

## Lab 2: Lecture Outline:

**An Introduction to GIS**

1. Introduce Paper Maps
  - a. It is a flat representation of a three dimensional surface with various features on it. The features are indicated with various different unique symbols. There is a scale and a contour interval. We can only clearly place so much data on it...thus we must be careful what we choose to show.
  - b. BUT, paper maps are static and one dimensional with no data hidden below the surface. (example of church: denomination, build age, # parishioners, address, owner, acres, # of parking spots...etc.)
2. Introduce G.I.S. (Geographic Information Systems)
  - a. Rather than being just a tool from making maps, it is a tool for organizing, analyzing, displaying and distributing complex spatial data.
  - b. Let's first consider the paper map and separate out the different layers:
    - i. roads, elevation contours, vegetation areas, homes, rivers, airports, place names, railroad tracks, political/agency boundaries, etc...
    - ii. Now allow each of the objects in each of the layers to have multiple attributes describing them (for each house you could have: age, price, acreage, square feet, owner, address...etc.)
  - c. Data Types
    - i. **Raster data**: continuous, pixilated information
      1. aerial photo, satellite image, digital elevation model (DEM)
    - ii. **Vector data**: discrete, often discontinuous data. 3 types:
      1. Point Data: houses, waterfalls, gauging stations, etc
      2. Line Data: rivers, roads, railroads, fences, trails, boundaries
      3. Polygon Data: vegetation, geologic units, lakes...
  - d. The Application: ESRI's ArcGIS is composed of multiple components
    - i. ArcMap: Create, Edit, Analyze and Print GIS maps.
    - ii. ArcCatalog: Organize do maintenance on GIS datasets
    - iii. ArcPad: A portable, field-friendly, mapping application for handheld computers. It's a stripped down version of ArcMap
    - iv. ArcScene: A three-dimensional data visualization tool. Allows you to fly through the data and create realistic looking landscapes.
    - v. ArcToolbox: an application embedded in Map and Catalog, providing tools for editing and manipulating your GIS data.
  - e. File Types
    - i. XXX.mxd is the document that you create in ArcMap. It does not contain data other than what layers were in the map and how you were displaying them, where the layers are located, etc. The file is small because it contains no data, BUT it has all your information regarding how you want to visualize your data.
    - ii. GRIDs: ArcGIS likes to store raster data (see above) as GRIDs. A single GRID file is composed of multiple separate files and you should not move them around using the traditional windows explorer. Only move them between directories using ArcCatalog. Arc Map is also capable of displaying Raster data that are .tiff, .jpg, or other raster data format, but only GRIDs retain their discrete data values (for example each pixel in a DEM being assigned a unique elevation) while .tif files are just assigned color value.
    - iii. Shapefiles: These files can store point, line or polygon data. They cannot store combinations of data types (for example points *and* polygons cannot exist in the same shapefile). Like GRIDs, an individual shapefile is composed of multiple files and should only be moved around on your computer using ArcCatalog.