Data Management in the GIS Environment

University of Maryland Libraries
GIS and Spatial Data Center

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GIS Services in the Libraries

- Workshops - 10 offerings available
  - Geospatial tools in R coming soon
- 1:1 consulting, collaboration
- Customized guest lectures/lab exercises
- Geospatial Researcher in Residence Program
- GIS lab in 4120 open for use during Library hours
- Access to free online tutorials and software trials
- See www.lib.umd.edu/gis for more information

Add'l Research Services

- Research Commons services:

- General research assistance

  - Proposals, ORAA requirements, presentations, etc.

- Data management

- Statistical consulting

- 3D scanning and printing; video editing

- Funding for open access publishing

- See www.lib.umd.edu/rc for more information

Workshop Outline

1. Brief Presentation

2. Exercises

   1. X-Y events

   2. Joining and relating tables

   3. Self-directed exercises (joining)

3. Questions and concerns?

What you need in GIS Data

- Good data (has reliable metadata)

- Data with a spatial component

- Data in spatial agreement

Projections and Coordinate Systems

- **Geographic coordinate system (GCS)**
  - Location on a sphere (latitude-longitude)
  - http://egsc.usgs.gov/isb//pubs/MapProjections/projections.html

- **Datum** (goes along with the GCS)
  - Horizontal datums are calculated using a mathematical calculation for the approximation of the shape of the earth, known as an ellipsoid. Most ellipsoids are calculated for a geographic region such as North America
  - GPS units use the WGS 1984 datum

- **Projected coordinate system**
  - Location on a flat map from a defined 0,0 origin
  - Has an underlying GCS

Projections ctd.

- A map projection distorts one or more of the following:
  - Distance
  - Shape
  - Area
  - Direction

- Reference website:
  http://egsc.usgs.gov/isb//pubs/MapProjections/projections.html

- Reference books:

  Flattening the earth: two thousand years of map projections / John P. Snyder

  An Album of Map Projections (USGS Professional Paper 1453) / John P. Snyder and Philip M. Voxland
  http://pubs.usgs.gov/pp/1453/report.pdf

The Mercator Projection

- One of the more common projections used for world maps is the Mercator Projection.

- This projection makes countries at the equator look small and countries away from the equator look large.

- Let's check out the true size of countries/states we come from.
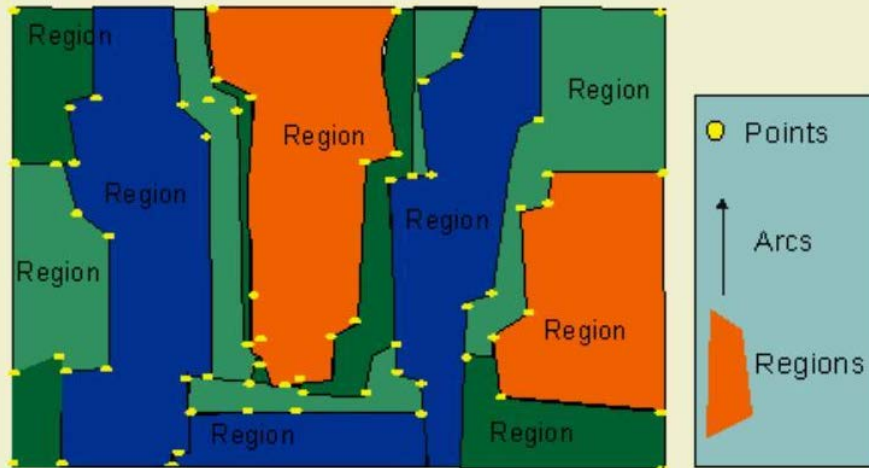
https://thetruesize.com/#?borders=1~!MTYwMzk3NjU.NDAwODY3NQ*MzU0NzE2NTA(MjAyMDQ3OA
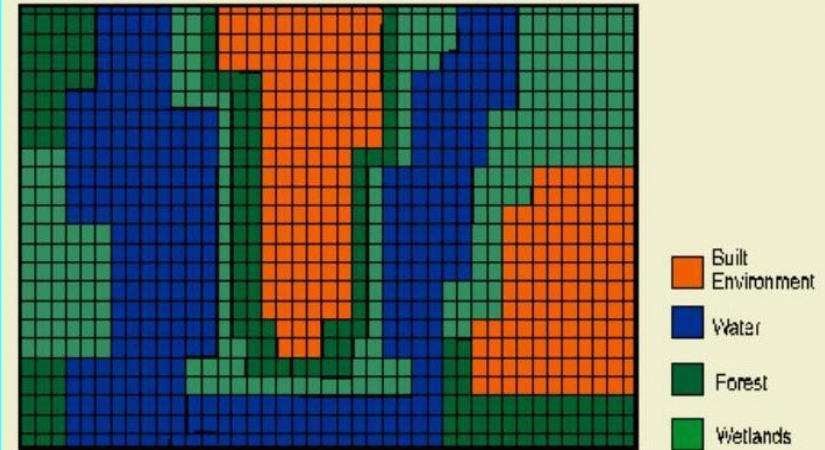
DATA TYPES

What do you think are some differences between the two maps?

How about the difference between these maps?

The vector GIS builds a model of the real world from points, lines, and regions. Points are positioned according to a location reference sytem such as latitude-longitude, UTM, or SPC. The application determines the level of precision.

The Raster GIS references phenomena by grid cell location in a matrix. The grid cell is the smallest unit of resolution and may vary from centimeters to kilometers depending on the application.

You have just identified the differences between Vector and Raster data types! Let's look at them in more detail.

Data Types

Vector

Uses geometric objects (points, lines and polygons) to represent real features on the earth's surface such as light poles, roads and buildings. Ideal for discrete themes with definite boundaries.

Raster

Is composed of a continuous grid of cells that represent a portion of the earth's surface. Ideal for continuous themes where there is lots of change.
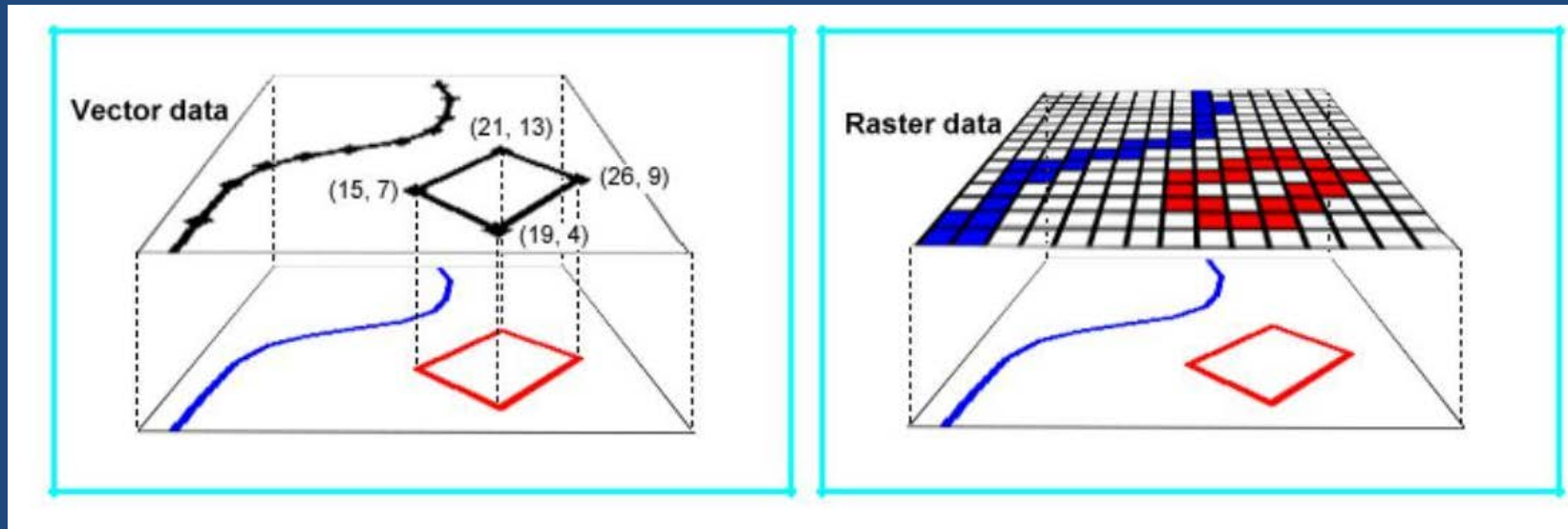
When to use Vector or Raster Data

What would you use for…

- Determining where to put new hospitals?

What would use for..

- Determining the elevation of land around the Chesapeake Bay?

Remember: either can be used, but one or the other will be better suited to certain kinds of data.

Data Types (Layers)

- Raster/Grid

DEM Digital Elevation Model

Image (raster) where the pixel values represent the ground elevation above sea level

DTM Digital Terrain Model

Image (raster) a DTM is a DEM that has been altered by elements such as break lines and observations to correct for artifacts by using photogrammetrically derived line work introduced into a DEM surface.

DSM Digital Surface Model

Image (raster) where the pixel values represent the elevations above sea level of the ground and all features on it. For example if there are buildings in the area, the DSM will include those building in the elevation values

Data Types (Layers)

- Vector
  - Boundaries
  - Features
  - Geology
  - Hydrology
  - Demographic

Data Sources (for layers)

- Digital or scanned maps or photos
- GPS
- Field sampling
- Remote sensing, aerial photos
- Databases/spreadsheets (standalone tables)
- Files from other software (CAD, survey)
- Manual digitization
- Lidar

Data Providers

1. **Free**

    - government (Federal, state, local)

    - people who share

    - libraries

2. **Pay**

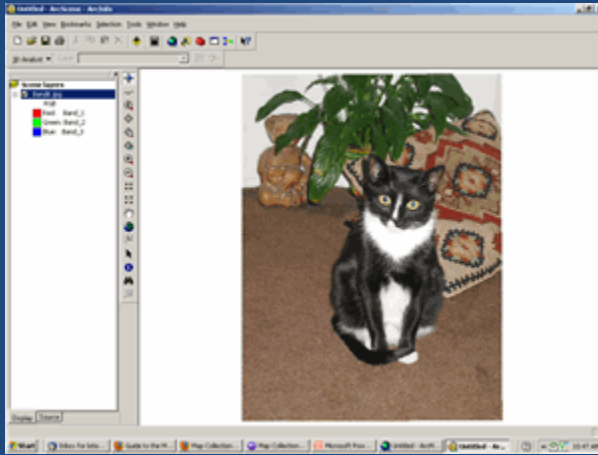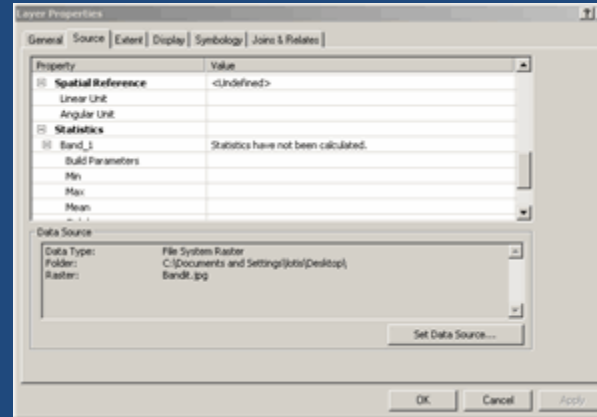   - commercial data providers

    - local government

3. **Create**

    - you

Geospatial Data

- Data.gov: http://www.data.gov

- Washington, D.C. GIS: http://data.dc.gov/

- Maryland iMap
  http://imap.maryland.gov/Pages/applications.aspx
- GeoLytics: http://www.geolytics.com/
- See our website for more data!
- https://www.lib.umd.edu/gis/data-and-resources

Data needs a spatial component to be useful in a GIS

Digital photograph + **No spatial information** = **NO** **GIS can't use**
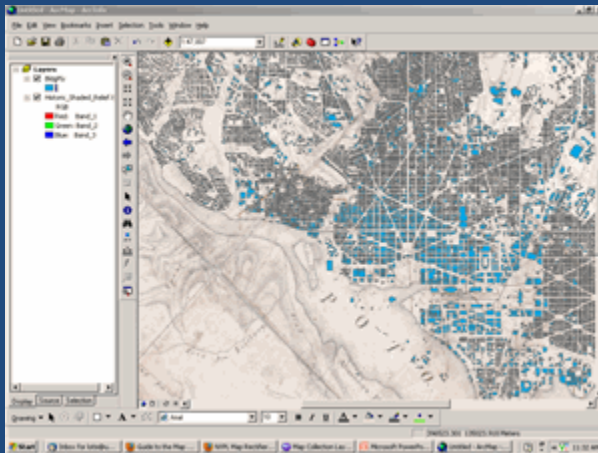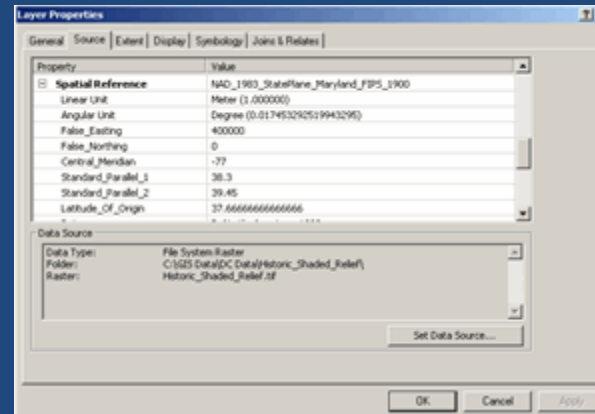
Scanned map + **Spatial information given** (coordinate system, datum, projection) = **YES** **GIS can use**

YES – has latitude and longitude, in correct format

	A	B	C	D	E
1	Latitude	Longitude	BirdsOct	BirdsNov	BirdsDec
2	38.98439	-76.946246	23	41	13
3	38.95534	-76.943176	18	35	10
4	38.89147	-77.088699	30	45	20
5					

YES, but… - latitude and longitude need to be in decimal degrees

	A	B	C	D	E
1	Latitude	Longitude	BirdsOct	BirdsNov	BirdsDec
2	38.59.4	-76.56.46	23	41	13
3	38.56.19	-76.56.35	18	35	10
4	38.53.29	-77.5.19	30	45	20
5					

	A	B	C	D
1	Zip	BirdsOct	BirdsNov	BirdsDec
2	20742	23	41	13
3	20781	18	35	10
4	22207	30	45	20
5				

MAYBE – can you match the zip code to a field in your boundary file?

MAYBE – can you match the state to a field in your boundary file?

	A	B	C	D	E
1	State	Town	BirdsOct	BirdsNov	BirdsDec
2	MD	College Park	23	41	13
3	MD	Hyattsville	18	35	10
4	VA	Arlington	30	45	20

	A	B	C
1	BirdsOct	BirdsNov	BirdsDec
2	23	41	13
3	18	35	10
4	30	45	20
5			

NO – no spatial information

ArcGIS Pro
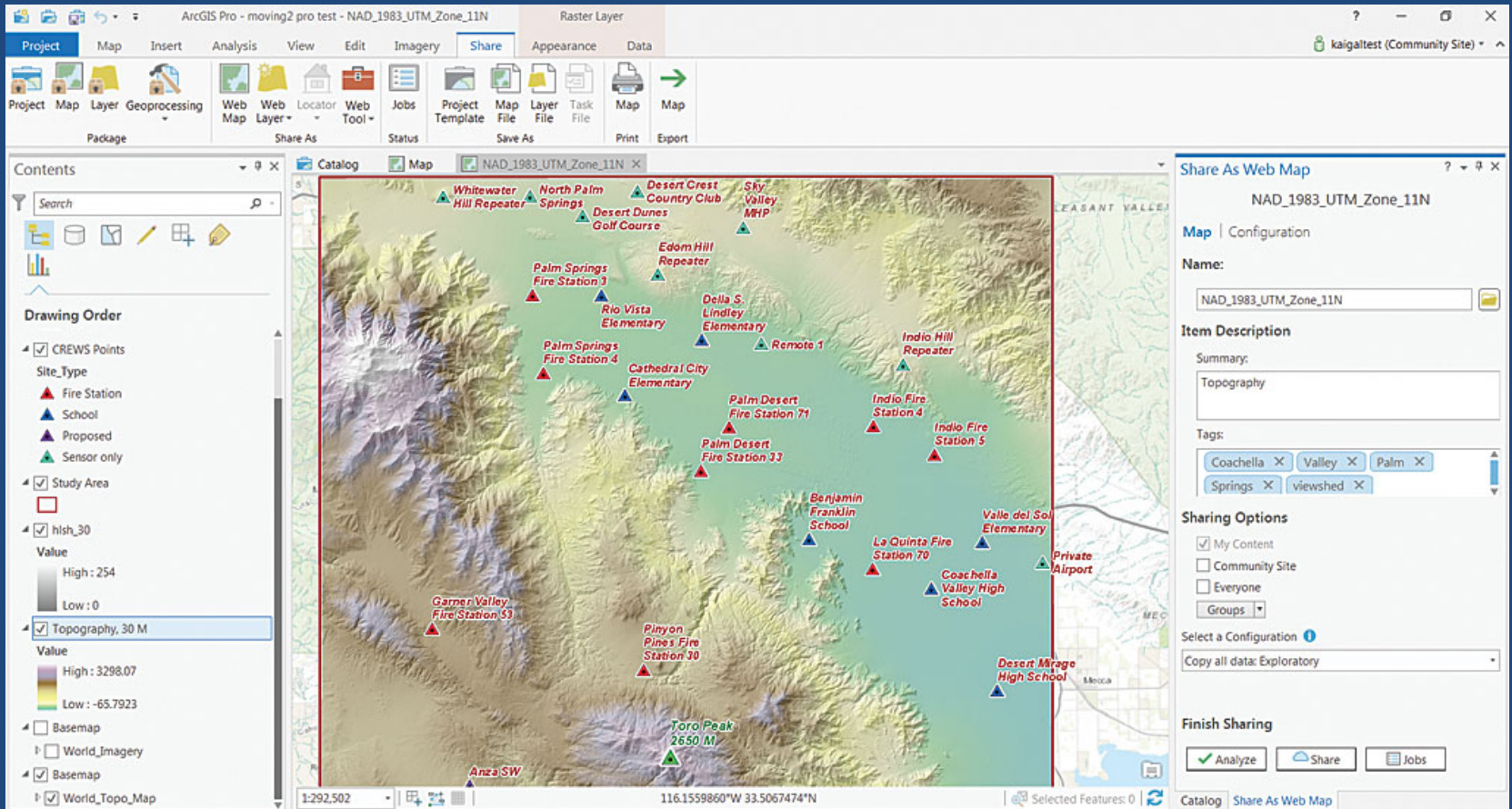
lib.umd.edu/gis/workshops

Let's Go!

ArcGIS Exercises

lib.umd.edu/gis/workshops