What is a Geographic Information System?

! stores information about geographic entities

  location of features, types of features
  attributes about those locations

! retrieves information about geographic entities

  relational database query using attributes

! performs spatial analysis on feature types

  spatial database query using locational information

  geoprocessing functions to create new geographic entities
    clip, union, intersect, dissolve

! Creates maps and reports about geographic phenomena

For example
Who is this course designed for?

- Graduate students who need the basic spatial analysis tools to conduct their thesis and dissertation research.
  - Geology MS 1, Civil Engineering MS 1, Ag Econ 3, MLA 2, Geog 1
  - Geography PhD 3, Ecology PhD 1, Atmospheric Sciences PhD 1, Civil Eng PhD 2
- Undergraduate students majoring in geography or the School of Earth Society and Environment which require GIS training.
  - Geography 2, ESES 11, Economics 1, Urban Planning 1
- Undergraduate students in the Environmental Fellows minor, or Informatics, where this course fulfills an elective.
- Students with previous introductory GIS courses that want to continue their study of GIS with another course.
- Others… Study Abroad 1
The objective of this course is to introduce you to the data sources and software, geographic information systems, that can be used to analyze environmental issues and problems. Geography 476 is an introductory course with no prerequisites. I assume you do not have prior experience with GIS software.

We use GIS software products sold by ESRI, Inc. - which are, in evolutionary order:

ArcInfo, ArcView and ArcGIS

All are widely used throughout the GIS community, with ArcInfo, their original GIS software, being a world leader since the 1960’s.

So you must be skilled at using these products to work in the environmental GIS field.

ArcGIS is the latest development from ESRI, it does not yet include all of the capabilities of ArcView. So, we must still learn about ArcView too.

ArcView does not contain all of the capabilities of ArcInfo either…. Hmmm … that’s another story … … for another time …
We have two computer labs available to you for coursework
   338 DH
   323 DH combination is 4, 5, 3
Foreign Language Building also has access to server storage

Both rooms have access to the classroom server

You can store files on the server at s:\ClassData\Fall2009\GEOG\geog476a\netid

I recommend using an external, transportable device such as a USB drive for backup of your files, but NOT for actual processing during lab exercises.

At the end of each class, upload your files to the server.
The Journey of Many Rivers

An Introduction to GIS methods
Geographic Information Systems work with maps.

Since most maps in the world are older maps, they have been drawn on paper and must be converted to a digital format for use in a GIS.
The most commonly used coordinate system for these maps is latitude and longitude. Longitude and latitude are spherical coordinates.
Equator and Prime Meridian

The Equator and the Prime Meridian are the reference lines used to measure latitude and longitude. The equator which lies halfway between the poles is a natural reference for latitude. A line through Greenwich, England, just outside London, is the Prime Meridian.

Latitude
Runs from 0° at the equator to 90°N or 90°S at the poles. These lines of latitude, called parallels, run in an east-west direction.

Longitude
Lines of longitude, called meridians, run in a north-south direction intersecting at both poles. Runs from 0° at the prime meridian to 180° east or west, halfway around the globe.
More on Degrees, Minutes, and Seconds

On the globe, one degree of latitude equals approximately 70 miles. One minute is just over a mile, and one second is around 100 feet. Length of a degree of longitude varies, from 69 miles at the equator to 0 at the poles. Because meridians converge at the poles, degrees of longitude tend to 0.

Longitude and Time

Since the earth rotates 360 degrees every 24 hours, or 15 degrees every hour, it's divided into 24 time zones- 15 degrees of longitude each. When it is noon at Greenwich, it is 10:00 A.M. 30 degrees W., 6:00 A.M. 90 degrees W., and midnight at 180 degrees on the opposite side of the earth.

Historical Note

Nature gave no clear direction on selecting the Prime Meridian, as it did with the equator as the 0 degree of latitude. (Half-way between the poles) As late as 1881, there were 14 different prime meridians still being used on topographic survey maps alone. The International Meridian Conference of 1884 adopted the Prime Meridian line passing through the Greenwich Observatory near London, England.
Click in the box to change from fill to hollow.
Turn of drawing layers by unclicking the check mark.
Traveling from Urbana to Newton Lake Lodge takes me through four states...... Select just those states using the Selection Icon
Or sort Name descending.....
I travel on:
Interstate 74W to
Interstate 280W to
Interstate 80W to
Interstate 380N to
Iowa Highway 20W to
Interstate 35N to
Interstate 90W
Now use the road file my route.shp instead of the previous road file, as it only contains the segments that go from Urbana to almost Newton Lake Lodge. Also add the towns in route.shp to the map, and label the towns.
Now the question before us is, “what rivers and streams does this route cross?”
Note the Feature Types:

Stream
Steam Intermittent
Shoreline

Only select Feature Type Stream
Wait a minute, where is my favorite river in route, the Missouri River? Why is it missing?
Moral of the story: examine your data carefully before using, expect the unexpected in spatial datasets.

Now save your project.......... Again.

Life Lesson: In the real world, there is no such thing as an A+ for effort.
You can add a title, and scale bar to your map. And also a ‘credits box’ that includes your name and the source of the data.