

A topographic map of the Colorado River region, showing contour lines, the Colorado River, and various geographical features. Overlaid on the map are yellow and blue GIS data, likely representing a watershed or specific land use areas. The text is centered over the map.

MAPPING WITH GOOGLE EARTH AND FREE GIS TOOLS

April 24, 2009

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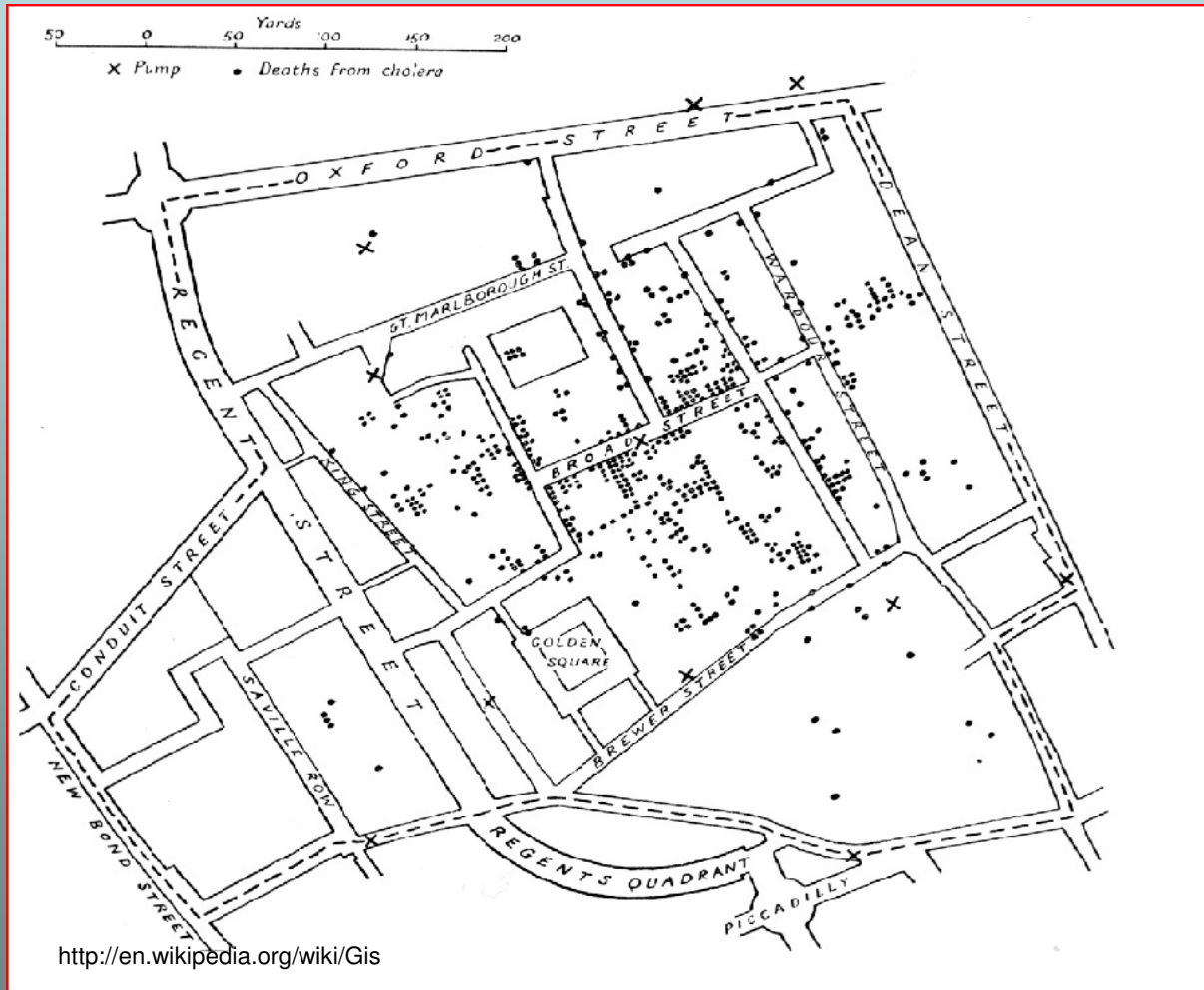
Taylor GeoServices Inc.
38 Bishop Hollow Road
Suite 200
Newtown Square, PA 19073
610.325.5570
www.TaylorGeoServices.com

A world map with a grid overlay, showing continents and oceans. The map is color-coded by continent: North America (orange), South America (green), Europe (yellow), Africa (brown), Asia (light green), and Oceania (light blue). The Arctic Ocean is labeled at the top, and the Indian Ocean is labeled on the right. The text 'What is GIS?' is centered over the map.

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



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.

GIS Basics

Data Types

- Raster

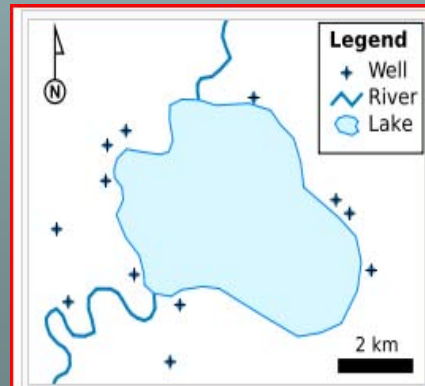
A data type that consists of rows and columns of cells where in each cell is stored a single value.

- 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.



Customers		
Cust...	Company Name	Contact Na
ALFKI	Alfreds Futterkiste	Maria Ander
ANATR	Ana Trujillo Empareda...	Ana Trujillo
ANTON	Antonio Moreno Taqu...	Antonio Mo
AROUT	Around the Horn	Thomas Har
BERGS	Berglunds snabbköp	Christina Be
BLAUS	Blauer See Delikatessen	Hanna Moo:
BLONP	Blondel père et fils	Frédérique

GIS Basics

Metadata

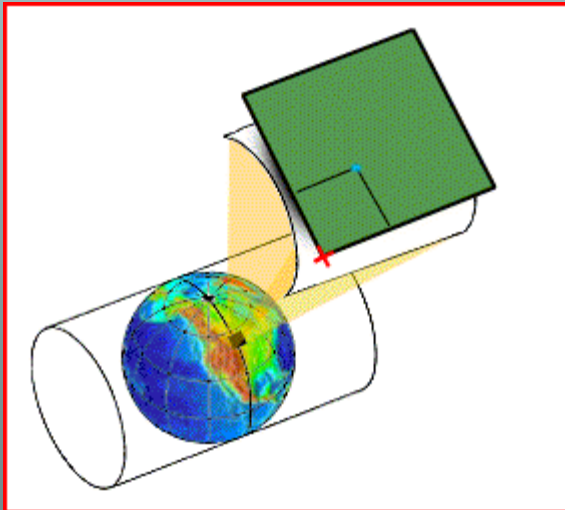
- Data about the data
- Accuracy
- Scale
- Reliability
- Creator
- Projection
- Coordinate System
- Units (meters, feet, lat and long)

GIS Basics

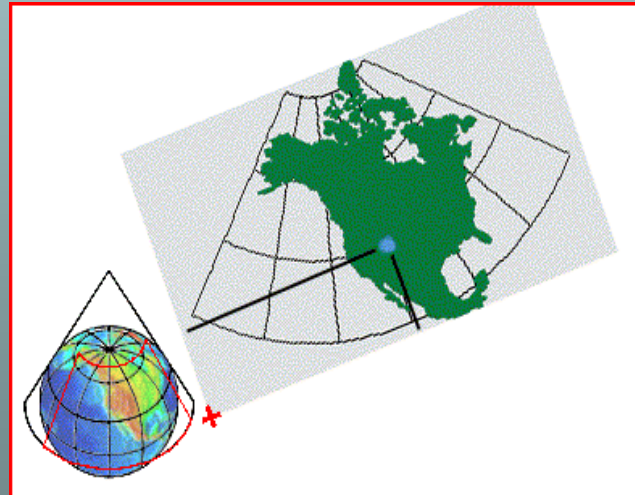
Projections

- 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**.

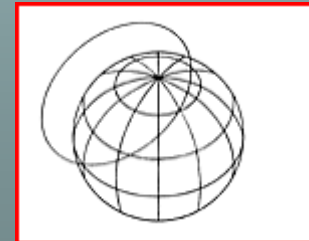
UTM - cylindrical



**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.

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://teraserver.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