Mini-lecture 3:
MODELLING AND mapping DATA

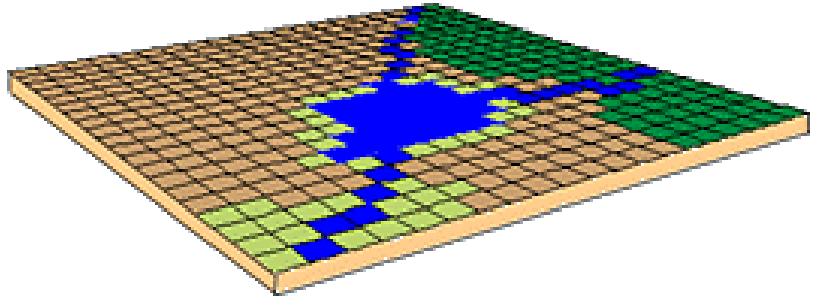
(How we represent features or spatial elements?)

Objectives

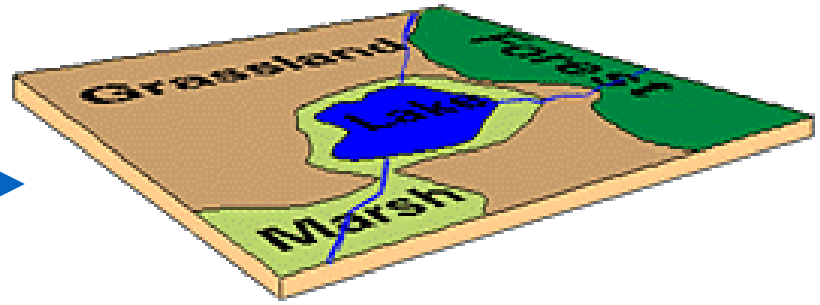
- Basics of GIS data
- Components and Functions of GIS
- GIS Applications
- Role of GIS in maps

Representing Spatial Elements

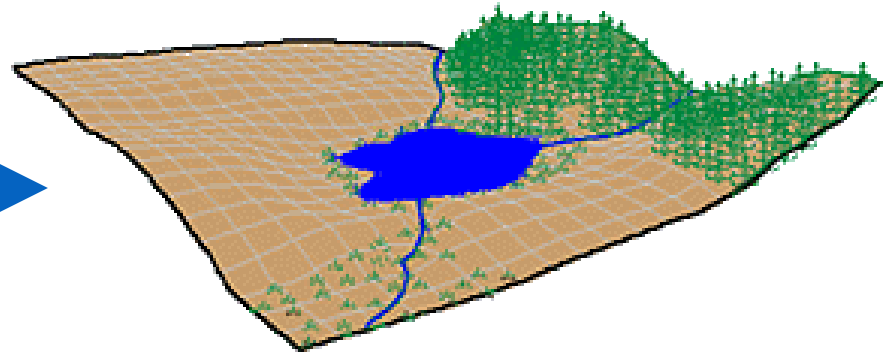
- RASTER



- VECTOR



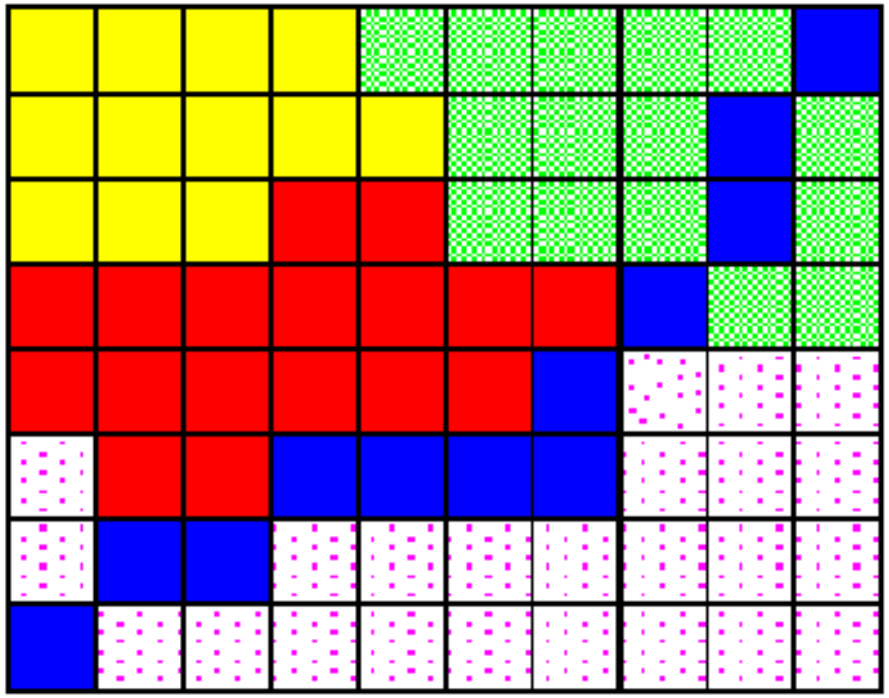
- Real World



Raster

*Stores images as rows and columns of numbers with a Digital Value/Number (DN) for each cell.

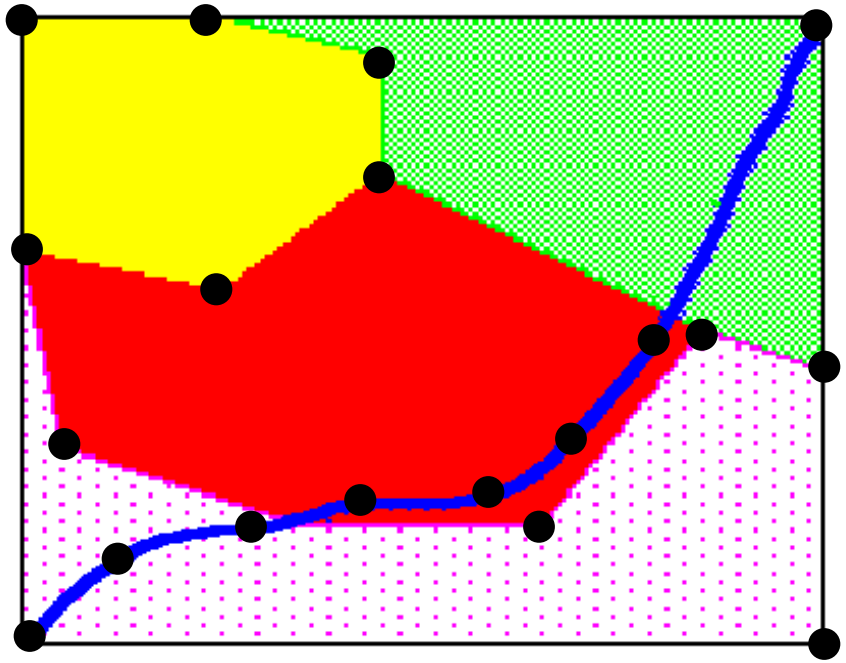
- Units are usually represented as square grid cells that are uniform in size.



Vector

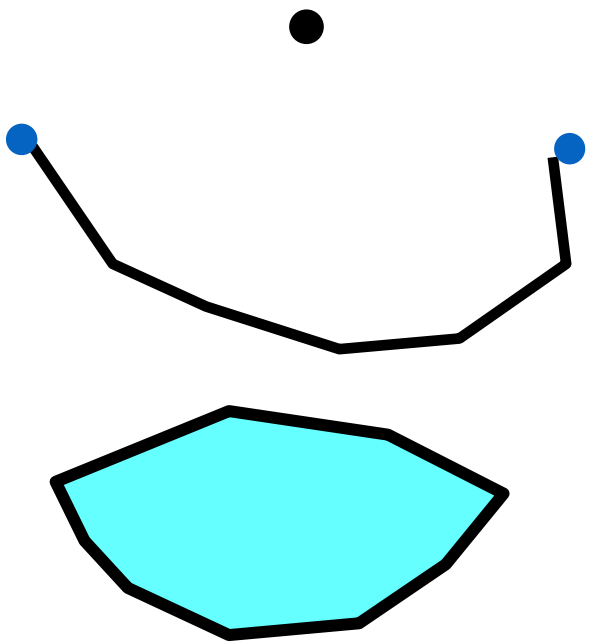
*Allows user to specify specific spatial locations and assumes that geographic space is continuous, not broken up into discrete grid squares (most GIS data).

- Stores features as sets of X,Y coordinate pairs.



Representing Spatial Elements

*GIS represents objects in space as three distinct spatial elements:



Points - simplest element

Lines (arcs) - set of connected points

Polygons - set of connected lines

**We use these three spatial elements to represent real world features and attach locational information to them.*

Attributes

- In the raster data model, the cell value (Digital Number) is the attribute.
  - Examples: brightness, landcover code, etc.

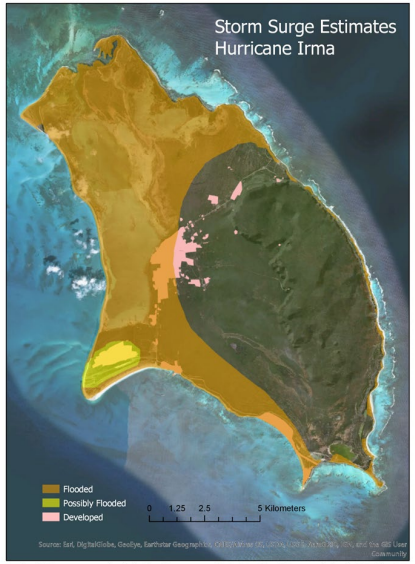
- For vector data, attribute records are linked to point, line & polygon features.
  - Can store *multiple* attributes per feature.

components of geographic data

- Geometry (Geographic features)
- Attributes (Descriptive information)
- Behavior (Rules we set, such as display only at a particular scale)

GIS Applications

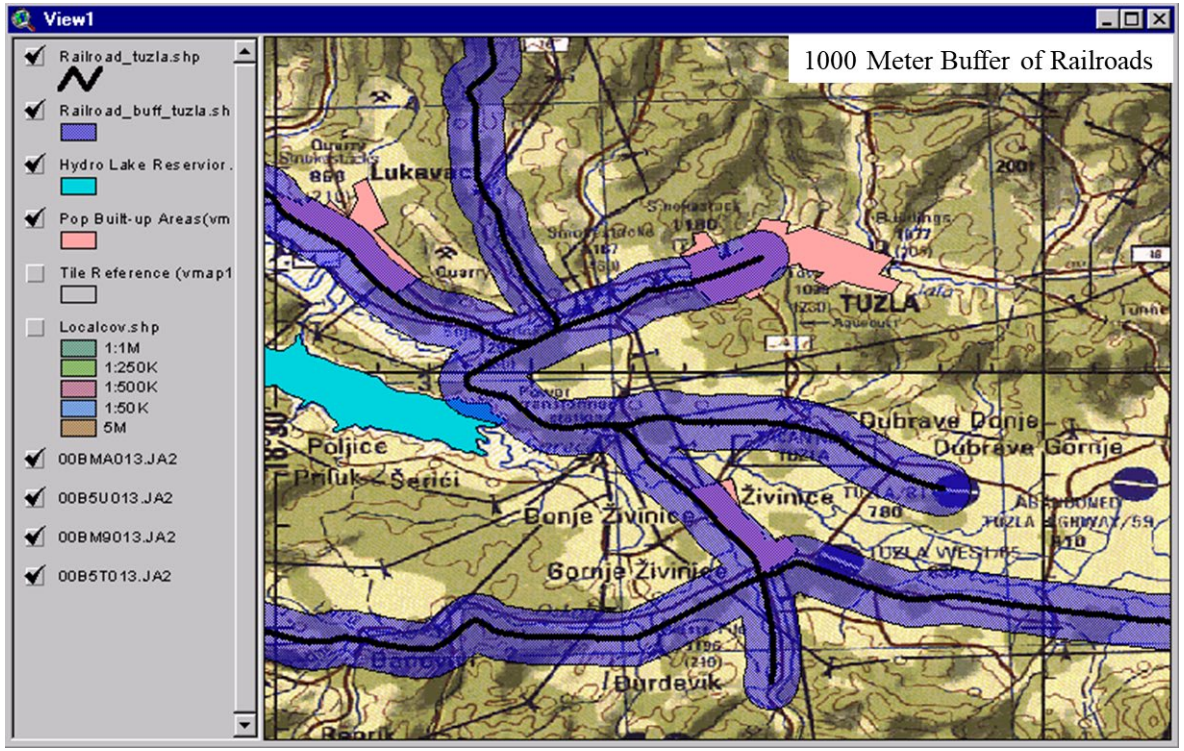
- Site selection
  - Store suitability
- Buffer Zones
  - Watershed analysis
- Modeling
  - Storm surge



A value of 2.63 meters was used as the height of the storm surge for Hurricane Irma. This was applied to the Digital Elevation Model (DEM) and modified by field observations. Areas in orange are within the storm surge. The Palmetto area shown in yellow was likely flooded although the DEM does not indicate this. Additional field work and DEM refinement will improve these estimates.

DEM source: USAID/OAS, http://www.oas.org/pgdm/data/gis_data.htm

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April 2018



It All Begins with a Map

- Layers: how geographic data is organized and combined to create maps and scenes (basis of geographic analysis).
- Web maps: the primary user interface by which work is done in ArcGIS (2D)
- Scenes: 3D online maps
- Apps: what enables a user to put their maps to use (user experience).

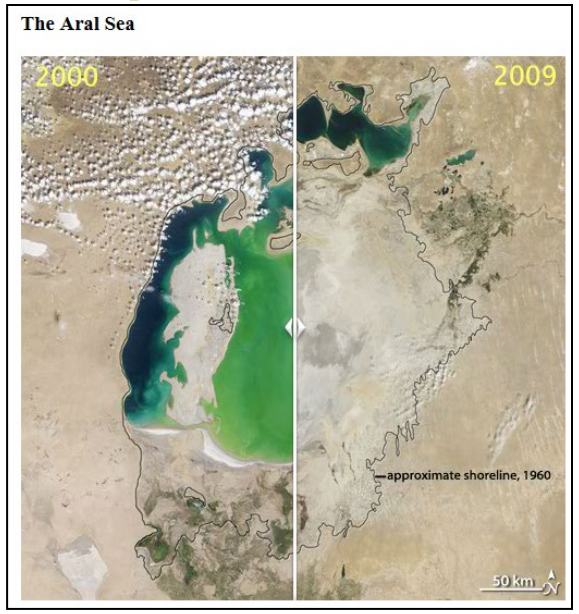
The Role of GIS Maps

- Web maps are online maps created with ArcGIS
  - Continuous and multiscale (zooming)
  - Pop-ups link a variety of content to maps
  - Real-time feeds – when data changes, so does the map
  - Mash-up culture – combine/recombine your data

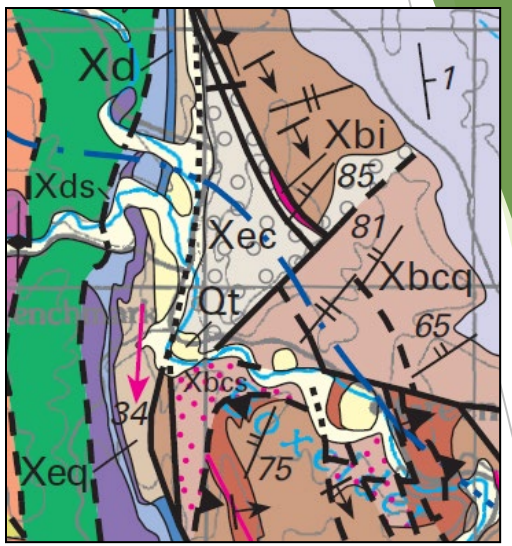
- Each map contains a Basemap (the canvas) along with a set of additional data layers and tools to work with these layers.

Maps serve many purposes

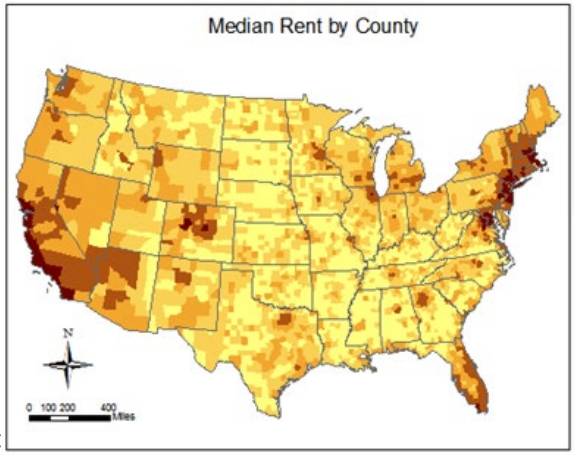
- Locating
- Navigating
- Compiling
- Convincing
- Comparing
- Analyzing

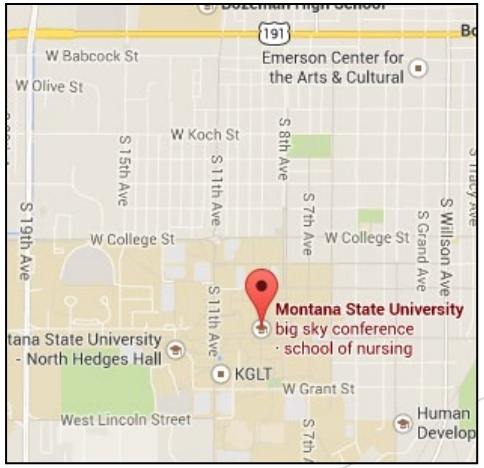


http://svs.gsfc.nasa.gov/images/gallery/Landsat/ChangePairs/index.html

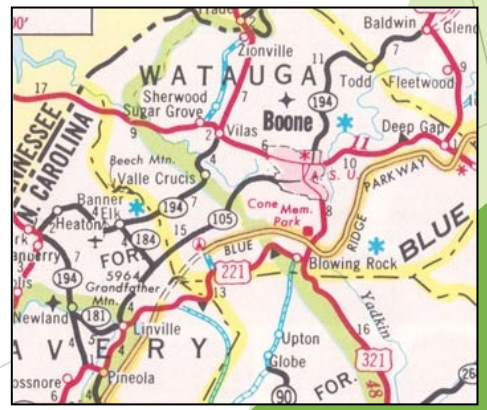


http://pubs.usgs.gov/sim/2777/downloads/2777_sheet1.pdf





https://www.google.com/maps



http://www2.lib.unc.edu/dc/ncmaps/images/highways_k12.jpg

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Review

- Spatial elements in a GIS (points, lines, and polygons) are presented in two basic formats: Raster and Vector data (Vector is the most common)
- Geographic data is composed of three elements: features, information, and rules
- GIS can be used to perform a variety of functions, such as site location, buffer zone analysis, and trend modeling
- GIS technology has taken mapping to a new level of applicability, especially with online web maps which serve many purposes