

# GEO 309 – Intro to GIS

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# Topics

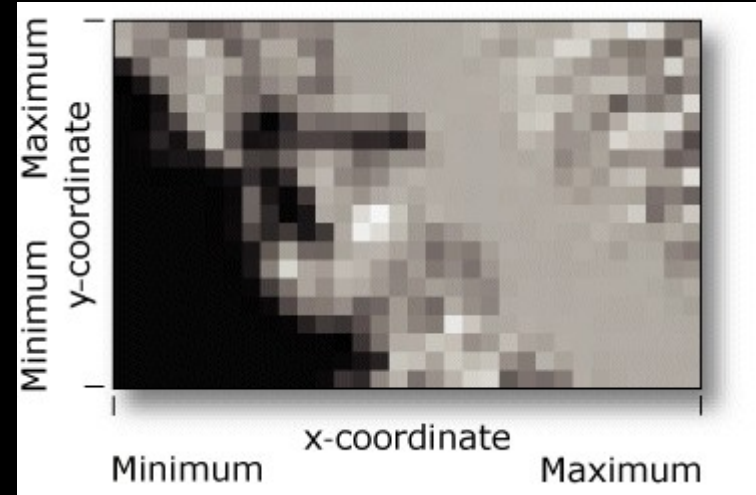
- Discussion – Fahy & Ó Cinnéide
- Raster geoprocessing
  - Raster formats
    - Grids, Images
  - DEM derivatives
  - Basic map algebra analysis
  - Digitizing features from imagery

# Discussion – Fahy & Ó Cinnéides

- Fahy, F. and M. Ó Cinnéide. 2009. Re-constructing the urban landscape through community mapping: An attractive prospect for sustainability? Area 41(2): 167-175.

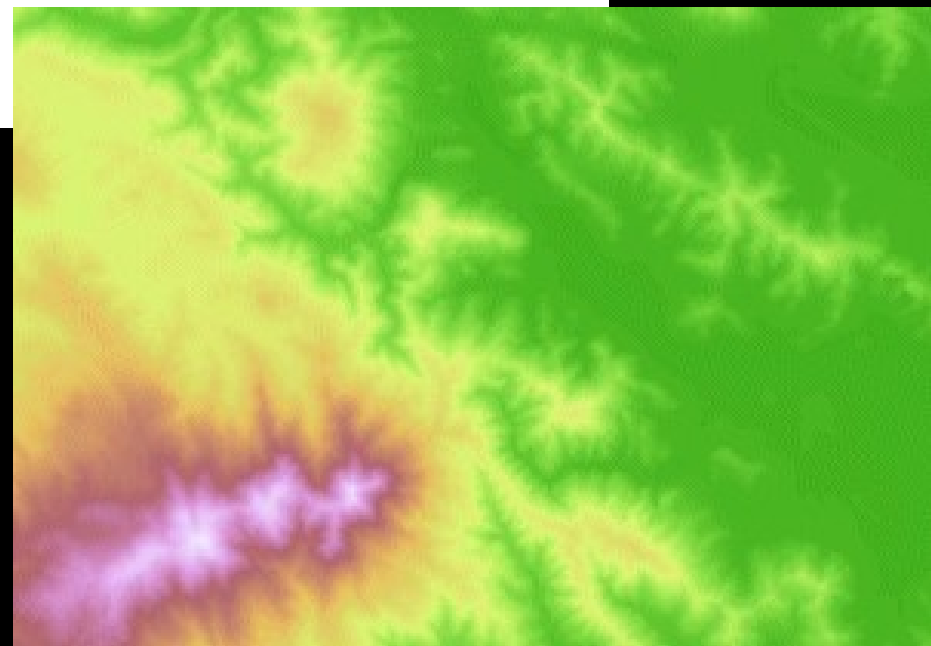
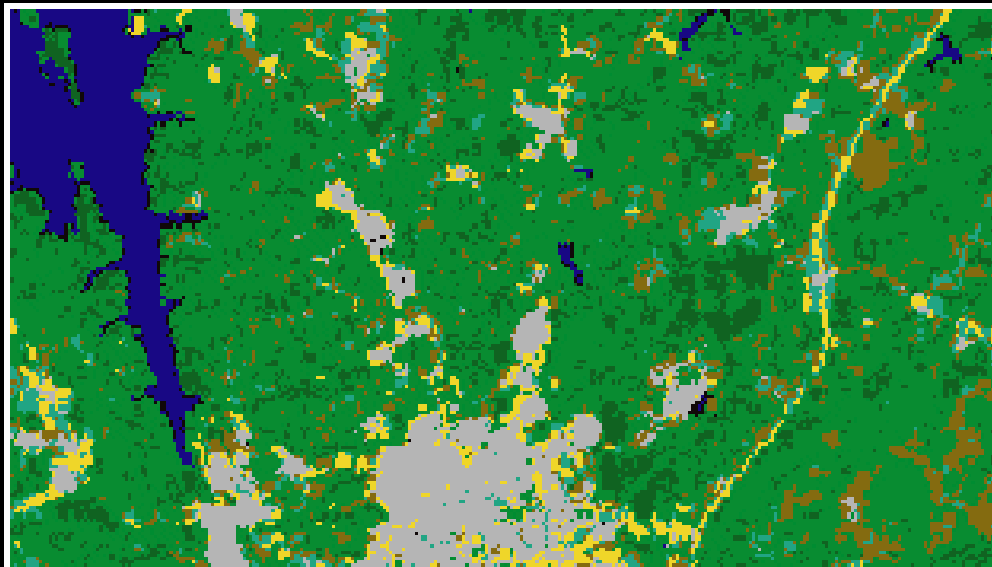
# Raster Geoprocessing

- Raster data formats
  - Values
    - At center of cell
    - Over entire cell
  - Coordinates
    - Cartesian coordinates
      - X-axis parallel to rows, Y to columns
      - Each square cell has a dimension
      - Cells start at (0, 0)



# Raster Geoprocessing

- Raster data formats
  - Grids
    - Discrete
      - Cells with integer values coded for a category
        - e.g., land use
    - Continuous
      - Cells with floating values coded for a continuous attribute
        - e.g., elevation



# Raster Geoprocessing

- Raster data formats
  - Image
    - Cells with brightness values
      - RGB Bands + Alpha
      - Resolution
      - Non-visible
    - Grayscale vs pseudocolor
    - Satellited imagery, Aerial photos, Scanned images



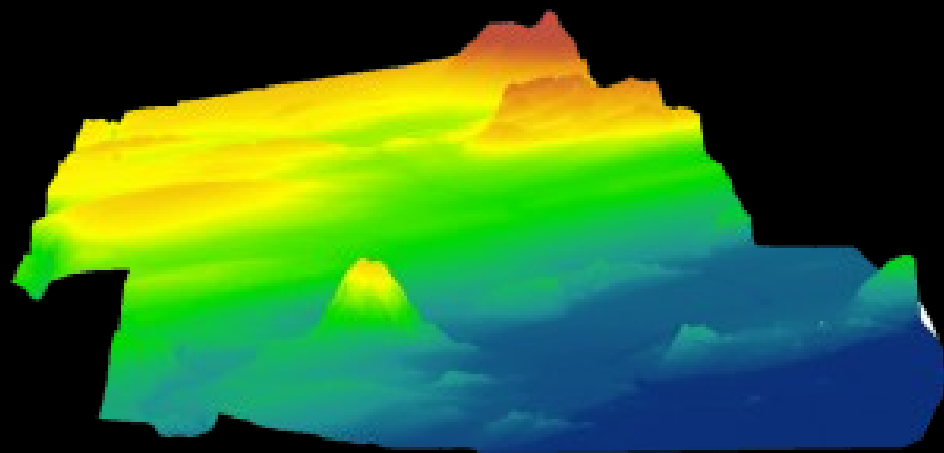
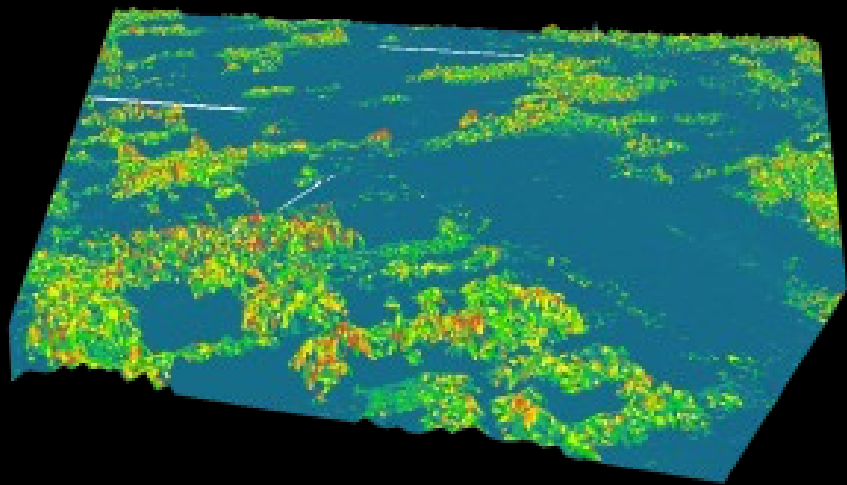
# Raster Geoprocessing

- Raster data formats
  - Uses
    - Base maps
    - Surface maps (topography)
    - Thematic maps
    - Attribute data



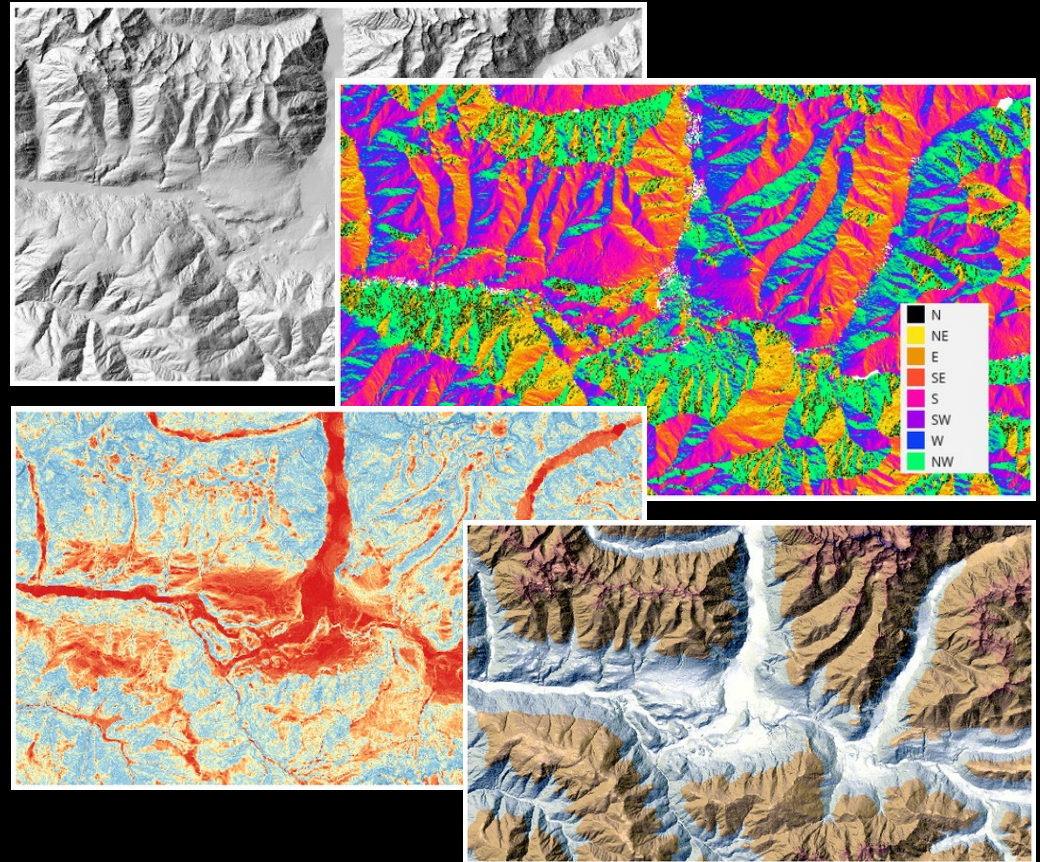
# Raster Geoprocessing

- Digital Elevation Models (DEM)
  - Vertical datum (bare-earth elevation)
- Digital Surface Models (DSM)
  - 3D modeling of natural & built features
  - e.g., LiDAR point cloud
- Digital Terrain Models (DTM)
  - Vector contour data (US & others)
  - Same as DEM (other countries)



# Raster Geoprocessing - Derivatives

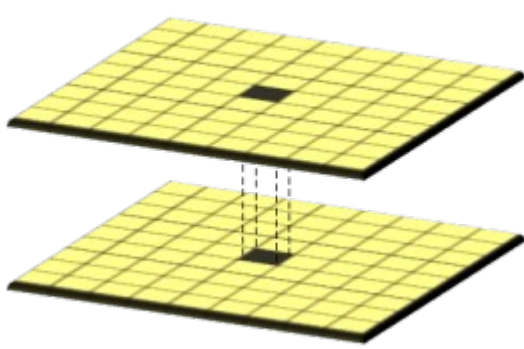
- Hillshade
  - Sun position
- Aspect
  - Slope direction
- Slope
  - Inclination of terrain
- Relief
  - Shaded elevation
- Ruggedness
  - Terrain heterogeneity



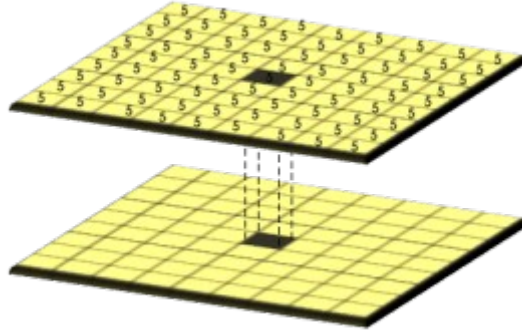
# Raster Geoprocessing

- Basic Map Algebra Analysis
  - Raster math
    - Local operations
      - Cell values based on same location
    - Focal operations
      - Cells value based on neighborhood values
    - Zonal operations
      - Cell value based on zone values
    - Global operations
      - Cell value based on all cell values

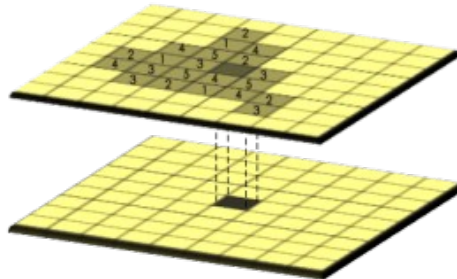
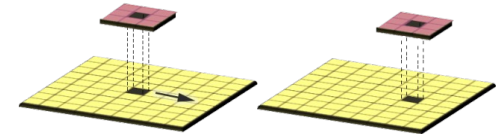
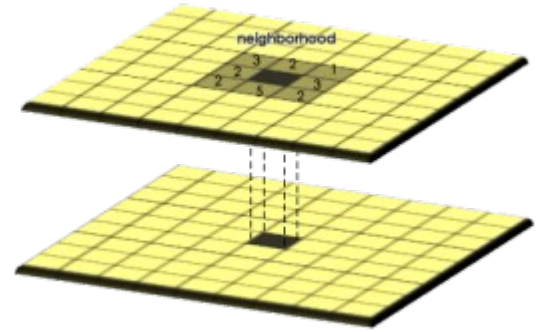
# Raster Geoprocessing




$$\begin{array}{|c|c|c|} \hline 1 & 4 & 5 \\ \hline 5 & 3 & 2 \\ \hline 2 & 5 & 2 \\ \hline \end{array} + \begin{array}{|c|c|c|} \hline 5 & 1 & 3 \\ \hline 1 & 2 & 1 \\ \hline 1 & 4 & 2 \\ \hline \end{array} = \begin{array}{|c|c|c|} \hline 6 & 5 & 8 \\ \hline 6 & 5 & 3 \\ \hline 3 & 9 & 4 \\ \hline \end{array}$$



$$\begin{array}{|c|c|c|} \hline 1 & & \\ \hline & & \\ \hline & & \\ \hline \end{array} = \begin{array}{|c|c|c|} \hline 0 & 1.0 & 2.0 \\ \hline 1.0 & 1.4 & 2.2 \\ \hline 2.0 & 2.2 & 2.8 \\ \hline \end{array}$$



# Raster Geoprocessing

- Digitizing features
    - New vector data sets
      - Manually digitizing features
      - Conversion tools
    - Georeferencing
      - Images to spatial rendered layer
        - Scanned maps to raster layers
- 



# Raster Geoprocessing

Demo