SMITHSONIAN'S NATIONAL ZOO & CONSERVATION BIOLOGY INSTITUTE

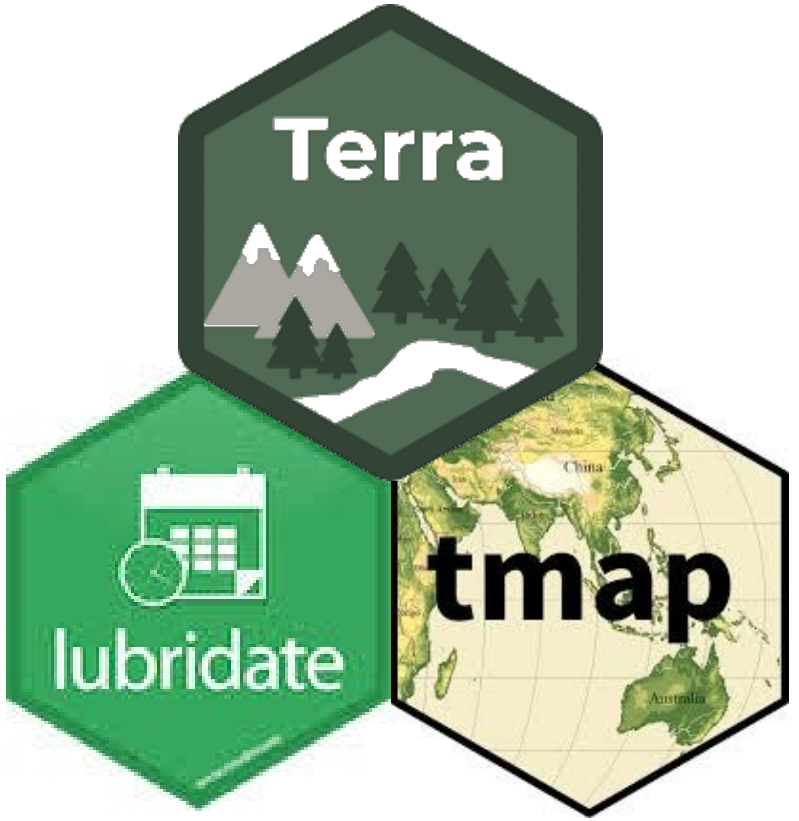
# Introduction to GIS in R

Wildlife Tourism College
Pardamat Conservation Area
17 September 2024

EARTH SCIENCE APPLIED SCIENCES
Award: 80NSSC23K1537

# Learning Objectives

- Create and import spatial data into R
- Basic vector and raster analysis
- Introduction to remote sensing
- Raster data extraction
- Simple spatial analysis
- Making maps in R



# Geographic Information Systems

A computer-based system to create, manage, analyze, and display geographical data

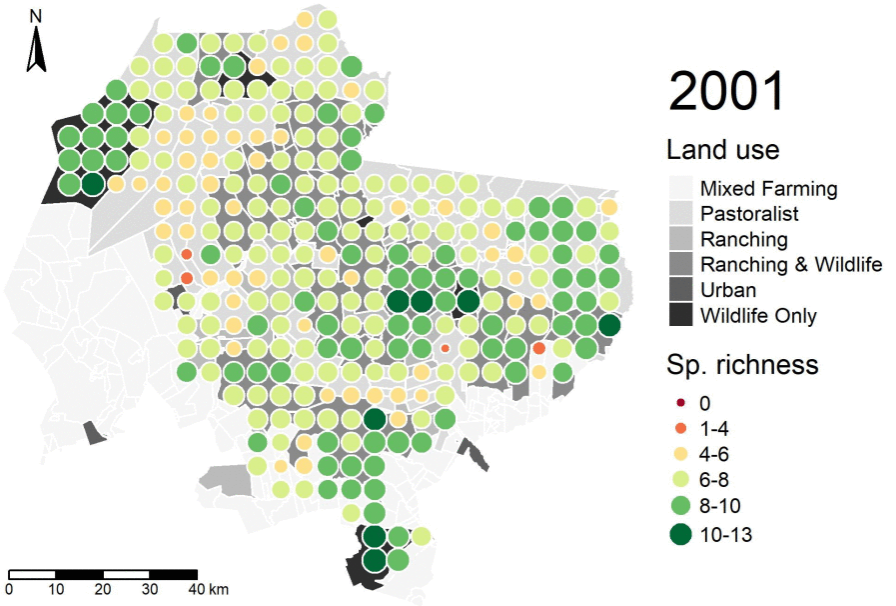
# GIS DATABASE

GEOGRAPHIC ANALYSIS

**Spatial Data (x,y)**

**Attribute Data**

STATISTICAL ANALYSIS

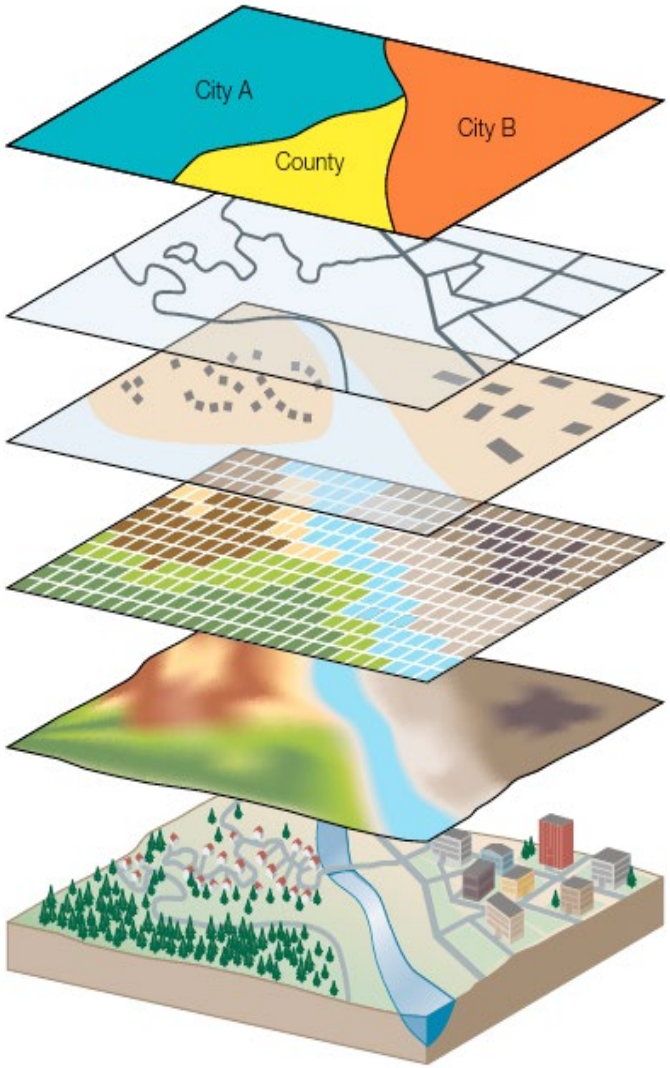


# TYPES of SPATIAL DATA:

*VECTOR*

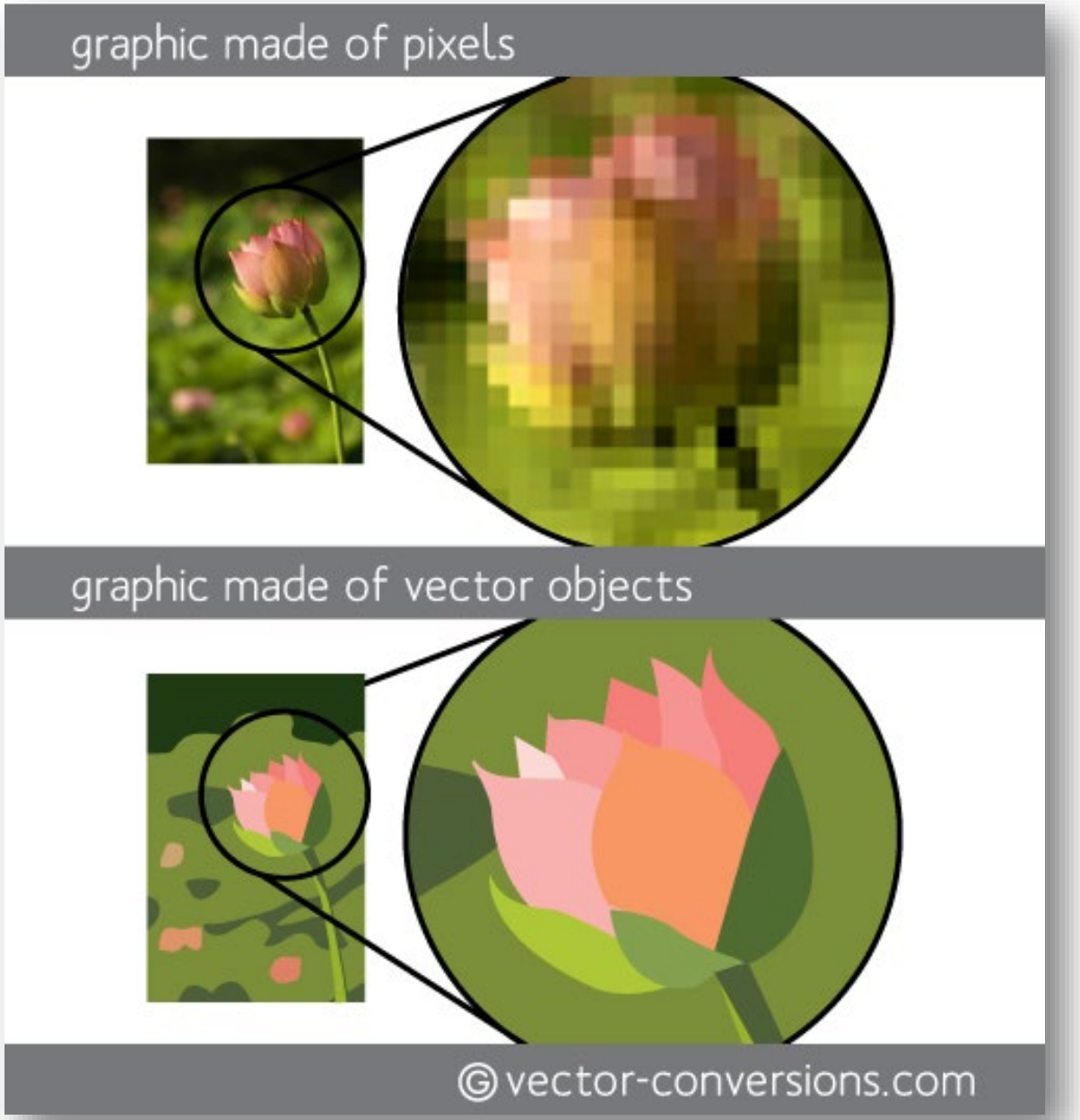
vs

RASTER

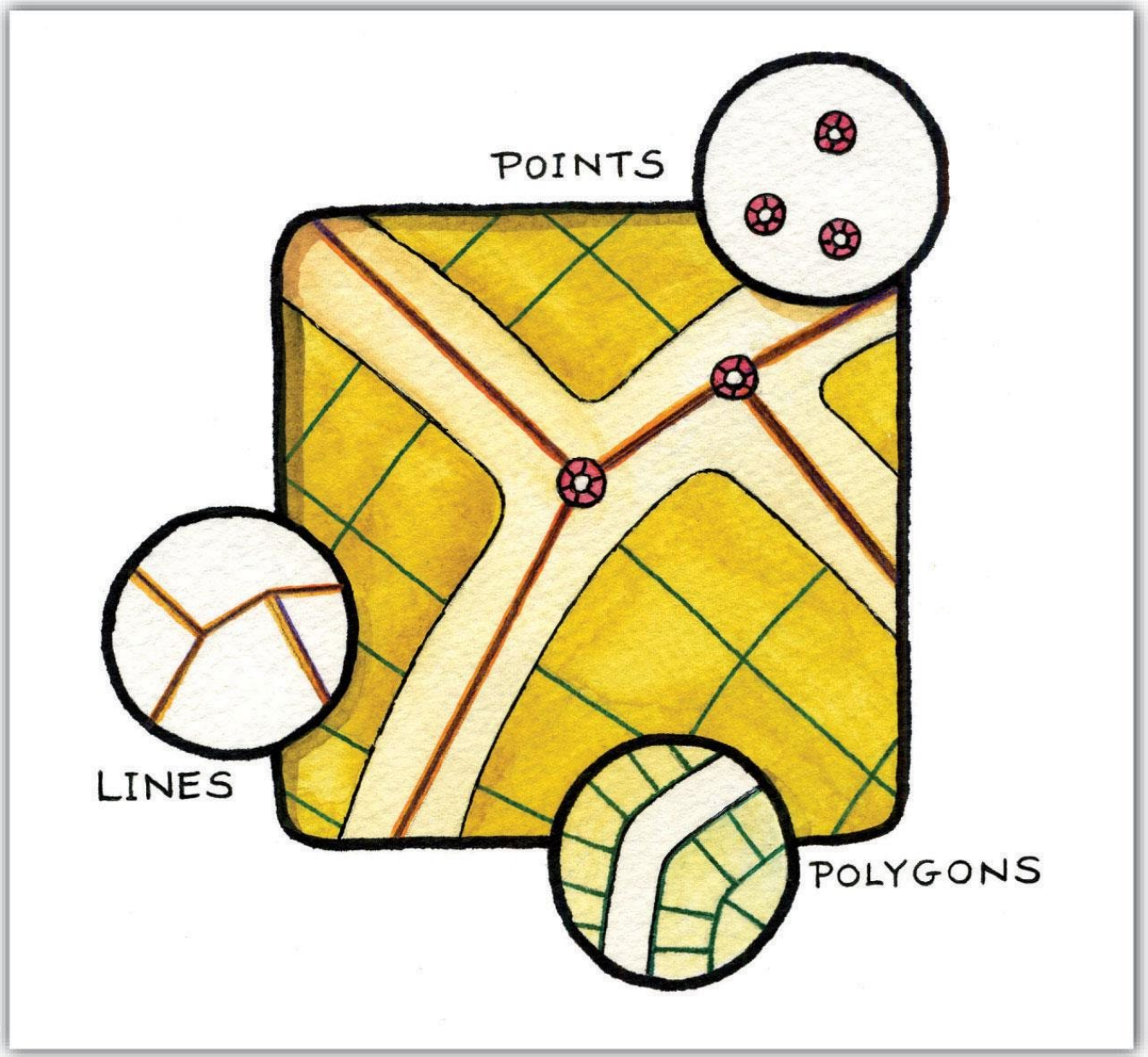


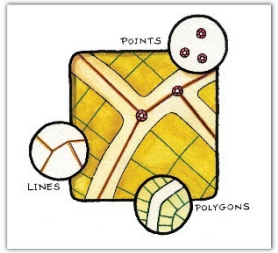
RASTER

VECTOR



# Vector Data

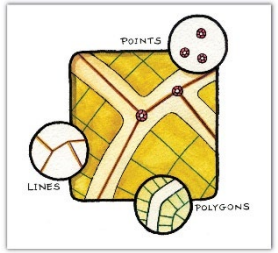





# Points (Vector)

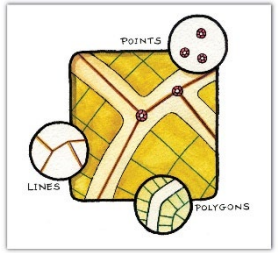
Single point (no area)

- Examples: GPS points, animal locations




# Lines (Vector)

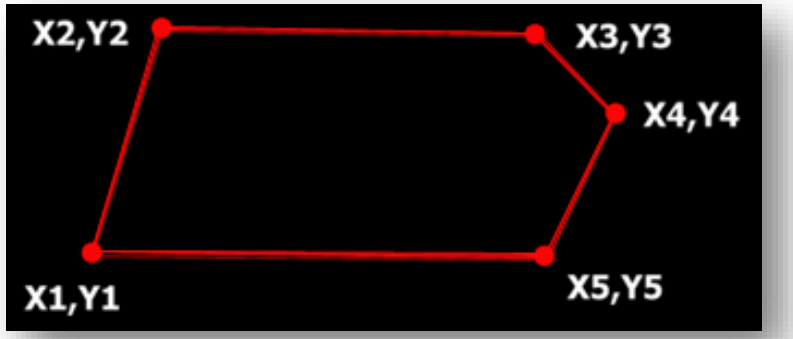
- Series of points connected together in order
- Has **length,** but not area
  - Examples: roads, boundaries, streams, route traveled

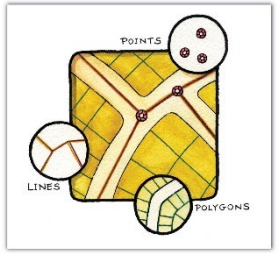



# Polygons (Vector)

Series of points connected

- Has length, width, and area
  - Examples: buildings, administrative boundaries, protected areas





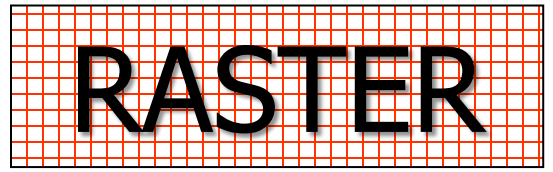

# Vector data

## Attributes are attached to each object:

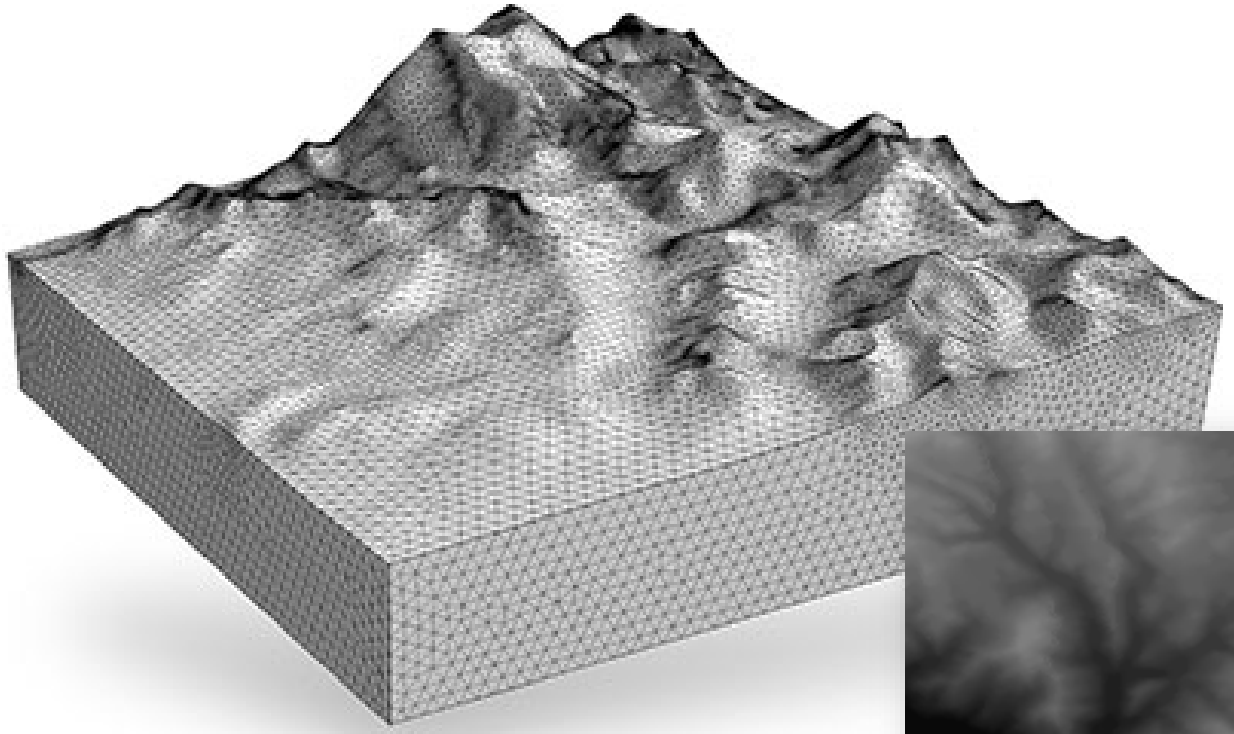
- Examples: species, date, depth, age, habitat

| | OBJECTID | AREA | PERIMETER | COUNTY3_ | COUNTY3_ID | COUNTY |
|---|---|---|---|---|---|---|
| 1 | 36 | 0.20600000000 | 2.53700000000 | 37.00000000000 | 36.00000000000 | Murang'a |
| 2 | 35 | 0.10600000000 | 1.67700000000 | 36.00000000000 | 35.00000000000 | Kisii |
| 3 | 34 | 1.45400000000 | 6.86200000000 | 35.00000000000 | 34.00000000000 | Narok |
| 4 | 33 | 0.07200000000 | 1.50500000000 | 34.00000000000 | 33.00000000000 | Nyamira |
| 5 | 40 | 1.77400000000 | 7.28000000000 | 41.00000000000 | 40.00000000000 | Kajiado |

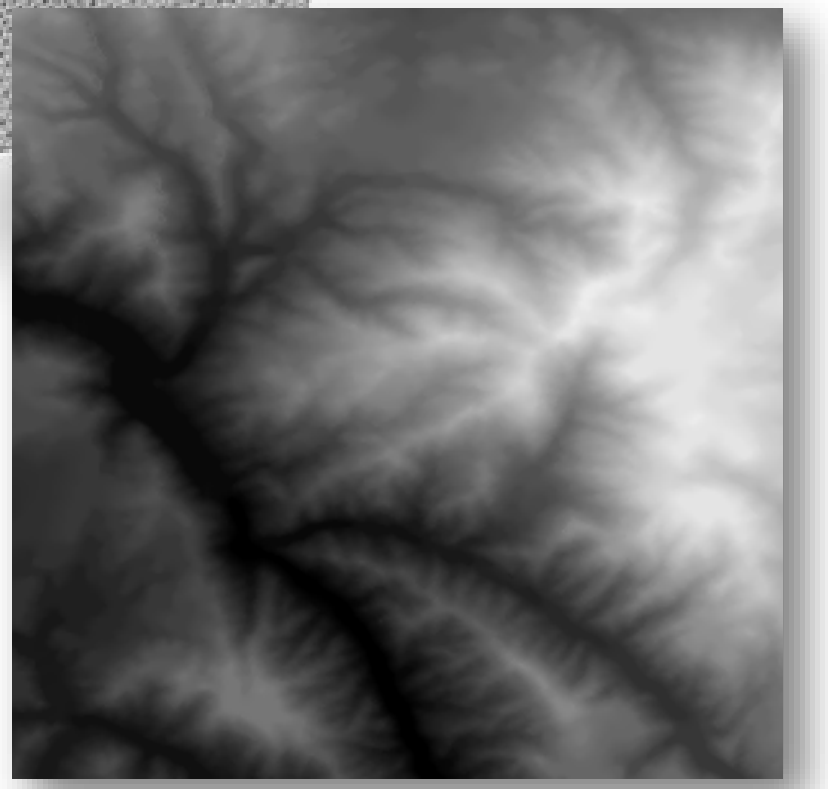
# Raster data




- Numbers or values in each pixel (cell)
- Good for mapping things that change continuously (like elevation)



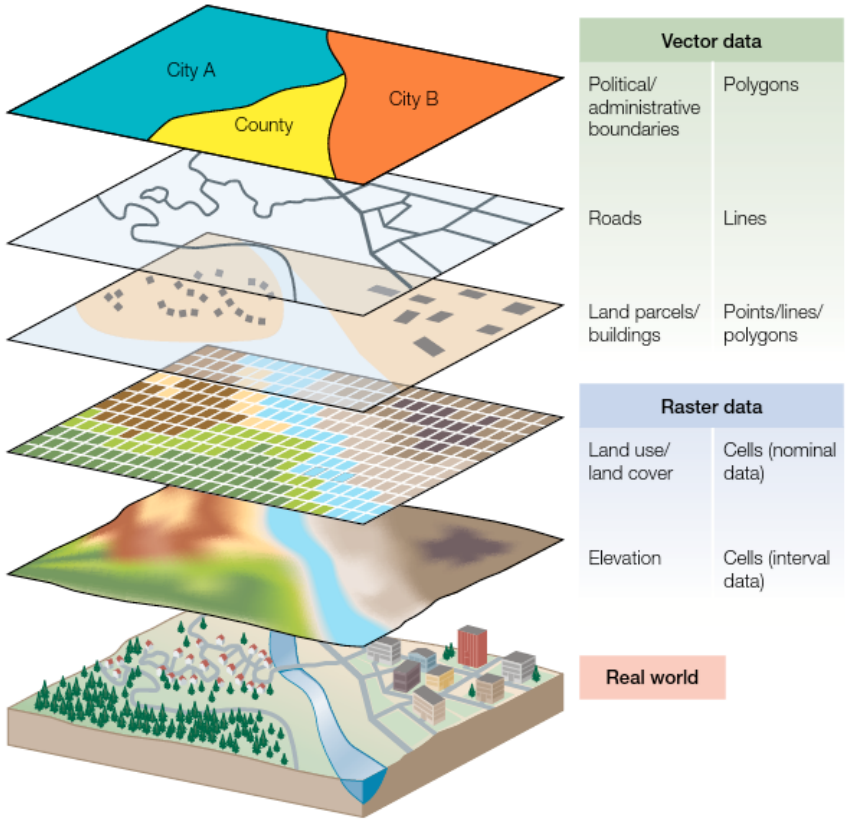
RASTER



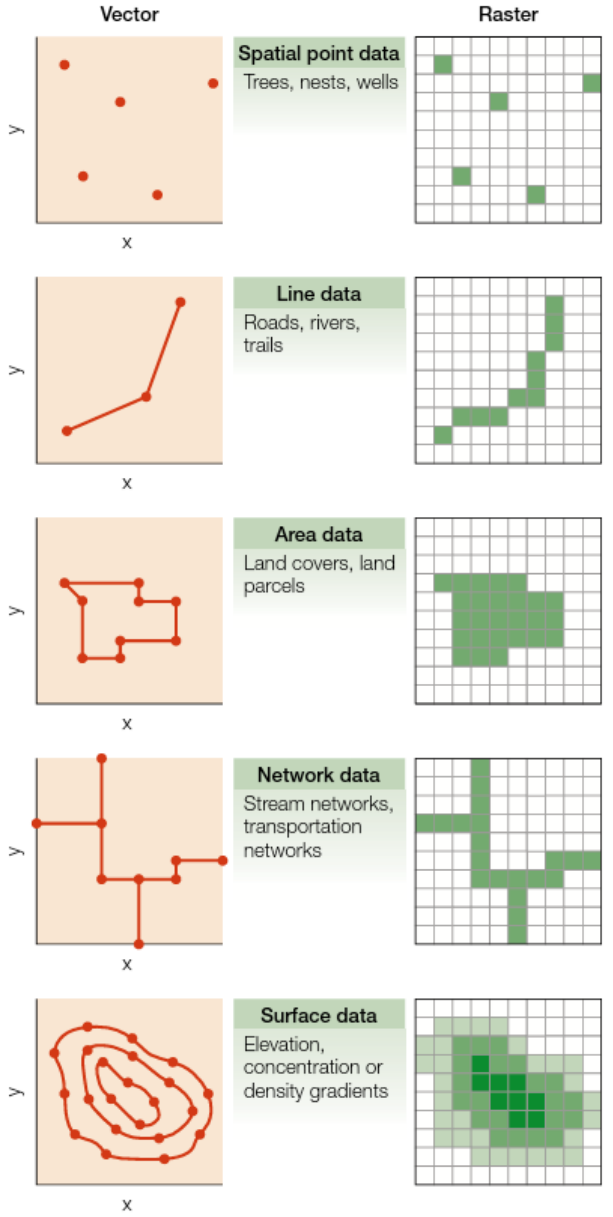
*Digital Elevation Model (DEM)*

**Spatial Resolution:** the level of detail of your data (e.g., pixel size)

# Summary




| Vector data | |
|---|---|
| Political/ administrative boundaries | Polygons |
| Roads | Lines |
| Land parcels/ buildings | Points/lines/ polygons |

| Raster data | |
|---|---|
| Land use/ land cover | Cells (nominal data) |
| Elevation | Cells (interval data) |

Real world