Center for
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Spatial Models – Raster

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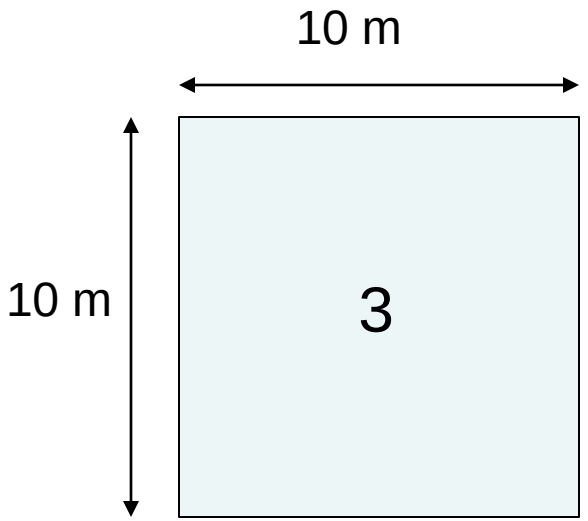
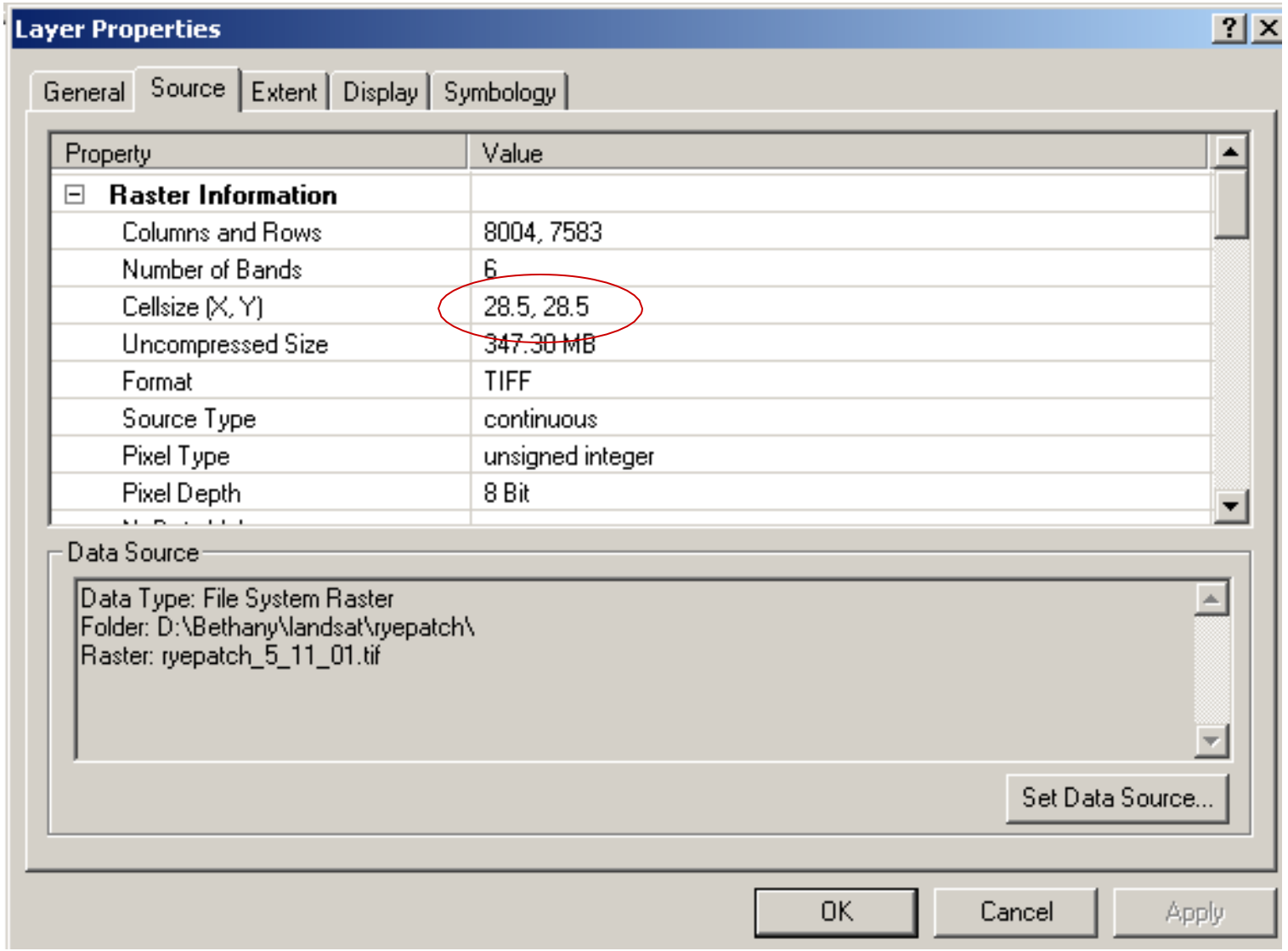
Raster data are made of pixels

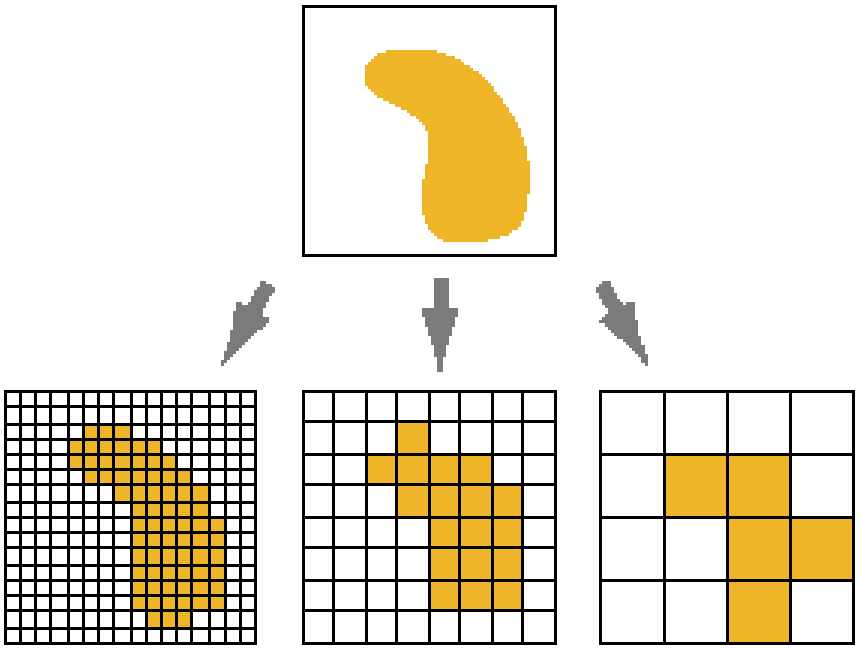
- Surface of values composed of **square** pixels each with a specific value
- Pixels are a specific size (ex. 10 m)
- Pixels are arranged in rows and columns



Pixel Size = Spatial Resolution

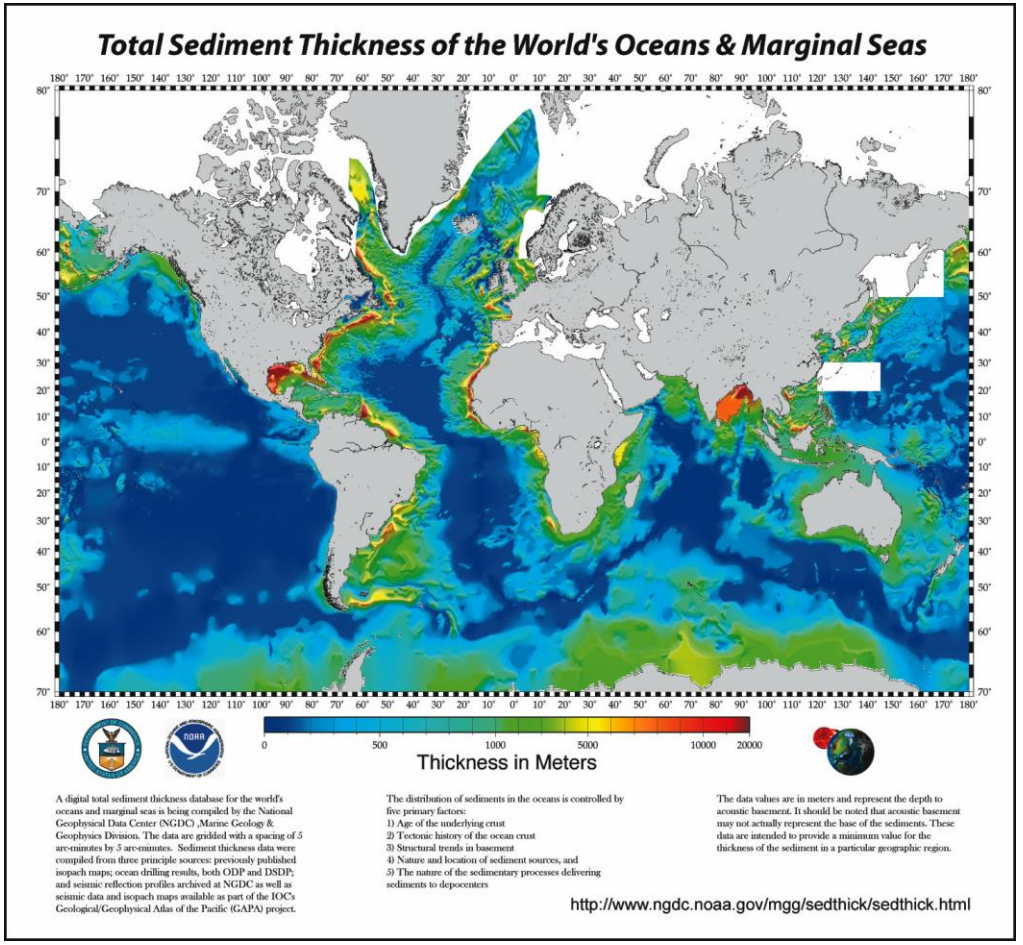


Pixel Size Matters!



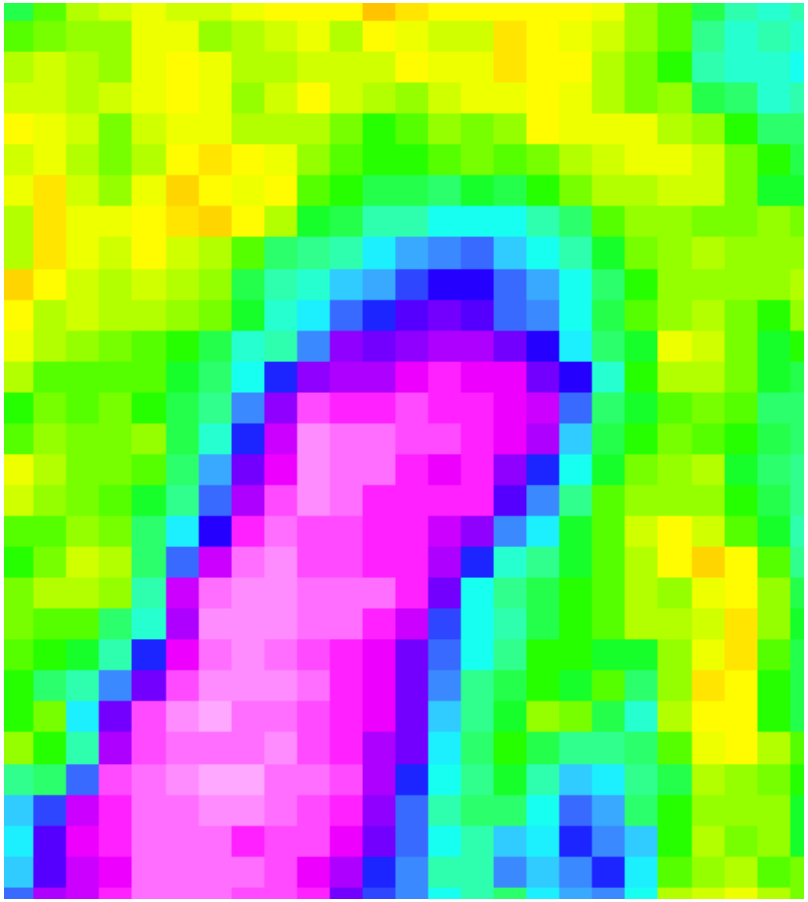
Advantages of Raster Data

- Represents a data surface.
  Every location within the raster extents has a value
- Sometimes smaller file size than shapefiles containing the same amount of data
- Looks good on a map if you're not close to the raster resolution



Disadvantages of Raster Data

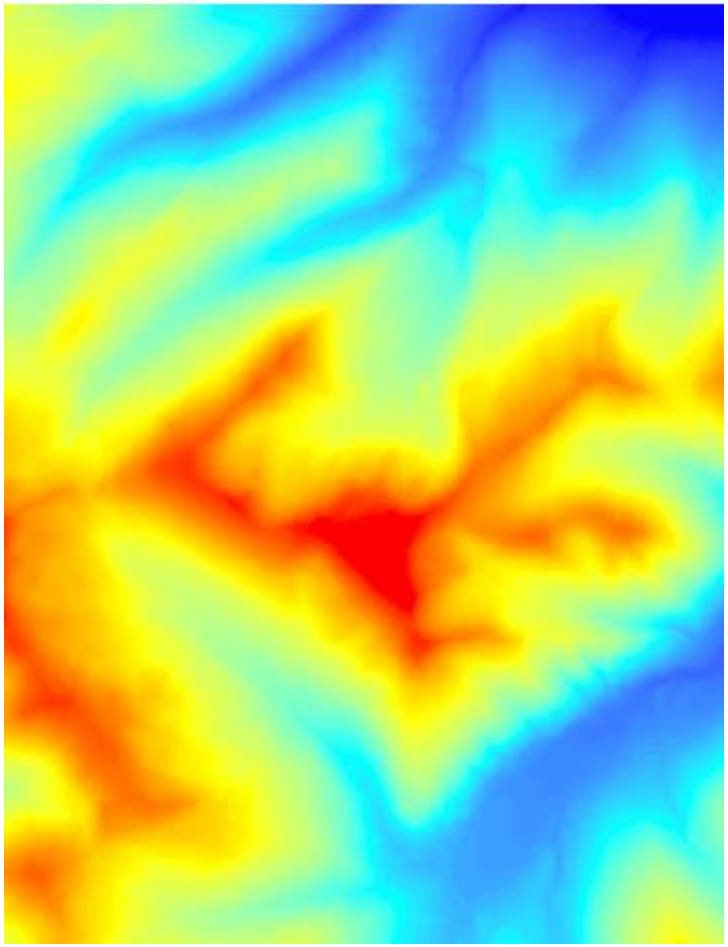
- Doesn’t look so good on a map if you try to zoom in close to the raster resolution
- Coarse resolution raster data don’t translate well to finer resolutions



Types of Raster Data

Continuous

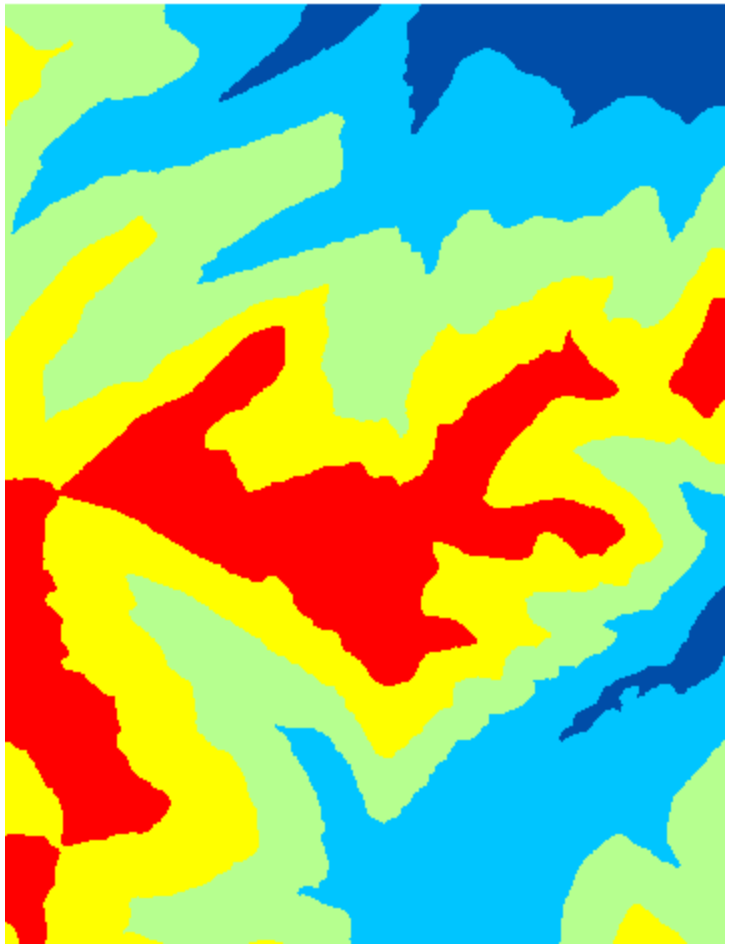
- Floating point or Integer
- Examples: Topography, satellite imagery, distance grids



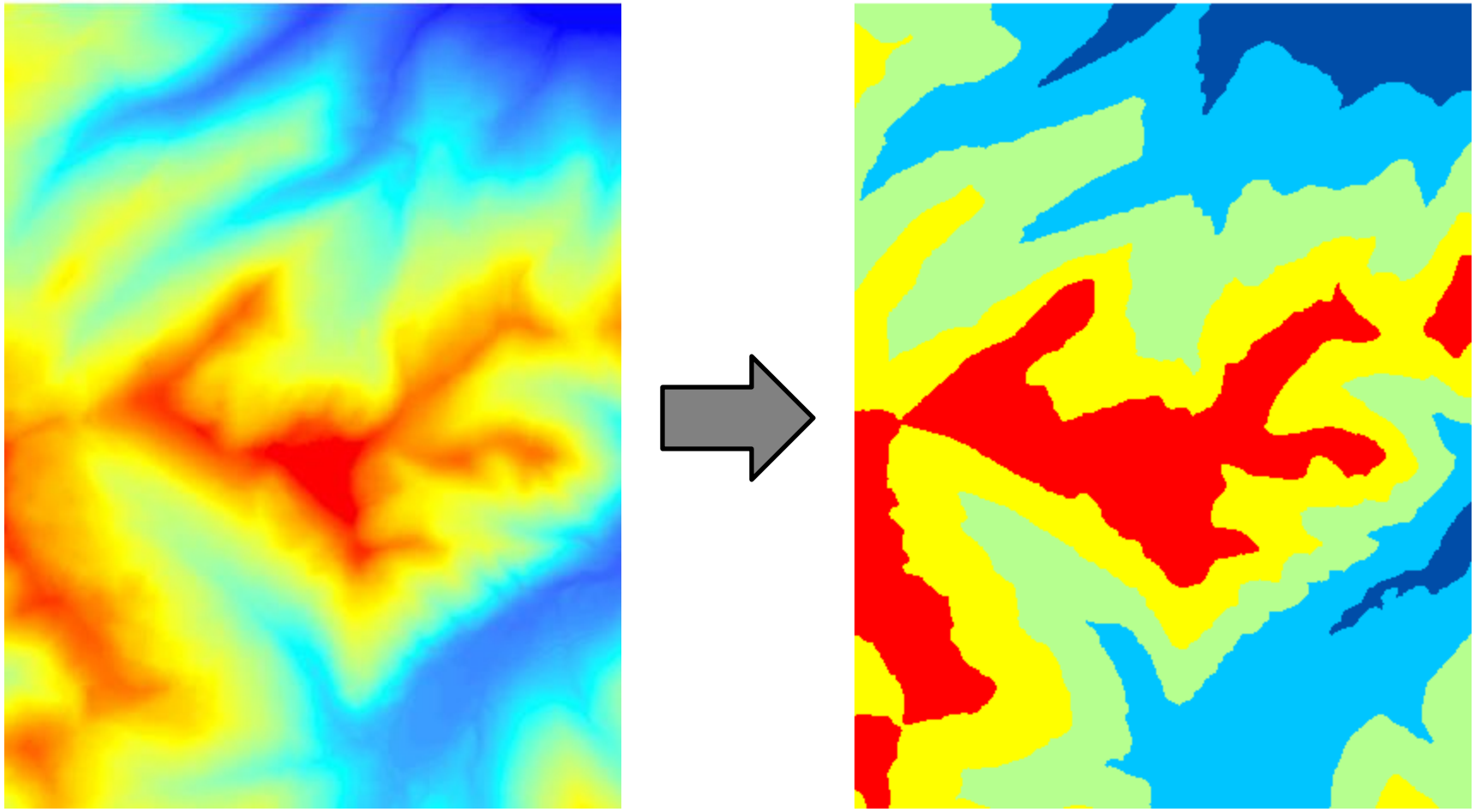
Types of Raster Data

Discrete or Thematic

- Could be binary (1,0)
- Could be limited number of unique values
- Examples: Land cover classification, true/false suitability

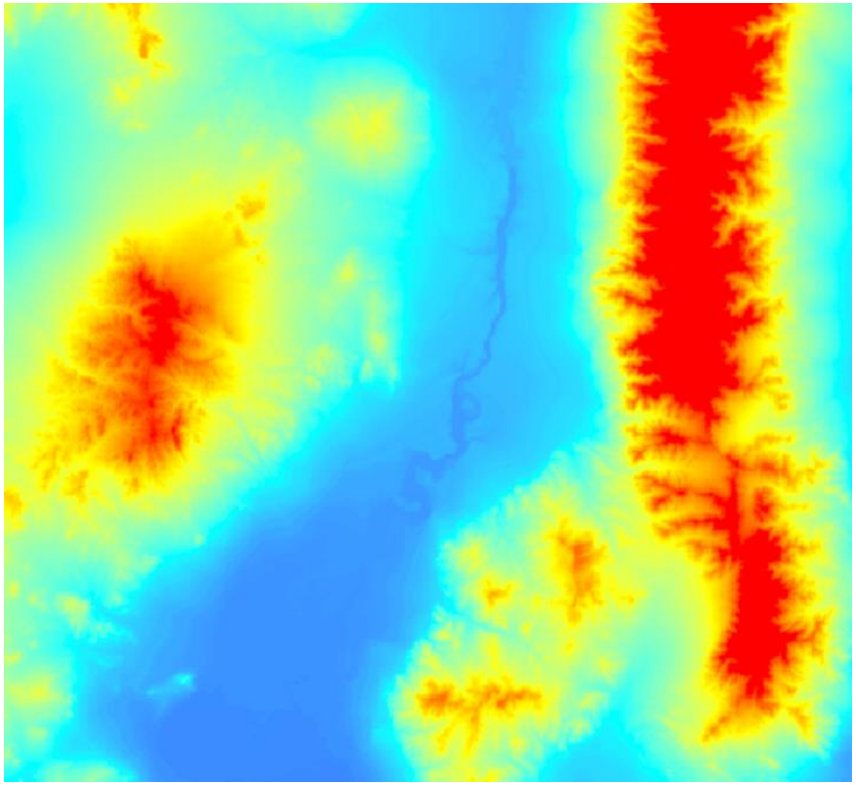


You can always *Reclassify* Continuous to Discrete, but never Discrete to Continuous



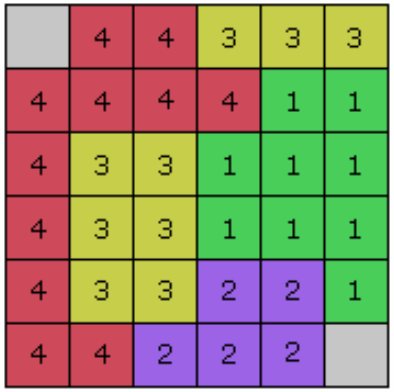
Some Popular Raster Formats

- ESRI Grid
- Geo TIFF
- IMG
- JPEG
- MrSID
- netCDF
- HDF
- USGS DEM



Raster Attribute Tables

- Discrete raster data can have an attribute table
- OID, VALUE, & COUNT fields can not be changed
- You can add fields, calculate fields, & join tables just like with vector data



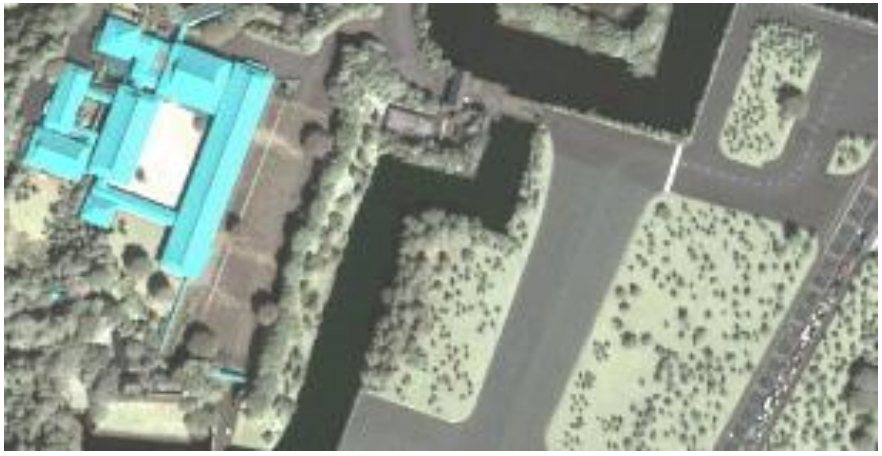
OID	VALUE	COUNT	TYPE	AREA	CODE
0	1	9	Forest land	8100	FL010
1	2	5	Wetland	4500	WL001
2	3	9	Crop land	8100	CL301
3	4	11	Urban	9900	UL040

NoData

Rendering and Symbolizing

- Stretched – continuous data displayed across a gradual ramp of colors

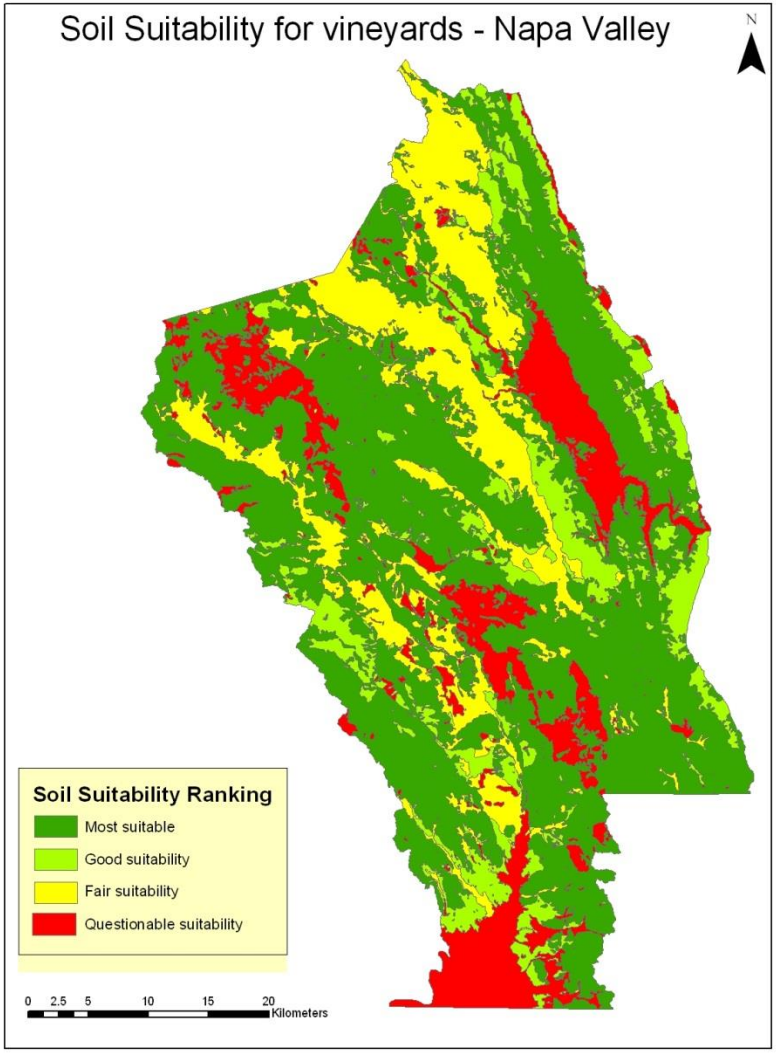
- RGB Composite – multi-band data in three filters



Rendering and Symbolizing

- Classified – displays thematic rasters by grouping cell values into classes

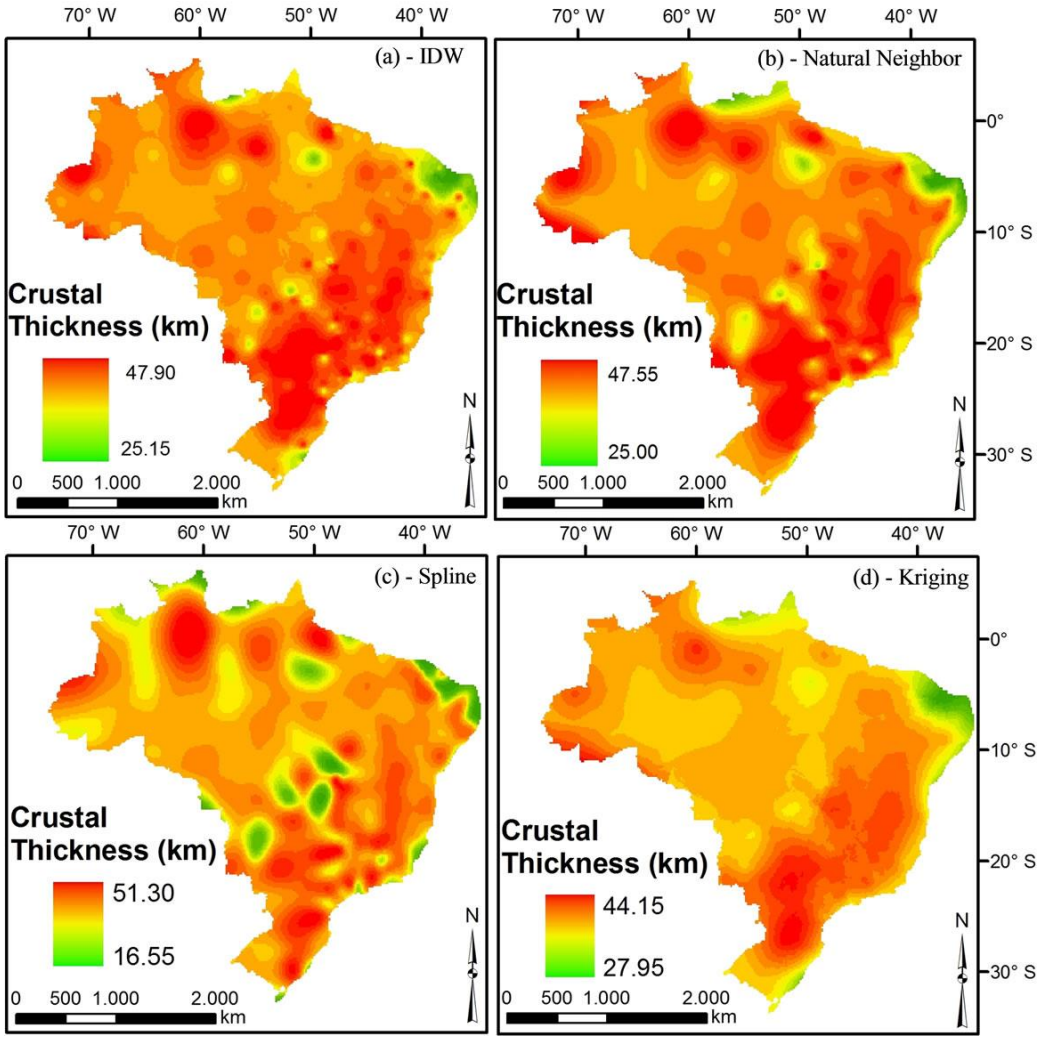
- For example, classifying a range of soil types into “suitable” to “not suitable” for vineyards



Raster Processing Tools in ArcGIS

Create rasters from vectors with Spatial Analyst Tools

- Interpolation
- Density
- Distance
- Polygon to Raster (Data Management Tools)



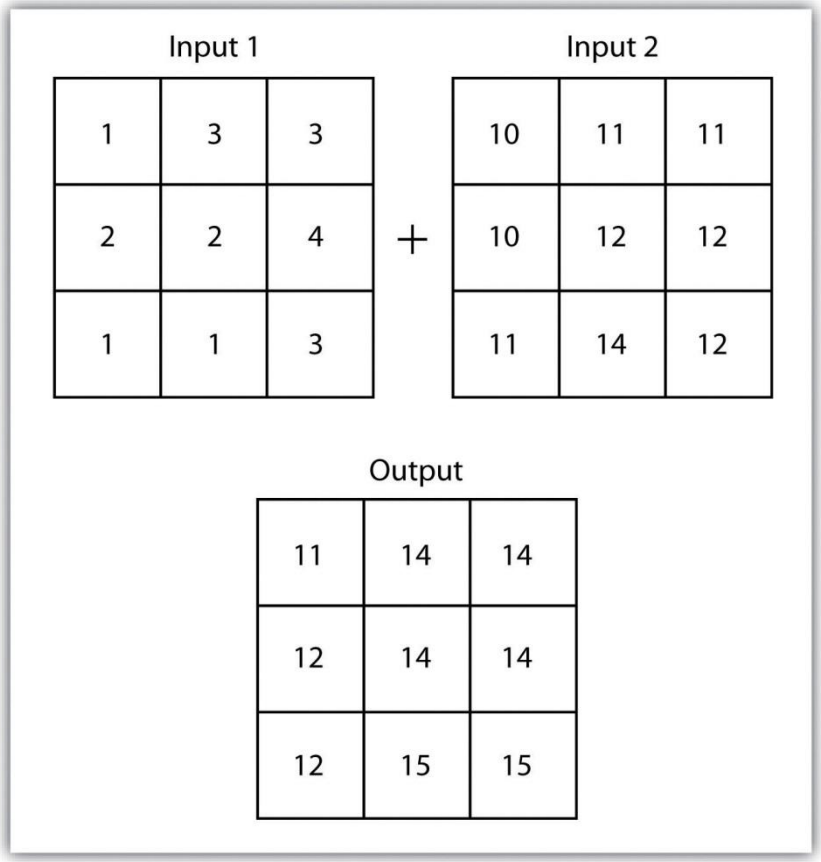
Raster Processing Tools in ArcGIS

Collect raster data with vectors

- Zonal statistics
- Extract values to points

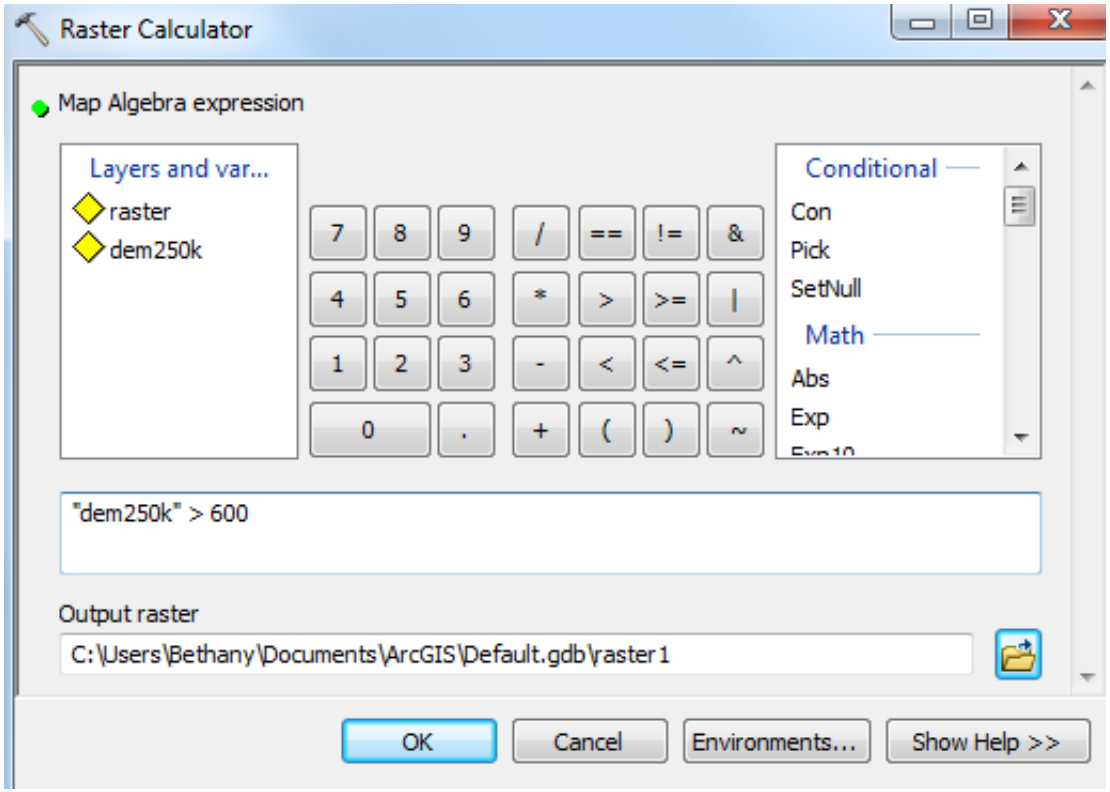
Raster Calculator for Overlay

- Simple Arithmetic
- Algebra
- Geometry



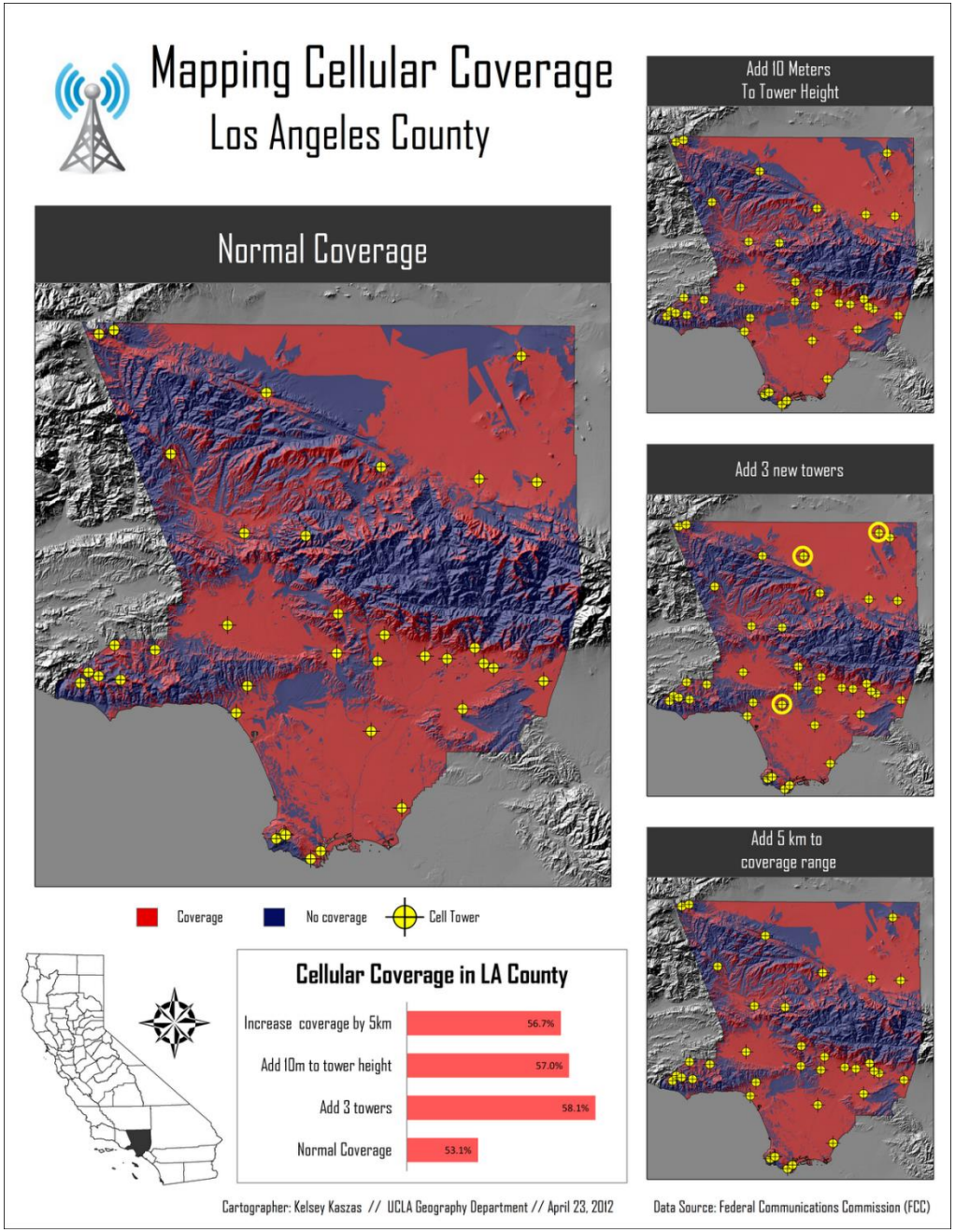
Raster Processing Tools in ArcGIS

For example, create a new grid of elevation greater than 600 m

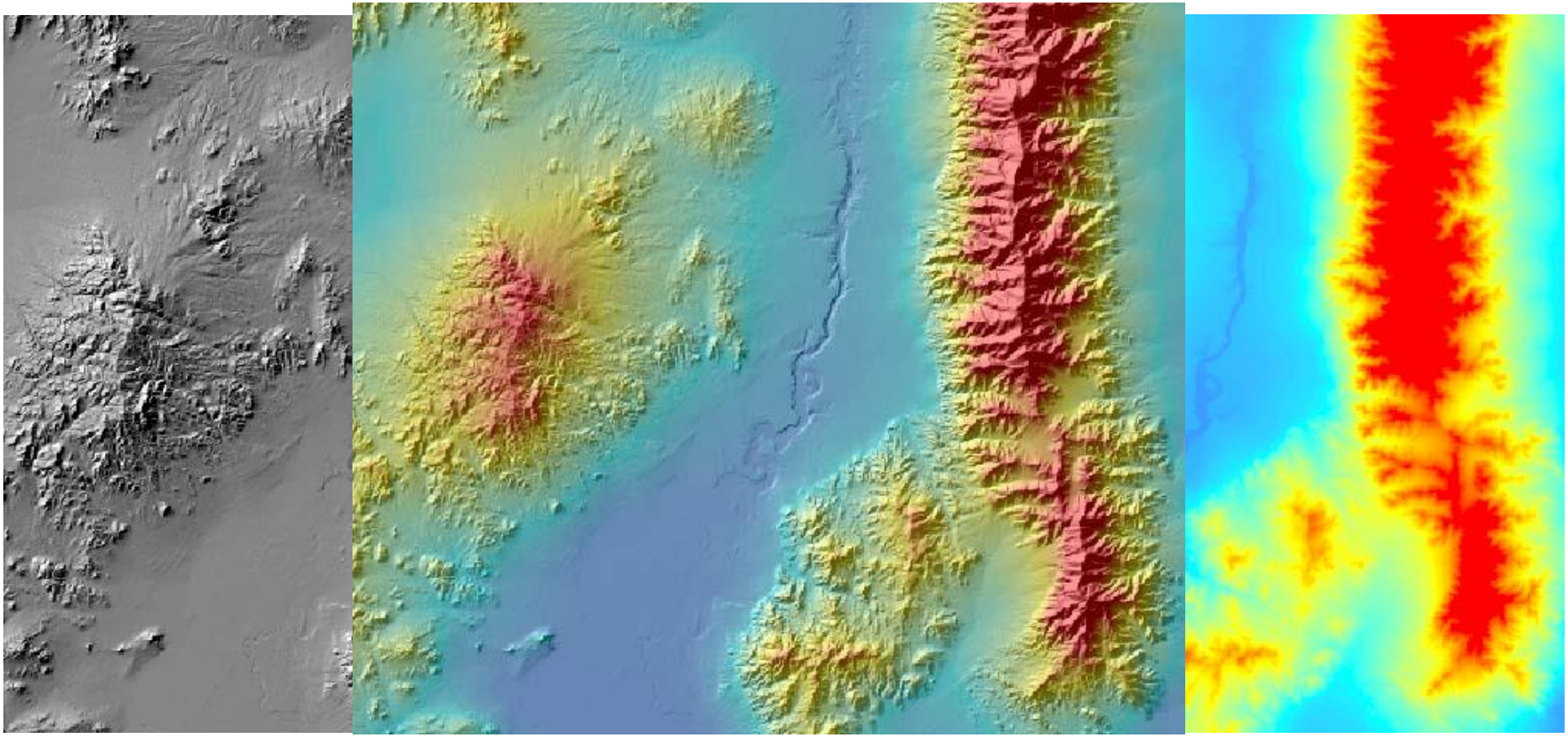


Terrain Analysis

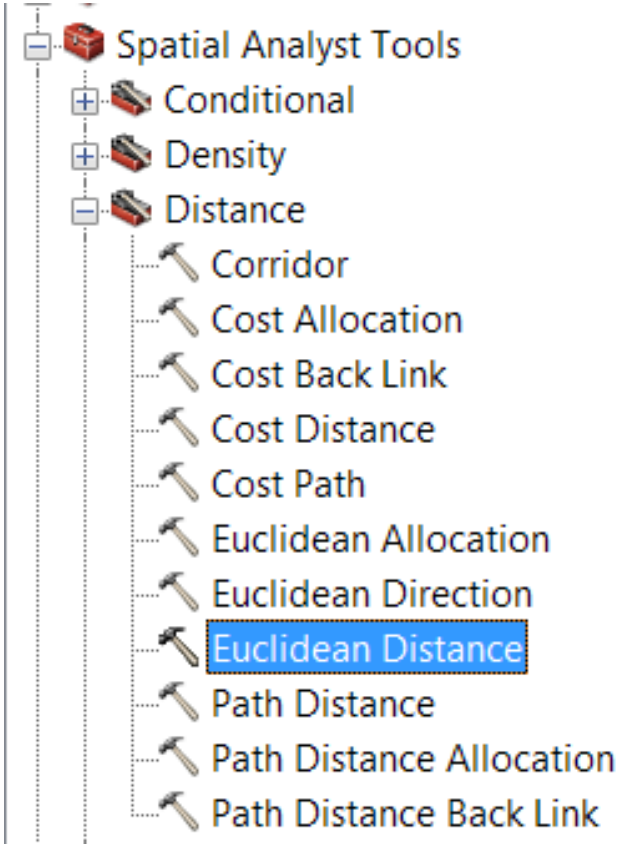
- Slope - degree or percent
- Aspect - slope direction (0- 360˚)
- Viewshed – which cells are visible from point locations
- Catchment – e.g. watersheds
- Flow path - distance of water flow to point

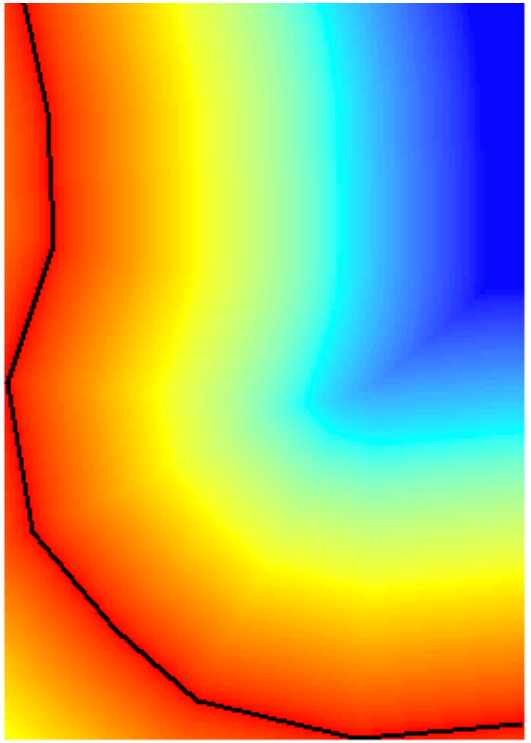


Hillshade for Texture Visualization



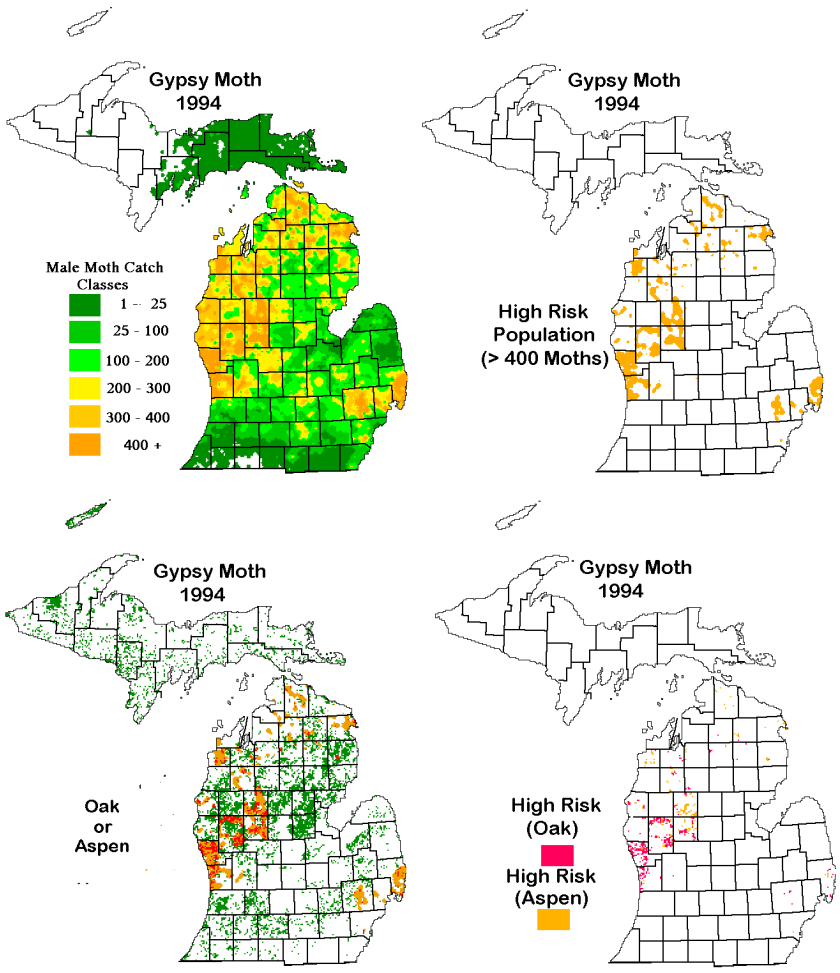
Distance Calculation





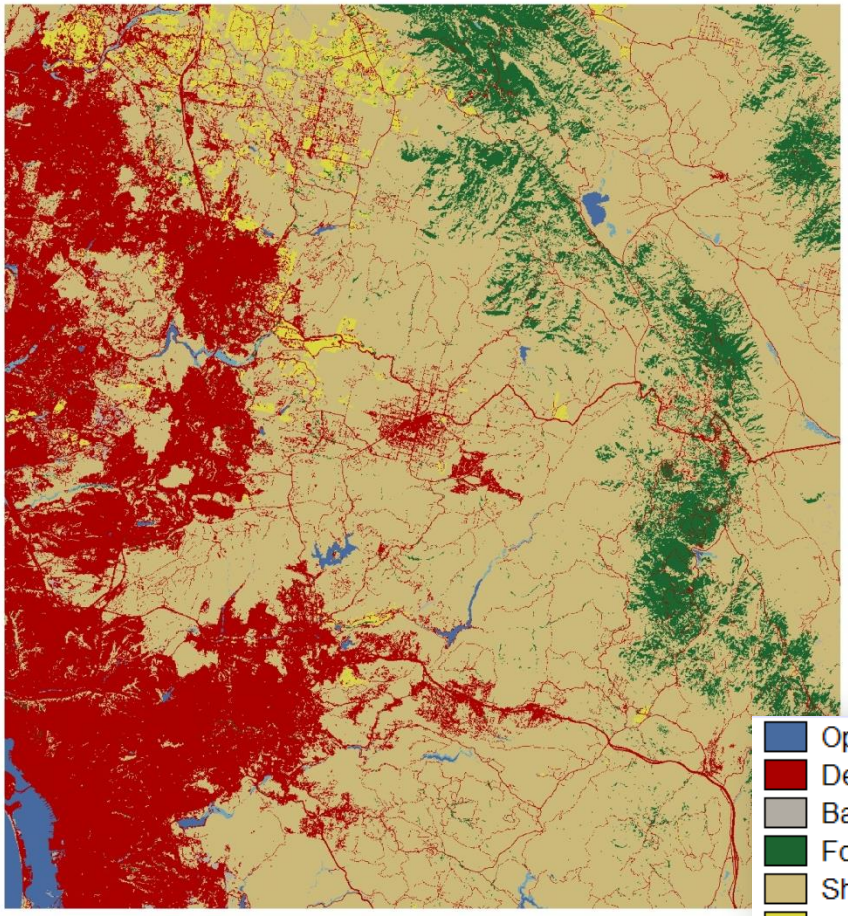
Gypsy Moth Risk in Michigan

Using overlays to identify stands of forest that are at high risk of gypsy moth infestation.

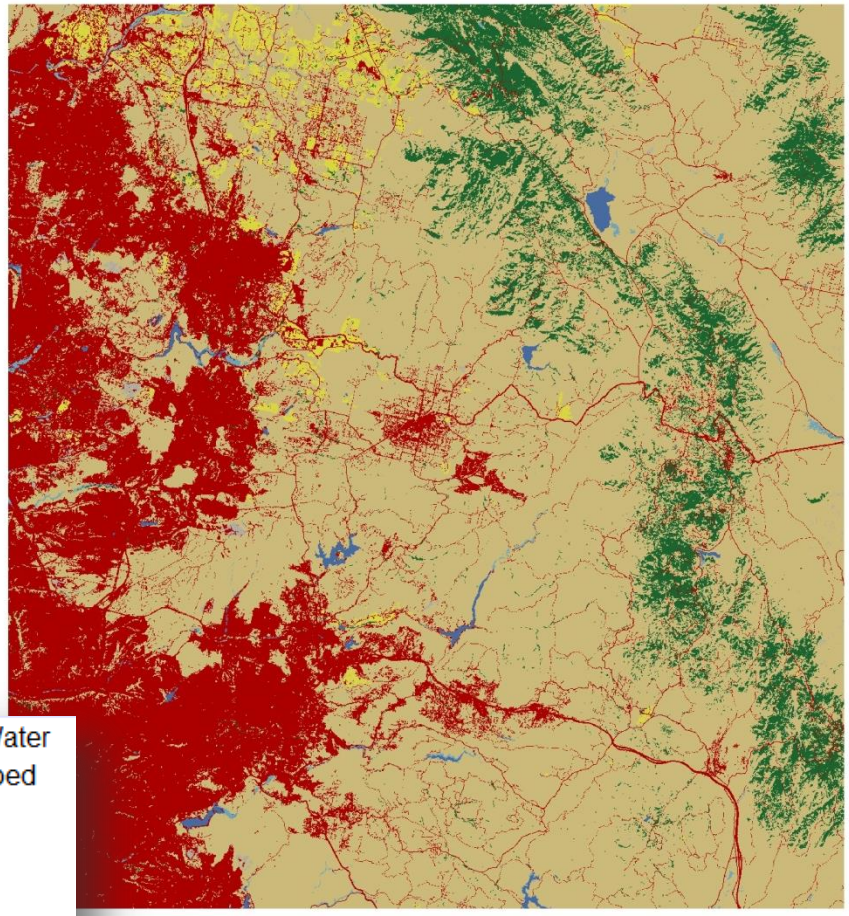


Land Use / Land Cover Change

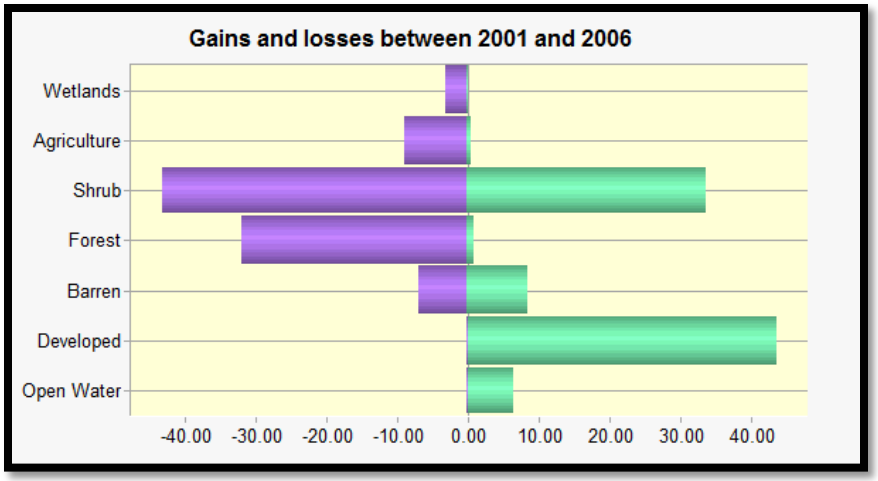
2001

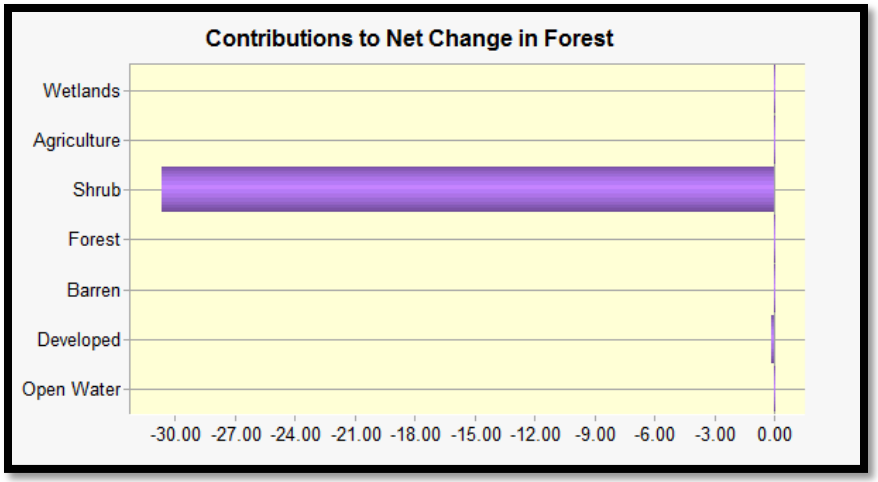


2006



Land Use / Land Cover Change





- Which land covers gained and lost between the time period?
- Which land covers gained or lost to which others?

Multi-Criterion Evaluation (MCE)

- Combining multiple pieces of information to address a research question.
- Variables are put into a similar scale, and can be weighted for importance.
- Raster math is used to create the final output.

Farmland risk index for fracking development in Southwestern Pennsylvania