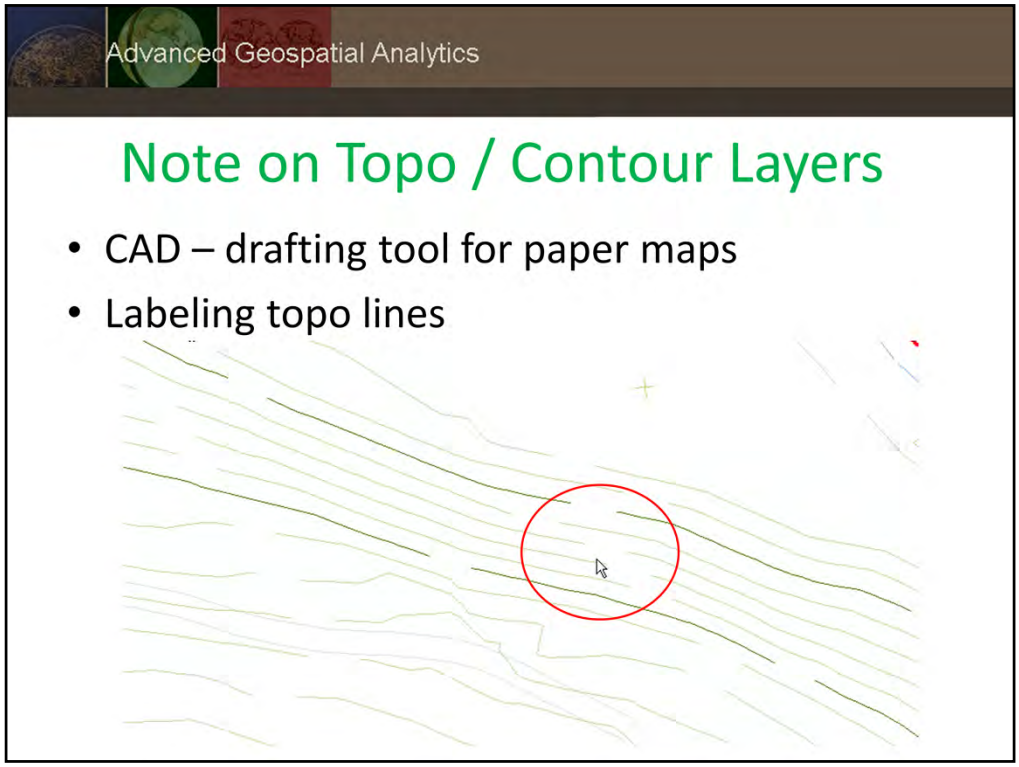


- How ArcGIS reads polyline / polygon data

Also note that all entities are listed in the table of contents when you add a CAD dataset to the display. Even if no features are present in a particular entity type.
Look at the Annotation layer for the exercise data. Are features present?



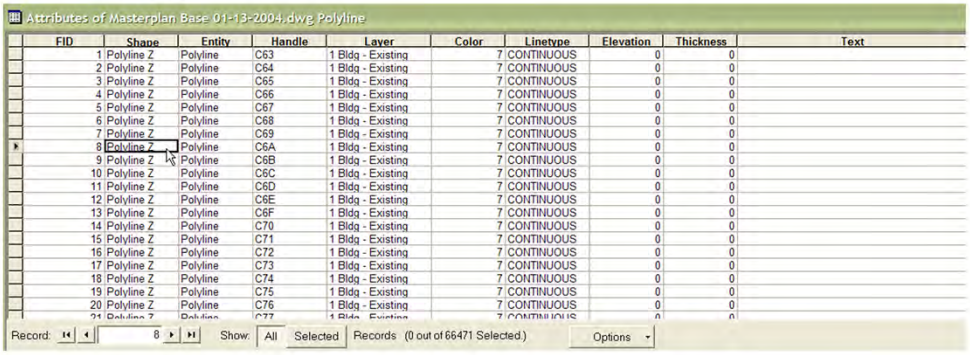
This slide illustrates the problem with polyline and polygon features. Note the two buildings that are note displayed as a polygon (circled in red). They are polylines that are not “closed” features. Therefore, ArcMap does not read them in as a polygon.



We are not using topography layers in today's exercise, but note the issue you may encounter if using topo data created in AutoCAD. CAD data is typically created for use in printed maps. To label topo lines with the elevation, cuts in the line are part of the annotatation / labeling process. This can present a problem if you want to use topo lines for analysis. As CAD and GIS users integrate data more often, I've noticed this issue much less often in CAD files created more recently.

CAD dataset – attribute table

- Default fields
- Shape – polylineZ if values entered in elevation field



Attributes of Masterplan Base 01-13-2004.dwg Polyline

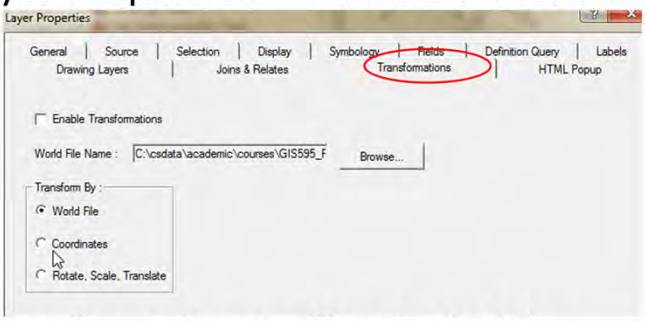
FID	Shape	Entity	Handle	Layer	Color	Linetype	Elevation	Thickness	Text
1	Polyline Z	Polyline	C63	1 Bldg - Existing	7	CONTINUOUS	0	0	
2	Polyline Z	Polyline	C64	1 Bldg - Existing	7	CONTINUOUS	0	0	
3	Polyline Z	Polyline	C65	1 Bldg - Existing	7	CONTINUOUS	0	0	
4	Polyline Z	Polyline	C66	1 Bldg - Existing	7	CONTINUOUS	0	0	
5	Polyline Z	Polyline	C67	1 Bldg - Existing	7	CONTINUOUS	0	0	
6	Polyline Z	Polyline	C68	1 Bldg - Existing	7	CONTINUOUS	0	0	
7	Polyline Z	Polyline	C69	1 Bldg - Existing	7	CONTINUOUS	0	0	
8	Polyline Z	Polyline	C6A	1 Bldg - Existing	7	CONTINUOUS	0	0	
9	Polyline Z	Polyline	C6B	1 Bldg - Existing	7	CONTINUOUS	0	0	
10	Polyline Z	Polyline	C6C	1 Bldg - Existing	7	CONTINUOUS	0	0	
11	Polyline Z	Polyline	C6D	1 Bldg - Existing	7	CONTINUOUS	0	0	
12	Polyline Z	Polyline	C6E	1 Bldg - Existing	7	CONTINUOUS	0	0	
13	Polyline Z	Polyline	C6F	1 Bldg - Existing	7	CONTINUOUS	0	0	
14	Polyline Z	Polyline	C70	1 Bldg - Existing	7	CONTINUOUS	0	0	
15	Polyline Z	Polyline	C71	1 Bldg - Existing	7	CONTINUOUS	0	0	
16	Polyline Z	Polyline	C72	1 Bldg - Existing	7	CONTINUOUS	0	0	
17	Polyline Z	Polyline	C73	1 Bldg - Existing	7	CONTINUOUS	0	0	
18	Polyline Z	Polyline	C74	1 Bldg - Existing	7	CONTINUOUS	0	0	
19	Polyline Z	Polyline	C75	1 Bldg - Existing	7	CONTINUOUS	0	0	
20	Polyline Z	Polyline	C76	1 Bldg - Existing	7	CONTINUOUS	0	0	

Record: 8 Show: All Selected Records (0 out of 66471 Selected.) Options

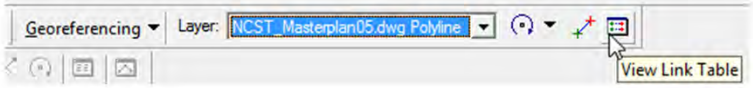
Review the attribute tables for your CAD layers and notice differences between other spatial data layers you have used.

Methods to Georeference

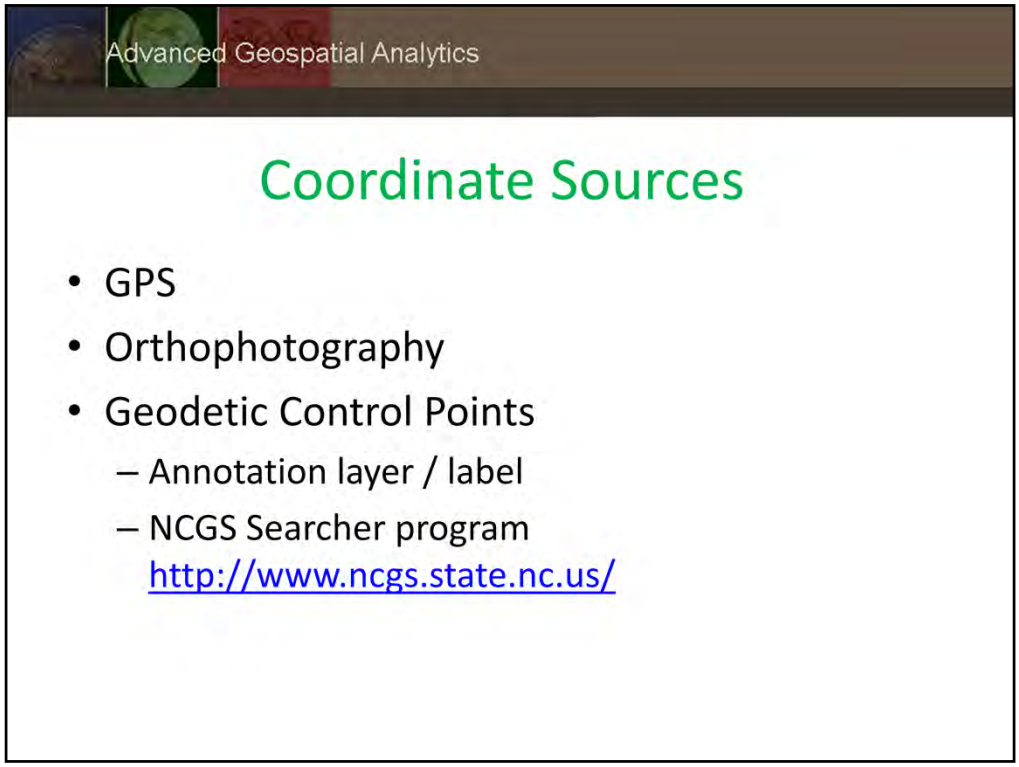
- Layer Properties – Transformations tab



- Georeferencing toolbar in ArcMap



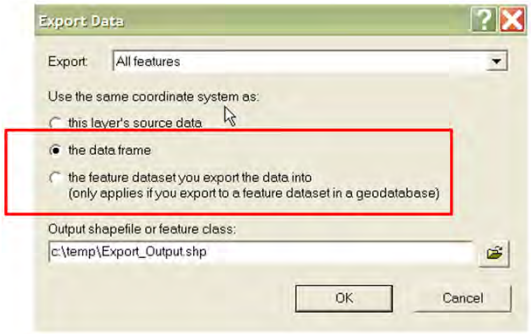
Note options available from the Transformations Tab in Layer Properties. The Georeferencing toolbar provides an easy method to transform your CAD data to use with other spatial data in ArcMap



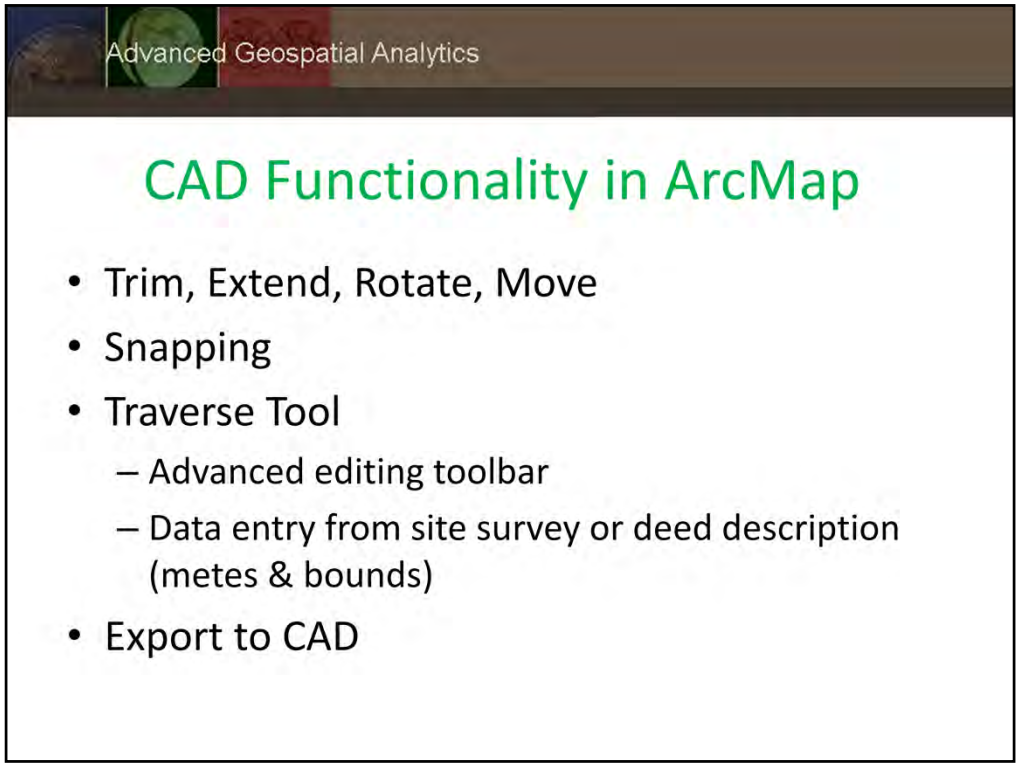
If you have no data to use in the transformation process, consider other options. If a geodetic control point is shown on the CAD drawing (especially if it is a survey), you may be able to use that as a reference.

Data Conversion

- Convert CAD data to GIS format
  - Geodatabase feature class
  - shapefile



Using the layer context menu, you may export your data to ArcMap format – note, only the layers displayed will be converted.



ArcMap also added editing functionality that was previously only available in drafting programs. We will not use these for this exercise, but be aware that they are available as you edit and create new data.

Thank You