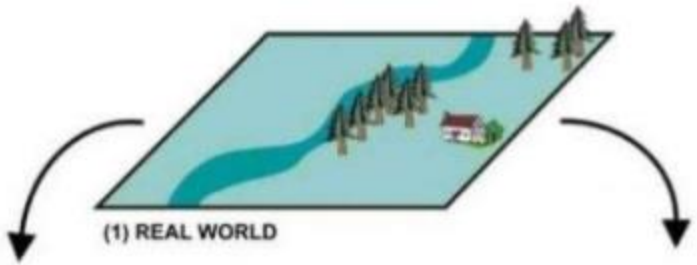
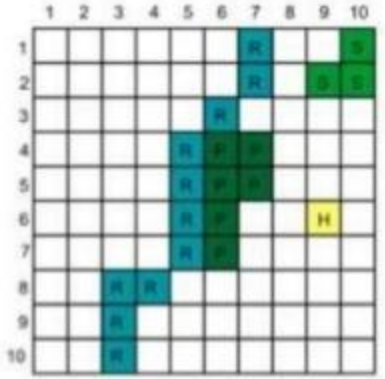
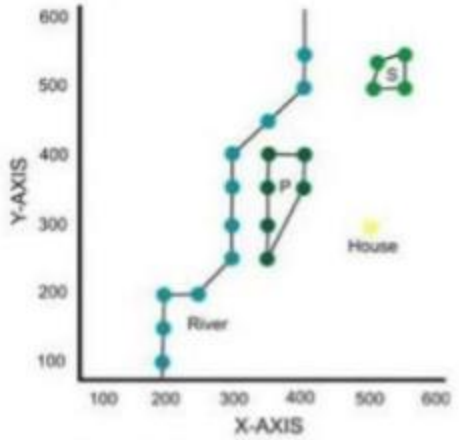
GIS Unit 1

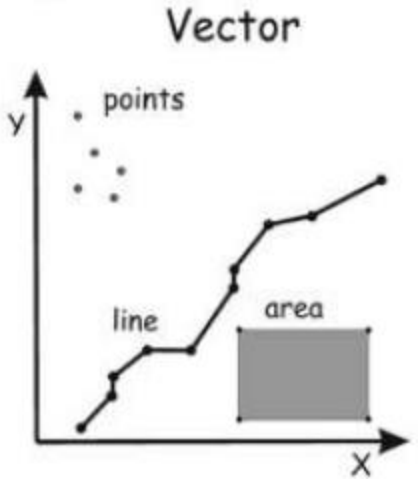
Geographical Phenomenon and their representation

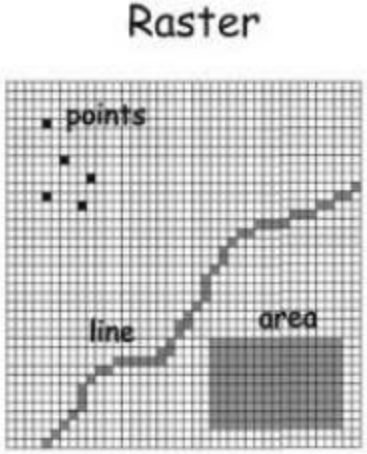
GIS Training –Day 2 @IOE, Pulchowk











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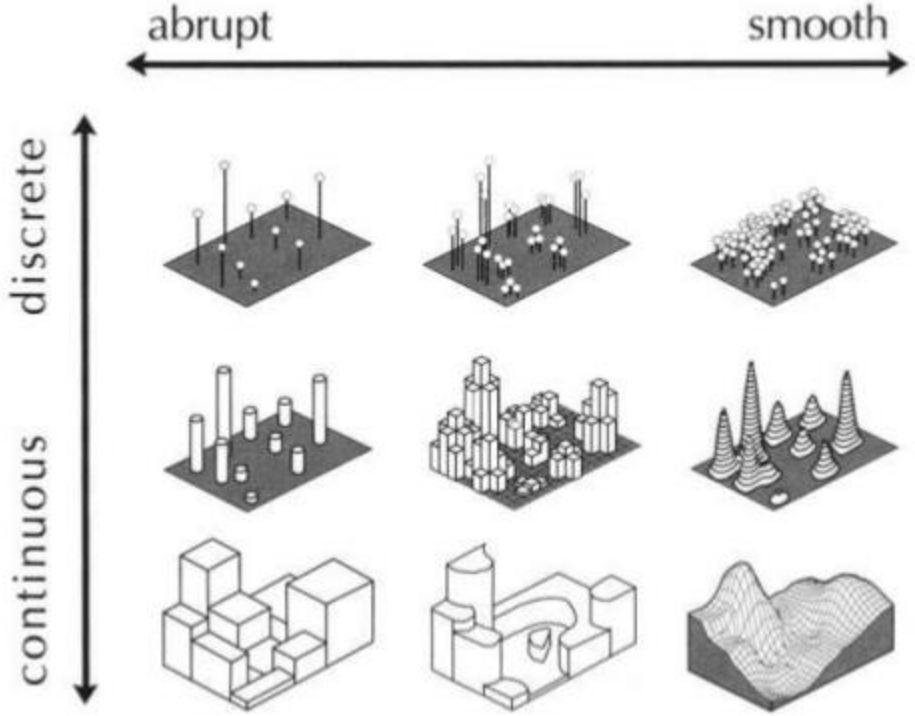
Geographic Phenomena

- Events that takes place in geographic space and time.

- Choice for a digital representation depends on the type of phenomenon.

- Can be :
  - Artificial: Buildings
  - Natural: Rivers
  - Mixed Type: Pollution



Data Types

- Two types of data
  - Spatial Data
  - Non-spatial or Attribute data

Spatial Data

- Data related to location.
- Example: Coordinate of center of a football ground

Non-spatial Data

- Describes such aspects of the spatial data which is not specified by its geometry alone.

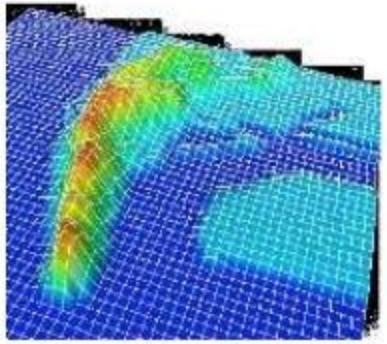
- Example: Name of roads, schools, forests etc., Population or census data etc.

Groups of Geographical Phenomenon

Two common groups of geographic phenomena:

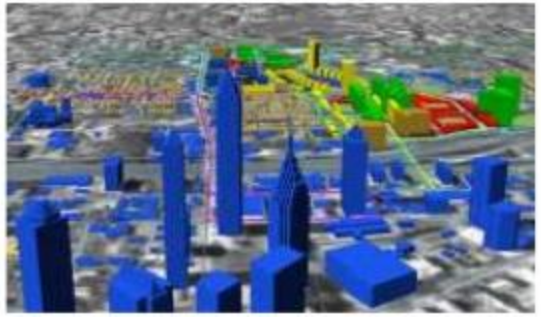
Fields

- For every point in the study area, a value can be determined.
- All changes in field values are gradual.
- Example: Elevation, Temperature.



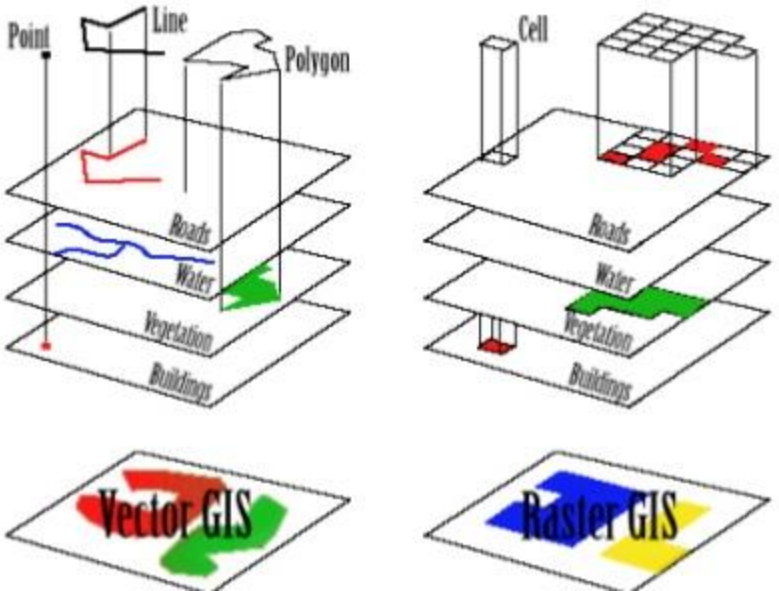
Objects

- Well distinguishable discrete entities.
- Empty spaces in between the features.
- Study space grouped into mutually exclusive bounded parts.
- Example: Buildings, Roads



Putting your data into GIS

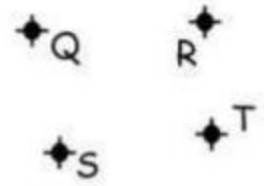
- What original raw data is available?
- What sort of data manipulation does the application want to perform?



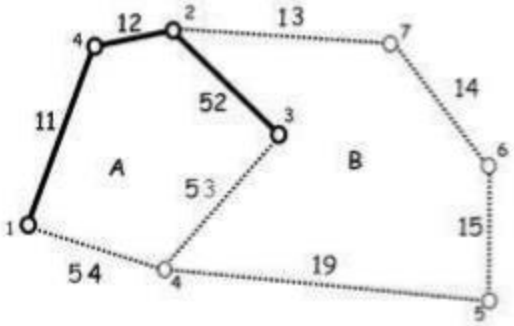
Vector Representations

- Represents each Geographic feature by a set of coordinates.
- An attempt to represent the object as exactly as possible.
- All positions, lengths, and dimensions to be defined precisely.

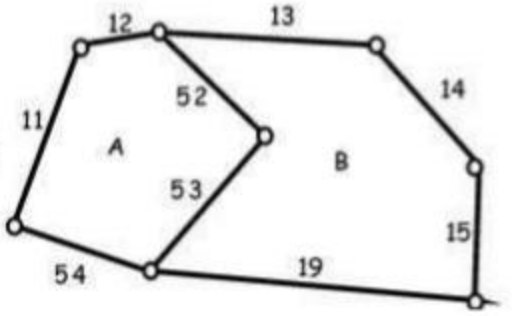
Points



Lines



Polygons

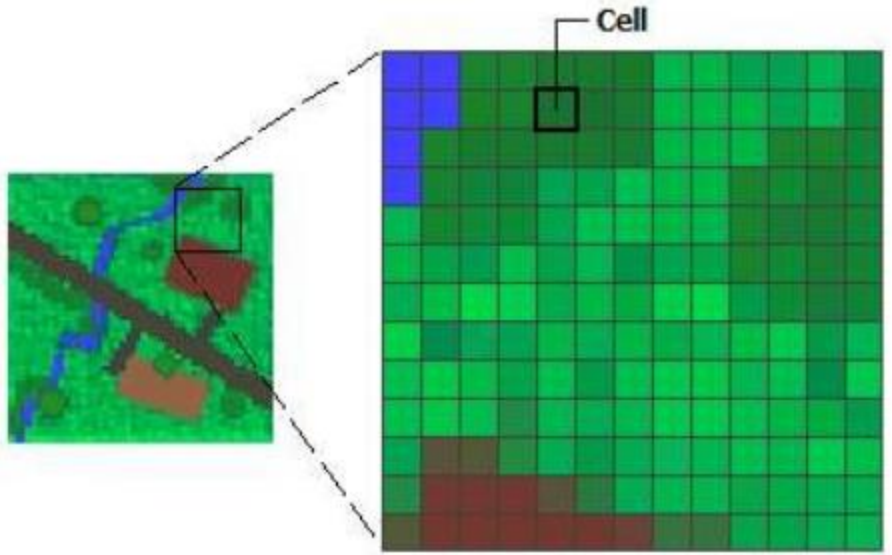


Types:

- Point representation
  - Defined as single coordinate pairs (x,y) in 2D and (x, y, z) in 3D
- Line Representation
  - Defined by 2 end nodes and 0-n internal nodes in between
- Area Representation
  - Represent each polygon as a set of XY co-ordinates of the boundary
  -
- TIN Representation

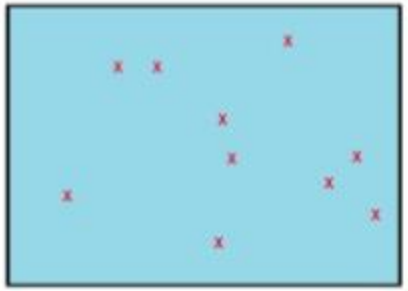
Raster Representation

- Entire space is broken into grid cells of a fixed or uniform size.
- Used Commonly to represent Geographic Fields.
- Each grid cell is referenced by a row and column number.

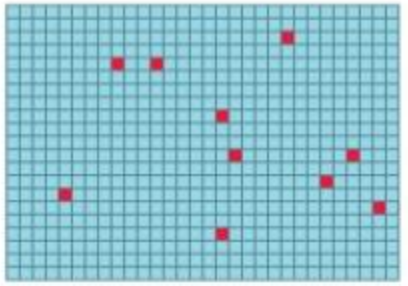


In a Raster

- A point is represented by a single grid cell.



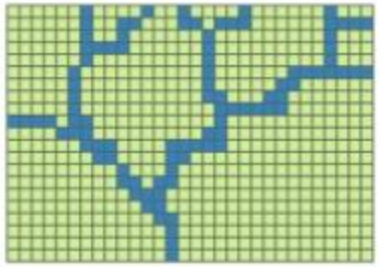
Point features



Raster point features

- A line by a number of neighboring cells strung out in given direction.

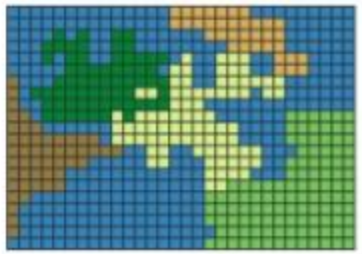
Line features



Raster line features

- An area by an agglomeration of neighboring cells.

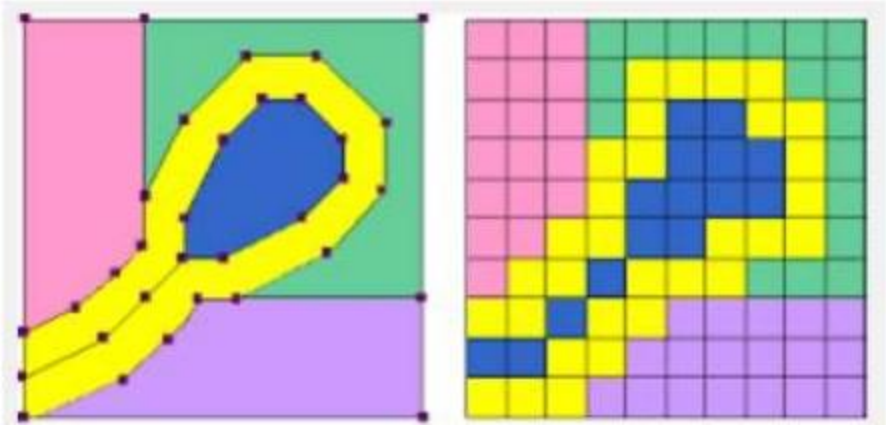
Polygon features



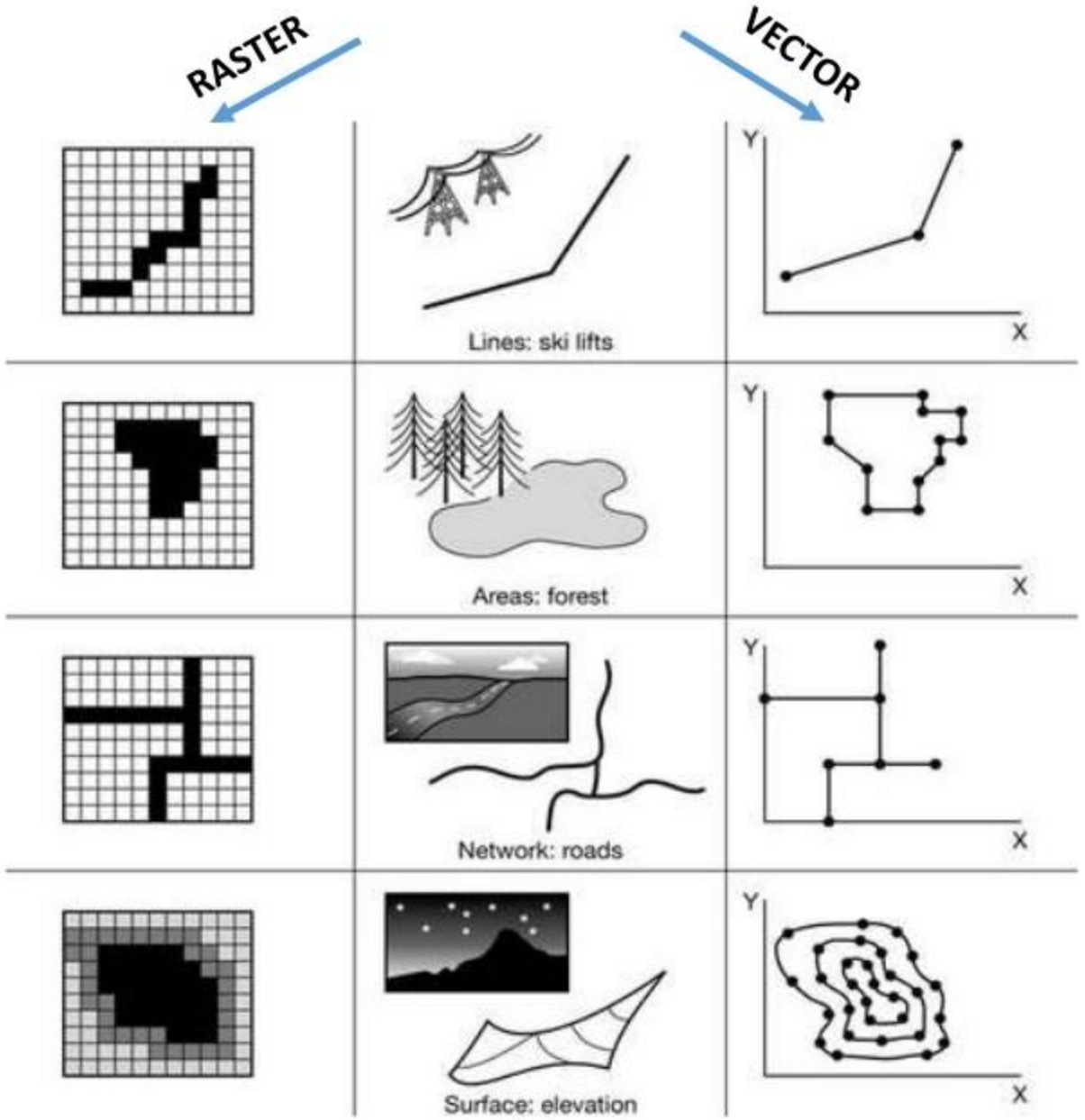
Raster polygon features

Comparison

VECTOR	RASTER
❑Complex data Structure	❑Simple Data Structure
❑Easy association with attribute data	❑Difficult to associate attribute data
❑Efficient representation of topology	❑Difficult in representing topology.
❑Overlay of several vector polygon maps creates difficulties	❑Overlay and combination of data is easier

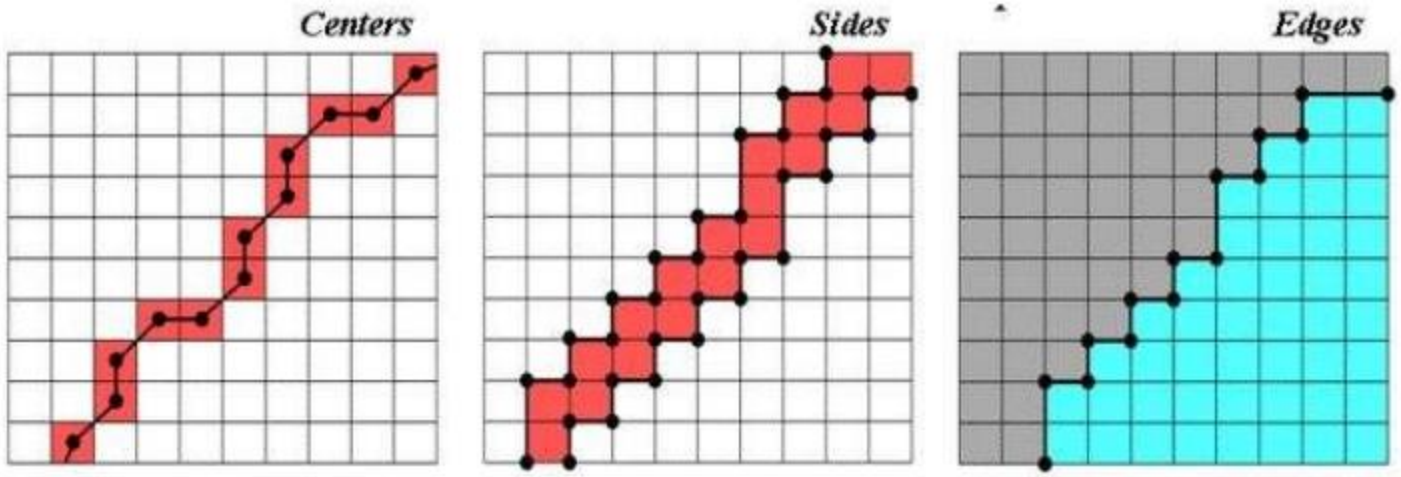


REAL WORLD

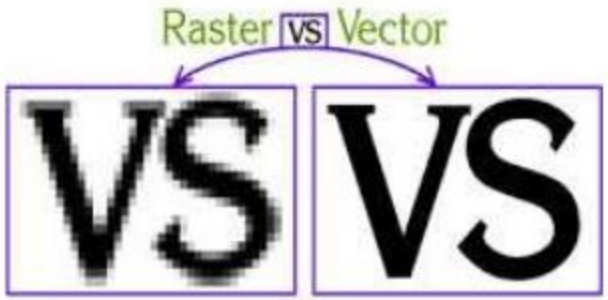

RASTER
VECTOR
Y
X
Lines: ski lifts
Areas: forest
Network: roads
Surface: elevation

However,

- Both structure are inter-convertible.
- Conversion from Vector to Raster
  - Is simplest
  - Many well known algorithms exist.
- Conversion from Raster to Vector
  - Much more complex operation.



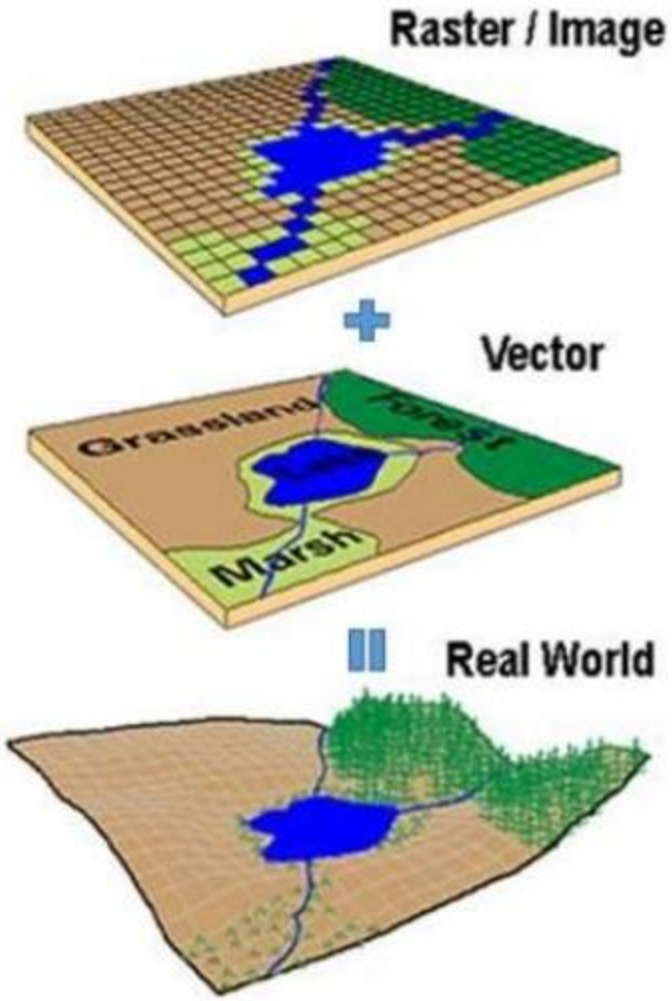
Choice between Vector and Raster

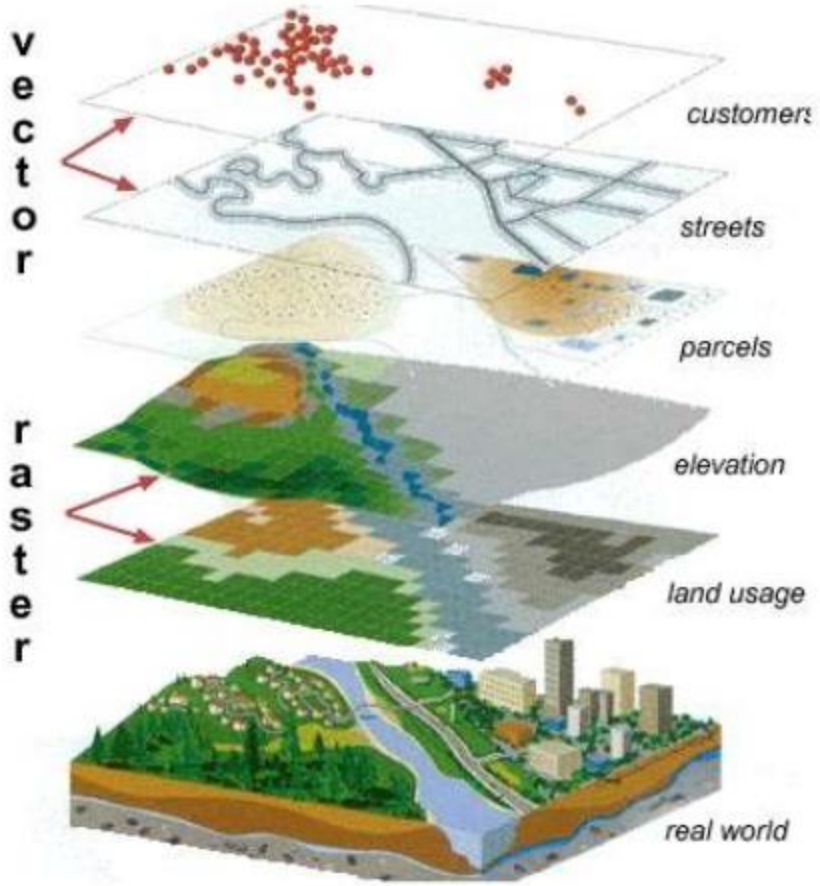


- Use VECTOR data structures for
  - Geographical objects like buildings ,Roads etc.
  - Network analysis :Transportation networks, Telephone networks etc.

- Use RASTER methods
  - Representing continuous geographical fields
  - When it is necessary to work with surfaces; Simulation and modeling
  - Spatial analysis ,Map overlays, etc.

Conclusion


Raster / Image
Vector
Grassland
Forest
Marsh
Real World


vector
raster
customers
streets
parcels
elevation
land usage
real world