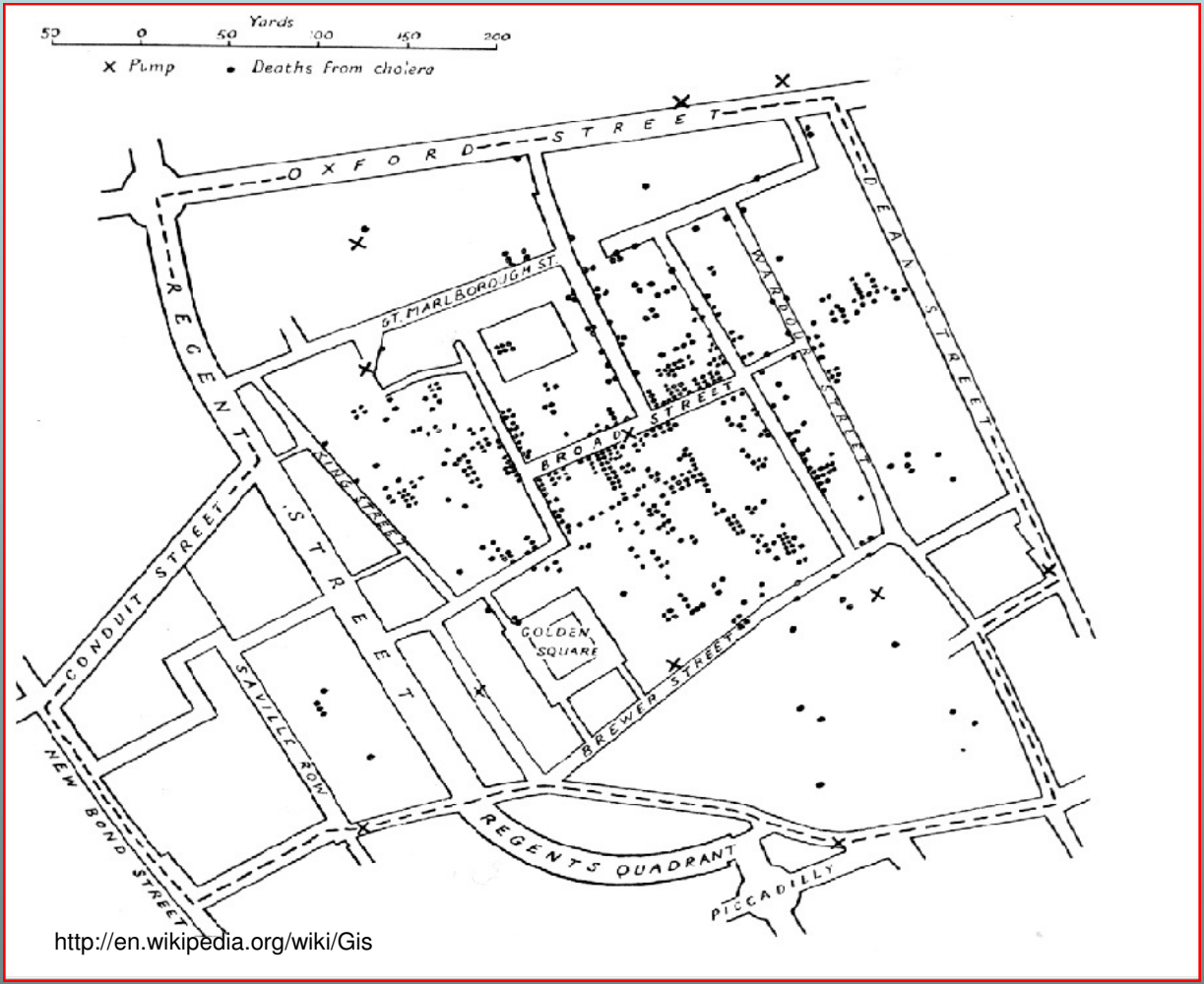

MAPPING WITH GOOGLE EARTH
AND FREE GIS TOOLS
April 24, 2009
Presented by:
Michael Napolitan, PG
Taylor GeoServices Inc.
38 Bishop Hollow Road
Suite 200
Newtown Square, PA 19073
610.325.5570
www.TaylorGeoServices.com

What is GIS?

A **geographic information system (GIS)**, is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the Earth.

Early Example of GIS



http://en.wikipedia.org/wiki/Gis

The original map drawn by Dr. John Snow (1813-1858), a British physician who is one of the founders of medical epidemiology, showing cases of cholera in the London epidemics of 1854, clustered around the locations of water pumps.

How is GIS used?

- Map where things are
- Map quantities

  People map quantities, like where the most and least are, to find places that meet their criteria and take action, or to see the relationships between places.
- Map densities

  A density map lets you measure the number of features using a uniform aerial unit, such as acres or square miles, so you can clearly see the distribution.
- Find what's inside

  Use GIS to monitor what's happening and to take specific action by mapping what's inside a specific area.
- Find what's nearby

  Find out what's occurring within a set distance of a feature by mapping what's nearby.
- Map Change

  Map the change in an area to anticipate future conditions, decide on a course of action, or to evaluate the results of an action or policy.

http://www.gis.com/whatisgis/dowithgis.html

GIS Basics
Data Types

- Raster

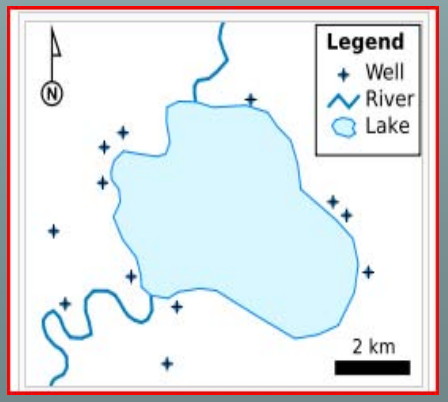
  A data type that consists of rows and columns of cells where in each cell is stored a single value.

- Vector

  In a GIS, geographical features are often expressed as vectors, by considering those features as geometrical shapes called points, lines and polygons.

- Non Spatial

  Additional non-spatial data can also be stored besides the spatial data represented by the coordinates of a vector geometry or the position of a raster cell. In vector data, the additional data are attributes of the object.



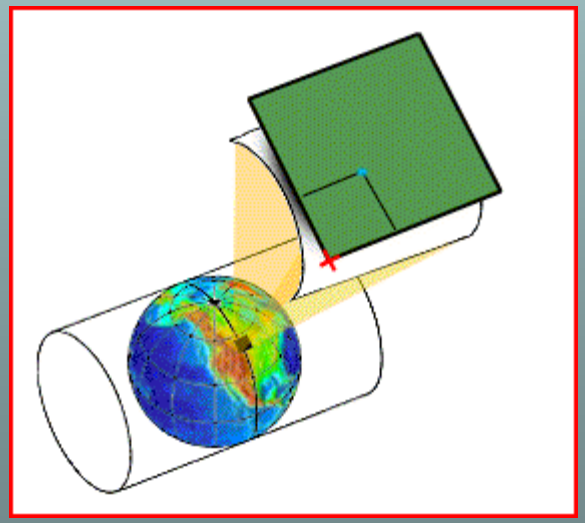
GIS Basics
Metadata

- Data about the data
- Accuracy
- Scale
- Reliability
- Creator
- Projection
- Coordinate System
- Units (meters, feet, lat and long)

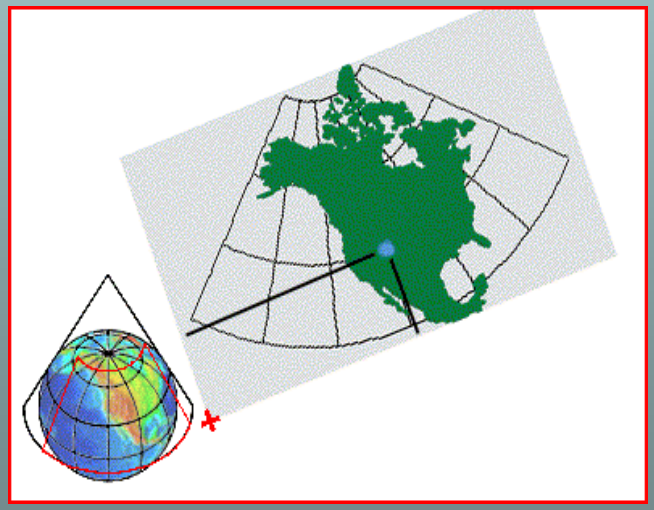
GIS Basics
Projections

- Geographic projections are a way of showing the curved surface of the Earth on a flat surface like a piece of paper or a computer monitor. Virtually all projections fall into one of three types of projections known as **cylindrical, conic, or azimuthal.**

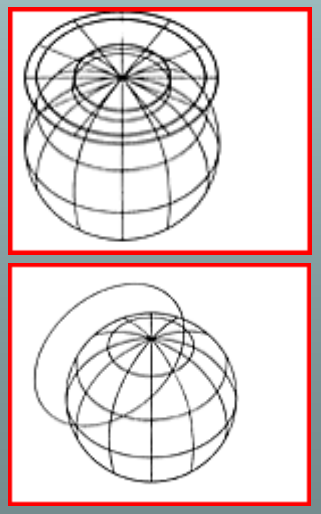
UTM - cylindrical



Lambert Conformal - Conic



Orthographic - Azimuthal



http://exchange.manifold.net/manifold/manuals/5_userman/mfd50Projections_Tutorial.htm

GIS Basics
Geocoding

- **Geocoding** is the process of finding the correct geographic position for a record in a table and then adding latitude and longitude values for each record in a table. There are two main types of geocoding:

- **Address geocoding** uses the values of address fields such as street, city, state or province, and postal code to attempt to position a record. Address geocoding requires a specialized database that gives the position of various address ranges for different streets. As a practical matter, address information is extremely rare and expensive outside of the United States. Even within the United States, because of the highly irregular nature of addresses in the US and the poor quality of most address databases, address geocoding provides at best an approximation of where a given address is truly located.

- **Spatial Geocoding** matches the values of records in a database table with field values in the table of an available drawing. The spatial layout and locations of the drawing objects are used to determine locations for records that match object data fields. In Manifold marketing documents this capability is at times referred to as "generic geocoding." Spatial geocoding has the advantage of allowing spatial matches to any available drawing.

http://exchange.manifold.net/manifold/manuals/5_userman/mfd50Geocoding.htm

GIS Basics
Data Collection

- Web sites like PASDA
- GPS units (new models are low cost and fairly accurate)
- Historical Maps and drawings
- Survey
- Historical databases (excel, access, text...)
- Local Government
- Conservation groups

GIS Basics
Analysis

- ## Data Modeling

  It is difficult to relate wetlands maps to rainfall amounts recorded at different points such as airports, television stations, and high schools. A GIS, however, can be used to depict two- and three-dimensional characteristics of the Earth's surface, subsurface, and atmosphere from information points. For example, a GIS can quickly generate a map with isopleths or contour lines that indicate differing amounts of rainfall.

- ## Topographic Modeling

  Topological relationships allow complex spatial modelling and analysis to be performed. Topological relationships between geometric entities traditionally include adjacency (what adjoins what), containment (what encloses what), and proximity (how close something is to something else).

- ## Networks

  A GIS can simulate the routing of materials along a linear network. Values such as slope, speed limit, or pipe diameter can be incorporated into network modeling in order to represent the flow of the phenomenon more accurately.

- ## Geographic Compilation

  Cartographic modeling refers to a process where several thematic layers of the same area are produced, processed, and analyzed.

http://en.wikipedia.org/wiki/GIS

Free GIS Tools

- Google Earth

  http://earth.google.com/

- GPS Interface software

  www.gpstm.com (GPS Trackmaker)

  www.easygps.com (Easy GPS)

- Geotag Pictures

  http://code.google.com/p/gpicsync/ (gpicsync)

GIS Web Sites

- http://erg.usgs.gov/isb/pubs/gis_poster/
- http://www.pasda.psu.edu
- http://www.emappa.dep.state.pa.us/emappa/viewer.htm
- www.esri.com
- www.manifold.net
- http://seamless.usgs.gov/
- http://www.census.gov/geo/www/tiger/
- http://terraserver.microsoft.com/
- http://websoilsurvey.nrcs.usda.gov/app/
- http://www.dcnr.state.pa.us/topogeo/gismaps/

GOOGLE Earth Example

PART 1: CREATE Desktop Recon Map
Step 1: Add topo map
Step 2: Add scanned geology map
Step 3: Add well data
Step 4: Improve map with PASDA PAMAP

PART 2: Create Recon points for GPS
Step 1: Pick some locations for field recon
Step 2: Export KML
Step 3: Use GPS trackmaker to upload KML file

PART 3: Import Photos and Tracks
Step 1: Download Photos
Step 2: Download Tack to GPX file
Step 3: Use GPixSync

PART 4: CREATE LAYOUT AND PRINT MAP