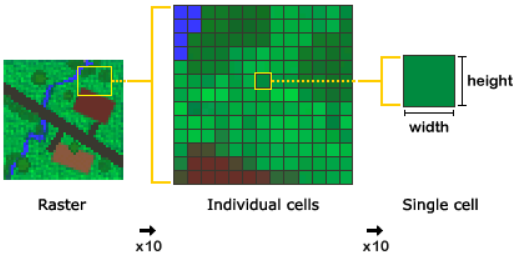
Rasters & Spatial Analyst

USFWS -
GIS Project Design II

Intro to the Raster Data Format

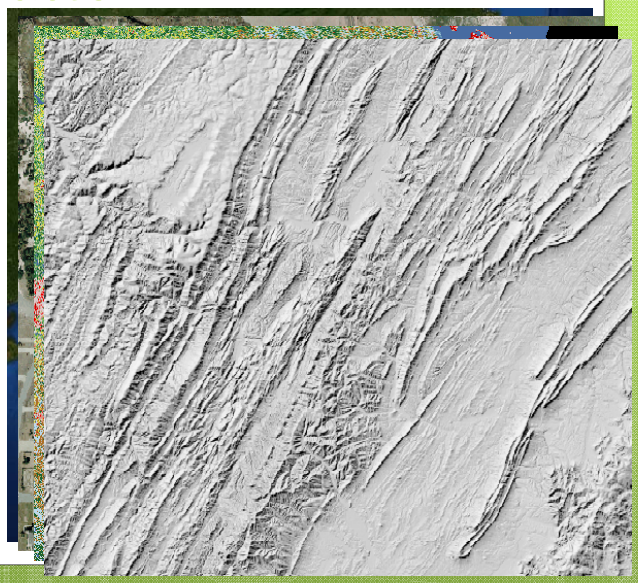
A raster is …

- A matrix of rows and columns of cells who's values represent some set of information
- ArcGIS – Any cell-based dataset that represents geographic features
  - Thematic (discrete)
    - Land-use
    - Vegetation type
  - Continuous
    - Temperature
    - Precipitation



Types of raster

- Satellite Imagery
- Digital Aerial Photographs
- GIS generated data
  - Landcover
  - DEM



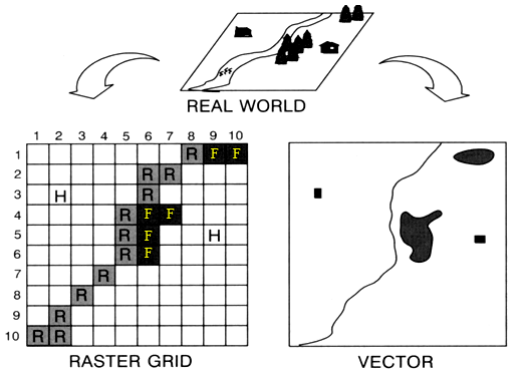
Supported raster formats

55 supported formats listed in 10

- ASCII Grid
- Bil, bip, bsq
- ERDAS Imagine .img
- ESRI Grid
- ENVI .hdr
- MrSID .sid
- .tif, .jpg, .jp2, .gif, .png, .bmp

Uses of raster data

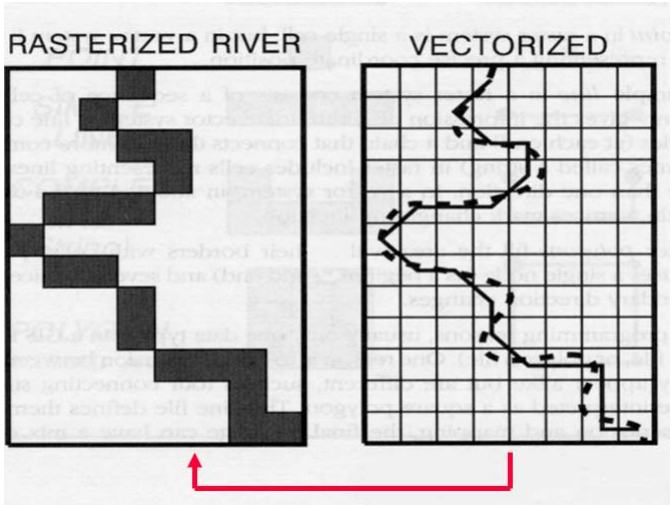
Raster vs. Vector



To raster or not to raster?

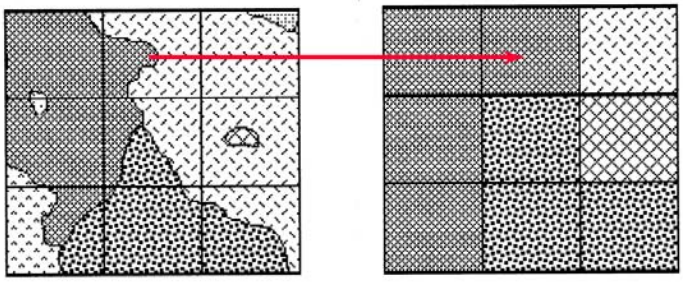
Raster Model	Vector Model
Advantages	**Advantages**
Simple data structure	More compact data structure – smaller file size
Overlay operations are easier & more efficient	More efficient encoding of topology
High spatial variability efficiently represented	Better graphic representation of features
Primary concern is locational relationship of the feature, not the features themselves	
Disadvantages	**Disadvantages**
Less compact – large file size	More complex data structure
Topological relationships more difficult to represent	Overlay operation more difficult
Graphics less aesthetically pleasing	Representation of high spatial variability inefficient

Vector to raster conversion



Vector to raster conversion

Cell Center Assignment

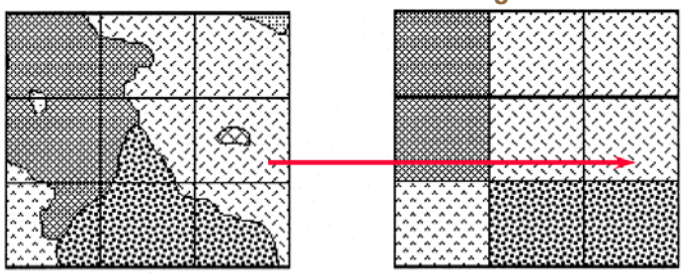


Input vegetation map

Output grid (center of cell)

Vector to raster conversion

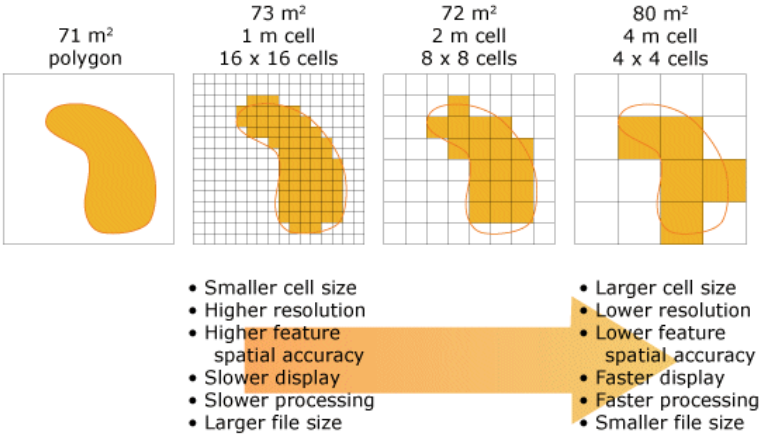
Maximum Area Assignment
Maximum Combined Area Assignment



Input vegetation map

Output grid (majority weighting)

Vector to raster conversion



- Smaller cell size
- Higher resolution
- Higher feature spatial accuracy
- Slower display
- Slower processing
- Larger file size

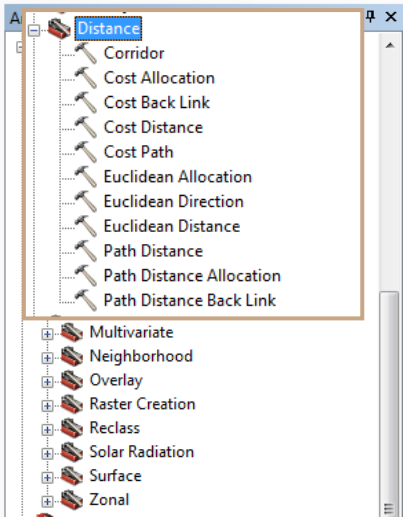
- Larger cell size
- Lower resolution
- Lower feature spatial accuracy
- Faster display
- Faster processing
- Smaller file size

Intro to Spatial Analyst

ArcGIS Spatial Analyst …

- provides a broad range of powerful spatial modeling and analysis capabilities.
- You can:
  - create, query, map, and analyze cell-based raster data;
  - perform integrated raster/vector analysis;
  - derive new information from existing data;
  - query information across multiple data layers;
  - fully integrate cell-based raster data with traditional vector data sources.

ArcGIS Spatial Analyst …



- Today we are only looking at a subset of tools
  - Won't cover 3D tools
  - Won't cover surface tools
- Even leaving out those, we will only skim the surface

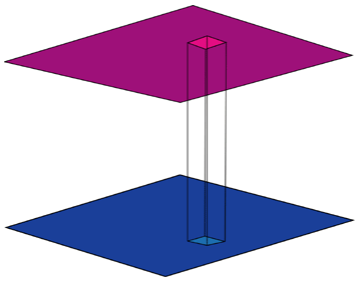
Intro to a few tools using White River Data

Raster Operations

- Local
  - Cell by cell basis (per cell)
- Focal
  - Neighborhood basis
- Zonal
  - Zone basis (same input values)
- Global
  - Entire raster basis
- Application Specific
  - Specific to a dicipline

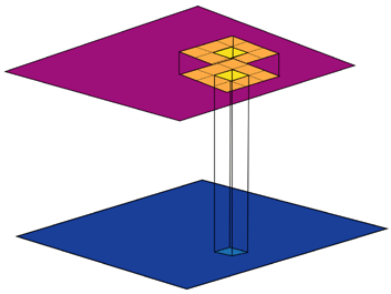
Raster Operations

- Local
  - Cell by cell basis (per cell)



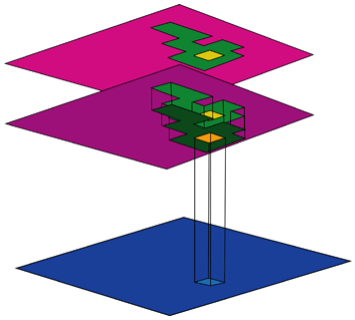
Raster Operations

- Local
  - Cell by cell basis (per cell)
- Focal
  - Neighborhood basis



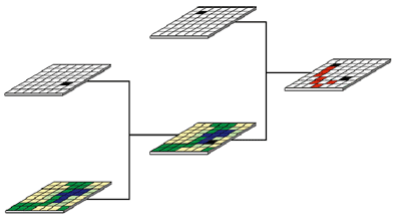
Raster Operations

- Local
  - Cell by cell basis (per cell)
- Focal
  - Neighborhood basis
- Zonal
  - Zone basis (same input values)



Raster Operations

- Local
  - Cell by cell basis (per cell)
- Focal
  - Neighborhood basis
- Zonal
  - Zone basis (same input values)
- Global
  - Entire raster basis



Raster Operations

- Local
  - Cell by cell basis (per cell)
- Focal
  - Neighborhood basis
- Zonal
  - Zone basis (same input values)
- Global
  - Entire raster basis
- Application Specific
  - Specific to a discipline

Demonstration & Exercises Fire Management on St Marks