

# MORE RASTER ANALYSIS

GIS Analysis | Winter 2016

# 1<sup>st</sup> Law of Geography

## ***Waldo Tober's 1<sup>st</sup> Law of Geography***

*"Everything is related to everything else, but near things are more related than distant things."*

## ***Spatial Autocorrelation***

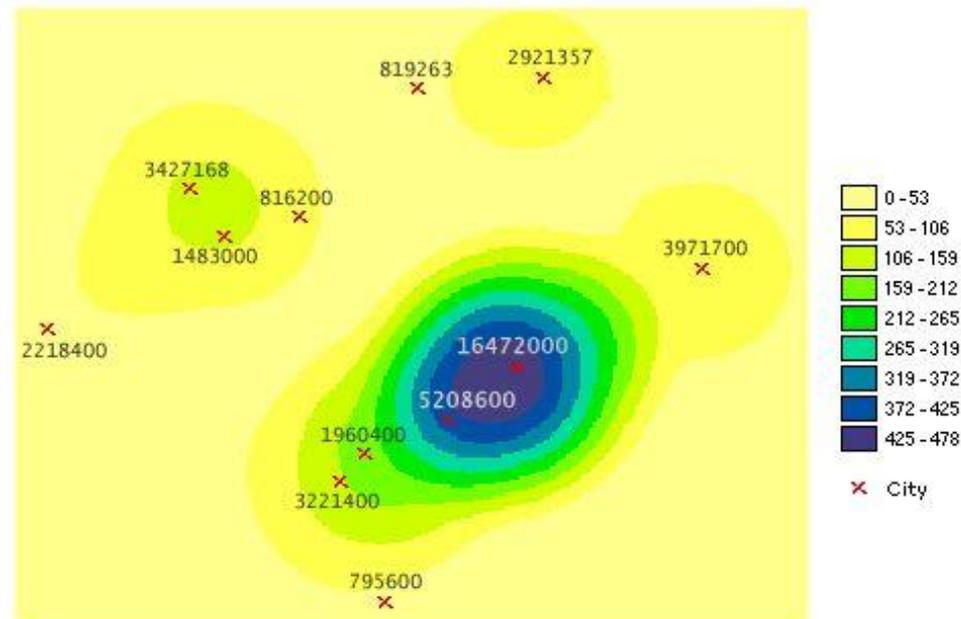
A measure of the degree to which a set of spatial features and their associated data values tend to be clustered together in space (positive spatial correlation) or dispersed (negative spatial autocorrelation)



# Spatial Interpolation

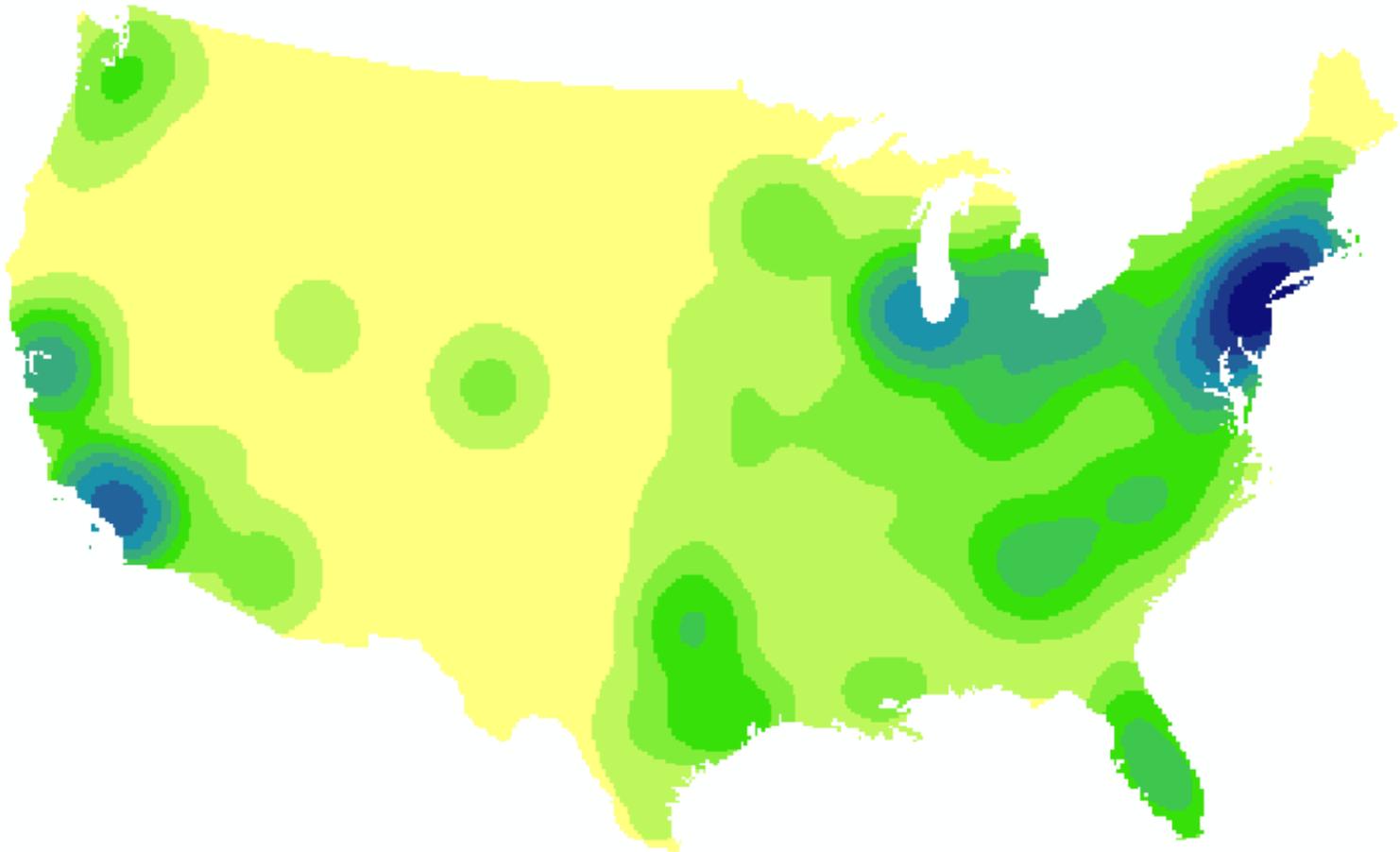
# Density Estimation

- Spreads known quantities of a phenomena across the landscape, based on quantities that are measured at point sample locations and search areas around each location.



(Point locations display census population figures for each town)

# Population Density across USA

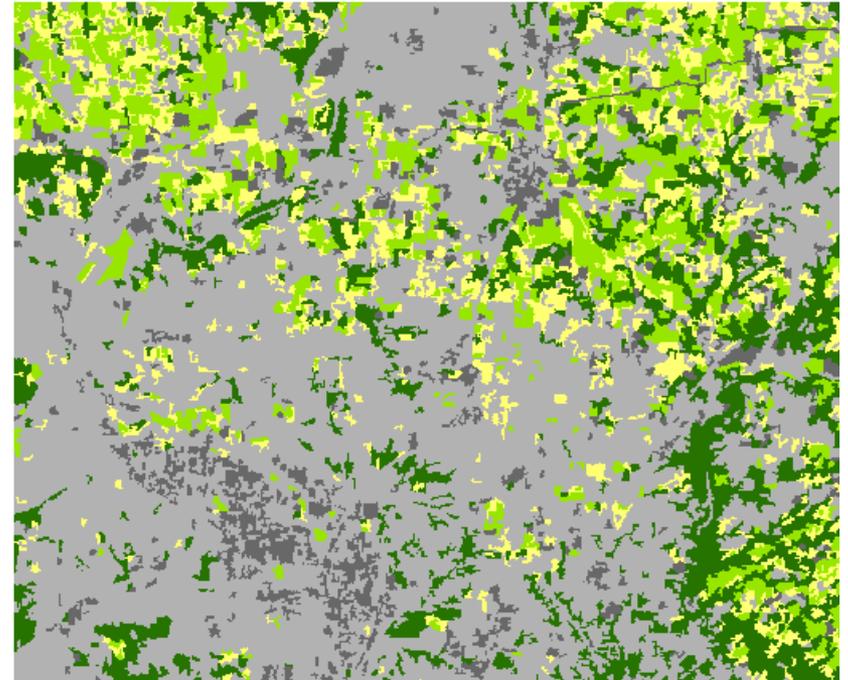
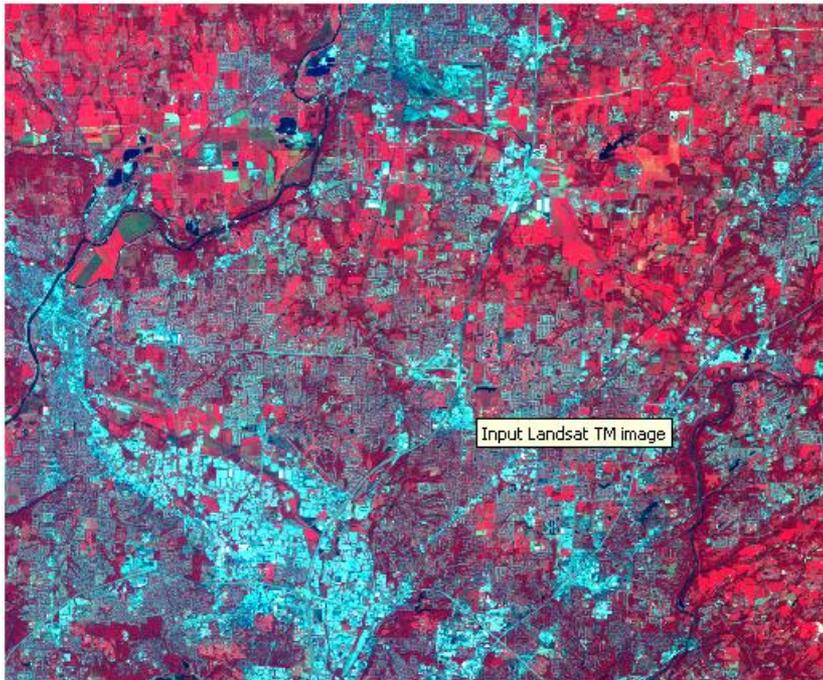




# Image Classification

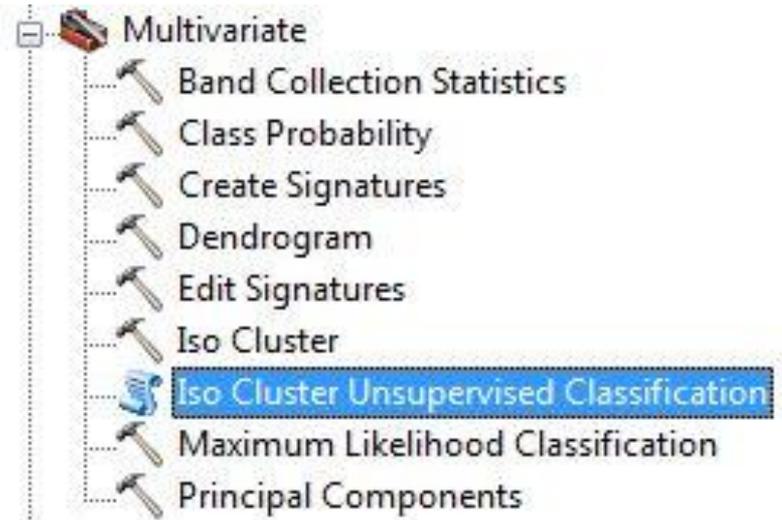
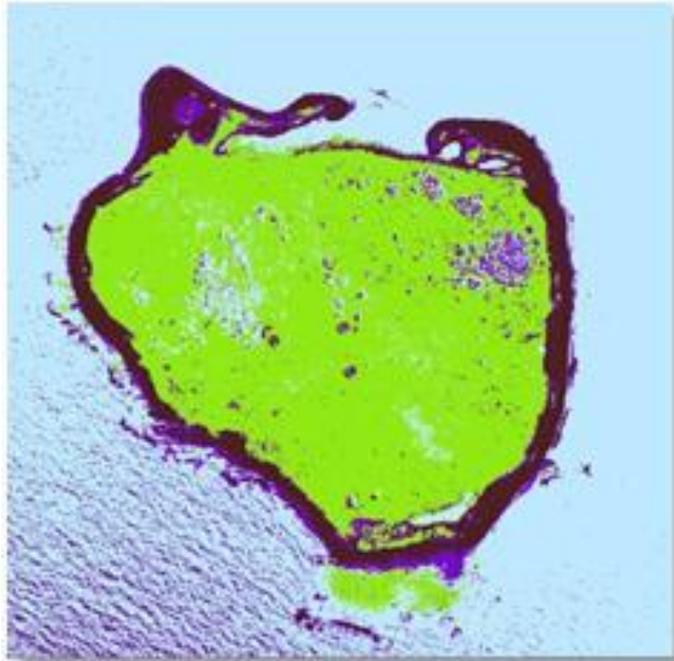
# Image Classification

- Extracts information from a multi-band raster image



# Image Classification | Unsupervised

- Finds *natural groupings (clusters)* of spectral classes in a multi-band image; e.g. Island vs. Ocean



# Image Classification | Supervised

- Uses the spectral signatures obtained from *training samples* to classify an image; e.g. vegetation classes

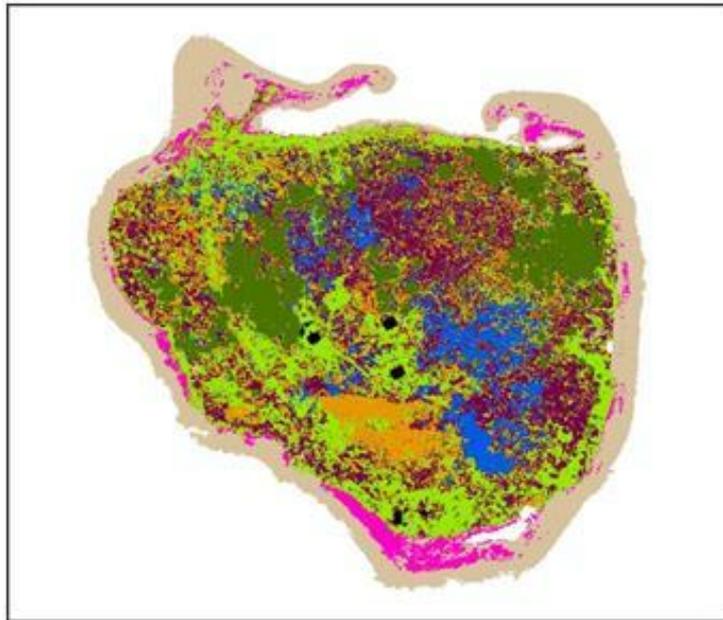


Image Classification toolbar:

ID	Class Name	Value	Color	Count
1	Urban	1	Grey	70
2	Residential	2	Yellow	51
3	Cropland	3	Red	90
4	Forest	4	Green	132
5	Pasture	5	Light Green	66

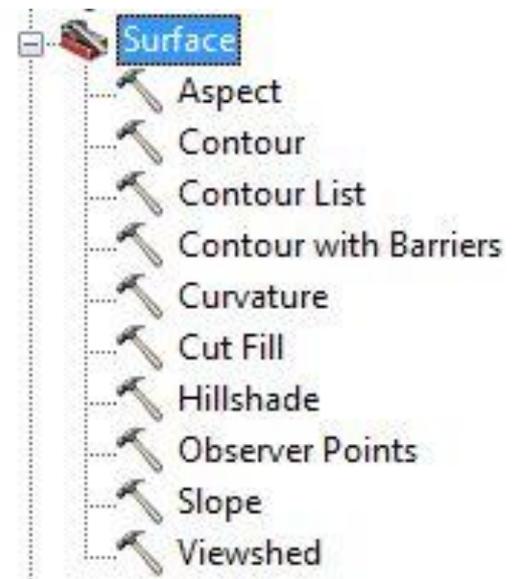
- Multivariate
  - Band Collection Statistics
  - Class Probability
  - Create Signatures
  - Dendrogram
  - Edit Signatures
  - Iso Cluster
  - Iso Cluster Unsupervised Classification
  - Maximum Likelihood Classification**
  - Principal Components



# Surface Analysis

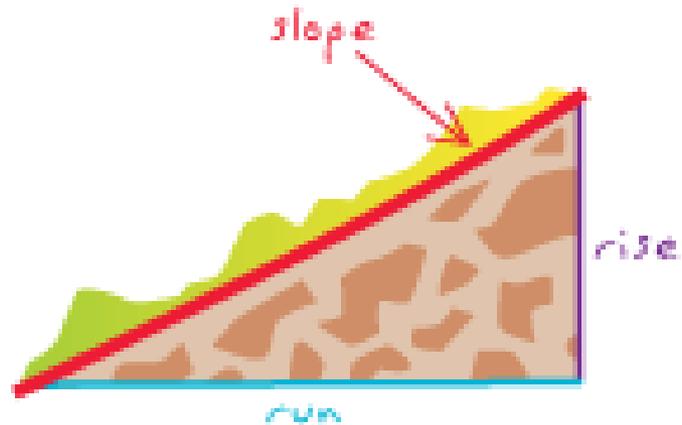
# Surface Analysis based on Elevation

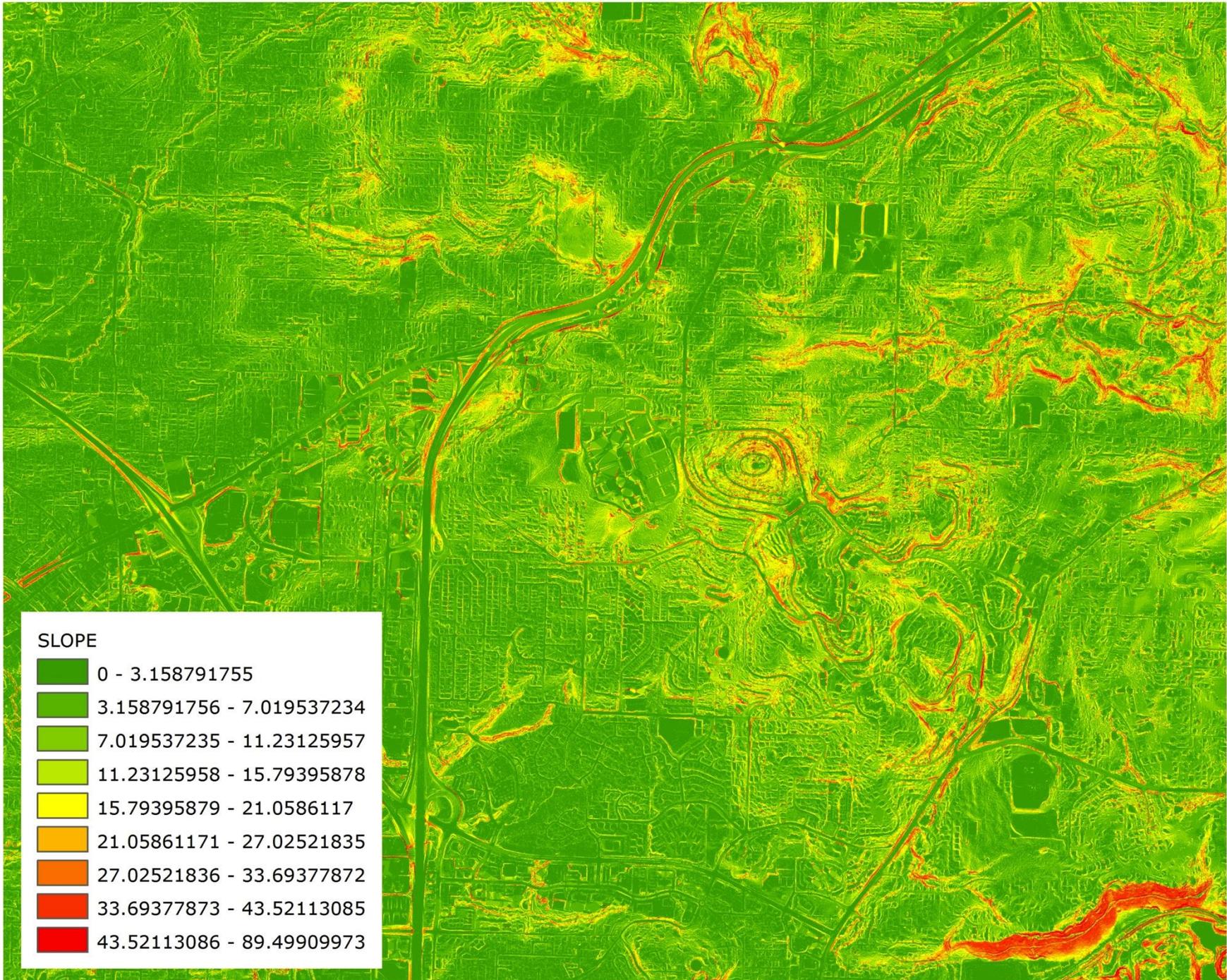
- Operations related to analysis of raster surfaces
- Variety available in ArcToolbox:
  - Slope
  - Hillshade
  - **Aspect**
  - **Contours**
  - **Viewshed**
  - **Watershed delineation**



# Slope

- The incline or steepness of a surface or terrain
- Can be measured in degrees (0-90) or percent slope  $(\text{rise}/\text{run}) * 100$

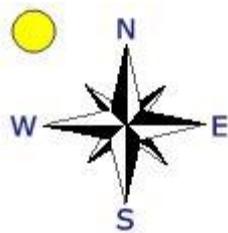




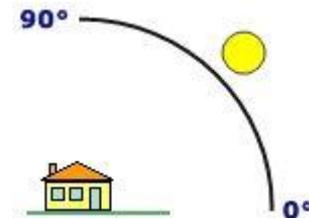
# Hillshade

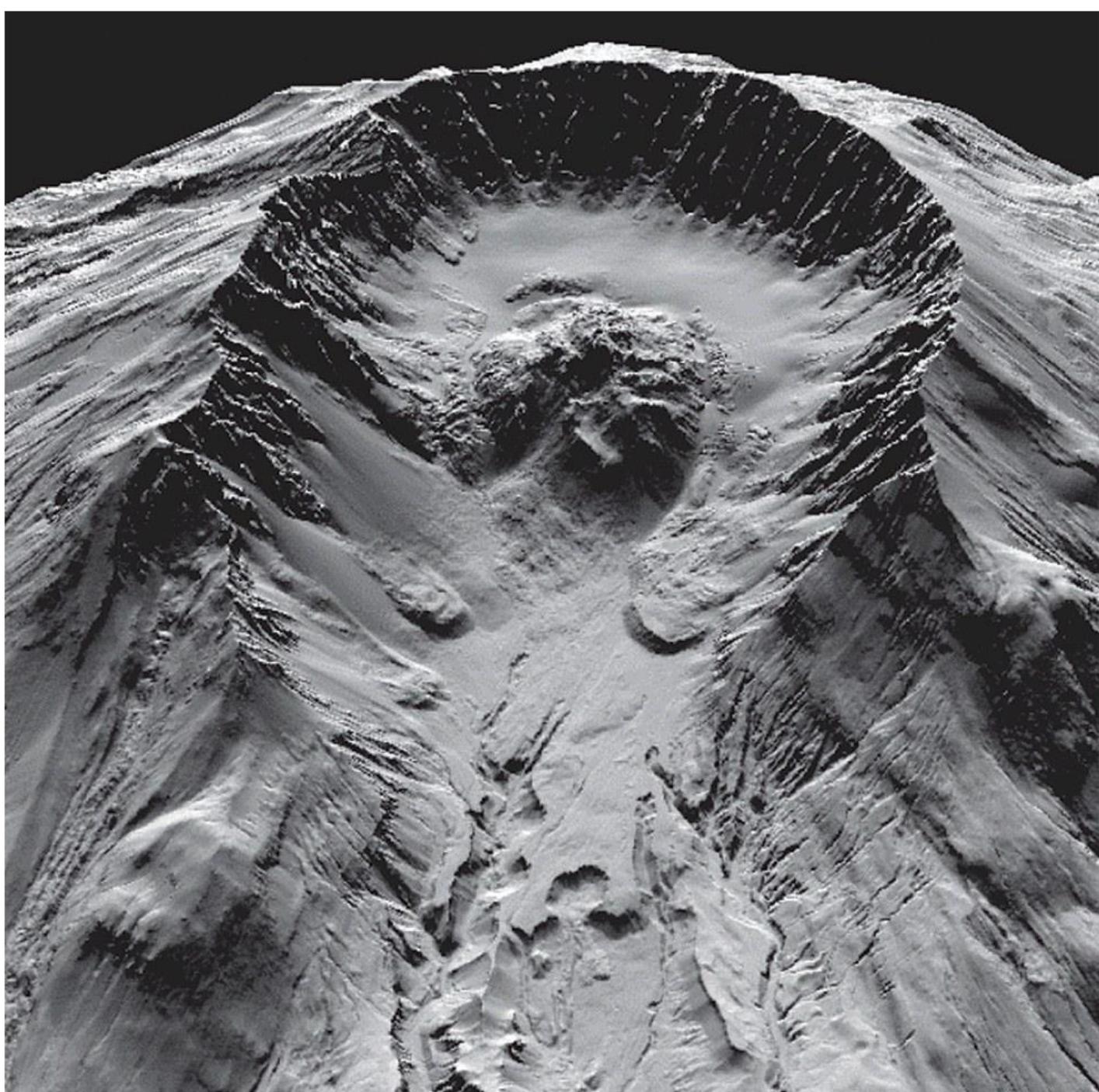
- Shadows drawn on a map to simulate the effect of the sun's rays over the varied terrain of the land
- Creates a 3D effect that provides a visual sense of shaded relief and a relative measure of incident height for analysis

**Azimuth** = angular direction of the sun



**Altitude** = angle of the sun above the horizon

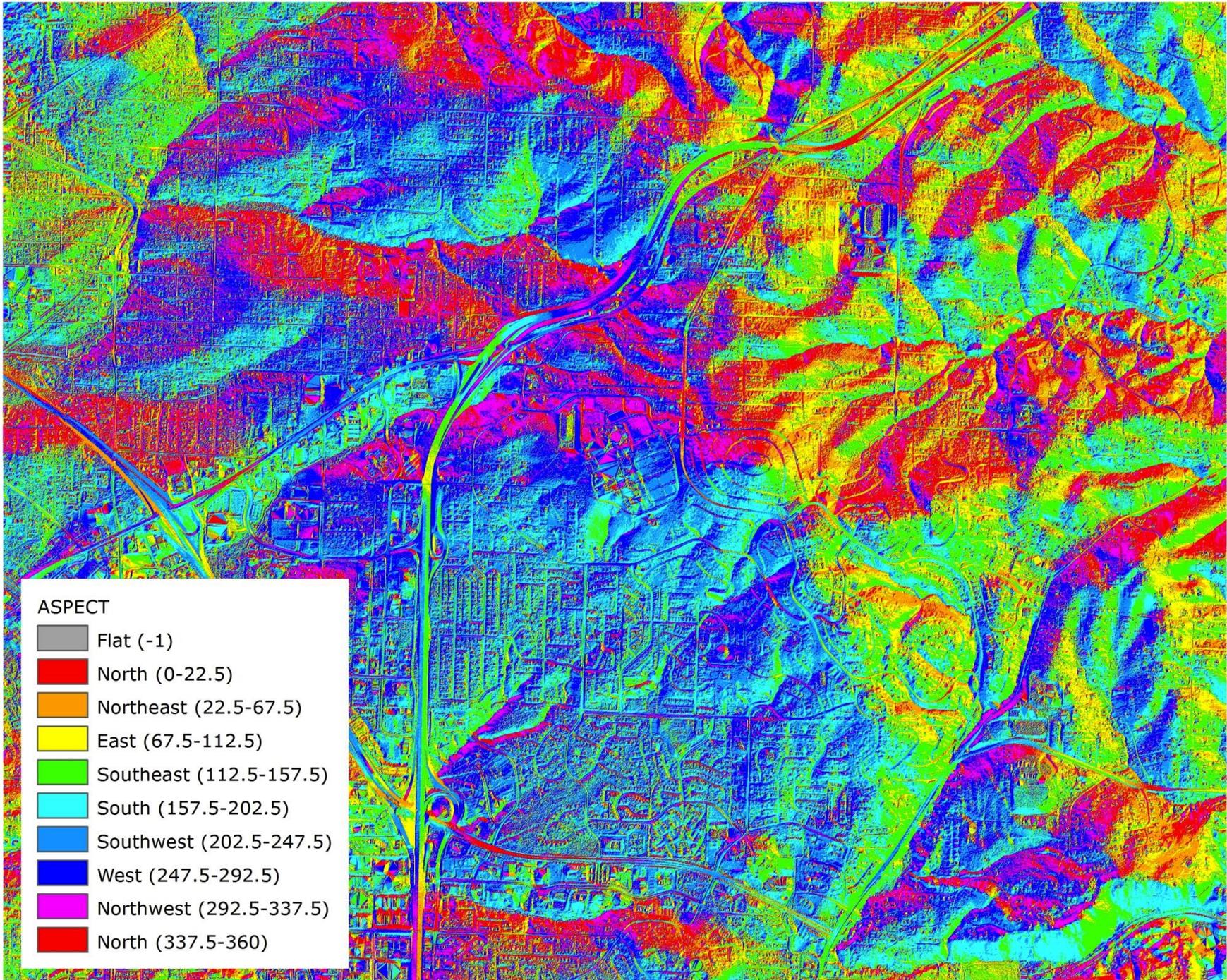




# Aspect



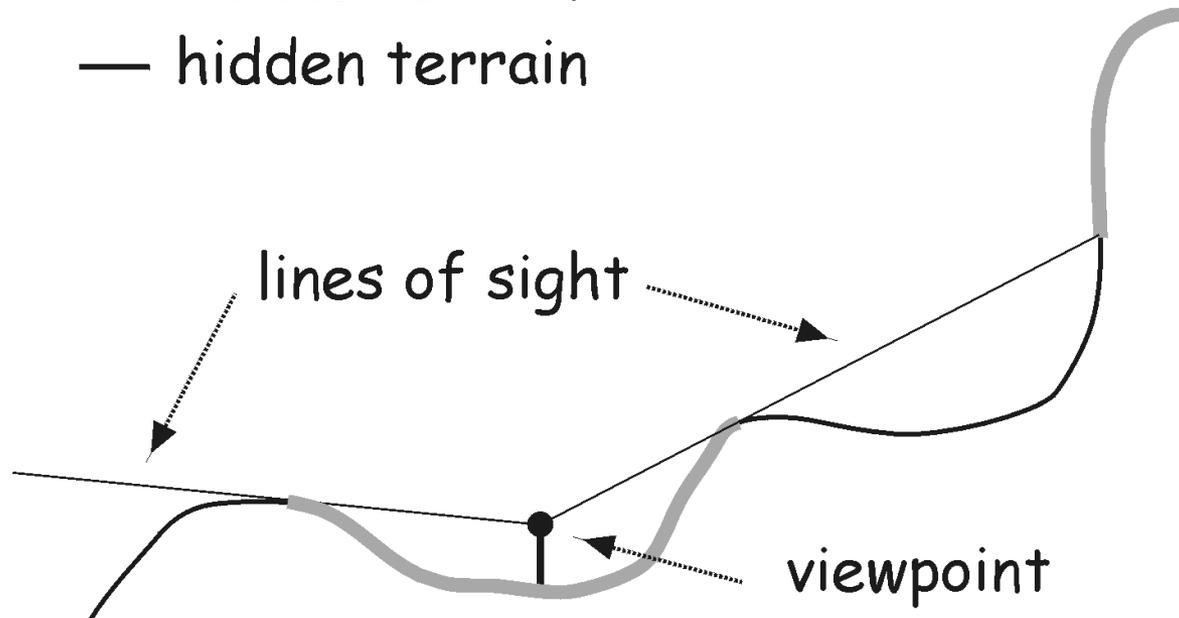
- The compass direction that a topographic slope faces, usually measured in degrees from North



# Viewshed

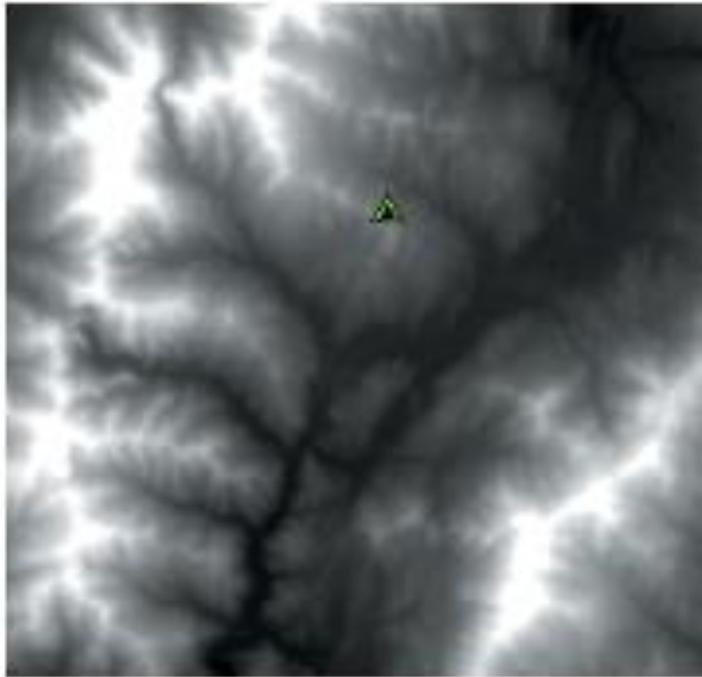
- The locations visible from any given point or line
- Finding well exposed places for communication lines or hidden places for parking lots

— visible terrain  
— hidden terrain

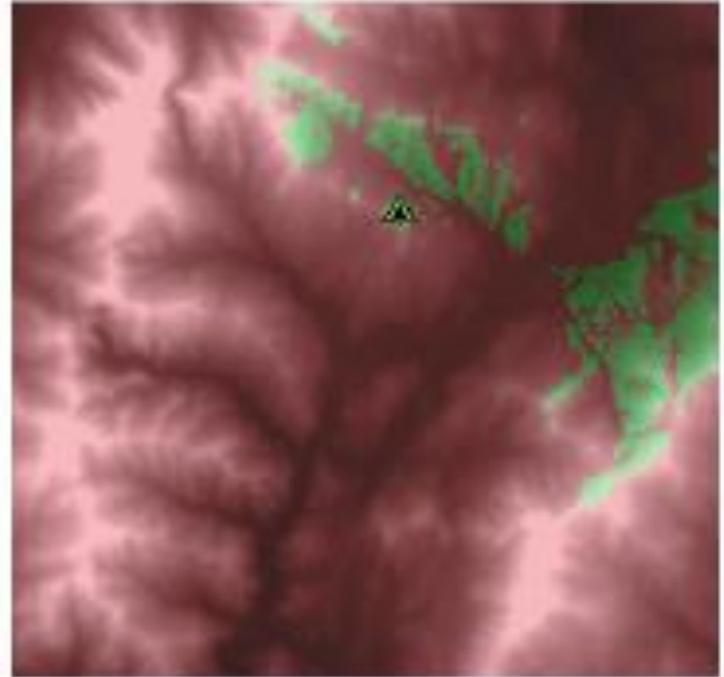


# Viewshed

Elevation in the area of the observation point



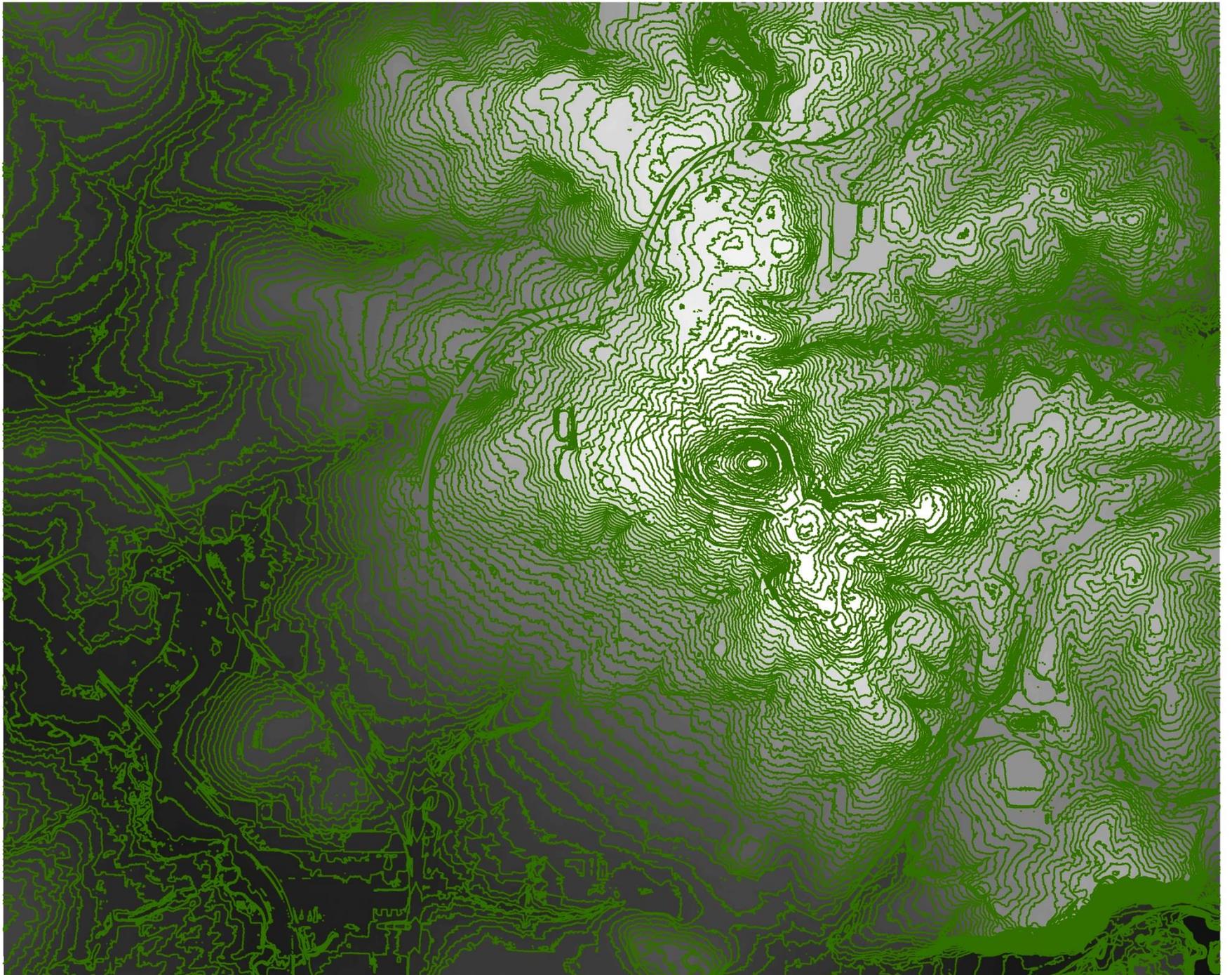
Green cells are visible from the observation point



# Contour Lines

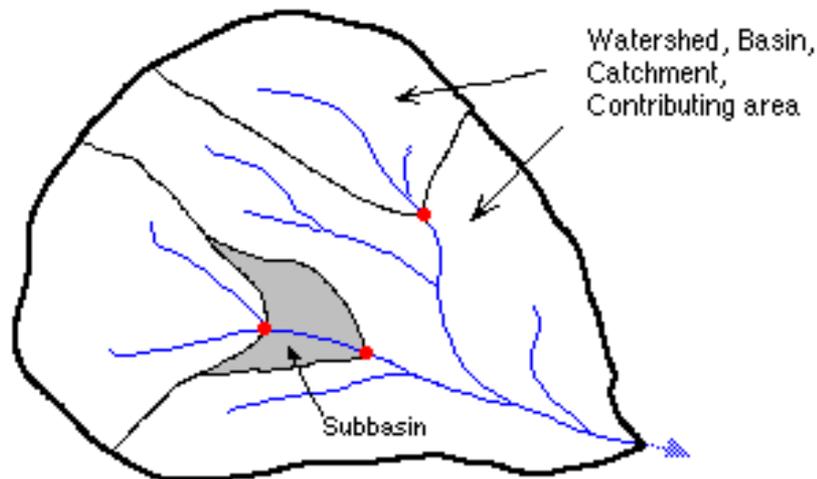
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- A line on a map that connects points of equal elevation usually based on sea level (or another vertical datum)



# Watershed Delineation

- Determines the contributing area above a set of cells in a raster; a watershed is an area that drains to a common outlet (a.k.a., basin, catchment)



- Watershed boundaries, drainage divides
- Stream network
- Outlets, pour points
- Subbasin

