

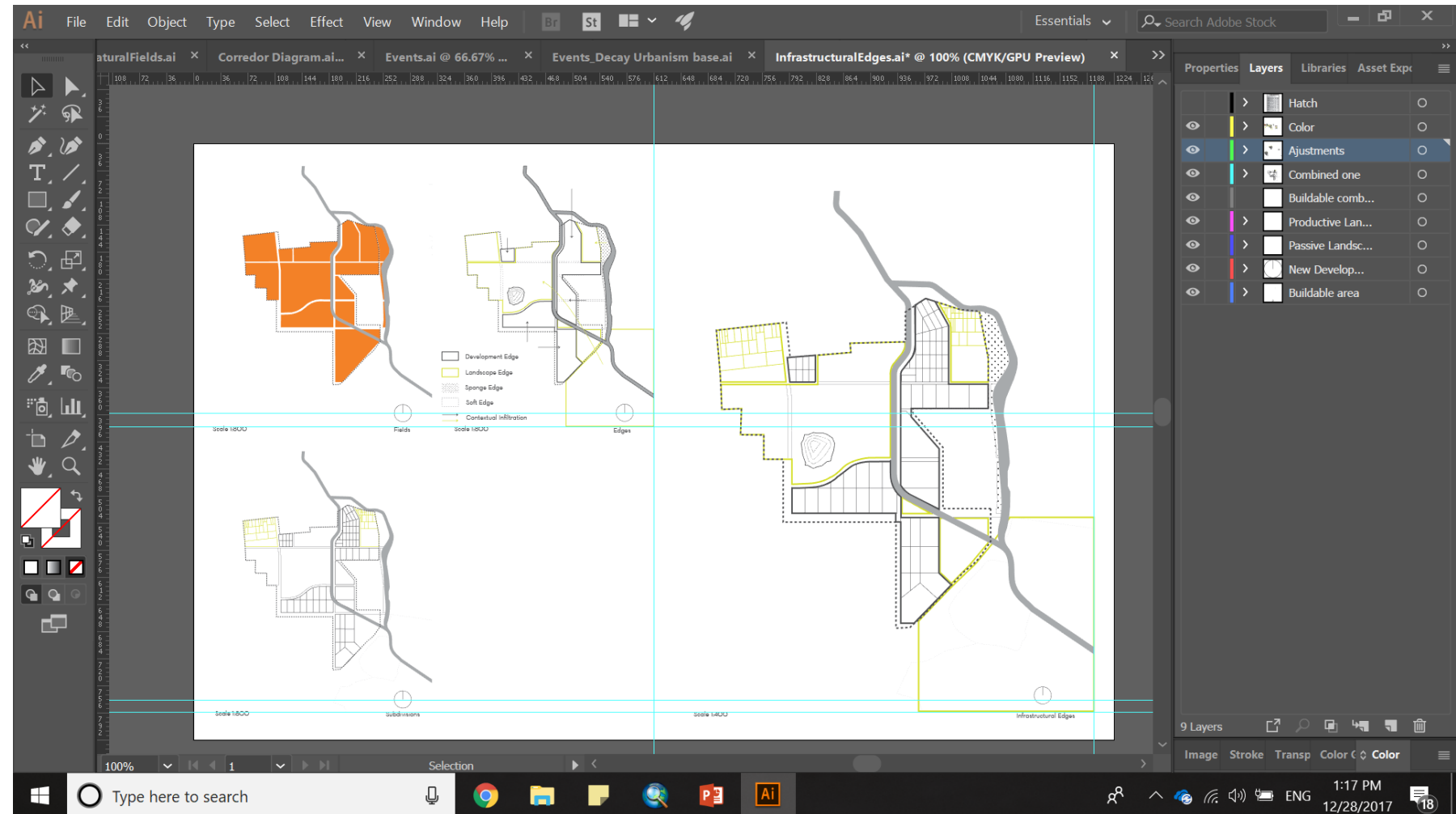
Introduction to GIS



But first:

Illustrator:

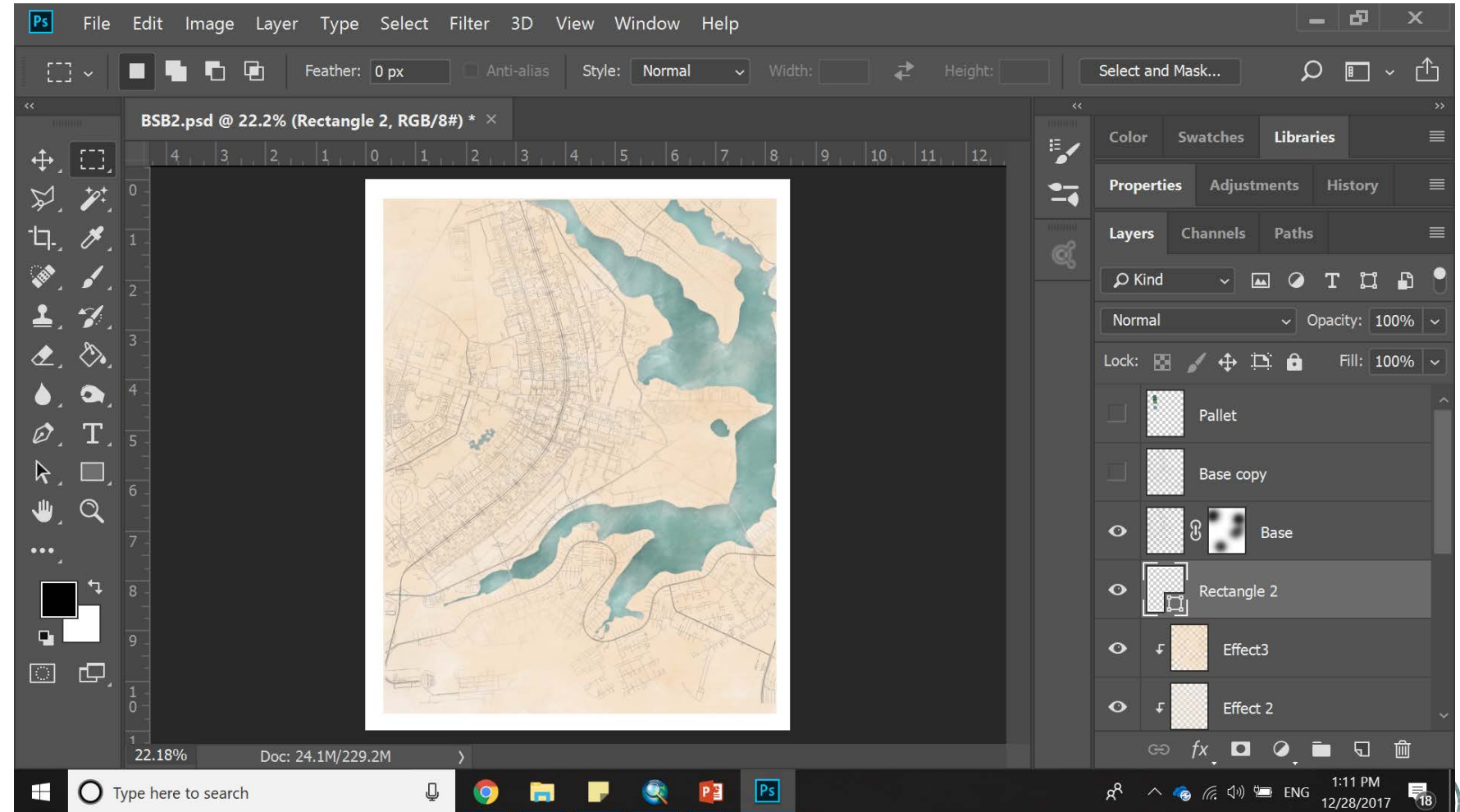
- Vector base
- Each line/point store some sort of information
- Mapping – Representation of the world



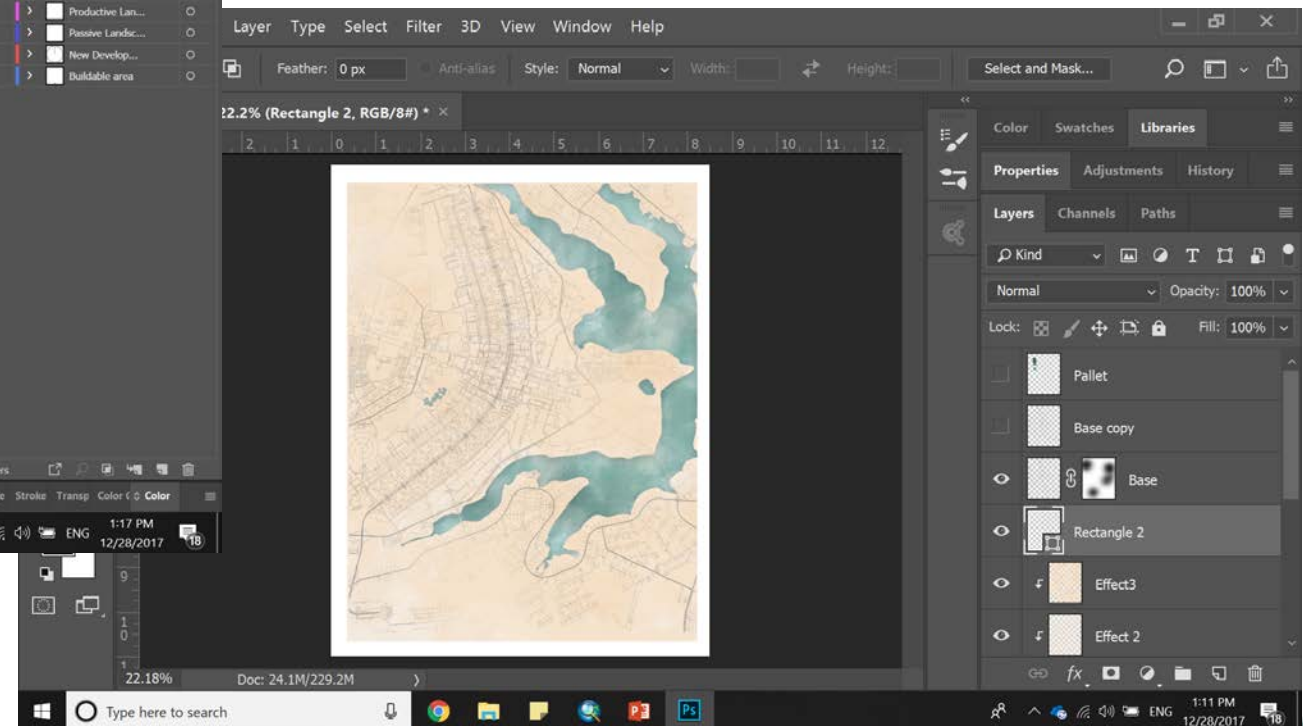
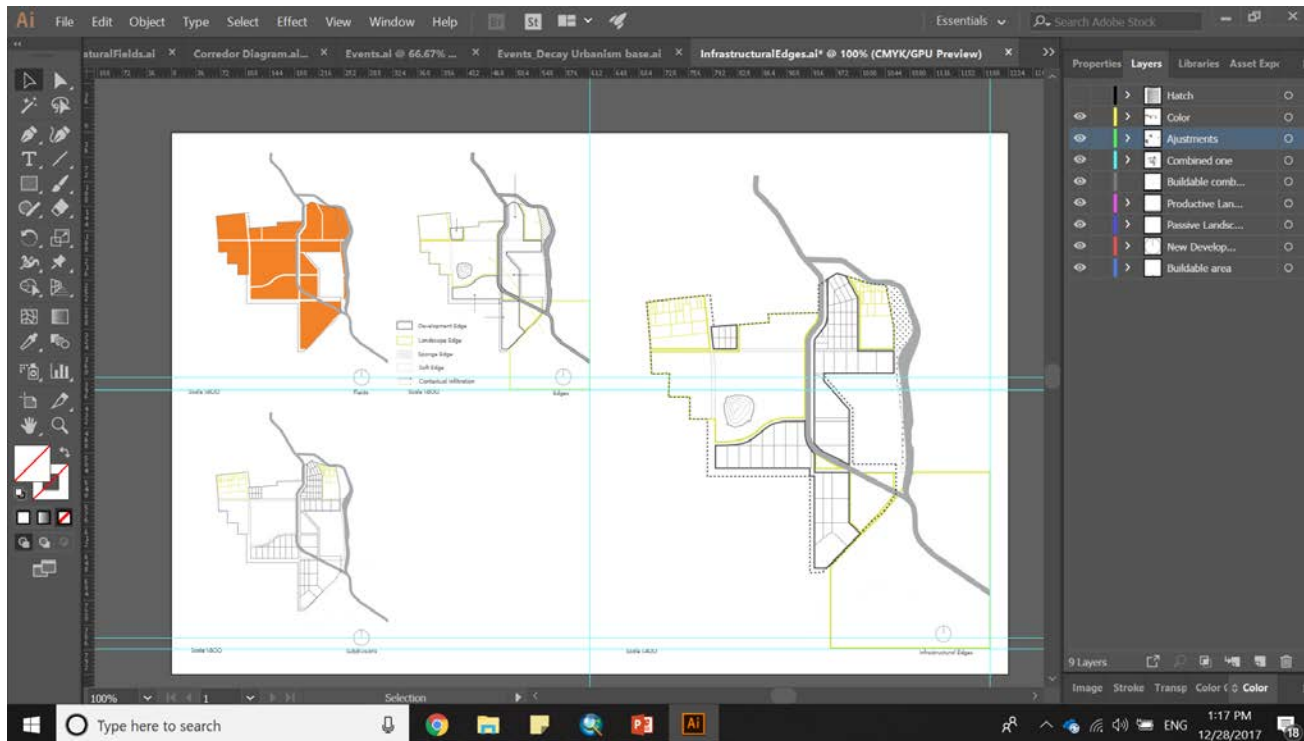
But first:

Photoshop

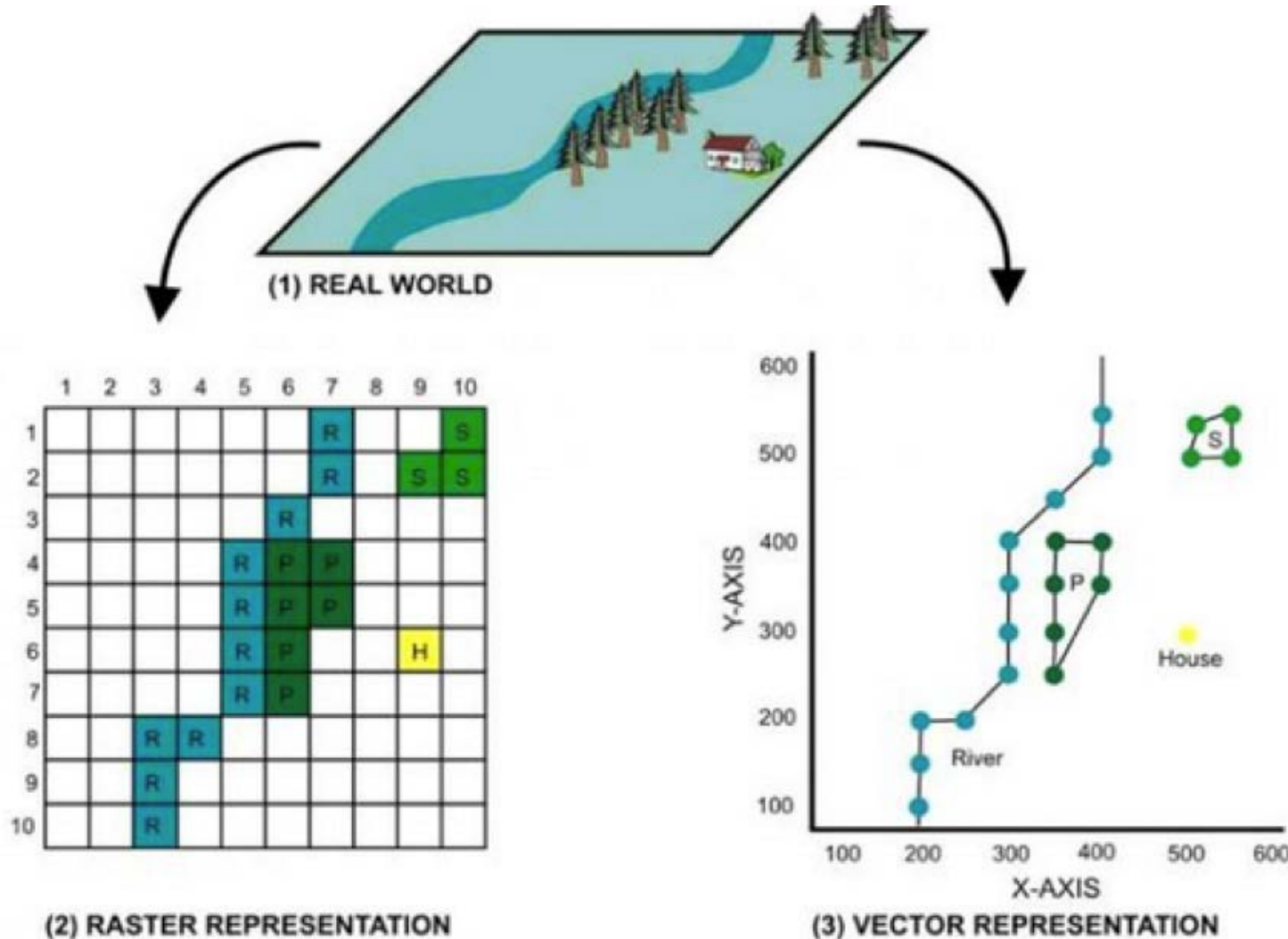
- Raster base
- Images can be overlaid
- Pixel



What kind of information do they store?



What kind of information do they store?



- **vector data model:** [data models]
A representation of the world using points, lines, and polygons. Vector models are useful for storing data that has discrete boundaries, such as country borders, land parcels, and streets.
- **raster data model:** [data models]
A representation of the world as a surface divided into a regular grid of cells. Raster models are useful for storing data that varies continuously, as in an aerial photograph, a satellite image, a surface of chemical concentrations, or an elevation surface.



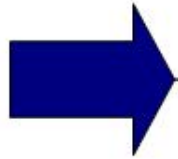


What is GIS?

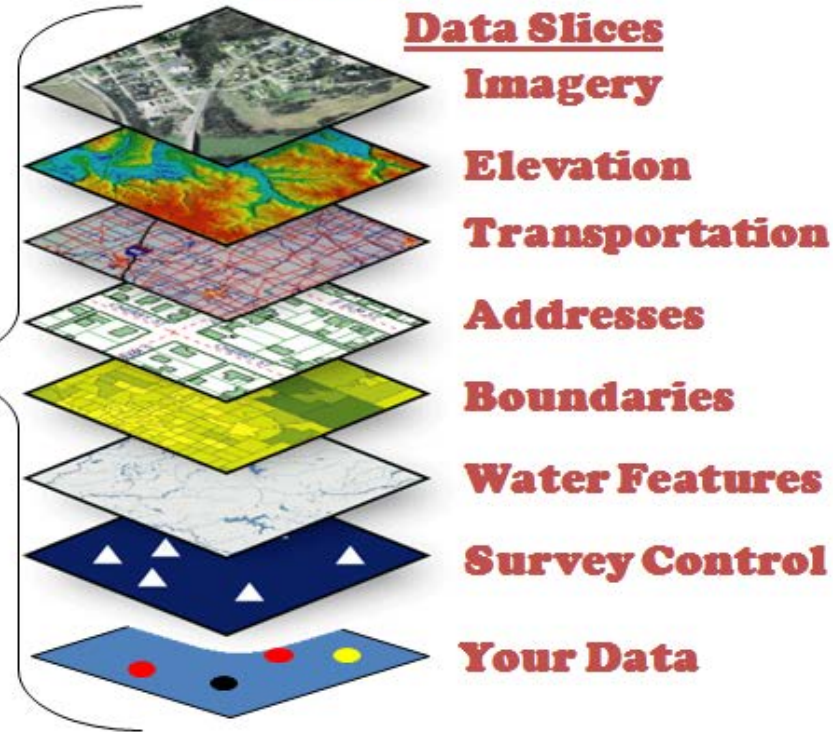
- **GIS = Geographical Information Systems**
- A **geographic information system (GIS)** is a system for storing and manipulating geographical information on computer.
- GIS lets us visualize, question, analyze, and interpret data to understand relationships, patterns, and trends(source:[esri](http://www.esri.com/what-is-gis/howgisworks))
- <http://www.esri.com/what-is-gis/howgisworks>



The Real World



GIS World Model



Representation of the world

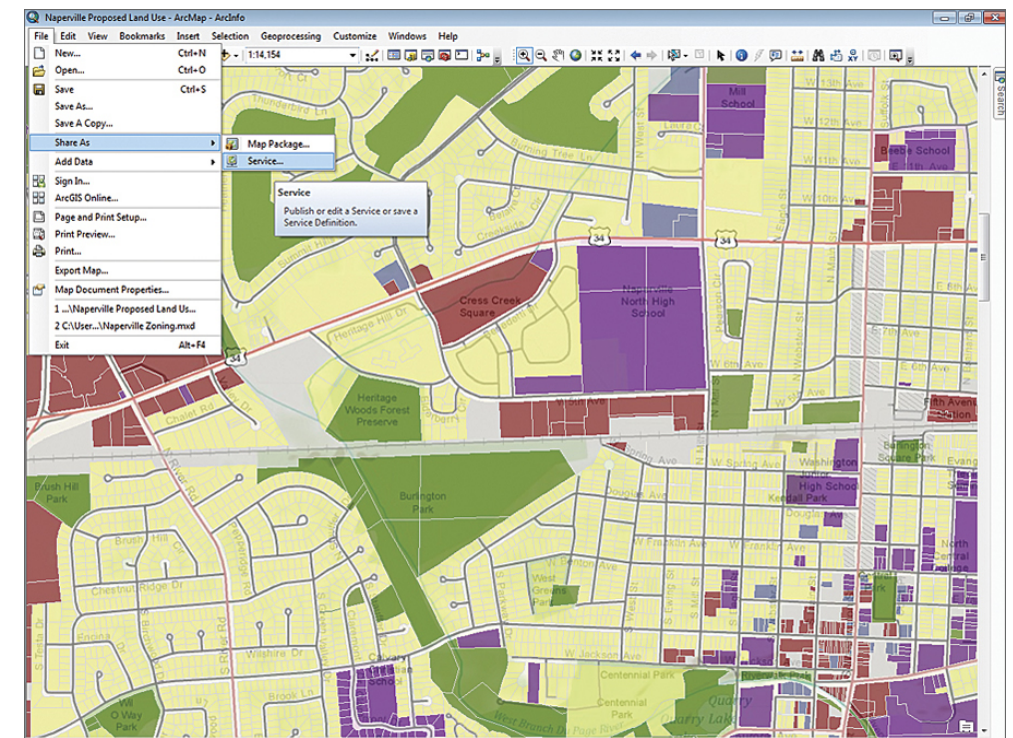
GIS allows us to look at our Surrounding environment in abstract layers

This abstraction is centered on extracting specific data types and representing it through raster, vector, or table form.



What goes into a GIS?

- Vector – outlines of objects, centerlines, contours, etc.
- Raster – elevation models, land cover, plant health, satellite derived information, etc.
- Point – object/assets, singular objects
- Tabular data – information in database or spreadsheet format that can be related to the data above



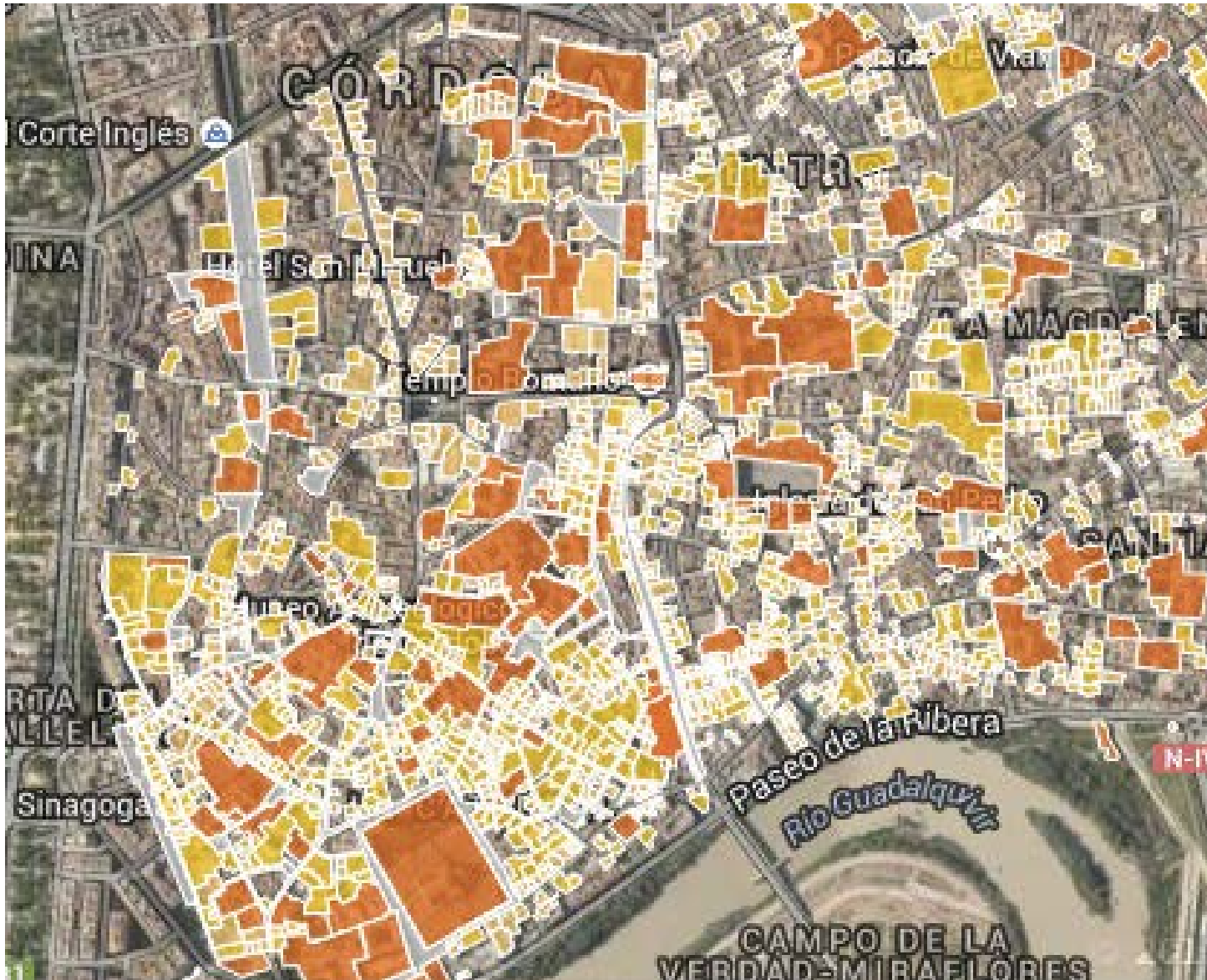
Table

Parcels

	FID	Parcel ID	Zoning	Address	Zip Code	State	Tax Region
	0	8618308030	Residential	7228 STREAMSIDE DR	80525	CO	2101
	1	9624125001	Residential	7605 S COUNTY RD 13	80527	CO	2019
	2	8618306004	Residential	7318 SILVER MOON LN	80525	CO	2101
	3	8618306026	Residential	7319 SILVER MOON LN	80525	CO	2101
	4	8618405075	Residential	1655 STREAMSIDE DR	80525	CO	2100
	5	8618308052	Residential	1300 STREAMSIDE CT	80525	CO	2101
	6	8618308032	Residential	7312 STREAMSIDE DR	80525	CO	2101
	7	8618310073	Residential	1606 GREENSTONE TR	80525	CO	2100
	8	8618306015	Residential	1401 WHITE PEAK CT	80525	CO	2101
	9	8618306014	Residential	7507 GREENSTONE TR	80525	CO	2101
	10	8618308042	Residential	7514 GOLD HILL CT	80525	CO	2101
	11	8618308043	Residential	7515 GOLD HILL CT	80525	CO	2101
	12	8618308062	Residential	7119 SILVER MOON LN	80525	CO	2101
	13	8618308062	Residential	7512 BLUE WATERS CT	80524	CO	2100

(0 out of 287 Selected)

Parcels

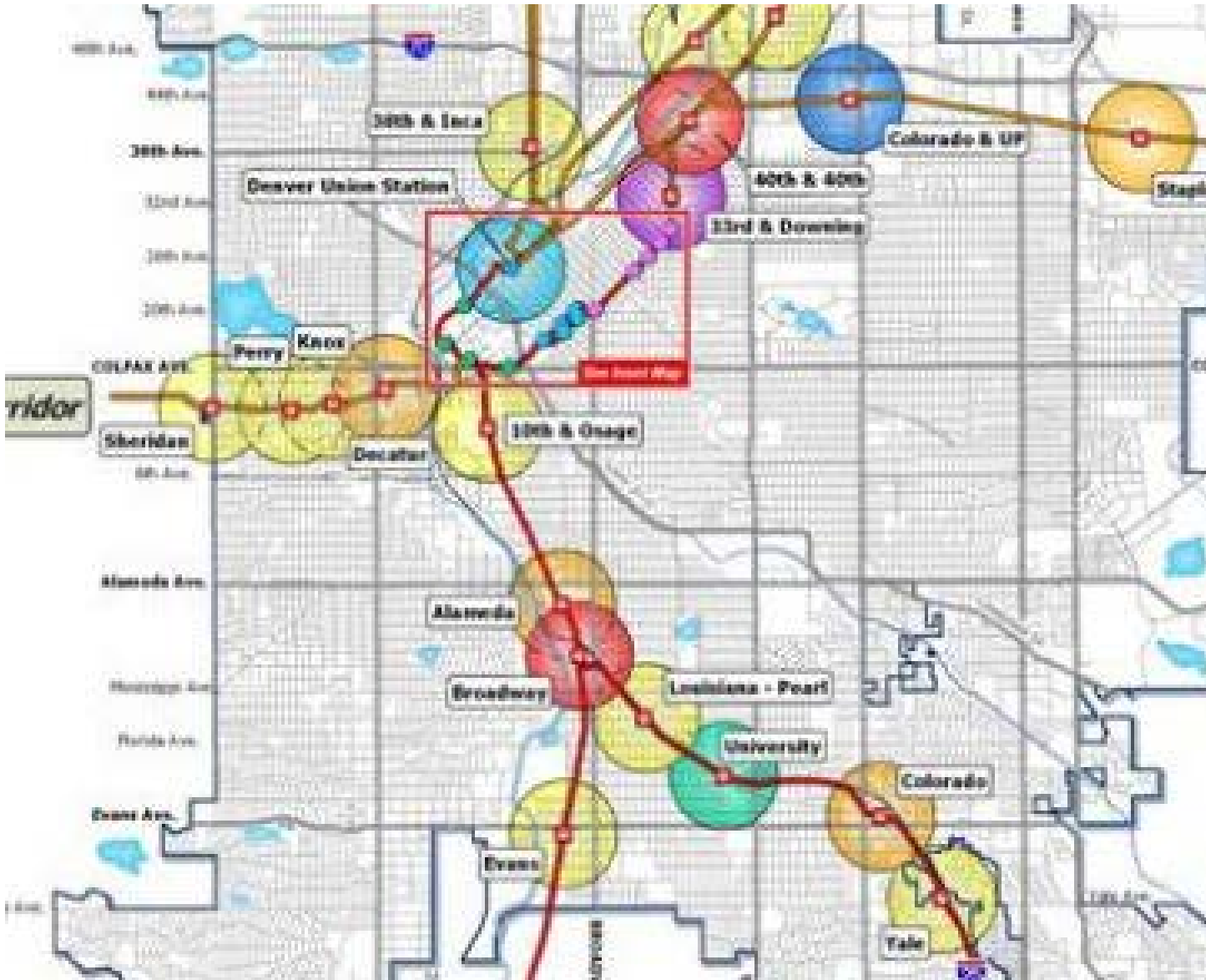


Applications of GIS

- **Urban Planning:**
- GIS technology is used to analyze the urban growth and its direction of expansion, and to find suitable sites for further urban development.

<http://grindgis.com/blog/gis-applications-uses>





Applications of GIS

- **Transportation Planning:**
- GIS can be used in managing transportation and logistical problems. If transport department is planning for a new railway or a road route then this can be performed by adding environmental and topographical data into the GIS platform.

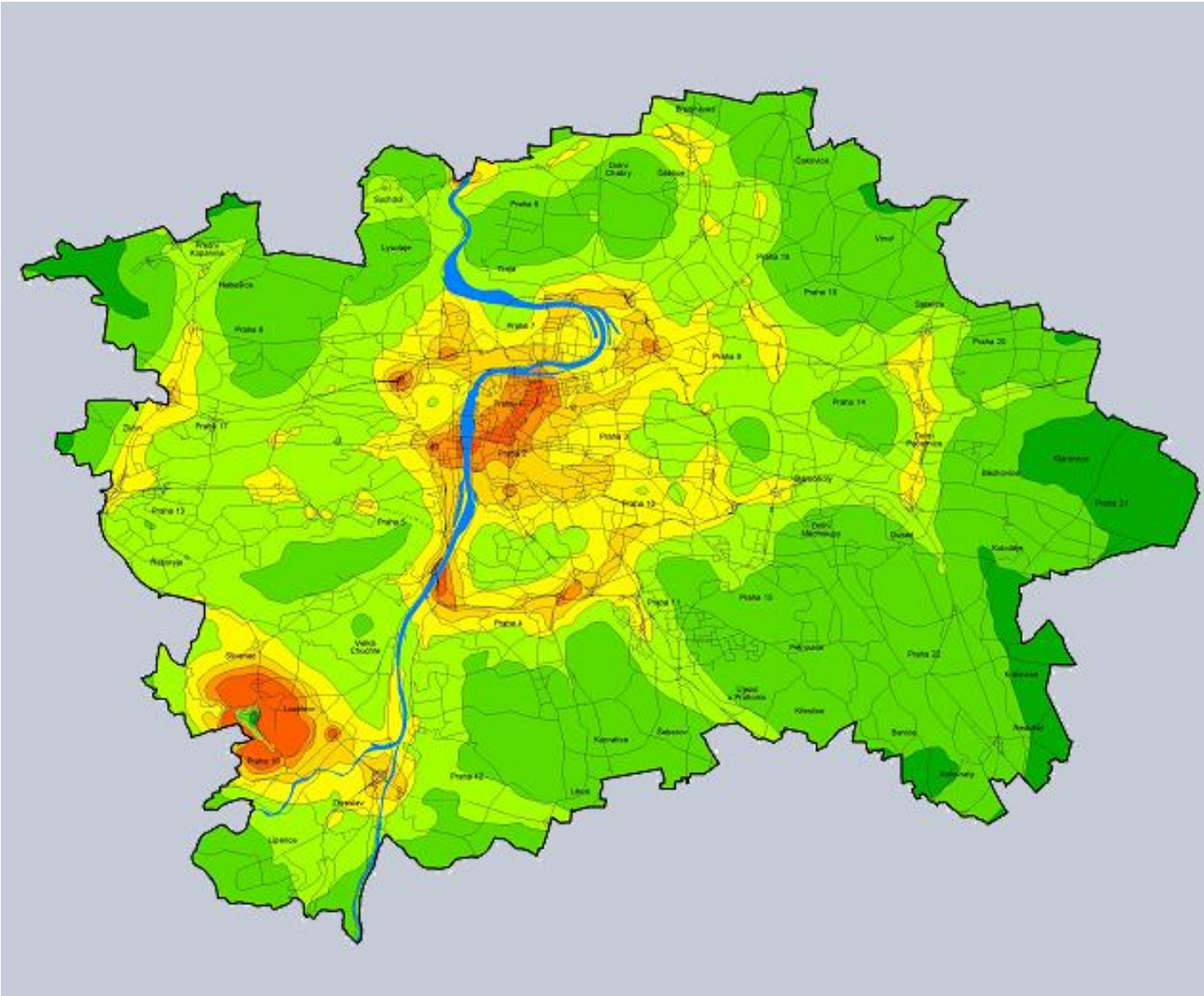
<http://grindgis.com/blog/gis-applications-uses>



Applications of GIS

- **Environmental Impact Analysis:**
- EIA is an important policy initiative to conserve natural resources and environment. Many human activities produce potential adverse environmental effects which include the construction and operation of highways, rail roads, pipelines, airports, radioactive waste disposal and more.

<http://grindgis.com/blog/gis-applications-uses>



Coordinate Systems

- A Method of Locating Objects on the Earth's Surface
- Examples:

Geographic (Global) Coordinate System

Geographic Coordinate System (GCS) uses a three dimensional **spherical** surface to define locations on the earth.

Geoid:

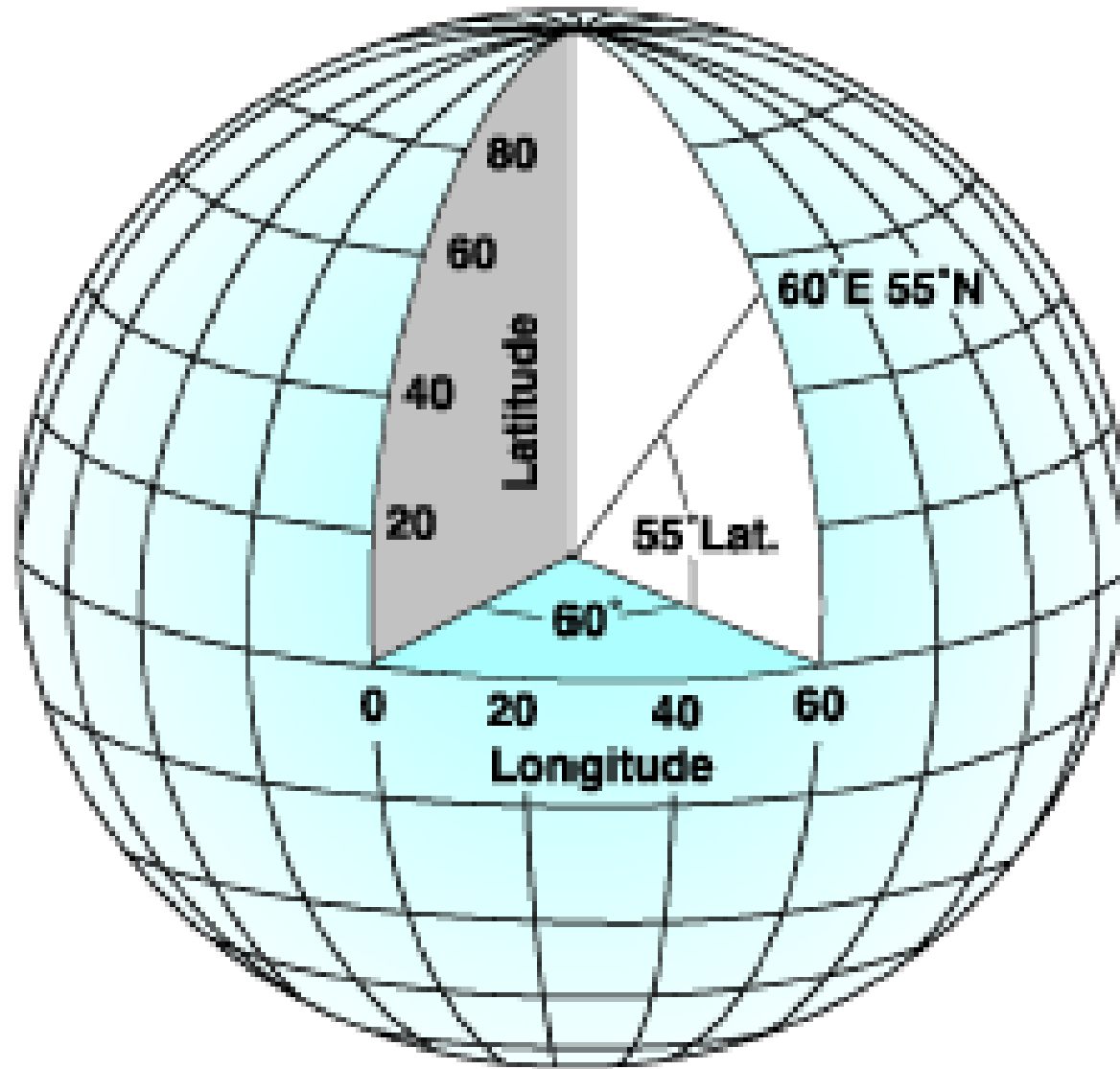
https://www.youtube.com/watch?v=T_hcMzqlSwYo

Projected (Cartesian) Coordinate System

A projected coordinate system is a two-dimensional planar surface. However, the Earth's surface is three-dimensional. Transforming three-dimensional space onto a two-dimensional surface is called *projection*.

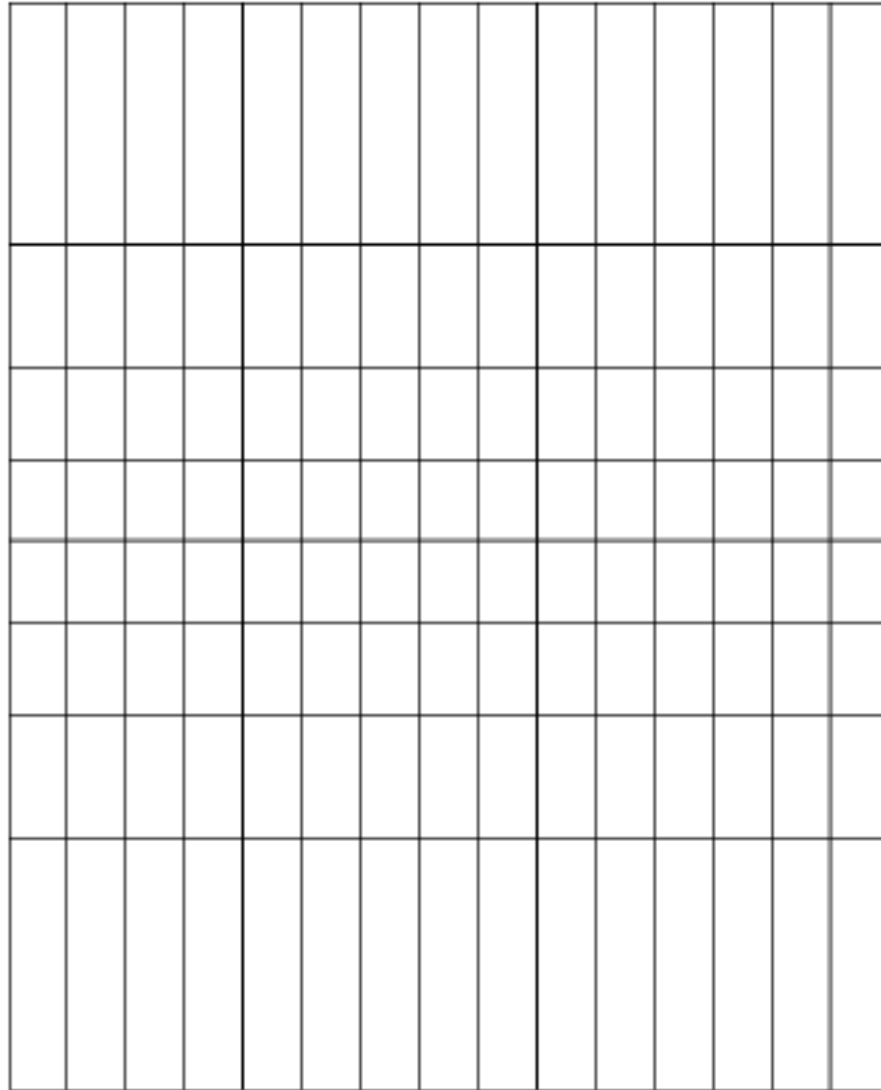
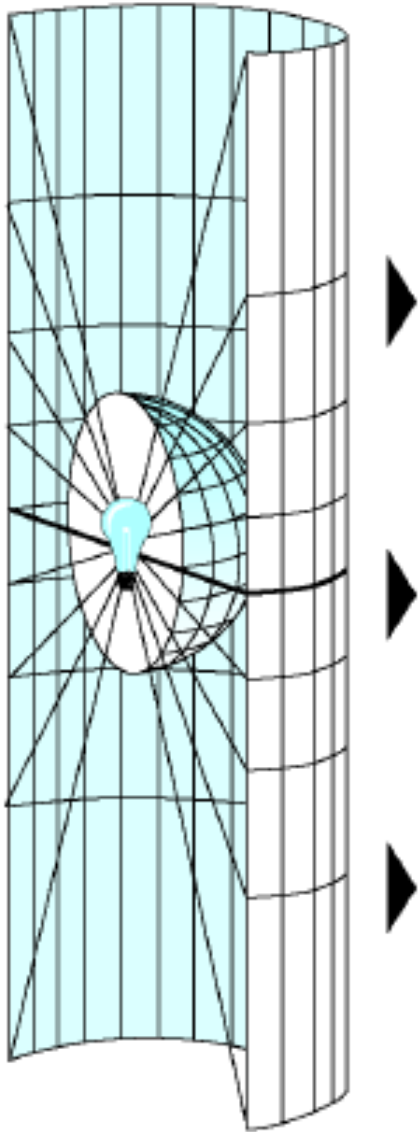


Geographic Coordinate Systems



- A point is referenced by its **longitude** and **latitude** values. Longitude and latitude are angles measured from the earth's center to a point on the earth's surface. The angles often are measured in degrees (or in grads).





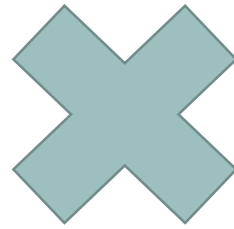
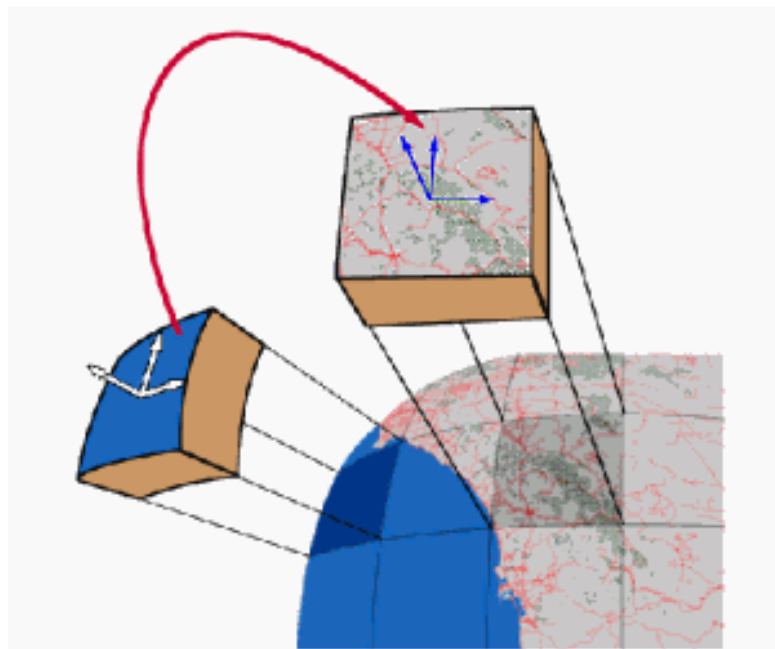
Projected Coordinate Systems

- Projection formulas are mathematical expressions that convert data from a geographical location (latitude and longitude) on a sphere or spheroid to a corresponding location (x and y) on a flat, two-dimensional surface.

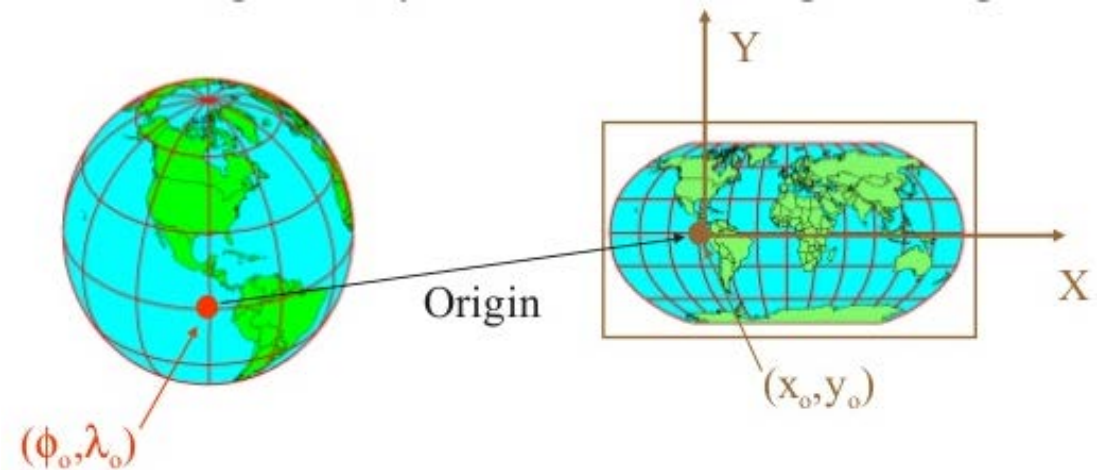


Global vs. Cartesian Coordinates

- Global
 - Spherical
- Effect on Areas
 - Minimal Distortion



- Cartesian
 - Planar
- Effect on Areas
 - High Distortion a Edges



Explore for next class:

- Why does google maps uses the Universal Transverse Mercator if this projection generates a lot of distortion?



Data mining

- <http://www.wakegov.com/gis/services/Pages/data.aspx>
 - Wake_Streets
 - Raleigh_Buildings
 - Wake_Corporate
 - Raleigh_Roads
 - Wake_Census_2010
- [Countywide Orthophotography Color](#)
- <https://viewer.nationalmap.gov/basic/>
 - Elevation
 - Historic Maps (15 x 15)
- <https://earthexplorer.usgs.gov/>
 - Aerial Photo Mosaics
 - Aerial Photo Single Frame

