Section 1: Objectives

• Become familiar with some of the GIS “lingo”
• Become familiar with the ArcMap interface
• Become familiar with some common techniques used in most GIS applications
• You will learn how to
  - add data to ArcMap,
  - modify the way it is represented,
  - use basic analysis and querying tools, and
  - produce a final map.

Section 1 Outline

• Basic Terminology
• Introduction to ArcGIS Software
• Introduction to data
• Introduction to Projections and Coordinate Systems
• Hands on stuff
Lingo:
Some terms you need to know

- ESRI -
- ArcGIS -
- Layer -
- Shapefile -
- Projection -

What is ESRI?

Environmental Systems Research Institute
The “Microsoft” of GIS software
GIS software product is called “ArcGIS”
http://www.esri.com

What is ArcGIS?

ESRI’s Premiere GIS software
A scalable GIS system: ArcView, ArcEditor, and ArcInfo
Provides a wide range of GIS tools: Desktop mapping to Geostatistical Analysis
ArcGIS Software Packages

ArcGIS – ArcView
ArcGIS – ArcEditor
ArcGIS – ArcInfo (Workstation)

lowest licensing level
highest licensing level

All licensing levels have similar look, but higher levels have more functionality (buttons and options)

You have been given an installation copy of ArcGIS-ArcView. ArcEditor and ArcInfo are also available to you at no cost.

There are some advantages and disadvantages to “scaling up” to ArcEditor and ArcInfo...

Advantages and Disadvantages

ArcView + ArcEditor - Totally portable. No Internet connection required, no hardware key required (dongle).

ArcInfo – more capabilities, requires internet connection OR hardware key (dongle)

George McLeod will discuss this in further detail later this week.

ArcGIS has a three part interface:
(i.e. 3 software modules in one)

ArcCatalog - for navigating spatial data (moving spatial data, copying spatial data files, etc.)

ArcMap - for creating presentation graphics (maps)

ArcToolbox – powerful geoprocessing tools (buffering, converting data, etc.)
ArcCatalog

ArcCatalog comparable to Windows "explorer" or the "My Computer" on your Windows desktop
Tool for navigating your GIS datasets
ArcCatalog has been specially designed for use with spatial (i.e. GIS) data

ArcCatalog

The Windows "explorer" for GIS (spatial) data
ArcCatalog: Previews
Using ArcCatalog you can easily preview both your spatial datasets, and the attribute data associated with them.

ArcCatalog: Data Management
Safe environment to cut and paste spatial data
Convert data into different formats including the newest ESRI spatial data structure, the geodatabase.

ArcCatalog: Metadata
ArcCatalog includes tools for viewing and editing Metadata.
Metadata

We will discuss metadata more in depth later in the week.

There are 1 day metadata training classes available through Virginia Information Technologies Agency (VITA). Information can be found here: http://gisdata.virginia.gov/

ArcMap

We’ll spend 80% of our time over the next week working in ArcMap.

This is the software module where you “make maps”

ArcMap

ArcMap is like a virtual drafting table with 2 main parts:

- **Canvas** where GIS data layers are drawn
- **Table of Contents (TOC)** lists all data in the canvas

For desktop mapping you will spend most of your time in ArcMap
ArcMap

The canvas can be viewed in two states:

Data view which is where most of the analysis is done.

Layout View is where you create a final map (similar to "Print Preview" in Microsoft Office). In layout view you gain access to cartographic tools (scale bar, north arrow, etc.).

ArcMap: Toolbars

**Standard**: basic file management tools (new, open, save, cut/paste, etc)

**Tools**: navigation tools, identification, and selection tools

**Draw**: basic windows style drawing toolbar

There are several other special need toolbars available from the View menu. Among other things, there is an edit toolbar and there are special toolbars for extensions that are available (for free) through the VCCS GIS software license.
ArcMap: Toolbars

To turn on/off a toolbar:
Go to the <View> menu, select <Toolbars>, and select your toolbar of choice.

ArcMap

In addition to the toolbars, there are several menus available in ArcMap.
The menus contain some commonly used items from toolbars as well as a few common functions from ArcCatalog and ArcToolbox.
ArcMap

Data View  Layout View

Saving your work in ArcMap

**Map Documents (.mxd)** - Saves your map set up and display
Map documents do **NOT** save GIS data, just the view

- **Map Documents (.mxd)**
- **Layer Files (.lyr)** - Saves symbology and other display properties for a data source, Does **NOT** save data
Saving your work in ArcMap

- **Map Documents (.mxd)**
- **Layer Files (.lyr)**
- **Map Templates (.mxt)**

If you are going to create several maps with a similar layout, the template can be a time-saving tool.

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Saving your work in ArcMap

- Set your .mxd to **RELATIVE paths** so your mxd works reconnects to your data.
- When you move mxds and data if you do not set relative paths you will “loose” your data connection (!) and have to reconnect your data.

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ArcToolbox

Central location to find, manage, and execute heavy duty processing (geoprocessing) tools.

Contains a multitude of tools such as analysis, conversion, and data management tools.

Also allows for the construction of custom tools.
An Introduction to “Spatial Data” Layers

Why is it called “spatial data”?
Every data entity is associated with a coordinate system, and therefore has a geographical (or spatial) reference.

What is a “layer”?
Layers are data. They form the basic “building blocks” of a GIS. There are 2 types of data “layers”:

- vector data
  - points
  - lines
  - polygons
- raster data
  - images (aerial photos, digital topomaps, etc.)
Layers are the basic building blocks:
- Elevation, Aspect, & Slope
- Soil Types + Characteristics
- Zoning
- Livestock Premise Locations
- FSA Common Land Unit Bndrys
- Rivers and Streams
- Flood zones / flood prone areas
- Zoning or Parcel Information

GIS can efficiently support incident assessments, monitoring, analysis, and reporting...

Vector Data

The data maintains its quality as you zoom in...
Vector Data

Raster Data (Imagery)

Is comprised of individual pixels

The smaller the pixel, the “sharper the image”

Remember when digital cameras first came out??
(1 megapixel vs. 10 megapixel cameras)
All of these points have coordinates associated with them...

In fact, every point on every photograph is associated with coordinates!!!
“Digital Orthophotography”

This means that accurate information can be obtained directly from the photographs:

- **Location**: Where is a particular coordinate?
- **Distance**: How far is it from “point A” to “point B”?
- **Area measurements**: How many acres are associated with this field or development site?
- **Length/Perimeter measurements**: What is the distance around this lake?

**Spatial Resolution**

**Vector data – roads, buildings, driveways**

**Acknowledgements**: Greg Bonynge

**Spatial Resolution**

30 meter TM w/ vector data overlay

**Acknowledgements**: Greg Bonynge
Spatial Resolution
Sub-meter ADAR w/ vector data overlay

Satellite Imagery

Google Earth
Another example of raster data
Data formats for ArcGIS

Vector Data
- ArcView Shapefiles
- ArcInfo Coverages
- Geodatabase
- CAD drawings

Raster Data
- Most common imagery (aerial photographs, digital topomaps, etc.) formats can be read
- ArcInfo GRIDs, MRSID, geoTiff's
ArcView Shapefiles

There are several files associated with a single shapefile layer.

To copy or move, must move ALL associated files (i.e. with the same name).

ArcCatalog does this automatically for you.

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15 min Break then Exercises